HITACHI PROGRAMMABLE CONTROLLER

MICRO·EHV

HARDWARE   MANUAL

DRAFT

○ 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 any repair and examination which results in information showing the fault was caused by any of the items mentioned above, the repair and examination cost are not covered. If you have any 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 any 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.

4. About preventive maintenance

⟨!⟩ DANGER
• Do not connect the (+) and (-) of the battery in reverse polarity. Do not recharge, disassemble, heat, place in fire, or short circuit the battery. There is a risk of explosion or fire.

Ⓝ PROHIBITED
• Do not attempt to disassemble, repair or modify any part of the PLC. 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	2021.XX	NJI-589I(X)

MEMO

HARDWARE MANUAL Table of Contents

Chapter 1　Introduction

Thank you for choosing Hitachi Programming Logic Controller (hereinafter referred to as PLC) MICRO-EHV Series.

This manual describes the information you need to use various functions of the MICRO-EHV series. Before using MICRO-EHV, please read this manual carefully.

Also, refer to the related materials listed in Table 1.1.

Table 1.1　List of description materials

Items	Title of material	Manual number*
MICRO-EHV programming	MICRO-EHV PROGRAMMING MANUAL	NJI-590*(X)
MICRO-EHV function	MICRO-EHV USER'S MANUAL	NJI-591*(X)
Programming software	Control Editor INSTRUCTION MANUAL	NJI-537*(X)
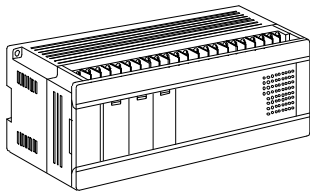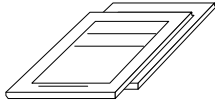
* The last digit of the manual number may change according to an updated version.

1.1　Confirmation of purchase

This product has been manufactured carefully; however, please check the following immediately after your purchasing. If there is anything wrong with your purchased product package, please contact your dealer.

(1) Whether the model is as your order.

(2) Whether the product has no damage.

(3) Whether there are all of bundled items in Table 1.2.

Table 1.2　List of content of MICRO-EHV package

No.	Item name	Model	Appearance	No. of items	Remarks
1	MICRO-EHV	MVH-*64** MVL-*64** MVH-*40** MVL-*40** MVL-*20**		1	
2	Instruction manual*	NJI-595* NJI-595*(X)		1	

* The last digit of the manual number may change according to an updated version.

1.2   Doing after unpacking

(1) Installing Battery

A battery is optional for the MICRO-EHV.

If you want to use a clock function and hold internal data when the power is off, please purchase a battery and connect it to the MICRO-EHV main body.

For battery installation, refer to "Chapter 9 PLC Installation, Loading, Wiring" in this manual.

(2) Initializing User Program

A blinking pattern may be displayed on the OK LED, which indicates a memory error, because the memory is unstable within the MICRO-EHV right after unpacking. After connecting a battery, initialize the memory of the MICRO-EHV (initialize the CPU) before using it.

Reference

The CPU initialization initializes a user program, data memory (internal output), and a part of parameters.

Communication parameters are not initialized.

(3) Communication parameter settings

The communication parameters are set to the factory default, so if they need to be changed, connect the programming tool (*), set necessary parameters, and turn off and then on the PLC.

(The set parameters are memorized in a backup memory. Once they are set, no more setting is required.)

* When connecting a programming tool to the serial communication port or Ethernet port, set the communication of the programming tool to the default values described in the next page. For the USB port, setting parameters is not required.

Table 1.3   Communication parameters (factory default)

No.	Parameter			Factory default
1	IP address	IP address		192. 168. 0. 1
		Subnet mask		255. 255. 255. 0
		Default gateway		0. 0. 0. 0
		Link Speed / Duplex		Auto Negotiation
2	NTP	Enable/Disable		Disable
		Timezone		GMT + 09:00
3	Serial communication setting	Programming/General purpose		Programming
		Port type		RS-232C
		Baudrate		38.4 kbps
		Protocol		Procedure 1 (1:1)
4	Ethernet communication setting (Task code)	Port 1	Enable/Disable	Enable
			Port No.	3004
			Protocol	TCP/IP
		Port 2	Enable/Disable	Enable
			Port No.	3005
			Protocol	TCP/IP
		Port 3	Enable/Disable	Enable
			Port No.	3006
			Protocol	TCP/IP
		Port 4	Enable/Disable	Enable
			Port No.	3007
			Protocol	TCP/IP
		Timeout (sec.)		30
5	Ethernet communication setting (ASR)	Port 1 Enable/Disable		Disable
		Port 2 Enable/Disable		Disable
		Port 3 Enable/Disable		Disable
		Port 4 Enable/Disable		Disable
		Port 5 Enable/Disable		Disable
		Port 6 Enable/Disable		Disable
6	Modbus-TCP/RTU setting	Port No.		502
		Gateway Enable/Disable		Disable
		Ethernet timeout ($\times 10$ ms)		3000
		Serial communication baudrate		38.4 kbps
		Serial communication format		8-E-1
		Serial communication timeout ($\times 10$ ms)		100

(4) Setting Clock Data (When Using Clock Function)

When the power is turned on after unpacking (or after the unit is left for a long time with a battery unconnected), the time of the clock data is updated from the initial value. To use the clock function, set the clock data with the programming tool after a battery is attached.

For the clock setting, refer to "Chapter 9 PLC Installation, Loading, Wiring" in this manual.

Reference

The initial value of the clock is 00:00:00, Saturday, January 1, 2000.

1.3   About manuals

Dedicated instruction manuals for MICRO-EH series expansion units have been issued.

For further details, refer to the expansion units instruction manuals described in Table 1.4.

Table 1.4   MICRO-EH expansion unit-related instruction manual (1 / 2)

Item name	Model	Type	Instruction manual No.*1	
			Japanese	English
64-point expansion unit	EH-A64EDR	AC power supply, DC input 40 points, Relay output 24 points	NJI-522*	NJI-522*(X)
	EH-D64EDR	DC power supply, DC input 40 points, Relay output 24 points		
	EH-D64EDT	DC power supply, DC input 40 points, Transistor output 24 points (sink)		
	EH-D64EDTPS	DC power supply, DC input 40 points, Transistor with short circuit protection output 20 points (source), Transistor output 4 points (source)		
28-point expansion unit	EH-A28EDR	AC power supply, DC input 16 points, Relay output 12 points	NJI-419*	NJI-419*(X)
	EH-D28EDR	DC power supply, DC input 16 points, Relay output 12 points		
	EH-D28EDT	DC power supply, DC input 16 points, Transistor output 12 points (sink)		
	EH-D28EDTP	DC power supply, DC input 16 points, Transistor output 12 points (source)		
	EH-D28EDTPS	DC power supply, DC input 16 points, Transistor with short circuit protection output 12 points (source)		
14-point expansion unit *2	EH-A14EDR	AC power supply, DC input 8 points, Relay output 6 points	MICRO-EH Application Manual NJI-349*	MICRO-EH Application Manual NJI-350*(X)
	EH-D14EDR	DC power supply, DC input 8 points, Relay output 6 points		
	EH-D14EDT	DC power supply, DC input 8 points, Transistor output 6 points (sink)		
	EH-D14EDTP	DC power supply, DC input 8 points, Transistor output 6 points (source)		
	EH-D14EDTPS	DC power supply, DC input 8 points, Short circuit protection output 6 points (source)		
16-point expansion unit	EH-D16ED	DC power supply, DC input 16 points	NJI-467*	NJI-467*(X)
	EH-D16ER	DC power supply, Relay output 16 points		
	EH-D16ET	DC power supply, Transistor output 16 points (sink)		
	EH-D16ETPS	DC power supply, Transistor with short circuit protection output 16 points (source)		
8-point expansion unit	EH-D8ED	DC power supply, DC input 8 points		
	EH-D8ER	DC power supply, Relay output 8 points		
	EH-D8ET	DC power supply, Transistor output 8 points (sink)		
	EH-D8ETPS	DC power supply, Transistor with short circuit protection output 8 points (source)		
	EH-D8EDR	DC power supply, DC input 4 points, Relay output 4 points		
	EH-D8EDT	DC power supply, DC input 4 points, Transistor output 4 points (sink)		
	EH-D8EDTPS	DC power supply, DC input 4 points, Transistor with short circuit protection output 4 points (source)		

*1   The end alphabet (one character) of the manual No. indicates the version. The first version is indicated with a space.
*2   For a 14-point expansion unit, refer to the MICRO-EH Application Manual.

Table 1.4   MICRO-EH expansion unit-related instruction manual (2 / 2)

Item name	Model	Type	Instruction manual No.*1	
			Japanese	English
Analog expansion unit	EH-A6EAN	AC power supply, 4ch input, 2ch output	NJI-424*	NJI-424*(X)
	EH-D6EAN	DC power supply, 4ch input, 2ch output		
RTD expansion unit	EH-A6ERTD	AC power supply, 4ch input, 2ch output	NJI-453*	NJI-453*(X)
	EH-D6ERTD	DC power supply, 4ch input, 2ch output		
	EH-A4ERTD	AC power supply, 4ch input		
	EH-D4ERTD	DC power supply, 4ch input		
Thermocouple expansion unit	EH-D6ETC	DC power supply, 4ch input, 2ch output	NJI-515*	NJI-515*(X)
	EH-D4ETC	DC power supply, 4ch input		

*1 The end alphabet (one character) of the manual No. indicates the version. The first version is indicated with a space.

1.4   Control Editor compatibility

Control Editor which is the programming software for MICRO-EHV is updating according to the modification of MICRO-EHV. If you use the old version of Control Editor, you may not be able to make the program for MICRO-EHV or you cannot use new additional function.

We recommend always using the latest version of Control Editor.

Table 1.5   Function correspondence table

MICRO-EHV Firmware version	Control Editor Recommended version	Main additional function
~ Ver.x102	Ver.4.01 or newer	
Ver.x104	Ver.4.02 or newer	Analog expansion unit, Special I/O (Pulse, PWM output), Modbus communication
Ver.x105	Ver.4.13 or newer	Analog option board
Ver.x106		Added commands. (OMST1, OCTP1, etc.)
Ver.x107		UDP/IP can be used in Ethernet communication (ASR).
Ver.x108		UDP/IP can be used in Ethernet communication (Hitachi dedicated protocol). Backup values of specific data memory without battery.
Ver.x109	Ver.4.20 or newer	Data logging, Analog output option board.
Ver.x110		Modified Ethernet communication.
Ver.x120	Ver.5.00 or newer	Simple positioning function
Ver.x121		
Ver.x122		
Ver.x123		
Ver.x124		
Ver.x125		
Ver.x126	Ver.7.10 or newer	HSDL communication, Insulated analog option board, Insulated RTD option board.

Caution

- Control Editor Ver.3.xx or older does not support MICRO-EHV series. If you want to make the program for MICRO-EHV, please prepare the Control Editor Ver.4.01 or newer.

Chapter 2　Features

2.1　Features

Multifunctional all-in-one type PLC

The MICRO-EHV is a multifunctional all-in-one type PLC which comprises an input/output section, a power supply section, and a CPU section in one unit. Two sizes of 64-point and 40-point are available. Both sizes allow to use MICRO-EH series expansion units (positioning excluded) and up to 4 levels of expansion units can be connected. The maximum 320 I/O points (64-point input/output basic unit + 4 units of 64-point input/output expansion unit used) allow to control wide-ranging systems from small scale systems to medium scale systems.

Simplified positioning with counter input and pulse-train output

The I/O functions can be selected from various modes. Selecting a mode allows setting I/O used as normal input/output to a counter input and a pulse-train output; therefore, combining these special input/output allows simplified positioning with a counter input and pulse-train output without a special module preparation.

Superior compatibility with upper series

The MICRO-EHV is of the EHV series family.

The MICRO-EHV allows program creation/debug in the same way as the EHV series.

Compact size and stylish body fits for embedded control

The 64-point basic unit has realized downsizing of 195 mm (7.68 in) (W) x 90 mm (3.54 in) (H) x 76 mm (2.99 in) (D). With the smart design, contribute miniaturization of assembling machine and equipment, space-saving improve, and the image up.

Dimension: mm (in.)
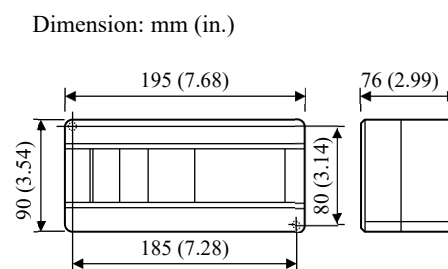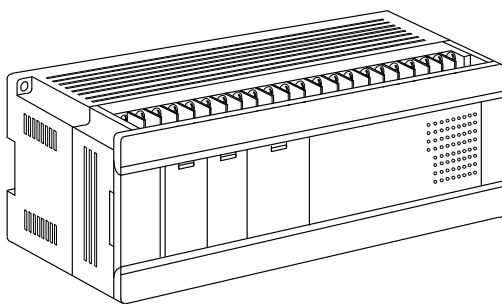
Good design for maintenance when being built into other devices

DIN rail installation by snapping
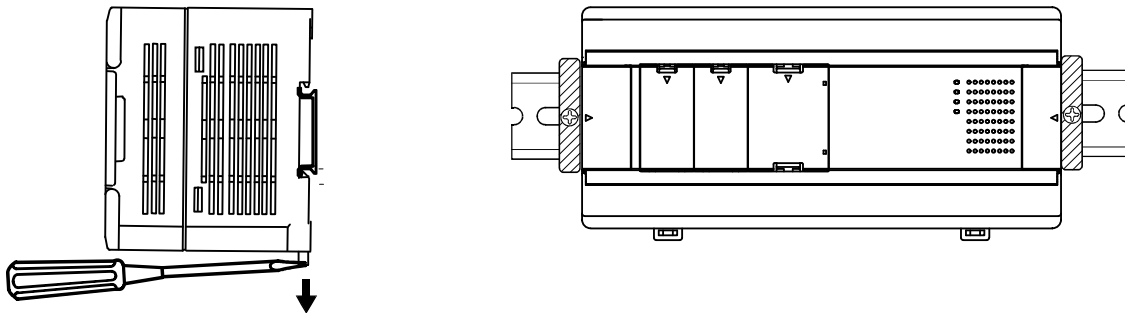
Using a flash memory to protect a user program from consumption of a battery

Battery maintenance from the front

Data memory can be backed up using a battery.

The battery can be replaced from the front of the basic unit.
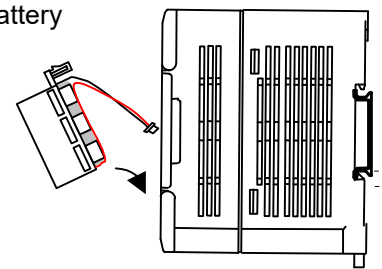
Fixed address system easy to recognize I/O No.

The fixed address system is adopted with which the input/output number is decided for each unit. Change of the input/output unit does not have an influence on other units at all. The input/output number tells a mounting position, which makes maintenance easy.

MICRO-EHV basic unit with 3 kinds of communication ports as standard

(1) USB communication port
A communication port for a universal serial bus is mounted as standard, which is the most common type for PCs. This is a maintenance port only for programming software. Programming software can be used even with a notebook PC without an RS-232C serial port. USB2.0 Full Speed is supported. Directly connecting to a USB port of a PC drastically reduces time to transfer a program.

(2) Serial communication port
A serial port (RS-232C) is also mounted like a conventional MICRO-EH series. A dedicated procedure and a general-purpose communication is supported.

(3) Ethernet port (High functional model: MVH)
An equivalent function to the Ethernet communication module (4 dedicated procedure connections and 6 messages communications) is mounted.
Supporting a network can be realized. 100-BASE-TX is supported.
When a communication failure occurs, reset can be executed from an internal output for each logical port (10 ports).

Power failure memory function

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

Comment storage function

A program comment is stored in another area than a program storage area. Maintenance of a user program is possible including a comment without carrying comment data.

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

	1	2	3	4	5	6	7	8	9	10	11	12
1	The value of the analog Ch1 is stored in the internal output while the startup Sw is on.											
2	R0 — Startup Sw									Analog Ch1 value stored / WR0 = WX0		

I/O comment   Circuit comment   Box comment
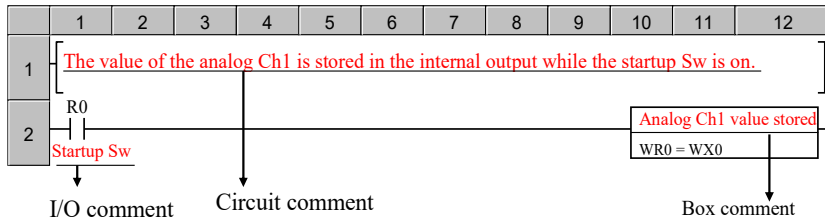
Program conversion support tool to protect program assets

A support tool is provided to convert a ladder program created by the LADDER EDITOR into a project file of the Control Editor. Conventional program assets can be used.

(I/O comments can be read with a CSV format file.)
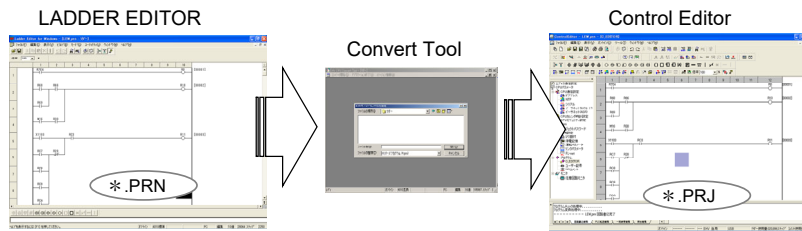
* After converting by a convert tool, some commands require manual conversion. For details, refer to the instruction manual of the Control Editor.

Supporting sheet structure for user program

A program sheet structure is supported which makes management, diversion, combination, and division of a program easy.
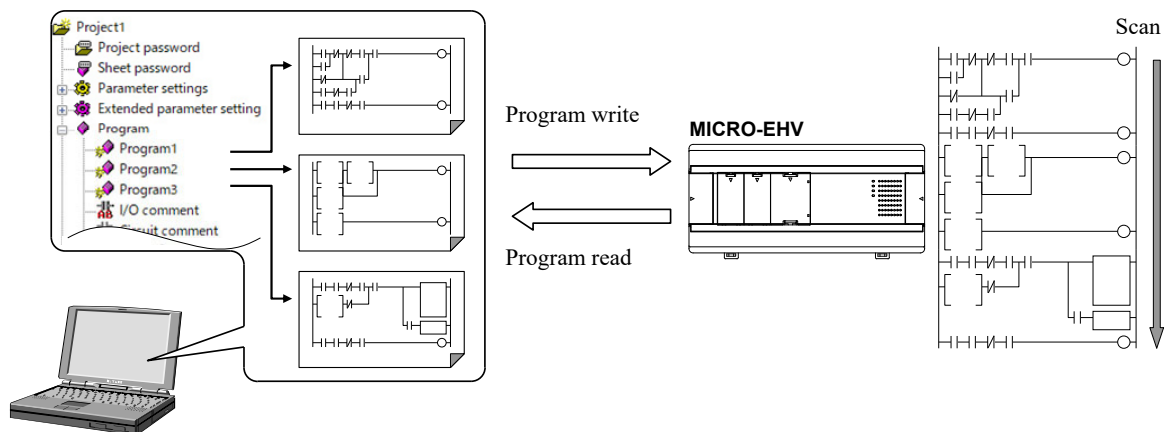
Four fixed-cycle programs

Separately from a program executed normally, up to four fixed-cycle scan programs can be created which are executed incorporating a normal program every fixed time. The cycle can be specified between 5 to 60,000 ms. The shorter the set cycle is, the higher the priority to be executed is.

Normal scan image   Fixed-cycle scan image
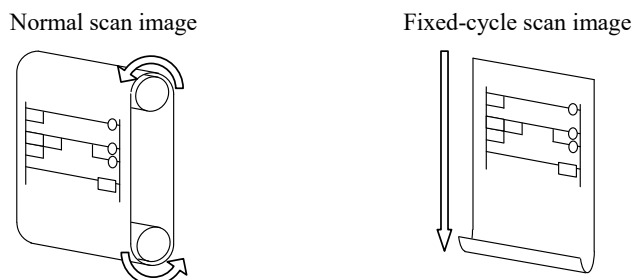
Calendar clock function

A real-time clock is mounted. A calendar function for a date (year / month / day), day of the week, and

time (hours / minutes / seconds) can be used by connecting a battery.

The calendar clock can be set easily from PC by using programming software.

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

Calendar clock setting   NTP setting
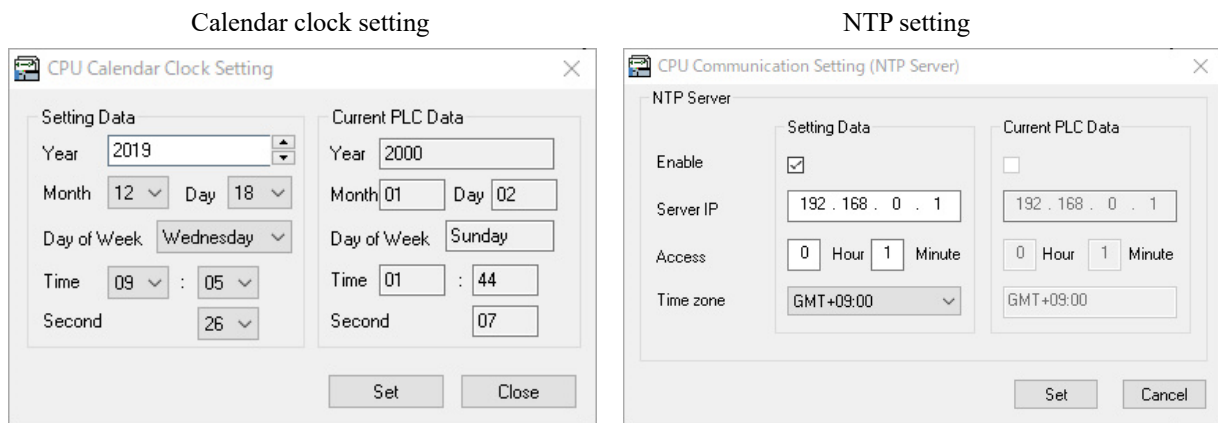
Task code communication

A dedicated procedure communication in Hitachi PLC is called a Task code communication. CPU control (occupation release, status read, etc.) and the read/write of I/O can be executed from a host. Sales manufacturers provide drivers for this Task code communication, such as a HMI and HMI software. Hitachi PLC supporting items do not require special communication program creation.
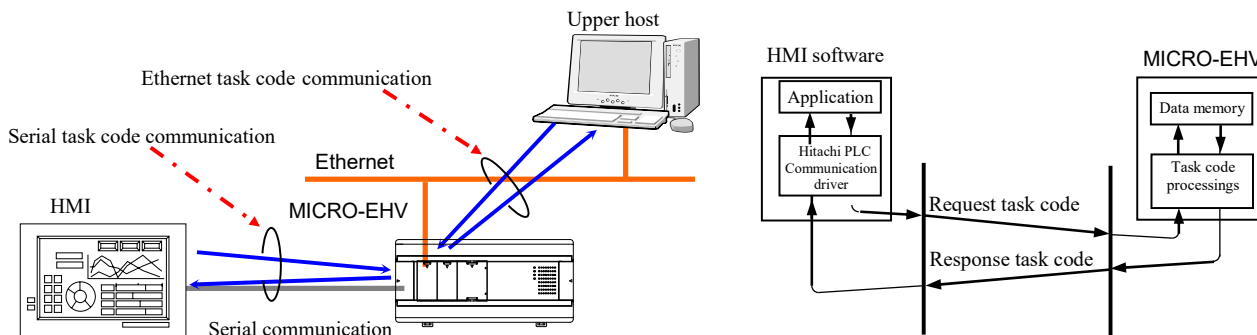
Serial communication port for general-purpose communication

A serial communication port can be used as a general-purpose communication port which can be controlled by a user program. Various settings for communication and processing for transmitting and receiving can be created with the user program according to external devices.
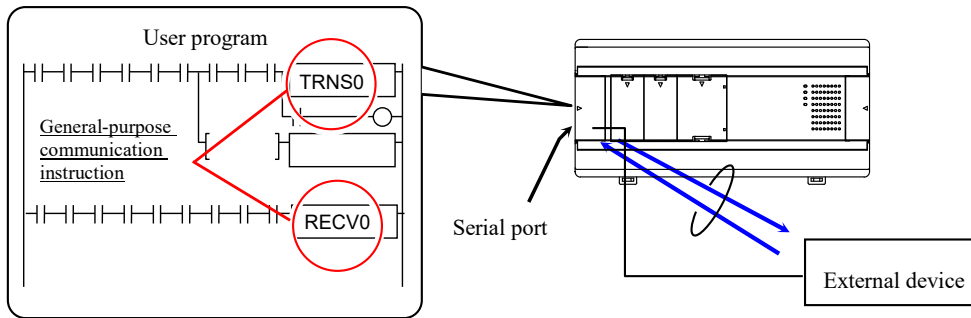
Ethernet port for ASR communication

The ASR communication function can be used for the event transmitting function which transmits data from the MICRO-EHV 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 six connections and the communication method can be specified respectively. Communication with the upper host is available with the minimum settings.

When a communication failure occurs, communications can be recovered without stopping the operation of MICRO-EHV because each logical port can be initialized respectively.
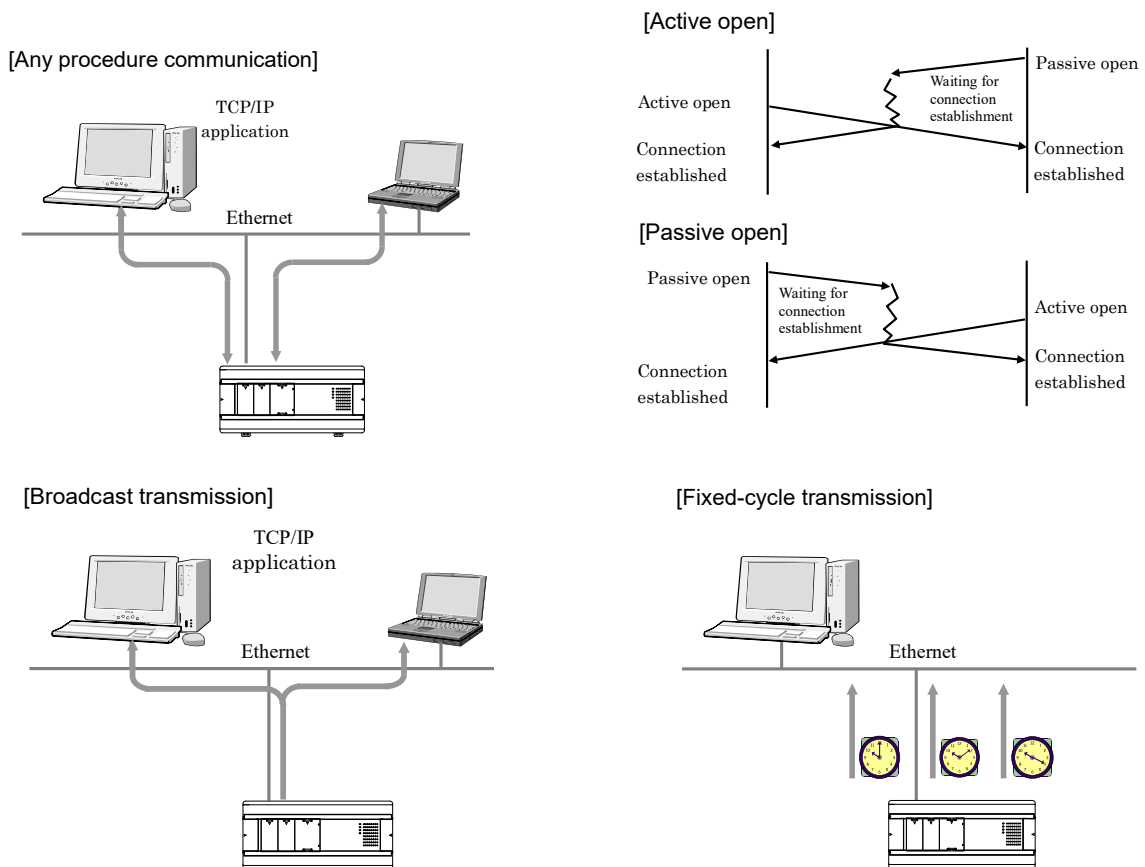
2.2　System configuration

(1) Single system

The MICRO-EHV is an all-in-one type programmable controller whose basic configuration is as follows.
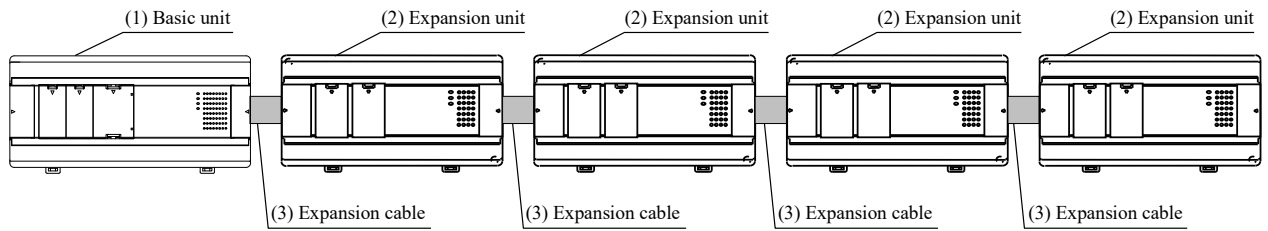
Figure 2.1 MICRO-EHV system configuration diagram

No.	Device name	Description of feature
(1)	Basic unit	Input data are imported, operations are executed according to the user program, and outputs are controlled.
(2)	Expansion unit	External input/output expansion unit
(3)	Expansion cable	A cable to connect between the basic unit and the expansion unit and between expansion units each other

* Use the cable so that the maximum interval between units is 1 m (3.28 ft.) and the maximum total length is 2 m (6.56 ft.) .

(2) Network system

The network system shown in the figure below can be constructed using the option board of the MICRO-EHV.
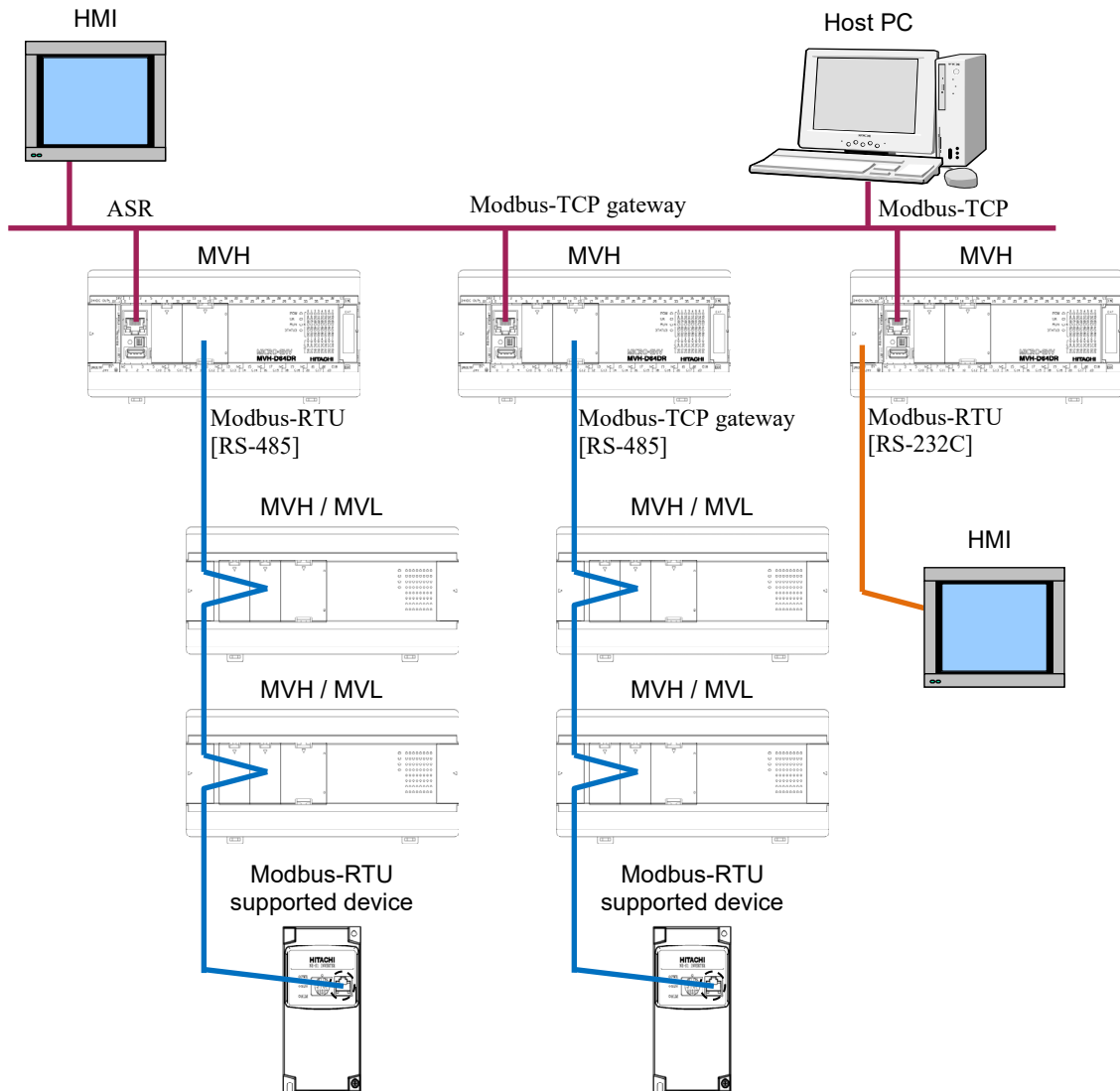
Figure 2.2 MICRO-EHV network system

Chapter 3　Specifications

3.1　General specifications

Item	Specification	
Power source type	AC	DC
Power source voltage	100/110/120 V AC (50/60 Hz) 200/220/240 V AC (50/60 Hz)	24 V DC
Power source voltage fluctuation range	85 to 264 V AC wide range	19.2 to 30 V DC
Allowable instantaneous power failure	85 to 100 V AC: For an instantaneous power failure of less than 10 ms, operation continues 100 to 264 V AC: For an instantaneous power failure of less than 20 ms, operation continues	19.2 to 30 V DC: For an instantaneous power failure of less than 10 ms, operation continues
Use ambient temperature	0 to 55 °C	
Storage ambient temperature	-10 to 75 °C	
Use ambient humidity	5 to 95 % RH (No condensation)	
Storage ambient humidity	5 to 95 % RH (No condensation)	
Pollution level	Pollution level 2 (IEC 61131-2)	
Use altitude/atmospheric pressure	2,000 m (6561.7 ft) or less elevation(Atmospheric pressure on transportation: 70 kPa or higher)	
Vibration resistance	Conforms to IEC 60068-2-6	
Impact resistance	Conforms to IEC 60068-2-27	
Noise resistance	Conforms to IEC 61131-2 Noise voltage 1,500 Vpp Noise pulse width 100 ns, 1 μs (Noise created by a noise simulator is applied across power supply terminals. This is determined by our measuring method.) Electrostatic noise voltage 3,000 V (Applied to exposed metal parts)	
Insulation resistance	20 MΩ or more between the power supply terminal and case ground (FE) terminal (measure with 500 V DC insulation resistance meter)	
Voltage resistance	1,500 V AC for one minute between the power supply terminal and case ground (FE) terminal	
Grounding method	Class D dedicated grounding	
Usage environment	No corrosive gases, no organic solvent attachment, no excessive dust	
Structure	Installation to open wall	
Installation direction	Vertical	
Installation fixing method	Fixing method: Direct installation (M4 screw) or DIN rail installation	
Cooling	Natural air cooling	

3.2   Function specifications
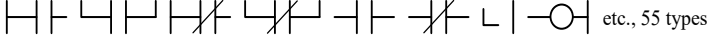
Functions of the MICRO-EHV are described in the table below.

No.	Item	Description of function
1	Basic function	Constructing a system using this PLC allows to realize functions below. 1. An input signal is imported from a control target, a calculation is carried out according to a program made by a user, and the result is output as a output signal. Also, the calculation result and information during the calculation can be held in an internal output area. 2. The operation of 1. is continued after the main unit is powered to start running until the power is cut or the running is stopped. 3. Information items held internally can be taken from a device connected externally and can be set to other information items. Also, these information items are initialized when the running is started; however, they can be held by user settings. 4. The operation status can be confirmed with an LED display of each unit and with external devices connected.
2	Setting and display	The following functions are included to allow a user to set and confirm various operation statuses. 1. RUN/STOP switch (Basic unit) Allows to instruct run/stop. 2. DIP switch (Basic unit) Allows to set an USB host function. (Only the High Function model supports) 3. LED display (Basic unit, expansion unit) Displays the power status, running status, and input/output operation status. 4. Communication connector (Basic unit) Allows connection with external devices with RS-232C, RS-485, USB, and Ethernet. (RS-485 is supported only when the option board is implemented, and Ethernet is supported only for the High Function model.) 5. Expansion connector (Basic unit, Expansion unit) Allows an external input/output expansion. 6. Terminal block (Basic unit, Expansion unit) Allows connections for power source and signal exchange with a control target.
3	Number of I/O points	The following are controllable numbers of points for a control target. 1. External input/output The number of points available for external I/O depends on the basic unit. Up to four expansion units can be connected. In I/O numbers, X, WX, and DX represent inputs, and Y, WY, and DY represent outputs. 2. Internal output There is an area to store information temporarily. There are M, WM, DM, R, WR, and DR for I/O numbers. 3. Timer/counter A timer/counter is available internally. 4. Array (Only an assignment expression supported) An array representation is available with I/O numbers with brackets (( )) attached.
4	User program memory	A program with descriptions of control details can be stored. This is a FLASH memory in the basic unit. 1. Even when the power is off, this memory holds the content. Therefore, right after the unit is purchased, the memory may be unstable and initialization is required. 2. For programming, the programming software (Control Editor) for the EHV/MICRO-EHV series programmable controller is used. 3. Instructions can be used which are specified with the ladder for the MICRO-EHV series. For details, refer to the list of instructions. 4. A battery is unneeded to retain the content of a user program. Just in case, never fail to store the created program in an external memory medium.

No.	Item	Description of function
5	Control method	This PLC collectively converts a user program when it starts running and sequentially reads and executes the program after conversion. 1. The I/O data (information) takes a method where they are scanned (executed for the program from the top to the end) and then updated collectively (a refresh method). If external I/O update is needed during scanning, use the refresh instruction. 2. Separately from a program executed normally, a fixed-cycle scan program can be created which is executed interrupting a normal program every fixed hours. The time interval can be set by a user arbitrarily. 3. A user program is executed from the top to the end and a system processing is executed which includes a timer elapsed value update, I/O refresh, and communications with peripheral devices, and they are repeated. 4. Interrupt scan 5. Constant scan
6	Run/stop control	Normally a user operates run/stop of this PLC. 1. The PLC starts running when the RUN/STOP switch is turned to RUN. Also, when it is turned to STOP, the PLC stops running. 2. Specifying a running control input with Control Editor allows to operate run/stop with a specified external input and an internal output. 3. When a system error is detected other than the above operation, if the PLC is running, it stops running and cuts the output off. 4. While the PLC is running, if the power is cut off and the power is turned on again, the PLC will start running. When the power is cut off, first cut off the power of the PLC main unit, and cut off the power of the external input power source. When the power is turned on, first turn on the power of the external power source and turn on the power of the PLC main unit. 5. When the PLC starts running, it clears internal information items which are not specified as to be memorized on power failure, and it starts running. When it stops running, it cuts off the output and stop running holding internal information items. 6. If an allowable instantaneous power failure time elapses and the power is cut off, the PLC may continue running or it may restart running assuming power cut off once depending on load status.
7	Environmental setting	Various conditions to operate this PLC can be set. The following settings are available for abnormal operations. 1. An operation can be continued on I/O information discrepancy. 2. A congestion check time can be set. The initial value is 100 ms. If the set congestion check time elapses before one scan completes, the scan will be stopped. (Scan time error) 3. An operation can be continued on scan time error. 4. Range of internal output area and timer/counter to hold information can be specified for power failure (power cut off). 5. In addition, the following settings are available. - A user program name can be registered. - A password can be set to prevent that a third party refers to a program. - A basic unit / expansion unit type to be used must be registered as an I/O configuration table. To create an I/O configuration table to be set, the connected basic unit / expansion unit type can be read.

No.	Item	Description of function
8	Online change in RUN	A part of a program can be changed during running. 1. When the Online change in RUN operation is executed with Control Editor, the user program within the CPU is changed, the changed program is converted internally at a timing of a scan end, and the PLC continues running with the changed program. 2. If the program change includes control instructions, the control instructions change procedure shall be executed with the Control Editor in advance to confirm safety, and change shall be executed. 3. "HALT time" of no running occurs by the time when the PLC starts running with the changed program. During the time, external input information is not imported; therefore, Online change in RUN shall be executed well in advance with the consideration of the timing.
9	Set/Reset	The specified I/O forced set/reset can be executed from Control Editor connected to the basic unit.
10	Forced output	A forced output for specified I/O numbers can be executed from Control Editor connected to the basic unit. Outputs are cut off for unspecified I/Os.
11	Calendar clock function	A calendar function for a date, day, and time can be used. The calendar clock can be set easily from PC by using Control Editor. The High Function model also allows that the calendar clock is updated using the NTP function to retrieve a current time from NTP server on the network.
12	Dedicated port	A communication port with a dedicated protocol of the EHV/MICRO-EHV series. Communication commands are defined which are called task codes. 1. Control Editor can be connected. 2. A standard serial port, USB port, Ethernet port, and optional port can be used as dedicated ports.
13	General-purpose port	A serial port which can be controlled with a user program. Various settings and transmission/reception processing for communications are executed with the user program. This function can be allocated to both the standard serial port and optional port with instructions.

3.3   Calculation specifications

Item	Classification		Specification	
			Standard model (MVL)	High Function model (MVH)
Control specification	CPU		32-bit CISC processor	
	Processing method		Stored program cyclic method	
	Processing speed	Basic instruction	Min. 0.30 µs	
		Assignment instruction	Min. 1.20 µs	
	User program memory		16 ksteps	
	IO comment (one character = two bytes)		128 kbytes	
	Circuit/box comment (one character = two bytes)		19 kbytes	
Calculation processing specification	Ladder	Basic instruction	⊣⊢ ⊣⊢ ⊣⊢ ⊣⊬ ⊣⊬ ⊣⊢ ⊣⊬ └ ⊣ ─○⊢ etc., 55 types	
		Arithmetic instruction Application instruction	170 types of arithmetic, application, control, etc.	
Input/output processing specification	External input/ output	I/O processing method	Refresh processing	
		64-point basic unit + 64-point expansion unit used	320 points (Input: 200 points / Output: 120 points)	
		Number of levels of expansion available	Up to 4 levels	
	Special I/O	High-speed counter	100 kHz x 4 ch. (32 bit)	100 kHz x 5 ch. (32 bit)
		Pulse/PWM output	65 kHz x 3 ch.	
		Interrupt input	4 ch.	5 ch.
	Internal output	Bit	1,984 points (R0 to R7BF)	
		Word (WR)	32,768 words (WR0 to WR7FFF)	
		Word (WN)	None	
		Bit/Word shared (WM)	2,047 words (M0 to M7FFF, WM0 to WM7FF)	
		Special internal output — Bit	2,112 points (R7C0 to RFFF)	
		Special internal output — Word	512 words (WRF000 to WRF1FF)	
		CPU link	None	
	Timer / Counter	Number of points *1	2,048 points (including counter 2,048 points)	
		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 *2		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	Standard serial port (Embedded to a basic unit)		1 port (RS-232C fixed)	
	Ethernet port		None	1 port (For peripheral devices and network construction)
	USB port		1 port (only for the programming software), USB 2.0 Full Speed	
	Optional port		1 port can be added (depending on the option board)	
Peripheral device	Program method		Ladder diagram	
	Peripheral device		Programming software (Control Editor Ver. 4.01 or newer)	
Extended function	Calendar clock		Supported	
	USB memory		Unavailable	Supported
Maintenance function	Self-diagnosis		PLC error (OK LED display): Microcomputer error, watchdog timer error, memory error, program error, system ROM/RAM error, scan time monitoring, battery voltage low detection, etc.	

*1 The same numbers cannot be shared by the timer and the counter.

*2 The edge numbers are managed by Control Editor.

3.4   List of system equipment

(1) Basic unit

Product	Model	Specification	I/O assignment symbol
MICRO-EHV basic unit	MVH-A64DR	AC power supply, DC input 40 points, Relay output 24 points Ethernet port, USB memory function supported	X48/Y32
	MVH-D64DR	DC power supply, DC input 40 points, Relay output 24 points Ethernet port, USB memory function supported	
	MVH-D64DT	DC power supply, DC input 40 points, Transistor output 24 points (sink) Ethernet port, USB memory function supported	
	MVH-D64DTPS	DC power supply, DC input 40 points, Transistor with short circuit protection output 20 points (source), Transistor output 4 points (source), Ethernet port, USB memory function supported	
	MVH-A40DR	AC power supply, DC input 24 points, Relay output 16 points Ethernet port, USB memory function supported	
	MVH-D40DR	DC power supply, DC input 24 points, Relay output 16 points Ethernet port, USB memory function supported	
	MVH-D40DT	DC power supply, DC input 24 points, Transistor output 16 points (sink) Ethernet port, USB memory function supported	
	MVH-D40DTPS	DC power supply, DC input 24 points, Transistor with short circuit protection output 12 points (source), Transistor output 4 points (source), Ethernet port, USB memory function supported	
	MVL-A64DR	AC power supply, DC input 40 points, Relay output 24 points	
	MVL-D64DR	DC power supply, DC input 40 points, Relay output 24 points	
	MVL-D64DT	DC power supply, DC input 40 points, Transistor output 24 points (sink)	
	MVL-D64DTPS	DC power supply, DC input 40 points, Transistor with short circuit protection output 20 points (source), Transistor output 4 points (source)	
	MVL-A40DR	AC power supply, DC input 24 points, Relay output 16 points	
	MVL-D40DR	DC power supply, DC input 24 points, Relay output 16 points	
	MVL-D40DT	DC power supply, DC input 24 points, Transistor output 16 points (sink)	
	MVL-D40DTPS	DC power supply, DC input 24 points, Transistor with short circuit protection output 12 points (source), Transistor output 4 points (source)	
	MVL-A20DR	AC power supply, DC input 12 points, Relay output 8 points	
	MVL-D20DR	DC power supply, DC input 12 points, Relay output 8 points	
	MVL-D20DT	DC power supply, DC input 12 points, Transistor output 8 points (sink))	
	MVL-D20DTPS	DC power supply, DC input 12 points, Transistor with short circuit protection output 4 points (source), Transistor output 4 points (source)	

(2) Expansion unit

Product	Model	Specification	I/O assignment symbol
64-point expansion unit	EH-A64EDR	AC power supply, DC input 40 points, Relay output 24 points	X48/Y32
	EH-D64EDR	DC power supply, DC input 40 points, Relay output 24 points	
	EH-D64EDT	DC power supply, DC input 40 points, Transistor output 24 points (sink)	
	EH-D64EDTPS	DC power supply, DC input 40 points, Transistor with short circuit protection output 20 points (source), Transistor output 4 points (source)	
28-point expansion unit	EH-A28EDR	AC power supply, DC input 16 points, Relay output 12 points	X1/Y1W (B1/1)
	EH-D28EDR	DC power supply, DC input 16 points, Relay output 12 points	
	EH-D28EDT	DC power supply, DC input 16 points, Transistor output 12 points (sink)	
	EH-D28EDTP	DC power supply, DC input 16 points, Transistor output 12 points (source)	
	EH-D28EDTPS	DC power supply, DC input 16 points, Transistor with short circuit protection output 12 points (source)	
16-point expansion unit	EH-D16ED	DC power supply, DC input 16 points	
	EH-D16ER	DC power supply, Relay output 16 points	
	EH-D16ET	DC power supply, Transistor output 16 points (sink)	
	EH-D16ETPS	DC power supply, Transistor with short circuit protection output 16 points (source)	
14-point expansion unit	EH-A14EDR	AC power supply, DC input 8 points, Relay output 6 points	
	EH-D14EDR	DC power supply, DC input 8 points, Relay output 6 points	
	EH-D14EDT	DC power supply, DC input 8 points, Transistor output 6 points (sink)	
	EH-D14EDTP	DC power supply, DC input 8 points, Transistor output 6 points (source)	
	EH-D14EDTPS	DC power supply, DC input 8 points, Transistor with short circuit protection output 6 points (source)	
8-point expansion unit	EH-D8ED	DC power supply, DC input 8 points	
	EH-D8ER	DC power supply, Relay output 8 points	
	EH-D8ET	DC power supply, Transistor output 8 points (sink)	
	EH-D8ETPS	DC power supply, Transistor with short circuit protection output 8 points (source)	
	EH-D8EDR	DC power supply, DC input 4 points, Relay output 4 points	
	EH-D8EDT	DC power supply, DC input 4 points, Transistor output 4 points (sink)	
	EH-D8EDTPS	DC power supply, DC input 4 points, Transistor with short circuit protection output 4 points (source)	
Analog expansion unit	EH-A6EAN	AC power supply, 4 ch. input, 2 ch. output	FUN0
	EH-D6EAN	DC power supply, 4 ch. input, 2 ch. output	
Resistance temperature detector expansion unit	EH-A6ERTD	AC power supply, 4 ch. input, 2 ch. output	
	EH-D6ERTD	DC power supply, 4 ch. input, 2 ch. output	
	EH-A4ERTD	AC power supply, 4 ch. input	
	EH-D4ERTD	DC power supply, 4 ch. input	
Thermocouple expansion unit	EH-D6ETC	DC power supply, 4 ch. input, 2 ch. output	
	EH-D4ETC	DC power supply, 4 ch. input	

(3) Option board

Model	Specification	Remark *
OBV-NES	RS-485 (Two-wire system) serial communication board	V4.02 or newer
OBV-485A	RS-485 (Four-wire system) serial communication board with 2 channels of analog input (Input range : 0 to 10 V)	V4.06 or newer
OBV-485TAI	RS-485 (Two-wire system) serial communication board with 2 channels of analog input (Input range : 0 to 10 V)	V4.13 or newer
OBV-485TAO	RS-485 (Two-wire system) serial communication board with 2 channels of analog output (Output range : 0 to 10 V)	V4.13 or newer
OBV-AIO	2 channels of analog input (Input range : 0 to 10 V), 2 channels of analog output (Output range : 0 to 10 V)	V4.13 or newer
OBV-AIG	4 channels of isolated analog input (Input range : 0 to 10 V / 0 to 20mA)	V7.10 or newer
OBV-AIOG	2 channels of isolated analog input (Input range : 0 to 10 V / 0 to 20mA), 2 channels of isolated analog output (Output range : 0 to 10 V / 0 to 20mA)	V7.10 or newer
OBV-RTD	4 channels of isolated RTD input (2 channels for 3-wire RTD)	V7.10 or newer

* In the remark column, the version of Control Editor that can set the option board is display.

(4) Peripheral device

Product	Model	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)

Note) For necessary PC operation environment to use the software, refer to " Control Editor INSTRUCTION MANUAL".

