HITACHI PROGRAMMABLE CONTROLLER

HIDIC EH-150

Compact remote module
Master: EH-TRMME/
Slave: EH-TRMLE
APPLICATION MANUAL

NJI-536A (X)

○ Warranty period and coverage

The warranty period is the shorter period either 18 months from the date 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 either 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

Warning

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(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 classified as “Danger” and “Caution” in this document.

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

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

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

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

Icons for prohibited items and required items are shown below:

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

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

1. About installation

⚠ CAUTION

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

2. About wiring

REQUIRED

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

⚠ CAUTION

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

3. Precautions when using the unit

⚠ DANGER

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

⚠ CAUTION

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

4. About preventive maintenance

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

PROHIBITED
• Do not disassemble or modify the unit. These actions may result in fire, malfunction, or malfunction.

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	English first edition made from Japanese version NJI-536A	2009/10/02	NJI-536A (X)

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MEMO

Chapter 1 Introduction

Thank you very much for choosing Hitachi Programmable Controller (hereinafter referred to as PLC) EH-150 series. This manual explains how to use the compact remote module with the Hitachi EH-150 Programmable Controller. Read this manual thoroughly and keep for installation operations, maintenance checks and other procedures. The following documentation related to PLC is also available and should be used together with this manual.

Table 1.1 List of Description materials

Items		Title of document	Manual number
EH-150 (EHV) series	Main system of EH-150	EH-150 EHV-CPU APPLICATION MANUAL	NJI-481*(X)
		EH-150 EHV-CPU PROGRAMMING MANUAL	NJI-482*(X)
	Programming software (Standard Edition)	EH-150 EHV series Ladder Programming software Control Editor INSTRUCTION MANUAL	NJI-537*(X)
	Programming software (Variable Name Edition)	EH-150 EHV series Ladder Programming software Control Editor INSTRUCTION MANUAL	NJI-486*(X)
EH-150 series	Main system of EH-150	EH-150 APPLICATION MANUAL	NJI-281* (X)
	Programming software	H-SERIES LADDER EDITOR for Windows® INSTRUCTION MANUAL	NJI-342* (X)

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

1.1 Supported CPU modules and programming software

Compact remote module EH-TRMME/EH-TRMLE can be used with CPU and programming software shown in Table1.2.

Table 1.2 Supported CPU modules and supported versions of programming software

CPU modules		Programming software			
Model name	Supported version	Product name		Model name	Supported version
EHV-CPU128	Not depend on the software version of CPU.	Control Editor	Standard Edition	EH-CTE-E	Ver.2.18 or newer (Note 1)
EHV-CPU64					
EHV-CPU32			Variable Name Edition	EH-CTE-EVN	Ver.2.22 or newer (Note 1)
EHV-CPU16					
EH-CPU548	Not depend on the software version of CPU.	LADDER EDITOR for Windows®		HLW-PC3E	Not depend on the software version of programming software.
EH-CPU516					
EH-CPU316A					
EH-CPU208A					
EH-CPU104A					

(Note 1) In spite of Ver.2.17 or older, Ver.2.20, and Ver.2.21, you can use compact remote modules without no restriction by setting I/O assignment as the next page.

■ I/O assignment for remote master with control editor of Ver.2.17 or older, Ver.2.20, and Ver.2.21

In the case of control editor you can set I/O assignment by selecting model name. But you can't select EH-TRMME (remote 2) or EH-TRMME (4W/4W) with control editor of unsupported version. So, in the case of setting "REMOTE 2", you must select EH-RMD (REMOTE 2) in "Others" tag. In the case of "X4Y4W", you must select EH-UKW (X4Y4W) in "Distributed I/O" tag.

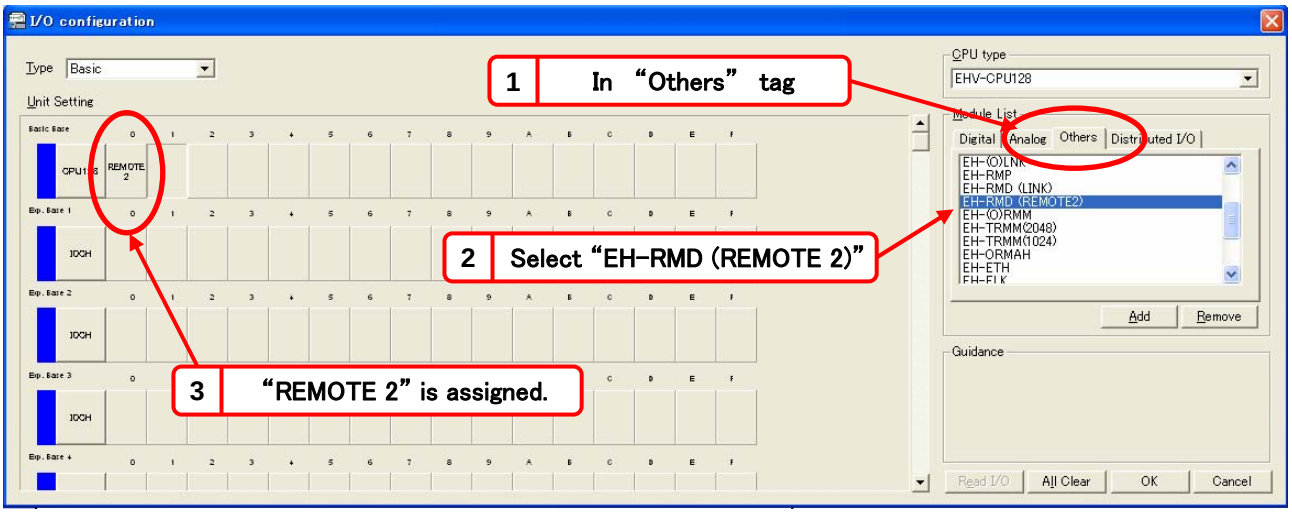


Figure1.1 I/O assignment for remote master with control editor of unsupported version (in the case of "REMOTE 2")

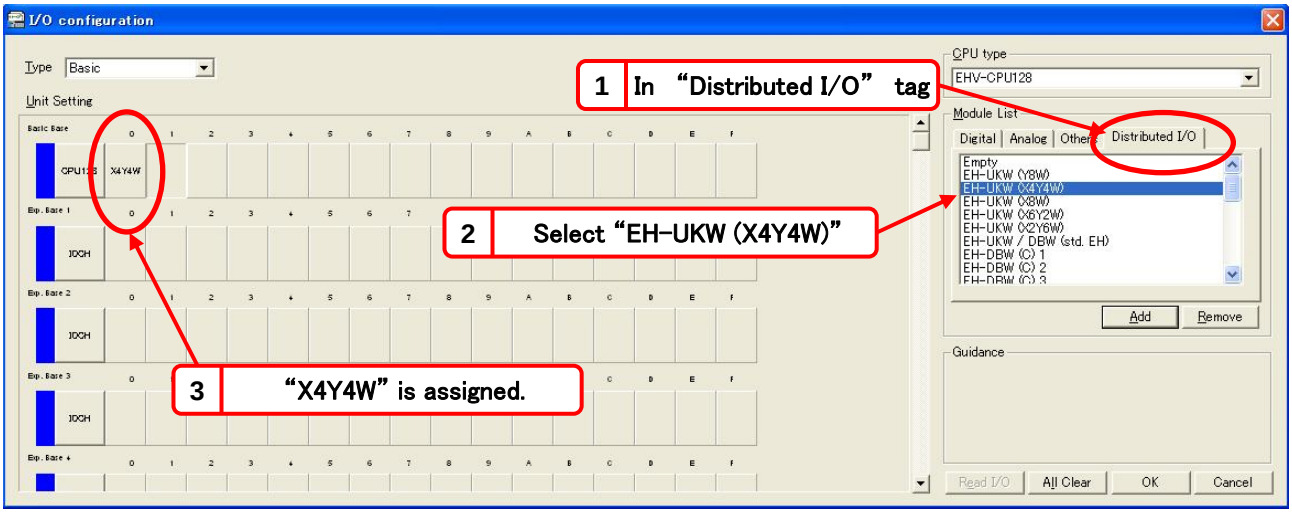


Figure1.2 I/O assignment for remote master with control editor of unsupported version (in the case of "4W/4W")

1.2 Before use

Great care has been taken in the manufacture of this product, but we advise that the following points are checked immediately after purchase.

1. Is the model the same one that you ordered?
2. Has the product been damaged in any way?
3. Are any of the accessories listed in Table 1.3 and Table1.4 missing?

Contact your dealer in the event of any defects being discovered.

Table 1.3 List of accessories supplied with the EH-TRMME

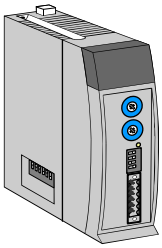
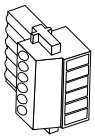
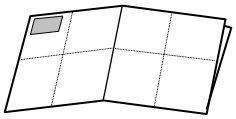
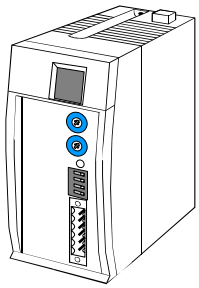
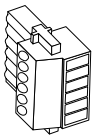
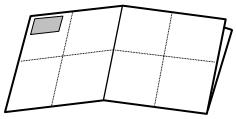
No.	Product name	Model name	Appearance	Numbers	Remarks
1	Compact remote master module	EH-TRMME		1	
2	Connector	BL3.5/6F		1	Plugged in the connector for communication. Made by Weidmuller
3	Instruction manual	NJI-527 (X)		1	

Table 1.4 List of accessories supplied with the EH-TRMLE

No.	Product name	Model name	Appearance	Numbers	Remarks
1	Compact remote slave module	EH-TRMLE		1	
2	Connector	BL3.5/6F		1	Plugged in the connector for communication. Made by Weidmuller
3	Instruction manual	NJI-528(X)		1	

1.3 Features

(1) Total economy

It is possible to lead to a reduction in total cost for system including wiring because the standard price of master and slave modules is reasonable and an affordable twisted cable can be used.

(2) Compatibility with current models

This remote module has communication-compatibility with the remote I/O for EM/EM-II and H-200/250/252B/252C and the remote I/O MINI for current H-2002/1002/702/302, and you can use an existing cable. Therefore, you do not need to rewire the cable and the replacement to EH-150/EHV is easy.

(3) Partial and step-by-step replacement

Since both of master and slave modules can be used with current models, it is possible to replace the modules step-by-step and partially. For instance, a program in CPU can be used without changing even if only a slave module is replaced, and I/O wiring for slave module is not required simultaneously even if only a master module is replaced.

(4) Fast response and high reliability

The remote refresh time is approximate 2.5ms (setting to high-speed mode (HS) and 256 I/O points). A reliable remote system can be built because improper communication data is discarded by the reverse double-transmission check function which has high performance as before.

(5) I/O hold function

Since a slave module has an output hold function and a master module has an input hold function from the remote slave module, these modules are applicable to the process control.

(6) Easy handling

The cable for these modules is easily-available due to the twist cable and easy to handle.

Chapter 2 Specifications

2.1 General specifications

General specifications are shown in Table 2.1. These specifications are common in EH-150 series.

Table 2.1 General specifications

Item	Specifications
Operating ambient temperature	0 to 55 °C [Storage ambient temperature −10 to 75 °C]
Operating ambient humidity	20 to 90 % RH (no condensation) [Storage ambient humidity 10 to 90 % RH (no condensation)]
Vibration resistance	Conforms to IEC 60068-2-6
Noise resistance	○ Noise voltage 1,500 Vpp Noise pulse width 100 ns, 1μs (Noise created by the noise simulator is applied across the power supply module's input terminals. This is determined by this company's measuring method.) ○ Based on NEMA ICS 3-304 (with the exception of input module) ○ Static noise: 3,000 V at metal exposed area
Insulation resistance	20 MΩ or more between the AC external terminal and case ground (FE) terminal (based on 500 V DC)
Dielectric withstand voltage	1,500 V AC for 1 minute between the AC external terminal and case ground (FE) terminal
Grounding	Class D grounding (ground with power supply module)
Usage environment	No corrosive gases, no excessive dust
Structure	Open, wall-mount type
Cooling	Natural air cooling

2.2 Functional specifications

Functional specifications are shown in Table 2.2. The compact remote modules have remote functions almost equal to remote modules (RIOH-TM/RIOH-TL) for H-200/250/252B/252C series and remote modules (RIOM-TM/RIOM-TL) for EM/EM-II series.

The compact remote modules have communication-compatibility with the remote I/O for EM/EM-II and H-200/250/252B/252C and the remote I/O MINI for current H-2002/1002/702/302, and you can use an existing cable. Therefore, you do not need to rewire the cable in replacement from these series.

Table 2.2 Functional specifications

Item			Specifications
Functional specifications	Usable CPU		EH-CPU104A/208A/316A/516/548, EHV-CPU16/32/64/128
	Connection modules		Remote master module: Maximum 4 units / CPU (I/O assignment: “Remote 2”)
			Remote slave module: Maximum 8 units / Master
	Number of I/O points		256 points/master (I/O assignment: “Remote 2”), 128 points/master (I/O assignment: “4W/4W”)
	Refresh time		2.5ms/256 points (HS: ON), 5.4ms/256 points (HS: OFF)
	Self-diagnosis		SRAM check, WDT check, Loop back check
	Fallback operation		Available (Even if a slave module is failed or powered off, it is possible to continue communication between a master module and other slave modules)
	I/O assignment (Note 1)		Master: “Remote 2” or “4W/4W”, Slave: No assignment
	Mountable module on slave base (Note 2)		8-point, 16-point I/O module (I/O assignment is “X16” or “Y16”) Dummy module (I/O assignment is “Empty 16”) 〔32-point/64-point module, analog I/O module, and high-performance module, communication modules, etc. cannot be mounted on the slave base.〕
	Consumption current		EH-TRMME: Approximately 150mA, EH-TRMLE: Approximately 150mA
Transmission specifications	Transmission speed		768kbps
	Transmission mode		Half-duplex serial transfer, frame synchronization
	Insulation, modulation method		Trans insulation, bipolar pulse modulation
	Transmission error check		Reverse double-transmission, time-out
	Error display		LED, special internal output
Transmission line	Connection mode		Multi-drop system
	Cable length		Between stations: 150m (0.3mm2) / 300m (0.75mm2)
			Total length: 150m (0.3mm2) / 300m (0.75mm2)
	Error station processing		Slave station: Bypass system
	Cable		Shielded twist-pair cable
	Recommended cable (made by Hitachi cable)	Existing	0.3mm^2 cable: CO-SPEV-SB(A)-1P-0.3SQ (Terminator 100Ω) 0.75mm^2 cable: CO-EX-SX-1P-0.75SQ (Terminator 150Ω)
		New	0.3mm^2 cable: CO-SPEV-SB(A)-1P-0.3SQ LF (Terminator 100Ω) 0.75mm^2 cable: CO-EX-SX 2×0.75SQ LF (Terminator 150Ω)
	Applicable connector		BL3.5/6F attached (made by Weidmuller)

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

(Note 2) Please refer to “2.5 Supporting module list in salve station” for detail.

2.3 Remote slaves that can be connected to remote master (EH-TRMME)

Remote slaves that can be connected to remote master module (EH-TRMME) are shown in Table 2.3.

Table 2.3 Slave list that can be connected to remote master module (EH-TRMME)

Series of PLC	Product name	Model name	Specifications (Maximum I/O points/slave)	Remarks
EH-150	Remote slave	EH-TRMLE	128points (8words)/slave (8slots/slave)	
Large H	Remote I/O MINI slave	REM-LMH	Linkage capacity: send 64words, receive 64words	
H-200/250/ 252B/252C	Remote slave	RIOH-TL	128points (8words)/slave (8slots/slave)	Cease in production
	Remote slave unit	RIOH-DT	24VDC input: 16points, Transistor output: 16points	Cease in production
	I/O linkage	REM-LH2	Linkage capacity: 128points (8words)	Cease in production
EM/EM-II	Remote slave	RIOM-TL	128points (8words)/slave (8slots/slave)	Cease in production
	Remote slave unit	RIOM-DT	24VDC input: 16points, Transistor output: 16points	Cease in production
H-board type	Remote slave unit	HR-20DR	24VDC input: 12points, Relay outputs: 8points	Cease in production
		HR-40DR	24VDC input: 24points, Relay outputs: 16points	Cease in production
		HR-64DR	24VDC input: 40points, Relay outputs: 24points	Cease in production
	Unit with linkage function	HL-40DR	Linkage capacity: 128points (8words)	Cease in production
		HL-64DR	Linkage capacity: 128points (8words)	Cease in production

2.4 Remote masters that can be connected to remote slave (EH-TRMLE)

Remote masters that can be connected to remote slave module (EH-TRMLE) are shown in Table 2.4.

Table 2.4 Master list that can be connected to remote slave module (EH-TRMLE)

Series of PLC	Product name	Model name	Specifications					Remarks
			Mode	I/O assignment for master	Not using image slot	Using image slot		
EH-150	Remote master	EH-TRMME	Compatible mode	REMOTE 2	I/O: 256points	Input: 128points Output: 128points	Total: 256points	
				4W/4W	I/O: 64points	Input: 64points Outputs: 64points	Total: 128points	
Large H	Remote I/O MINI	REM-MMH	MODE 0	4W/4W	I/O: 352points	Input: 352points Output: 352points	Total: 704points	
			MODE 1	Y8W	Output: 128points	Not available		
			MODE 2	4W/4W	I/O: 64points	Input: 64points Output: 64points	Total: 128points	
			MODE 3	X8W	Input: 128points	Not available		
H-200/250/ 252B/252C	Remote master	RIOH-TM	-	REMOTE	I/O: 128points	Input: 128points Output: 128points	Total: 256points	Cease in production
EM/EM-II	Remote master	RIOM-TM	-	Unnecessary	I/O: 128points	Input: 128points Output: 128points	Total: 256points	Cease in production
H board type	Unit with remote function	HL-40DR	-	REMOTE	I/O: 128points	Input: 128points Output: 128points	Total: 256points	Cease in production
		HL-64DR	-	REMOTE	I/O: 128points	Input: 128points Output: 128points	Total: 256points	

2.5 Supporting module list in salve station

Modules and units that can be used with remote slave module (EH-TRMLE) are shown in Table 2.5.

You can mount only modules that are “X16”, “Y16”, and “DUMMY 16” in I/O assignment on remote base.

Table 2.5 Supporting module list on slave station

Product name	Model name	Specifications	I/O Assignment symbol	Remarks
Power module	EH-PSA	Input 100 to 240 V AC Output 5 V DC 3.8 A, 24 V DC 0.4 A	—	
	EH-PSD	Input 21.6 to 26.4 V DC Output 5 V DC 3.8 A	—	
Base unit	EH-BS3A	3 I/O modules installed.	—	
	EH-BS5A	5 I/O modules installed.	—	
	EH-BS6A	6 I/O modules installed.	—	
	EH-BS8A	8 I/O modules installed.	—	
	EH-BS11A	11 I/O modules installed.	—	Mountable on 0-7slot only
	EH-BS3	3 I/O modules installed.		Cease in production
	EH-BS5	5 I/O modules installed.		
	EH-BS8	8 I/O modules installed.		
Digital input module	EH-XD8	8 points, 24 V DC input	X16	
	EH-XD16	16 points, 24 V DC input	X16	
	EH-XDL16	16 points, 24 V DC input, Intensified filter	X16	
	EH-XD32	32 points, 24 V DC input	X32	Do not mount on the slave base. (Note 1)
	EH-XD32E	32 points, 24 V DC input, Spring type terminal block	X32	
	EH-XDL32E	32 points, 24 V DC input, Spring type terminal block, Intensified filter	X32	
	EH-XD32H	32 points, 24 V DC input, Compatible connecter with EM and H-200	X32	
	EX-XD64	64 points, 24 V DC input	X64	
	EH-XA16	16 points, 100 to 120 V AC input	X16	
	EH-XAH16	16 points, 200 to 240 V AC input	X16	
Digital output module	EH-YR8B	8 points, relay output (isolated contact point), 100/240 V AC, 24 V DC	Y16	
	EH-YR12	12 points, relay output, 100/240 V AC, 24 V DC	Y16	
	EH-YR16	16 points, relay output, 100/240 V AC, 24 V DC	Y16	
	EH-YT8	8 points, transistor output, 12/24 V DC (sink type)	Y16	
	EH-YTP8	8 points, transistor output, 12/24 V DC (source type)	Y16	
	EH-YT16	16 points, transistor output, 12/24 V DC (sink type)	Y16	
	EH-YTP16	16 points, transistor output, 12/24 V DC (source type)	Y16	
	EH-YTP16S	16 points, transistor output, 12/24 V DC (source type)	Y16	
	EH-YT32	32 points, transistor output, 12/24 V DC (sink type)	Y32	Do not mount on the slave base. (Note 1)
	EH-YTP32	32 points, transistor output, 12/24 V DC (source type)	Y32	
	EH-YT32E	32 points, transistor output, 12/24 V DC (sink type), Spring terminal block	Y32	
	EH-YTP32E	32 points, transistor output, 12/24 V DC (source type), Spring terminal block	Y32	
	EH-YT32H	32 points, transistor output, 12/24 V DC (sink type), Compatible connecter with EM and H-200	Y32	
	EH-YT64	64 points, transistor output, 12/24 V DC (sink type)	Y64	
	EH-YTP64	64 points, transistor output, 12/24 V DC (source type)	Y64	
	EH-YS4	4 points, triac output, 100/240 V AC	Y16	
	EH-YS16	16 points, triac output, 100/240 V AC	Y16	

Product name	Model name	Specifications	I/O assignment symbol	Remarks
Analog input module	EH-AX44	12 bits analog input (4 to 20mA, 0 to 10 V) each 4 ch.	X8W	Do not mount on the slave base. (Note 1)
	EH-AX8V	12 bits analog input 8 ch., Voltage (0 to +10 V)	X8W	
	EH-AX8H	12 bits analog input 8 ch., Voltage (-10 to +10 V)	X8W	
	EH-AX8I	12 bits analog input 8 ch., Current (4 to 20 mA)	X8W	
	EH-AX8IO	12 bits analog input 8 ch., Current (0 to 22 mA)	X8W	
	EH-AXH8M	14 bits analog input (0 to 22mA, 4 to 22mA, -10 to +10V, 0 to 10V) 8 ch.	X8W	
	EH-PT4	4 channels resistance bulb input, Signed 15 bits Platinum (Pt 100Ω / Pt 1000Ω)	X4W	
	EH-TC8	Signed 15 bits, Thermocouple input (K, E, J, T, B, R, S, N) 8 points	X8W	
Analog output module	EH-AY22	12 bits analog output (4 to 20mA, 0 to 10 V) each 2 ch.	Y8W	Do not mount on the slave base. (Note 1)
	EH-AY2H	12 bits analog output 2 ch., Voltage (-10 to +10 V)	Y8W	
	EH-AY4V	12 bits analog output 4 ch., Voltage (0 to +10 V)	Y8W	
	EH-AY4H	12 bits analog output 4ch., Voltage (-10 to +10 V)	Y8W	
	EH-AY4I	12 bits analog output 4 ch., Current (4 to 20 mA)	Y8W	
	EH-AYH8M	14 bits analog output (0 to 22mA, 4 to 22mA, 0 to 10V) 8 ch.	Y8W	
Positioning and counter module	EH-CU	2 channels high-speed counter input, Maximum frequency of 100 kHz, 1/ 2-phases switchover, 4-point opened collector output	X5Y3W	Do not mount on the slave base. (Note 1)
	EH-CUE	1 channel high-speed counter input, Maximum frequency of 100 kHz, 1 /2-phases switchover, 2-point opened collector output	X5Y3W	
	EH-POS	1-axis pulse positioning module	X4Y4W	
	EH-POS4	4-axes pulse positioning module	X4Y4W	
Communication and network module	EH-ETH	Ethernet module IEEE802.3 standard, 10BASE-T, 8 units per CPU	COMM (ETH)	Do not mount on the slave base. (Note 1)
	EH-LNK	CPU link module (coaxial), 8 units per CPU	LINK	
	EH-OLNK	CPU link module (optical fiber), 8 units per CPU	LINK	
	EH-OLNKG	CPU link module (support optical fiber GI50/125μm cable), 8 units per CPU	LINK	
	EH-OLNKE	CPU link module (support optical fiver GI62.5/125μm cable), 8 units per CPU	LINK	
	EH-RMD	Device Net master module CPU link assignment…256/256 words I/O, 8 units per CPU Remote 2 assignment …64 words I/O total, 4 units per CPU can be installed	LINK / REMOTE2	
	EH-RMP	PROFIBUS-DP master module, 256/256 words I/O, 8 units per CPU can be installed	LINK	
	EH-IOCD	Device Net slave module, 256 words input/256 words output	—	
	EH-IOCP	PROFIBUS-DP slave controller, 208 words I/O	—	
	EH-SIO	Serial communication module, RS-232C / RS-422 / RS-485 general-purpose, Modbus protocol, Hi-Protocol, Simple data link	4W/4W (SIO)	
	EH-TRMME	Compact remote master module	REMOTE2/ 4W/4W	
Dummy module	EH-DUM	Module for an opened slot	Empty16 (Note 2)	

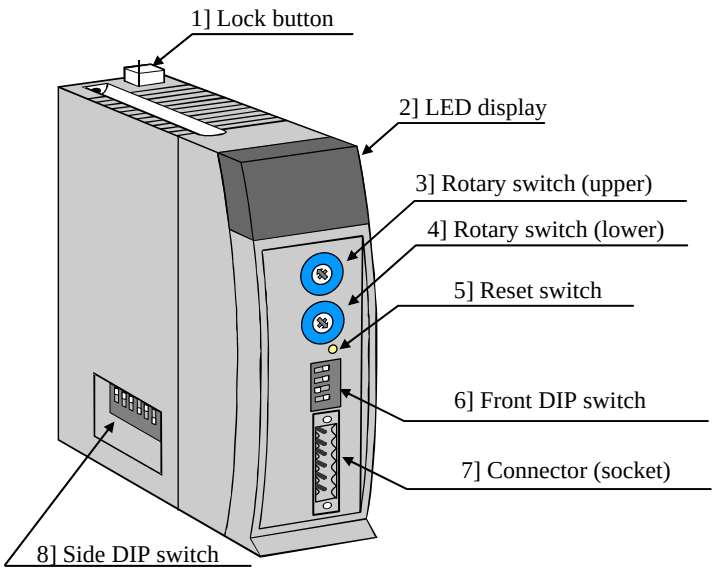
(Note 1) 32-point/64-point modules, analog I/O modules, high-performance modules, and communication modules, etc. cannot operate normally on the slave base.

(Note 2) In the case of EHV, Please set “X16” or “Y16” for I/O assignment of dummy module. If you set “Empty” for I/O assignment of dummy module, slot numbers of right side of dummy module become wrong.

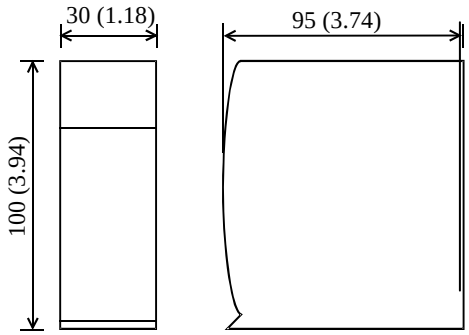
Chapter 3 Name and function of each part

3.1 Name and function of each part in master module

Name and function of each part

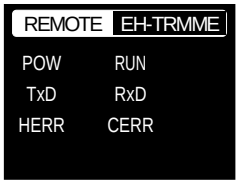


Model name	EH-TRMME
Weight	Approx. 0.12 kg
Consumption current (5VDC)	Approx. 150 mA
Dimensions (mm (in.))	