(5) Connection cable

Product	Model	Specification
Basic to Expansion unit connection cable *1	EH-MCB01	Length 0.1 m (0.32 ft.) (Shared with basic to expansion and expansion to expansion)
	EH-MCB05	Length 0.5 m (1.64 ft.) (Shared with basic to expansion and expansion to expansion)
	EH-MCB10	Length 1.0 m (3.28 ft.) (Shared with basic to expansion and expansion to expansion)
Peripheral device connection conversion cable *2	EH-RS05	Length 0.5 m (1.64 ft.) (between RJ45 and D-sub15-pin female)
For peripheral device *3	WVCB02H	Length 2 m (6.56 ft.) (between D-sub15-pin male and D-sub9-pin female)
	EH-VCB02	Length 2 m (6.56 ft.) (between CPU(RJ-45) and D-sub9-pin female)

*1 Use the cable within the interval between units of 1 m (3.28 ft.) and the total 2 m (6.56 ft.).
*2 Use it in combination with WVCB02H.
*3 EH-VCB02 and WVCB02H can be used to connect our H / EH series to the LADDER EDITOR for Windows®.

(6) Option

Model	Use
MV-BAT	Battery

Note) Batteries are sold separately.

3.5   List of current consumption

Current consumption

Model	Weight (g)	Weight (lb.)	Current consumption (A)		
			100 V AC	264 V AC	24 V DC
			Steady-state	Steady-state	Steady-state
MVH-A64DR	730	1.61	0.2	0.1	-
MVH-D64DR	655	1.44	-	-	0.5
MVH-D64DT	600	1.32	-	-	0.5
MVH-D64DTPS	600	1.32	-	-	0.5
MVH-A40DR	570	1.26	0.2	0.1	-
MVH-D40DR	500	1.10	-	-	0.4
MVH-D40DT	460	1.01	-	-	0.4
MVH-D40DTPS	460	1.01	-	-	0.4
MVL-A64DR	720	1.59	0.2	0.1	-
MVL-D64DR	645	1.42	-	-	0.5
MVL-D64DT	590	1.30	-	-	0.5
MVL-D64DTPS	590	1.30	-	-	0.5
MVL-A40DR	560	1.23	0.2	0.1	-
MVL-D40DR	490	1.08	-	-	0.4
MVL-D40DT	450	0.99	-	-	0.4
MVL-D40DTPS	450	0.99	-	-	0.4
MVL-A20DR	560	1.23	0.1	0.05	-
MVL-D20DR	480	1.06	-	-	0.3
MVL-D20DT	450	0.99	-	-	0.3
MVL-D20DTPS	450	0.99	-	-	0.3
EH-A64EDR	720	1.59	0.4	0.2	-
EH-D64EDR	640	1.41	-	-	0.5
EH-D64EDT	640	1.41	-	-	0.4
EH-D64EDTPS	640	1.41	-	-	0.4
EH-A28EDR	600	1.32	0.2	0.06	-
EH-D28EDR	500	1.10	-	-	0.3
EH-D28EDT	500	1.10	-	-	0.2
EH-D28EDTP	500	1.10	-	-	0.2
EH-D28EDTPS	500	1.10	-	-	0.2
EH-D16ED	260	0.57	-	-	0.13
EH-D16ER	300	0.66	-	-	0.11
EH-D16ET	260	0.57	-	-	0.03
EH-D16ETPS	260	0.57	-	-	0.04
EH-A14EDR	400	0.88	-	-	0.16
EH-D14EDR	400	0.88	-	-	0.16
EH-D14EDT	300	0.66	-	-	0.16
EH-D14EDTPS	300	0.66	-	-	0.16
EH-D8ED	260	0.57	-	-	0.16
EH-D8ER	280	0.62	-	-	0.16
EH-D8ET	260	0.57	-	-	0.16
EH-D8ETPS	260	0.57	-	-	0.16
EH-D8EDR	300	0.66	-	-	0.16
EH-D8EDT	260	0.57	-	-	0.16
EH-D8EDTPS	260	0.57	-	-	0.16
EH-A6EAN	400	0.88	0.1	0.06	-
EH-D6EAN	300	0.66	-	-	0.16
EH-A6ERTD	400	0.88	0.1	0.06	-
EH-D6ERTD	300	0.66	-	-	0.16
EH-A4ERTD	400	0.88	0.1	0.06	-
EH-D4ERTD	300	0.66	-	-	0.16
EH-D6ETC	300	0.66	-	-	0.16
EH-D4ETC	300	0.66	-	-	0.16

3.6　I/O specification

3.6.1　Input specification

Item	Specification		Internal circuit diagram
	MVH: X0, X2, X4, X6, X8 MVL(64/40): X0, X2, X4, X6, X8 MVL(20): X0, X2, X4, X6	Other than the left	
Input voltage	24 V DC		
Allowable input voltage range	0 to 30 V DC		
Input impedance	Approx. 2.7 kΩ	Approx. 4.7 kΩ	
Input current	8 mA typical	4.8 mA typical	
Operation voltage — ON voltage	Min. 18 V DC	Min. 18 V DC	
Operation voltage — OFF voltage	Max. 5 V DC	Max. 5 V DC	
Input delay — OFF → ON	0.5 to 20 ms (User setting available) *		
Input delay — ON → OFF	0.5 to 20 ms (User setting available) *		
Number of input points	64-point type: 40 points 40-point type: 24 points 20-point type: 12 points		
Number of commons	64 / 40-point type: 2 commons 20-point type: 3 commons		
Polarity	None		
Insulation method	Photocoupler insulation		
Input display	LED display (Green color)		
External connection	Removable screw terminal block (M3)		

* User setting available: Can be set with the digital filter setting from Control Editor.

■ High-speed counter setting

Item		Single phase	2 phases
Input with counter available		MVH: X0, X2, X4, X6, X8 MVL: X0, X2, X4, X6	X0 and X2 are used as a pair, X4 and X6 are used as a pair
Operation voltage	ON voltage	Min. 18 V DC	
Operation voltage	OFF voltage	Max. 5 V DC	
Count pulse width		10 μs	17 μs
Maximum count frequency		Each channel: 100 kHz	Each channel: 60 kHz
Count register		32 bits	
Accordant output		Can be supported with interrupt instructions	
ON/OFF preset		Can be supported with interrupt instructions	
Upper/lower limit setting		Unavailable (for 32 bits: Ring counter up to 0 to 4,294,967,295)	
Preload/Strobe		Can be supported with interrupt instructions	

3.6.2   Output specification

(1) Relay output (All outputs on MVH-*64DR, MVL-*64DR, MVH-*40DR, MVL-*40DR, MVL-*20DR)

Item		Specification	Internal circuit diagram
Rated load voltage		5 to 250 V AC, 5 to 30 V DC	
Minimum switching current		10 mA (5 V DC) Reference value *1	
Maximum load current	1 circuit	2 A (24 V DC, 240 V AC)	
	1 common	5 A	
Output response time	OFF → ON	Max. 15 ms	
	ON → OFF	Max. 15 ms	
Number of output points		64-point type: 24 points 40-point type: 16 points 20-point type: 8 points	
Number of commons		64-point type: 9 commons 40/20-point type: 5 commons	
Surge removal circuit		None	
Fuse		None	
Insulation method		Relay insulation	
Output display		LED display (Green color)	
External connection		Removable screw terminal block (M3)	
External power source (for relay drive)		Unnecessary	
Contact lifetime *2		20,000,000 times (mechanical) 200,000 times (electrical: 1.5 A)	
Withstand voltage		1,500 V or more (external-internal) 500 V or more (external-external)	

*1 The minimum switching current is a reference value as a guide. This value may change with switching frequency, environmental conditions, etc. When the PLC is used, please confirm them with actual loads.

*2 Refer to the figure below.

■ Relay contact lifetime

Lifetime characteristics
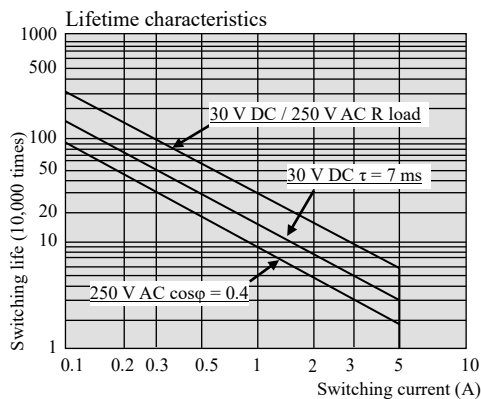
The contact lifetime is inversely proportional to the square of the current approximately; therefore, please note that if inrush currents are cut off or capacitor loads are directly driven, the relay lifetime will become shorter significantly.

(2) DC output (Y100 to Y103 of MVH-D64DT, MVL-D64DT, MVH-D40DT, MVL-D40DT, MVL-D20DT)

Item		Specification	Internal circuit diagram
Output specification		Transistor output (sink)	
Rated load voltage		24 / 12 V DC (+10 %, -15 %)	
Minimum switching current		10 mA	
Leak current		Max. 0.1 mA	
Maximum load current	1 circuit	0.5 A 24 V DC, 0.3 A 12VDC	
	1 common	2 A	
Output response time	OFF → ON	Max. 5 µs 24 V DC 0.2 A (64/40 points: Max. 0.1ms 24V DC for Y103 only)	
	ON → OFF	Max. 5 µs 24 V DC 0.2 A (64/40 points: Max. 0.1ms 24V DC for Y103 only)	
Number of output points		4 points	
Number of commons *1		1 point	
Surge removal circuit		None	
Fuse		None	
Insulation method		Photocoupler insulation	
Output display		LED display (Green color)	
External connection		Removable screw terminal block (M3)	
External power source *2		12 to 30 V DC	
Withstand voltage		1,500 V or more (external-internal) 500 V or more (external-external)	
Output voltage reduction		Max. 0.3 V DC	

*1 V terminals and C terminals are separated by each common. For details, refer to "Chapter 4 or Chapter 5 Terminal Array".

*2 External 12 to 30 V DC must be supplied to the connection between the V terminal and C terminal.

(3) DC output (Y104 or later of MVH-D64DT, MVL-D64DT, MVH-D40DT, MVL-D40DT, MVL-D20DT)

Item		Specification	Internal circuit diagram
Output specification		Transistor output (sink)	
Rated load voltage		24 / 12 V DC (+10 %, -15 %)	
Minimum switching current		10 mA	
Leak current		Max. 0.1 mA	
Maximum load current	1 circuit	0.5 A	
	1 common	64-point type: 3 A 40-point type: 5 A 20-point type: 2 A	
Output response time	OFF → ON	Max. 0.1 ms 24 V DC	
	ON → OFF	Max. 0.1 ms 24 V DC	
Number of output points		64-point type: 20 points 40-point type: 12 points 20-point type: 4 points	
Number of commons *1		64-point type: 3 commons 40/20-point type: 1 common	
Surge removal circuit		None	
Fuse		None	
Insulation method		Photocoupler insulation	
Output display		LED display (Green color)	
External connection		Removable screw terminal block (M3)	
External power source *2		12 to 30 V DC	
Withstand voltage		1,500 V or more (external-internal) 500 V or more (external-external)	
Output voltage reduction		Max. 0.3 V DC	

*1 V terminals and C terminals are separated by each common. For details, refer to "Chapter 4 or Chapter 5 Terminal Array".

*2 External 12 to 30 V DC must be supplied to the connection between the V terminal and C terminal.

(4) DC output (Y100 to Y103 of MVH-D64DTPS, MVL-D64DTPS, MVH-D40DTPS, MVL-D40DTPS, MVL-D20DTPS)

Item		Specification	Internal circuit diagram
Output specification		Transistor output (source)	
Rated load voltage		24 / 12 V DC (+10 %, -15 %)	
Minimum switching current		10 mA	
Leak current		Max. 0.1 mA	
Maximum load current	1 circuit	0.5 A 24VDC, 0.3 A 12VDC	
	1 common	2 A	
Output response time	OFF → ON	Max.5 μs 24 V DC 0.2 A (64/40 points: Max.0.1 ms 24V DC for Y103 only)	
	ON → OFF	Max.5 μs 24 V DC 0.2 A (64/40 points: Max.0.1 ms 24V DC for Y103 only)	
Number of output points		4 points	
Number of commons *1		1 point	
Surge removal circuit		None	
Fuse		None	
Insulation method		Photocoupler insulation	
Output display		LED display (Green color)	
External connection		Removable screw terminal block (M3)	
External power source *2		12 to 30 V DC	
Withstand voltage		1,500 V or more (external-internal) 500 V or more (external-external)	
Output voltage reduction		Max. 0.3 V DC	

*1 V terminals and C terminals are separated by each common. For details, refer to "Chapter 4 or Chapter 5 Terminal Array".

*2 External 12 to 30 V DC must be supplied to the connection between the V terminal and C terminal.

(5) DC output (Y104 or later of MVH-D64DTPS, MVL-D64DTPS, MVH-D40DTPS, MVL-D40DTPS, MVL-D20DTPS)

Item		Specification	Internal circuit diagram
Output specification		Transistor output (source: with short-circuit protection)	
Rated load voltage		24 / 12 V DC (+10%, -15 %)	
Minimum switching current		10 mA	
Leak current		Max. 0.1 mA	
Maximum load current	1 circuit	0.7 A	
	1 common	64-point type: 3.0 A 40-point type: 5.0 A 20-point type: 2.8 A	
Output response time	OFF -> ON	Max. 0.5 ms 24 V DC	
	ON -> OFF	Max. 0.5 ms 24 V DC	
Number of output points		64-point type: 20 points 40-point type: 12 points 20-point type: 4 points	
Number of commons *1		64-point type: 3 commons 40/20-point type: 1 common	
Surge removal circuit		None	
Fuse		None	
Insulation method		Photocoupler insulation	
Output display		LED display (Green color)	
External connection		Removable screw terminal block (M3)	
External power source *2		12 to 30 V DC	
Withstand voltage		1,500 V or more (external-internal) 500 V or more (external-external)	
Output voltage reduction		Max. 0.3 V DC	

*1 V terminals and C terminals are separated by each common. For details, refer to "Chapter 4 or Chapter 5 Terminal Array".

*2 External 12 to 30 V DC must be supplied to the connection between the V terminal and C terminal.

■ Pulse / PWM output setting

Item	64 / 40 / 20-point type transistor output
Output available	Y100 to Y102 (by user setting)
Load voltage	12 / 24 V
PWM maximum output frequency*	65,535 Hz
Pulse-train maximum output frequency*	65,535 Hz

* The pulse output can be set with the relay output type; however, high frequency cannot be conformed with.

3.7　Power source for sensor

The MICRO-EHV can externally feed currents from the 24 V terminal in the input terminal section side.

When the currents are used as power sources for the input section of this unit, the remaining currents can be used as power sources for a sensor.

The currents (I) can be calculated with the formula below, which can be fed as power sources for a sensor.

I = 430 mA - (5 mA* × No. of simultaneous ON input points + 5 mA × No. of simultaneous output points)

* For X0, X2, X4, X6, and X8, use 10 mA for calculation.

3.8   Standard serial communication port (RS-232C) specifications (Port 1)

3.8.1   Physical layer interface
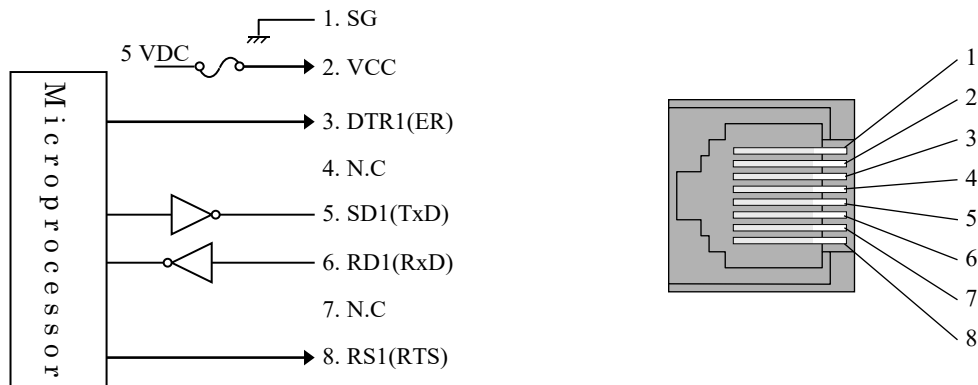
Figure 3.1 Circuit diagram and pin No. of standard serial communication port (Port 1)

Table 3.1 List of signals of standard serial communication port (Port 1)

Pin No.	Signal abbreviation	Direction		Meaning
		PLC	Host	
1.	SG	←	→	Ground for signal
2.	VCC	→		5 V DC is supplied. (A protective fuse is connected.)
3.	DTR1(ER)	→		Signal which can communicate. Communication is possible when this signal is High level.
4.	N.C			Unused. Do not connect to it.
5.	SD1(TxD)	→		Transmitting data of PLC
6.	RD1(RxD)	←		Receiving data of PLC
7.	N.C			Unused. Do not connect to it.
8.	RS1(RTS)	→		Transmitting request signal. Indicates that PLC can receive data when this signal is High level.

3.8.2   Dedicated port

Specifications in specifying a standard serial communication port as a dedicated port are shown in Table 3.2.

Table 3.2 Dedicated port specifications

Item	Specification
Transmission speed	4,800 / 9,600 / 9,200 / 38,400/ 57,600 / 115,200 bps Set from the Control Editor.
Interface	RS-232C
Maximum cable length	15 m (49.2 ft.)
Connection mode	1 : 1
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: 1 start, 7-bit data, EVEN parity, 1 stop
Transmission code outgoing sequence	Send out from the lowest bit in character units
Error control	Vertical party check, sum check, overrun check, and framing check
Transmission unit	Message unit (variable length)
Maximum message length	1,460 bytes (including control characters)
Control procedure	H-series dedicated procedure (Hi-protocol) Standard procedure 1(Transmission control procedure 1), Simplified procedure (Transmission control procedure 2)
Connector	8-pin modular connector (RJ-45 type)

3.8.3   General-purpose port

Specifications in specifying a standard serial communication port as a general-purpose port are shown in Table 3.3.

Table 3.3 General-purpose port specifications

Item	Specification
Transmission speed	300 / 600 / 1,200 / 2,400 / 4,800 / 9,600 / 19,200 / 38,400 / 57,600 / 115,200 bps Set by TRNS0 / RECV0 instructions.
Interface	RS-232C
Maximum cable length	15 m (49.2 ft.)
Connection mode	1 : 1
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 definition
Transmission code configuration	User setting (1 start, 7 or 8-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, and framing check
Transmission unit	Message unit (variable length)
Maximum message length	1,024 bytes (including control characters)
Control procedure	No procedure
Control code	User definition
Connector	8-pin modular connector (RJ-45 type)

3.9   USB communication port specifications

The USB communication port is a dedicated port for connecting the Control Editor.

Table 3.4 USB communication port specifications

Item	Specification
Interface	USB2.0 (Full Speed-compliant)
Maximum cable length	3 m (9.84 ft.)
Connection mode	1 : 1
Connector	USB Type B

3.10   Ethernet port specifications (Only High Function model (MVH))

3.10.1 Physical layer interface

1 2 3 4 5 6 7 8

LNK/ACT   100M LED
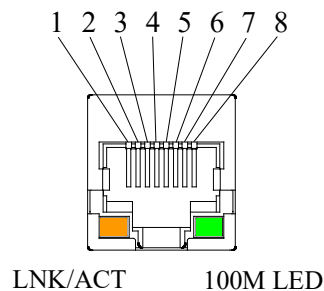
Pin No.	Signal abbrev.	Remarks
1	TXD+	Transmission data (+)
2	TXD-	Transmission data (-)
3	RXD+	Reception data (+)
4	—	Unused
5	—	Unused
6	RXD-	Reception data (-)
7	—	Unused
8	—	Unused

3.10.2 Port specifications

Table 3.5 Ethernet port specifications

Item	Specification
Ethernet specifications	IEEE802.3-compliant (10BASE-T/100BASE-TX (automatic recognition)
Transmission modulation method	Baseband
Media access method	CSMA / CD
Connection	Task code communication: 4 ASR communication: 6 Modbus-TCP communication: 4
Maximum segment length	100 m (328 ft.)
Connector	8-pin modular connector (RJ-45 type)
Connection cable	Category 5 STP or UTP (STP cable recommended)

3.11 Port for USB memory (Only High Function model (MVH))

Table 3.6 Specifications of port for USB memory

Item	Specification
Supported standard	USB2.0 (Full Speed-compliant)
USB-HUB connection	Unavailable
Media access method	FAT32
Usable USB memory	32 Gbyte or less
Maximum file size	2 Gbyte

3.12 Backup

(1) Battery (option)

The content of a data memory and clock data can be retained with MV-BAT.

For the battery lifetime, refer to the times described below.

Battery lifetime (total power suspension time) [year]	
Guaranteed value (MIN) @55 °C	Actual use value (MAX) @25 °C
5 years	10 years or longer

The battery can be replaced from the front of the unit.
If a calendar clock is used, MV-BAT must be used.

(2) Capacitor

The capacitor within the PLC main unit allows retaining the content of the data memory and the clock data for 12 hours (25°C).

* However, to retain the content of the data memory and the clock data for 12 hours, the PLC main unit must be supplied for 20 minutes or longer to charge the capacitor in the PLC main unit.

3.13 LED display

The LED display section on the MICRO-EHV front face allows confirming the operation status and external input/output ON/OFF status.
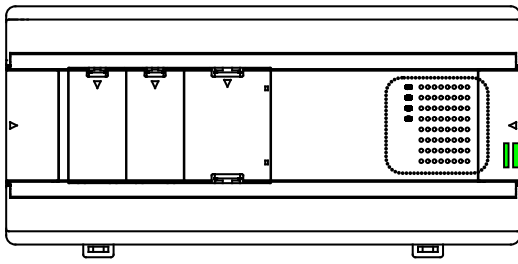
Figure 3.2 MICRO-EHV front face
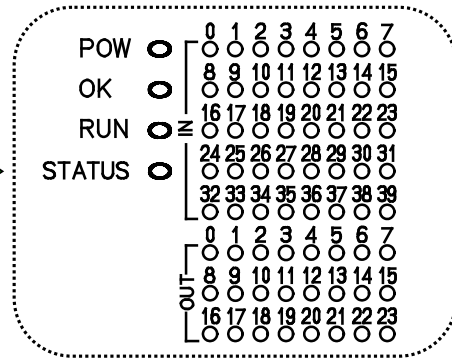
Figure 3.3 LED display section (enlarged)

(1) POW LED

It indicates correct power source to the basic unit and the power source circuit status within the unit.
Normal power: Turned on, Abnormal power: Turned off

(2) OK LED

It indicates the result of self-diagnosis by the basic unit.
Normal result: Turned on, Abnormal result: Blinking/Turned off
For Blinking/Turned off, refer to "Chapter 10 Troubleshooting - Error Code and Countermeasure Procedures".
For the battery error "H71", Retentive data area is undefined status "H76", backup memory error "H77" occurrence, the OK LED display method (blinking or lighting) can be set with [ERR LED Mode] on the [Operation parameters] setting window of the Control Editor.
Also for minor failure error occurrence, the OK LED display method (blinking or lighting) can be set with [Error Display Level] on the same window. The initial setting allows all errors to be displayed.
Set Displayed/Not displayed as needed.

(3) RUN LED

It indicates the operation status of the basic unit.
RUN (running): Turned on, STOP (stopped): Turned off

(4) STATUS LED

It indicates the refresh processing mode and the FLASH memory being written.
- Refresh processing mode
For normal refresh processing mode, the STATUS LED is turned off.
When either [Input refresh disabled] or [Output refresh disabled] or both modes are set from the Control Editor, the STATUS LED is turned on.
- FLAH memory being written
If a program is transferred from the Control Editor or USB memory to the MICRO-EHV unit, it will be written to the FLASH memory within the unit.
While it is written to the FLASH memory within the unit, the STATUS LED blinks (500 ms turned off/500 ms turned on).

(5) IN LED

It indicates the external input (X0 and later) ON/OFF status.
When an external input is ON, corresponding LED is turned on, and it is OFF, corresponding LED is turned off.

(6) OUT LED

It indicates the external output (Y100 and later) ON/OFF status.
When an external output is ON, corresponding LED is turned on, and it is OFF, corresponding LED is turned off.

MEMO

Chapter 4　High Function model (MVH) Basic unit

4.1　64-point High Function model (MVH) Basic unit

4.1.1　Section name and function of 64-point High Function model (MVH) Basic unit

Section name and function	Model	MVH-A64DR, MVH-D64DR, MVH-D64DT, MVH-D64DTPS		
	Weight	MVH-A64DR:　730 g (1.61 lb.)	MVH-D64DR:　655 g (1.44 lb.)	
		MVH-D64DT:　600 g (1.32 lb.)	MVH-D64DTPS:　600 g (1.32 lb.)	

Front cover open / removed

No.	Item	Detail description
(1)	POW LED	Turns on when the PLC is powered.
(2)	OK LED	Turns on during normal operation. For turning off / blinking, refer to "Chapter 10 Troubleshooting - Error Code and Countermeasure Procedures."
(3)	RUN LED	Indicates the PLC operation status with turning on / off. (On: RUN, Off: STOP)
(4)	STATUS LED	Turns on during the input refresh prohibited / output refresh prohibited mode. Also, it blinks while FLASH memory being backed up.
(5)	I/O LED	The LED turns on whose number corresponds to the external input (X0, etc.) turned ON. The LED turns on whose number corresponds to the external output (Y100, etc.) turned ON.
(6)	Communication port cover	When this cover is opened, the RUN/STOP switch, serial port, and USB communication port appear. It is opened / closed when the RUN/STOP switch is operated and the USB / serial communication port is used.

No.	Item	Detail description
(7)	Ethernet port cover	Under this cover, there are the Ethernet port and port for USB memory. Remove the cover when the Ethernet port or USB port is used.
(8)	Battery cover	Under this cover, there is the battery connector. Remove the cover to attach the battery.
(9)	Option board cover	Under this cover, there is the option board connector. Remove the cover to attach the option board. Avoid directly touching the printed board and others with your hands when the cover is removed.
(10)	Expansion connector cover	Under this cover, there is the expansion connector. Open the cover when the expansion cable is removed / attached.
(11)	Terminal cover	The cover for the terminal block. Open the cover for wiring operation.
(12)	DIN mount	Mounting to the DIN rail can be performed.
(13)	Mounting hole	The unit can be fixed to a control panel and others using screws (M4).
(14)	Input terminals	Terminals for external input devices wiring. A recommended terminal is shown in the figure right. One wire of AWG14 to AWG22 (2.1 to 0.36 mm^2) or two wires of AWG16 to AWG22 (1.3 to 0.36 mm^2) can be used for one terminal. (Recommended) 6 6 [mm] (Be careful about falling with loose screws.)
(15)	Output terminals	Connection terminals for external loads. The wiring specification is equal to one for input terminals.
(16)	Power terminals	Connection terminals for power sources. The wiring specification is equal to one for input terminals.
(17)	RUN/STOP switch	When the switch lever is pressed to "RUN," the PLC starts running. When it is pressed to "STOP," the PLC stops running. For correct operation, the following conditions are required. 1. A user program has been written. 2. When the operation definition input has been set, the specified input is set to ON. 3. There is no error cause. STOP RUN
(18)	USB communication port	The port (dedicated port) for connecting to the programming device. With connection to programming software, a program creation and monitoring are available. * Please arrange a USB communication cable by yourself.
(19)	Standard serial communication port	The dedicated port or general-purpose port for serial communications with external devices. Dedicated port: For communications with the programming device, etc. General-purpose port: For communications with external devices with the serial communication function set with a user program.
(20)	Ethernet port	The port for communications with the programming device, network devices, etc. Four ports are available as dedicated ports, and six ports are available for message communications. If a HUB or a communication device is connected with a cable, LNK/ACT LED will turn on (orange color) and blink (orange color) during transmission/reception of data. During operation with 100 Mbps, the 100 M LED turns on (green color), and during operation with 10 Mbps, the 100 M LED turns off. When a communication failure occurs, each logical port can be initialized with a special internal output. When the PLC is turned on, the LNK/ACT LED turns on for a moment; however, that has no problem. LNK/ACT 100 M LED
(21)	USB memory port, Setting switch, USB memory operation LED	With a general-purpose USB memory (up to 32 Gbyte), a ladder program is read / written. Read / write operation is set with the setting switch. When an USB memory is attached to the USB memory port and recognized, the USB memory operation LED turns on (green color). While an USB memory is accessed, the USB memory operation LED blinks (green color). USB memory operation LED Setting switch USB memory port

No.	Item	Detail description
(22)	Battery connector	The connector for connecting the battery sold separately. Attaching the battery retains the following data even while the PLC is turned off. (1) Data specified to a retentive area (2) Calendar clock data (WRF00B to WRF00F) (A user program is retained without the battery because it is memorized to the backup memory.) ⚠ **Caution** - The battery has polarity. Confirm the polarity before the connector is connected.
(23)	Option board connector	The connector connected to the option board when the option board is attached. Only one option board can be attached.
(24)	Expansion connector	The connector for connecting the expansion cable to connect with an expansion unit. Up to four expansion units can be connected.

Caution

Please note the following for communication ports.

(1) If an Ethernet communication cable is connected to the serial communication port, external devices connected to the serial communication port and the serial communication port of the PLC may be damaged.

(2) With the 100BASE-TX connected (100 Mbps) high-speed communications, the installation environment / cable length / exogenous noise may cause communication errors and the link with a network HUB, etc. may not be established, or the link may be cut off easily.

In that case, execute the following or others to construct a network system.

1. Use the TCP/IP communication as the protocol to communicate with connected equipment, and increase the number of retries as needed.

2. Change the network HUB, etc. to a 10 Mbps product or 10 Mbps setting, and set 10 Mbps for the data communication speed.

(3) When the PLC is connected to the programming software with the USB communication port, the programming software may have a communication error under noise environment.

If a communication error occurs under noise environment, use the serial communication port or Ethernet port for connection. Also, for stable communications, avoid that communication cables are placed closer to other wires or they are stored in a duct together with other wires.

4.1.2 64-point High Function model (MVH) Basic unit terminal array

For MVH-A64DR (AC power type)
* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24V	1	3	5	7	9	11	13	15	16	18	20	22	24	26	28	30	32	34	36	38	C1
0V	0	2	4	6	8	10	12	14	C0	17	19	21	23	25	27	29	31	33	35	37	39

AC	NC	1	3	5	NC	7	NC	9	11	NC	13	NC	15	NC	17	NC	19	NC	21	22	C18
AC	FE	0	2	4	C10	6	C11	8	10	C12	12	C13	14	C14	16	C15	18	C16	20	C17	23

Power supply 100 to 240 V AC

Power for load (Relay output) 5 V to 30 V DC, 5 to 250 V AC

For MVH-D64DR (DC power type) (Input wiring same as MVH-A64DR)

0V	NC	1	3	5	NC	7	NC	9	11	NC	13	NC	15	NC	17	NC	19	NC	21	22	C18
24V	FE	0	2	4	C10	6	C11	8	10	C12	12	C13	14	C14	16	C15	18	C16	20	C17	23

Power supply 24 V DC

Power for load (Relay output) 5 V to 30 V DC, 5 to 250 V AC

For MVH-D64DTPS (DC power type) (Input wiring same as MVH-A64DR)

0V	NC	1	3	C10	V10	5	7	9	11	C11	V11	13	15	17	19	C12	V12	21	23	C13	V13
24V	FE	0	2	C10	V10	4	6	8	10	C11	V11	12	14	16	18	C12	V12	20	22	C13	V13

Power supply 24 V DC

Power for load 12 / 24 V DC

For MVH-D64DT (DC power type) (Input wiring same as MVH-A64DR)

0V	NC	1	3	V10	C10	5	7	9	11	V11	C11	13	15	17	19	V12	C12	21	23	V13	C13
24V	FE	0	2	V10	C10	4	6	8	10	V11	C11	12	14	16	18	V12	C12	20	22	V13	C13

Power supply 24 V DC

Power for load 12 / 24 V DC

4.2   40-point High Function model (MVH) Basic unit
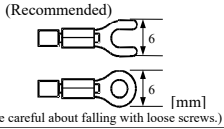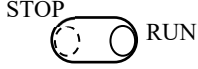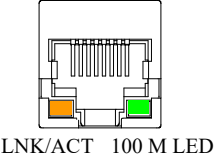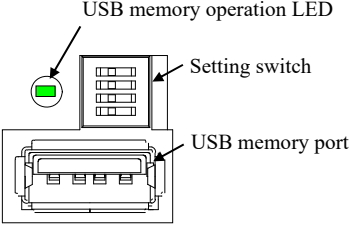
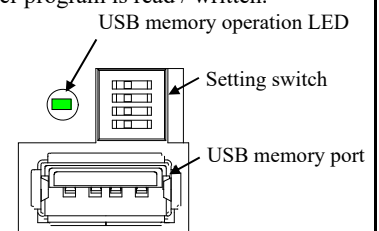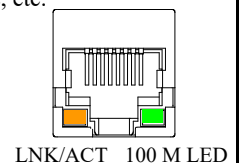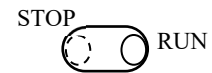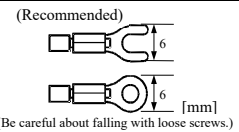## 4.2.1   Section name and function of 40-point High Function model (MVH) Basic unit

Section name and function	Model	MVH-A40DR, MVH-D40DR, MVH-D40DT, MVH-D40DTPS	
	Weight	MVH-A40DR: 570 g (1.25 lb.)	MVH-D40DR: 500 g (1.10 lb.)
		MVH-D40DT: 460 g (1.01 lb.)	MVH-D40DTPS: 460 g (1.01 lb.)

(6) Communication port cover   (9) Option board cover
(8) Battery cover
(11) Terminal cover
(1) POW LED
(2) OK LED
(3) RUN LED
(4) STATUS LED
(5) I/O LED
(10) Expansion connector cover
(7) Ethernet port cover
(11) Terminal cover
(12) DIN mount (back face of unit)

Front cover open/removed

(13) Mounting hole   (18) USB communication port   (23) Option board connector
(17) RUN/STOP switch   (20) Ethernet port   (14) Input terminal
(24) Expansion connector
(19) Standard serial communication port   (22) Battery connector   (13) Mounting hole
(21) USB memory port, Setting switch, USB memory operation LED   (15) Output terminal
(16) Power terminal

No.	Item	Detail description
(1)	POW LED	Turns on when the PLC is powered.
(2)	OK LED	Turns on during normal operation. For turning off / blinking, refer to "Chapter 10 Troubleshooting - Error Code and Countermeasure Procedures."
(3)	RUN LED	Indicates the PLC operation status with turning on / off. (On: RUN, Off: STOP)
(4)	STATUS LED	Turns on during the input refresh prohibited / output refresh prohibited mode. Also, it blinks while FLASH memory being backed up.
(5)	I/O LED	The LED turns on whose number corresponds to the external input (X0, etc.) turned ON. The LED turns on whose number corresponds to the external output (Y100, etc.) turned ON.
(6)	Communication port cover	When this cover is opened, the RUN/STOP switch, serial port, and USB communication port appear. It is opened / closed when the RUN/STOP switch is operated and the USB / serial communication port is used.
(7)	Ethernet port cover	Under this cover, there are the Ethernet port and port for USB memory. Remove the cover when the Ethernet port or USB port is used.

No.	Item	Detail description
(8)	Battery cover	Under this cover, there is the battery connector. Remove the cover to attach the battery.
(9)	Option board cover	Under this cover, there is the option board connector. Remove the cover to attach the option board. Avoid directly touching the printed board and others with your hands when the cover is removed.
(10)	Expansion connector cover	Under this cover, there is the expansion connector. Open the cover when the expansion cable is removed / attached.
(11)	Terminal cover	The cover for the terminal block. Open the cover for wiring operation.
(12)	DIN mount	Mounting to the DIN rail can be performed.
(13)	Mounting hole	The unit can be fixed to a control panel and others using screws (M4).
(14)	Input terminals	Terminals for external input devices wiring. A recommended terminal is shown in the figure right. One wire of AWG14 to AWG22 (2.1 to 0.36 mm^2) or two wires of AWG16 to AWG22 (1.3 to 0.36 mm^2) can be used for one terminal.
(15)	Output terminals	Connection terminals for external loads. The wiring specification is equal to one for input terminals.
(16)	Power terminal	Connection terminals for power sources. The wiring specification is equal to one for input terminals.
(17)	RUN/STOP switch	When the switch lever is pressed to "RUN," the PLC starts running. When it is pressed to "STOP," the PLC stops running. For correct operation, the following conditions are required. 1. A user program has been written. 2. When the operation definition input has been set, the specified input is set to ON. 3. There is no error cause.
(18)	USB communication port	The port (dedicated port) for connecting to the programming device. With connection to programming software, a program creation and monitoring are available. * Please arrange a USB communication cable by yourself.
(19)	Standard serial communication port	The dedicated port or general-purpose port for serial communications with external devices. Dedicated port: For communications with the programming device, etc. General-purpose port: For communications with external devices with the serial communication function set with a user program.
(20)	Ethernet port	The port for communications with the programming device, network devices, etc. Four ports are available as dedicated ports, and six ports are available for message communications. If a HUB or a communication device is connected with a cable, LNK/ACT LED will turn on (orange color) and blink (orange color) during transmission/reception of data. During operation with 100 Mbps, the 100 M LED turns on (green color), and during operation with 10 Mbps, the 100 M LED turns off. When a communication failure occurs, each logical port can be initialized with a special internal output. When the PLC is turned on, the LNK/ACT LED turns on for a moment; however, that has no problem.
(21)	USB memory port, Setting switch, USB memory operation LED	With a general-purpose USB memory (up to 32 Gbyte), a ladder program is read / written. Read / write operation is set with the setting switch. When an USB memory is attached to the USB memory port and recognized, the USB memory operation LED turns on (green color). While an USB memory is accessed, the USB memory operation LED blinks (green color).

No.	Item	Detail description
(22)	Battery connector	The connector for connecting the battery sold separately. Attaching the battery retains the following data even while the PLC is turned off. (3) Data specified to a retentive area (4) Calendar clock data (WRF00B to WRF00F) (A user program is retained without the battery because it is memorized to the backup memory.) ⚠ **Caution** - The battery has polarity. Confirm the polarity before the connector is connected.
(23)	Option board connector	The connector connected to the option board when the option board is attached. Only one option board can be attached.
(24)	Expansion connector	The connector for connecting the expansion cable to connect with an expansion unit. Up to four expansion units can be connected.

Caution

Please note the following for communication ports.

(1) If an Ethernet communication cable is connected to the serial communication port, external devices connected to the serial communication port and the serial communication port of the PLC may be damaged.

(2) With the 100BASE-TX connected (100 Mbps) high-speed communications, the installation environment / cable length / exogenous noise may cause communication errors and the link with a network HUB, etc. may not be established, or the link may be cut off easily.
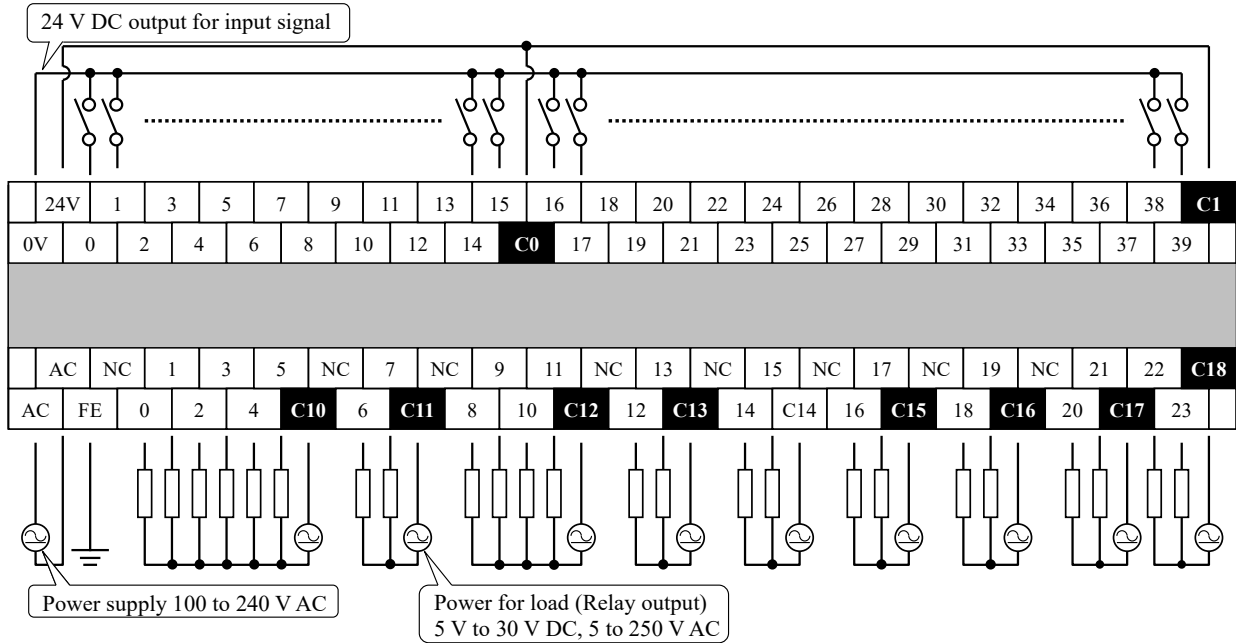
In that case, execute the following or others to construct a network system.

    1. Use the TCP/IP communication as the protocol to communicate with connected equipment, and increase the number of retries as needed.

    2. Change the network HUB, etc. to a 10 Mbps product or 10 Mbps setting, and set 10 Mbps for the data communication speed.

(3) When the PLC is connected to the programming software with the USB communication port, the programming software may have a communication error under noise environment.

If a communication error occurs under noise environment, use the serial communication port or Ethernet port for connection. Also, for stable communications, avoid that communication cables are placed closer to other wires or they are stored in a duct together with other wires.
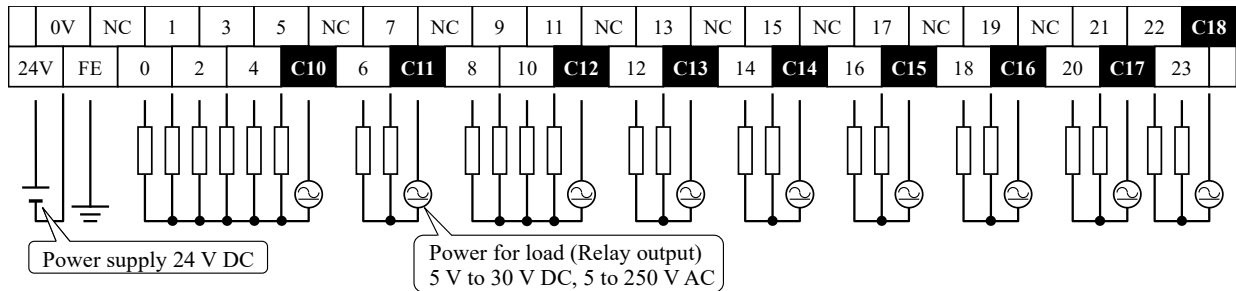
4.2.2   40-point High Function model (MVH) Basic unit terminal array
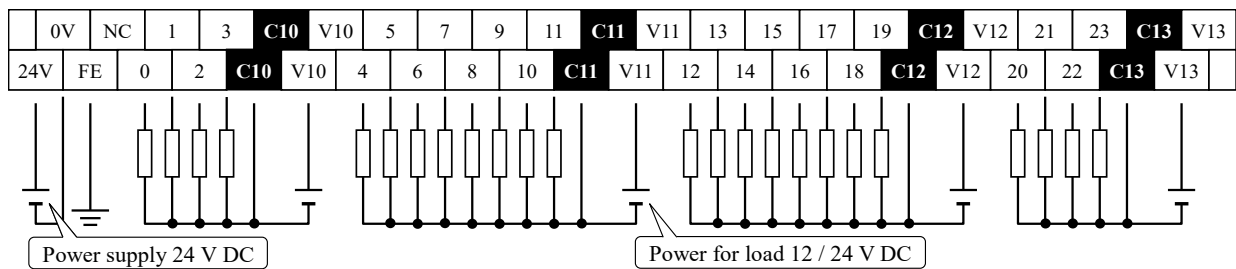
For MVH-A40DR (AC power type)
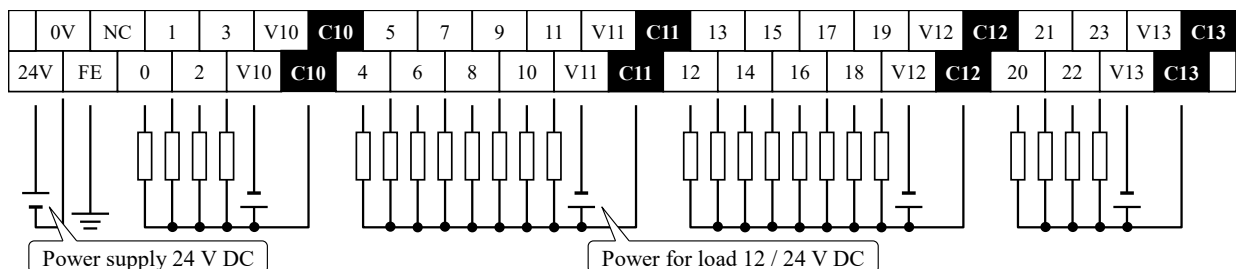* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

24V	1	3	5	7	C0	9	11	13	15	17	19	21	23	C1
0V	0	2	4	6	C0	8	10	12	14	16	18	20	22	C1

AC	NC	1	3	5	NC	7	NC	9	11	NC	13	NC	15	C14
AC	FE	0	2	4	C10	6	C11	8	10	C12	12	C13	14	C14

Power supply 100 to 240 V AC

Power for load (Relay output)
5 V to 30 V DC, 5 to 250 V AC
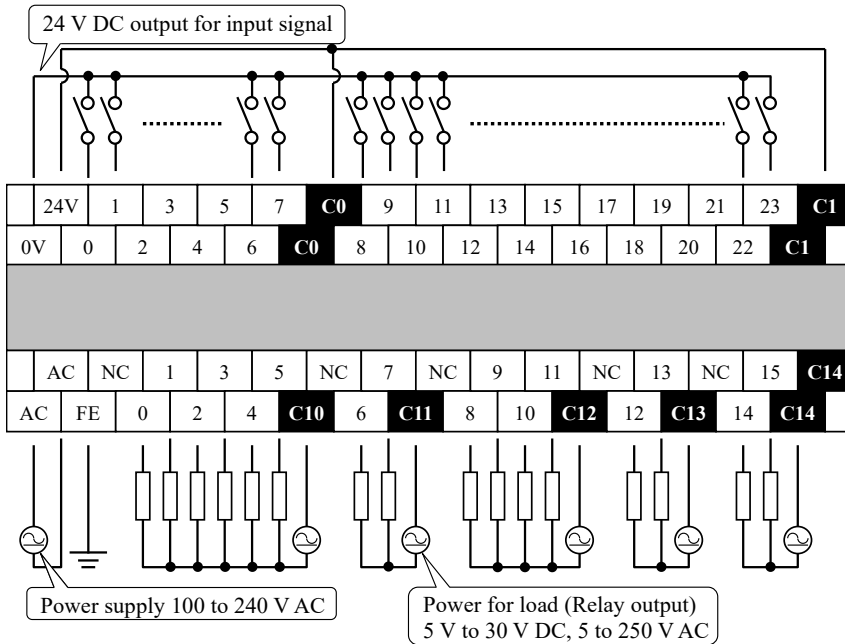
For MVH-D40DR (DC power type) (Input wiring same as MVH-A40DR)
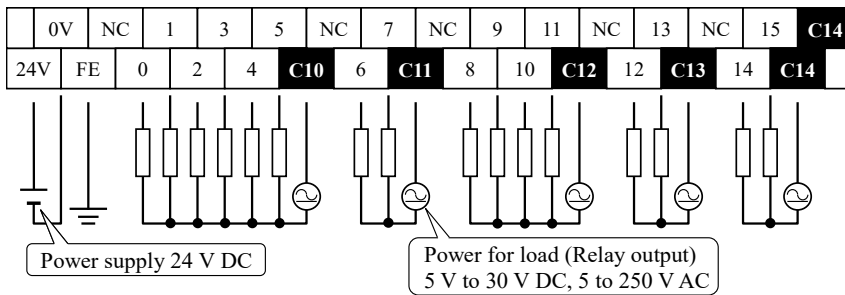
0V	NC	1	3	5	NC	7	NC	9	11	NC	13	NC	15	C14
24V	FE	0	2	4	C10	6	C11	8	10	C12	12	C13	14	C14

Power supply 24 V DC

Power for load (Relay output)
5 V to 30 V DC, 5 to 250 V AC

For MVH-D40DTPS (DC power type) (Input wiring same as MVH-A40DR)

0V	NC	1	3	C10	V10	5	7	9	11	13	15	C11	V11	NC
24V	FE	0	2	C10	V10	4	6	8	10	12	14	C11	V11	NC

Power supply 24 V DC

Power for load 12 / 24 V DC

For MVH-D40DT (DC power type) (Input wiring same as MVH-A40DR)

0V	NC	1	3	V10	C10	5	7	9	11	13	15	V11	C11	NC
24V	FE	0	2	V10	C10	4	6	8	10	12	14	V11	C11	NC

Power supply 24 V DC

Power for load 12 / 24 V DC
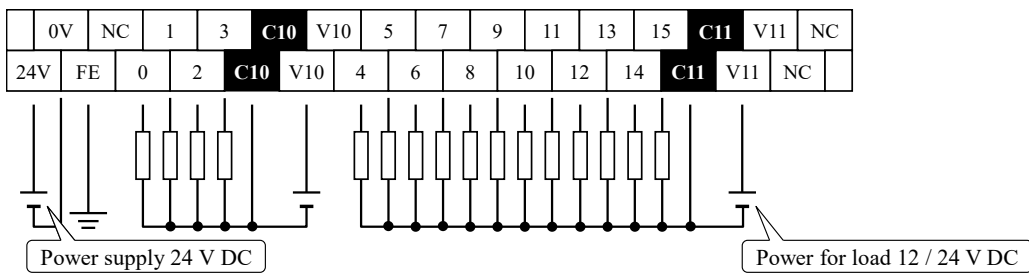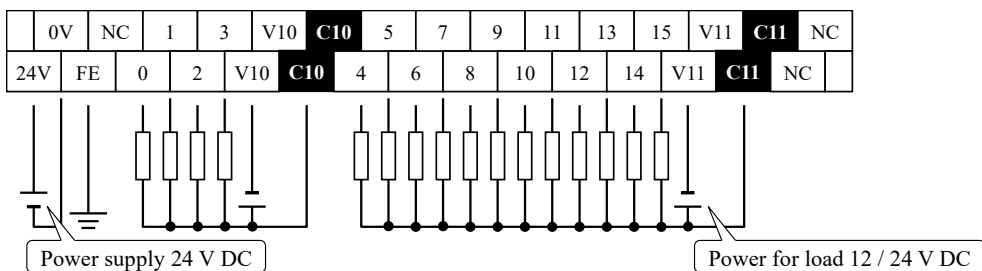
4.3   High Function model (MVH) Dimensional drawing

4.3.1   64-point High Function model (MVH) Dimensional drawing

2- φ 4.4 Mounting hole

[mm(in.)]

185(7.28)
195(7.68)

80(3.15)
90(3.54)
4.8(0.19)

8.4(0.33)
76(2.99)

4.3.2   40-point High Function model (MVH) Dimensional drawing

2- φ 4.4 Mounting hole

[mm(in.)]