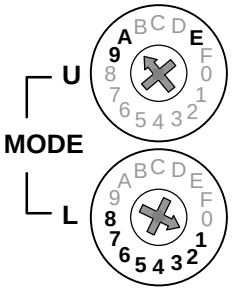


No.	Name	Function	Remarks
1]	Lock button	This is used when removing the module from base unit. After it is installed to the base unit, the fixation can be reinforced using screws. In this case, use M4 × 10 mm (0.39 in.) screw.	
2]	LED display	The status of module is displayed on this LED.	See a table shown below.
3]	Rotary switch (upper)	This is a switch to set I/O assignment for master module.	See next page.
4]	Rotary switch (lower)	This is a switch to set the number of connected slave modules.	See next page.
5]	Reset switch	The module can be reset by pressing this switch when error such as the module abnormal occurred.	See Section 6.4 for details.
6]	Front DIP switch	This is a switch to set an operation mode (HS refresh mode, etc.).	See next page.
7]	Connector	This is a connector to connect a twist-pair cable for connecting slave modules.	See next page or later.
8]	Side DIP switch	This is a switch to set an operation mode (the last channel number of master, etc.).	See next page or later.

■ Description of LED display

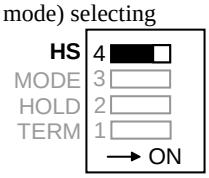
LED	LED name	Indication	Details
	POW	Power supply	Light up when 5V DC power is supplied to the module.
	RUN	Normal communication	Light up in proper communication. (Light is turned off due to time-out error when the communication with slave station is discontinued for 500ms or more.)
	TxD	Transmission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

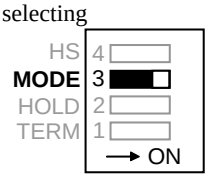
■ Description of Rotary switch

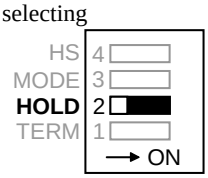
<table>
<tr><th>Rotary switch</th><th>Symbol</th><th>Meaning</th><th>Details of setting</th></tr>
<tr><td rowspan="2"> 

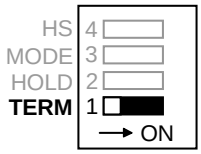
[Default setting: U=A, L=0]</td><td>U
(upper)</td><td>I/O assignment
(9, A, E)</td><td>I/O assignment of master module is set. Always set 9 or A or E.
<table>
<tr><th>Set</th><th>I/O assignment of master</th><th>Remarks</th></tr>
<tr><td>0 to 8</td><td>Undefined</td><td>-</td></tr>
<tr><td>9</td><td>4W/4W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

■ Description of Front DIP switch

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

[Default setting: ON]</td><td>Refresh operation mode on remote communication is set (High-speed or Low-speed).
In the case of all local stations are EH-TRMLE, the high-speed refresh mode can be selectable. Remote refresh time is shown below.
HS = ON: Refresh time = 0.156 ms × Number of master occupancy channels
HS = OFF: Refresh time = 0.338 ms × Number of master occupancy channels
The channel is unit of transmitted and received data between master and slave stations. Refer to Chapter 4 for detail.
<table>
<tr><th>HS</th><th>Position</th><th>Remote refresh mode selection</th></tr>
<tr><td>OFF</td><td> </td><td>Low-speed refresh mode (for low-speed remote slave module)</td></tr>
<tr><td>ON</td><td> </td><td>High-speed refresh mode (for high-speed EH-TRMLE)</td></tr>
</table></td></tr>
<tr><td>MODE</td><td>MODE (compatible mode) selecting
 

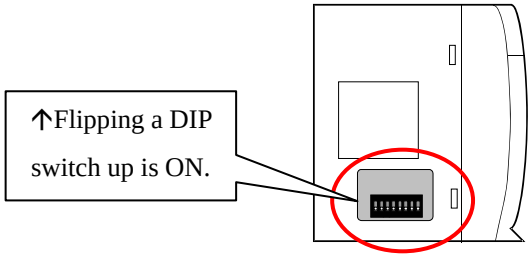
Always ON
[Default setting: ON]</td><td>Operation mode on remote communication for remote master module is set. Compatible mode allows slave module(EH-TRMLE) to connect with master/slave stations for series other than EH-150.
Always make sure that this switch is turned on, that is the compatible mode.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

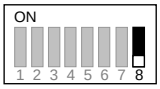
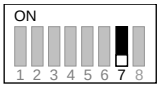
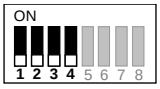
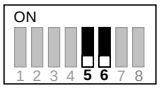
[Default setting: OFF]</td><td>When the communication time-out error occurred, it is selected whether the input data from the slave is held or not. (Hold means the last data received properly is fixed.)
<table>
<tr><th>HOLD</th><th>Position</th><th>Input hold function selection</th></tr>
<tr><td>OFF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

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

■ Description of Side DIP switch

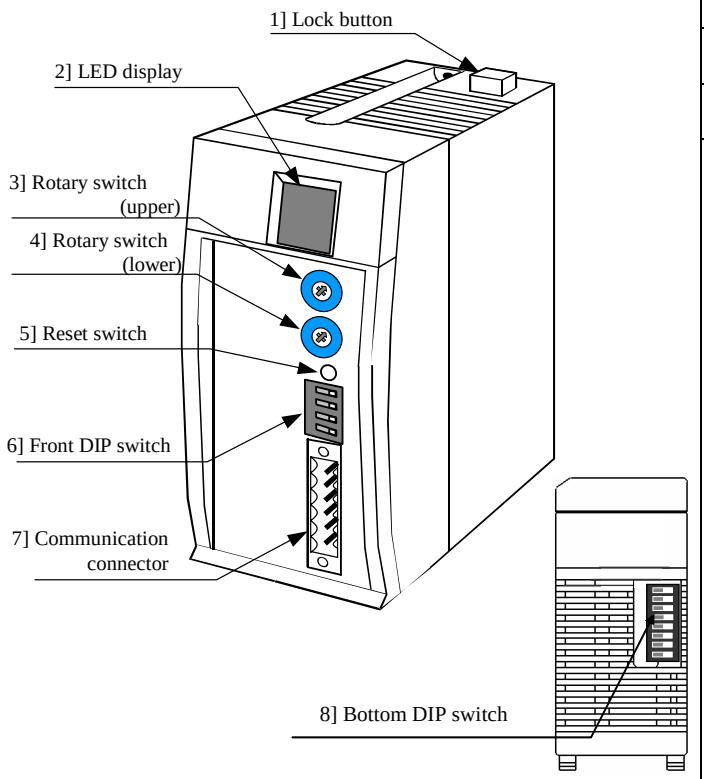
When flipping a DIP switch up, it means ON as the figure shown in the right side.

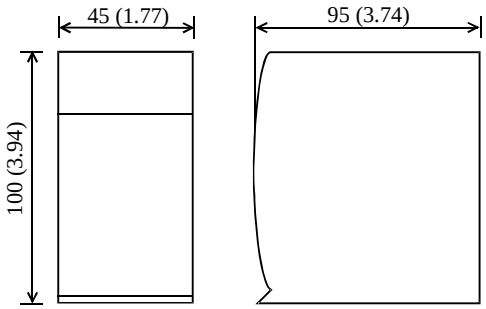


No.	Setting description	Details
1	Select the built-in terminator value  [Default setting: OFF]	100Ω or 150Ω terminator build in a master module, it is chosen which terminator is inserted between A and B terminals of communication connector. **Bit8** / Position / Selection of built-in terminator OFF — 100 Ω (for recommended 0.3mm^2 twist-pair cable) ON — 150 Ω (for recommended 0.75mm^2 twist-pair cable)
2	Compression mode selecting  [Default setting: OFF]	Enable/disable of the compression mode is chosen according to I/O assignment of master and slave module. Refer to Chapter 4 for details of compression mode. **Bit7** / Position / Selection of compression mode / Master I/O assignment / Local I/O assignment OFF — Disable of compression mode — 4W/4W — Unnecessary OFF — Disable of compression mode — Remote2 — X16, Y16, Empty16 ON — Enable of compression mode — Remote2 — B1/1 in all slots
3	Setting the last channel number of master  [Default setting: all OFF]	The last channel number of the master station is set. Refer to Chapter 4 for details. **Bit1 / Bit2 / Bit3 / Bit4 / Position / Last channel No.** and **Bit1 / Bit2 / Bit3 / Bit4 / Position / Last channel No.** OFF OFF OFF OFF — 0 — OFF OFF OFF ON — 8 ON OFF OFF OFF — 1 — ON OFF OFF ON — 9 OFF ON OFF OFF — 2 — OFF ON OFF ON — A ON ON OFF OFF — 3 — ON ON OFF ON — B OFF OFF ON OFF — 4 — OFF OFF ON ON — C ON OFF ON OFF — 5 — ON OFF ON ON — D OFF ON ON OFF — 6 — OFF ON ON ON — E ON ON ON OFF — 7 — ON ON ON ON — F
4	Undefined  [Default setting: all OFF]	Bit 5 to 6 are undefined. Always turn off Bit 5 and 6. **Bit5** / **Bit6** / Position / Description OFF OFF — Undefined (Always turn Bit5 and 6 off.)

3.2 Name and function of each part in slave module

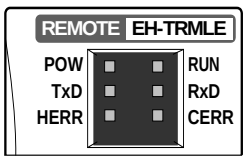
Name and function of each part	Model name	EH-TRMLE
	Weight	Approx. 0.14 kg
	Consumption current (5VDC)	Approx. 150 mA
	Dimensions (mm (in.))	



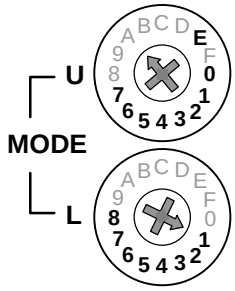


No.	Name	Function	Remarks
1]	Lock button	This is used when removing the module from base unit. After it is installed to the base unit, the fixation can be reinforced using screws. In this case, use M4 × 10 mm (0.39 in.) screw.	
2]	LED display	The status of module is displayed on this LED.	See a table shown below
3]	Rotary switch (upper)	This is a switch to set the station No.	See next page
4]	Rotary switch (lower)	This is a switch to set the number of occupancy slots.	See next page
5]	Reset switch	The module can be reset by pressing this switch when error such as the module abnormal occurred.	See Section 6.4 for details.
6]	Front DIP switch	This is a switch to set an operation mode (HS refresh mode, etc.).	See next page
7]	Communication connector	This is a connector to connect a twist-pair cable for communication.	See next page or later.
8]	Bottom DIP switch	This is a switch to set an operation mode (the first slave number of slave, etc.).	See next page or later.

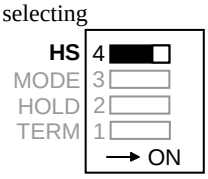
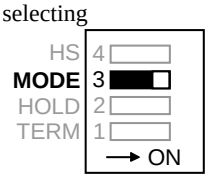
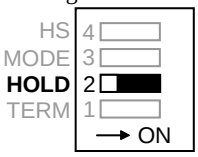
■ Description of LED display

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

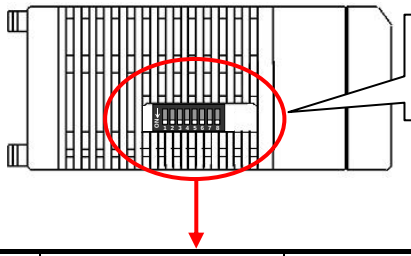
■ Description of Rotary switch

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

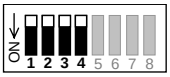
■ Description of Front DIP switch

Symbol	Setting description	Details
HS	HS (high-speed refresh mode) selecting  [Default setting: ON]	Refresh operation mode on remote communication is set (High-speed or Low-speed). In the case of all stations consist from EH-TRMME and EH-TRMLE, the high-speed refresh mode can be selectable. Remote refresh time is shown below. HS = ON: Refresh time = 0.156 ms × Number of master occupancy channels HS = OFF: Refresh time = 0.338 ms × Number of master occupancy channels The channel is unit of transmitted and received data between master and slave stations. Refer to Chapter 4 for detail. **HS** / Position / Remote refresh mode selection OFF / / Low-speed refresh mode (for low-speed remote modules) ON / / High-speed refresh mode (for high-speed remote modules EH-TRMME, EH-TRMLE)
MODE	MODE (compatible mode) selecting  Always ON [Default setting: ON]	Operation mode on remote communication for remote slave module is set. Compatible mode allows slave module(EH-TRMLE) to connect with master/slave stations for series other than EH-150. Always make sure that this switch is turned on, that is the compatible mode. **MODE** / Position / Compatible mode selection OFF / / Undefined ON / / Compatible mode
HOLD	HOLD (output hold function) selecting  [Default setting: OFF]	When the communication time-out error occurred, it is selected whether the output data from the master is held or not. (Hold means the last data received properly is fixed.) **HOLD** / Position / Output hold function selection OFF / / Disable the output hold function (Turn off all output data from the master at the communication error.) ON / / Enable the output hold function (At the communication error, output data from the master is held with last data received properly.)
TERM	TREM (built-in terminator insertion / non-insertion) selecting [Default setting: OFF]	It is selected whether the terminator build in the slave module is inserted between A and B terminals of the communication connector. The terminator has to be inserted in both ends of master or slave module connected through a twist-pair cable. 2 types of terminator, 100Ω and 150Ω, are build in the slave module. It is possible to select which to insert by the bottom DIP switch. **TERM** / Position / Selection of insertion / non-insertion of terminator OFF / / Not insert a built-in terminator. (in unnecessary case because it is not both ends of a twist-pair cable) ON / / Insert a built-in terminator. (when it is both ends of a twist-pair cable)

■ Description of Bottom DIP switch



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

No.	Setting description	Details
1	Built-in terminator value selecting [Default setting: OFF]	100Ω or 150Ω terminator built in a slave module, it is chosen which terminator is inserted between A and B terminals of a connection connector. **Bit8** / Position / Selection of built-in terminator OFF — 100Ω (for 0.3mm^2 recommended twist-pair cable) ON — 150Ω (for 0.75mm^2 recommended twist-pair cable)
2	Compression mode selecting [Default setting: OFF]	Enable/disable of the compression mode is chosen according to I/O assignment of master module. Refer to Chapter 4 for details of compression mode. **Bit7** / Position / Selection of compression mode OFF — Disable of compression mode (In this case, we can use the number of I/O modules equal to the number of occupancy slots of slave module setting with rotary switch) ON — Enable of compression mode (In this case, we can use the number of I/O modules equal to the double number of occupancy slots of slave module setting with rotary switch.)
3	Slave first channel No.setting  [Default setting: all OFF]	The first channel No. of slave station is set. Refer to Chapter 4 for details. **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / 1st channel No. / **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / 1st channel No. OFF OFF OFF OFF — 0 — OFF OFF OFF ON — 8 ON OFF OFF OFF — 1 — ON OFF OFF ON — 9 OFF ON OFF OFF — 2 — OFF ON OFF ON — A ON ON OFF OFF — 3 — ON ON OFF ON — B OFF OFF ON OFF — 4 — OFF OFF ON ON — C ON OFF ON OFF — 5 — ON OFF ON ON — D OFF ON ON OFF — 6 — OFF ON ON ON — E ON ON ON OFF — 7 — ON ON ON ON — F
4	Undefined [Default setting: all OFF]	Bit 5 to 6 are undefined . Always turn off Bit 5 and 6. **Bit6** / Position / Description OFF — Undefined (Always turn Bit 5 and 6 off.)

Chapter 4　Basic functions and System configuration

4.1　Selection of CPU module for compact remote system

There are three methods to use compact remote system by I/O assignment and compression mode selecting.

(1) Normal remote method

(2) Compression remote method

(3) 4W/4W method

Differences between these methods are shown in Table 4.1. I/O assignment of master module and compression mode selecting determines the maximum mountable number of master modules on basic unit, the maximum number of slave stations per master module, and maximum remote I/O points. Normal remote method has 256points per master for remote I/O and free location of input modules and output modules on slave station. I/O assignment “REMOTE 2” is supported by EHV-CPU16 to 128, EH-CPU516, and EH-CPU548. So, We recommend these CPU for compact remote system. But in the case of using EH-CPU104A to 316A for cost reduction, please set “Word 4W/4W” for I/O assignment for master module.

In the case of “Word 4W/4W” I/O assignment there is a disadvantage of not using internal inputs indicating remote refresh cycle time and so on. But in this case there is an advantage of not limiting it to the number of mounting of master modules per CPU. So, you can construct large-scale remote system with twisted pair cable by use many master modules per CPU.

Table 4.1 Using method of compact remote for each CPU

CPU module		EHV-CPU16/32/64/128，EH-CPU516/548			EH-CPU104A/208A/316A
Using method of compact remote		Normal remote method	Compression remote method	4W/4W method	4W/4W method
I/O assignment of master		REMOTE 2		WORD 4W/4W	WORD 4W/4W
I/O assignment of slave		X16, Y16, Empty 16points	B1/1 for all slots	Unnecessary	Unnecessary
Number of mountable master module		4 modules/CPU		Not limited (according to CPU)	Not limited (according to CPU)
Number of connectable slave modules		8 modules / master		4 modules / master	4 modules / master
Number of occupied channels in master		16	8	4	4
Number of I/O points	Input	I/O 256 points （free location）	Input 128 points	Input 64 points	Input 64 points
	Output		Output 128 points	Output 64 points	Output 64 points
Compression mode setting	Master	OFF	ON	OFF	OFF
	Slave	OFF	ON	ON	ON
Special internal outputs for remote function		Available (Note 1)	Available (Note 1)	Not available	Not available
Operation parameters for remote function		Not available	Not available	Not available	Not available
Reference section	Basic system	Section 4.3.1	—	Section 4.3.2	Section 4.3.2
	Replace of H-200	Section 4.4.1	Section 4.4.2	—	—
	Replace of large H	Section 4.5.1, 4.5.3, and 4.5.4	—	Section 4.5.2	Section 4.5.2
	Replace of EM	Section 4.6.1	Section 4.6.2		

(Note 1) Please refer to Section 6.2 for detail of special internal outputs for remote function

4.2 Basic functions of compact remote

4.2.1 Channels and remote I/O area

(1) Channels

The channel is the unit of transmitted and received data between master module (EH-TRMME) and slave module (EH-TRMLE). One channel consists from 16 bit (1 word) input area and 16 bit (1 word) output area as shown as Figure 4.1.

(2) Remote I/O area

The master module (EH-TRMME) and the slave module (EH-TRMLE) has remote I/O area consists from 16 channels (0 to F).

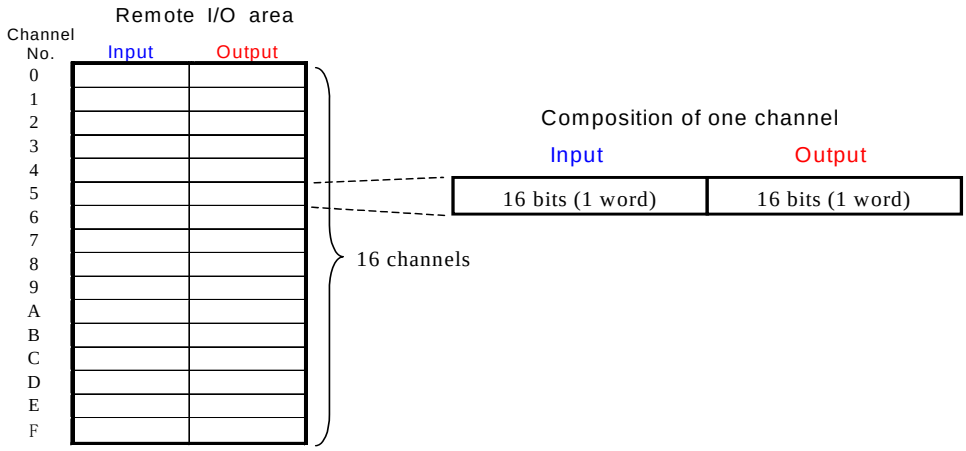


Figure 4.1 Composition of remote I/O area and one channel

4.2.2 Master number and slave station number

(1) Master number (Master No.)

Maximum four compact remote master modules (EH-TRMME) can be mounted on slots those slot number are 0 to 7 as shown as Figure 4.2 in the case of setting I/O assignment of master module “REMOTE 2”. In this case remote master number is sequentially allocated from one near CPU from 1 to 4. I/O No. on remote slave base are determined according to this master number. Please refer to Section 4.3.1 for I/O No. on remote slave base.

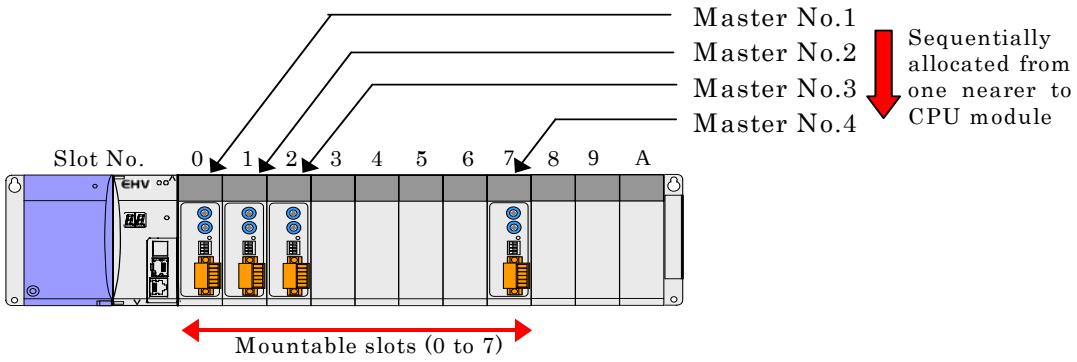


Figure 4.2 Mountable slots for master module and master number

(2) Slave station number (Slave St. No.)

Please set slave station number 0 to 7 to compact remote slave module (EH-TRMLE) with rotary switch (U) unlike old model slave module (RIOH-TL, RIOM-TL, etc) for the slave station identification.

In this case, please set not to overlap slave station number. "Slave station number" is abbreviated at the following, "Slave St. No.".

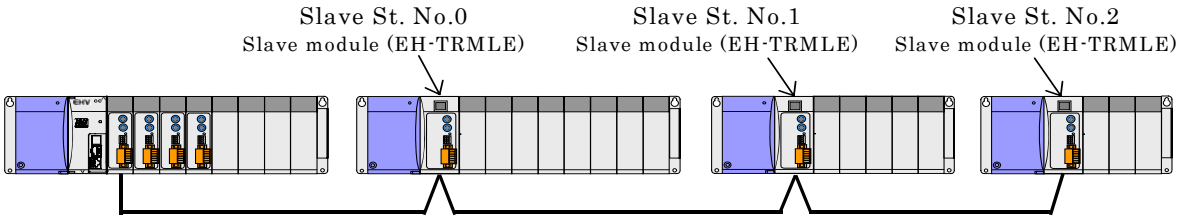


Figure 4.3 Slave station number (Slave St. No.)

4.2.3 Occupied channels and specification method

(1) Occupied channels

The area used respectively in compact remote master module (EH-TRMME) and slave module (EH-TRMLE) is called an occupied channels. Figure 4.4 shows the example of the occupied channels of one master and two slave stations. The number of occupied channels used in the slave module is decided according to the number of I/O modules mounted on the slave base. Moreover, the number of occupied channels of master module is matched to the total of the number of occupied channels of all slave modules. The occupied channels of slave modules not overlap between slave modules.

(2) Transmission range of remote communication

Occupied channels of master and slave are always refreshed to the same data by remote communication. Unused channels are not transmitted by remote communication. Therefore, the remote refresh time depends on the number of occupied channels of master module as the formula 4.2 to 4.3 in Section 4.8

(3) Specification method of occupied channels

Please set final channel number with side DIP switch for occupied channels of master module. And for occupied channels of slave module, please set first channel number with bottom DIP switch and occupied slots with front rotary switch (L). Please refer to Chapter 3 for details of each switch.

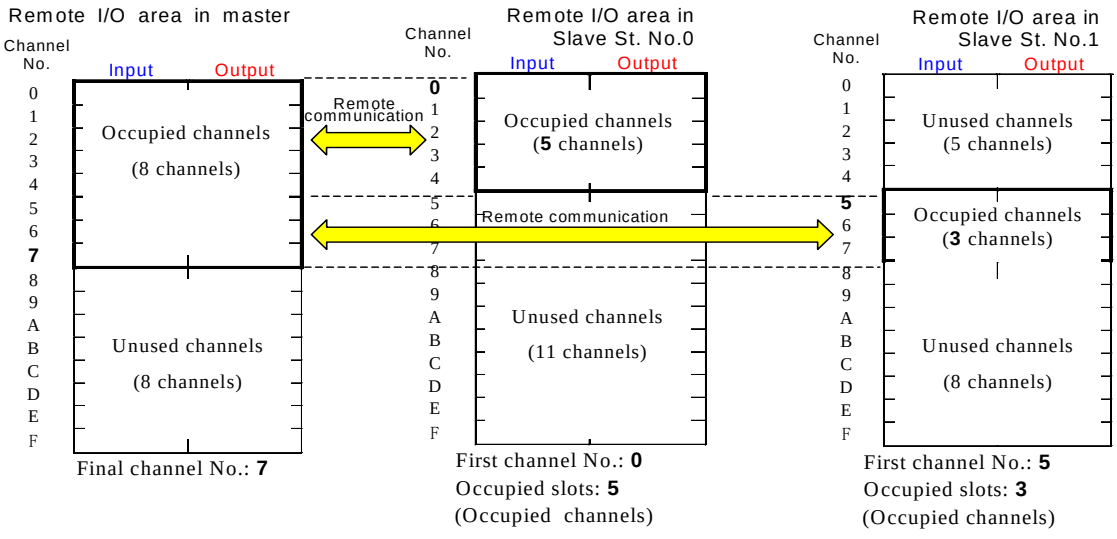


Figure 4.4 Occupied channels and remote communication

4.2.4 Correspondence of occupied channels and I/O slots (Normal remote method)

In the case of normal remote method I/O data are stored in occupied channels according to I/O assignment for remote base as showing in Figure 4.5. One channel corresponds to one slot because only either of them is used among I/O in one channel. It is allocated from the order with small channel number since slot No.0 of the slave base. Maximum 8 I/O modules can be mounted on the one slave base.

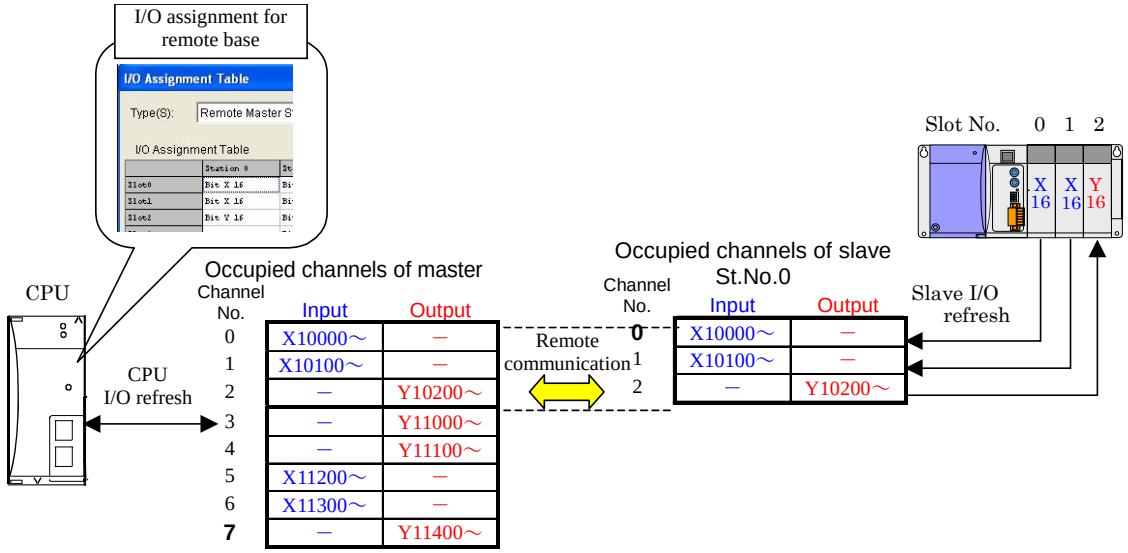


Figure 4.5 Correspondence of occupied channels and I/O slots

4.2.5 Compression mode of slave module (4W/4W method)

In the case of 4W/4W method CPU module stores I/O data in occupied channels of master module as shown in Figure 4.6. Data is stored in both the input and the output in one channel unlike a normal remote method. The compression mode of slave is a mode that compresses the data of the occupied slots and the image slots into half the occupied channels of the number of slots to correspond to this as shown in Figure 4.6. Therefore, you can use image slots of the same number as the occupied slots. It is allocated from the order with small channel number since slot No.0 of occupied slots of the slave base. It is allocated from the order with small channel number since slot No.2 of image slots of the slave base. Only input modules are mounted on the occupied slots, and only output modules are mounted on the image slots of slave base. The output module installed in the occupied slot doesn't operate.