140(5.51)
150(5.91)

80(3.15)
90(3.54)
4.8(0.19)

8.4(0.33)
76(2.99)
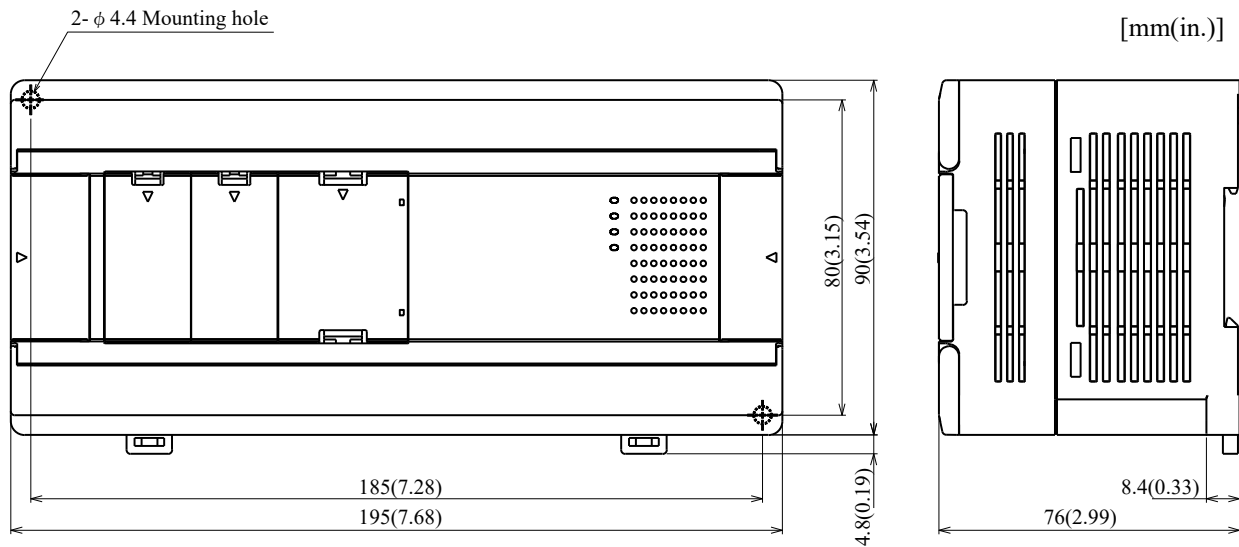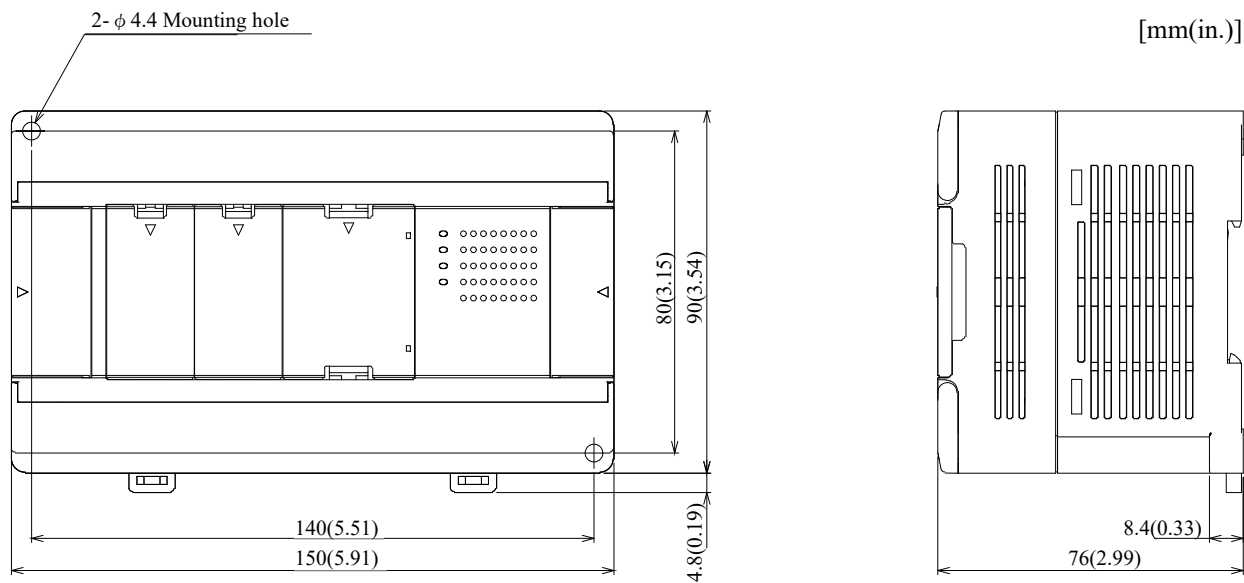
MEMO

Chapter 5　Standard model (MVL) Basic unit
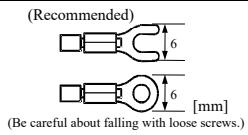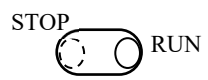
5.1　64-point Standard model (MVL) Basic unit

5.1.1　Section Name and Function of 64-point Standard model (MVL) Basic unit

Section name and function	Model	MVL-A64DR, MVL-D64DR, MVL-D64DT, MVL-D64DTPS	
	Weight	MVL-A64DR:　720 g (1.61 lb.)	MVL-D64DR:　645 g (1.61 lb.)
		MVL-D64DT:　590 g (1.61 lb.)	MVL-D64DTPS:　590 g (1.61 lb.)

No.	Item	Detail description
(1)	POW LED	Turns on when the PLC is powered.
(2)	OK LED	Turns on during normal operation.
		For turning off / blinking, refer to "Chapter 10 Troubleshooting - Error Code and Countermeasure Procedures."
(3)	RUN LED	Indicates the PLC operation status with turning on / off. (On: RUN, Off: STOP)
(4)	STATUS LED	Turns on during the input refresh prohibited / output refresh prohibited mode.
		Also, it blinks while FLASH memory being backed up.
(5)	I/O LED	The LED turns on whose number corresponds to the external input (X0, etc.) turned ON.
		The LED turns on whose number corresponds to the external output (Y100, etc.) turned ON.
(6)	Communication port cover	When this cover is opened, the RUN/STOP switch, serial port, and USB communication port appear. It is opened / closed when the RUN/STOP switch is operated and the USB communication / serial port is used.
(7)	Cover	Do not remove this cover.
		(Even if the cover is removed, do not touch the printed circuit board directly by hand.)
(8)	Battery cover	Under this cover, there is the battery connector.
		Remove the cover to attach the battery.

No.	Item	Detail description
(9)	Option board cover	Under this cover, there is the option board connector. Remove the cover to attach the option board. Avoid directly touching the printed board and others with your hands when the cover is removed.
(10)	Expansion connector cover	Under this cover, there is the expansion connector. Open the cover when the expansion cable is removed / attached.
(11)	Terminal cover	The cover for the terminal block. Open the cover for wiring operation.
(12)	DIN mount	Mounting to the DIN rail can be performed.
(13)	Mounting hole	The unit can be fixed to a control panel and others using screws (M4).
(14)	Input terminals	Terminals for external input devices wiring. A recommended terminal is shown in the figure right. One wire of AWG14 to AWG22 (2.1 to 0.36 mm^2) or two wires of AWG16 to AWG22 (1.3 to 0.36 mm^2) can be used for one terminal. (Recommended) [mm] (Be careful about falling with loose screws.)
(15)	Output terminals	Connection terminals for external loads. The wiring specification is equal to one for input terminals.
(16)	Power terminals	Connection terminals for power sources. The wiring specification is equal to one for input terminals.

(17)	RUN/STOP switch	When the switch lever is pressed to "RUN," the PLC starts running.
		When it is pressed to "STOP," the PLC stops running.
		For correct operation, the following conditions are required.
		  1. A user program has been written.
		  2. When the operation definition input has been set, the specified input is set to ON.
		  3. There is no error cause.
		STOP RUN

(18)	USB communication port	The port (dedicated port) for connecting to the programming device. With connection to programming software, a program creation and monitoring are available. * Please arrange a USB communication cable by yourself.
(19)	Standard serial communication port	The dedicated port or general-purpose port for serial communications with external devices. Dedicated port: For communications with the programming device, etc. General-purpose port: For communications with external devices with the serial communication function set with a user program.
(20)	Setting switch	Not supported. Please keep off.
(21)	Battery connector	The connector for connecting the battery sold separately. Attaching the battery retains the following data even while the PLC is turned off. (1) Data specified to a retentive area (2) Calendar clock data (WRF00B to WRF00F) (A user program is retained without the battery because it is memorized to the backup memory.) ⚠ Caution - The battery has polarity. Confirm the polarity before the connector is connected.
(22)	Option board connector	The connector connected to the option board when the option board is attached. Only one option board can be attached.
(23)	Expansion connector	The connector for connecting the expansion cable to connect with the expansion unit. Up to four expansion units can be connected.

Caution

Please note the following for communication ports.

(1) If an Ethernet communication cable is connected to the serial communication port, external devices connected to the serial communication port and Ethernet port of the PLC may be damaged.

(2) When the PLC is connected to the programming software with the USB communication port, the programming software may have a communication error under noise environment.
If a communication error occurs under noise environment, use the serial communication port.
Also, for stable communications, avoid that communication cables are placed closer to other wires or they are stored in a duct together with other wires.

5.1.2 64-point Standard model (MVL) Basic unit terminal array

For MVL-A64DR (AC power type)
* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

| 24V | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | **C1** |
| 0V | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | **C0** | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | |

| AC | NC | 1 | 3 | 5 | NC | 7 | NC | 9 | 11 | NC | 13 | NC | 15 | NC | 17 | NC | 19 | NC | 21 | 22 | **C18** |
| AC | FE | 0 | 2 | 4 | **C10** | 6 | **C11** | 8 | 10 | **C12** | 12 | **C13** | 14 | **C14** | 16 | **C15** | 18 | **C16** | 20 | **C17** | 23 |

Power supply 100 to 240 V AC

Power for load (Relay output)
5 V to 30 V DC, 5 to 250 V AC
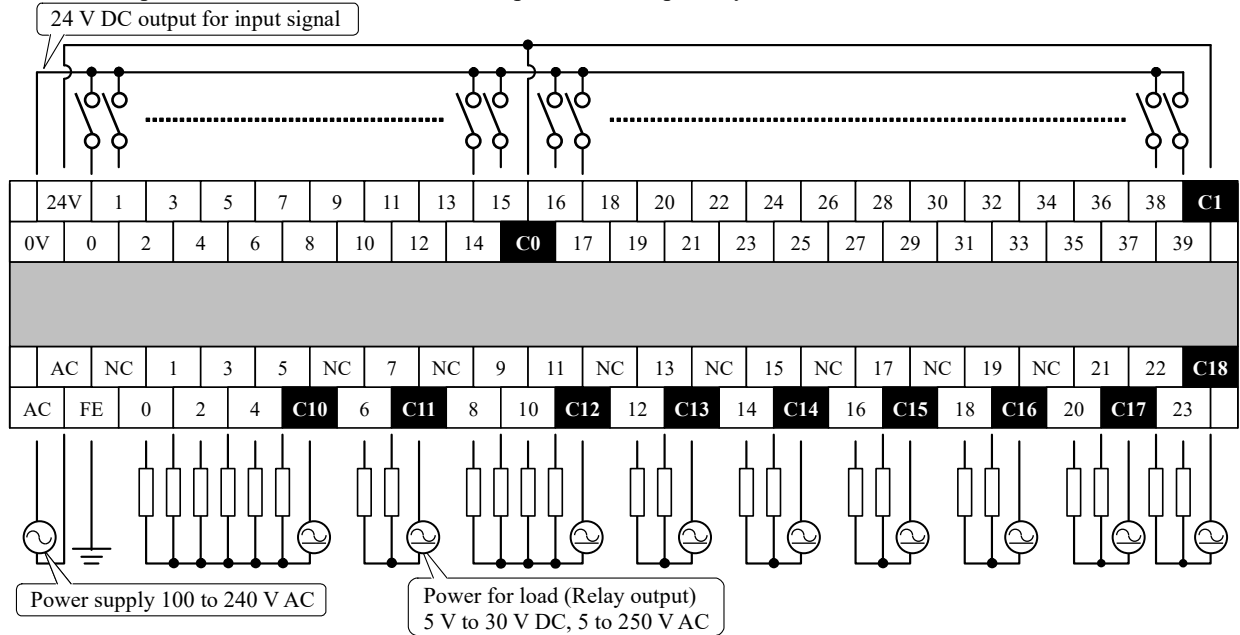
For MVL-D64DR (DC power type) (Input wiring same as MVL-A64DR)

| 0V | NC | 1 | 3 | 5 | NC | 7 | NC | 9 | 11 | NC | 13 | NC | 15 | NC | 17 | NC | 19 | NC | 21 | 22 | **C18** |
| 24V | FE | 0 | 2 | 4 | **C10** | 6 | **C11** | 8 | 10 | **C12** | 12 | **C13** | 14 | **C14** | 16 | **C15** | 18 | **C16** | 20 | **C17** | 23 |

Power supply 24 V DC

Power source for load (relay output)
5 to 30 V DC, 5 to 250 V AC

For MVL-D64DTPS (DC power type) (Input wiring same as MVL-A64DR)

| 0V | NC | 1 | 3 | **C10** | V10 | 5 | 7 | 9 | 11 | **C11** | V11 | 13 | 15 | 17 | 19 | **C12** | V12 | 21 | 23 | **C13** | V13 |
| 24V | FE | 0 | 2 | **C10** | V10 | 4 | 6 | 8 | 10 | **C11** | V11 | 12 | 14 | 16 | 18 | **C12** | V12 | 20 | 22 | **C13** | V13 |

Power supply 24 V DC

Power for load 12 / 24 V DC
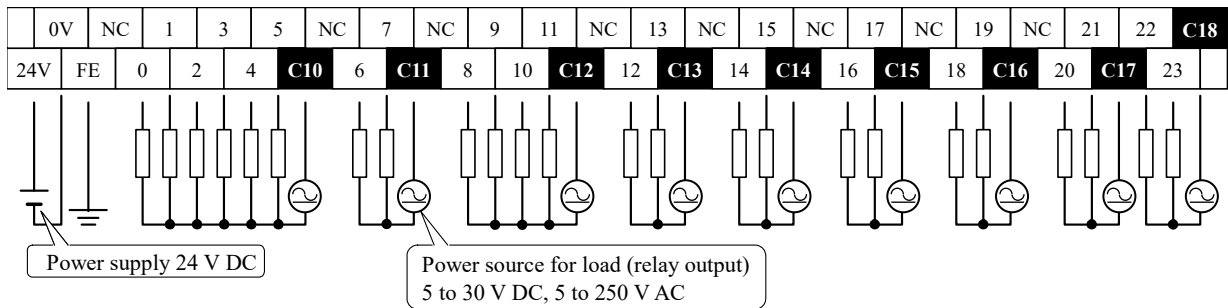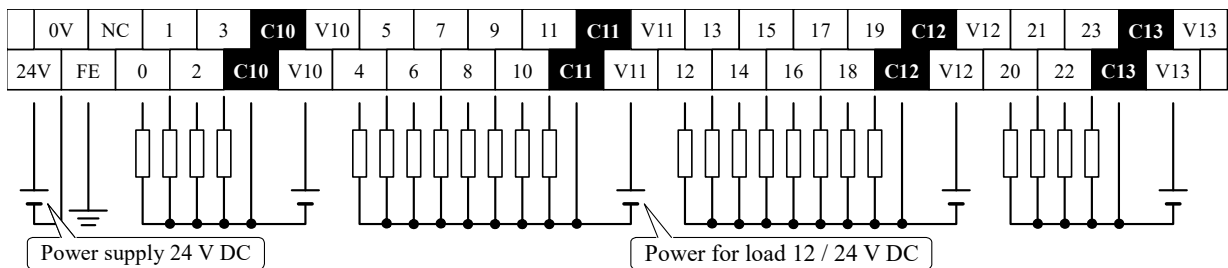
For MVL-D64DT (DC power type) (Input wiring same as MVL-A64DR)

| 0V | NC | 1 | 3 | V10 | **C10** | 5 | 7 | 9 | 11 | V11 | **C11** | 13 | 15 | 17 | 19 | V12 | **C12** | 21 | 23 | V13 | **C13** |
| 24V | FE | 0 | 2 | V10 | **C10** | 4 | 6 | 8 | 10 | V11 | **C11** | 12 | 14 | 16 | 18 | V12 | **C12** | 20 | 22 | V13 | **C13** |

Power supply 24 V DC

Power for load 12 / 24 V DC
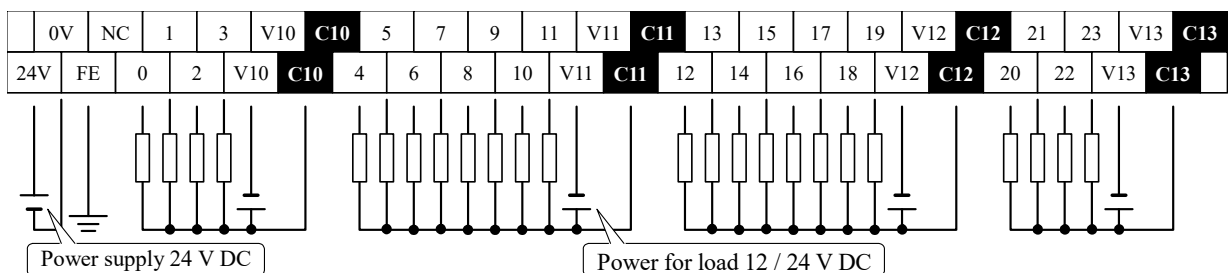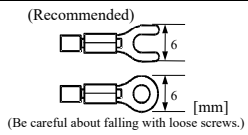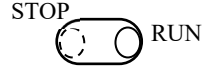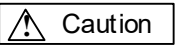
5.2   40-point Standard model (MVL) Basic unit

5.2.1   Section name and function of 40-point Standard model (MVL) Basic unit

Section name and function	Model	MVL-A40DR, MVL-D40DR, MVL-D40DT, MVL-D40DTPS	
	Weight	MVL-A40DR: 560g (1.23 lb.)	MVL-D40DR: 490g (1.08 lb.)
		MVL-D40DT: 450g (0.99 lb.)	MVL-D40DTPS: 450g (0.99 lb.)

Front cover open / removed

No.	Item	Detail description
(1)	POW LED	Turns on when the PLC is powered.
(2)	OK LED	Turns on during normal operation. For turning off / blinking, refer to "Chapter 10 Troubleshooting - Error Code and Countermeasure Procedures."
(3)	RUN LED	Indicates the PLC operation status with turning on / off. (On: RUN, Off: STOP)
(4)	STATUS LED	Turns on during the input refresh prohibited / output refresh prohibited mode. Also, it blinks while FLASH memory being backed up.
(5)	I/O LED	The LED turns on whose number corresponds to the external input (X0, etc.) turned ON. The LED turns on whose number corresponds to the external output (Y100, etc.) turned ON.
(6)	Communication port cover	When this cover is opened, the RUN/STOP switch, serial port, and USB communication port appear. It is opened / closed when the RUN/STOP switch is operated and the USB communication / serial port is used.
(7)	Cover	Do not remove this cover. (Even if the cover is removed, do not touch the printed circuit board directly by hand.)
(8)	Battery cover	Under this cover, there is the battery connector. Remove the cover to attach the battery.

No.	Item	Detail description
(9)	Option board cover	Under this cover, there is the option board connector. Remove the cover to attach the option board. Avoid directly touching the printed board and others with your hands when the cover is removed.
(10)	Expansion connector cover	Under this cover, there is the expansion connector. Open the cover when the expansion cable is removed / attached.
(11)	Terminal cover	The cover for the terminal block. Open the cover for wiring operation.
(12)	DIN mount	Mounting to the DIN rail can be performed.
(13)	Mounting hole	The unit can be fixed to a control panel and others using screws (M4).
(14)	Input terminals	Terminals for external input devices wiring. A recommended terminal is shown in the figure right. One wire of AWG14 to AWG22 (2.1 to 0.36 mm^2) or two wires of AWG16 to AWG22 (1.3 to 0.36 mm^2) can be used for one terminal.
(15)	Output terminals	Connection terminals for external loads. The wiring specification is equal to one for input terminals.
(16)	Power terminal	Connection terminals for power sources. The wiring specification is equal to one for input terminals.

(17)	RUN/STOP switch	When the switch lever is pressed to "RUN," the PLC starts running.
		When it is pressed to "STOP," the PLC stops running.
		For correct operation, the following conditions are required.
		  1. A user program has been written.
		  2. When the operation definition input has been set, the specified input is set to ON.
		  3. There is no error cause.

(18)	USB communication port	The port (dedicated port) for connecting to the programming device. With connection to programming software, a program creation and monitoring are available. * Please arrange a USB communication cable by yourself.
(19)	Standard serial communication port	The dedicated port or general-purpose port for serial communications with external devices. Dedicated port: For communications with the programming device, etc. General-purpose port: For communications with external devices with the serial communication function set with a user program.
(20)	Setting switch	Not supported. Please keep off.
(21)	Battery connector	The connector for connecting the battery sold separately. Attaching the battery retains the following data even while the PLC is turned off. (3) Data specified to a retentive area (4) Calendar clock data (WRF00B to WRF00F) (A user program is retained without the battery because it is memorized to the backup memory.) ⚠ Caution - The battery has polarity. Confirm the polarity before the connector is connected.
(22)	Option board connector	The connector connected to the option board when the option board is attached. Only one option board can be attached.
(23)	Expansion connector	The connector for connecting the expansion cable to connect with the expansion unit. Up to four expansion units can be connected.

Caution

Please note the following for communication ports.

(1) If an Ethernet communication cable is connected to the serial communication port, external devices connected to the serial communication port and the serial communication port of the PLC may be damaged.

(2) When the PLC is connected to the programming software with the USB communication port, the programming software may have a communication error under noise environment.

If a communication error occurs under noise environment, use the serial communication port.

Also, for stable communications, avoid that communication cables are placed closer to other wires or they are stored in a duct together with other wires.

5.2.2 40-point Standard model (MVL) Basic unit terminal array

For MVL-A40DR (AC power type)
* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

24V	1	3	5	7	**C0**	9	11	13	15	17	19	21	23	**C1**
0V	0	2	4	6	**C0**	8	10	12	14	16	18	20	22	**C1**

AC	NC	1	3	5	NC	7	NC	9	11	NC	13	NC	15	**C14**
AC	FE	0	2	4	**C10**	6	**C11**	8	10	**C12**	12	**C13**	14	**C14**

Power supply 100 to 240 V AC

Power for load (relay output)
5 to 30 V DC, 5 to 250 V AC
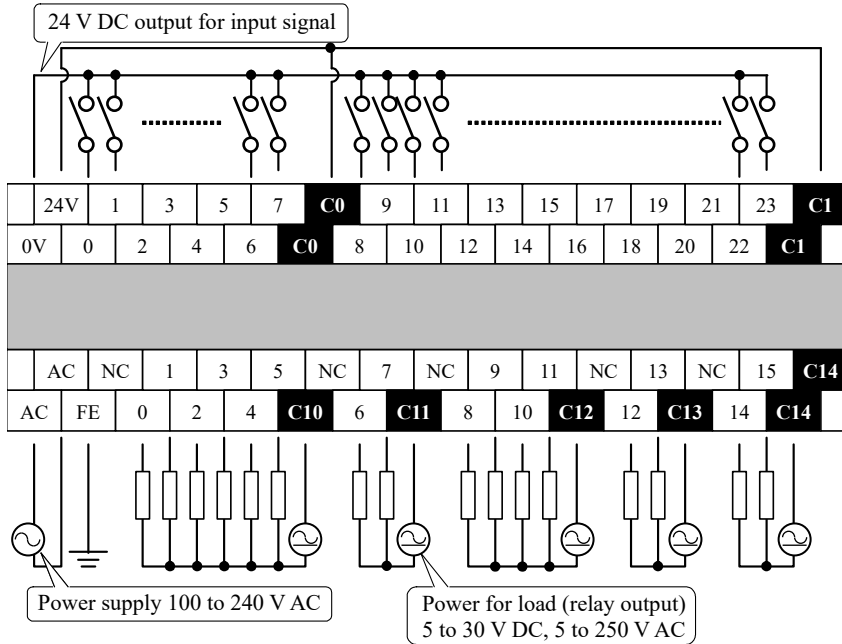
For MVL-D40DR (DC power type) (Input wiring same as MVL-A40DR)
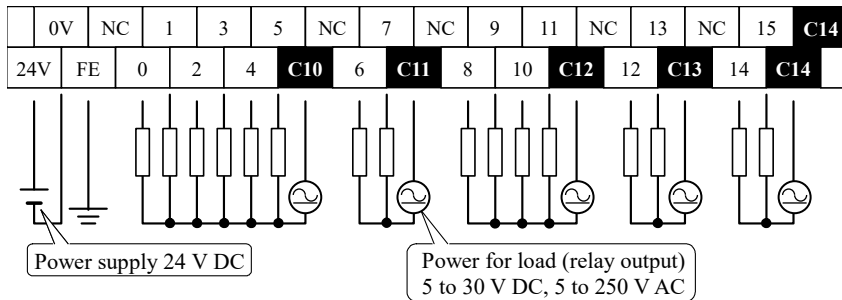
0V	NC	1	3	5	NC	7	NC	9	11	NC	13	NC	15	**C14**
24V	FE	0	2	4	**C10**	6	**C11**	8	10	**C12**	12	**C13**	14	**C14**

Power supply 24 V DC

Power for load (relay output)
5 to 30 V DC, 5 to 250 V AC

For MVL-D40DTPS (DC power type) (Input wiring same as MVH-A40DR)

0V	NC	1	3	**C10**	V10	5	7	9	11	13	15	**C11**	V11	NC
24V	FE	0	2	**C10**	V10	4	6	8	10	12	14	**C11**	V11	NC

Power supply 24 V DC

Power for load 12 / 24 V DC

For MVH-D40DT (DC power type) (Input wiring same as MVH–A40DR)

0V	NC	1	3	V10	**C10**	5	7	9	11	13	15	V11	**C11**	NC
24V	FE	0	2	V10	**C10**	4	6	8	10	12	14	V11	**C11**	NC

Power supply 24 V DC

Power for load 12 / 24 V DC
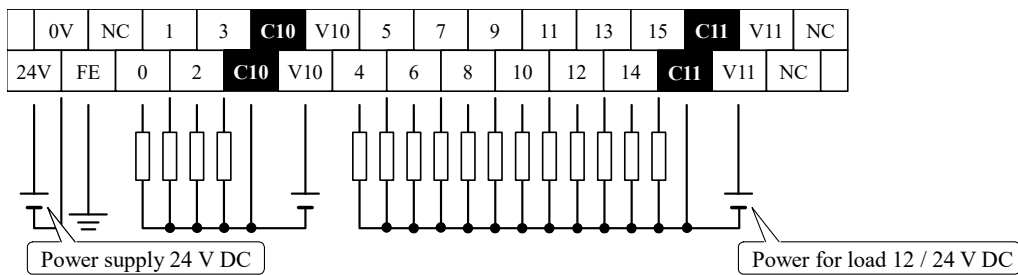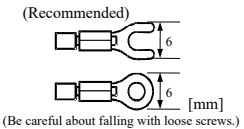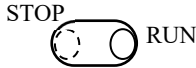
5.3   20-point Standard model (MVL) Basic unit

5.3.1   Section name and function of 20-point Standard model (MVL) Basic unit

Section name and function	Model	MVL-A20DR, MVL-D20DR, MVL-D20DT, MVL-D20DTPS	
	Weight	MVL-A20DR : 560g (1.23 lb.)	MVL-D20DR : 480g (1.06 lb.)
		MVL-D20DT : 450g (0.99 lb.)	MVL-D20DTPS : 450g (0.99 lb.)

Front cover open/removed

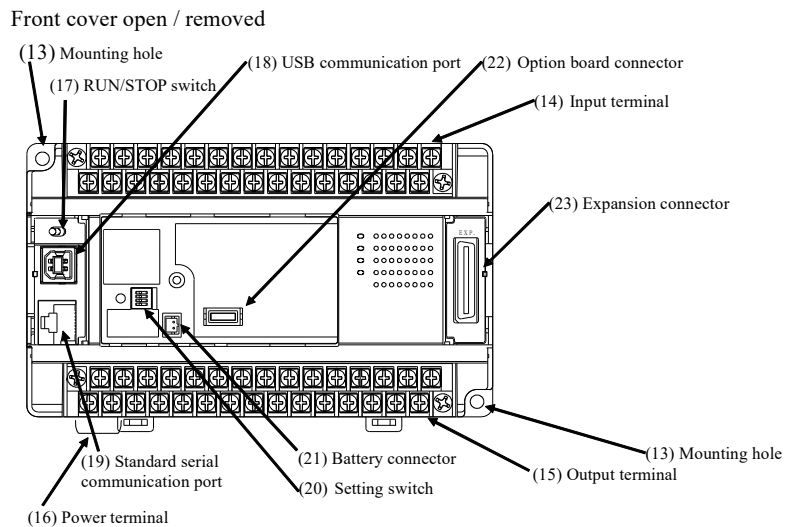| No.	Item	Detail description
(1)	POW LED	Turns on when the PLC is powered.
(2)	OK LED	Turns on during normal operation.
		For turning off / blinking, refer to "Chapter 10 Troubleshooting - Error Code and Countermeasure Procedures."
(3)	RUN LED	Indicates the PLC operation status with turning on / off. (On: RUN, Off: STOP)
(4)	STATUS LED	Turns on during the input refresh prohibited / output refresh prohibited mode.
		Also, it blinks while FLASH memory being backed up.
(5)	I/O LED	The LED turns on whose number corresponds to the external input (X0, etc.) turned ON.
		The LED turns on whose number corresponds to the external output (Y100, etc.) turned ON.
(6)	Communication port cover	When this cover is opened, the RUN/STOP switch, serial port, and USB communication port appear. It is opened / closed when the RUN/STOP switch is operated and the USB communication / serial port is used.
(7)	Cover	Do not remove this cover.
		(Even if the cover is removed, do not touch the printed circuit board directly by hand.)
(8)	Battery cover	Under this cover, there is the battery connector.
		Remove the cover to attach the battery.

No.	Item	Detail description
(9)	Option board cover	Under this cover, there is the option board connector. Remove the cover to attach the option board. Avoid directly touching the printed board and others with your hands when the cover is removed.
(10)	Expansion connector cover	Under this cover, there is the expansion connector. Open the cover when the expansion cable is removed / attached.
(11)	Terminal cover	The cover for the terminal block. Open the cover for wiring operation.
(12)	DIN mount	Mounting to the DIN rail can be performed.
(13)	Mounting hole	The unit can be fixed to a control panel and others using screws (M4).
(14)	Input terminals	Terminals for external input devices wiring. A recommended terminal is shown in the figure right. One wire of AWG14 to AWG22 (2.1 to 0.36 mm^2) or two wires of AWG16 to AWG22 (1.3 to 0.36 mm^2) can be used for one terminal.
(15)	Output terminals	Connection terminals for external loads. The wiring specification is equal to one for input terminals.
(16)	Power terminal	Connection terminals for power sources. The wiring specification is equal to one for input terminals.

(17)	RUN/STOP switch	When the switch lever is pressed to "RUN," the PLC starts running.
		When it is pressed to "STOP," the PLC stops running.
		For correct operation, the following conditions are required.
		  1. A user program has been written.
		  2. When the operation definition input has been set, the specified input is set to ON.
		  3. There is no error cause.

(18)	USB communication port	The port (dedicated port) for connecting to the programming device. With connection to programming software, a program creation and monitoring are available. * Please arrange a USB communication cable by yourself.
(19)	Standard serial communication port	The dedicated port or general-purpose port for serial communications with external devices. Dedicated port: For communications with the programming device, etc. General-purpose port: For communications with external devices with the serial communication function set with a user program.
(20)	Setting switch	Not supported. Please keep off.
(21)	Battery connector	The connector for connecting the battery sold separately. Attaching the battery retains the following data even while the PLC is turned off. (5) Data specified to a retentive area (6) Calendar clock data (WRF00B to WRF00F) (A user program is retained without the battery because it is memorized to the backup memory.) ⚠ Caution - The battery has polarity. Confirm the polarity before the connector is connected.
(22)	Option board connector	The connector connected to the option board when the option board is attached. Only one option board can be attached.
(23)	Expansion connector	The connector for connecting the expansion cable to connect with the expansion unit. Up to four expansion units can be connected.

Caution

Please note the following for communication ports.

(1) If an Ethernet communication cable is connected to the serial communication port, external devices connected to the serial communication port and the serial communication port of the PLC may be damaged.

(2) When the PLC is connected to the programming software with the USB communication port, the programming software may have a communication error under noise environment.
If a communication error occurs under noise environment, use the serial communication port.
Also, for stable communications, avoid that communication cables are placed closer to other wires or they are stored in a duct together with other wires.

5.3.2 20-point Standard model (MVL) Basic unit terminal array

For MVH-A20DR (AC power type)
* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

| 24V | 1 | 3 | 4 | 6 | C1 | | 9 | 11 | C2 | NC | NC | NC |
| 0V | 0 | 2 | C0 | 5 | 7 | | 8 | 10 | C2 | NC | NC | NC |

| AC | 0 | NC | 2 | 4 | 5 | | 6 | 7 | NC | NC | NC | NC |
| AC | FE | C10 | 1 | 3 | C11 | | C12 | C13 | C14 | NC | NC | NC |

Power supply 100 to 240 V AC

Power for load (relay output) 5 to 30 V DC, 5 to 250 V AC
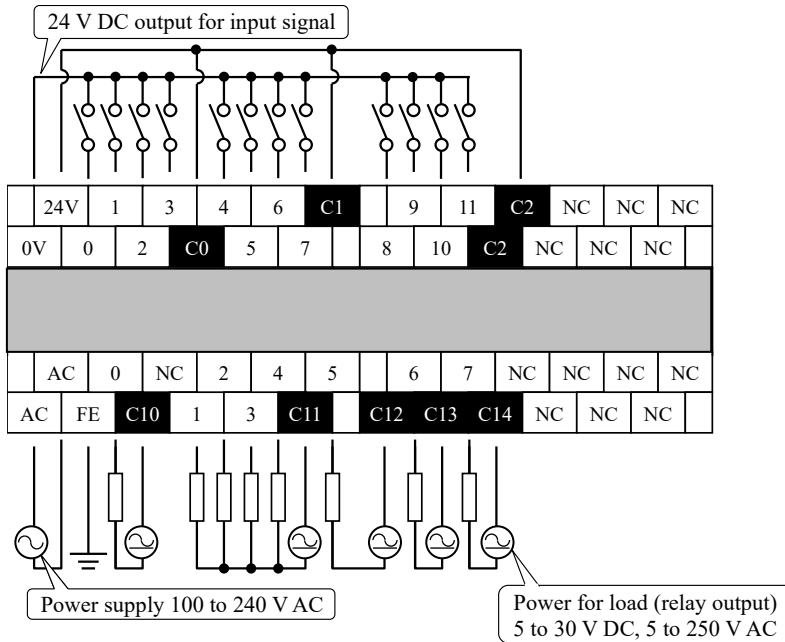
For MVL-D20DR (DC power type) (Input wiring same as MVL-A20DR)

| 0V | 0 | NC | 2 | 4 | 5 | | 6 | 7 | NC | NC | NC | NC |
| 24V | FE | C10 | 1 | 3 | C11 | | C12 | C13 | C14 | NC | NC | NC |

Power supply 24 V DC

Power for load (relay output) 5 to 30 V DC, 5 to 250 V AC
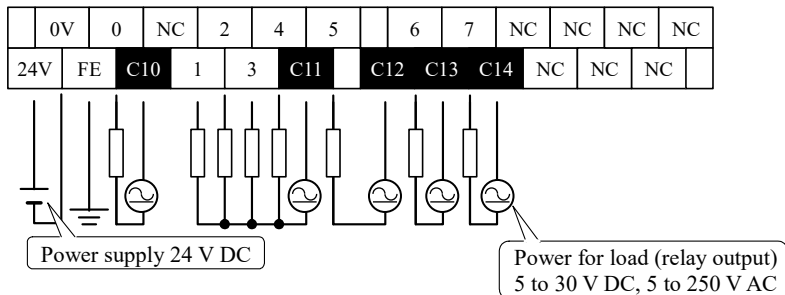
For MVL-D20DTPS (DC power type) (Input wiring same as MVL-A20DR)

| 0V | 0 | NC | 3 | C10 | 5 | | 7 | V11 | NC | NC | NC | NC |
| 24V | FE | 1 | 2 | V10 | 4 | | 6 | C11 | NC | NC | NC | NC |

Power supply 24 V DC

Power for load 12 / 24 V DC
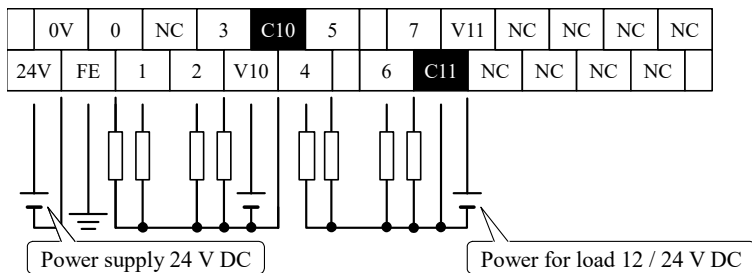
For MVL-D20DT (DC power type) (Input wiring same as MVL-A20DR)

| 0V | 0 | NC | 3 | V10 | 5 | | 7 | C11 | NC | NC | NC | NC |
| 24V | FE | 1 | 2 | C10 | 4 | | 6 | V11 | NC | NC | NC | NC |

Power supply 24 V DC

Power for load 12 / 24 V DC
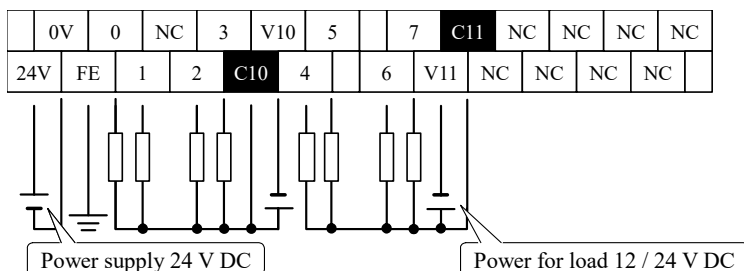
5.4   Standard model (MVL) Dimensional drawing

5.4.1   64-point Standard model (MVL) Dimensional drawing
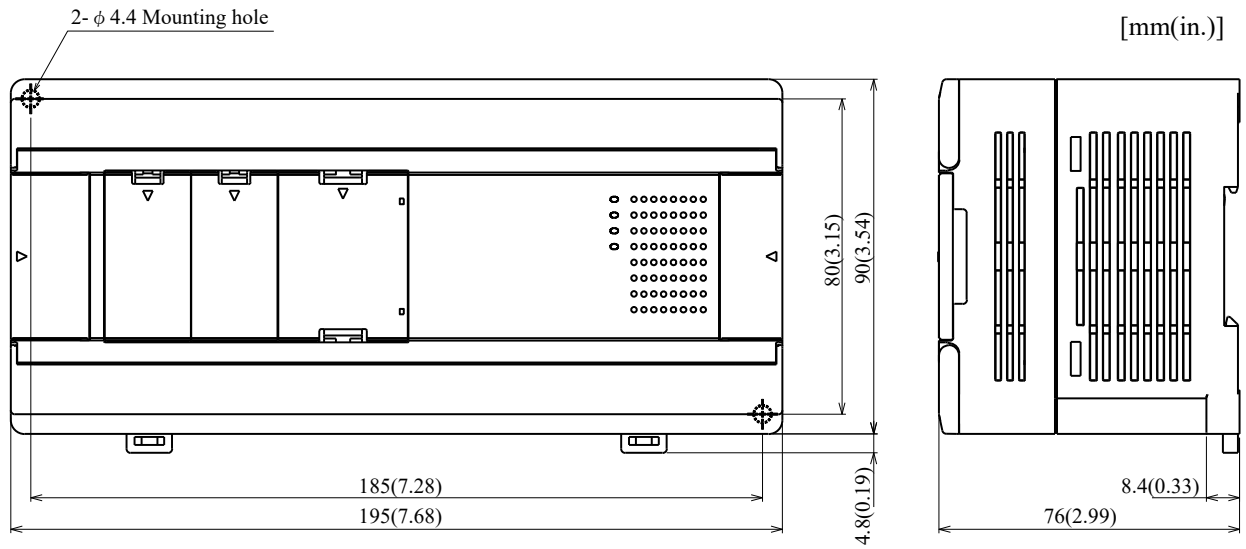
2- φ 4.4 Mounting hole

[mm(in.)]

80(3.15)
90(3.54)

185(7.28)
195(7.68)

4.8(0.19)

8.4(0.33)
76(2.99)

5.4.2   40-point Standard model (MVL) Dimensional drawing

2- φ 4.4 Mounting hole

[mm(in.)]

80(3.15)
90(3.54)

140(5.51)
150(5.91)

4.8(0.19)

8.4(0.33)
76(2.99)

5.4.3   20-point Standard model (MVL) Dimensional drawing

2- φ 4.4 Mounting hole

[mm(in.)]

80(3.15)

90(3.54)

4.8(0.19)

140(5.51)

150(5.91)

8.4(0.33)

76(2.99)

5 - 11

MEMO

5 - 12
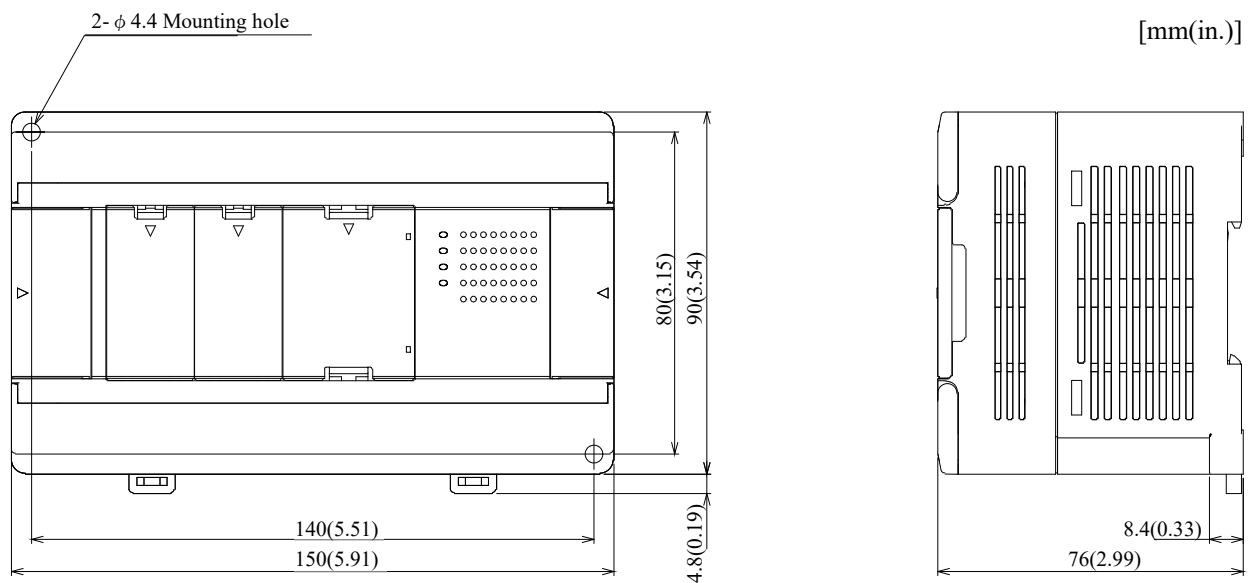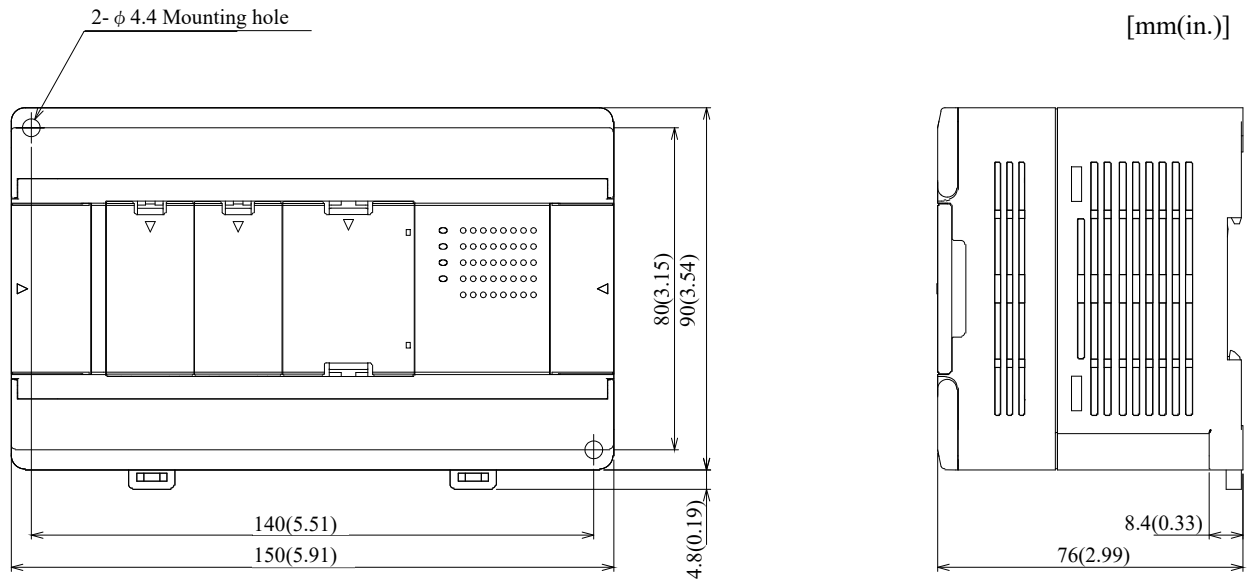
MEMO

Chapter 6　Expansion unit

6.1　8-point Expansion unit terminal array

For EH-D8EDR

* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

| 24 V | 1 | 3 | NC | NC | NC | Input |
| 0 V | 0 | 2 | **C0** | NC | NC | |

| 0 V | 16 | 17 | 18 | NC | **C2** | Output |
| 24 V | ⏚ | **C0** | **C1** | 19 | NC | |

Power supply 24 V DC

Power for load (relay output) 5 to 30 V DC, 5 to 250 V AC
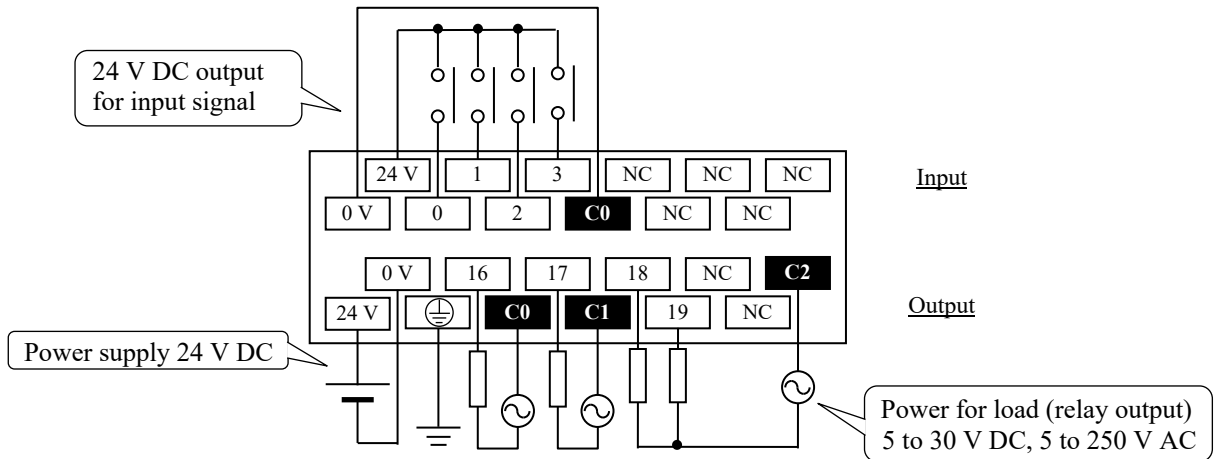
For EH-D8EDTPS

* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

| 24 V | 1 | 3 | NC | NC | NC | Input |
| 0 V | 0 | 2 | **C0** | NC | NC | |

| 0 V | 16 | NC | 19 | NC | **C0** | Output |
| 24 V | ⏚ | 17 | 18 | NC | V0 | |

Power supply 24 V DC

Power for load 12 / 24 V DC
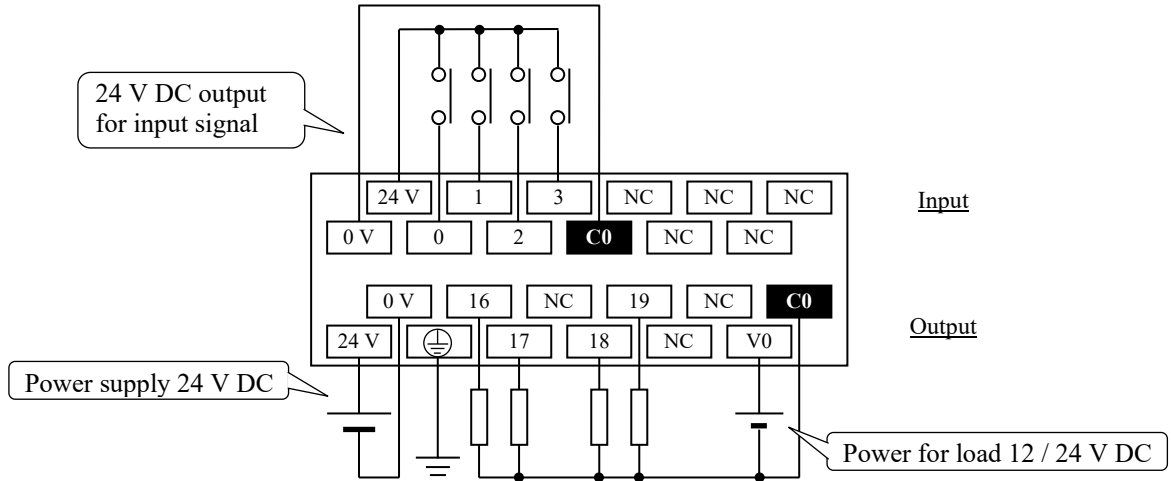
For EH-D8EDT (Input wiring same as EH-D8EDTPS)

| 0 V | 16 | NC | 19 | NC | **C0** | Output |
| 24 V | ⏚ | 17 | 18 | NC | V0 | |

Power supply 24 V DC

Power for load 12 / 24 V DC
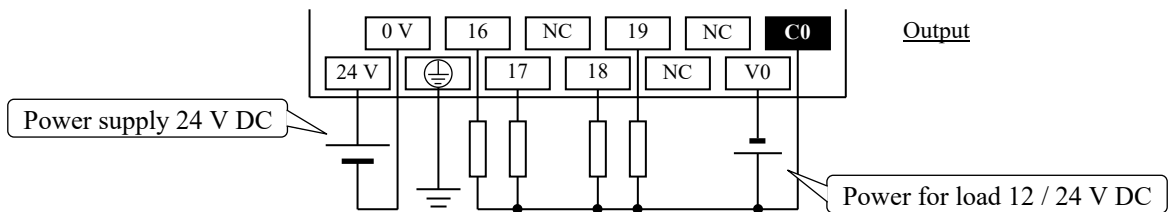
For EH-D8ED (only input)

* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output
for input signal

| 24 V | 1 | 3 | 4 | 6 | **C1** |
| 0 V | 0 | 2 | **C0** | 5 | 7 |

| 0 V | NC | NC | NC | NC | NC |
| 24 V | ⏚ | NC | NC | NC | NC |

Power supply 24 V DC

For EH-D8ER (only output)

Power for load (relay output)
5 to 30 V DC, 5 to 250 V AC

| 17 | 19 | 20 | 22 | **C1** | NC |
| 16 | 18 | **C0** | 21 | 23 | NC |

| 0 V | NC | NC | NC | NC | NC |
| 24 V | ⏚ | NC | NC | NC | NC |

Power supply 24 V DC
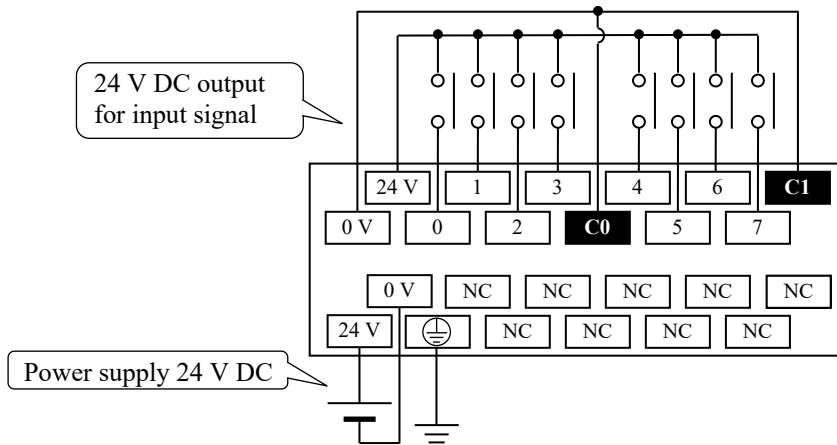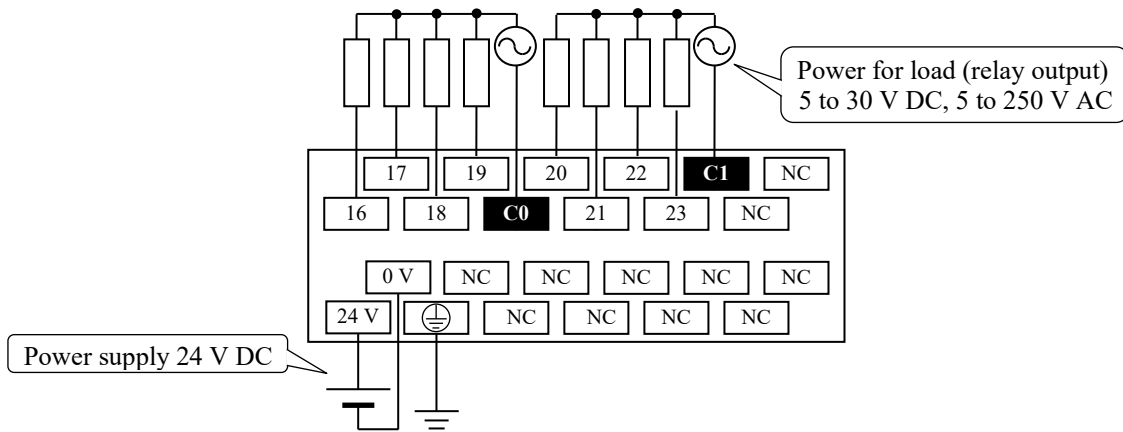
For EH-D8ETPS (only output)

Power for load 12 / 24 V DC

| V0 | 17 | 19 | 21 | 23 | NC |
| **C0** | 16 | 18 | 20 | 22 | NC |

| 0 V | NC | NC | NC | NC | NC |
| 24 V | ⏚ | NC | NC | NC | NC |

Power supply 24 V DC

For EH-D8ET (only output)

Power for load 12 / 24 V DC

V0		17		19		21		23		NC
C0		16		18		20		22		NC	
0 V	NC	NC	NC	NC	NC
24 V	⏚	NC	NC	NC	NC

Power supply 24 V DC
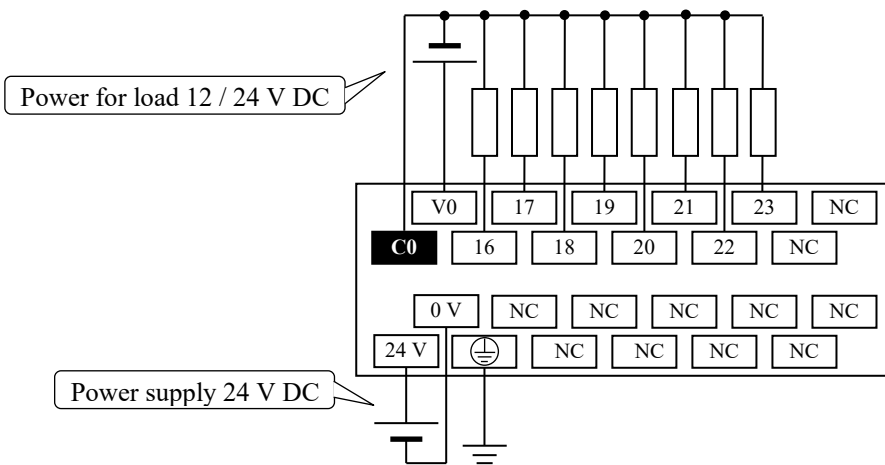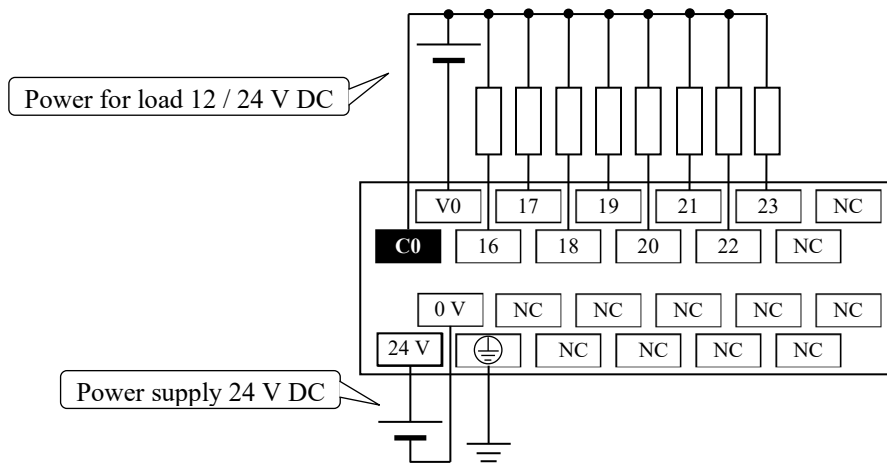
6.2   14-point Expansion unit terminal array

For EH-A14EDR
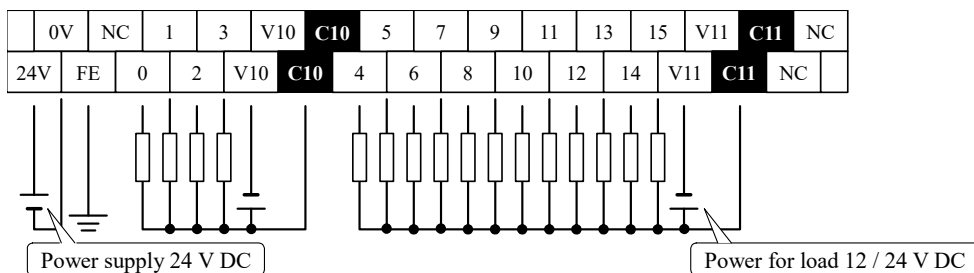* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

| 24 V | 1 | 3 | 4 | 6 | C1 | Input
| 0 V | 0 | 2 | C0 | 5 | 7 |

| AC | 16 | 17 | 18 | 20 | C2 |
| AC | ⏚ | C0 | C1 | 19 | 21 | Output

Power supply 100 to 240 V AC

Power for load (relay output) 5 to 30 V DC, 5 to 250 V AC
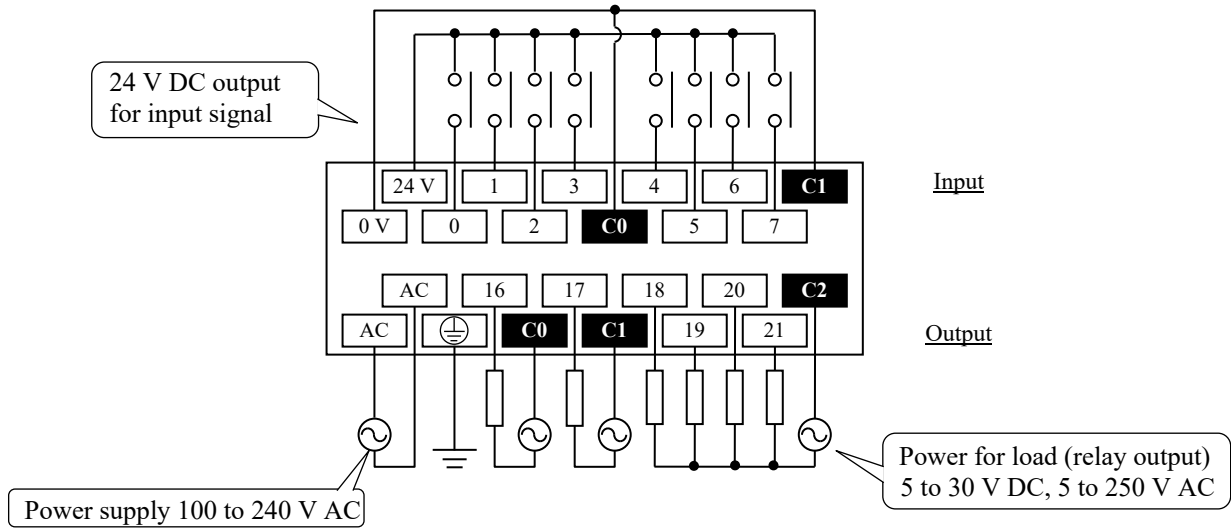
For EH-D14EDR (Input/output wiring same as EH-A14EDR)

| 0 V |
| 24 V | ⏚ |

Power supply 24 V DC
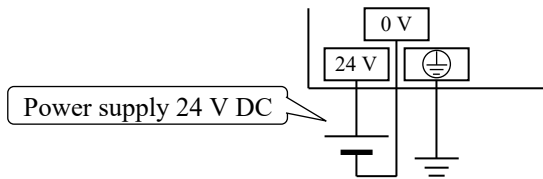
For EH-D14EDTP and EH-D14EDTPS
* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

| 24 V | 1 | 3 | 4 | 6 | C1 | Input
| 0 V | 0 | 2 | C0 | 5 | 7 |

| 0 V | 16 | NC | 19 | 21 | C0 |
| 24 V | ⏚ | 17 | 18 | 20 | V0 | Output

Power supply 24 V DC

Power for load 12 / 24 V DC
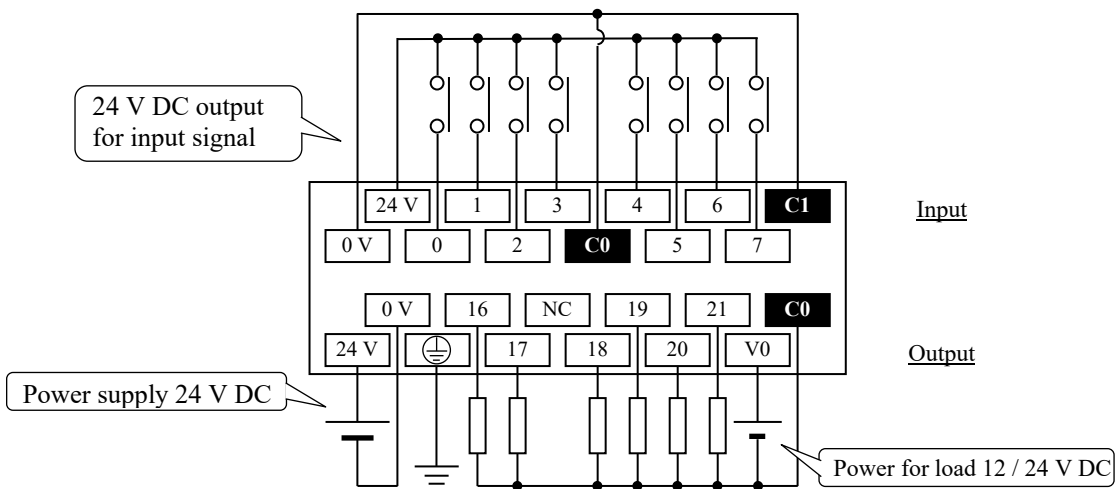
For EH-D14EDT (Input wiring same as EH-D14EDTP and EH-D14EDTPS)
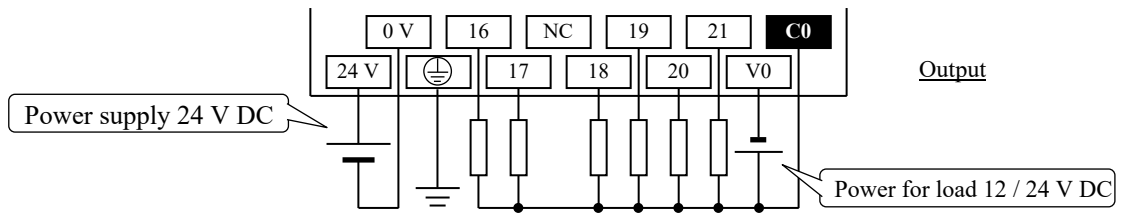
6.3 16-point Expansion unit terminal array

For EH-D16ED (only input)

* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

Power supply 24 V DC

For EH-D16ER (only output)

Power for load (relay output)
5 to 30 V DC, 5 to 250 V AC

Power supply 24 V DC
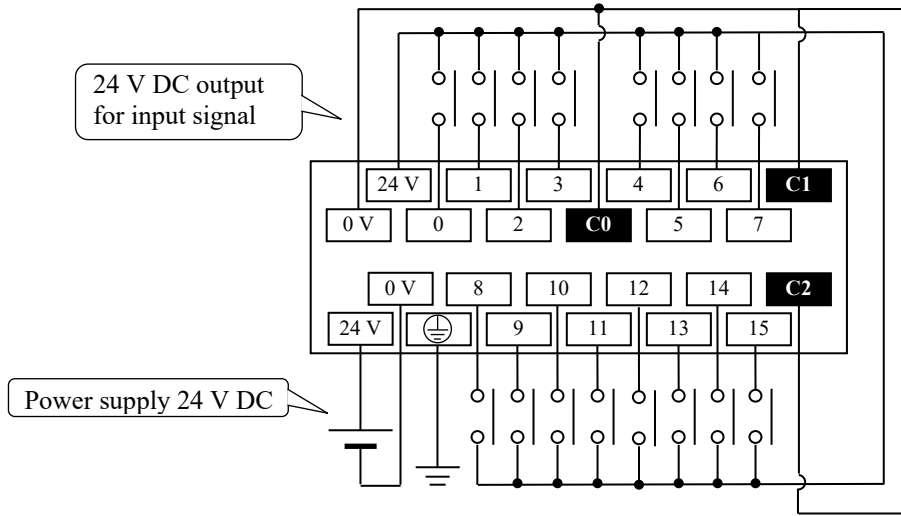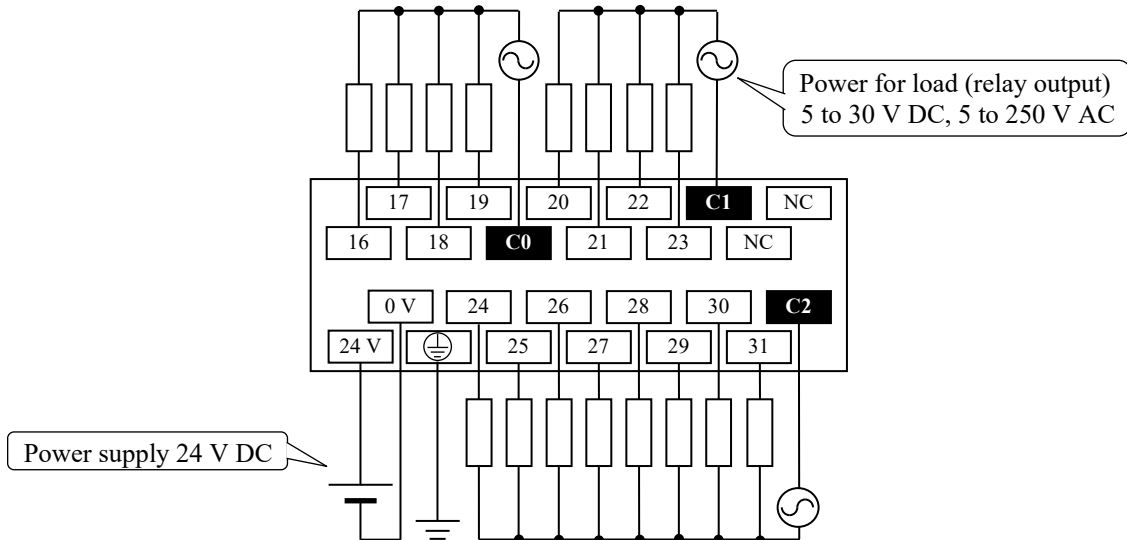
For EH-D16ETPS (only output)

Power for load 12 / 24 V DC

| V0 | 17 | 19 | 21 | 23 | 25 |
| C0 | 16 | 18 | 20 | 22 | 24 |

| 0 V | NC | | 27 | 29 | 31 |
| 24 V | ⏚ | C1 | 26 | 28 | 30 |

Power supply 24 V DC

For EH-D16ET (only output)

Power for load 12 / 24 V DC

| V0 | 17 | 19 | 21 | 23 | 25 |
| C0 | 16 | 18 | 20 | 22 | 24 |

| 0 V | NC | | 27 | 29 | 31 |
| 24 V | ⏚ | C1 | 26 | 28 | 30 |

Power supply 24 V DC
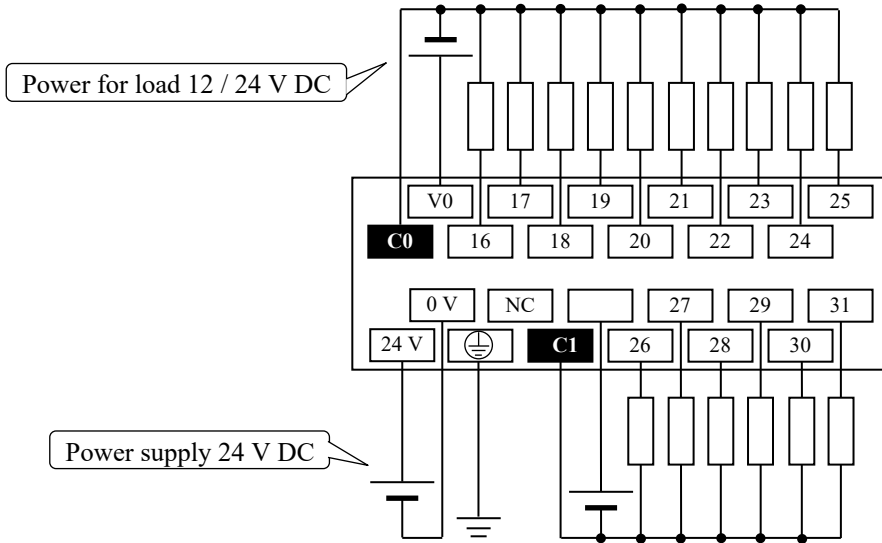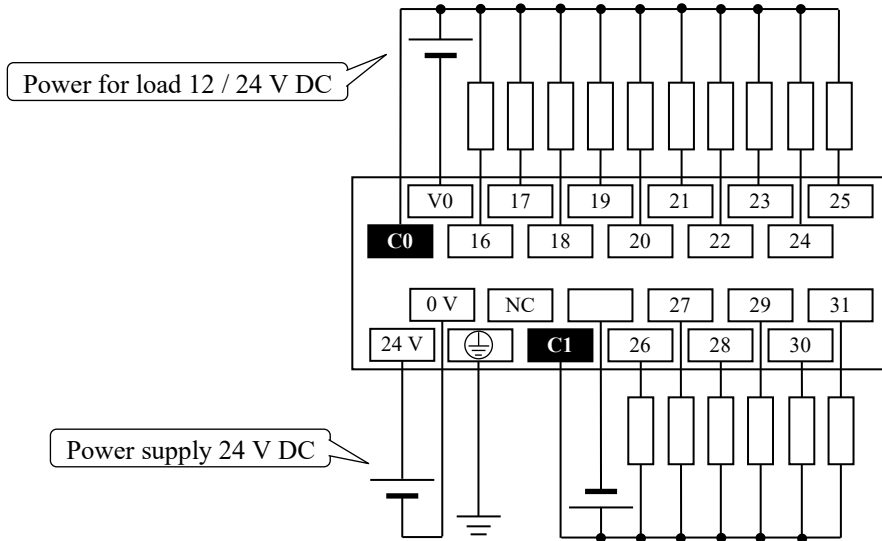
6.4   28-point Expansion unit terminal array

For EH-A28EDR

* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

| 24 V | 1 | 3 | 4 | 6 | C1 | | 9 | 11 | C2 | 13 | 15 | C3 | Input |
| 0 V | 0 | 2 | C0 | 5 | 7 | | 8 | 10 | C2 | 12 | 14 | C3 | |

| AC ⏚ | 16 | NC | 18 | 20 | 21 | | 22 | 23 | 24 | 25 | 27 | C6 | |
| AC | | C0 | 17 | 19 | C1 | | C2 | C3 | C4 | C5 | 26 | C6 | Output |

Power supply 100 to 240 V AC

Power for load (relay output)
5 to 30 V DC, 5 to 250 V AC
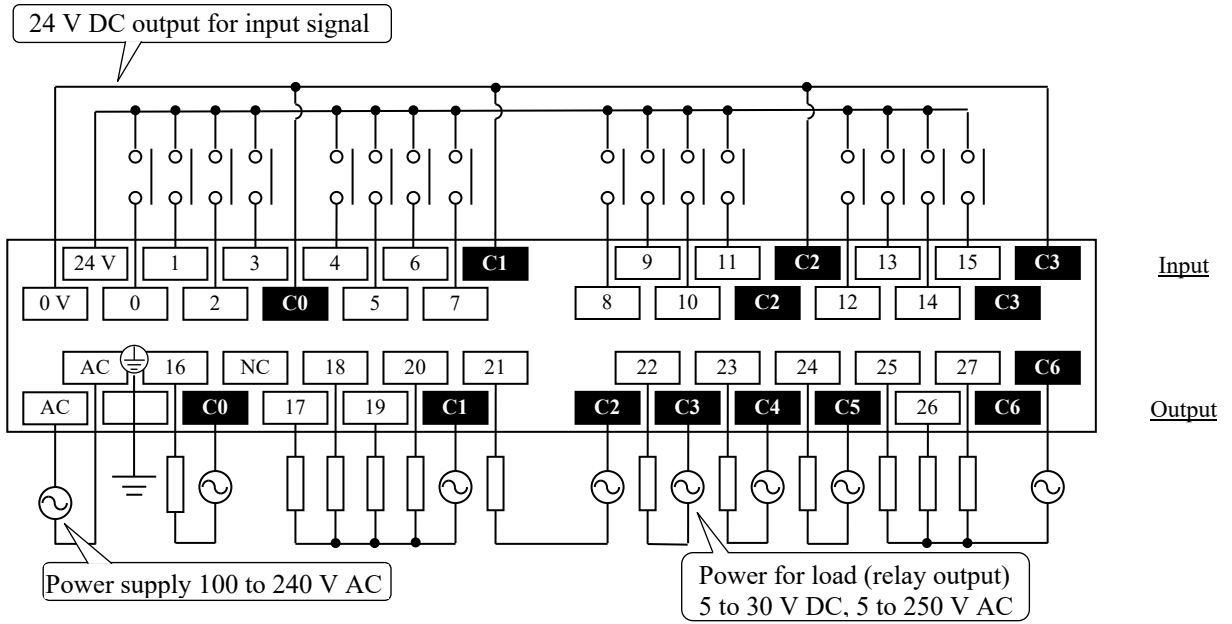
For EH-D28EDR (Input/output wiring same as EH-A28EDR)

| 0 V | 0 | NC | 2 | Output |
| 24 V | ⏚ | C0 | 1 | |

Power supply 24 V DC

6 - 8
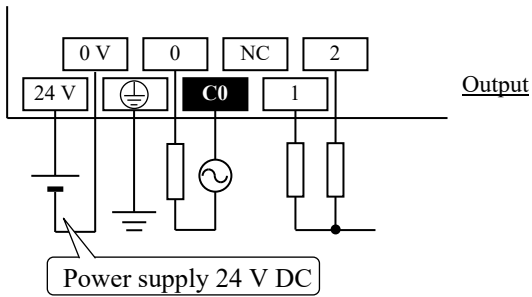
For EH-D28EDTP

* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

| 24 V | 1 | 3 | 4 | 6 | C1 | | 9 | 11 | C2 | 13 | 15 | C3 | Input |
| 0 V | 0 | 2 | C0 | 5 | 7 | | 8 | 10 | C2 | 12 | 14 | C3 | |

| 0 V | 16 | NC | 19 | 21 | C0 | | C1 | V1 | 22 | 24 | NC | 27 | Output |
| 24 V | ⏚ | 17 | 18 | 20 | V0 | | NC | C1 | V1 | 23 | 25 | 26 | |

Power supply 24 V DC

Power for load 12 / 24 V DC
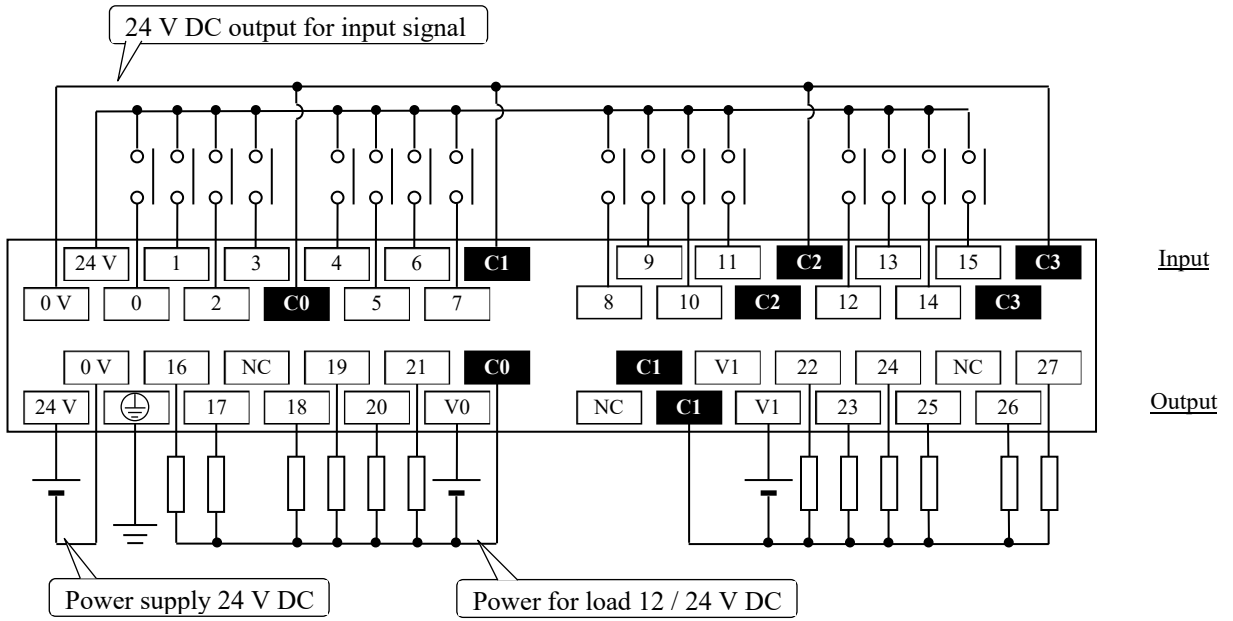
For EH-D28EDTPS (Input wiring same as EH-D28EDTP)

| 0V | 16 | NC | 19 | C0 | 21 | | 23 | V1 | C2 | 24 | NC | 27 | Output |
| 24V | ⏚ | 17 | 18 | V0 | 20 | | 22 | C1 | NC | V2 | 25 | 26 | |

Power supply 24 V DC

Power for load 12 / 24 V DC
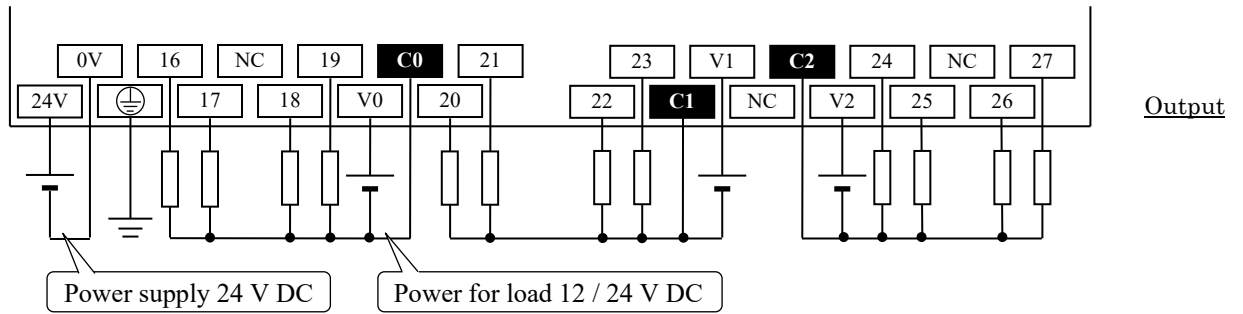
For EH-D28EDT (Input wiring same as EH-D28EDTP)

| 0 V | 16 | NC | 19 | 21 | C0 | | C1 | V1 | 22 | 24 | NC | 27 | Output |
| 24 V | ⏚ | 17 | 18 | 20 | V0 | | NC | C1 | V1 | 23 | 25 | 26 | |

Power supply 24 V DC

Power for load 12 / 24 V DC

6 - 9
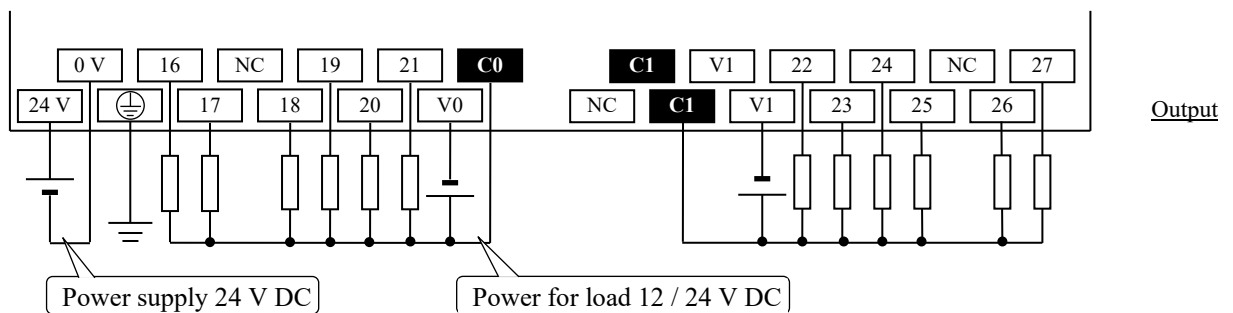
6.5   64-point Expansion unit terminal array

For EH-A64EDR (AC power source type)

* The DC input is bidirectional; therefore, also power source polarity can be inverted.

24 V DC output for input signal

24V	1	3	5	7	9	11	13	15	16	18	20	22	24	26	28	30	32	34	36	38	**C1**
0V	0	2	4	6	8	10	12	14	**C0**	17	19	21	23	25	27	29	31	33	35	37	39

Input

AC	NC	1	3	5	NC	7	NC	9	11	NC	13	NC	15	NC	17	NC	19	NC	21	22	**C18**
AC	⏚	0	2	4	**C10**	6	**C11**	8	10	**C12**	12	**C13**	14	**C14**	16	**C15**	18	**C16**	20	**C17**	23

Output

Power supply 100 to 240 V AC

Power for load (relay output) 5 to 30 V DC, 5 to 250 V AC
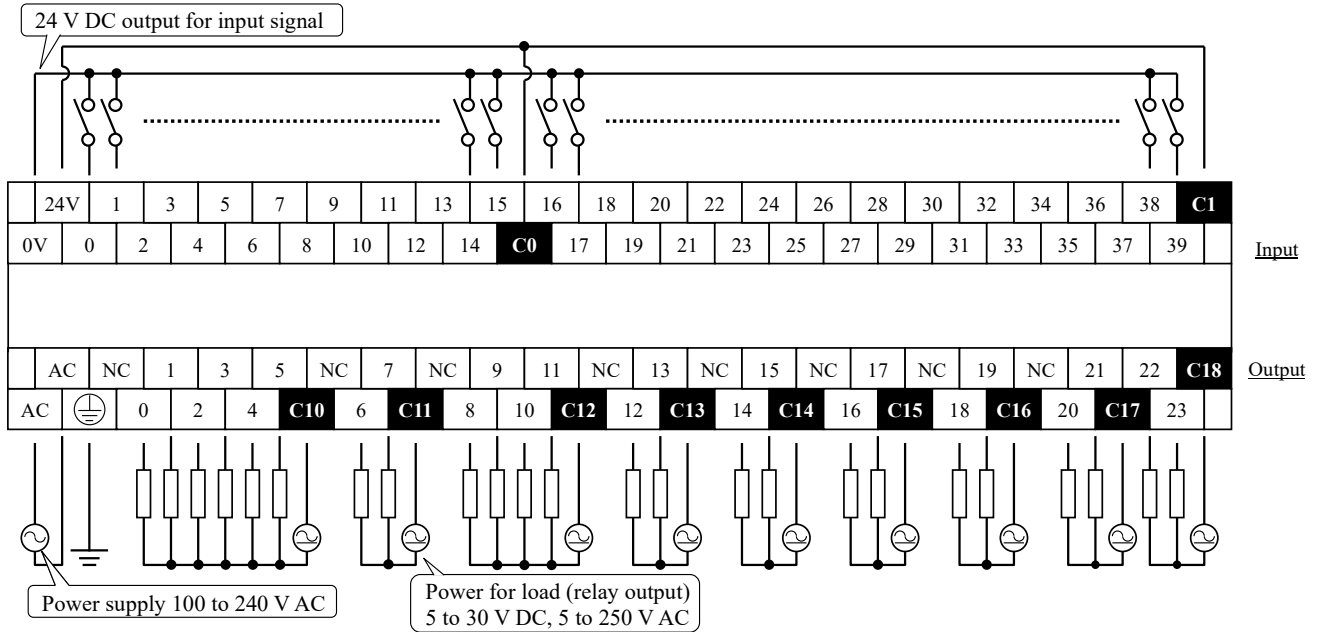
For EH-D64EDR (DC power source type) (Input wiring same as EH-A64EDR)

0V	NC	1	3	5	NC	7	NC	9	11	NC	13	NC	15	NC	17	NC	19	NC	21	22	**C18**
24V	⏚	0	2	4	**C10**	6	**C11**	8	10	**C12**	12	**C13**	14	**C14**	16	**C15**	18	**C16**	20	**C17**	23

Output

Power supply 24 V DC

Power for load (relay output) 5 to 30 V DC, 5 to 250 V AC
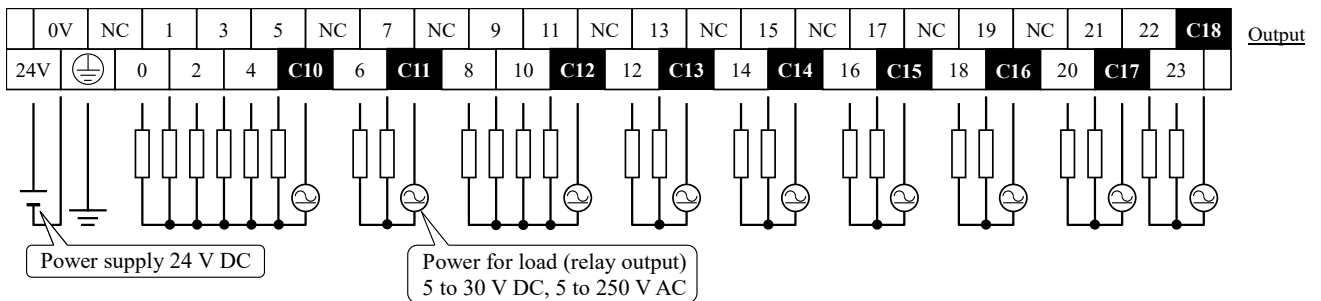
For EH-D64EDTPS (DC power source type) (Input wiring same as EH-A64EDR)

0V	NC	1	3	**C10**	V10	5	7	9	11	**C11**	V11	13	15	17	19	**C12**	V12	21	23	**C13**	V13	Output
24V	⏚	0	2	**C10**	V10	4	6	8	10	**C11**	V11	12	14	16	18	**C12**	V12	20	22	**C13**	V13	

Power supply 24 V DC

Power for load 12 / 24 V DC
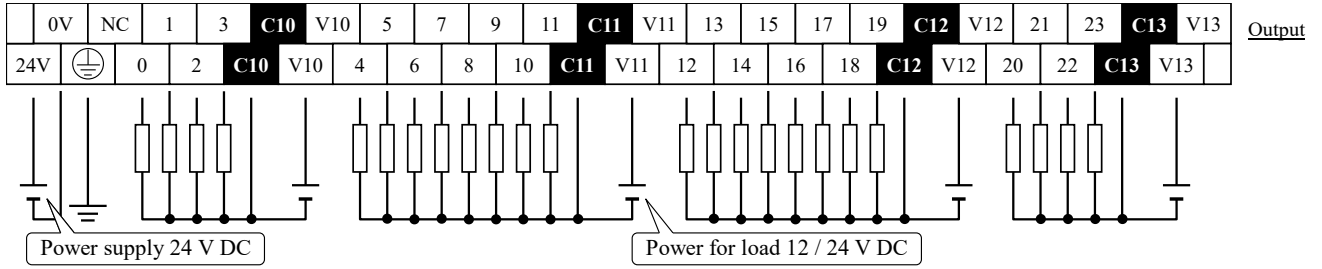
For EH-D64EDT (DC power source type) (Input wiring same as EH-A64EDR)

0V	NC	1	3	V10	**C10**	5	7	9	11	V11	**C11**	13	15	17	19	V12	**C12**	21	23	V13	**C13**	Output
24V	⏚	0	2	V10	**C10**	4	6	8	10	V11	**C11**	12	14	16	18	V12	**C12**	20	22	V13	**C13**	

Power supply 24 V DC

Power for load 12 / 24 V DC

6 - 11
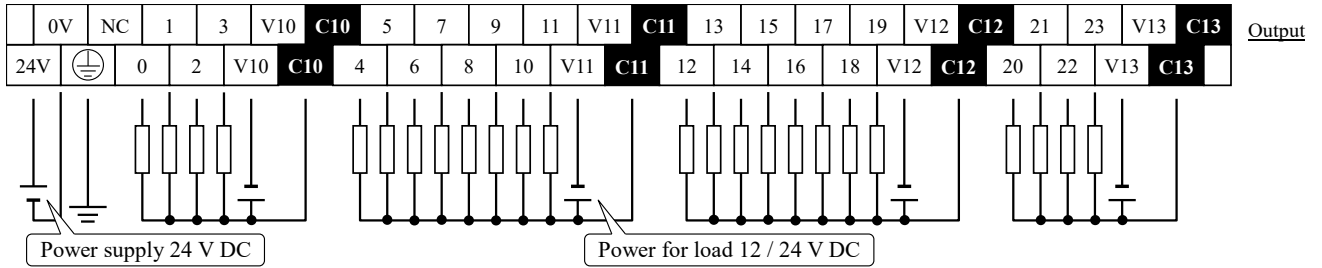
6.6   Analog Expansion unit terminal array

For EH-A6EAN (for voltage input/output both)

Voltage input × 4

Voltage and current can be
set for input and output
separately.

Power supply 100 to 240 V AC

Voltage output × 2
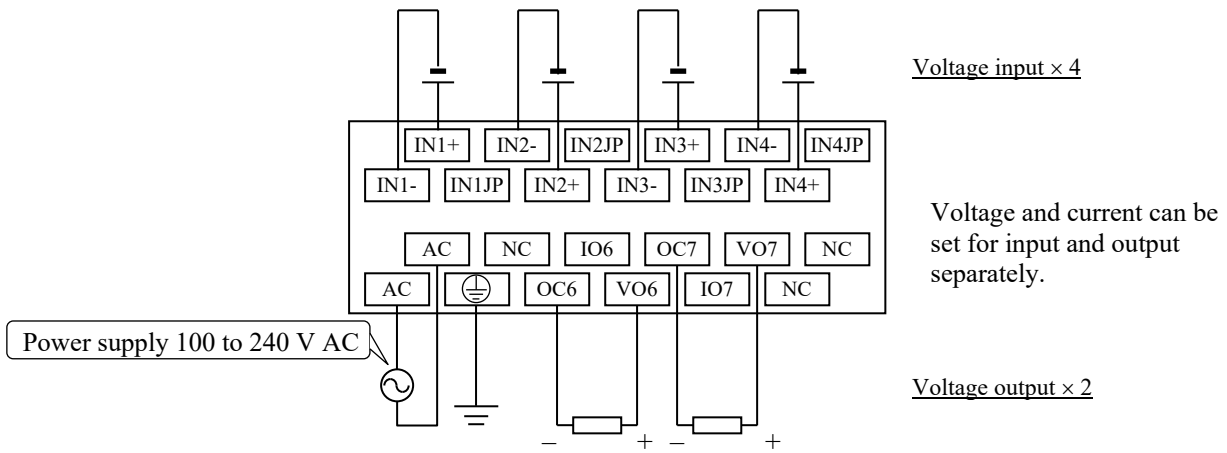
For EH-D6EAN (for current input/output both)

Current input × 4

Voltage and current can be
set for input and output
separately.

Power supply 24 V DC

Current output × 2
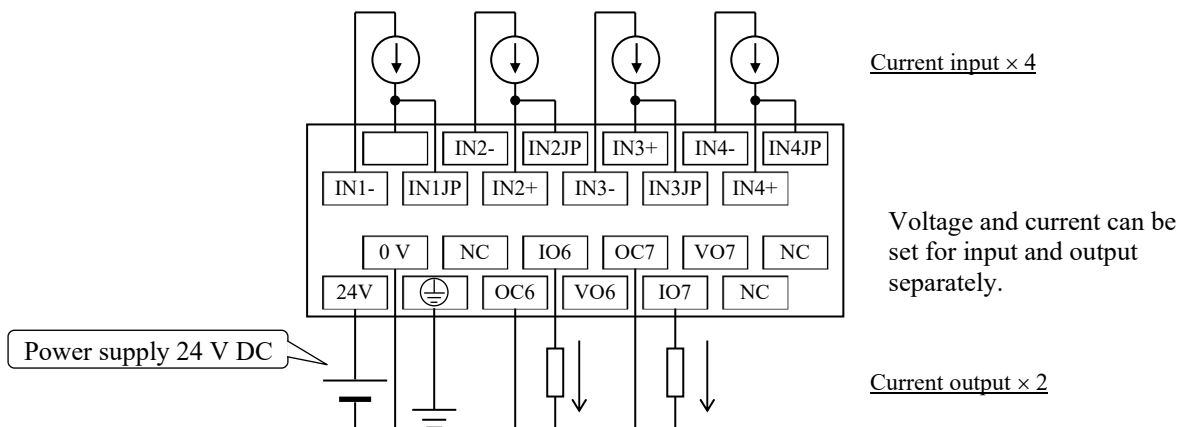
6.7   RTD Expansion unit terminal array

For EH-A6ERTD / EH-D6ERTD

Pt100

RTD (temperature) input × 4

| IN1B | IN2A | IN2b | IN3B | IN4A | IN4b |

| IN1A | IN1b | IN2B | IN3A | IN3b | IN4B |

| AC | NC | IO6 | OC7 | VO7 | NC |

| AC | ⏚ | OC6 | VO6 | IO7 | NC |

Voltage and current can be set for input and output separately.

Power supply 100 to 240 V AC

Voltage output × 2

- +   - +

| 0 V |
| 24 V | ⏚ |

Power supply 24 V DC

| NC | IO6 | OC7 | VO7 | NC |
| OC6 | VO6 | IO7 | NC |

Current output × 2

For EH-A4ERTD/EH-D4ERTD

Pt100

RTD (temperature) input × 4

| IN1B | IN2A | IN2b | IN3B | IN4A | IN4b |

| IN1A | IN1b | IN2B | IN3A | IN3b | IN4B |

| AC | NC | NC | NC | NC | NC |

| AC | ⏚ | NC | NC | NC | NC |

Power supply 100 to 240 V AC

| 0 V |
| 24 V | ⏚ |

Power supply 24 V DC

6.8 Thermocouple Expansion unit terminal array

For EH-D6ETC

(For current output)

Ch1 Ch2 Ch3 Ch4

Thermocouple sensor
-200 to 1,700°C

Cold junction

| NC | NC | IN1+ | IN2+ | IN3+ | IN4+ |
| CJ- | CJ+ | IN1- | IN2- | IN3- | IN4- |

| 0 V | NC | NC | IO6 | OC7 | VO7 |
| 24 V | ⏚ | NC | OC6 | VO6 | IO7 |

Power supply 24 V DC

Ch6   Ch7

Output current
0 to 20 mA

(For voltage output)

Output voltage
0 to 10 V

| 0 V | NC | NC | IO6 | OC7 | VO7 |
| 24 V | ⏚ | NC | OC6 | VO6 | IO7 |

Power supply 24 V DC

-    +   -   +

Ch6   Ch7

For EH-D4ETC

Ch1 Ch2 Ch3 Ch4

Cold
junction

Thermocouple sensor
-200 to 1,700°C

| NC | NC | IN1+ | IN2+ | IN3+ | IN4+ |
| CJ- | CJ+ | IN1- | IN2- | IN3- | IN4- |

| 0 V | NC | NC | NC | NC | NC |
| 24 V | ⏚ | NC | NC | NC | NC |

Power supply 24 V DC

Chapter 7　Option board

　With the MICRO-EHV series, attaching the option board allows additional communication functions, analog input and analog output. If you use option board, you should combine the basic unit which correspond with option board. The programming software (Control Editor) which correspond with option board is also needed.

The MICRO-EHV software versions are described below which can use the option board.

Table 7.1　List of option boards

No.	Model	Function	Support software version *
1	OBV-NES	RS-485 (Two-wire system) serial communication board	Ver.x104 (Dec. 2012 manufactured) or newer
2	OBV-485A	RS-485 (Four-wire system) serial communication board with 2 ch. 10-bit voltage analog input	Ver.x105 (Jun. 2013 manufactured) or newer
3	OBV-485TAI	RS-485 (Two-wire system) serial communication board with 2 ch. 10-bit voltage analog input	Ver.x109 (Feb. 2015 manufactured) or newer
4	OBV-485TAO	RS-485 (Two-wire system) serial communication board with 2 ch. 10-bit voltage analog output	
5	OBV-AIO	Analog input / output board with 2 ch. 10-bit voltage analog input, 2 ch. 10-bit voltage analog output	
6	OBV-AIG	4 channel isolated analog input	Ver.x126 (Mar. 2021 manufactured) or newer
7	OBV-AIOG	2 channel isolated analog input, 2 channel isolated analog output	
8	OBV-RTD	RTD temperature input, 4 channel isolated input (2 wired) or 2 channel isolated input (3 wired)	

* For the upper value "x" of the software version, "0" indicates the high function model (MVH) and "1" indicates the standard model (MVL).
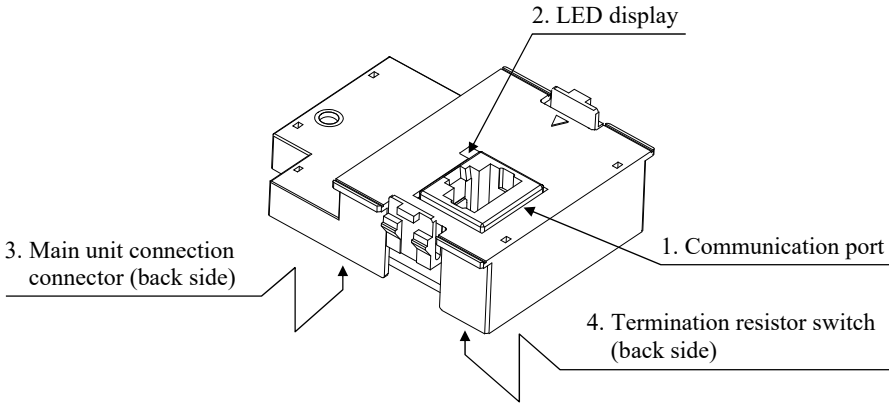
Caution

Please note the following for using the option boards.
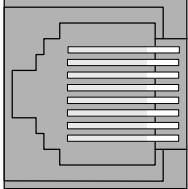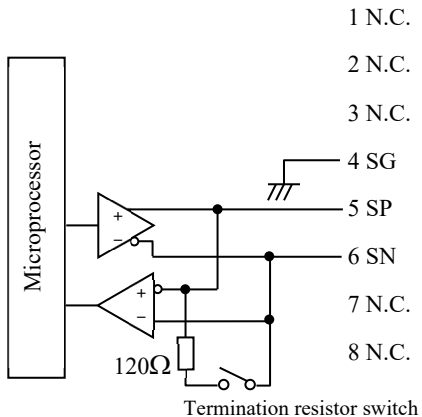
(1) When install or remove the option board, please turn off the power of MICRO-EHV.
　　If the option board is installed / removed while the unit is energized, an error or failure may occur.
(2) The parameter for the option board can be set by Control Editor [Tool] - [CPU settings] - [Option board settings].
　　As to the communication option board, if you want to use Modbus protocol, the parameter for Modbus communication can be set by Control Editor [Tool] - [CPU settings] - [Modbus-TCP/RTU].
(3) If the option board is used with [Purpose: Programming] and [Protocol : Procedure 1 (1:n)] or [Protocol : Procedure 2 (1:n)], Control Editor Ver.4.02 or newer will be required.
　　Do not use Control Editor Ver. 4.01 or older because a station number setting is unavailable.
(4) When OBV-485A is used, use Control Editor Ver.4.06 or newer.
　　When Control Editor Ver.4.02 to Ver.4.05 is used, note that the initial value of the analog input filter is "1."
　　When Control Editor Ver.4.06 or newer is used, note the initial value of the analog input filter is "10".
(5) When OBV-AIG, OBV-AIOG and OBV-RTD is used, use Control Editor Ver.7.10 or newer.
　　(Control Editor Ver.7.01 or older is used, parameter for above option board cannot be set.)

7.1   RS-485 Communication board

7.1.1   Names and functions of OBV-NES

Section name and function		Model	OBV-NES
		Weight	15 g (0.03 lb.)