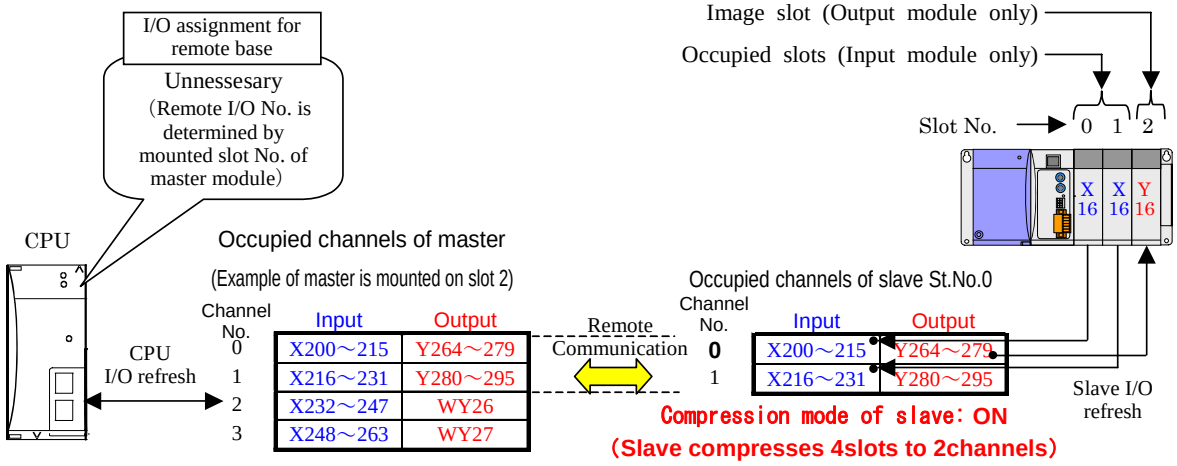


Figure 4.6 Correspondence of occupation channels and I/O slots in slave with compression mode (4W/4W method)

4.2.6 Compression mode of master module (Compression remote method)

In the case of old models H-200/250/252B/252C, input data and output data are stored in one channel by setting I/O assignment “B1/1” as shown in left side of Figure 4.7. But in the case of EH-150 (include EHV) series, input data and output data are stored in separate channel by setting I/O assignment “B1/1” as shown as right side of Figure 4.7. In order to replace old models to EH-150 with compatibility, you can set master module with compression mode, and can compress one word of input data and one word of output data into one channel as shown in Figure 4.8. You can replace old models to EH-150 (include EHV) with no change in I/O number for slot on slave base by setting master and slaves compression mode. Please refer to Section 4.4.2 for example of replacement with compression mode.

Similarly in the case of EM/EM-II series, there is a function that input data and output data are stored in one channel, and slave module outputs the output data to image slots. In this case it is convenient to setting compression mode as Section 4.6.2.

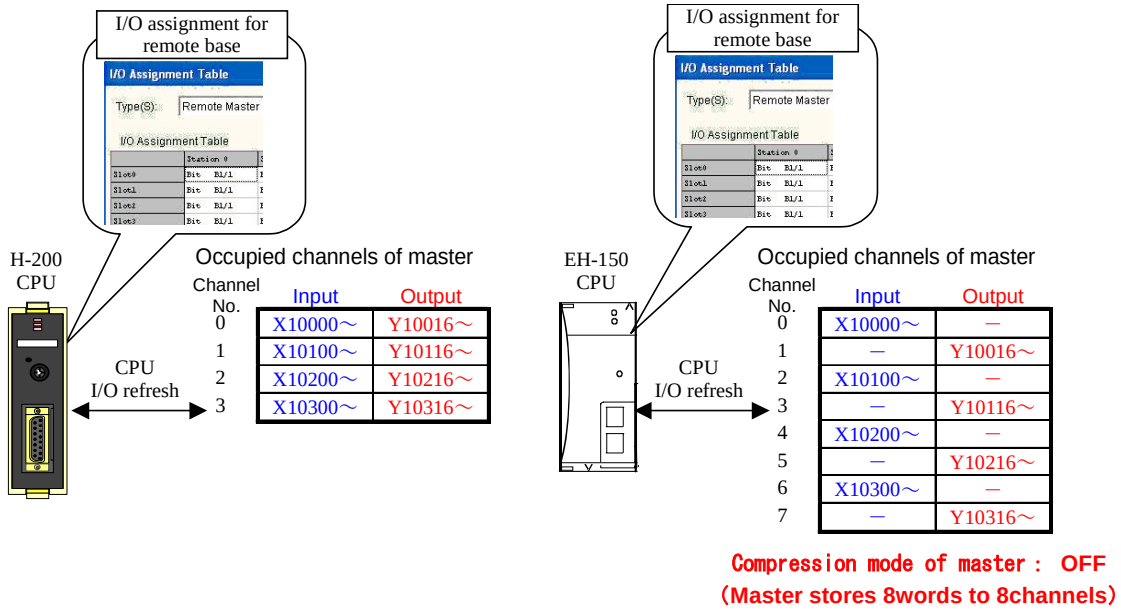


Figure 4.7 Difference point of H-200 and EH-150 in the case of assignment “B1/1” for remote base

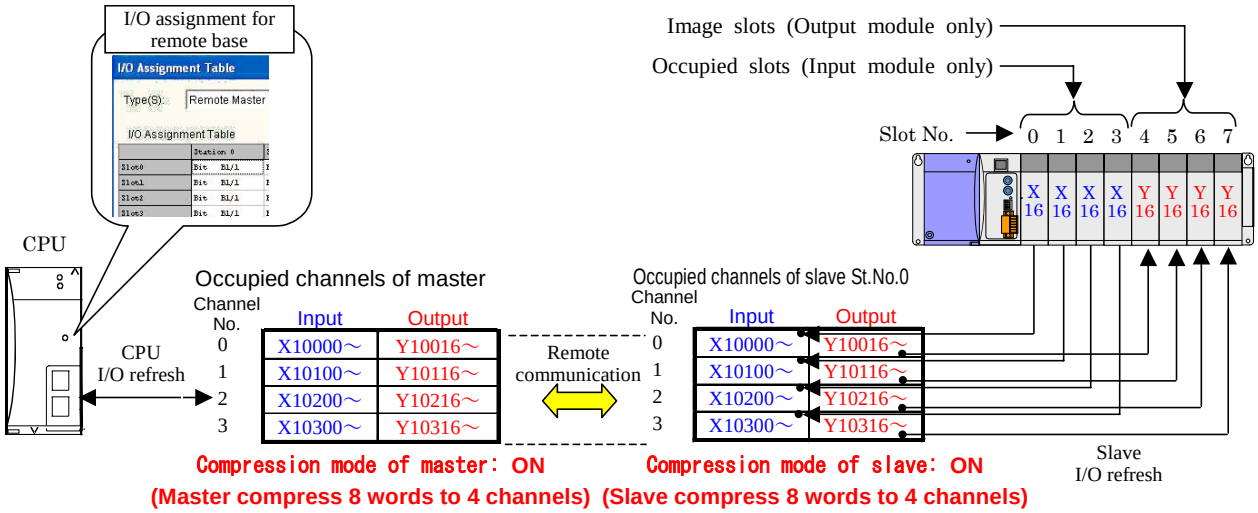


Figure 4.8 Correspondence of occupied channels and I/O slots (Compression remote method)

4.3 Basic system configuration

Basic system configurations consist from remote master module (EH-TRMME) and remote slave modules (EH-TRMLE) are shown in Section 4.3.1 and 4.3.2.

4.3.1 System configuration (Normal remote method)

Typical system configuration example that I/O assignment of master module (EH-TRMME) is “Remote 2” is shown in Figure 4.9. The final channel number is abbreviated to “Final CH.”, and The first channel number is abbreviated to “First CH” in the following figures of setting for DIP switch.

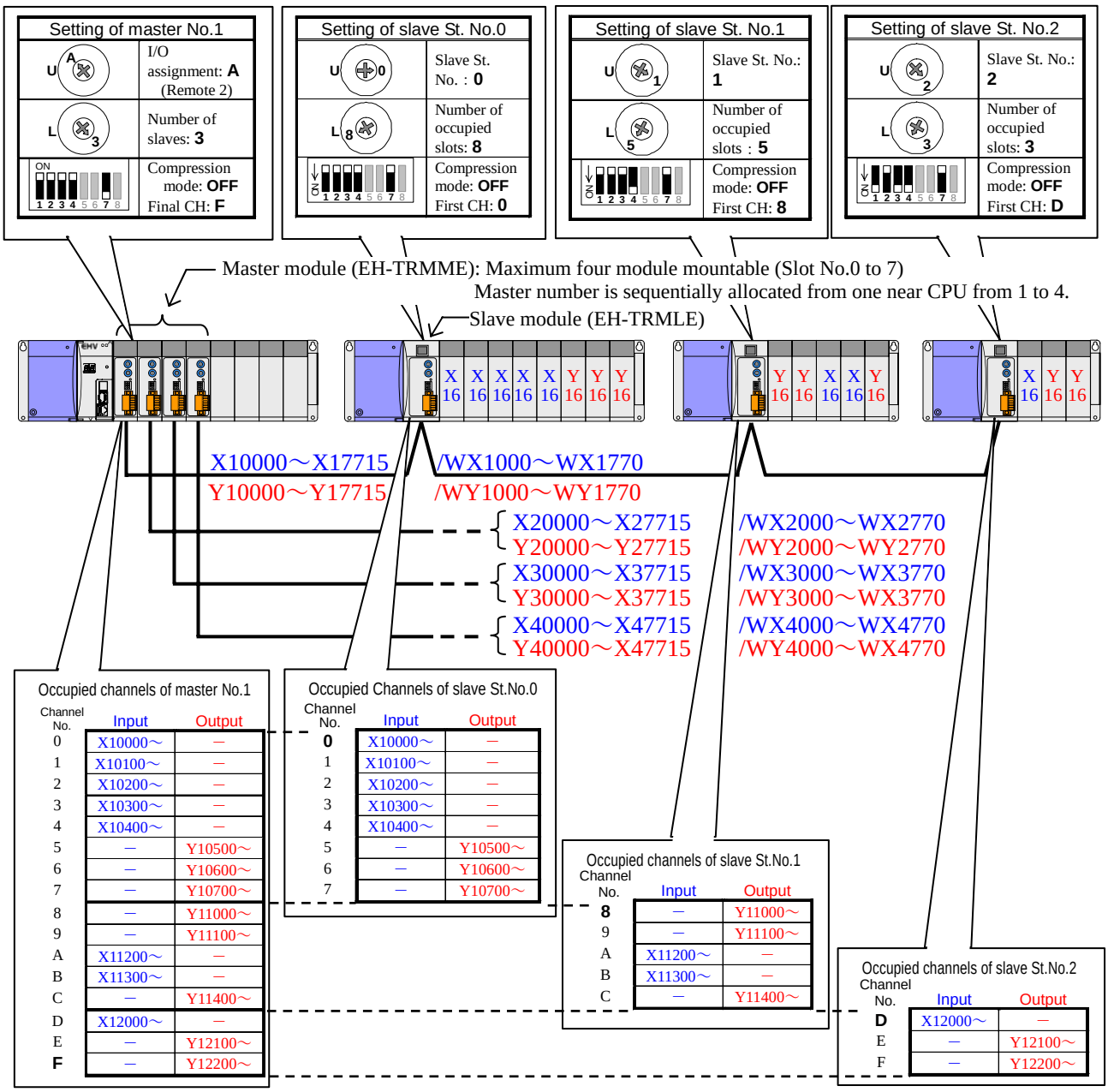


Figure 4.9 System configuration example-1 (I/O assignment of master: “Remote 2”)

[Explanations]

1) Master module (EH-TRMME) has remote I/O area of 16 channels (0 to F). Each channels corresponds to I/O slots (0 to 7) on remote slave bases according to remote I/O assignment as Figure 4.11.

2) Each channel consists from input area of 16 bits and output area of 16 bits. In the case of I/O assignment of master is “Remote 2”, either of input area or output area in one channel is used according to I/O assignment of the slot is “X16” or “Y16”.
3) One master module can communicate maximum 256points data with 16 channels between slave modules.
4) Maximum 8 slave modules can be connected to one master module. (Example of Figure4.9 is three slaves.)
5) Slave module must be mounted right side of power supply module.
6) Maximum 8 slots are available on slave base. You can only modules shown in Table2.5 on slave base.
7) Maximum 4 master modules can be used for one CPU. Master number is sequentially allocated from one near CPU from 1 to 4.
8) Master module is mountable on only slot that’s number is 0 to 7.
9) I/O number for I/O module on remote slave base are as follows.