2. LED display

3. Main unit connection connector (back side)

1. Communication port

4. Termination resistor switch (back side)

No.	Item	Detail description
1.	Communication port	A dedicated port or general-purpose port for RS-485 serial communications with external devices. Dedicated port: For communications with HMI, etc. General-purpose port: For communications with external devices with a serial communication function set with a user program. Modbus-RTU port: For communications with external devices with Modbus-RTU.
2.	LED display	Blinks during data transmission/reception.
3.	Main unit connection connector	A connector for connecting to the basic unit.
4.	Termination resistor switch	A switch for selecting Valid/invalid for built-in 120 Ω termination resistor. (It is hidden in the back side of the diagram above.) ON: Termination resistor Enable OFF: Termination resistor Disable

7.1.2   Communication connector pin assignment and internal circuit

Terminal array	No.	Signal name	Description	Internal circuit diagram
	1	N.C	Unused	1 N.C.
	2	N.C	Unused	2 N.C.
	3	N.C	Unused	3 N.C.
Communication port seen from the top	4	SG	Signal ground	4 SG
	5	SP	Transmission/reception data + side	5 SP
	6	SN	Transmission/reception data - side	6 SN
	7	N.C	Unused	7 N.C.
	8	N.C	Unused	8 N.C.

Microprocessor

120Ω

Termination resistor switch

7.1.3   OBV-NES Communication cable connection example

The RS-485 I/F communication cable connection example is shown below.
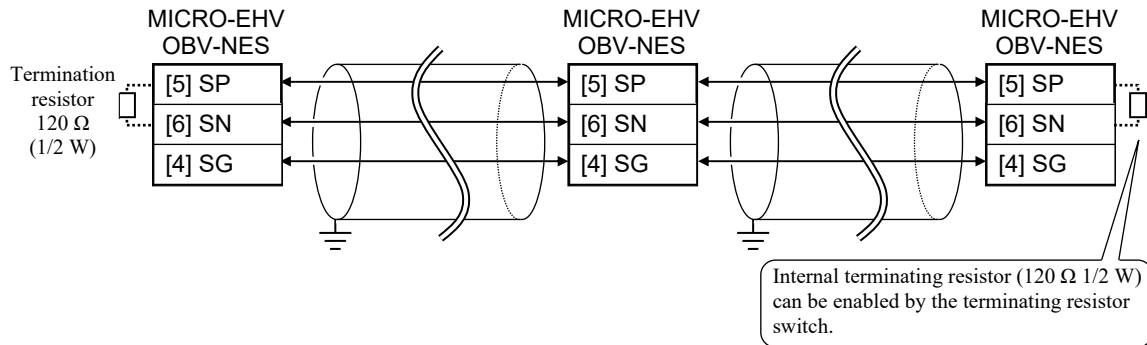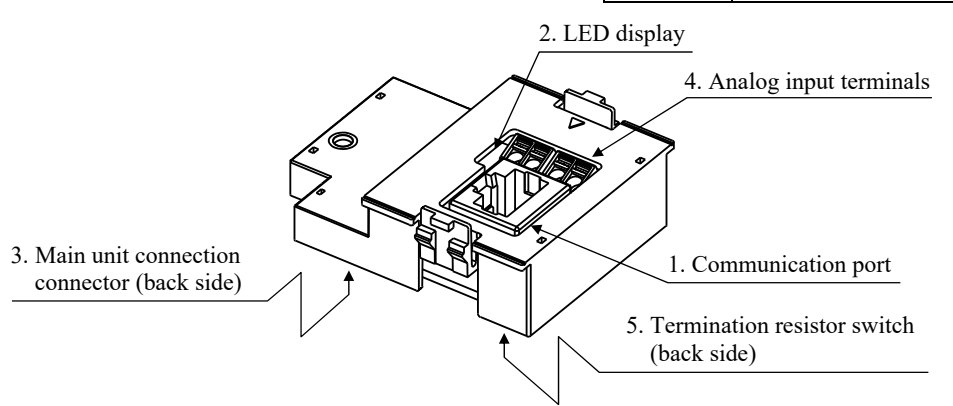
Use the termination resistor (120 Ω) built-in in the OBV-NES depending on the use environment and a cable used for the communication cable.

If communications are unstable, execute the following.

(1) Without using the termination resistor built-in in the OBV-NES, attach a termination resistor to both ends of the communication cable, which fits the cable characteristic impedance.

(2) Make SG (Signal Ground) of each equipment unconnected.

(3) Lower the transmission speed.

(4) If it is used under noisy environments, attach a ferrite core to the communication cable.

7.2   RS-485 Communication board (With analog input)

7.2.1   Names and functions of OBV-485A

Section name and function		Model	OBV-485A
		Weight	20 g (0.04 lb.)

2. LED display

4. Analog input terminals

3. Main unit connection connector (back side)

1. Communication port

5. Termination resistor switch (back side)

No.	Item	Detail description
1.	Communication port	A dedicated port or general-purpose port for RS-485 serial communications with external devices. Dedicated port: For communications with HMI, etc. General-purpose port: For communications with external devices with a serial communication function set with a user program. Modbus-RTU port: For communications with external devices with Modbus-RTU.
2.	LED display	Blinks during data transmission/reception.
3.	Main unit connection connector	A connector for connecting to the basic.
4.	Analog input terminals	Terminals for connecting analog input signals (voltage). Size of electric wire: For a single wire: 0.2 to 1.5 mm^2 For a twisted wire: 0.2 to 1.0 mm^2
5.	Termination resistor switch	A switch for selecting Valid/invalid for built-in 120 Ω termination resistor. (It is hidden in the back side of the diagram above.) ON: Termination resistor Enable OFF: Termination resistor Disable

7.2.2   OBV-485A Communication connector pin assignment and internal circuit

Terminal array	No.	Signal name	Description	Internal circuit diagram
	1	SG	Signal ground	1 SG
	2	VCC	5 V DC output	2 VCC
	3	N.C	Unused	3 N.C
Communication port seen from the top	4	SDP	Transmission data + side	4 SDP
	5	SDN	Transmission data - side	5 SDN
	6	RDN	Reception data - side	6 RDN
	7	RDP	Reception data + side	7 RDP
	8	TERM	Termination resistor	8 TERM

Microprocessor   120 Ω   Termination resistor switch

7.2.3 OBV-485A Communication cable connection example

The RS-422 I/F communication cable connection example is shown below.

Use a common shielded twisted pair cable for connection.
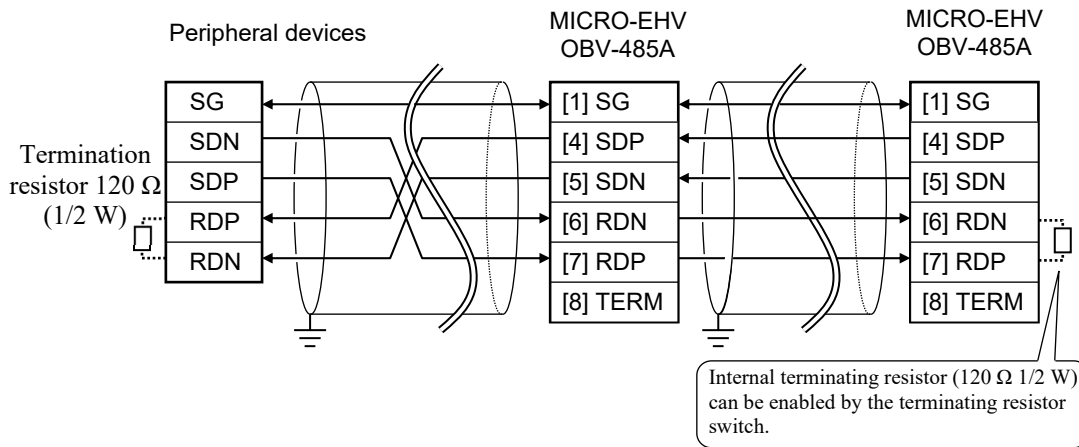
The RS-485 I/F communication cable connection example is shown below.

Use a common shielded twisted pair cable for connection.
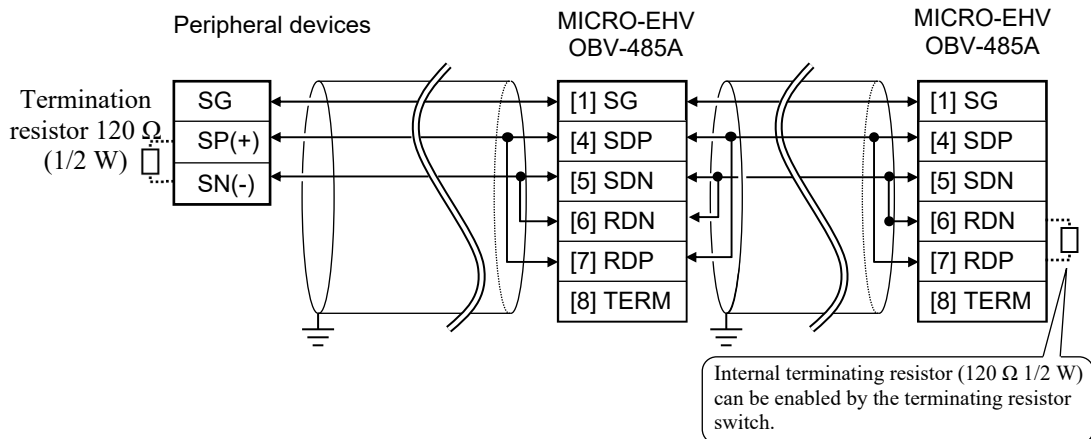
Use the termination resistor (120 Ω) built-in in the OBV-485A depending on the use environment and a cable used for the communication cable.

If communications are unstable, execute the following.

(1) Without using the termination resistor built-in in the OBV-485A, attach a termination resistor to both ends of the communication cable, which fits the cable characteristic impedance.

(2) Make SG (Signal Ground) of each equipment unconnected.

(3) Lower the transmission speed.

(4) If it is used under noisy environments, attach a ferrite core to the communication cable.

7.2.4　OBV-485A Analog input specifications

Item		Specification
Number of channels for input		2 channels
Input value storage special internal output (Ch.1, Ch.2)		WRF03E, WRF03F
Input voltage range		0 to 10 V (Max.10.24 V)
Accuracy		±1 % (against full-scale values)
Resolution		10 bits
AD conversion cycle		8 ms / 2 channels
Maximum external wiring length		Less than 3 m (9.84 ft.)
Input impedance		Approx. 100 kΩ
Insulation	Between a channel and internal circuit	Non-insulation
	Between channels	Non-insulation

Connect the analog input to the terminal block on the option board.

The correspondence between the analog input terminal block and channels and the terminal array are shown below.

The analog input data are stored to the special internal output.

WRF03E :　Analog input Ch.1 input value

WRF03F :　Analog input Ch.2 input value

　　The analog input values change depending on the PLC operation environment. When the fluctuation rate is to be reduced, set the number of times for analog input filter with the Control Editor.

　　When the analog input filter times are set, the averaged value of the data of filter setting values is set to the analog input data (storage special internal output).

Settable number of analog input filters are 1 to 40. (Default value: 10)

Setting analog input filter

7.2.5　Names and functions of OBV-485TAI

Section name and function		Model	OBV-485TAI
		Weight	20 g (0.04 lb.)

1. Communication port

2. LED display

3. Main unit connection connector (back side)

4. Analog input terminals

No.	Item	Detail description
1.	Communication port	A dedicated port or general-purpose port for RS-485 serial communications with external devices. Dedicated port: For communications with HMI, etc. General-purpose port: For communications with external devices with a serial communication function set with a user program. Modbus-RTU port: For communications with external devices with Modbus-RTU.
2.	LED display	Blinks during data transmission/reception.
3.	Main unit connection connector	A connector for connecting to the basic unit.
4.	Analog input terminals	Terminals for connecting analog input signals (voltage). Size of electric wire: For a single wire: 0.2 to 1.5 mm^2 For a twisted wire: 0.2 to 1.0 mm^2

7.2.6　OBV-485TAI Communication connector pin assignment and internal circuit

Terminal array	No.	Signal name	Description	Internal circuit diagram
Communication port seen from the top	1	SDP	Transmission/reception data + side	Microprocessor — 1 SDP, 2 SDN, 3 TERM, 4 SG, 120 Ω
	2	SDN	Transmission/reception data - side	
	3	TERM	Termination resistor	
	4	SG	Signal ground	

7.2.7   OBV-485TAI Communication cable connection example

The RS-485 I/F communication cable connection example is shown below.

Use a common shielded twisted pair cable for connection.

Internal terminating resistor (120 Ω 1/2 W) can be enabled by connecting SDN and TERM terminal externally.
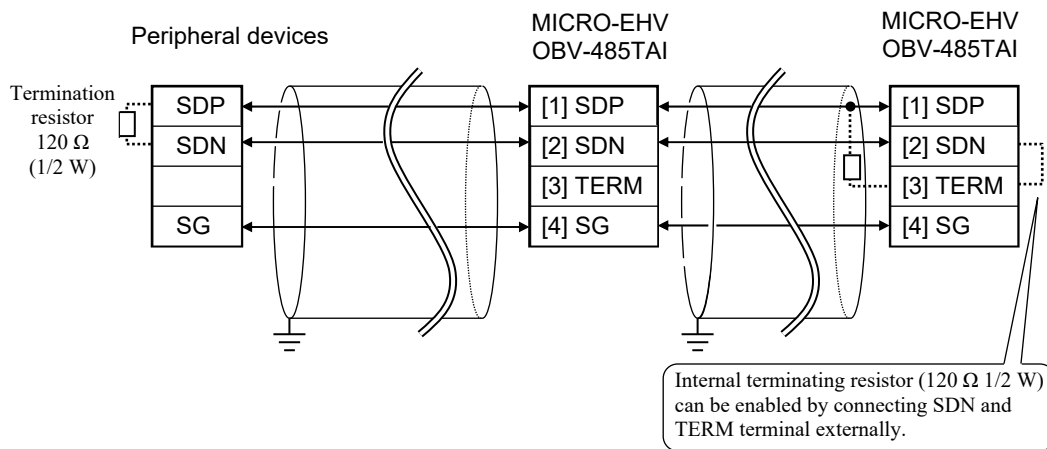
Use the termination resistor (120 Ω) built-in in the OBV-485TAI depending on the use environment and a cable used for the communication cable.

If communications are unstable, execute the following.

(1) Without using the termination resistor built-in in the OBV-485TAI, attach a termination resistor to both ends of the communication cable, which fits the cable characteristic impedance.

(2) Make SG (Signal Ground) of each equipment unconnected.

(3) Lower the transmission speed.

(4) If it is used under noisy environments, attach a ferrite core to the communication cable.

7.2.8   OBV-485TAI Analog input specifications

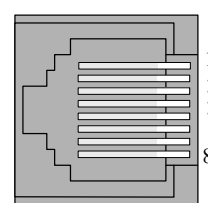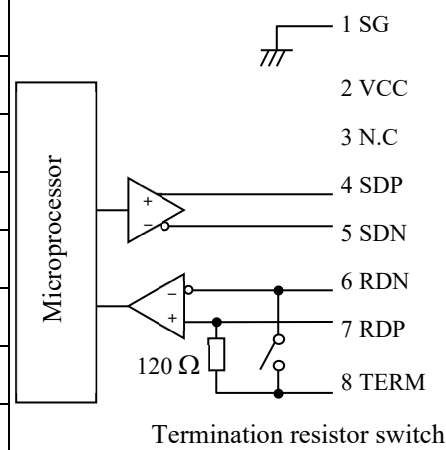| Item		Specification
Number of channels for input		2 channels
Input value storage special internal output (Ch.1, Ch.2)		WRF03E, WRF03F
Input voltage range		0 to 10 V (Max.10.24 V)
Accuracy		±1 % (against full-scale values)
Resolution		10 bits
AD conversion cycle		8 ms / 2 channels
Maximum external wiring length		Less than 3 m (9.84 ft.)
Input impedance		Approx. 100 kΩ
Insulation	Between a channel and internal circuit	Non-insulation
	Between channels	Non-insulation

Connect the analog input to the terminal block on the option board.

The correspondence between the analog input terminal block and channels and the terminal array are shown below.

The analog input data are stored to the special internal output.

WRF03E :   Analog input Ch.1 input value

WRF03F :   Analog input Ch.2 input value

   The analog input values change depending on the PLC operation environment. When the fluctuation rate is to be reduced, set the number of times for analog input filter with the Control Editor.

   When the analog input filter times are set, the averaged value of the data of filter setting values is set to the analog input data (storage special internal output).

Settable number of analog input filters are 1 to 40. (Default value: 10)

Setting analog input filter

7.3   RS-485 Communication board (With analog output)

7.3.1   Names and functions of OBV-485TAO

Section name and function		Model	OBV-485TAO
		Weight	20 g (0.04 lb.)

2. LED display

1. Communication port

3. Main unit connection connector (back side)

4. Analog output terminals

| No.	Item	Detail description
1.	Communication port	A dedicated port or general-purpose port for RS-485 serial communications with external devices. Dedicated port: For communications with HMI, etc. General-purpose port: For communications with external devices with a serial communication function set with a user program. Modbus-RTU port: For communications with external devices with Modbus-RTU.
2.	LED display	Blinks during data transmission/reception.
3.	Main unit connection connector	A connector for connecting to the basic unit.
4.	Analog output terminals	Terminals for connecting analog output signals (voltage). Size of electric wire: For a single wire: 0.2 to 1.5 mm^2 For a twisted wire: 0.2 to 1.0 mm^2

7.3.2   OBV-485TAO Communication connector pin assignment and internal circuit

Terminal array	No.	Signal name	Description	Internal circuit diagram
Communication port seen from the top	1	SDP	Transmission/reception data + side	
	2	SDN	Transmission/reception data - side	
	3	TERM	Termination resistor	
	4	SG	Signal ground	

Microprocessor

1 SDP

2 SDN

3 TERM

120 Ω   4 SG

7.3.3 OBV-485TAO Communication cable connection example

The RS-485 I/F communication cable connection example is shown below.

Use a common shielded twisted pair cable for connection.
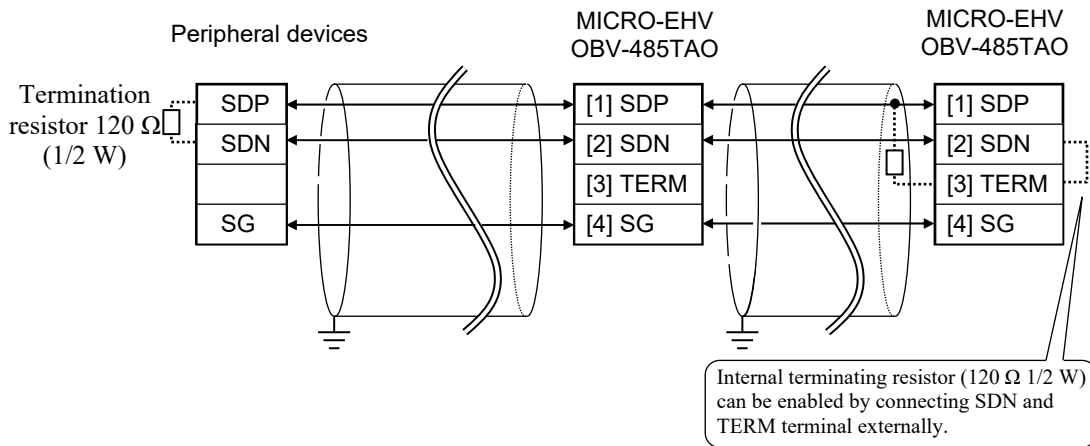
Use the termination resistor (120 Ω) built-in in the OBV-485TAO depending on the use environment and a cable used for the communication cable.

If communications are unstable, execute the following.
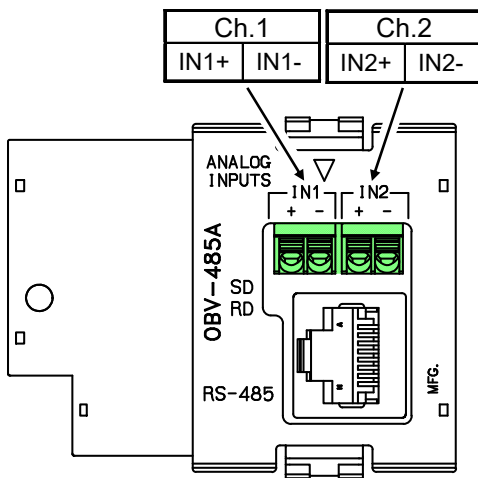
(1) Without using the termination resistor built-in in the OBV-485TAO, attach a termination resistor to both ends of the communication cable, which fits the cable characteristic impedance.

(2) Make SG (Signal Ground) of each equipment unconnected.

(3) Lower the transmission speed.

(4) If it is used under noisy environments, attach a ferrite core to the communication cable.

7.3.4   OBV-485TAO Analog output specifications

Item		Specification
Number of channels for output		2 channels
Output value storage special internal output (Ch.1, Ch.2)		WRF03C, WRF03D
Output voltage range		0 to 10 V (Max.10.24 V)
Accuracy		±1 % (against full-scale values)
Resolution		10 bits
AD conversion cycle		8 ms / 2 channels
Maximum external wiring length		Less than 3 m (9.84 ft.)
Output impedance		Approx. 100 kΩ
Insulation	Between a channel and internal circuit	Non-insulation
	Between channels	Non-insulation

Connect the analog input to the terminal block on the option board.

The correspondence between the analog input terminal block and channels and the terminal array are shown below.
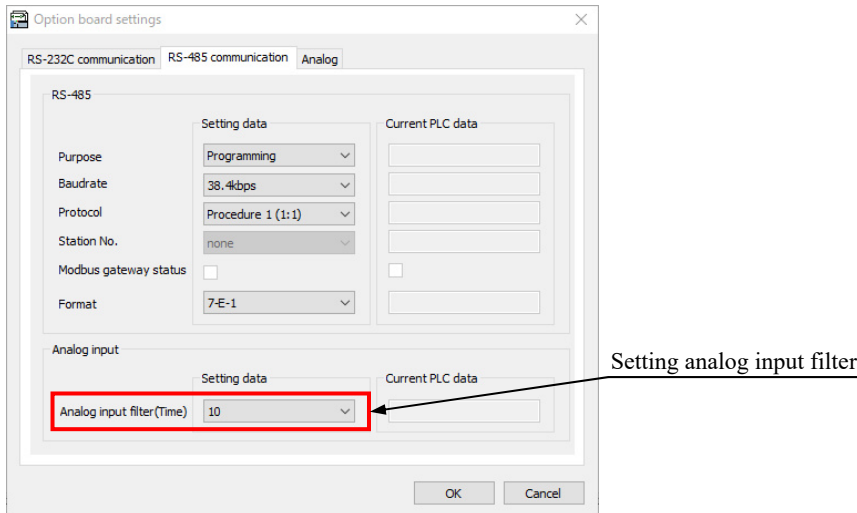

The analog output data are stored to the special internal output.

WRF03C : | Analog Output Ch.1 output value |

WRF03D : | Analog Output Ch.2 output value |

7.4 Analog input / output board
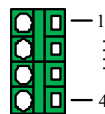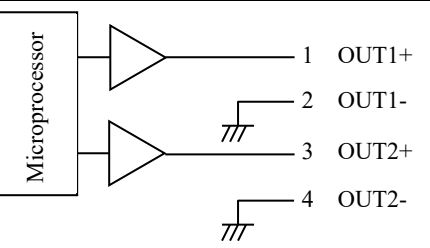
7.4.1 Names and functions of OBV-AIO

Section name and function		Model	OBV-AIO
		Weight	20 g (0.04 lb.)

1. Analog input terminals
3. Main unit connection connector (back side)
2. Analog output terminals

No.	Item	Detail description
1.	Analog input terminals	Terminals for connecting analog output signals (voltage). Size of electric wire: For a single wire: 0.2 to 1.5 mm^2 For a twisted wire: 0.2 to 1.0 mm^2
2.	Analog output terminals	Terminals for connecting analog output signals (voltage). Size of electric wire: For a single wire: 0.2 to 1.5 mm^2 For a twisted wire: 0.2 to 1.0 mm^2
3.	Main unit connection connector	A connector for connecting to the basic unit.

7.4.2 OBV-AIO Analog input connector pin assignment and internal circuit

Terminal array	No.	Signal name	Description	Internal circuit diagram
Communication port seen from the top	1	IN1+	Ch.1+	Microprocessor — 1 IN1+ 2 IN1- 3 IN2+ 4 IN2-
	2	IN1-	Ch.1-	
	3	IN2+	Ch.2+	
	4	IN2-	Ch.2-	

7.4.3 OBV-AIO Analog output connector pin assignment and internal circuit

Terminal array	No.	Signal name	Description	Internal circuit diagram
Communication port seen from the top	1	OUT1+	Ch.1+	Microprocessor — 1 OUT1+ 2 OUT1- 3 OUT2+ 4 OUT2-
	2	OUT1-	Ch.1-	
	3	OUT2+	Ch.2+	
	4	OUT2-	Ch.2-	

7.4.4   OBV-AIO Analog input specifications

Item		Specification
Number of channels for input		2 channels
Input value storage special internal output (Ch.1, Ch.2)		WRF03E, WRF03F
Input voltage range		0 to 10 V (Max.10.24 V)
Accuracy		±1 % (against full-scale values)
Resolution		10 bits
AD conversion cycle		8 ms / 2 channels
Maximum external wiring length		Less than 3 m (9.84 ft.)
Input impedance		Approx. 100 kΩ
Insulation	Between a channel and internal circuit	Non-insulation
	Between channels	Non-insulation

Connect the analog input to the terminal block on the option board.

The correspondence between the analog input terminal block and channels and the terminal array are shown below.

The analog input data are stored to the special internal output.

WRF03E :   Analog input Ch.1 input value

WRF03F :   Analog input Ch.2 input value

   The analog input values change depending on the PLC operation environment. When the fluctuation rate is to be reduced, set the number of times for analog input filter with the Control Editor.

   When the analog input filter times are set, the averaged value of the data of filter setting values is set to the analog input data (storage special internal output).

Settable number of analog input filters are 1 to 40. (Default value: 10)

Setting analog input filter

7.4.5 OBV-AIO Analog output specifications

Item		Specification
Number of channels for output		2 channels
Output value storage special internal output (Ch.1, Ch.2)		WRF03C, WRF03D
Output voltage range		0 to 10 V (Max.10.24 V)
Accuracy		±1 % (against full-scale values)
Resolution		10 bits
AD conversion cycle		8 ms / 2 channels
Maximum external wiring length		Less than 3 m (9.84 ft.)
Output impedance		Approx. 100 kΩ
Insulation	Between a channel and internal circuit	Non-insulation
	Between channels	Non-insulation

Connect the analog input to the terminal block on the option board.

The correspondence between the analog input terminal block and channels and the terminal array are shown below.

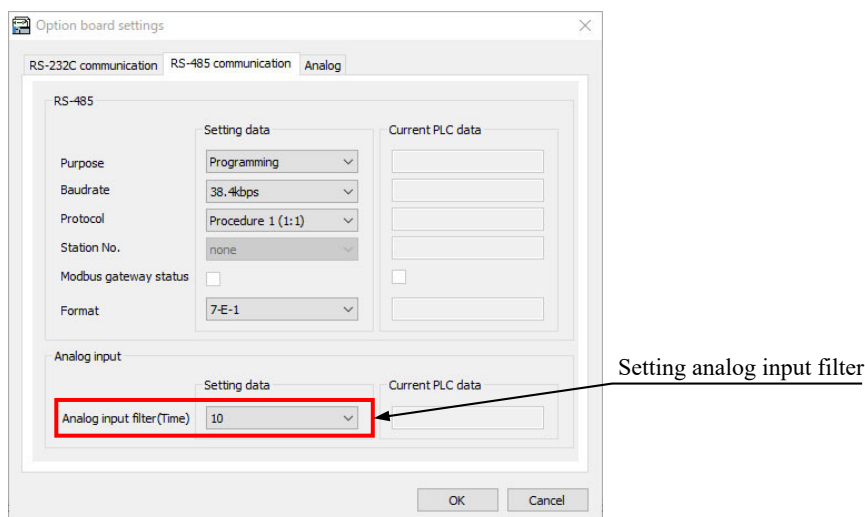The analog output data are stored to the special internal output.

WRF03C :   Analog Output Ch.1 output value

WRF03D :   Analog Output Ch.2 output value

7.5   Analog board (Isolated input)

7.5.1   Names and functions of OBV-AIG

Section name and function		Model	OBV-AIG
		Weight	20 g (0.04 lb.)

[Upper side]
1. Analog input terminal

[Back side]
3. Dip switch

2. Connector to basic unit

No.	Item	Detail description
1.	Analog input terminal	Terminals to connect analog input signals. Cable diameter : Single wire : 0.2 mm^2 to 1.5 mm^2 Strand wire : 0.2 mm^2 to 1.0 mm^2
2.	Connector to basic unit	A connector is located at the back side to connect basic unit.
3.	Dip switch	Dip switches to change voltage / current mode of analog input signals. Please set these Dip switches before insertion of the option board.

Setting of Dip switch

Voltage / current mode can be set for each channel of analog I/O.
Be sure to make setting of Dip switches and setting by Control Editor the same. In the case of not equal, the option board does not work normally.

Switch No.	Position	View	Setting
SW1-1	OFF		IN1 : Voltage input
	ON		IN1 : Current input
SW1-2	OFF		IN2 : Voltage input
	ON		IN2 : Current input
SW2-1	OFF		IN3 : Voltage input
	ON		IN3 : Current input
SW2-2	OFF		IN4 : Voltage input
	ON		IN4 : Current input

Note) All Dip switches are set voltage I/O mode at the time of shipment from factory.

7.5.2　OBV-AIG Analog input connector pin assignment and internal circuit

Terminal array	No.	Signal name	Description	Internal circuit diagram
	1	IN1+	Ch.1+	
	2	IN1-	Ch.1-	
	3	IN2+	Ch.2+	
	4	IN2-	Ch.2-	
	5	IN3+	Ch.3+	
	6	IN3-	Ch.3-	
	7	IN4+	Ch.4+	
	8	IN4-	Ch.4-	

7.5.3　OBV-AIG Analog input specifications

Item		Specification
Number of channels for input		Single-ended 4 channels
Input range	Voltage input	0 to 10 V (Max. 10.24 V)
	Current input	0 to 20 mA (Max. 20.48 mA)
Resolution	Voltage input	0 to 10 V: 0 to 4,000 / 0 to 16,000
	Current input	0 to 20 mA: 0 to 4,000 / 0 to 16,000
Accuracy *1	At 25±3 °C	±0.2 % (FS)
	Temperature coefficient	±0.01 % / °C (FS)
Conversion time		8 ms × 1 to 10 (4 ch. use), 6 ms × 1 to 10 (3 ch. use), 4 ms × 1 to 10 (2 ch. use), 2 ms × 1 to 10 (1 ch. use)
Input impedance	Voltage input	150 kΩ
	Current input	250 Ω
Maximum external wiring length		Less than 20 m (65.62 ft.) (Shielded cable)
Isolation	Channel - internal circuit	Isolated
	Between channels	Non-isolated

*1　e.g. Accuracy at 35 °C in voltage input of OBV-AIOG without noise is calculated as follows.
　　Accuracy: (0.4 % + 0.01 % × 10 [Difference form 25 °C]) × 10 V [Full scale] = ±0.05 V

Connect the analog input to the terminal block on the option board.

The correspondence between the analog input terminal block and channels and the terminal array are shown below.

The analog input data are stored to the special internal output.

WRF03E:　Analog input Ch.1 Input value

WRF03F:　Analog input Ch.2 Input value

WRF04E:　Analog input Ch.3 Input value

WRF04F:　Analog input Ch.4 Input value

7.5.4 OBV-AIG Parameter setting

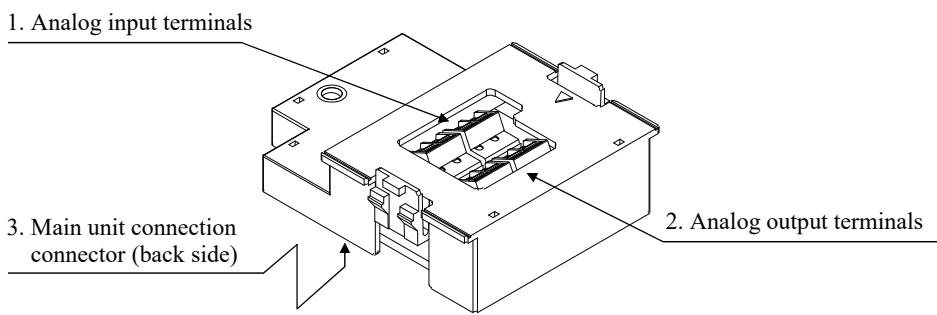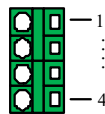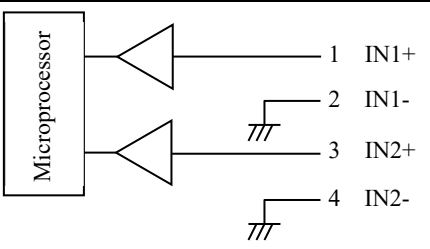| Parameter		Contents	Standard	Advanced
Channel used		Select the channel to use.	✓	✓
Conversion cycle		Set the constant of conversion cycle. Conversion cycle is determined by the value of constant and number of channel to use. In case of input channel is 2 and the values of conversion cycle is 2, conversion cycle becomes 8 ms.	—	✓
Number of time to add		The analog input value can be averaged by sampling it the specified number of times. (Addition averaging) In case that setting value is 8, the sampling data of 8 times will be averaged, and it becomes analog input value.	✓	✓
Input type		Can be selected the input type (Voltage or Current).	✓	✓
Input range		Set the range of analog input signal. Voltage 0-10 V, 1-5 V, User* Current 0-20 mA, 4-20 mA, User* * "User" can be selected only when the advanced settings are selected. If you select "User", you can set any input range within the specification range.	✓	✓
Input settings		Can be selected the input resolution (12 bits or 14 bits). In case that the input range is "Voltage 1-5 V", input resolution will be fixed 12 bits.	✓	✓
Conversion settings	Input value	This parameter only uses when "User" is selected as input range. Set the input value IV_1 and IV_2 in following figure with conversion value. The value out of the range also can be set.	—	✓
	Conversion Value	This parameter only uses when "User" is selected as input range. Set the conversion value CV_1 and CV_2 in following figure with input value.	—	✓
Range settings	Conversion Value	This parameter only uses when "User" is selected as input range. Upper limit value and lower limit value can be specified. If input value becomes under lower limit value, input value becomes lower limit value. If input value overs upper limit value, input value becomes upper limit value.	—	✓

In case use by standard
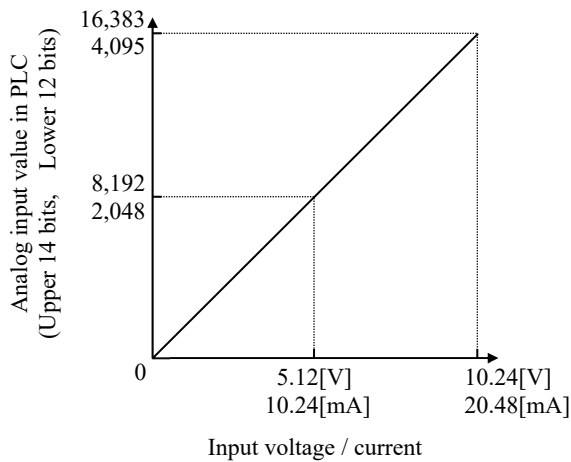
In case use by advanced setting (Voltage)
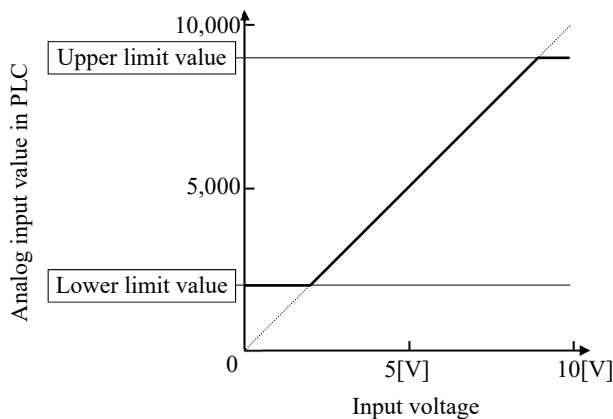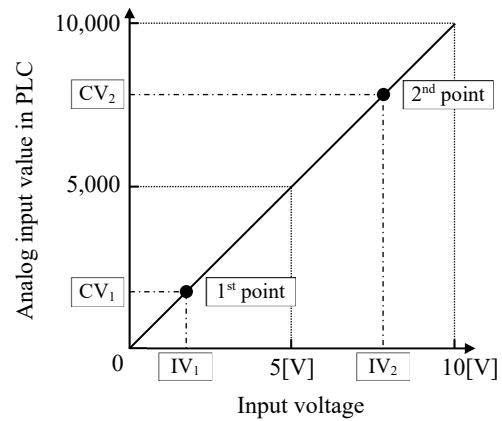
7.6 Analog board (Isolated input, output)
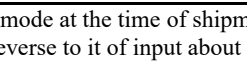
7.6.1 Names and functions of OBV-AIOG

Section name and function		Model	OBV-AIOG
		Weight	20 g (0.04 lb.)

[Upper side]   [Back side]

1. Analog input terminal / Analog output terminal

3. Dip switch

2. Connector to basic unit

No.	Item	Detail description
1.	Analog input terminal / Analog output terminal	Terminals to connect analog input signals and output signals. Cable diameter : Single wire : 0.2 mm² to 1.5 mm² / Strand wire : 0.2 mm² to 1.0 mm²
2.	Connector to basic unit	A connector is located at the back side to connect basic unit.
3.	Dip switch	Dip switches to change voltage / current mode of analog I/O signals. Please set these Dip switches before insertion of the option board.

Setting of Dip switch

Voltage / current mode can be set for each channel of analog I/O.
Be sure to make setting of Dip switches and setting by Control Editor the same. In the case of not equal, the option board does not work normally.

Switch No.	Position	View	Setting
SW1-1	OFF		IN1 : Voltage input
	ON		IN1 : Current input
SW1-2	OFF		IN2 : Voltage input
	ON		IN2 : Current input
SW2-1	OFF		OUT1 : Current input *1
	ON		OUT1 : Voltage input *1
SW2-2	OFF		OUT2 : Current input *1
	ON		OUT2 : Voltage input *1

Note) All Dip switches are set voltage I/O mode at the time of shipment from factory.
*1 Be careful that the setting of output is reverse to it of input about voltage / current mode.

7.6.2　OBV-AIOG Analog I/O connector pin assignment and internal circuit

Terminal array	No.	Signal name	Description	Internal circuit diagram
	1	IN1+	Ch.1+	120 kΩ SW1-1 1 IN1+ Voltage 30 kΩ 2 IN1-
	2	IN1-	Ch.1-	
	3	IN2+	Ch.2+	3 IN2+ SW1-2 Current 30 kΩ 250 Ω 4 IN2-
	4	IN2-	Ch.2-	
	5	OUT1+	Ch.1+	5 OUT1+ *1 SW2-1 Voltage 6 OUT1-
	6	OUT1-	Ch.1-	
	7	OUT2+	Ch.2+	7 OUT2+ SW2-2 Current 8 OUT2-
	8	OUT2-	Ch.2-	

*1 An output method of this product is the method that current flows out from this product. If current flows from the other equipment, the error may become large by addition to output from this product. So, please confirm input circuit of the other equipment beforehand.

　　Example 1: If input circuit of the other equipment is non-isolated between channels, and the sneak current flows from other channels.

　　Example 2: If a pull-up resister is inserted in input of the other equipment, and current flows out from there.
　　　　　　 When it becomes the circuit configuration that current flows from the other equipment into this product, you can reduce the error by putting resistor (more than 1 kΩ) between input terminals of the other equipment.

7.6.3　OBV-AIOG Analog input specifications

Item		Specification
Number of channels for input		Single-ended 2 channels
Input range	Voltage input	0 to 10 V (Max. 10.24 V)
	Current input	0 to 20 mA (Max. 20.48 mA)
Resolution	Voltage input	0 to 10 V: 0 to 4,000 / 0 to 16,000
	Current input	0 to 20 mA: 0 to 4,000 / 0 to 16,000
Accuracy *1	Reference temperature (25±3 °C)	±0.4 % (FS)
	Temperature coefficient	±0.01 % / °C (FS)
Conversion time		4 ms × 1 to 10 (Input 2ch. use)
		3 ms × 1 to 10 (Input 1ch. Output 2ch. use)
		2 ms × 1 to 10 (Input 1ch. Output 1ch. use)
Input impedance	Voltage input	150 kΩ
	Current input	250 Ω
Maximum external wiring length		Less than 20 m (65.62 ft.) (Cable with shield)
Isolation	Between a channel and internal circuit	Isolated
	Between channels	Non-isolated

*1　e.g. Accuracy at 35 °C in voltage input of OBV-AIOG without noise is calculated as follows.
　　Accuracy: (0.4 % + 0.01 % × 10 [Difference form 25 °C]) × 10 V [Full scale] = ±0.05 V

Connect the analog input to the terminal block on the option board.

The correspondence between the analog input terminal block and channels and the terminal array are shown below.

Ch.1
IN1+
IN1-

Ch.2
IN2+
IN2-

Analog input data are stored to the special internal output.

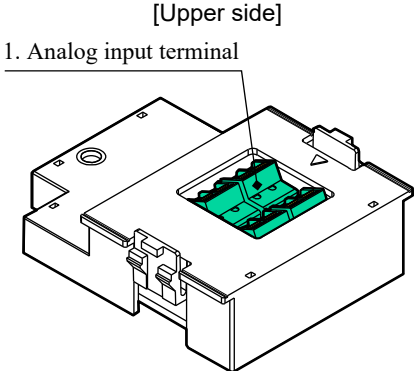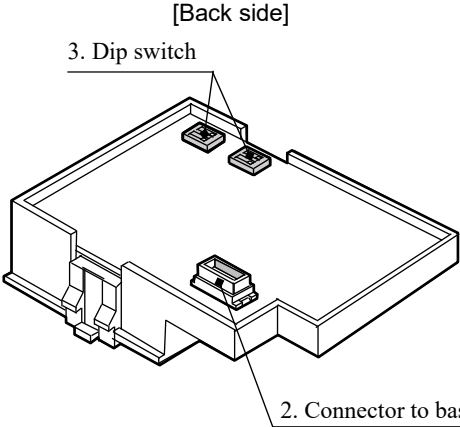WRF03E:　| Analog input Ch.1 Input value |

WRF03F:　| Analog input Ch.2 Input value |

7.6.4   OBV-AIOG Analog output specifications

Item		Specification
Number of channels for output		Single-ended 2 channels
Output range	Voltage output	0 to 10 V (Max. 10.24 V)
	Current output	0 to 20 mA (Max. 20.48 mA)
Resolution	Voltage output	0 to 10 V: 0 to 4,000 / 0 to 16,000
	Current output	0 to 20 mA: 0 to 4,000 / 0 to 16,000
Accuracy *1	At 25 ± 3 °C	±0.4 % (FS)
	Temperature coefficient	±0.01 % / °C (FS)
Conversion time		4 ms × 1 to 10 (Input 2ch. use)
		3 ms × 1 to 10 (Input 1ch. Output 2ch. use)
		2 ms × 1 to 10 (Input 1ch. Output 1ch. use)
Output load impedance	Voltage output	Min. 1 kΩ
	Current output	1 to 500 Ω (Max. 10 V)
Maximum external wiring length		Less than 20 m (65.62 ft.) (Cable with shield)
Isolation	Between a channel and internal circuit	Isolated
	Between channels	Non-isolated

*1   In case the measurement of voltage, accuracy can be calculated by following formula in an environment of 45 °C or less. (Out of noise environment)

Input accuracy : (0.4 % + 0.01 % × 20[Temperature difference from 25 °C]) × 10 V[Full scale] = ±0.06 V

Connect the analog output to the terminal block on the option board.

The correspondence between the analog output terminal block and channels and the terminal array are shown below.

The analog output data are stored to the special internal output.

WRF03C: Analog output Ch.1 output value

WRF03D: Analog output Ch.2 output value
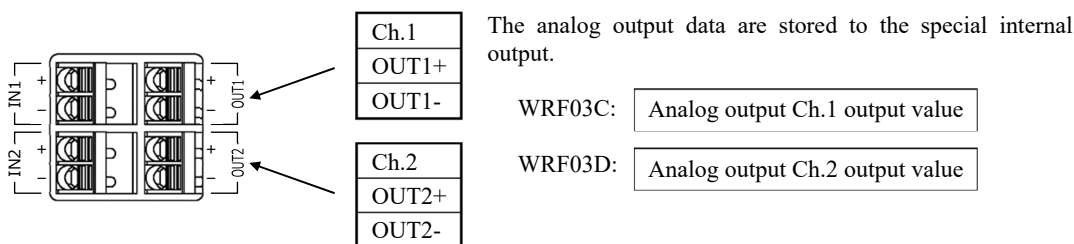
7.6.5   OBV-AIOG Parameter setting

Parameter setting for analog input is same as OBV-AIG. Please refer to "7.5.4 OBV-AIG Parameter setting".

Regarding to the parameter setting for analog output, please refer to next page.

Parameter		Contents	Standard	Advanced
Channel to use		Select the channel to use.	✓	✓
Conversion cycle		Set the constant of conversion cycle. Conversion cycle is determined by the value of constant and number of channel to use. In case of input channel is 0, output channel is 2 and the values of conversion cycle is 2, conversion cycle becomes 4 ms.	−	✓
Slew rate setting		Quantity of actual analog output signal can be changed gradually toward to the specified value. Maximum amount of change by 1 conversion cycle can be specified. If 0 is specified, actual output change to the specified value immediately. You can check the approximate changing time from lower limit to upper limit in Lower-Upper time in Control Editor.	✓	✓
Output type		Can be selected the output type (Voltage or Current).	✓	✓
Output range		Set the range of analog output signal. Voltage　0-10 V,　　1-5 V,　　　User* Current　0-20 mA,　4-20 mA,　User* * "User" can be selected only when the advanced settings are selected. If you select "User", you can set any output range within the specification range.	✓	✓
Output settings		Resolution of analog output is fixed to 12 bits.	✓	✓
Conversion settings	Output value	This parameter only uses when "User" is selected as output range. Set the input value OV_1 and OV_2 in following figure with conversion value. The value out of the range also can be set.	−	✓
	Set value	This parameter only uses when "User" is selected as output range. Set the conversion value CV_1 and CV_2 in following figure with input value.	−	✓
Range settings	Set value	This parameter only uses when "User" is selected as output range. Upper limit value and lower limit value can be specified. If output value is specified less than lower limit value, actual output value becomes lower limit value. If output value is specified over upper limit value, actual output value becomes upper limit value.	−	✓

In case use by standard
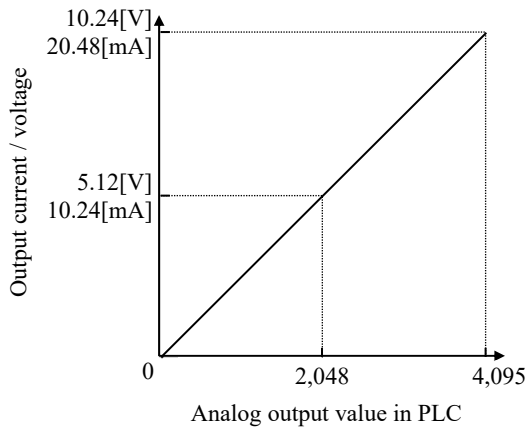
In case use by advanced setting (Current)
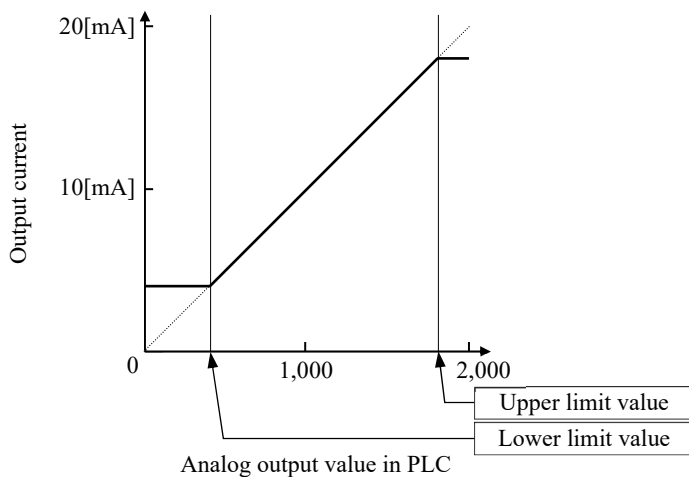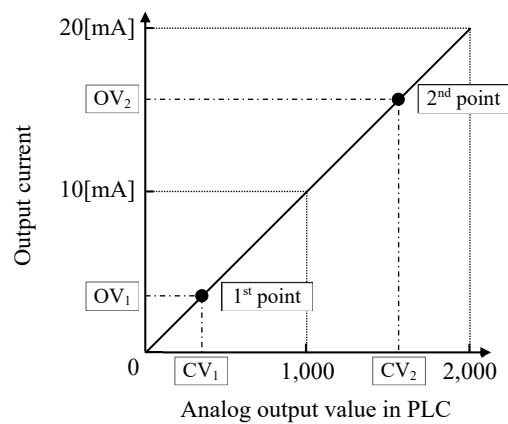
7.7   Analog board (Isolated RTD input)

7.7.1   Names and functions of OBV-RTD

Section name and function		Model	OBV-RTD
		Weight	20 g (0.04 lb.)

[Upper side]   1. RTD input terminal

[Back side]   2. Connector to basic unit

No.	Item	Detail description
1.	RTD input terminal	Terminals to connect analog input signals and output signals. Cable diameter : Single wire : 0.2 mm^2 to 1.5 mm^2 Strand wire : 0.2 mm^2 to 1.0 mm^2
2.	Connector to basic unit	A connector is located at the back side to connect basic unit.

7.7.2   OBV-RTD Temperature input connector pin assignment and internal circuit

In case of 3-wire

Terminal layout	No.	Signal	Function	Internal circuit
	1	1A	Ch.1 input A	
	2	1b	Ch.1 input -	
	3	1B	Ch.1 input B	
	4	—	N.C.	
	5	3A	Ch.3 input A	
	6	3b	Ch.3 input -	
	7	3B	Ch.3 input B	
	8	—	N.C.	

In case of 2-wire

Terminal layout	No.	Signal	Function	Internal circuit
	1	1A	Ch.1 input A	
	2	1B	Ch.1 input B	
	3	2A	Ch.2 input A	
	4	2B	Ch.2 input B	
	5	3A	Ch.3 input A	
	6	3B	Ch.3 input B	
	7	4A	Ch.4 input A	
	8	4B	Ch.4 input B	

7.7.3   OBV-RTD Temperature input specifications

Item		Specification
Supported RTD type		Pt100 (3-wire or 2-wire)
Number of channels		4 channels (2-wire) or 2 channels (3-wire)
Measurement temperature range		-200 to 850 °C
Resolution		0.1 °C
Accuracy *		Measured temperature under 0 °C : Max. ±0.3 °C Measured temperature over 0° C : Max. ±(0.3 °C + Measured temperature × 0.2 %)
Measurement current		0.49 mA
Conversion time		8 ms × 1 to 10
Diagnostic error		Conversion value : H7FFF
Cable		Shielded cable (Ohmic value of cable : Max. 5 Ω)
Isolation	Channel - internal circuit	Isolated
	Between channels	Non-isolated

*1   e.g. In the case of measured temperature is 100 °C, accuracy without noise is calculated as follows.
Accuracy: 0.3 °C + 100 °C × 0.2 % = ±0.5 °C

Connect the temperature input to the terminal block on the option board.

The correspondence between the temperature input terminal block and channels and the terminal array are shown below.

In case of 3-wire
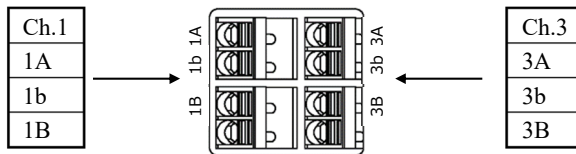
The temperature input data are stored to the special internal output.

WRF03E: Temperature input Ch.1 value

WRF04E: Temperature input Ch.3 value

In case of 2-wire
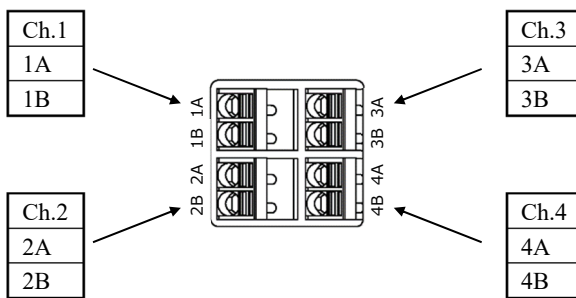
The temperature input data are stored to the special internal output.

WRF03E: Temperature input Ch.1 value

WRF03F: Temperature input Ch.2 value

WRF04E: Temperature input Ch.3 value

WRF04F: Temperature input Ch.4 value

7.7.4   OBV-RTD Parameter setting

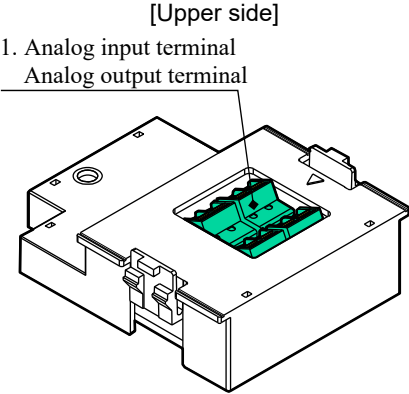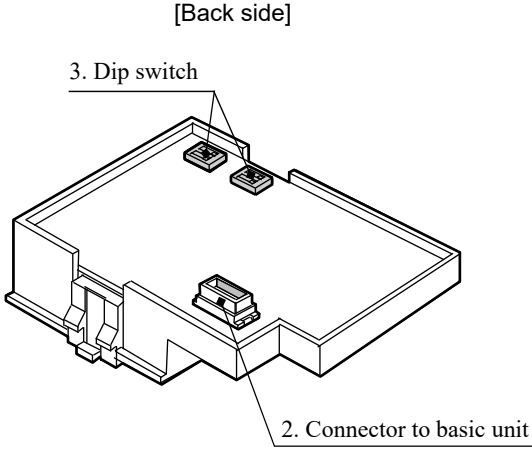| Parameter		Contents	Standard	Advanced
Channel to use		Select the channel to use.	✓	✓
Number of wiring		Select the connection method (3 wiring, 2 wiring) of RTD.	✓	✓
Number of times to add		The temperature input value can be averaged by sampling it the specified number of times. (Addition averaging) In case that setting value is 8, the sampling data of 8 times will be averaged, and it becomes temperature input value.	✓	✓
Input type		Select the input type from Celsius, Fahrenheit and resistor value. * If "resistor value" is selected, resistor value of element connected to the terminal (0 to 400Ω) can be measured.	✓	✓
Correction of measured values	Designated temperature	If you want to fine tune the input value, measurement value can be corrected by this parameter. Set the input value TV_1 and TV_2 in following figure together with the amount of change. The value out of the range also can be set. Please refer to the figure under this table as example.	—	✓
	Changed amount	Set the amount of change a_1 and a_2 against TV_1 and TV_2 in following figure together with the specified temperature. Please refer to the figure under this table as example.	—	✓
Range settings	Designated range	Upper limit value and lower limit value can be specified. If input value becomes under lower limit value, input value becomes lower limit value. If input value overs upper limit value, input value becomes upper limit value.	—	✓

Example: When input temperature is 0 °C, input value in PLC becomes 0. But when input temperature is 600 °C, input value in PLC becomes 608.4 °C. (a2 = 8.4 in following figure)
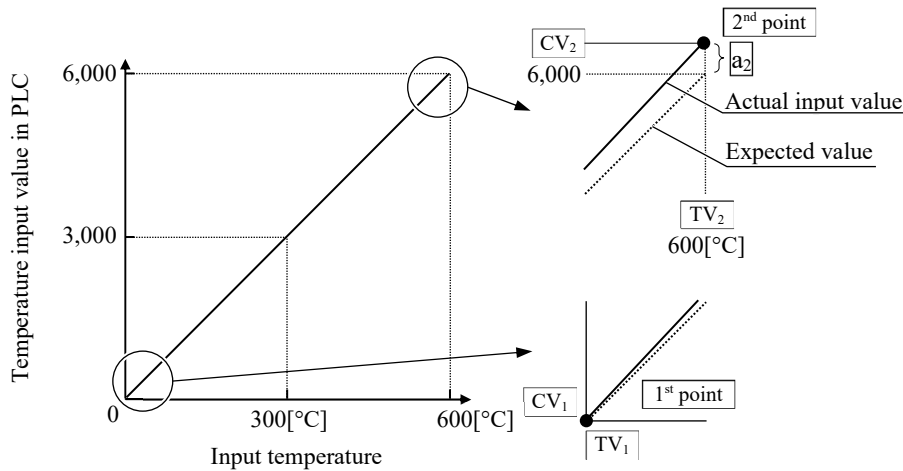
In this case, if the parameters are set as TV_1 =0.0, a_1 = 0.0, TV_2 = 600.0, a_2 = -8.4, the input value in PLC at 600 °C is corrected to 6,000. (a_1 and a_2 are deviation against expected value.)
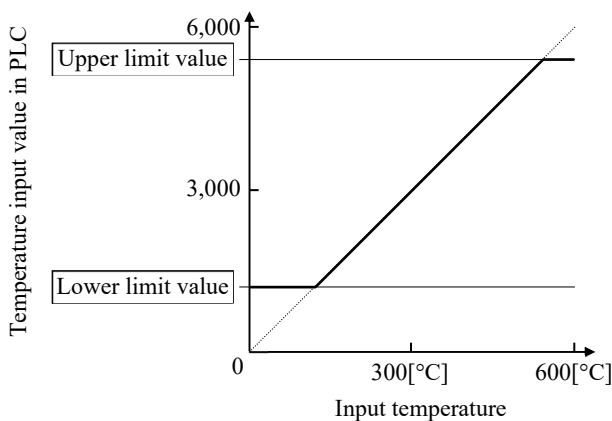
7.8　Installing Option Board

(1) Remove the two covers from the basic unit.
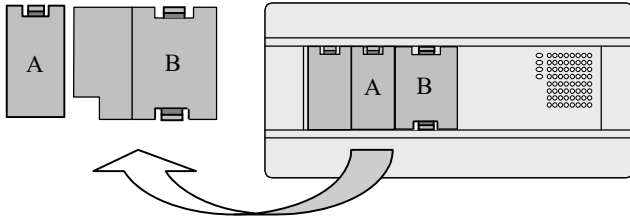
(2) Insert the connector on the back side of the option board to the connector on the basic unit.

To prevent connector loose connection, insert the connector pressing the connector case of the option board.
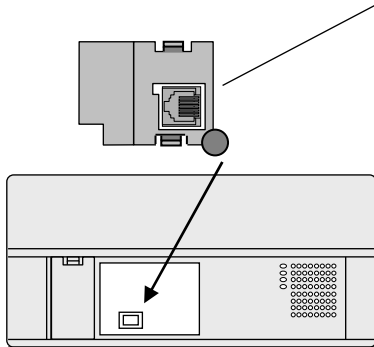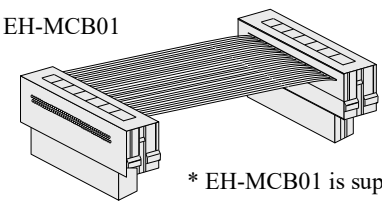
(3) After inserted. Attach the cover A.
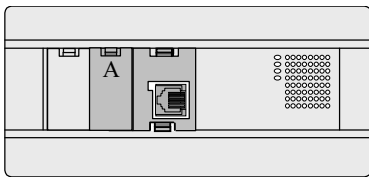
Chapter 8　Accessory
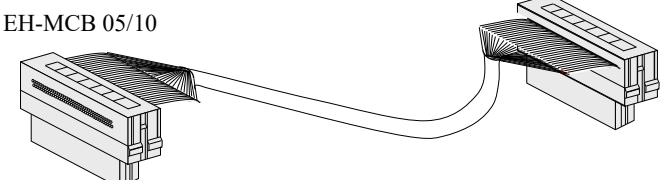
8.1　Expansion cable

Name and function of each part		Model	EH-MCB01 / 05 / 10
		Weight	Approx. 210 g (0.46 lb.) / 240 g (0.53 lb.) / 300 g (0.66 lb.)
		Length	0.1 m (0.32 ft.) / 0.5 m (1.64 ft.) / 1.0 m (3.28 ft.)

EH-MCB01

* EH-MCB01 is supplied with an expansion unit.

EH-MCB 05/10

Connect the cable to the expansion cable connection connector of the basic unit and the expansion cable connection connector of the expansion unit.

The cable has no directionality.

Connect the cable in the order of Basic Unit Right ➔ Expansion Unit Left ➔ Expansion Unit Right.

Wrong connection causes wrong operation.
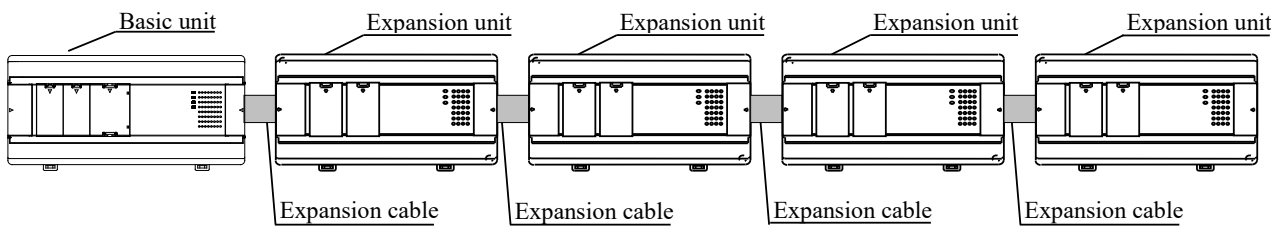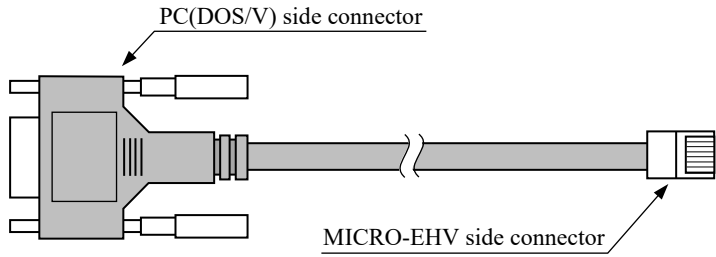
8.2   Communication cable for PC (EH-RS05)

EH-RS05 is the serial communication cable used to connect a PC and MICRO-EHV.

The connector on the MICRO-EHV side is RJ-45, and the connector on the PC side is D-sub 15 pin (female).
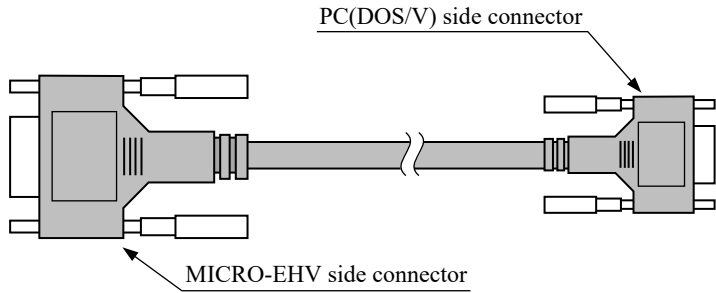
This cable is the conversion cable for using the communication cable (WVCB02H) for H series with EHV and MICRO-EHV series.

Name and function of each part		Model	EH-RS05
		Weight	Approx. 130 g (0.29 lb)
		Length	0.5 m (1.64 ft)

PC(DOS/V) side connector

MICRO-EHV side connector

In combination with the WVCB02H, connect the MICRO-EHV serial port to a PC with this cable.

8.3   Communication cable for PC (WVCB02H)

WVCB02H is the serial communication cable used to connect a PC and H series CPU module.
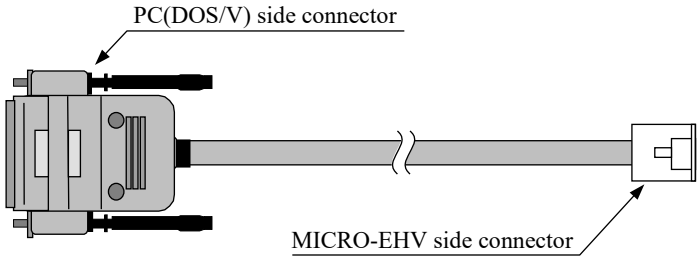
The connector on the H series side is D-sub 15 pin (male), and the connector on the PC side is D-sub 9 pin (female).

Name and function of each part		Model	WVCB02H
		Weight	Approx. 130 g (0.29 lb)
		Length	2.0 m (6.56 ft)

PC(DOS/V) side connector

MICRO-EHV side connector

In combination with the EH-RS05, connect the MICRO-EHV serial port to a PC with this cable.

8.4   Communication cable for PC (EH-VCB02)

EH-VCB02 is the serial communication cable used to connect a PC and MICRO-EHV.

The connector on the MICRO-EHV side is RJ-45, and the connector on the PC side is D-sub 9 pin (female).

Name and function of each part		Model	EH-VCB02
		Weight	Approx. 130 g (0.29 lb)
		Length	2.0 m (6.56 ft)

PC(DOS/V) side connector

MICRO-EHV side connector

Connect the MICRO-EHV serial port to a PC with this cable.

Internal wiring of EH-VCB02 is shown as following.

MICRO-EHV Serial communication port		EH-VCB02	PC D-Sub 9Pin	
Pin No.	Signal		Pin No.	Signal
1	SG		5	SG
2	VCC		7	RTS
3	DTR1 (ER)		1	DCD
4	N.C.		4	DTR
5	SD1 (TxD)		2	RXD
6	RD1 (RxD)		3	TXD
7	N.C.		6	DSR
8	RS1 (RTS)		8	CTS
			9	RI
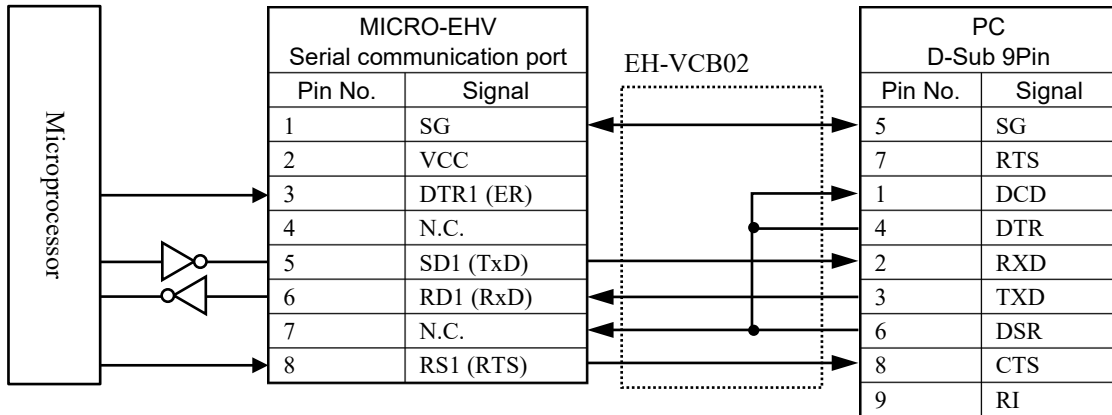
Pin No.	Signal	Direction		Meaning
		PLC	Host	
1.	SG	←	→	Ground for signal
2.	VCC		→	5 V DC is supplied. (The protective fuse is connected.)
3.	DTR1(ER)		→	Signal which can communicate. Communication is possible when this signal is High level.
4.	N.C			Unused. Do not connect to it.
5.	SD1(TxD)		→	Transmitting data of PLC
6.	RD1(RxD)	←		Receiving data of PLC
7.	N.C			Unused. Do not connect to it.
8.	RS1(RTS)		→	Transmitting request signal. Indicates that PLC can receive data when this signal is High level.

8.5   Others

Product	Model	Specification
Lithium battery	MV-BAT	For data memory backup

Chapter 9   PLC Installation, Loading, Wiring

9.1   Installation

(1)   Installing location and environment

  (a)   Install the PLC in Use the environment specified in the "3.1 General Specifications".

  (b)   Mount the PLC onto the metal plate.

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

(2)   Installation of a unit

  (a)   Precaution when installing the unit

  1]   Fix the basic unit securely with screws in 2 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.
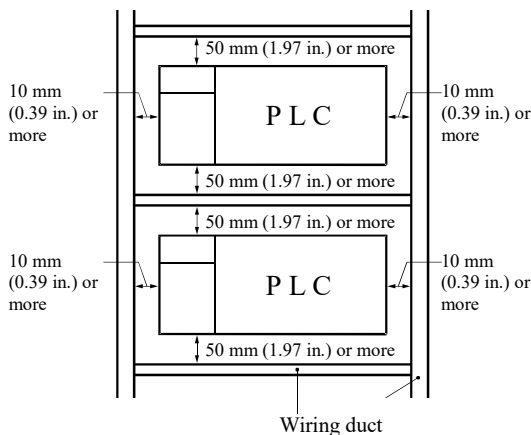
Figure 9.1 Amount of installation
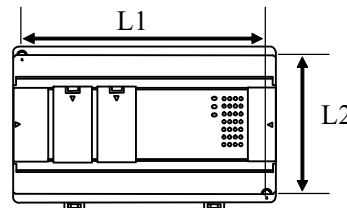
Figure 9.2 External dimensions

Dimensional table

Unit	L1	L2
8, 14, 16-point, Analog Expansion	85 (3.35)	80 (3.15)
20, 40-point (Basic), 28-point (Expansion)	140 (5.51)	80 (3.15)
64-point (Basic / Expansion)	185 (7.28)	80 (3.15)

Unit : mm (inch)

  (b)   Mounting to a DIN rail

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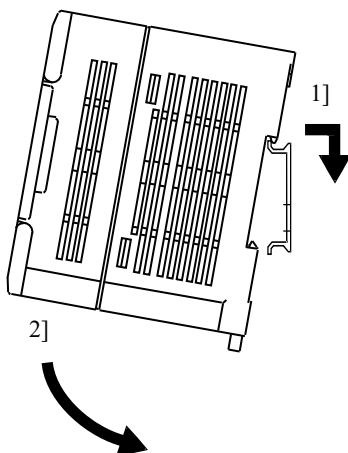
1] Hook the claw fixed at the bottom of the unit, to the DIN rail.
2] Press the unit into the DIN rail until it clicks.

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

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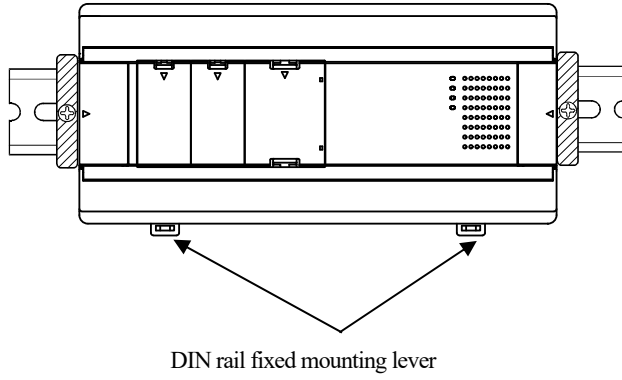
Secure the unit by installing DIN rail fixing brackets from both sides. (The product may go out of place if not secured within the fixing brackets.)

DIN rail fixed mounting lever

Removing the unit from the DIN rail
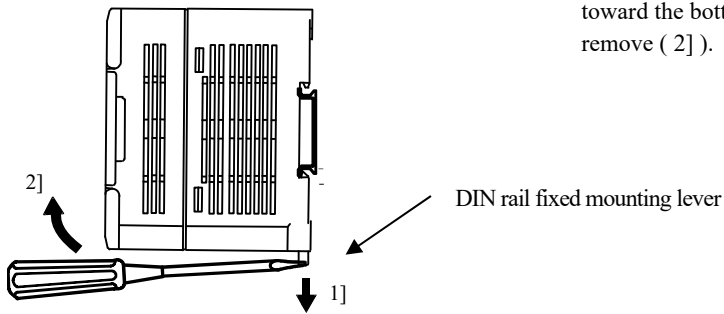
While lowering the DIN rail fixing mounting lever toward the bottom (1]), raise the unit upward to remove (2]).

2]

DIN rail fixed mounting lever

1]

9.2   Wiring

(1) Separation of the power system

There is power for the MICRO-EHV 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.
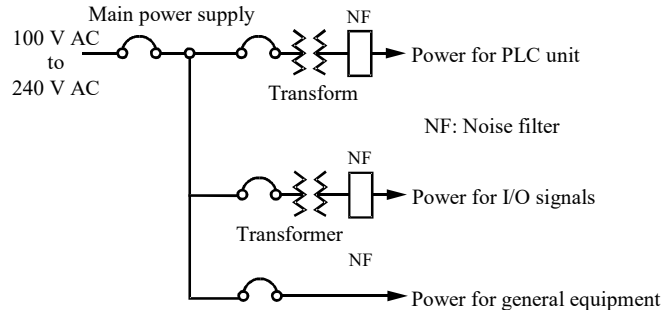
Figure 9.3   Example of power system diagram

(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 basic unit's power and the expansion unit's power or the external power (particular DC power supply) for the PLC I/O signals may temporarily cause the I/O not to operate normally. For this reason, apply the power to the expansion unit before the basic unit or apply the power to the basic unit and the expansion unit at the same time. In addition, the external power (particular DC power supply) for the PLC I/O signals should be applied before the PLC units.

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 in the entire system, and from a point of view of creating a fail safe mechanism, construct circuit such as an emergency stop circuit, the protect circuit, and the interlock circuit, for the sections that lead to a mechanical breakdown and accident from abnormal actions outside the PLC.

2] Install a lightning arrester

To prevent damage to equipment as a result of being struck by lightning, we recommend setting up a lightning arrester for each PLC power supply circuit. MICRO-EHV detects power failures when internal 3.3 V DC power drop off. For this reason, the load in the 3.3 V DC power of the unit is light, the 3.3 V DC is retained for a long time and operations may continue for more than 100 ms. Therefore, when using the AC input, an OFF delay timer for coordinating with the internal 3.3 V DC is needed because the AC input signal turns off more quickly than the internal.

(3) Wiring to power terminals

Power supply for sensor

100 V AC
to 240 V AC

ELB

Insulation
Transformer
with shield

Noise
filter
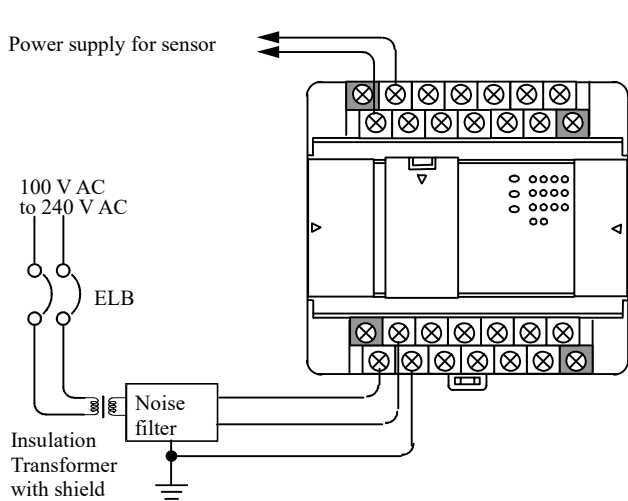
Figure 9.4 Power supply wiring diagram

(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) Use the terminal screws within the range of the following tightening torque.

Unit	Screw	Tightening torque
8, 14, 16, 28-point, Analog expansion 20, 40-point (Basic) 64-point (Basic / Expansion)	M3.0	0.5 to 0.6 N・m

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

(4) Wiring cable for I/O signals
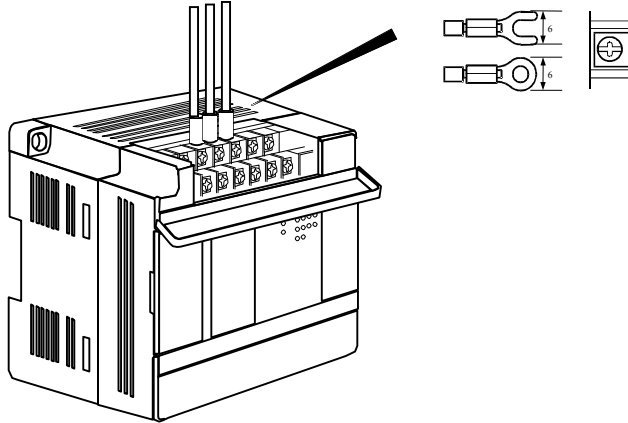
The terminal screw size is M3.

Tighten within a torque range of 0.5 to 0.6 N・m.

Use a crimp terminal with an outer diameter of 6 mm (0.24 in.) or less when using it.

Use only up to 2 crimp terminals in the same terminal. Avoid clamping down more than 3 at the same time.

In case that the cable type is between AWG22 to AWG14 (Cable thickness ranging between 0.36 to 2.1 mm^2), only one cable can be wired to one terminal. In case that the cable type is between AWG22 to AWG16 (Cable thickness ranging between 0.36 to 1.3 mm^2), two cables can be wired to one terminal.

(5) Wiring to input terminals

Item	DC input	DC input (High-speed counter)
External wiring	Current-output-type proximity switch 24V DC 0V [1] [3] [5] 24V [0] [2] [4] [6] [C0]	Rotary encoder 1kΩ, 3W 24V DC 0V [1] [3] 24V [0] [2] [C0]
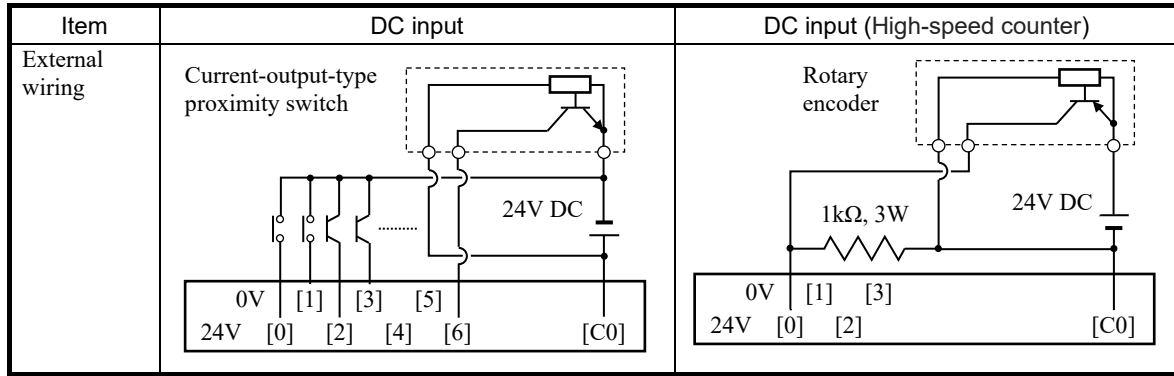
Figure 9.5 Input wiring

(a) DC input

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 4.8 mA current or approximately 8 mA current, 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 high load current contact

Strong electric contact

Approx. 50 mA

3W 560Ω

24V DC

[1]

C

External input
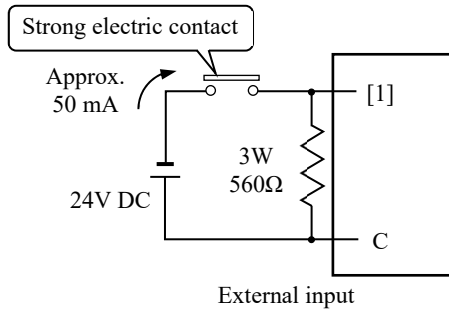
The current that flows to a contact when external contacts are closed is approximately 4.8 mA or approximately 8.0 mA.
If the use of high load current contact cannot be avoided, add resistance as shown in the diagram at left and supply sufficient current to the contact to prevent a faulty contact.

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

5]   The multiple commons in the input terminal are not connected internally. Connect externally if necessary.

(6) Wiring to output terminal

Item	Relay output MV*-***DR
External wiring	POW [0] [1] [2] [4] [C2] POW ⏚ [C0] [C1] [3] [5] Fuse Surge killer POW [0] [1] [2] [4] [C2] POW ⏚ [C0] [C1] [3] [5] Fuse Diode
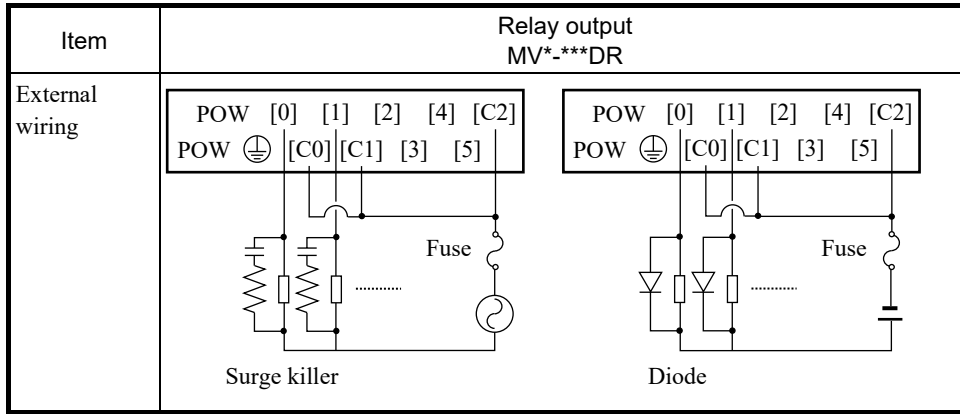
Figure 9.6   Relay output wiring

Item	Transistor output (sink type) MV*-***DT
External wiring	POW [0] NC [3] [5] [C] POW ⏚ [1] [2] [4] [V] Fuse Diode
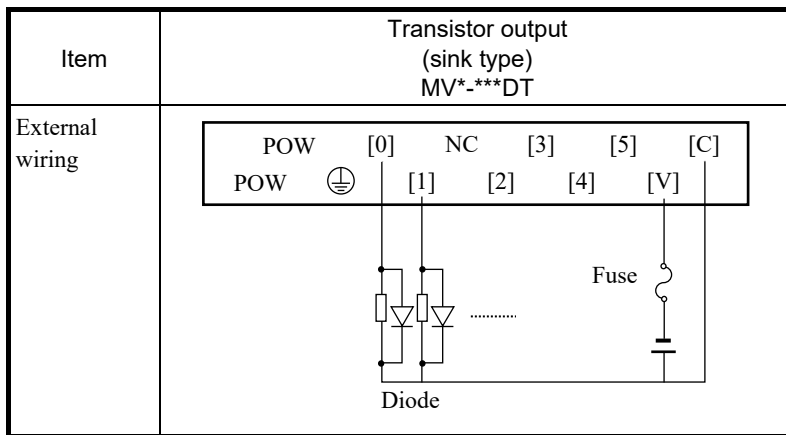
Figure 9.7   Transistor output wiring

Item	Transistor output (source type) MV*-***DTP(S)
External wiring	POW [0] NC [3] [5] [C] POW ⏚ [1] [2] [4] [V] Fuse Diode
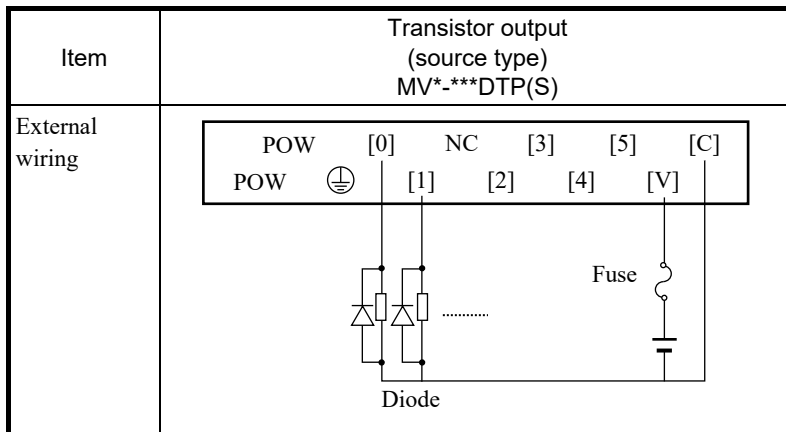
Figure 9.8   Transistor output wiring

(a) Wiring for the relay output terminal

    1] Life of relay contact

Lifetime characteristics

30 V DC / 250 V AC R load

30 V DC τ = 7 ms

250 V AC cosφ = 0.4

Switching life (10,000 times)

Switching current (A)
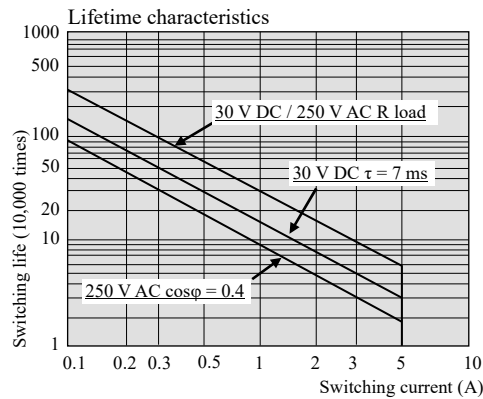
Life of the contact is also in squared reverse proportion to the current, so be aware that interrupting rush current or directly driving the condenser load will drastically reduce the life of the relay.

When switching is done with high frequency, use a transistor output module.

Above figure:
    MICRO-EHV
        20, 40, 64-point basic unit
    MICRO-EH
        20, 40, 64-point basic unit
        16-point expansion unit
Below figure:
    Other than listed above

Lifetime characteristics

30 V DC / 250 V AC R load

250 V AC cosφ = 0.4

30 V DC τ = 7 ms

Switching life (10,000 times)

Switching current (A)
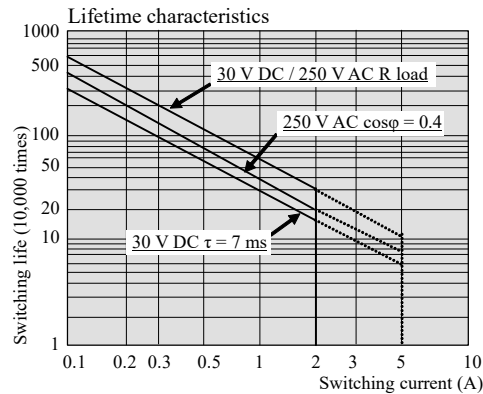
    2] Surge killer

    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 6 A fuse in the common to prevent the external wiring from burning out. Provide a 2 A fuse per circuit for the independent contact output section.

(b) Wiring for the transistor output terminal

    1] Flywheel diode

    For inductive load, connect a flywheel diode in parallel.

    2] V and C terminals

    Always connect an V 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

    There is no built-in fuse to prevent external wiring burning out. Therefore, to prevent external wiring burnout, it is recommended to install a fuse outside (it does not protect the internal transistor element). If the external load is shorted, be sure to request repair.

(7) Wiring to the unit terminal

Wiring for the power supply
Use a 2 mm^2 (0.031 in.^{2}) cable and twist it.
Leave a distance of 100 mm (3.94 in.) or more from the signal cable and 200 mm (7.87 in.) or more from the power line.

Shielded insulation transformer

AC Power

NF

Always connect a noise filter

Expansion cable
Always segregate power line. I/O signal and power supply cable.

Ground wiring
Use a cable 2 mm^2 (0.0031 in.^{2}) or more and wire it within a distance of 20 m (65.62 ft.).

Class D grounding

I/O signal cable
Use cable 0.75 mm^2 (0.0011 in^2.) or less.
Leave a distance of 200 mm (7.87 in.) or more from the power line and do not have it running next to the power cable.

Outer hull (cabinet)
Implement class D grounding

Metal plate
Implement class D grounding

Figure 9.9 Example of wiring

(8) Wiring to analog I/O terminal

- Do not apply excess voltage to the analog input terminals beyond the rated input voltage. Similarly, do not subject the terminals to current that exceeds the rated input current. Connecting the analog input terminal 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.

- 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.

9.3   Installing battery (MV-BAT)

■Installation of battery (MV-BAT)

(1) Remove the cover (B) from the main unit.
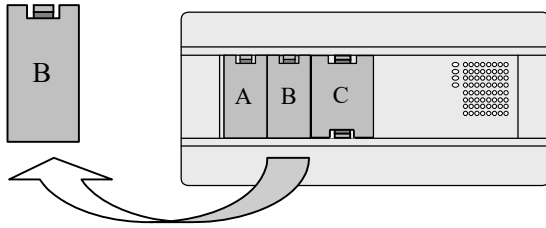
(2) Insert the battery connector into the connector on the unit.
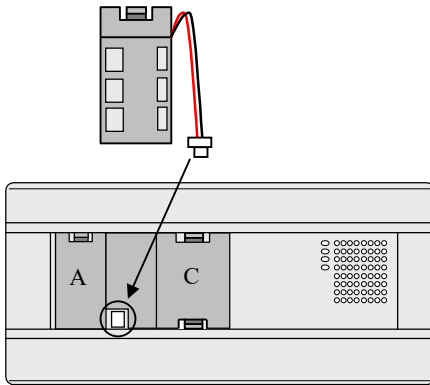
(3) Attach the battery with the cover to the main body.
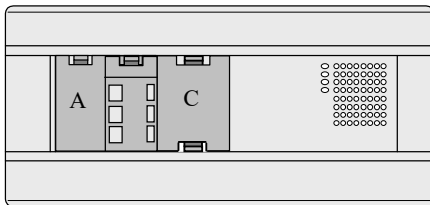
　　　　* If replacing the battery without power supplied, power off time should be less than 30 minute.

　　Battery life

　　　　The table below shows the battery life guarantee period.

Battery lifetime (total power suspension time) [year]	
Guaranteed value (MIN) @55°C	Actual use value (MAX) @25°C
5 years	10 years or longer

・Battery life indicates the total time when the power of the basic unit is turned off.
・By monitoring the blinking of the OK LED determine battery life.
・The battery life is also displayed on the bit special internal output "R7D9".

Precaution when handling the battery.

Use MV-BAT for the new batteries. Be careful because a false replacement may cause the battery to explode. 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.

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.

9.4   Calendar clock setting

Clock setting is performed from the menu [Tool]-[CPU Settings]-[Calendar clock] window of Control Editor.
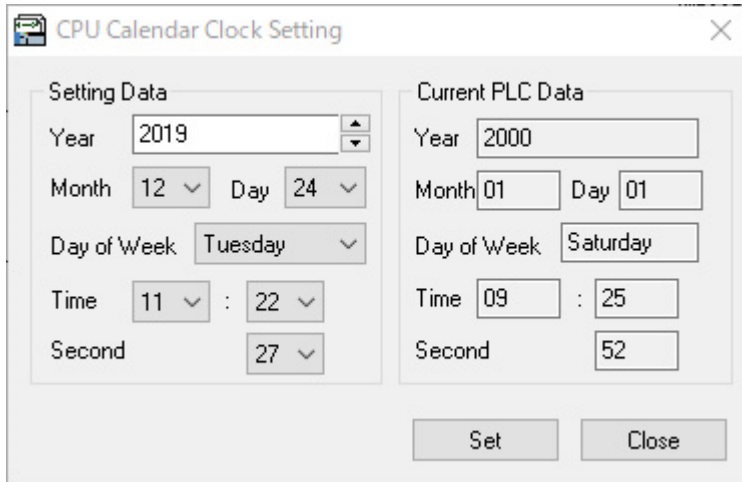
The default value is 00:00:00 on Saturday, January 1, 2000.

When turn on the power supply of basic unit under condition that there is no battery, calendar and clock will start from default value.

Chapter 10   Troubleshooting

10.1 Error code and countermeasure procedures

(1) Error indication

The MICRO-EHV basic unit displays an error by OK LED.

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.

(2) OK LED

MICRO-EHV detects an error that is serious than the middle failure, the OK LED turns off.

When detected error is not serious but error which should be recognized by customer, the OK LED blinking.

(3) Setting of error indication level

In MICRO-EHV, error indication level can be set by customer. If error display level is set, when error which is low level than setting level occurs, error code is not stored in the special internal output (excepts bit special internal output) and OK LED does not indicate the error information. (All error information is stored to error history regardless of error indication level.)

If the error display level is changed from high to low, OK LED may not turn on depending on the error factor because the error information is reflected after changing error indication level.

Reference

Error level which can set Display / Non-display

Level	Details	Display	Remarks
—	No setting	Displays all error codes	Factory Setting
1	Error codes of warning level (communication error) are not displayed.	Error code 6x or higher are not displayed.	
2	Error codes of warning level (high-function module error) are not displayed.	Error code 5x or higher are not displayed.	
3	Error codes of slight failure level are not displayed.	Error code 4x or higher are not displayed.	

The battery error (H71), Retentive data area is undefined status (H76), and the backup memory error (H77) are set independent of the error indication level. Even if the slight failure level is set to the non-display on the error indication level, the battery error is displayed if it is set to the display.

(4) Operation / Error history

MICRO-EHV can memorize the history of errors that occurred in MICRO-EHV and the operations performed by the user. The time information is added to the history, and it is possible to memorize up to 128 pieces. Since the history storage area is a ring buffer, if it exceeds 128, the oldest history is overwritten.

This history information can be checked in [CPU Log] in the [Tool] menu of Control Editor.

Caution

If the error is detected during the initial processing that is executed in power-on, time-stamp of history data may be recorded as the initial value.

(5) Self-diagnosis error codes

The list of error codes is shown below.

Table 10.1 List of error codes

Error code	Error name [Detecting timing]	Classification	Details of error	OK LED	Operation	Related special internal output Bit	Word
–	Power off, Power error [Always check]	Serious failure	No power supply from the power module.	OFF	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.	OFF	Stop	R7C8 R7DB	–
12	System RAM error [At power ON]	Serious failure	RAM used in the system program cannot be read and written properly.	OFF	Stop	R7C8 R7DB	–
13	Microcomputer error [Always check]	Serious failure	Address error interrupt and undefined command interrupt occurred in the microcomputer.	OFF	Stop	R7C8 R7DB	–
16	FLASH system error [Always check]	Serious failure	FLASH CRC anomaly used in system programs.	OFF	Stop	R7C8 R7DB	–
18	Ethernet MAC Address Anomaly [At power ON]	Serious failure	MAC address has a sum error.	250 ms OFF/250 ms ON	Stop	R7C8 R7DB	–
23	Undefined instruction [Checking during operation]	Medium failure	The microcomputer code which cannot be decoded was performed and as a result, error was detected.	500 ms OFF/500 ms ON	Stop	R7C9 R7DB	–
27	Data memory error [At power On, at initializing]	Medium failure	Data memory cannot be read and written properly.	250 ms OFF/250 ms ON	Stop	R7DB	–
31	User memory error [At power On, during RUN, at initializing]	Medium failure	A sun error is detected in the user memory or the RUNNING memory.	1 s OFF/1 s ON	Stop	R7CA R7DB	–
41	I/O information verify error [Always check]	Minor failure	I/O assignment information and actual mounting of module do not match.	250 ms OFF/250 ms ON	Stop*1	R7CD R7DB	WRF002
42 *2	Option board verification error [Always check]	Minor failure	Option board information and actual mounting option board do not match. (OBV-AIG, OBV-AIOG, OBV-RTD)	1 s OFF/1 s ON	Stop*3	–	–
44	Overload error (Normal scan/constant scan) [During operation]	Minor failure	Performance time for the normal scan exceeded the overload check time set by the parameter. Constant scan did not end at specified Time.	1 s OFF/1 s ON	Stop*1	R7D1 R7DB	–
45	Overload error (Cyclic scan) [Cyclic processing]	Minor failure	Performance time for the cyclic scan exceeded the performance cycle.	2 s OFF/2 s ON	Stop*1	R7D2 R7DB	–
46	Overload error (Interrupt scan) [During operation]	Minor failure	Performance time for the interrupt scan exceeded the performance cycle.	250 ms OFF/250 ms ON	Stop*1	R7D3 R7DB	–
4F	Overload error (Cyclic scan) [During operation]	Minor failure	The different scan, of which priority is lower, from the executing scan is started during execution of the cyclic scan.	1 s OFF/1 s ON	Stop*1	R7D2 R7DB	–
5E	Option board error [Always check]	Warning	Detected a hardware error of the option board.	250 ms OFF/250 ms ON	Run	–	–
5F	Backup memory error [When writing settings and programs to flash]	Warning	FLASH memory erase failed.	1 s OFF/1 s ON	Run	–	–

-●-: ON   -●-: 250 ms OFF/250 ms ON   -●-: 500 ms OFF/500 ms ON   -●- : 1 s OFF/1 s ON   -●- : 2 s OFF/2 s ON   ● : OFF

*1 Depending on the run parameter setting, operation can continue even when error occurs.
*2 Error code is added from software Ver.x126.
*3 Depending on the parameter for option board in Control Editor, operation can continue even when error occurs.

Table 10.1 List of error codes (continued from the preceding page)

Error code	Error name [Detecting timing]	Classification	Details of error	OK LED	Operation	Related special internal output Bit	Word
61	RS-232C port transmission error (parity) [At transmission]	Warning	Parity error was detected during transmission.	ON	Run	—	—
62	RS-232C port transmission error (Framing / Overrun) [At transmission]	Warning	Framing error, or overrun error was detected during transmission.	ON	Run	—	—
63	RS-232C port transmission error (timeout) [At transmission]	Warning	Timeout error was detected during transmission.	ON	Run	—	—
64	RS-232C port transmission error (protocol error) [At transmission]	Warning	Protocol (transmission procedure) error was detected during transmission.	ON	Run	—	—
65	RS-232C port transmission error (BCC error) [At transmission]	Warning	Sum error was detected during transmission.	ON	Run	—	—
67	RS-485 port transmission error (parity) [At transmission]	Warning	Parity error was detected during transmission.	ON	Run	—	—
68	RS-485 port transmission error (Framing / Overrun) [At transmission]	Warning	Framing error, or overrun error was detected during transmission.	ON	Run	—	—
69	RS-485 port transmission error (timeout) [At transmission]	Warning	Timeout error was detected during transmission.	ON	Run	—	—
6A	RS-485 port transmission error (protocol error) [At transmission]	Warning	Protocol (transmission procedure) error was detected during transmission.	ON	Run	—	—
6B	RS-485 port transmission error (BCC error) [At transmission]	Warning	Sum error was detected during transmission.	ON	Run	—	—
6C	Ethernet port (Con 1) Timeout error [At transmission]	Warning	Timeout error of Ethernet communication port (Con 1) was detected during transmission.	ON	Run	—	—
6D	Ethernet port (Con 2) Timeout error [At transmission]	Warning	Timeout error of Ethernet communication port (Con 2) was detected during transmission.	ON	Run	—	—
6E	Ethernet port (Con 3) Timeout error [At transmission]	Warning	Timeout error of Ethernet communication port (Con 3) was detected during transmission.	ON	Run	—	—
6F	Ethernet port (Con 4) Timeout error [At transmission]	Warning	Timeout error of Ethernet communication port (Con 4) was detected during transmission.	ON	Run	—	—
71	Battery error [Always check]	Warning	Battery voltage dropped below prescribed value. Battery is not installed.	250 ms OFF/250 ms ON	Run	R7D9	—
76	Retentive data area is undefined status [At power ON]	Warning	Area specified to retentive data area is undefined because the battery is dead.	250 ms OFF/250 ms ON	Run	—	—
77	Backup memory error (FLASH) [in writing into FLASH memory]	Warning	Data cannot be written into the flash memory.	250 ms OFF/250 ms ON	Run	R7D9	—
78	Setting parameter data is undefined status.	Warning	Serial communication stored in CPU, Ethernet communication, and parameter set by security function have sum error.	250 ms OFF/250 ms ON	Run	—	—
7B	Data memory backup error [Power ON]	Warning	Checksum value is wrong in backup data.	250 ms OFF/250 ms ON	Run	—	—
7C	Logging setting error [Power ON]	Warning	Checksum value is wrong in the logging setting stored in MICRO-EHV.	250 ms OFF/250 ms ON	Run	—	—
7D	Analog option board conversion processing delay [Always check]	Warning	Conversion of analog values had not completed within the set time.	ON	Run	—	—

-●-: ON   -◑-: 250 ms OFF/250 ms ON   -◐-: 500 ms OFF/500 ms ON   -◐-: 1 s OFF/1 s ON   -◑-: 2 s OFF/2 s ON   ●: OFF

Table 10.1 List of error codes (continued from the preceding page)

Error code	Error name [Detecting timing]	Classification	Details of error	OK LED	Operation	Related special internal output Bit	Word
81	Modbus Gateway port transmission error (parity) [At transmission]	Warning	A parity error was detected during transmission.	ON	Run	—	—
82	Modbus Gateway port transmission error (framing/ overrun) [At transmission]	Warning	A framing error or overrun error was detected during transmission.	ON	Run	—	—
83	Modbus Gateway port transmission error (timeout) [At transmission]	Warning	A timeout error was detected during transmission	ON	Run	—	—
85	Modbus Gateway port transmission error (CRC error) [At transmission]	Warning	A sum error was detected during transmission.	ON	Run	—	—
88	WDT error [Always check]	Serious error	Watchdog timer detects microprocessor abnormality because the microprocessor no longer works according to the system program.	OFF	Stop	R7C8*5 R7DB*5	—
8C	Modbus-TCP port (Con 1) Timeout error [At transmission]	Warning	Timeout error of Modbus-TCP communication port (Con 1) was detected during transmission.	ON	Run	—	—
8D	Modbus-TCP port (Con 2) Timeout error [At transmission]	Warning	Timeout error of Modbus-TCP communication port (Con 2) was detected during transmission.	ON	Run	—	—
8E	Modbus-TCP port (Con 3) Timeout error [At transmission]	Warning	Timeout error of Modbus-TCP communication port (Con 3) was detected during transmission.	ON	Run	—	—
8F	Modbus-TCP port (Con 4) Timeout error [At transmission]	Warning	Timeout error of Modbus-TCP communication port (Con 4) was detected during transmission.	ON	Run	—	—
A0	USB memory device error [When USB memory is inserted]	Warning	The USB device could not be detected correctly.	250 ms OFF/250 ms ON	Run	—	—
A1	USB memory file open error [When opening a file]	Warning	File in USB memory could not open.	250 ms OFF/250 ms ON	Run	—	—
A2	USB memory file write error [When writing to file]	Warning	File in USB memory could not be written.	250 ms OFF/250 ms ON	Run	—	—
A3	USB memory file read error [When reading from file]	Warning	File in USB memory could not be read.	250 ms OFF/250 ms ON	Run	—	—
A4	Work memory allocation error [When accessing memory]	Warning	Work memory for file edit could not be allocated.	250 ms OFF/250 ms ON	Run	—	—
A7 *4	Too many files opened	Warning	Number of files that can be opened at the same time has exceeded the upper limit. (12 files)	ON	Run	—	—
A8 *4	Downloaded program includes not supported function	Warning	Program downloaded from USB memory includes the parameter which is not correspond with this unit.	ON	Run	—	—
A9 *4	Downloaded program has not sufficient information	Warning	Program downloaded from USB memory does not contain the parameters required to use new features.	ON	Run	—	—

: ON   : 250 ms OFF/250 ms ON   : 500 ms OFF/500 ms ON   : 1 s OFF/1 s ON   : 2 s OFF/2 s ON   : OFF

*4 Error code is added from software Ver.x126.
*5 Related special internal output are added from Ver.x126.