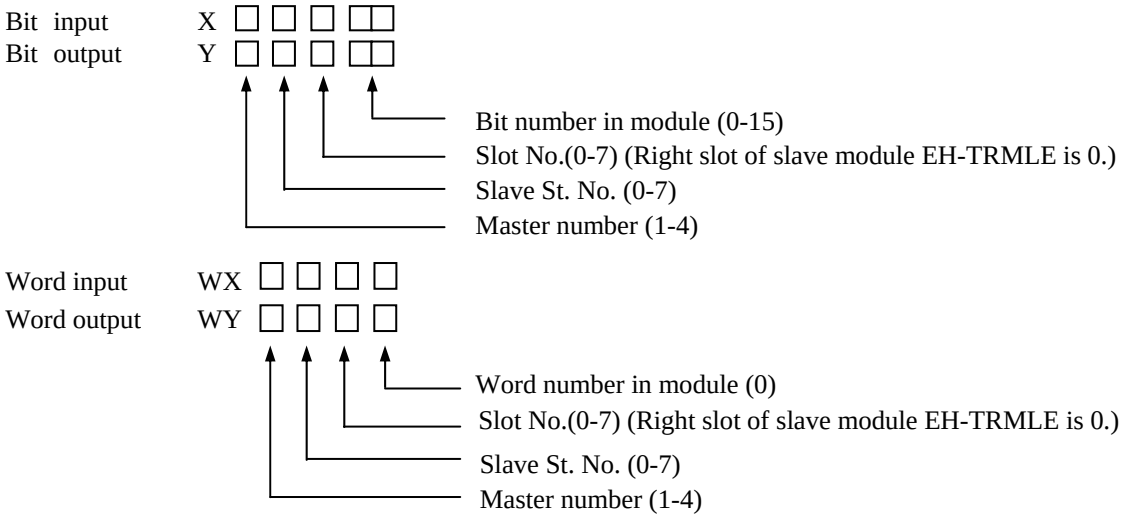


Figure 4.10 I/O number of I/O module on remote slave base

10) There are Rotary switches and DIP-switches on remote master module and slave module in order to set I/O assignment of master, slave St. No., and so on. Please refer to Section 3.1 and 3.2.
11) Set I/O assignment with programming software to CPU module. Please set I/O assignment for all slots one by one as Figure 4.11 because compact remote system doesn’t support copy function of I/O assignment from mounted modules.

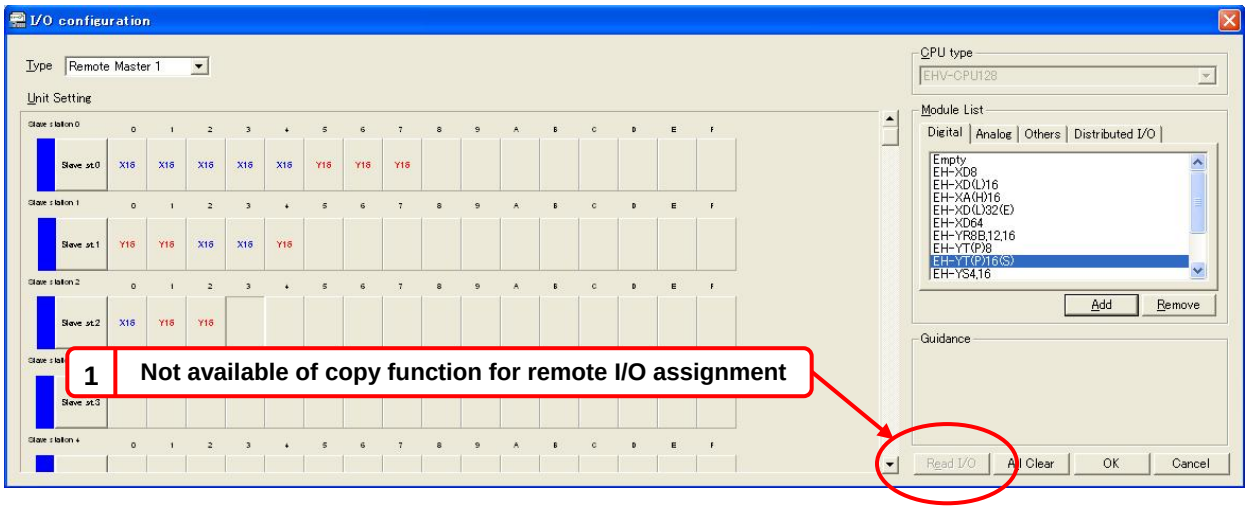


Figure 4.11 Example of I/O assignment for slave bases with Control editor (in system configuration example-1)

12) In the case of EHV, Please set “X16” or “Y16” for I/O assignment of dummy module. If you set “Empty” for I/O assignment of dummy module, slot numbers of right side of dummy module become wrong.

4.3.2 System configuration (4W/4W method)

Typical system configuration example that I/O assignment of master module (EH-TRMME) is “Word 4W/4W” (“X4Y4W” in Control editor) is shown in Figure 4.12.

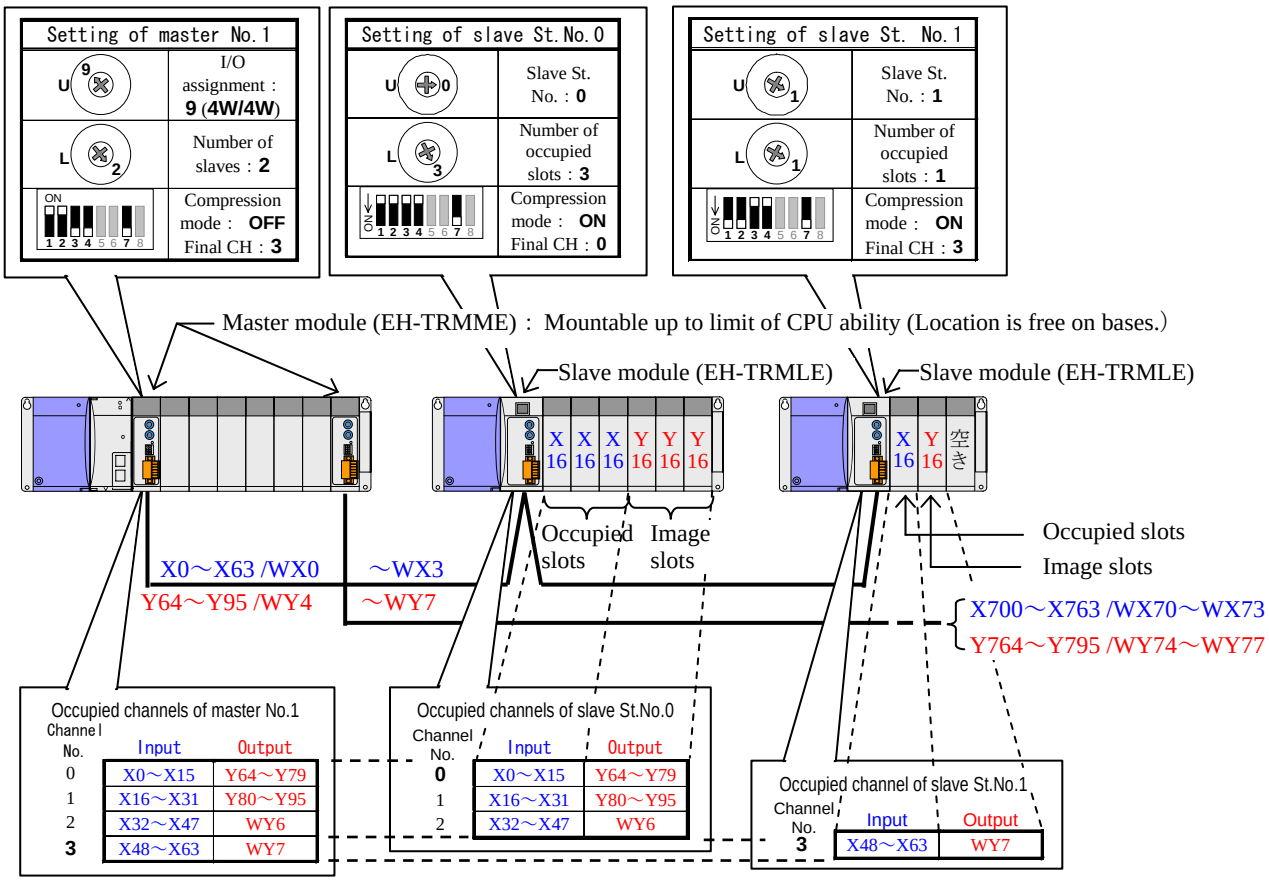


Figure 4.12 System configuration example-1 (I/O assignment of master: “Word 4W/4W”)

[Explanations]

1) Master module (EH-TRMME) has 4 channels for remote I/O area (0 to 3).
2) One channel consists from 16 bit (1 word) input area and 16 bit (1 word) output area. In the case of I/O assignment for master module is “Word 4W/4W”, I/O number of slot that master module mounted is assigned to each channel as shown as Figure 4.12.
3) One master module can communicate maximum 128points data with 4 channels between slave modules.
4) Set compression mode of slave module ON, and you can use the same number of image slots as occupied slots. Occupied slots are mountable with only input modules, and image slots are mountable with only output modules. We will recommend an empty slot to mount the dummy module (EH-DUM) to prevent dust. You can mount modules as shown in Table 2.5 on slave base.
5) Maximum 4 slave modules can be connected to one master module. (Example of Figure4.12 is two slaves.)
6) Slave module must be mounted right side of power supply module.
7) Master modules are mountable to limit of CPU ability.
8) Master module is mountable on any slot on basic base and expansion bases.

9) I/O numbers of I/O module on remote slave base are as follows. CPU accesses master module as not remote module but as I/O module because I/O assignment of master is “Word 4W/4W”. So, I/O number for I/O module on remote slave base becomes the I/O number of slot mounted master module.

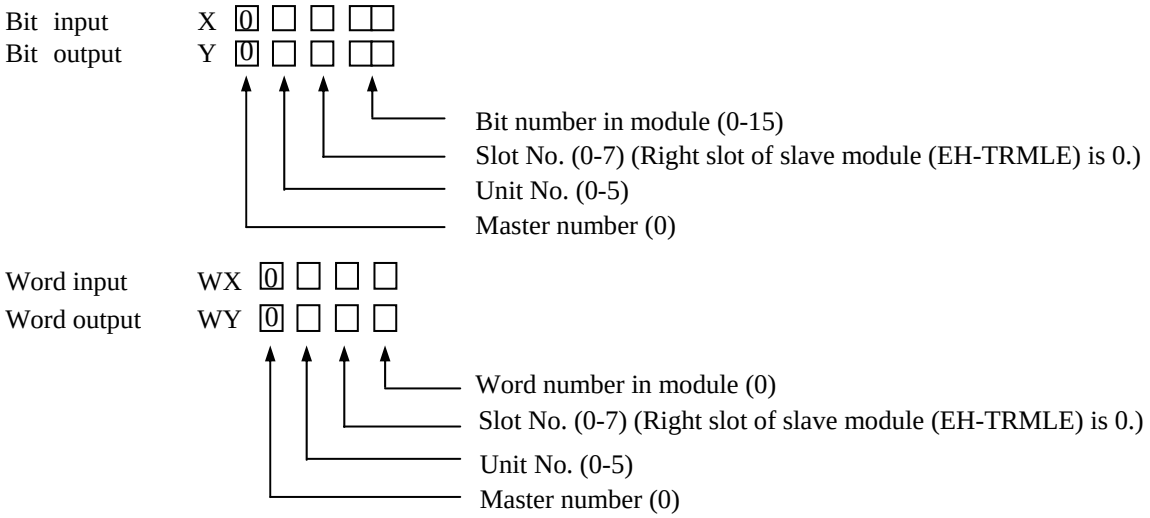


Figure 4.13 I/O number of I/O module on remote slave base (I/O assignment for master: “Word 4W/4W”)

10) Bit number in module is from 0 to 95. Therefore, please use the word number such as WY6 and WY7 in Figure 4.12 for the number that exceeds 95. In the case of using these No. as coil or contact in ladder program, Please use internal output like as M/WM temporarily and transfer these data to external output later as shown in Figure 4.14.

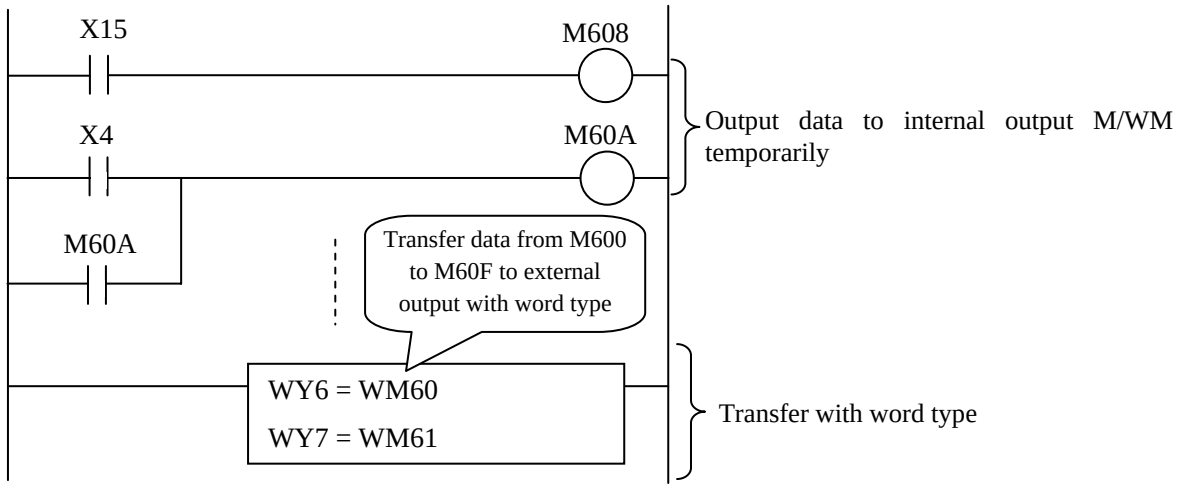


Figure 4.14 Sample program with bit I/O numbers that exceed 95

11) There are Rotary switches and DIP-switches on remote master module and slave module in order to set I/O assignment of master, slave St. No., and so on. Please refer to Section 3.1 and 3.2.

12) You cannot use operation parameters for remote module and remote error flag area in internal output when I/O assignment of master is “Word 4W/4W”.

4.4 Replacement from H-200/250/252B/252C

This remote module has communication-compatibility with remote I/O for H-200/250/252B/252C, you can use an existing cable in replacement. But there are differences with lineup of I/O modules, specifications, dimensions, I/O assignment, and support of commands, please consider these differences in replacement.

And you must set compression mode according to usage of image slots in H-200/250/252B/252C.

It explains around the content concerning the replacement of a remote system as follows.

4.4.1 Replacement with normal remote method

Figure 4.15 shows the system configuration example of the H-200 series using no image slot. Figure 4.16 shows I/O assignment for remote bases of this system. Figure 4.17 shows the replaced system configuration example of the EH-150 series. In this case, it is necessary to change I/O assignment for master module from "Remote" to "Remote 2".