Note

The OK LED display pattern has been changed from MICRO-EHV basic unit software Ver.x104.

The MICRO-EHV basic unit software Ver.x101 and Ver.x102 before the change are indicated by the OK LED below.

Error Code   [18] [23] [27] [31] [41] [44] [45] [46] [4F]   :   ● OFF

Error Code   [5E] [5F] [78]   : ON

Error Code   [71] [76] [77]   : 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	No.	Word special internal output
R7C8	Serious failure flag	WRF000	Self-diagnostic error code
R7C9	Operation microcomputer abnormal	WRF002	I/O verify mismatch details
R7CA	User memory error		
R7CD	I/O verify mismatch		
R7D0	Overload error (normal scan)		
R7D1	Overload error (cyclic scan)		
R7D2	Overload error (interrupt scan)		
R7D6	I/O assignment points over		
R7D8	Clock error		
R7D9	Battery error		
R7DB	Self-diagnostic error		

No.	Bit special internal output
R800	Undefined IP address
R801	Undefined serial communication setup
R802	Undefined Ethernet task code function setup
R803	Undefined ASR function setup
R804	Undefined NTP function setup
R805	Undefined security function parameter
R806	Undefined ASR mode setup
R807	Undefined Modbus-TCP parameter

When all of the special internal output data cannot be cleared during program execution, refer to the self-diagnostic error code list and clear only the corresponding error flags by using forced set of the programmer or peripheral unit.

Note

If the internal output for a self-diagnostic error R7DB (WRF000) is used as a system error for the stop condition of CPU RUN, the R7DB may be turned on even with an error of the warning level (battery error, etc.), causing the CPU to stop. Therefore, do not use the internal output of the self-diagnostic error as a condition for stopping the CPU.

(6) Corrective action when an error occurred

The process flow when an error occurred is shown below.

Error occurred

Error is detected by the CPU module and displayed by lit/flashing/not lit of RUN and OK LEDs.

Verify the self-diagnosis error code using the programming tool.

Remove the error cause according to the corrective action for each error code as shown below.

If there are spare parts available, replace the parts. → Contact our service department.
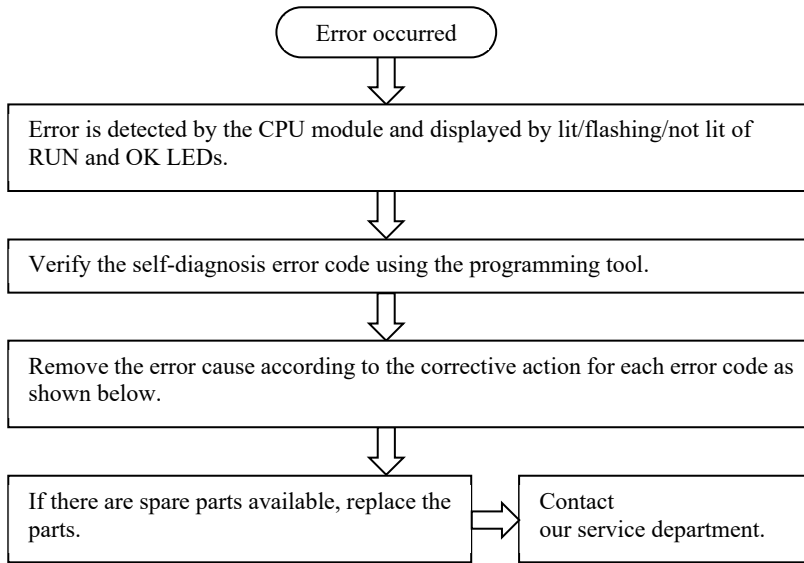
Error code	Error name	Corrective action
88	Microcomputer overload error	Restart the power. If the same error occurs, it is a hardware error in the basic unit. Replace the CPU module with a spare. Make sure that there are no machines, etc. that generate excessive noise near MICRO-EHV.
11	System ROM error	
12	System RAM error	
13	Microcomputer error	
16	FLASH system error	
18	Ethernet MAC Address Anomaly	
23	Undefined instruction	
27	Data memory error	
_	Power shut-off, power supply 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.
41	I/O information verify error	Check the I/O assignment once more. Recheck the fixation of each basic unit and expansion unit, and the connection of the expansion cable.
42	Option board verification error	Check the parameter setting for the option board once more. Recheck the connection of the option board and basic unit.
44	Overload error (Normal scan)	Change the program so that the scan time of the user program is less or change the congestion check time.
45	Overload error (Cyclic scan)	Change the program so that the cyclic interrupt program execution time is less.
46	Overload error (Interrupt scan)	Change the program so that the interrupt program execution time is less.
4F	Overload error (Cyclic scan)	Set a cycle of all cyclic scan to a multiple of integer.

Error code	Error name	Corrective action
5E	Option board error	Check for abnormal in option board and replace the malfunctioning module.
5F	Backup memory error	Transfer the program again after CPU initialization.
61	RS-232C port transmission error (parity)	Check the connection of the communication cable. Check the settings such as the transmission speed.
62	RS-232C port transmission error (framing / overrun)	Check there are no sources of noise near the communication cable.
63	RS-232C port transmission error (timeout)	Check the connection of the communication cable. Check there are no sources of noise near the communication cable.
64	RS-232C port transmission error (protocol error)	Verify the protocol specification, examine the host computer processing, and correct any error.
65	RS-232C port transmission error (BCC error)	
67	RS-485 port transmission error (parity)	Check the connection of the communication cable. Check the settings such as the transmission speed.
68	RS-485 port transmission error (framing / overrun)	Check there are no sources of noise near the communication cable.
69	RS-485 port transmission error (timeout)	Check the connection of the communication cable. Check there are no sources of noise near the communication cable.
6A	RS-485 port transmission error (protocol error)	Verify the protocol specification, examine the host computer processing, and correct any error.
6B	RS-485 port transmission error (BCC error)	
6C	Ethernet port (Con 1) 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 port (Con 2) timeout error	
6E	Ethernet port (Con 3) timeout error	
6F	Ethernet port (Con 4) timeout error	
71	Battery error	Replace the battery with a new one. Check the connection of the battery connector.
76	Retentive data area is undefined status	Clear the retentive data area
77	Backup memory error	Read the programming tool from the user program and back up it. Though the basic unit 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.
7B	Data memory backup error	The backup data is abnormal. After executing data backup again, restart the power supply and check whether the data backup is performed normally.
7C	Logging setting error	The logging setting is abnormal. After setting the parameter for logging again, and check whether the logging is performed normally.
7D	Analog option board conversion processing delay	
81	Modbus Gateway port transmission error (Parity)	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.
82	Modbus Gateway port transmission error (Framing/Overrun)	
83	Modbus Gateway port transmission error (Timeout)	
85	Modbus Gateway port transmission error (CRC error)	

Error code	Error name	Corrective action
8C	Modbus-TCP port (Con1) Timeout error	Check the connection of the communication cable. Check there are no sources of noise near the communication cable.
8D	Modbus-TCP port (Con2) Timeout error	Verify the protocol specification, examine the host computer processing, and correct any error.
8E	Modbus-TCP port (Con3) Timeout error	
8F	Modbus-TCP port (Con4) Timeout error	
A0	USB memory device error	Check the connection of the USB memory Check there are no sources of noise in USB memory.
A1	USB memory file Open error	
A2	USB memory file Write error	
A3	USB memory file Read error	
A4	Work memory allocation error	
A7	Too many files opened	Check the ladder program for data logging. Under the logging condition is "Specify file number in internal output" and "Add to same file", if the file number in the internal output is updated by the program, a new file will be generated with the previous file open. If the number of files opened at the same time exceeds 12, A7 error will occur.
A8	Downloaded program includes not supported function	The basic unit does not support the additional functions stored in the OBC file. Replace with the basic unit that supports the additional functions. This error occurs when the software version of MICRO-EHV is old, but if you do not use the additional functions, you can use it as it is even if this error occurs.
A9	Downloaded program has not sufficient information	The downloaded OBC file lacks information about additional functions. Create the OBC file with the Control Editor that supports the additional function, or upload the OBC file again from MICRO-EHV that supports the additional function. This error occurs when the software version of the MICRO-EHV is new, but if you do not use the additional functions, you can use it as it is even if this error occurs.

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 OK LED turns on if the error has been corrected.

However, the error information remai ns 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 running (RUN)

Set the special internal output R7EC to 1.

If the error has been corrected, the OK LED will be lit and the error information set in the error special internal output, which stores the type and details of the CPU error, will be reset.

10.2 Operation error code and countermeasure procedures

When an error occurs in an execution of a control command, "1" will set to the internal special output (R7F3) 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 10.2 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

10.3 Check list when abnormality occurred

Check the following items if an error is generated in the MICRO-EHV 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 power supply supplied from the power supply for the sensor within the specification (430 mA)?
- Is the POW LED lit? Are the turn off or blinking?

(2) The basic unit related items
- Are the initial settings (CPU initialization, I/O assignment, parameter settings, etc.) proper?
- Is the OK LED turn off or blinking?
- Is the RUN switch in the proper location?
- Are batteries mounted properly? Is the battery life still remaining?
- Are the expansion connector and communication cable properly connected?

(3) Input related items
- Is the input voltage within the specifications?
- Is there any noise or chattering in the input?
- Do the I/O assignment numbers in the program match?
- Is the wiring done properly?

(4) Output related items
- Do the output specifications of the unit and the load power type (DC/AC) match?
- Do the load voltage and current match the specification of the output section?
- Is there any noise or chattering in the output waveform?
- Is the wiring done properly?
- Do the I/O assignment numbers in the program match?
- Are there any unintentional overlaps in the output numbers?

(5) Wiring related items
- Is the FE terminal of the power supply wiring grounded using Class D dedicated grounding?
- Is the wiring between the 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 unit?

Note

(1) Always replace the unit with the power off.

(2) Please notify us of the malfunctioning effect in as much detail as possible when returning the unit 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 briefly as follows:

Phillips/flathead drivers, digital multimeter, tester, oscilloscope (necessary depending on the case) etc.

10.4　Procedure to solve abnormality

The following shows the processing flow when a problem has occurred:

```
        ┌──────────────────────────────┐
        │    Malfunction generation     │
        └──────────────────────────────┘
                      ⬇
        ┌──────────────────────────────┐
        │ Bring the system to a safe    │
        │ condition                     │
        └──────────────────────────────┘
                      ⬇
        ┌──────────────────────────────┐
        │      Record the status        │
        └──────────────────────────────┘
                      ⬇
        ┌──────────────────────────────┐
        │ Problem, Analysis, Presumption│
        └──────────────────────────────┘
```
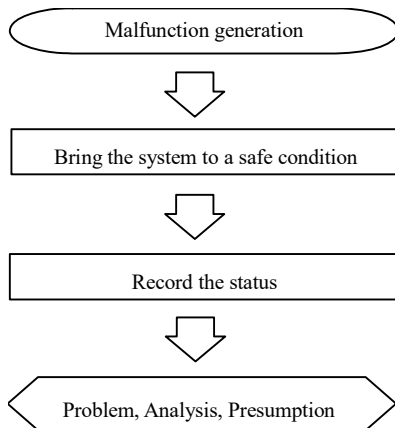
Major problem	Check point	Typical causes of the problem	Reference item
PLC will not start	POW LED, OK LED	Power supply abnormal, power off, power supply capacity shortage, serious CPU failure	(a)
Will not operate (will not RUN)	POW LED, OK LED, RUN LED, Internal output of error	I/O assignment error, incorrect parameter setting, incorrect user program, Syntax error, RUN conditions not met, write-occupied status	(b)
Operation stopped (RUN stopped)	POW LED, OK LED, RUN LED, CPU error code	Power supply abnormal, expansion power supply abnormal/off, CPU abnormal, memory error.	(c)
Wrong input, or will not input. (abnormal operation)	OK LED, RUN LED, I/O LED Monitoring by peripheral devices	User program timing, input power supply, bad connection, I/O external input circuit error, I/O inductive noise.	(d)
Wrong output, or will not output. (abnormal operation)	OK LED, RUN LED, I/O LED, Monitoring by peripheral devices Forced setting	User program timing, bad connection, I / O output circuit error, I/O inductive noise.	(e)
Peripheral devices abnormal	CPU error code, Peripheral device	Serious CPU failure, peripheral devices abnormal, peripheral devices setting error, cable abnormal	(f)

```
                      ⬇
        ┌──────────────────────────────┐
        │ Correct or replace the faulty │
        │ area (Verify according to the │
        │ item corresponding of the     │
        │ program.)                     │
        └──────────────────────────────┘
                      ⬇
        ┌──────────────────────────────┐
        │   Verify the system operation?│
        └──────────────────────────────┘
                      ⬇
        ┌──────────────────────────────┐
        │         Operation             │
        └──────────────────────────────┘
```
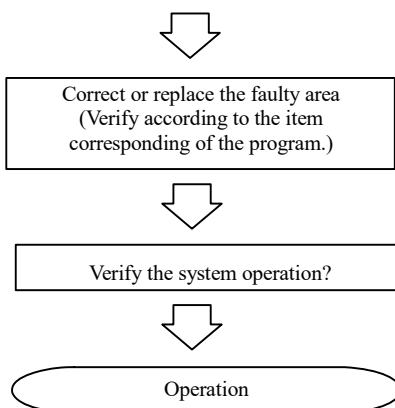
(a)   PLC will not start

The OK LED on basic unit does not light up when the power is turned on, and peripherals cannot be connected online.

```
                         ┌──────────────┐
                         │ POW LED of the│──── NO ────┐
                         │ basic unit is lit.│          │
                         └──────────────┘           ▼
                              │             ┌─────────────────────────────────┐
                             YES            │        Check the power supply    │
                              │             ├─────────────────────────────────┤
                              │             │ AC power supply type             │
                              │             │ - AC power supply voltage (at the input terminal)│
                              │             │ - Capacity of the output 24 V DC │
                              │             │ DC power supply type             │
                              │             │ - DC power supply voltage (at the input terminal)│
                              │             │ - Capacity of the output 24 V DC Connection│
                              │             │ Between main unit and terminal stand.│
                              ▼             └─────────────────────────────────┘
              ┌────────────────────────┐
              │ Self-diagnostic error code│──── NO ────┐
              │ 11 12 13 16 18 1F        │            │
              │ serious failure in CPU.  │            ▼
              └────────────────────────┘    ┌──────────────────────────────────┐
                         │                   │ The power supply of the PLC may be damaged.│
                        YES                  └──────────────────────────────────┘
                         │                              │
                         ▼                              │
              ┌────────────────────┐                    │
              │  Occur frequently? │──── NO ────────────┤
              └────────────────────┘                    │
                         │                              │
                        YES                             │
                         ▼                              ▼
         ┌──────────────────────────────┐   ┌──────────────────────────────┐
         │ There may be transient malfunctions caused│   │ Contact our service department.│
         │ by noise.                    │   └──────────────────────────────┘
         └──────────────────────────────┘
```

(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.

Caution

If the CPU is in the WRITE occupied state, switching the RUN switch from "STOP" to "RUN" will not cause the CPU to RUN.
Connect the device and perform the occupancy operation.

```
                    ▽

          ◇ Self-diagnostic error code
             [23][27][31]                    YES       ┌─────────────────────────────────┐
          medium failure in CPU.    ─────────────→     │      Check the basic unit       │
                    │                                   ├─────────────────────────────────┤
                    │ NO                                │ - The power supply is turned on again. │
                    │                                   │ - Performs the initialization of CPU.  │
                    │                                   │ If the above does not help, replace the unit. │
                    ▼                                   └─────────────────────────────────┘

          ◇ Self-diagnostic error code
             [44][45]                         NO        ┌─────────────────────────────────┐
          slight failure in CPU.   ──────────────→      │     Check the user program      │
                    │                                   ├─────────────────────────────────┤
                    │ YES                               │ - Check a version of the programming tool │
                    │                                   │ - Check the program using peripheral │
                    ▼                                   │   devices                       │
          ┌─────────────────────────────┐              │ - Verify the scan time          │
          │   Check I/O assignments     │              │ - Modify the program            │
          ├─────────────────────────────┤              └─────────────────────────────────┘
          │ - Verify the assignment using peripheral │
          │   devices                   │
          │ - Can I / O Assignment      │
          │ - Transient malfunction due to noise │
          └─────────────────────────────┘
```

(c)   Operation stopped (RUN stopped)

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

```
                              ▽

                    POW LED is turn off.              YES
                  (Power supply is abnormal)  ─────────────────┐
                                                               │
                         │ NO                                  ▼
                         │              ┌──────────────────────────────────────────────┐
                         │              │           Check the power supply              │
                         │              ├──────────────────────────────────────────────┤
                         │              │ - Power wiring check                          │
                         │              │ - Power supply terminal power supply voltage check │
                         │              │ - Power supply capacity check for sensors     │
                         │              │ If the above problem is not found, replace the unit. │
                         ▼              └──────────────────────────────────────────────┘
                  Self-diagnosis error code          NO
                       11 to 1F         ─────────────────┐
                  serious failure in CPU                 │
                         │                                ▼
                         │ YES          ┌──────────────────────────────────────────────┐
                         │              │            Check the basic unit               │
                         │              ├──────────────────────────────────────────────┤
                         │              │ - Replace the unit if error occurs when the power is │
                         │              │   supplied again.                             │
                         ▼              └──────────────────────────────────────────────┘
                  Self-diagnostic error code         YES
                      23 27 31          ─────────────────┐
                  medium failure in CPU                  │
                         │                                ▼
                         │ NO           ┌──────────────────────────────────────────────┐
                         │              │            Check the basic unit               │
                         │              ├──────────────────────────────────────────────┤
                         │              │ - Power is supplied again                     │
                         │              │ - Perform initialization of CPU               │
                         │              │ If the error occurs again, replace the unit.  │
                         ▼              └──────────────────────────────────────────────┘
                  Self-diagnostic error code         YES
                       41 to 4F         ─────────────────┐
                  slight failure in CPU                  │
                         │                                ▼
                         │ NO           ┌──────────────────────────────────────────────┐
                         │              │            Check I/O assignment               │
                         │              ├──────────────────────────────────────────────┤
                         │              │ - Connector malfunction between basic unit and │
                         │              │   expansion unit                              │
                         │              │ - Verify assignment using peripheral device   │
                         │              │ - Verify model of basic/expansion unit        │
                         │              │ - Replace basic unit                          │
                         │              │ - Replace expansion unit                      │
                         │              │ - Transient malfunction due to noise          │
                         ▼              └──────────────────────────────────────────────┘
          ┌──────────────────────────────────┐
          │       Check the user program      │
          ├──────────────────────────────────┤
          │ - Check the program using peripheral devices │
          │ - Verify the scan time            │
          │ - Modify the program              │
          └──────────────────────────────────┘
```

(d)   Wrong input, or will not input. (Operation error)

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

```
                    ▽

        ◇ Input LED is not lit.        YES
          Input cannot be read.  ──────────────┐
                                               ▼
              │ NO                    ┌──────────────────────────────┐
              │                       │       Check input signal      │
              │                       ├──────────────────────────────┤
              │                       │ - Input signal voltage        │
              │                       │ - Input power supply type     │
              │                       │ - Terminal block connector connection │
              │                       │ - Cable disconnection         │
              │                       │ - Replace the unit            │
              ▼                       └──────────────────────────────┘

        ◇ Input LED is lit.           YES
          Input can be read.   ──────────────┐
                                             ▼
              │ NO                  ┌──────────────────────────────┐
              │                     │      Check the related unit    │
              │                     ├──────────────────────────────┤
              │                     │ - Check input monitor          │
              │                     │ - I/O assignment               │
              │                     │ - Program                      │
              │                     │ - Input signal voltage         │
              │                     │ - Verify model of basic/expansion unit │
              ▼                     └──────────────────────────────┘

        ◇ Input LED is not lit.       YES
          Input can be read.   ──────────────┐
                                             ▼
              │ NO                  ┌──────────────────────────────┐
              │                     │ LED failure                    │
              │                     │  * LED replace may not be performed by │
              │                     │    user, so a repair request must be │
              │                     │    submitted.                  │
              ▼                     └──────────────────────────────┘

    ┌──────────────────────────┐
    │        False input        │
    ├──────────────────────────┤
    │ - Check input signal source │
    │ - Replace the unit        │
    │ - Check input program     │
    │ - Malfunction due to noise │
    └──────────────────────────┘
```

Data cannot be input.

```
                              ▽

                    ╱─────────────╲
                   ╱  Are there a   ╲   YES
                  ╱   wrong wiring,   ╲ ──────►  ┌────────────────────┐
                  ╲ disconnection, and╱          │ Perform rewiring.  │
                   ╲loose screw on the╱          └────────────────────┘
                    ╲terminal block? ╱
                     ╲──────────────╱
                           │ NO
                           ▼
                    ╱─────────────╲
                   ╱ Is input      ╲   NO
                  ╱  detected during ╲ ──────►  ┌──────────────────────────┐
                  ╲ the voltage check╱          │ Check the wiring system. │
                   ╲between input and╱          │ Change the voltage to    │
                    ╲  common?      ╱           │ satisfy specifications.  │
                     ╲──────────────╱           └──────────────────────────┘
                           │ YES
                           ▼
                    ╱─────────────╲
                   ╱               ╲   NO
                  ╱  LED is being   ╲ ──────►  ┌──────────────────────────┐
                  ╲     lit?        ╱          │ Contact out service      │
                   ╲               ╱           │ department.              │
                    ╲─────────────╱            └──────────────────────────┘
                           │ YES
                           ▼
                    ╱─────────────╲
                   ╱               ╲   NO
                  ╱  Is setting of  ╲ ──────►  ┌──────────────────┐
                  ╲ expansion unit? ╱          │ Set properly.    │
                   ╲               ╱           └──────────────────┘
                    ╲─────────────╱
                           │ YES
                           ▼
                    ╱─────────────╲
                   ╱ Is there any   ╲   YES
                  ╱  damage in       ╲ ──────►  ┌───────────────────────────────┐
                  ╲ connector on     ╱          │ Replace the basic/expansion   │
                   ╲basic/expansion  ╱          │ unit.                         │
                    ╲   units?     ╱            └───────────────────────────────┘
                     ╲──────────────╱
                           │ NO
                           ▼
                    ╱─────────────╲
                   ╱ Is there any   ╲   YES
                  ╱  abnormal in the ╲ ──────►  ┌──────────────────────────┐
                  ╲ internal connector╱         │ Replace terminal block.  │
                   ╲of the terminal  ╱          └──────────────────────────┘
                    ╲   block?     ╱
                     ╲──────────────╱
                           │ NO
                           ▼
              ┌──────────────────────────┐
              │ Replace applicable unit. │
              └──────────────────────────┘
```

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

```
                    ▽

         ╱─────────────────╲        NO    ┌──────────────────────┐
        ╱ Are the program and ╲─────────→ │ Correct them.        │
        ╲ I/O assignment        ╱         └──────────────────────┘
         ╲ correct?          ╱
          ╲───────────────╱
                 │ YES
                 ▼
         ╱─────────────────╲        NO    ┌──────────────────────┐
        ╱ Is the expansion    ╲─────────→ │ Set it properly.     │
        ╲ unit set correctly?  ╱          └──────────────────────┘
         ╲                  ╱
          ╲───────────────╱
                 │ YES
                 ▼
         ╱─────────────────╲        YES   ┌────────────────────────────────┐
        ╱ Is there any damage ╲────────→  │ Replace the basic/expansion    │
        ╲ in connector on      ╱          │ unit.                          │
         ╲ basic/expansion    ╱           └────────────────────────────────┘
          ╲ unit?          ╱
           ╲─────────────╱
                 │ NO
                 ▼
    ┌──────────────────────────────────┐
    │ Replace the basic/expansion unit.│
    └──────────────────────────────────┘
```

(e)   Output error, no output(abnormal operation)

CPU runs, but output signals are not correct.

```
                    ▽
                    │
          ┌─────────◇─────────┐   YES
          │ Output LED is not  │─────────────────┐
          │ lit.               │                 │
          │ Will not output.   │                 ▼
          └─────────◇─────────┘       ┌───────────────────────────────────┐
                    │ NO               │           Check output            │
                    │                  ├───────────────────────────────────┤
                    │                  │ - Forced output                   │
                    │                  │ - Verify IO assignment            │
                    │                  │ - Verify program                  │
                    │                  │ - Replace the basic unit          │
                    │                  │ - Verify model of basic/expansion │
                    │                  │   unit                            │
                    │                  └───────────────────────────────────┘
                    ▼
          ┌─────────◇─────────┐   YES
          │ Output LED is lit. │─────────────────┐
          │ Will not output.   │                 │
          └─────────◇─────────┘                 ▼
                    │ NO               ┌───────────────────────────────────┐
                    │                  │        Check output signal        │
                    │                  ├───────────────────────────────────┤
                    │                  │ - Output signal voltage           │
                    │                  │ - Power voltage for load          │
                    │                  │ - Terminal block wiring           │
                    │                  │ - Check voltage between output    │
                    │                  │   common                          │
                    │                  │ - Wiring, especially the S        │
                    │                  │   terminal of transistor output   │
                    │                  │ - Replace the basic unit          │
                    │                  └───────────────────────────────────┘
                    ▼
          ┌─────────◇─────────┐   YES
          │ Output LED is not  │─────────────────┐
          │ lit.               │                 │
          │ Will output.       │                 ▼
          └─────────◇─────────┘       ┌───────────────────────────────────┐
                    │ NO               │ LED failure                       │
                    │                  │ * User cannot replace LED, so     │
                    │                  │   repair request must be          │
                    │                  │   submitted.                      │
                    │                  └───────────────────────────────────┘
                    ▼
          ┌───────────────────────────┐
          │       Output error        │
          ├───────────────────────────┤
          │ - Check output power supply│
          │ - Malfunction due to noise │
          │ - Replace the unit         │
          │ - Check program            │
          │ - Check expansion cable    │
          └───────────────────────────┘
```

CPU runs, but output signal are not detected.

```
                              ▽

                    ┌─────────────────┐      NO    ┌──────────────────┐
                    │   Is LED lit?   │──────────▶ │ Check program.   │
                    └─────────────────┘            └──────────────────┘
                            │ YES
                            ▼
              ┌──────────────────────────┐  YES   ┌──────────────────┐
              │ Are there wiring, wrong  │──────▶ │ Perform rewiring.│
              │ wring, and loose screw   │        └──────────────────┘
              │ of terminal block?       │
              └──────────────────────────┘
                            │ NO
                            ▼
              ┌──────────────────────────┐  NO    ┌─────────────────────────────┐
              │ Is the voltage meeting   │──────▶ │ Change the voltage and      │
              │ the specification in the │        │ polarity to satisfy the     │
              │ terminal block?          │        │ specification.              │
              └──────────────────────────┘        └─────────────────────────────┘
                            │ YES
                            ▼
              ┌──────────────────────────┐  YES   ┌─────────────────────────────┐
              │ Are there error and      │──────▶ │ Replace the basic/expansion │
              │ damage on the connector  │        │ unit.                       │
              │ of basic/expansion units?│        └─────────────────────────────┘
              └──────────────────────────┘
                            │ NO
                            ▼
              ┌──────────────────────────┐  YES   ┌─────────────────────────────┐
              │ Is there any abnormality │──────▶ │ Replace the terminal block. │
              │ in the contacts inside   │        └─────────────────────────────┘
              │ the terminal block?      │
              └──────────────────────────┘
                            │ NO
                            ▼
        ┌──────────────────────────────────┐
        │ Replace the corresponding unit.. │
        └──────────────────────────────────┘
```

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

```
                              ▽

              ╱────────────────────╲
             ╱  Does I/O assignment  ╲        NO    ┌─────────────────┐
             ╲  match with the        ╱ ─────────▶  │ Correct it.     │
              ╲ program?             ╱              └─────────────────┘
               ╲──────────────────╱
                        │ YES
                        ▼
              ╱────────────────────╲
             ╱  Is there any         ╲       YES    ┌──────────────────────────────┐
             ╱  abnormality or        ╲ ─────────▶  │ Replace the basic/expansion   │
             ╲  damage to the         ╱             │ unit.                         │
             ╲  connector of the     ╱              └──────────────────────────────┘
              ╲ basic/expansion     ╱
               ╲ unit?            ╱
                ╲──────────────╱
                        │ NO
                        ▼
         ┌──────────────────────────────┐
         │ Replace the corresponding     │
         │ unit.                         │
         └──────────────────────────────┘
```

(f)　Peripheral devices abnormal

　　Peripheral devices cannot be connected with serial communication port.

```
                    ⬇

            ╱ Is it a serious ╲   YES    ┌──────────────────────┐
           ⟨  CPU failure?     ⟩ ──────→ │ Replace basic unit.  │
            ╲                 ╱          └──────────────────────┘
                    │ NO

            ╱ Are the connection ╲
           ╱  cable continuity,   ╲ NO   ┌──────────────────────────┐
          ⟨   and connector        ⟩───→ │ Check connection connector.│
           ╲  connection normal?  ╱      │ Replace cable.           │
            ╲                    ╱       └──────────────────────────┘
                    │ YES

            ╱ Is communication   ╲ NO    ┌──────────────────────┐
           ⟨  speed setting of    ⟩────→ │ Set properly.        │
            ╲ basic unit correct?╱       └──────────────────────┘
                    │ YES

    ┌─────────────────────────────────────────┐
    │ Refer to manual for each peripheral device.│
    └─────────────────────────────────────────┘
```

Cannot connect with Ethernet port

Is it serious CPU failure? — YES → Replace basic unit.

NO

Are connection cable continuity, and connector connection normal? — NO → Check connection connector. Replace cable.

YES

If connecting to a hub, is the cable straight? — NO → Use straight cable.

YES

Is the LINK / ACT LED on the basic unit lit? — NO → Verify cable. Verify if HUB is operating normally.

YES

Does response return by PING command? — NO → Verify IP address of base unit.

YES

Refer to manual for each peripheral device.

MEMO

Chapter 11 Maintenance and Inspection

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

(1) Daily inspection

Verify the following items while the system is running.

Table11.1 Items for daily inspection

Item	LED display	Inspection method	Normal status	Main cause of error
Unit LED display	POW	Visual check	Lighting	Power supply error, etc.
	RUN	Visual check	Lighting (running)	
	OK *1	Visual check	Lighting	Turn off: Microprocessor error, memory error, etc. Blinking: Battery error etc. *2

*1   MICRO-EHV displays the error information by lighting / blinking / turning off the OK LED.
  For details, please refer to "Chapter 10 Troubleshooting Error Code List".

*2   Battery is not replaced after battery error happens and turn off the power supply for the basic unit for a long term, there is possibility to lose the data in memory. In case that the power has not supplied to basic unit for a long term, the data in the memory may lost due to run out the battery.

(2) Periodic inspection

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

Table11.2 items for periodic inspection

Part	Item	Check criteria	Remarks
Programming device to CPU	Check the operation of the programming device	Online connection possible. All switch and display lamps work normally.	
Power supply	Check for the voltage fluctuations	85 to 264 V AC	Tester
I/O unit	Output relay life	Electrical life 200,000 times Mechanical life 10 million times	Refer to the relay contact life curve (Chapter 3).
	LED	Turns ON/OFF correctly	
	External power voltage	Within the specification for each I/O	I/O specifications (Chapter 3).
Battery (Lithium battery)	Check voltage and life	OK LED turns on. Within 5 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 5 to 95 % 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.

(3) Power supply life

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.

When stocking spare parts, the standard for consideration is that the power module has a life of approximately 5 years when used at the rated ambient temperature (30 °C). Also, to lengthen the life of the unit, consider the air circulation around the unit and ambient temperature when installing it.

Appendix1 List of Special Internal Output

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

The special internal output area is retentive area, the value is retained even if the power supply is OFF if the battery is installed.

A1.1 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.
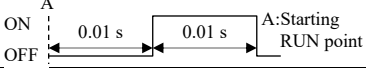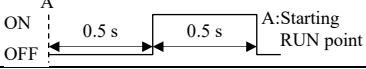
No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R7C0 to R7C7	Undefined	—	—	—	—
R7C8	Serious failure flag	0: No serious failure 1: Serious failure	Indicates whether there is an abnormal in system.	S	U, R7EB, R7EC
R7C9	Microcomputer error	0: Normal 1: Error	Indicates whether there is an abnormal in the microcomputer.	S	U, R7EB, R7EC
R7CA	User memory error	0: Normal 1: Error	Indicates whether there is an abnormal in the user memory.	S	U, R7EB, R7EC
R7CB	Undefined	—	—	—	—
R7CC	Undefined	—	—	—	—
R7CD	I/O verify mismatch	0: Normal 1: Unmatched	Indicates whether I/O assignment and loading are matched. (Mismatched information output to WRF002)	S	U, R7EB, R7EC
R7CE	Undefined	—	—	—	—
R7CF	Undefined	—	—	—	—
R7D0	Undefined	—	—	—	—
R7D1	Overload error (normal scan)	0: Normal 1: Scan time over	Indicates whether the normal scan execution time has exceeded the designated time.	S	U, R7EB, R7EC
R7D2	Overload error (cyclic scan)	0: Normal 1: Scan time over	Indicates whether the cyclic scan was completed within cycle time.	S	U, R7EB, R7EC
R7D3	Overload error (interrupt scan)	0: Normal 1: Scan time over	Indicates whether an interrupt of the same factor occurred during interrupt scan execution.	S	U, R7EB, R7EC
R7D4	Undefined	—	—	—	—
R7D5	Undefined	—	—	—	—
R7D6	IO assignment points over	0: Normal 1: I/O assignment points over	Indicates whether the number of I/O assigned points has exceeded the maximum points.	S	U, R7EB, R7EC
R7D7	Undefined	—	—	—	—
R7D8	Clock error	0: Normal 1: Error	When clock IC is in error, this bit is activated.	S	U, R7EC
R7D9	Battery error	0: Normal 1: Error	Indicates the battery voltage drop or the backup memory abnormal.	S	U *1 R7EB, R7EC
R7DA	Undefined	—	—	—	—
R7DB	Self-diagnostic error	0: Normal 1: Error	Indicates whether there is a self-diagnostic error. (Detailed information output to WRF000)	S *2	U, R7EB, R7EC
R7DC to R7DF	Undefined	—	—	—	—

Set / Reset Condition：
  S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
  X…Always display

*1 Battery error (R7D9) will be turned off if the cause of the error is removed by replacing the battery.
*2 Self-diagnostic error (R7DB) turns on only when there is the serious, medium, or minor failure.
    Unlike EH-CPU, it does not turn on with the warning level error.

No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R7E0	RUN switch position (STOP)	0: RUN/STOP Sw; RUN 1: RUN/STOP Sw; STOP	Turn on when RUN/STOP Sw position is STOP.	S	S
R7E1	Undefined	—	—	—	—
R7E2	RUN switch position (RUN)	0: RUN/STOP Sw; STOP 1: RUN/STOP Sw; RUN	Turn on when RUN/STOP Sw position is RUN.	S	S
R7E3	The first scan is ON after RUN	0: The 2nd scan or later after RUN 1: The 1st scan after RUN		S	S
R7E4	Always ON	0: Non-status of 0 1: Always	Always outputs 1 regardless of CPU status.	S	Cannot be turned OFF.
R7E5	0.02 second clock	0: 0.01 seconds 1: 0.01 seconds		S	S
R7E6	0.1 second clock	0: 0.05 seconds 1: 0.05 seconds		S	S
R7E7	1.0 second clock	0: 0.5 seconds 1: 0.5 seconds		S	S
R7E8	Occupied flag	0: Unoccupied 1: Occupied	Indicates occupancy status from the peripheral unit.	S	S
R7E9	RUN prohibited	0: Operation allowed 1: Operation prohibited	Indicates whether it is operation prohibited status.	S	S
R7EA	Executing a online change in RUN	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 the retentive area	0: - 1: Clear the retentive area and error	Clear the retentive area and error special internal output. (WRF000, WRF002, R7C8 to R7CA, R7CD, R7D1 to R7D3, R7D6, R7D9, R7DB, R800 to R804, R806, R807, R9DC to R9DF)	U	S
R7EC	Clear error special internal output	0: - 1: Clear error information	Clear error special internal output (WRF000, WRF002, R7C8 to R7CA, R7CD, R7D1 to R7D3, R7D6, R7D8, R7D9, R7DB, R800 to R804, R806, R807, R9DC to R9DF), ERR Display, CPU status	U	S
R7ED	Undefined	—	—	—	—
R7EE	Undefined	—	—	—	—
R7EF	Backup memory writing execution flag	0: Write complete 1: Write in progress	Indicates whether or not data is being written to the backup memory.	S	S
R7F0	Carry flag (CY)	0: No carry 1: Carry	Indicates whether there is a carryover from the operation result.	S	S
R7F1	Overflow flag (V)	0: No overflow 1: Overflow	Indicates whether there is overflow in the operation result.	S	S
R7F2	Shift data (SD)	0: Shift data "0" 1: Shift data "1"	Designates the shift data used in shift instructions, etc.	U	U
R7F3	Operation error (ERR)	0: Normal 1: Error	Indicates whether there is an operation error when operation is executed.	S	S
R7F4	Data error (DER)	0: Normal 1: Error	Indicates whether there is a data error when operation is being executed.	S	S
R7F5 to R7F7	Undefined	—	—	—	—

Set / Reset Condition：

S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,

X…Always display

No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R7F8	Calendar, clock read request	1: Read	Read the present values of calendar, clock and set in WRF01B to WRF01F	U	S
R7F9	Calendar, clock setting request	1: Set	Set the data set in WRF01B to WRF01F in the calendar and clock.	U	S
R7FA	Clock ±30 second adjustment request	1: Request adjustment	When second data (WRF00F) is 0 to 29, it becomes 0 seconds and when it is 30 to 59, +1 minute is added and second data becomes 0.	U	S
R7FB	Calendar and clock set data error	0: Normal 1: Error	Indicates whether there is an error in calendar and clock set data.	S	S
R7FC	Pulse/PWM running flag 1 (Y100)	0: Pulse/PWM output stopped 1: Pulse/PWM output	ON during pulse / PWM output at Y100.	S	S
R7FD	Pulse/PWM running flag 2 (Y101)	0: Pulse/PWM output stopped 1: Pulse/PWM output	ON during pulse / PWM output at Y101.	S	S
R7FE	Pulse/PWM running flag 3 (Y102)	0: Pulse/PWM output stopped 1: Pulse/PWM output	ON during pulse / PWM output at Y102.	S	S
R7FF	Undefined	—	—	—	—
R800 *3	IP address undefined	0: Normal 1: Error	IP address of Ethernet port is unfixed.	S	U, R7EB, R7EC
R801 *3	Serial communication setting data undefined	0: Normal 1: Error	Setup about serial communication port is unfixed.	S	U, R7EB, R7EC
R802 *3	Ethernet task code communication setting data undefined	0: Normal 1: Error	Parameter about task code function of Ethernet port is not fixed.	S	U, R7EB, R7EC
R803 *3	ASR function setting data undefined	0: Normal 1: Error	Parameter about ASR function of Ethernet port is not fixed.	S	U, R7EB, R7EC
R804 *3	NTP setting data undefined	0: Normal 1: Error	Parameter about NTP function of Ethernet port is not fixed.	S	U, R7EB, R7EC
R805	Undefined	—	—	—	—
R806 *3	ASR mode setting data undefined	0: Normal 1: Error	Parameter about ASR mode of Ethernet port is not fixed.	S	U, R7EB, R7EC
R807 *3	Modbus-TCP parameter undefined	0: Normal 1: Error	The parameter about a Modbus-TCP function is undefined.	S	U, R7EB, R7EC
R808 to R80F	Undefined	—	—	—	—
R810	Backup request bit	1: Backup request	When data memory backup function enables and this bit is turned on, data from WR7F00 to WR7FFF is written to FLASH memory.	U	S
R811	Backup result bit	0: Normal 1: Error	The result of data memory backup is shown.	S	S
R812 to R81F	Undefined	—	—	—	—
R820	HSDL Run / Stop	0: HSDL Stop 1: HSDL Run	Serial data link (HSDL) can be controlled by this bit (Only for master).	U	U
R821	HSDL link data update time (Max.) initialization	1: Initialization	HSDL link data update time (Max.) in WRF0ED will be update to zero (Only for master).	U	S
R822	HSDL link data update time (Min.) initialization	1: Initialization	HSDL link data update time (Min.) in WRF0EF will be update to 65,535 (Only for master).	U	S
R823 to R8FF	Undefined	—	—	—	—

Set / Reset Condition :

S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC, X…Always display

*3 Even if there were multiple error factors, only one bit is turned on.

| No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R900	NTP time retrieval user program control valid/invalid	0: Program setting cycle 1: Control by R901 ➜For details, refer to User's Manual chapter 3, 3.5 setting a clock with NTP Communication.	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
R901	NTP time retrieval request	1: Retrieval start ➜For details, refer to User's Manual chapter 3, 3.5 setting a clock with NTP Communication.	Retrieves the time data from NTP server.	U	S
R902	NTP time retrieval result	0: Retrieval success 1: Retrieval failure ➜For details, refer to User's Manual chapter 3, 3.5 setting a clock with NTP Communication.	Indicates failure of the time data retrieval from NTP server.	S	U
R903 to R90E	Undefined	—	—	—	—
R90F	Modbus-TCP server access target switching	0: Write to WM 1: Write to WR	Type of internal output which is wrote by Modbus protocol function code 06 can be changed.	U	U
R910	Ethernet port (Task code port 1) Reset request	1: Reset request	Reset task code port 1. Clear the task code send / receive counter (WRF1F0 to WRF1F3) to 0. (Setting data by Control Editor remains.)	U	S
R911	Ethernet port (Task code port 2) Reset request	1: Reset request	Reset task code port 2. Clear the task code send / receive counter (WRF1F4 to WRF1F7) to 0. (Setting data by Control Editor remains.)	U	S
R912	Ethernet port (Task code port 3) Reset request	1: Reset request	Reset task code port 3. Clear the task code send / receive counter (WRF1F8 to WRF1FB) to 0. (Setting data by Control Editor remains.)	U	S
R913	Ethernet port (Task code port 4) Reset request	1: Reset request	Reset task code port 4. Clear the task code send / receive counter (WRF1FC to WRF1FF) to 0. (Setting data by Control Editor remains.)	U	S
R914	Ethernet port (ASR port 1) Reset request	1: Reset request	Reset ASR port 1. (Setting data by Control Editor remains.)	U	S
R915	Ethernet port (ASR port 2) Reset request	1: Reset request	Reset ASR port 2. (Setting data by Control Editor remains.)	U	S
R916	Ethernet port (ASR port 3) Reset request	1: Reset request	Reset ASR port 3. (Setting data by Control Editor remains.)	U	S
R917	Ethernet port (ASR port 4) Reset request	1: Reset request	Reset ASR port 4. (Setting data by Control Editor remains.)	U	S
R918	Ethernet port (ASR port 5) Reset request	1: Reset request	Reset ASR port 5. (Setting data by Control Editor remains.)	U	S
R919	Ethernet port (ASR port 6) Reset request	1: Reset request	Reset ASR port 6. (Setting data by Control Editor remains.)	U	S
R91A	Ethernet port (Modbus-TCP) Reset request	1: Reset request	Reset Modbus-TCP port. (Setting data by Control Editor remains.)	U	S
R91B to R91F	Undefined	—	—	—	—
R920	Ethernet communication initialization completed	0: Initializing 1: Initialization complete	This bit turns ON when the power is turned on and initialization of the Ethernet port is completed.	S	S
R921	Task code send / receive counter clear	1: Counter clear request	Clear the task code send / receive counter (WRF1F0 to WRF1FF) to 0.	U	S

Set / Reset Condition :
S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
X…Always display

| No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
R922 to R92F	Undefined	—	—	—	—
R930 to R9CF	Data logging status / control bit	For details, refer to User's Manual Chapter 7, 7.7 Special internal output for Logging and Trace function.		U, S	U, S
R9D0	Ethernet port (Task code port 1) Reset complete	1: Reset complete	Turns ON when reset of task code port 1 is completed.	S	U
R9D1	Ethernet port (Task code port 2) Reset complete	1: Reset complete	Turns ON when reset of task code port 2 is completed.	S	U
R9D2	Ethernet port (Task code port 3) Reset complete	1: Reset complete	Turns ON when reset of task code port 3 is completed.	S	U
R9D3	Ethernet port (Task code port 4) Reset complete	1: Reset complete	Turns ON when reset of task code port 4 is completed.	S	U
R9D4	Ethernet port (ASR port 1) Reset complete	1: Reset complete	Turns ON when ASR port 1 reset is complete.	S	U
R9D5	Ethernet port (ASR port 2) Reset complete	1: Reset complete	Turns ON when ASR port 2 reset is complete.	S	U
R9D6	Ethernet port (ASR port 3) Reset complete	1: Reset complete	Turns ON when ASR port 3 reset is complete.	S	U
R9D7	Ethernet port (ASR port 4) Reset complete	1: Reset complete	Turns ON when ASR port 4 reset is complete.	S	U
R9D8	Ethernet port (ASR port 5) Reset complete	1: Reset complete	Turns ON when ASR port 5 reset is complete.	S	U
R9D9	Ethernet port (ASR port 6) Reset complete	1: Reset complete	Turns ON when ASR port 6 reset is complete.	S	U
R9DA	Ethernet port (Modbus-TCP) Reset complete	1: Reset complete	Turns ON when reset of Modbus-TCP port is completed.	S	U
R9DB	Undefined	—	—	—	—
R9DC	Ethernet port (Task code port 1) Error occurred	0: Normal 1: Error	Turns ON when a communication error occurs on the Ethernet port (task code port 1).	S	U, R7EB, R7EC
R9DD	Ethernet port (Task code port 2) Error occurred	0: Normal 1: Error	Turns ON when a communication error occurs on the Ethernet port (task code port 2).	S	U, R7EB, R7EC
R9DE	Ethernet port (Task code port 3) Error occurred	0: Normal 1: Error	Turns ON when a communication error occurs on the Ethernet port (task code port 3).	S	U, R7EB, R7EC
R9DF	Ethernet port (Task code port 4) Error occurred	0: Normal 1: Error	Turns ON when a communication error occurs on the Ethernet port (task code port 4).	S	U, R7EB, R7EC
R9E0 to R9FF	Undefined	—	—	—	—

Set / Reset Condition :

S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC, X…Always display

No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
RA00 to RA0A	System use area	—	(Area which is used by system.)	—	—
RA0B	Ch1 Homing in progress	0: Before homing or executing other operation. 1: Under Homing.	Indicates that ch1 is performing the homing operation.	S	S
RA0C	System use area	—	(Area which is used by system.)	—	—
RA0D	Ch1 Homing complete	0: Before homing or executing other operation. 1: Under Homing.	If homing operation for Ch1 completed it will be turned on, and after this, when pulse outputs this bit will be turned off.	S	S
RA0E to RA1A	System use area	—	(Area which is used by system.)	—	—
RA1B	Ch2 Homing in progress	0: Before homing or executing other operation. 1: Under Homing.	Indicates that ch2 is performing the homing operation.	S	S
RA1C	System use area	—	(Area which is used by system.)	—	—
RA1D	Ch2 Homing complete	0: Before homing or during pulse output. 1: Homing complete.	If homing operation for Ch2 completed it will be turned on, and after this, when pulse outputs this bit will be turned off.	S	S
RA1E to RA2A	System use area	—	(Area which is used by system.)	—	—
RA2B	Ch3 Homing in progress	0: Before homing or executing other operation. 1: Under Homing.	Indicates that ch3 is performing the homing operation.	S	S
RA2C	System use area	—	(Area which is used by system.)	—	—
RA2D	Ch3 Homing complete	0: Before homing or during pulse output. 1: Homing complete.	If homing operation for Ch3 completed it will be turned on, and after this, when pulse outputs this bit will be turned off.	S	S
RA2E to RA3F	System use area	—	(Area which is used by system.)	—	—
RA40 to RFFF	Undefined	—	—	—	—

Set / Reset Condition :

S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC, X…Always display

(1) Special internal output for NTP client function

The clock data can be acquired from NTP server automatically by setting NTP client function using Control Editor.

There are two methods to acquisition 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 Control Editor. 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 Control Editor.)

■ Clock data read using NTP client function Sample program
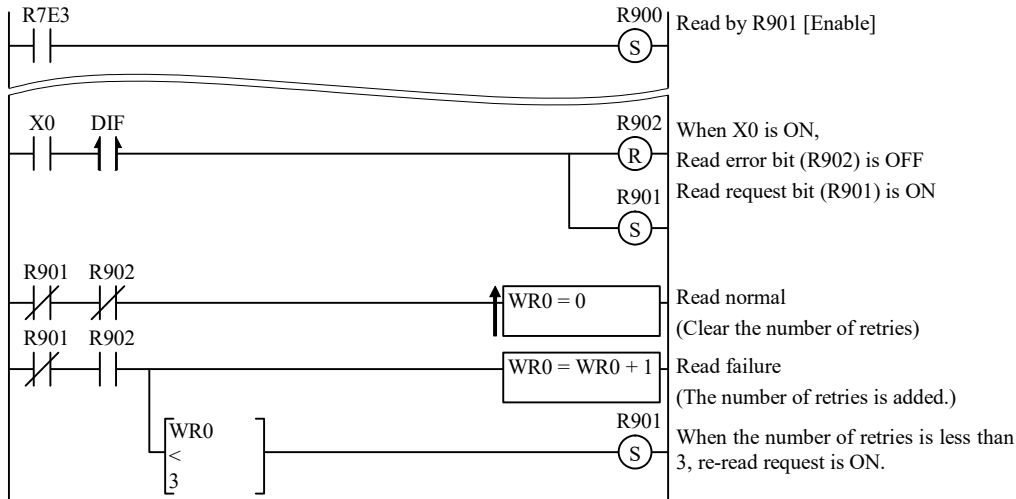
■ Control of special internal output
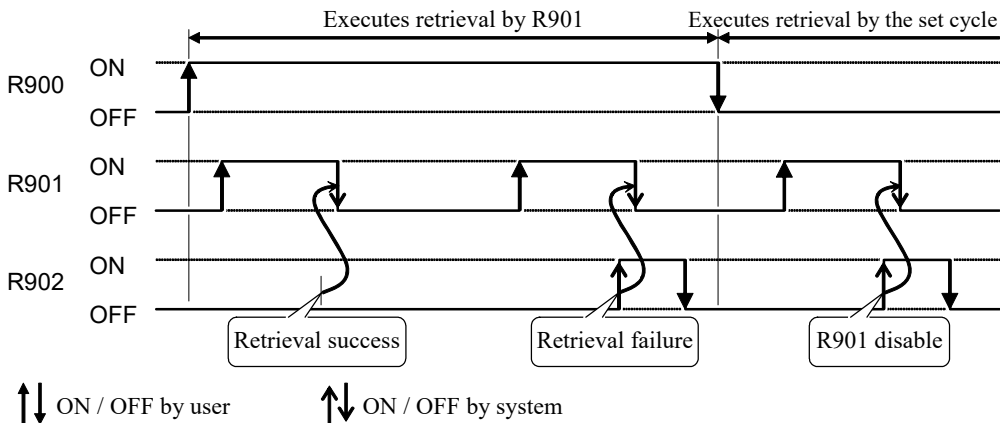
N o t e

In order to enable NTP client function, the power supply needs to be turned ON again after setting the parameter using Control Editor.

When NTP client function is disable, the clock data cannot be read from NTP server using the special internal output.
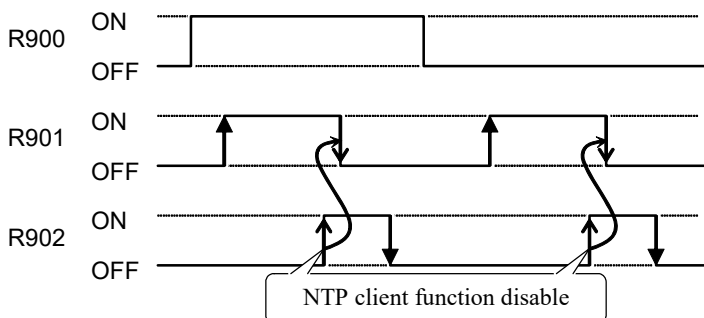
(2) Reset function for Ethernet port

If the Ethernet port (task code port, ASR port, Modbus-TCP port) becomes unable to communicate for some reason, the Ethernet port can be returned to the initial state using a programming tool. (In the case of TCP/IP, it returns to the state before connection establishment.)

The Ethernet port is reset by bit special internal output.

Ethernet port reset request bits (R910 to R91A) and reset completion bits (R9D0 to R9DA) are provided for bit special internal output. When the reset request bit of the corresponding Ethernet port is turned ON, the Ethernet port reset starts. When the reset of the Ethernet port is completed, the reset request bit is automatically turned OFF and the reset completion bit is turned ON.
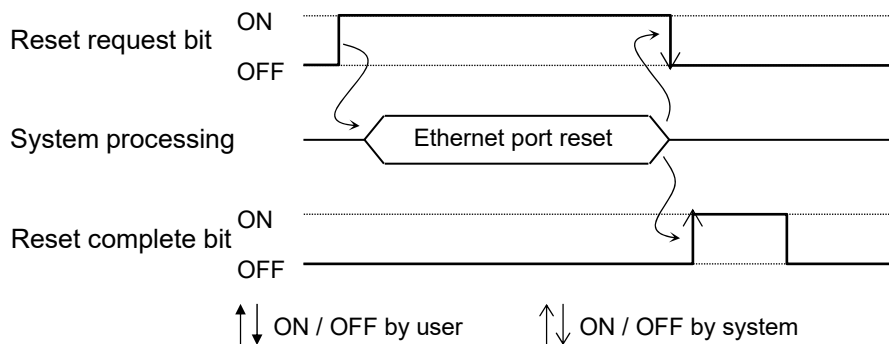
Reference

The reset completion bit indicates the result, so even if the reset completion bit is ON, the Ethernet port can be reset by turning ON the reset request bit.

(When the reset request flag is turned ON, the reset completion flag is automatically turned OFF.)
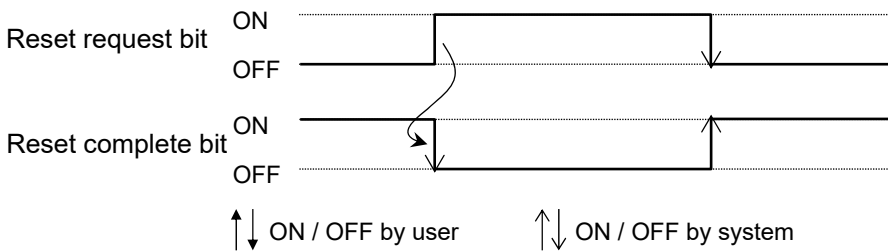
A1.2 Word special internal output

The word special internal output area is WRF000 to WRFFFF. Functions of each word are shown below.
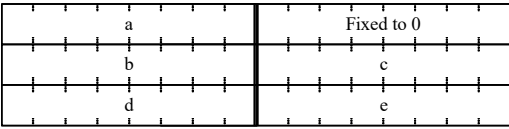
No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF000	Self-diagnosis error code	Error code (2 digit hexadecimal, upper 2 digits are 00)	Stores the error No. in CPU as a binary code.	S	U, R7EB, R7EC
WRF001	Undefined	—	—	—	—
WRF002 (R7CD)	I/O verify mismatch details	Mismatched slot number *	15 1211 87 43 0 [0 | a | b | 0] a: Unit number (0 to 5) b: Slot number (0 to F)	S	U, R7EB, R7EC
WRF003 to WRF00A	Undefined	—	—	—	—
WRF00B	Calendar and clock current value (4 digit BCD)	Year	Always displays the 4 digit year.	S	X
WRF00C		Month/day	Always displays month/day data.	S	X
WRF00D		Day of the week	Always displays day of the week data.	S	X
WRF00E		Hour/minute	(Sunday: 0000 to Saturday: 0006)	S	X
WRF00F		Seconds	Always displays hour/minute data.	S	X
WRF010	Scan time (maximum value)	Maximum execution time for a normal scan	Maximum execution time for a normal scan is stored in 1 ms units.	S	S
WRF011	Scan time (current value)	Present value of execution time for a normal scan	Present value of execution time for a normal scan is stored in 1 ms units.	S	S
WRF012	Scan time (minimum value)	Minimum execution time for a normal scan	Minimum execution time for a normal scan is stored in 1 ms units. (the first scan after RUN is HFFFF)	S	S
WRF013	CPU status	15 14 13 8 7 6 5 4 3 2 1 0 [| | a | b | | c | d | e] b15,14 : Unused, b13 to b8 : (a)CPU type MVH-*64* : 100101 MVH-*40* : 100100 MVL-*64* : 100010 MVL-*40* : 100001 MVL-*20* : 100000 b7 : (b) Battery error 0 : No Error, 1 : Error b6 to b4 : Unused b3 : (c) Error 0 : No Error, 1 : Error b2 : Unused b1 : (d) HALT 0 : No Executing, 1 : Executing b0 : (e)CPU operation 0 : STOP, 1 : RUN	S	S
WRF014	Word internal output capacity	Number of words for word internal output (WR)	MICRO-EHV: H8000	S	X
WRF015	Operation error code	Operation error code	Operation error code is stored. (4 digit hexadecimal)	S	U
WRF016	Division remainder register (lower)	Remainder data when division instruction executed	For a word operation: WRF016 only	S	S
WRF017	Division remainder register (upper)		For a double word operation: WRF017 (upper), WRF016 (lower)	S	S
WRF018 to WRF01A	Undefined	—	—	—	—

Set / Reset Condition :
   S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
   X…Always display

 * You must turn the applicable bit special internal output (inside ( ) of No) OFF once if you want to check which slot the error is occurring currently. And you must check it after turning R7EC ON once.

No.	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF01B	Reading (latch) or writing data area for the calendar clock (BCD 4 digits)	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 of the week data (Sunday: 0000 to Saturday: 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		Seconds	Stores second data read or sets the set value.	S, U	U
WRF020	NTP client time zone	Time zone setup	Time zone of NTP client function is specified. → refer to appendix A1-16 * Current time zone setting value is set on the system only when the power supply is ON.	U	S
WRF021	Reading (latch) or writing data area for the calendar clock (BCD 4 digits)	Year	4 digits for year [yyyy]	S	S
WRF022		Month/day	Month and day [mmdd]	S	S
WRF023		Day of the week data (Sunday : 0000 to Saturday : 0006)	Sunday : 0000 to Saturday : 0006	S	S
WRF024		Hour/minute(24-hour system)	Hour and minute [hhmm] (24-hour)	S	S
WRF025		Seconds	Second [00ss] (Upper 2 digits are 00.)	S	S
WRF026 to WRF03B	Undefined	—	—	—	—
WRF03C	Option board analog output 1	Output value of analog channel 1 on option board	Stores the analog value output from option board analog channel 1.	U	S, U
WRF03D	Option board analog output 2	Output value of analog channel 2 on option board	Stores the analog value output from option board analog channel 2.	U	S, U
WRF03E	Option board analog input 1	Input value of analog channel 1 on option board	Analog input value of option board analog channel 1 is stored.	S	S
WRF03F	Option board analog input 2	Input value of analog channel 2 on option board	Analog input value of option board analog channel 2 is stored.	S	S
WRF040 to WRF042	Occupied member registration area 1	Occupied port number （図） a: 0=Not occupied, 1=Read-occupied, 2=Write-occupied b: Loop number c: Unit number d: Module number e: Port number (serial :H01 , Ethernet :H03 to H06, USB :H07)		S	S
WRF043 to WRF045	Occupied member registration area 2			S	S
WRF046 to WRF048	Occupied member registration area 3			S	S
WRF049 to WRF04B	Occupied member registration area 4			S	S
WRF04C to WRF04D	Undefined	—	—	—	—
WRF04E	Option board analog input 3	Input value of analog channel 3 on option board	Analog input value of option board analog channel 3 is stored.	S	S
WRF04F	Option board analog input 4	Input value of analog channel 4 on option board	Analog input value of option board analog channel 4 is stored.	S	S
WRF050	System software version [DISP]	System software version	The most significant digit in the hexadecimal display indicates the model. 0 ***: High function model (MVH) 1 ***: Standard model (MVL)	S	S
WRF051 to WRF053	System use area	—	(Area which is used by system.)	X	X
WRF054 WRF055	Total power-on time	Displays cumulative energization time in seconds	Accumulated energization time is stored in double word.(DRF054)	S	X

Set / Reset Condition：
　S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
　X…Always display

No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF056 to WRF05F	System use area	—	(Area which is used by system.)	X	X
WRF060 to WRF077	Ethernet port ASR communication control	ASR communication control and status display → Refer to Appendix 1-16	WRF060 to WRF063 ASR port 1 WRF064 to WRF067 ASR port 2 WRF068 to WRF06B ASR port 3 WRF06C to WRF06F ASR port 4 WRF070 to WRF073 ASR port 5 WRF074 to WRF077 ASR port 6	Refer to Appendix 1-16	Refer to Appendix 1-16
WRF078 to WRF07F	System use area	—	(Area which is used by system.)	X	X
WRF080 to WRF0DF	Ethernet port ASR communication control	ASR communication mode, transmission size setting, reception size display → Refer to Appendix 1-17	WRF080 to WRF08F ASR port 1 WRF090 to WRF09F ASR port 2 WRF0A0 to WRF0AF ASR port 3 WRF0B0 to WRF0BF ASR port 4 WRF0C0 to WRF0CF ASR port 5 WRF0D0 to WRF0DF ASR port 6	Refer to Appendix 1-17	Refer to Appendix 1-17
WRF0E0	Modbus-RTU waiting time (master)	Modbus-RTU waiting time (master)	Wait time can be set before query transmission in MBMST command, INV command, OMST command, OCTP command, Modbus-TCP gateway. Unit of time : ms	U	U
WRF0E1	Modbus-RTU waiting time (slave)	Modbus-RTU waiting time (slave)	The time from query reception to response transmission can be set in the Modbus slave function. Unit of time : ms	U	U
WRF0E2 to WRF0EC	Undefined	—	—	—	—
WRF0ED	HSDL link data update time (max)	Maximum update time for HSDL	Maximum update time for HSDL is stored in 1 ms units.	S	U
WRF0EE	HSDL link data update time (current)	Current update time for HSDL	Current update time for HSDL is stored in 1 ms units.	S	X
WRF0EF	HSDL link data update time (min)	Minimum update time for HSDL	Minimum update time for HSDL is stored in 1 ms units.	S	U
WRF0F0 to WRF0F2	MAC address	Displays Ethernet peculiar address of MICRO-EHV (MAC address)	☐:☐:☐:☐:☐:☐ WRF0F0　WRF0F1　WRF0F2 Upper digits | Middle digits | Lower digits Example) Case of A4:97:BB:05:12:00 WRF0F0 … HA497 WRF0F1 … HBB05 WRF0F2 … H1200	S	X
WRF0F3	Ethernet port communication speed [DISP]	Displays communication speed of Ethernet port which is set to MICRO-EHV	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
WRF0F4	USB memory size (L)	The capacity of USB memory attached on MICRO-EHV	Displays the capacity of the USB memory in kilobytes.	S	X
WRF0F5	USB memory size (H)				
WRF0F6	USB free space (L)	Free space of USB memory attached on MICRO-EHV	Displays the free space of the USB memory in kilobytes.	S	X
WRF0F7	USB free space (H)				
WRF0F8 to WRF0FF	Undefined	—	—	—	—

Set / Reset Condition :
　S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
　X…Always display

No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF100 WRF101	Counter 1 Current value	Current value of counter 1	The current value of counter 1 is stored as a double word. (DRF100)	S	U
WRF102 WRF103	Counter 2 Current value	Current value of counter 2	The current value of counter 2 is stored as a double word. (DRF102)	S	U
WRF104 WRF105	Counter 3 Current value	Current value of counter 3	The current value of counter 3 is stored as a double word. (DRF104)	S	U
WRF106 WRF107	Counter 4 Current value	Current value of counter 4	The current value of counter 4 is stored as a double word. (DRF106)	S	U
WRF108 WRF109	Counter 5 Current value	Current value of counter 5	The current value of counter 5 is stored as a double word. (DRF108)	S	U
WRF10A WRF10B	Pulse 1 Position data	Pulse output 1 position data	The position data of pulse output 1 is stored as a double word. (DRF10A)	S	U
WRF10C WRF10D	Pulse 2 Position data	Pulse output 2 position data	The position data of pulse output 2 is stored as a double word. (DRF10C)	S	U
WRF10E WRF10F	Pulse 3 Position data	Pulse output 3 position data	The position data of pulse output 3 is stored as a double word. (DRF10E)	S	U
WRF110	Counter 1 system use area	—	(Area which is used by system.)	X	X
WRF111	Undefined	—	—	—	—
WRF112 WRF113	Counter 1 ON-preset	Counter 1 ON-preset	Counter 1 ON-preset value is stored in double word. (DRF112)	S	S
WRF114 WRF115	Counter 1 OFF-preset	Counter 1 OFF-preset	Counter 1-OFF preset value is stored in double word. (DRF114)	S	S
WRF116 to WRF119	System use area	—	(Area which is used by system.)	X	X
WRF11A WRF11B	Counter 2 ON-preset	Counter 2 ON-preset	Counter 2 ON-preset value is stored in double word. (DRF11A)	S	S
WRF11C WRF11D	Counter 2 OFF-preset	Counter 2 OFF-preset	Counter 2 OFF-preset value is stored in double word. (DRF11C)	S	S
WRF11E to WRF121	System use area	—	(Area which is used by system.)	X	X
WRF122 WRF123	Counter 3 ON-preset	Counter 3 ON-preset	Counter 3 ON-preset value is stored in double word. (DRF122)	S	S
WRF124 WRF125	Counter 3 OFF-preset	Counter 3 OFF-preset	Counter 3 OFF-preset value is stored in double word. (DRF124)	S	S
WRF126 to WRF129	System use area	—	(Area which is used by system.)	X	X
WRF12A WRF12B	Counter 4 ON-preset	Counter 4 ON-preset	Counter 4 ON-preset value is stored in double word. (DRF12A)	S	S
WRF12C WRF12D	Counter 4 OFF-preset	Counter 4 OFF-preset	Counter 4 OFF-preset value is stored in double word. (DRF12C)	S	S
WRF12E WRF131	System use area	—	(Area which is used by system.)	X	X
WRF132 WRF133	Counter 5 ON-preset	Counter 5 ON-preset	Counter 5 ON-preset value is stored in double word. (DRF132)	S	S
WRF134 WRF135	Counter 5 OFF-preset	Counter 5 OFF-preset	Counter 5 OFF-preset value is stored in double word. (DRF134)	S	S
WRF136 to WRF137	System use area	—	(Area which is used by system.)	X	X

Set / Reset Condition :
   S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
   X…Always display

No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF138 WRF139	Pulse/PWM 1 Output frequency	Pulse/PWM 1 Output frequency	Pulse / PWM 1 output frequency is stored in double word. (DRF138)	S	U
WRF13A WRF13B	Pulse 1 Number of pulses	Pulse 1 Number of pulses	The number of output pulses of pulse 1 is stored as a double word. (DRF13A)	S	U
	PWM 1 ON-Duty	PWM 1 ON-Duty	PWM 1 ON-Duty is stored in double word. (DRF13A)		
WRF13C to WRF13F	System use area	—	(Area which is used by system.)	X	X
WRF140 WRF141	Pulse/PWM 2 Output frequency	Pulse/PWM 1 Output frequency	Pulse / PWM 2 output frequency is stored in double word. (DRF140)	S	U
WRF142 WRF143	Pulse 2 Number of pulses	Pulse 2 Number of pulses	The number of output pulses of pulse 2 is stored as a double word. (DRF142)	S	U
	PWM 2 ON-Duty	PWM 2 ON-Duty	PWM 2 ON-Duty is stored in double word. (DRF142)		
WRF144 to WRF147	System use area	—	(Area which is used by system.)	X	X
WRF148 WRF149	Pulse/PWM 3 Output frequency	Pulse/PWM 3 Output frequency	Pulse / PWM 3 output frequency is stored in double word. (DRF148)	S	U
WRF14A WRF14B	Pulse 3 Number of pulses	Pulse 3 Number of pulses	The number of output pulses of pulse 3 is stored as a double word. (DRF14A)	S	U
	PWM 3 ON-Duty	PWM 3 ON-Duty	PWM 3 ON-Duty is stored in double word. (DRF14A)		
WRF14C to WRF14F	System use area	—	(Area which is used by system.)	X	X
WRF150 to WRF15F	HSDL status area	Status display for HSDL master and slave	As to the details, refer to "3.6 Serial data link communication". WRF150 … St. No.1, Master WRF151 … St. No.3, St. No.2 WRF152 … St. No.5, St. No.4 WRF153 … St. No.7, St. No.6 WRF154 … St. No.9, St. No.8 WRF155 … St. No.11, St. No.10 WRF156 … St. No.13, St. No.12 WRF157 … St. No.15, St. No.14 WRF158 … St. No.17, St. No.16 WRF159 … St. No.19, St. No.18 WRF15A … St. No.21, St. No.20 WRF15B … St. No.23, St. No.22 WRF15C … St. No.25, St. No.24 WRF15D … St. No.27, St. No.26 WRF15E … St. No.29, St. No.28 WRF15F … St. No.31, St. No.30	S	X
WRF160 to WRF1DF	System use area	—	(Area which is used by system.)	X	X
WRF1E0 WRF1EF	Undefined	—	—	—	—

Set / Reset Condition :
 S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
 X…Always display

No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF1F0	Ethernet port (task code port 1) sending counter	Task code port 1 response sending counter	In Hitachi protocol communication, the number of times is added each time a response is sent to a request from a host.	S	U
WRF1F1	Ethernet port (task code port 1) receiving counter 1	Task code port 1 request Receiving counter	In Hitachi protocol communication, the number of times is added when a packet that exceeds 7 bytes and the start code is the specified value is received.	S	U
WRF1F2	Ethernet port (task code port 1) receiving counter 2	Task code port 1 error request (error command) reception count	In Hitachi protocol communication, if a packet of less than 7 bytes is received or a packet of 7 bytes or more whose leading code is not the specified value is received, the number of times is added.	S	U
WRF1F3	Ethernet port (task code port 1) receiving counter 3	Task code port 1 error request (error format) reception count	In Hitachi protocol communication, when a request task code that returns an abnormal response is received or a request that returns a non-executable response is received, the number is added.	S	U
WRF1F4	Ethernet port (task code port 2) sending counter	Task code port 2 response transmission count	In Hitachi protocol communication, the number of times is added each time a response is sent to a request from a host.	S	U
WRF1F5	Ethernet port (task code port 2) receiving counter 1	Task code port 2 request reception count	In Hitachi protocol communication, the number of times is added when a packet that exceeds 7 bytes and the start code is the specified value is received.	S	U
WRF1F6	Ethernet port (task code port 2) receiving counter 2	Task code port 2 error request (error command) reception count	In Hitachi protocol communication, if a packet of less than 7 bytes is received or a packet of 7 bytes or more whose leading code is not the specified value is received, the number of times is added.	S	U
WRF1F7	Ethernet port (task code port 2) receiving counter 3	Task code port 2 error request (error format) reception count	In Hitachi protocol communication, when a request task code that returns an abnormal response is received or a request that returns a non-executable response is received, the number is added.	S	U
WRF1F8	Ethernet port (task code port 3) sending counter	Task code port 3 response transmission count	In Hitachi protocol communication, the number of times is added each time a response is sent to a request from a host.	S	U
WRF1F9	Ethernet port (task code port 3) receiving counter 1	Task code port 3 request reception count	In Hitachi protocol communication, the number of times is added when a packet that exceeds 7 bytes and the start code is the specified value is received.	S	U
WRF1FA	Ethernet port (task code port 3) receiving counter 2	Task code port 3 error request (error command) reception count	In Hitachi protocol communication, if a packet of less than 7 bytes is received or a packet of 7 bytes or more whose leading code is not the specified value is received, the number of times is added.	S	U
WRF1FB	Ethernet port (task code port 3) receiving counter 3	Task code port 3 error request (error format) reception count	In Hitachi protocol communication, when a request task code that returns an abnormal response is received or a request that returns a non-executable response is received, the number is added.	S	U

Set / Reset Condition :
S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
X…Always display

No	Name [Main use]	Meaning	Description	Setting condition	Resetting condition
WRF1FC	Ethernet port (task code port 4) transmission counter	Task code port 4 response transmission count.	In Hitachi protocol communication, the number of times is added each time a response is sent to a request from a host.	S	U
WRF1FD	Ethernet port (task code port 4) reception counter 1	Task code port 4 request reception count.	In Hitachi protocol communication, the number of times is added when a packet that exceeds 7 bytes and the start code is the specified value is received.	S	U
WRF1FE	Ethernet port (task code port 4) reception counter 2	Task code port 4 error request (error command) reception count.	In Hitachi protocol communication, if a packet of less than 7 bytes is received or a packet of 7 bytes or more whose leading code is not the specified value is received, the number of times is added.	S	U
WRF1FF	Ethernet port (task code port 4) reception counter 3	Task code port 4 error request (error format) reception count.	In Hitachi protocol communication, when a request task code that returns an abnormal response is received or a request that returns a non-executable response is received, the number is added.	S	U

Set / Reset Condition：

S…ON / OFF by system, U…ON / OFF by user, R7EB…Set 1 to R7EB, R7EC…Set 1 to R7EC,
X…Always display

(1) NTP client function time zone

The relation between the value set to WRF020 and time zone is shown below.

Set value	Time zone	Set value	Time zone	Set value	Time zone
H0000	GMT − 12:00	H000D	GMT	H001A	GMT + 8:00
H0001	GMT − 11:00	H000E	GMT + 1:00	H001B	GMT + 9:00
H0002	GMT − 10:00	H000F	GMT + 2:00	H001C	GMT + 9:30
H0003	GMT − 9:00	H0010	GMT + 3:00	H001D	GMT + 10:00
H0004	GMT − 8:00	H0011	GMT + 3:30	H001E	GMT + 11:00
H0005	GMT − 7:00	H0012	GMT + 4:00	H001F	GMT + 12:00
H0006	GMT − 6:00	H0013	GMT + 4:30	H0020	GMT + 13:00
H0007	GMT − 5:00	H0014	GMT + 5:00	Out of range	GMT
H0008	GMT − 4:00	H0015	GMT + 5:30		
H0009	GMT − 3:30	H0016	GMT + 5:45		
H000A	GMT − 3:00	H0017	GMT + 6:00		
H000B	GMT − 2:00	H0018	GMT + 6:30		
H000C	GMT − 1:00	H0019	GMT + 7:00		

N o t e

Setting the parameter to WRF020. Makes the time zone valid. However, even if a time zone is changed while time data is read from the NTP server, the time zone is not reflected.

(2) Ethernet communication port ASR function

■Status register, Control register and Sending/Receiving counter

ASR communication registers are assigned to the special internal outputs WRF060 to WRF077 (24 words). As shown in Figure A1.1, it consists of 4 words per port and 24 words for 6 ports. Refer to the status register information and control the ASR function with the control register.
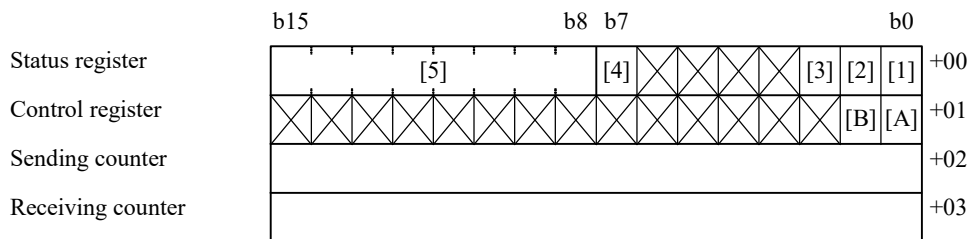

Figure A1.1 Status register and Control register

[Status register]

[1] Port status flag   1: Open

[2] Even transmitted completed flag   1: Transmitting completed

[3] Receiving completed flag   1: Receiving completed

[4] Error flag   1: Error occurred

[5] Error code   0x01: Despite not opening the port, the event transmitted request flag was turned ON.

0x02: The event transmitted request flag was re-turned ON while the transmitting has not completed.

[Control register]

[A] Port opened request flag   1: Open request   0: Close request

[B] Event transmitted request flag   1: Start transmitting

■ Sending mode, Sending data size and Receiving data size

-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 WRF080.

Special internal outputs	Meanings
WRF080 to WRF08F	Mode, Sending data size and Receiving data size about ASR port 1.
WRF090 to WRF09F	Mode, Sending data size and Receiving data size about ASR port 2.
WRF0A0 to WRF0AF	Mode, Sending data size and Receiving data size about ASR port 3.
WRF0B0 to WRF0BF	Mode, Sending data size and Receiving data size about ASR port 4.
WRF0C0 to WRF0CF	Mode, Sending data size and Receiving data size about ASR port 5.
WRF0D0 to WRF0DF	Mode, Sending data size and Receiving data size about ASR port 6.

No.	Name	Meanings
WRF0x0	Setup of mode 0: Control Editor setting operation mode 1: Special Internal Output setting operation mode	Control Editor setting operation mode transmits data (word unit) for the number of I/O points set from Control Editor. Special Internal Output setting operation mode transmits data (byte unit) of the size set for special internal output.
WRF0*1	Setup of sending data size for send area 1	Set the send data size in bytes.
WRF0*2	Setup of sending data size for send area 2	Set the send data size in bytes.
WRF0*3	Setup of sending data size for send area 3	Set the send data size in bytes.
WRF0*4	Setup of sending data size for send area 4	Set the send data size in bytes.
WRF0*5	Setup of sending data size for send area 5	Set the send data size in bytes.
WRF0*6	Setup of sending data size for send area 6	Set the send data size in bytes.
WRF0*7	Setup of sending data size for send area 7	Set the send data size in bytes.
WRF0*8	Setup of sending data size for send area 8	Set the send data size in bytes.
WRF0*9	Setup of sending data size for send area 9	Set the send data size in bytes.
WRF0*A	Setup of sending data size for send area 10	Set the send data size in bytes.
WRF0*B	Display of receiving data size	Receive data size is stored in bytes.
WRF0*C to WRF0*F	Reserve	

* It means 8 to D corresponding to ASR ports 1 to 6.

MEMO

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Appendix 2 I/O Address

A2.1 External I/O

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

<div align="center">List of external I/O classification and data type</div>

I/O symbols	Input or output	Data types	Remarks
X	External input	Bit (Bool) (1 bit)	Decimal number (X0, 1, 2, .., 9, 10, .., 15, 16, 17, .., 39)
WX		Word (16 bits)	Data in 0 to 15 are batch-processed. 16-point synchronicity is guaranteed.
DX		Double word (32 bits)	Address is hexadecimal number. Simultaneity of 32 bits data is not ensured.
Y	External output	Bit (Bool) (1 bit)	Decimal number (Y100, 101, 102, .., 109, 110, .., 115, 116, 117, .., 123)
WY		Word (16 bits)	Data in 0 to 15 are batch-processed. 16-point synchronicity is guaranteed.
DY		Double word (32 bits)	Two word data are batch-expressed. 32-point synchronicity is not guaranteed

The I/O configuration and I/O address of each unit are shown below.

I/O configuration and I/O address of each unit

Type			I/O configuration	Input/ output	20-point	40-point	64-point
Basic	Digital		(Fixed)	Input	X0 to 11 (WX0)	X0 to 23 (WX0 to 1)	X0 to 39 (WX0 to 2)
				Output	Y100 to 107 (WY10)	Y100 to 115 (WY10)	Y100 to 123 (WY10 to 11)
Expansion 1	Digital	8/14/16/28-point	B1/1	Input	X1000 to 1015 (WX100)		
				Output	Y1016 to 1027 (WY101)		
		64-point expansion	X48/Y32	Input	X1000 to 1039 (WX100 to 102)		
				Output	Y1100 to 1123 (WY110 to 111)		
	Analog		FUN0	Input	WX100 to 104		
				Output	WY105 to 107		
Expansion 2	Digital	8/14/16/28-point	B1/1	Input	X2000 to 2015 (WX200)		
				Output	Y2016 to 2027 (WY201)		
		64-point expansion	X48/Y32	Input	X2000 to 2039 (WX200 to 202)		
				Output	Y2100 to 2123 (WY210 to 211)		
	Analog		FUN0	Input	WX200 to 204		
				Output	WY205 to 207		
Expansion 3	Digital	8/14/16/28-point	B1/1	Input	X3000 to 3015 (WX300)		
				Output	Y3016 to 3027 (WY301)		
		64-point expansion	X48/Y32	Input	X3000 to 3039 (WX300 to 302)		
				Output	Y3100 to 3123 (WY310 to 311)		
	Analog		FUN0	Input	WX300 to 304		
				Output	WY305 to 307		
Expansion 4	Digital	8/14/16/28-point	B1/1	Input	X4000 to 4015 (WX400)		
				Output	Y4016 to 4027 (WY401)		
		64-point expansion	X48/Y32	Input	X4000 to 4039 (WX400 to 402)		
				Output	Y4100 to 4123 (WY410 to 411)		
	Analog		FUN0	Input	WX400 to 404		
				Output	WY405 to 407		

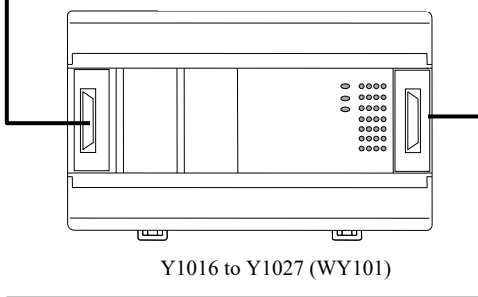I/O number example

MV*-*64**

X0 to X39 (WX0 to WX2)
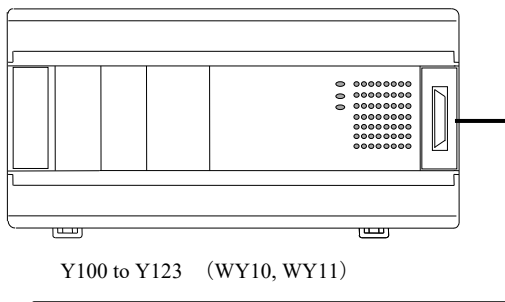
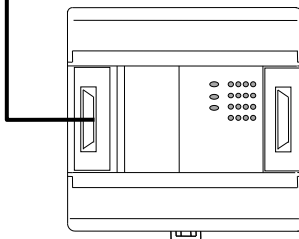Y100 to Y123 （WY10, WY11）

EH-A28EDR

X1000 to X1015 (WX100)

Y1016 to Y1027 (WY101)

EH-A6EAN (Analog expansion)

WX201 to WX204

WY206, WY207

A2.2 Internal output

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

The EHV series internal output has a bit dedicated area (R), a word dedicated area (WR, WN) and a bit / word shared area (M / WM) in the internal output. And there is a link area (L / WL) for exchanging data with other CPU using the link module. However, the MICRO-EHV series does not have a dedicated word area (WN) or link area (L / WL).

The internal output includes an area that can be freely accessed by the user and an area that is used for a specific purpose. The area that is used for a specific purpose is called "special internal output". The special internal output is used for setting the system and indicating the status. Refer to "Appendix 1 List of Special Internal Output" for the details.
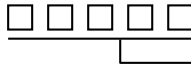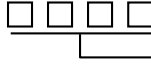
List of internal outputs
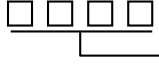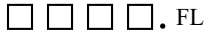
I/O type	CPU model	Number of points	
		MVL-*20/40/64** (Standard model)	MVH-*40/64** (High Function model)
Bit		1,984 bits (R0 to R7BF)	
Word (WR)		32,768 words (WR0 to WR7FFF)	
Word (WN)		-	
Bit/word shared (WM)		32,768 bits, 2,048 words (M0 to M7FFF, WM0 to WM7FF)	
Special internal output	Bit	2,112 bits (R7C0 to RFFF)	
	Word	4,096 words (WRF000 to WRF1FF)	
CPU link		-	

Internal output I/O numbers are represented based on the following rules.

List of internal output I/O numbering rules (1/2)

Data type	Numbering rule
Bit-dedicated type	R □□□　　Normal area H000 to H7BF 　　└── Special area H7C0 to H7FF 　　Both hexadecimal
Word-dedicated type	<For word>　　W R □□□□　Normal area H0000 or above 　　└── Special area HF000 or above 　　Both hexadecimal [Bit specification]　W R □□□□.□　Specify ".n". (n: Bit No., 0 to F) [Signed integer]　W R □□□□.S　Specify ".S". [String specification]　W R □□□□.ASC.n　Specify ".n". (n: Number of bytes, 1 to 32 [decimal])　Specify ".ASC". <For double word>　D R □□□□　Normal area H0000 or above 　　└── Special area HF000 or above 　　Sequential 2-word WR representation 　　Both hexadecimal [Signed integer]　D R □□□□.S　Specify ".S". [Real number (floating point)]　D R □□□□.FL　Specify ".FL".

List of internal output I/O numbering rules (2/2)

Data type	Numbering rule
Bit/word shared type	**<For bit>** M ☐☐☐☐☐ H00000 or above / H0000 or above Hexadecimal
	<For word> W M ☐☐☐☐ H0000 or above Hexadecimal M120F M1200 ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ WM120 * No bit specification is available for the bit/word shared type.
	[Signed integer] W M ☐☐☐☐.S Specify ".S".

	[String specification]
	
	W M ☐☐☐☐.A S C.n
	     Specify ".n". (n: Number of bytes, 1 to 32 [decimal])
	     Specify ".ASC".

	<For double word>
	
	D M ☐☐☐☐ H0000～
	     Both hexadecimal
	     Sequential 2-word WR representation

	[Signed integer] D M ☐☐☐☐.S Specify ".S".
	[Real number (floating point)] D M ☐☐☐☐.FL Specify ".FL".

The word type data for external input / output is data that puts together 16 points bit data, and the double word type data is data that puts together 32 points.

Example: Relationship between DX10, WX10 and X100-X115
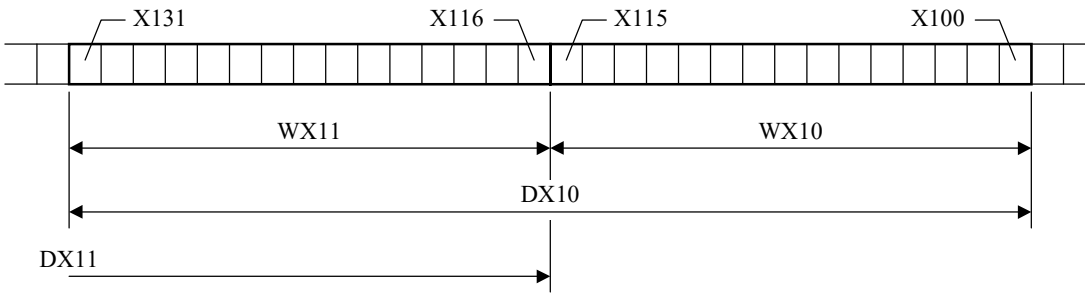
The internal output R area is different from the WR and DR areas.

Example: Correspondence between R100 and WR10/DR10
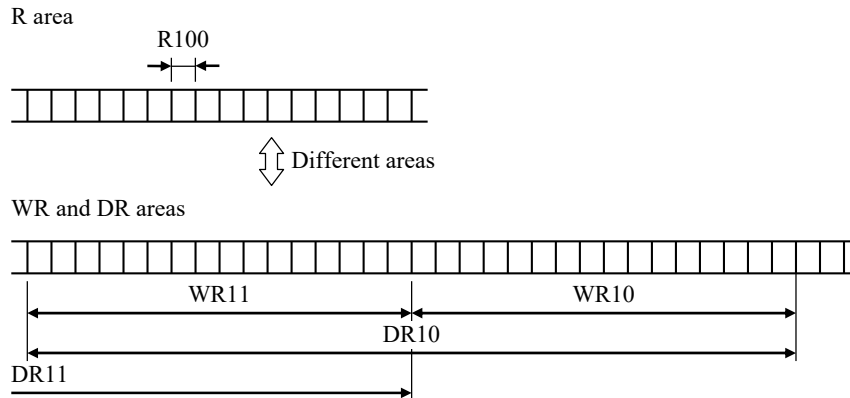
Caution

MICRO-EHV can select a specific bit from word data to access.

The internal outputs M, WM, and DM use the same area. (Each bit can be manipulated via word I/O.)

Example: Correspondence between M100 and WM10/DM10

Appendix 3 List of Supported Functions

MICRO-EHV has different functions depending on the software version. The software version can be monitored with the special internal output WRF050 (hexadecimal display).

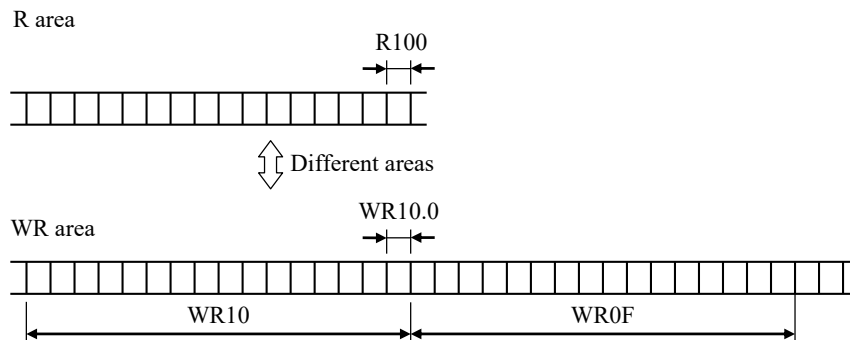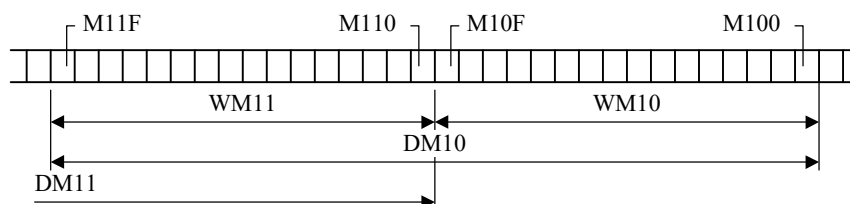| Function			Software version		
		High Function (MVH)	0102 or older	0104	0105
		Standard (MVL)	1102 or older	1104	1105
Command	Basic command		✔	✔	✔
	Arithmetic command (all except the following)		✔	✔	✔
	Arithmetic command (SGET, EXT, SQR, BSQR, POW, EXP, FLOG, FLOG10 Radian trigonometric function)		-	✔	✔
	Application command (all except the following)		✔	✔	✔
	Application command (PID)		-	✔	✔
	Application command (High speed counter)		✔	✔	✔
	Application command (Pulse・PWM output) *1		-	✔	✔
	Application command (BMOV / BCOPY)		-	-	-
	Control command		✔	✔	✔
	Transfer command (TRNS0 / RECV 0)		✔	✔	✔
	Transfer command (MBMST / INV1)		-	✔	✔
	Transfer command (OMST1 / OCTP1)		-	-	-
I/O	Expansion	Expansion unit (Digital)	✔	✔	✔
		Expansion unit (Analog)	-	✔	✔
		Expansion unit (RTD, Thermocouple)	-	✔	✔
		Expansion unit (Positioning)	-	-	-
	Special internal output	NTP client function *2	-	✔	✔
		Task code port reset *2	-	-	✔
		Option board analog	-	-	✔
		communication speed setting *2	-	-	✔
	Special IO	High-speed counter input	✔	✔	✔
		Interrupt input	✔	✔	✔
		Pulse / PWM output *1	-	✔	✔
Communication function	Serial communication port (RS-232C)	Programming / Display	✔	✔	✔
		General-purpose communication (TRNS0 / RECEIVE 0)	✔	✔	✔
	Ethernet port *2	Programming / Display (TCP / IP)	✔	✔	✔
		Display etc. (UDP / IP)	-	-	-
		Modbus-TCP server	✔	✔	✔
		ASR communication function (TCP / IP)	-	-	✔
		ASR communication function (UDP / IP)	-	-	-
		Variable communication speed	-	-	✔
	USB port	Programming	✔	✔	✔
USB memory (host) *2	Uploading program (USB memory ← PLC)		✔	✔	✔
	Downloading program(USB memory → PLC)		✔	✔	✔
	Data logging		-	-	-
	Multiple programs of USB upload (in the file name MAC added)		-	-	-
Other	Data memory backup function		-	-	-
Option board	Communication	Programming / display (serial)	-	✔	✔
		Modbus-RTU master	-	✔	✔
		Modbus-RTU slave	-	✔	✔
		General-purpose communication (TRNS0 / RECEIVE 0)	-	✔	✔
		Modbus gateway *2	-	✔	✔
	Analog input		-	-	✔

✔ : Supported   - : Not supported

* 1   This function is supported only for the transistor output type.

* 2   This function is supported only by the high function version (MVH).

Function			Software version			
		High Function (MVH)	0106	0107	0108	0109
		Standard (MVL)	1106	1107	1108	1109
Command	Basic command		✔	✔	✔	✔
	Arithmetic command (all except the following)		✔	✔	✔	✔
	Arithmetic command (SGET, EXT, SQR, BSQR, POW, EXP, FLOG, FLOG10 Radian trigonometric function)		✔	✔	✔	✔
	Application command (all except the following)		✔	✔	✔	✔
	Application command (PID)		✔	✔	✔	✔
	Application command (High speed counter)		✔	✔	✔	✔
	Application command (Pulse・PWM output) *1		✔	✔	✔	✔
	Application command (BMOV / BCOPY)		✔	✔	✔	✔
	Control command		✔	✔	✔	✔
	Transfer command (TRNS0 / RECV 0)		✔	✔	✔	✔
	Transfer command (MBMST / INV1)		✔	✔	✔	✔
	Transfer command (OMST1 / OCTP1)		✔	✔	✔	✔
I/O	Expansion	Expansion unit (Digital)	✔	✔	✔	✔
		Expansion unit (Analog)	✔	✔	✔	✔
		Expansion unit (RTD, Thermocouple)	✔	✔	✔	✔
		Expansion unit (Positioning)	-	-	-	-
	Special internal output	NTP client function *2	✔	✔	✔	✔
		Task code port reset *2	✔	✔	✔	✔
		Option board analog	✔	✔	✔	✔
		communication speed setting *2	✔	✔	✔	✔
	Special IO	High-speed counter input	✔	✔	✔	✔
		Interrupt input	✔	✔	✔	✔
		Pulse / PWM output *1	✔	✔	✔	✔
		Programming / Display	-	-	-	✔
Communication function	Serial communication port (RS-232C)	General-purpose communication (TRNS0 / RECV 0)	✔	✔	✔	✔
		Programming / Display (TCP / IP)	✔	✔	✔	✔
	Ethernet port *2	Display etc. (UDP / IP)	✔	✔	✔	✔
		Modbus-TCP server	-	-	✔	✔
		ASR communication function (TCP / IP)	✔	✔	✔	✔
		ASR communication function (UDP / IP)	✔	✔	✔	✔
		Variable communication speed	-	✔	✔	✔
		Programming	✔	✔	✔	✔
	USB port	Expansion unit (Digital)	✔	✔	✔	✔
USB memory (host) *2	Uploading program (USB memory ← PLC)		✔	✔	✔	✔
	Downloading program (USB memory → PLC)		✔	✔	✔	✔
	Data logging		-	-	✔	✔
	Multiple programs of USB upload (in the file name MAC added)		-	-	-	✔
	Data memory backup function		-	-	-	✔
Other	Uploading program (USB memory ← PLC)		-	-	✔	✔
Option board	Communication	Programming / display (serial)	✔	✔	✔	✔
		Modbus-RTU master	✔	✔	✔	✔
		Modbus-RTU slave	✔	✔	✔	✔
		General-purpose communication (TRNS0 / RECV 0)	✔	✔	✔	✔
		Modbus gateway *2	✔	✔	✔	✔
	Analog input		✔	✔	✔	✔
	Analog output		-	-	-	✔

✔ : Supported   - : Not supported

*1 This function is supported only for the transistor output type.

*2 This function is supported only by the high function version (MVH).

*3 The counter ON / OFF preset value, pulse / PWM output frequency, pulse output pulse count, and PWM ON duty are displayed on the special internal output.

Function		High Function (MVH)	Software version	
			0109 or older	0110
		Standard (MVL)	1109 or older	1110
Special internal Output (Bit)	Reset Ethernet Modbus-TCP	[R91A]	-	✔
	Clear Task code transmit counter	[R921]	-	✔
	Task code P1 resetting completed	[R9D0]	-	✔
	Task code P2 resetting completed	[R9D1]	-	✔
	Task code P3 resetting completed	[R9D2]	-	✔
	Task code P4 resetting completed	[R9D3]	-	✔
	ASR port1 resetting completed	[R9D4]	-	✔
	ASR port2 resetting completed	[R9D5]	-	✔
	ASR port3 resetting completed	[R9D6]	-	✔
	ASR port4 resetting completed	[R9D7]	-	✔
	ASR port5 resetting completed	[R9D8]	-	✔
	ASR port6 resetting completed	[R9D9]	-	✔
	Ethernet port (Modbus-TCP port) Reset completed	[R9DA]	-	✔
	Task code port1 error	[R9DC]	-	✔
	Task code port2 error	[R9DD]	-	✔
	Task code port3 error	[R9DE]	-	✔
	Task code port4 error	[R9DF]	-	✔
Special internal Output(Word)	Task code P1 send count	[WRF1F0]	-	✔
	Task code P1 correctly receive count	[WRF1F1]	-	✔
	Task code P1 receive error (command)	[WRF1F2]	-	✔
	Task code P1 receive error (format)	[WRF1F3]	-	✔
	Task code P2 send count	[WRF1F4]	-	✔
	Task code P2 correctly receive count	[WRF1F5]	-	✔
	Task code P2 receive error (command)	[WRF1F6]	-	✔
	Task code P2 receive error (format)	[WRF1F7]	-	✔
	Task code P3 send count	[WRF1F8]	-	✔
	Task code P3 correctly receive count	[WRF1F9]	-	✔
	Task code P3 receive error (command)	[WRF1FA]	-	✔
	Task code P3 receive error (format)	[WRF1FB]	-	✔
	Task code P4 send count	[WRF1FC]	-	✔
	Task code P4 correctly receive count	[WRF1FD]	-	✔
	Task code P4 receive error (command)	[WRF1FE]	-	✔
	Task code P4 receive error (format)	[WRF1FF]	-	✔

✔ : Supported   - : Not supported

Function			Software version	
		High Function (MVH)	0110 or older	0120
		Standard (MVL)	1110 or older	1120
I/O	Special I/O	I/O mixed setting	-	✔
		Operation from Control Editor (Jog operation)	-	✔
		Operation from Control Editor (Inching operation)	-	✔
		Operation from Control Editor (Return to origin)	-	✔
Command	Application command (PLSTA) Absolute position coordinate specification		-	✔
	Application command (PLSTAR)		-	✔
	Application command (PLSPDR)		-	✔
	Application command (PLSCNGR)		-	✔
	Application command (PLSTPR)		-	✔
Special internal Output (Bit)	Ch1 Homing returning in progress	[RA0B]	-	✔
	Ch1 Homing returned	[RA0D]	-	✔
	Ch2 Homing returning in progress	[RA1B]	-	✔
	Ch2 Homing returned	[RA1D]	-	✔
	Ch3 Homing returning in progress	[RA2B]	-	✔
	Ch3 Homing returned	[RA2D]	-	✔

✔ : Supported　　- : Not supported

Function			Software version	
		High Function (MVH)	0125 or older	0126
		Standard (MVL)	1125 or older	1126
Communication	Option board port	Hitachi Serial Data Link (HSDL) protocol	-	✔
Option board	Analog input (OBV-AIG)		-	✔
	Analog input / output (OBV-AIOG)		-	✔
	RTD input (OBV-RTD)		-	✔
Special internal Output (Bit)	R7C8 (Serious failure), R7DB (Self-diagnostic error) turns on in WDT error.		-	✔
	HSDL Run / Stop	[R820]	-	✔
	HSDL Link data update time (max) initialization	[R821]	-	✔
	HSDL Link data update time (min) initialization	[R822]	-	✔
	Modbus F.C.	[R90F]	-	✔
Special internal Output (Word)	Option board analog input 3	[WRF04E]	-	✔
	Option board analog input 4	[WRF04F]	-	✔
	HSDL Link data update time (max)	[WRF0ED]	-	✔
	HSDL Link data update time (current)	[WRF0EE]	-	✔
	HSDL Link data update time (min)	[WRF0EF]	-	✔
	HSDL Status (Station 1, Master)	[WRF150]	-	✔
	HSDL Status (Station 3, Station 2)	[WRF151]	-	✔
	HSDL Status (Station 5, Station 4)	[WRF152]	-	✔
	HSDL Status (Station 7, Station 6)	[WRF153]	-	✔
	HSDL Status (Station 9, Station 8)	[WRF154]	-	✔
	HSDL Status (Station 11, Station 10)	[WRF155]	-	✔
	HSDL Status (Station 13, Station 12)	[WRF156]	-	✔
	HSDL Status (Station 15, Station 14)	[WRF157]	-	✔
	HSDL Status (Station 17, Station 16)	[WRF158]	-	✔
	HSDL Status (Station 19, Station 18)	[WRF159]	-	✔
	HSDL Status (Station 21, Station 20)	[WRF15A]	-	✔
	HSDL Status (Station 23, Station 22)	[WRF15B]	-	✔
	HSDL Status (Station 25, Station 24)	[WRF15C]	-	✔
	HSDL Status (Station 27, Station 26)	[WRF15D]	-	✔
	HSDL Status (Station 29, Station 28)	[WRF15E]	-	✔
	HSDL Status (Station 31, Station 30)	[WRF15F]	-	✔
Error code	H42 Option board verification error		-	✔
	H7D Analog option board *4 conversion processing delay		-	✔
	HA7 Too many files opened in USB memory		-	✔
	HA8 USB download program not supported		-	✔
	HA9 Insufficient USB download program information		-	✔

✔ : Supported   - : Not supported

*4 This error will be detected only in OBV-AIG, OBV-AIOG, OBV-RTD.

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