Figure 4.17 is an example of replacing all of master and slave modules with the EH-150 series. It is also possible to leave all or partially slave modules like the H-200 series in order to postpone the wiring work of slaves. In this case, please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules.

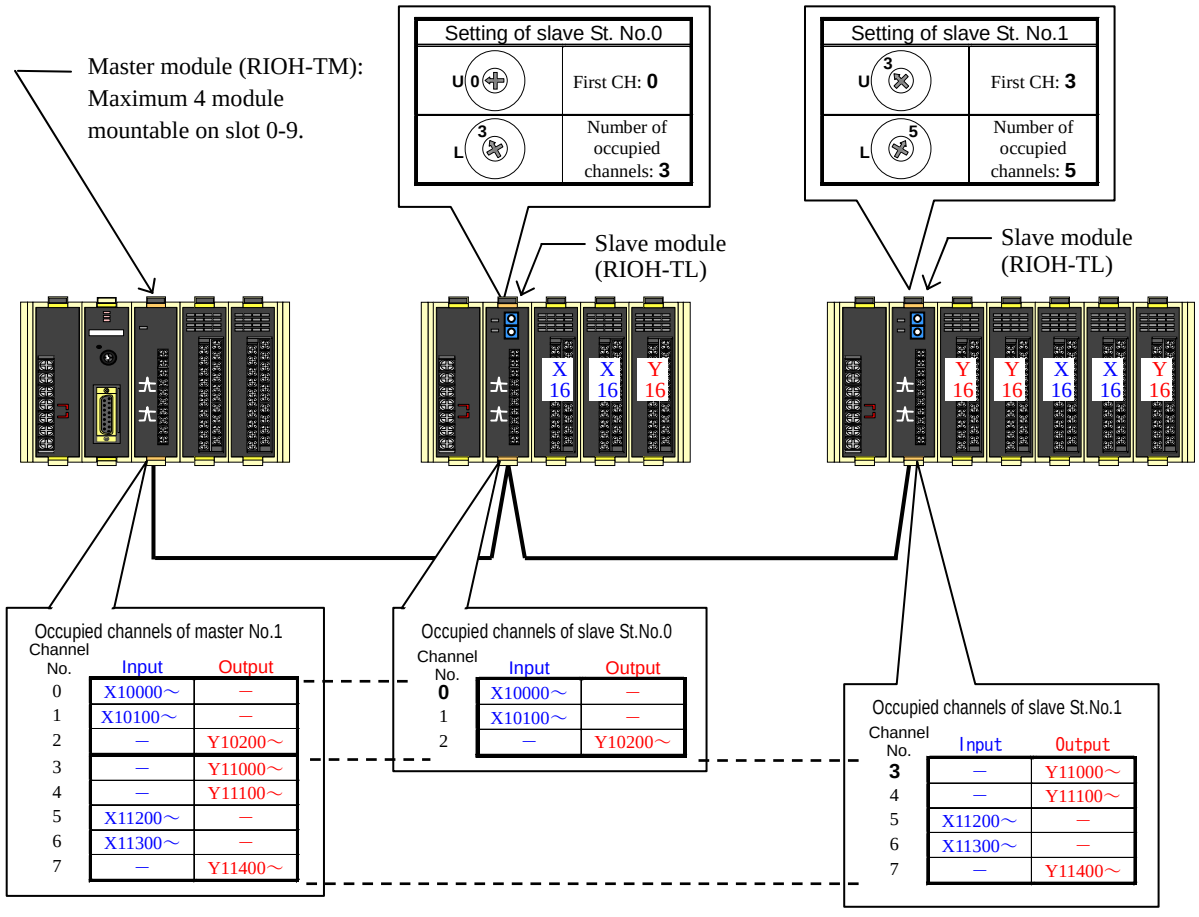


Figure 4.15 System configuration example-3 of the H-200 series (Not using image slot)

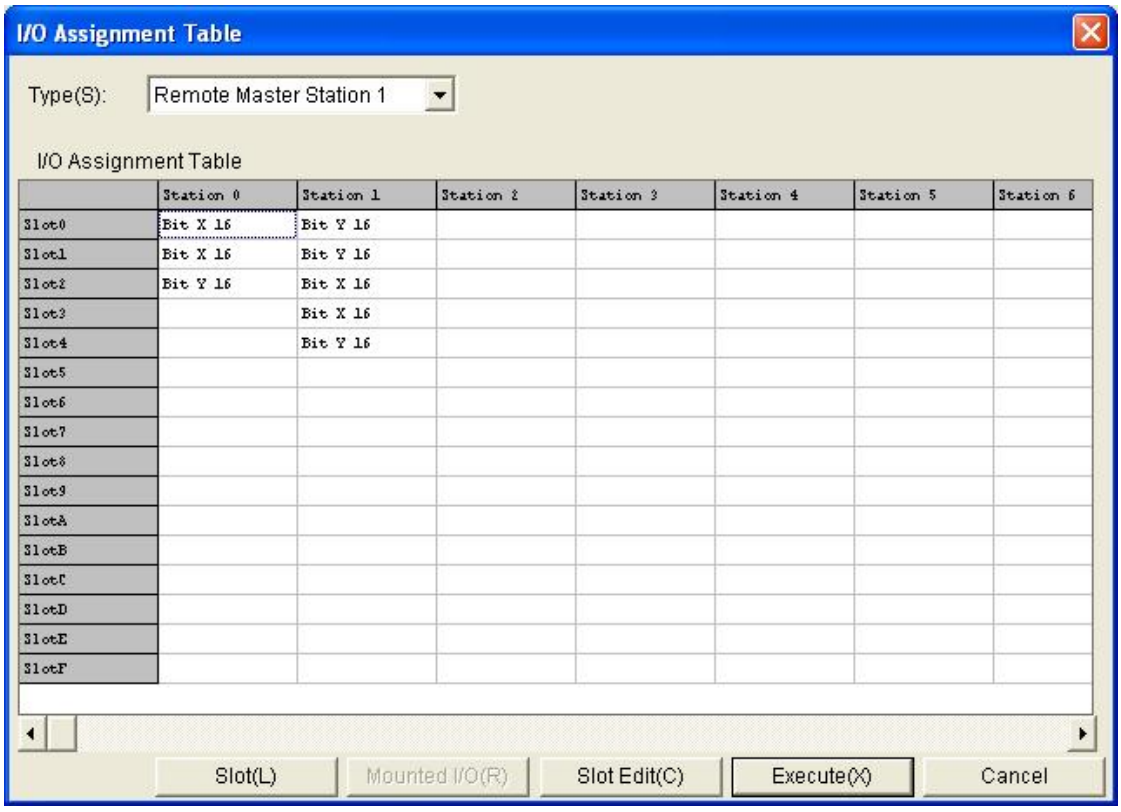


Figure 4.16 Example of I/O assignment for slave bases (with Ladder editor in system configuration example-3)

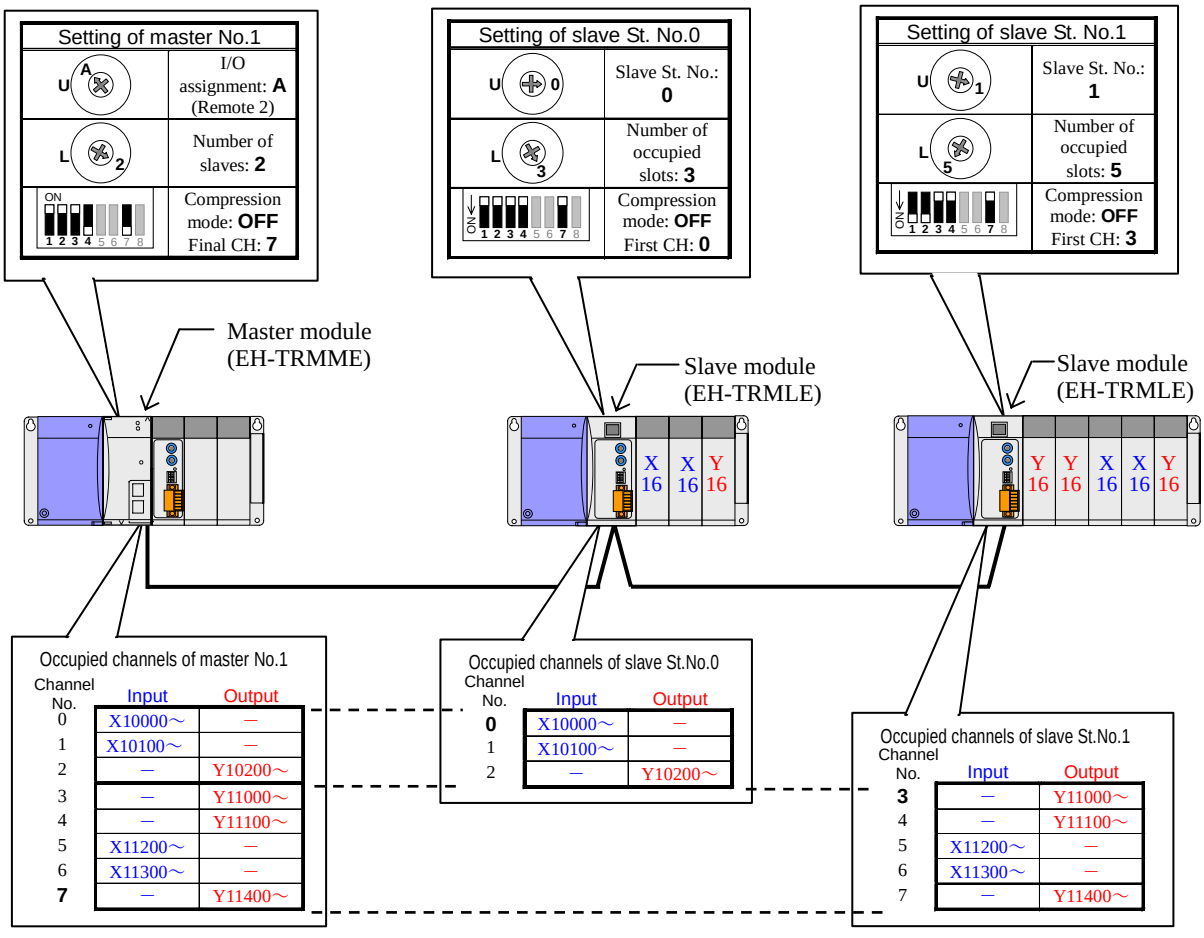


Figure 4.17 Replaced system configuration example-4 of the EH-150 (Not using image slot)

4.4.2 Replacement with compression remote method

In the case of H-200/250/252B/252C series, you can use the same number of image slots as occupied channels by setting I/O assignment “B1/1” for all I/O modules on remote bases. Therefore you can mount I/O modules twice the number of occupied slots.

This system configuration example is shown in Figure 4.18. I/O assignment of this system is shown in Figure 4.19. Figure 4.20 shows the system configuration example replaced to EH-150.

In this case, it is necessary to change I/O assignment for master module from "Remote" to "Remote 2", too.

And make sure to set compression mode of master and slave modules ON with front DIP switch.

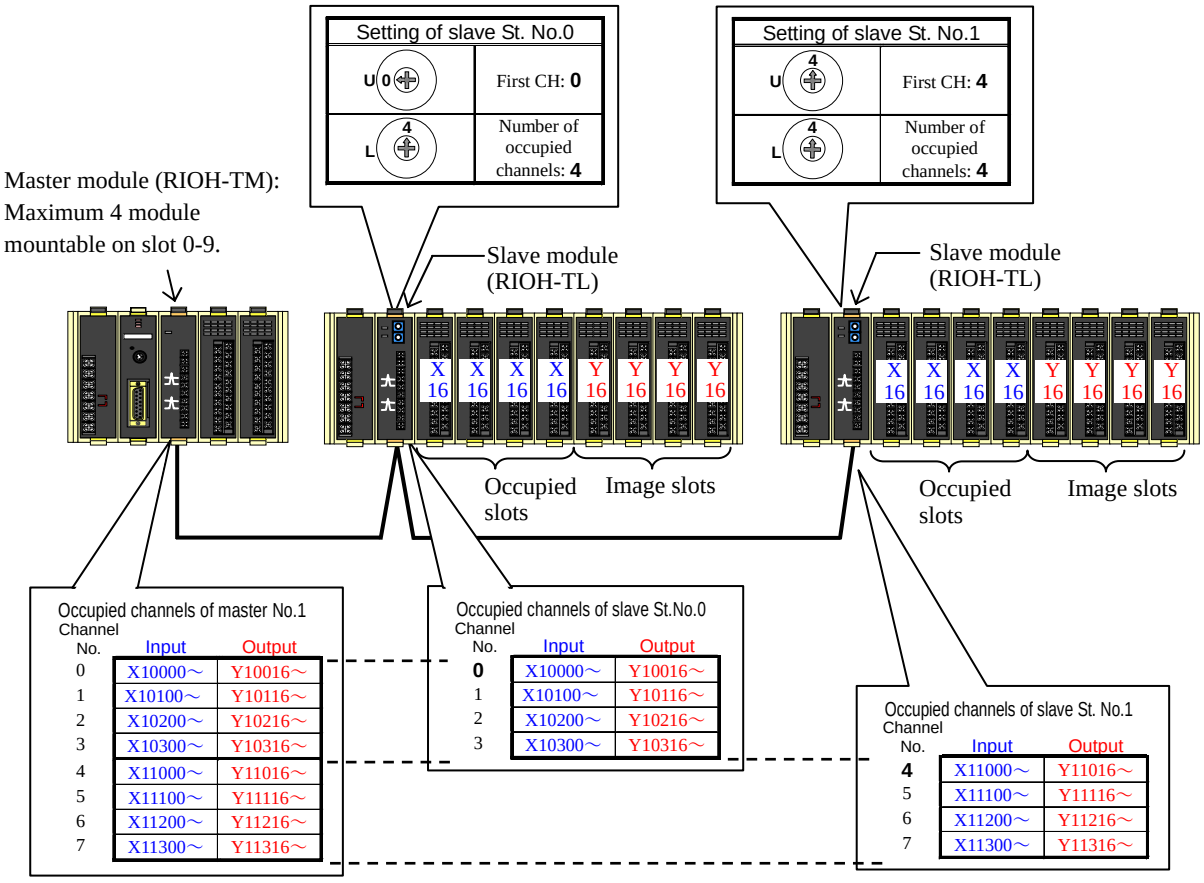


Figure 4.18 System configuration example-5 of the H-200 series (Using image slots)

Only input modules are mountable on occupied slots of slave base, and only output modules are mountable on image slots normally. But in the case of the number of output modules is more than number of input modules for H-200/250/252B/252C series, output modules can be mounted in occupied slots as shown as Figure 4.40 in order to exclude empty slot.

If you replace this system to EH-150 series with compression remote method, output modules on occupied slots don’t operate normally. Please use normal remote method for this case, and change I/O assignment for I/O modules on remote base from “B1/1” to “X16” or “Y16”, and change related I/O numbers in program.

Figure 4.20 is an example of replacing all of master and slave modules with the EH-150 series. It is also possible to leave all or partially slave modules like the H-200 series in order to postpone the wiring work of slaves. In this case, please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules.

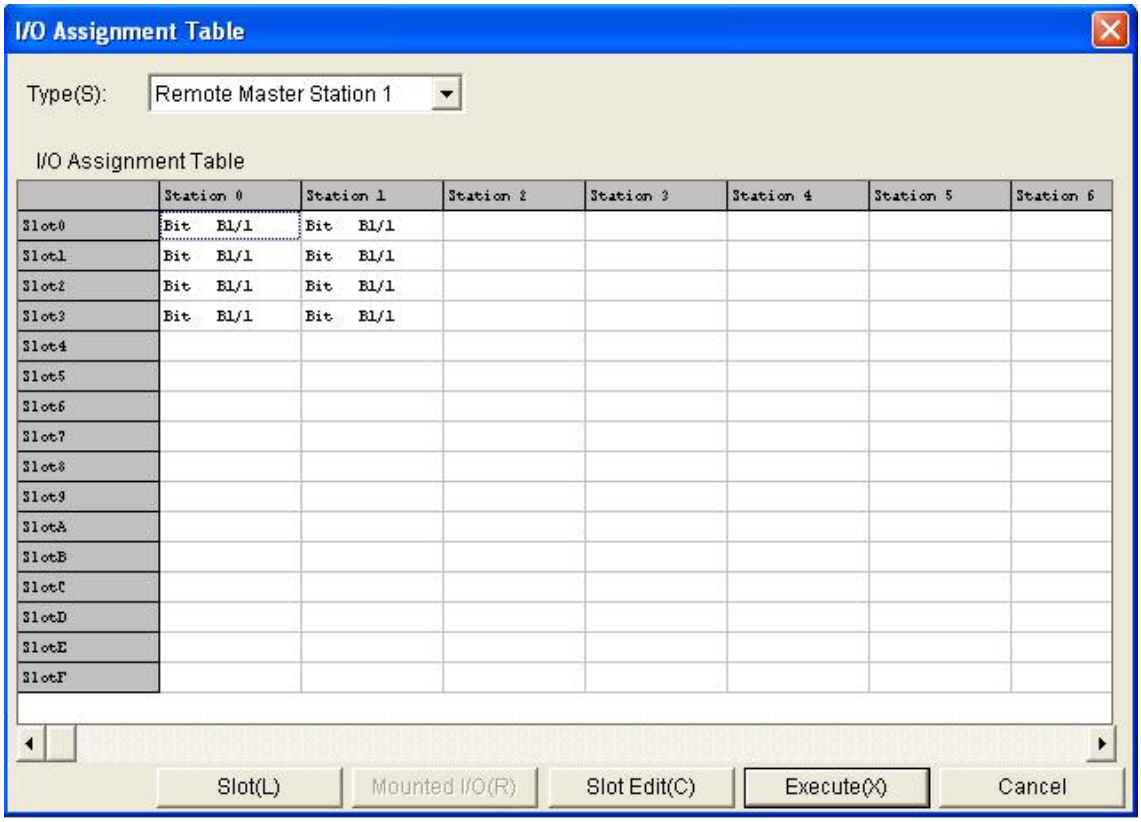


Figure 4.19 Example of I/O assignment for slave bases (with Ladder editor in system configuration example-5)

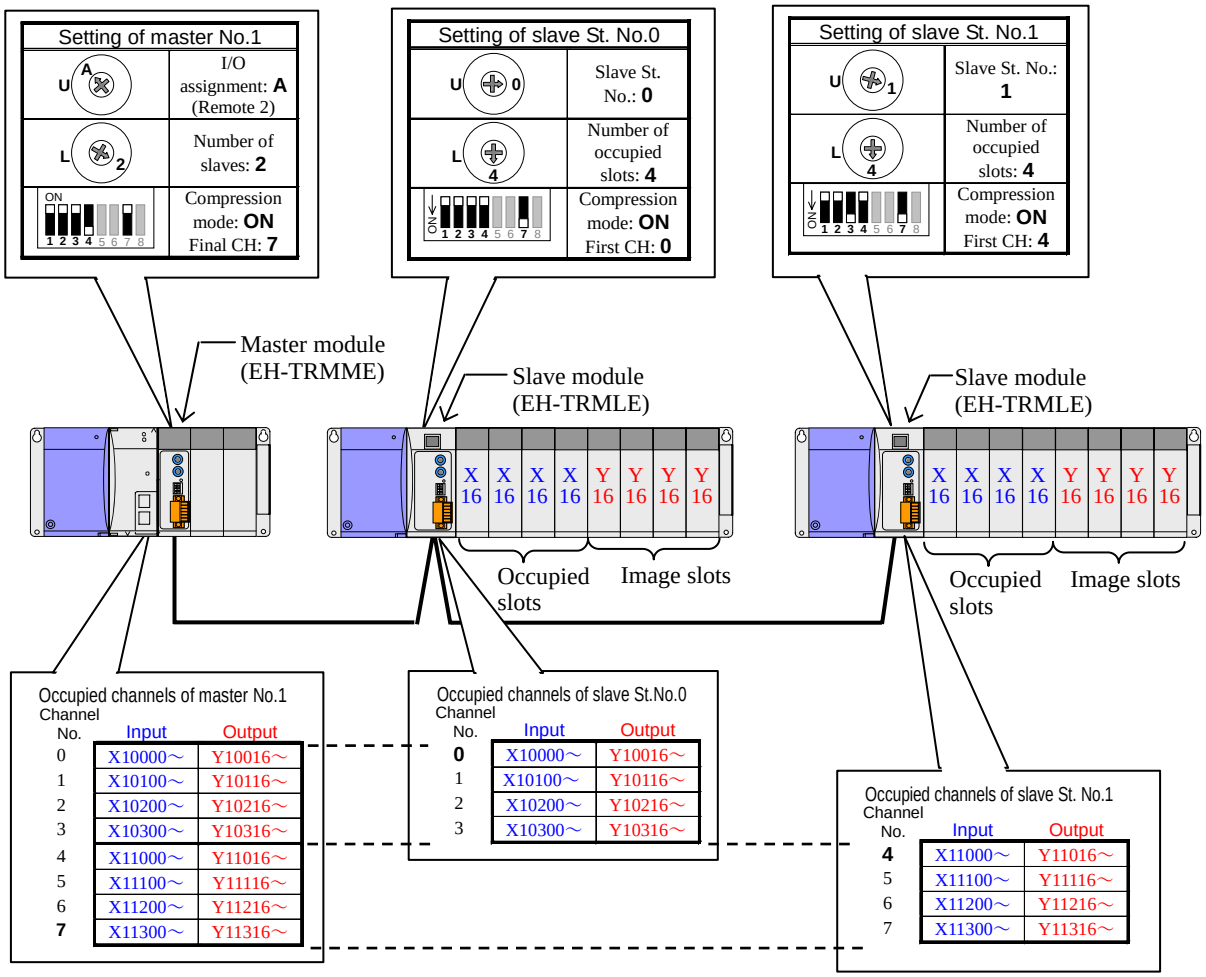


Figure 4.20 Replaced system configuration example-6 of the EH-150 (Using image slot)

4.5 Replacement from Remote I/O MINI of Large H series

Table 4.2 shows the outline of replacement from Remote I/O MINI of Large H series to compact remote of EH-150 series. According to operating mode (0 to 3) of master module (REM-MMH), Please set I/O assignments for master and I/O modules on slave bases in replaced compact remote system as shown as Table 4.2.

When the number of mounting slots exceeds 16 and connected number of the slave stations exceeds 8, it is not possible to replace compact remote system and examine the replacement with optical remote system and so on.

Moreover there is no communication modules that communicate between CPU and remote system like Remote I/O MINI slave (REM-LMH) and H-200 slave (REM-LH2). So, examine replacement with CPU linkage modules (EH-LNK, EH-OLNK) in this case.

Table 4.2 Replacement from Remote I/O MINI

Remote I/O MINI (Master: REM-MMH)					Compact remote (Master: EH-TRMME)			
Operating mode of master	I/O assignment of master	I/O assignment of slave	Maximum number of I/O slots	Maximum number of slaves	I/O assignment of master	I/O assignment of slave	Maximum number of I/O slots	Final channel of master
Mode-0	Word 4W/4W	Unnecessary	16	8	Remote 2	X16, Y16, Empty16	16	F
			17 to 44	9 to 12	Not applicable (Replace with optical remote and so on)			
Mode-1	Word Y8W	Unnecessary	8	8	Remote 2	Y16, Empty 16	8	7
Mode-2	Word 4W/4W	Unnecessary	8	8	Word 4W/4W	Unnecessary	8	3
Mode-3	Word X8W	Unnecessary	8	8	Remote 2	X16, Empty 16	8	7

4.5.1 Replacement from Remote I/O MINI with mode-1

Mode-1 of remote I/O MINI is a mode that uses the remote output 128 points. Figure 4.21 shows the system configuration example of Remote I/O MINI with mode-1 for H-300/700/2000/302/702/1002/2002/4010.

Figure 4.22 shows replaced system configuration example with compact remote.

In this case, it is necessary to change I/O assignment of master module from "Word Y8W" to "Remote 2".

Please set I/O assignment “Y16” for all output modules on slave bases, and change I/O numbers to its on remote slave bases in program by using I/O No. batch change function.

Master module (EH-TRMME) of replaced system must be mounted on slot from 0 to 7 of base unit because master module is treated as remote module. Moreover one CPU allows maximum 4 master modules in remote system, it is necessary to change I/O assignment of master module to “Word 4W/4W” to use the number exceeding 4 of master module per CPU. But in this case, it is necessary to make the number of output modules below 4 per master module.

Figure 4.22 is an example of replacing all of master and slave modules with the EH-150 series. It is also possible to leave all or partially slave modules like the H-200 series in order to postpone the wiring work of slaves. In this case, please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules.

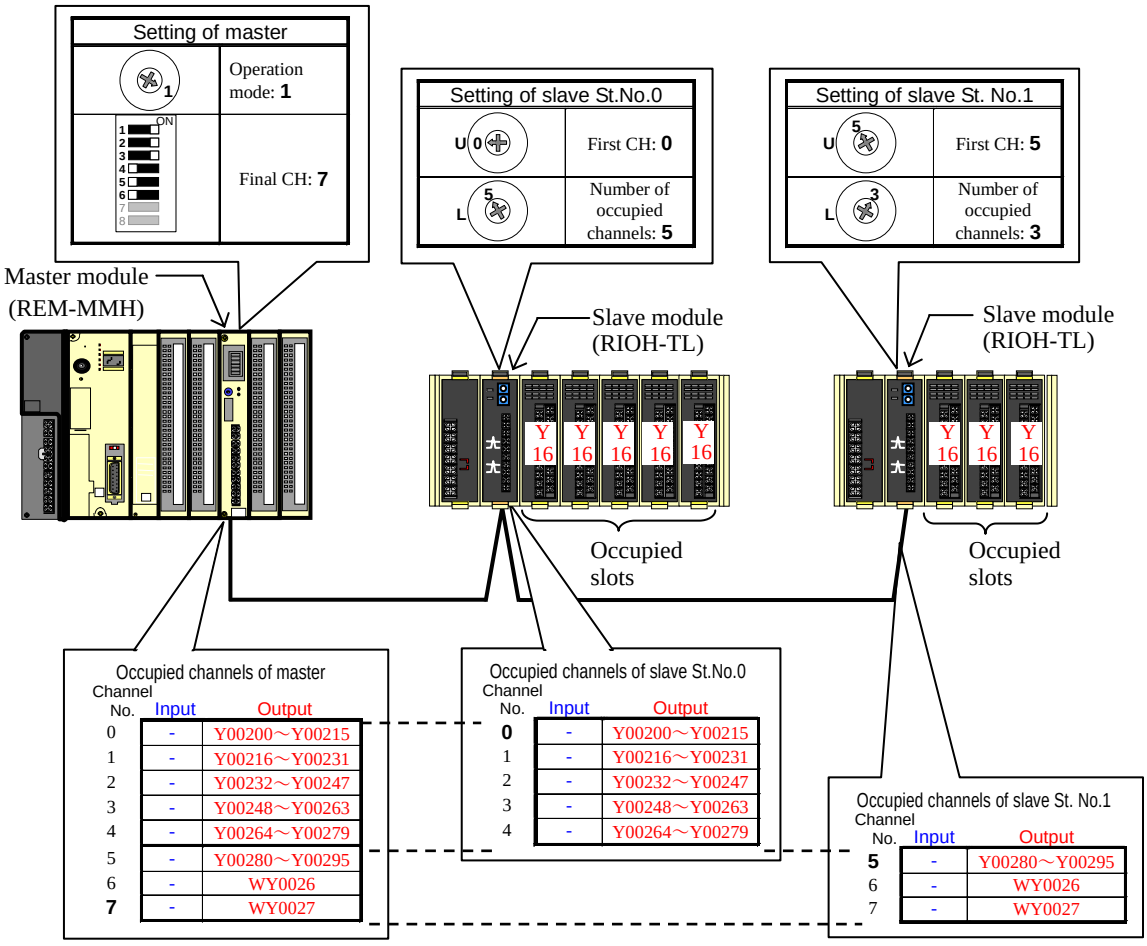


Figure 4.21 System configuration example-7 of Remote I/O MINI with mode-1

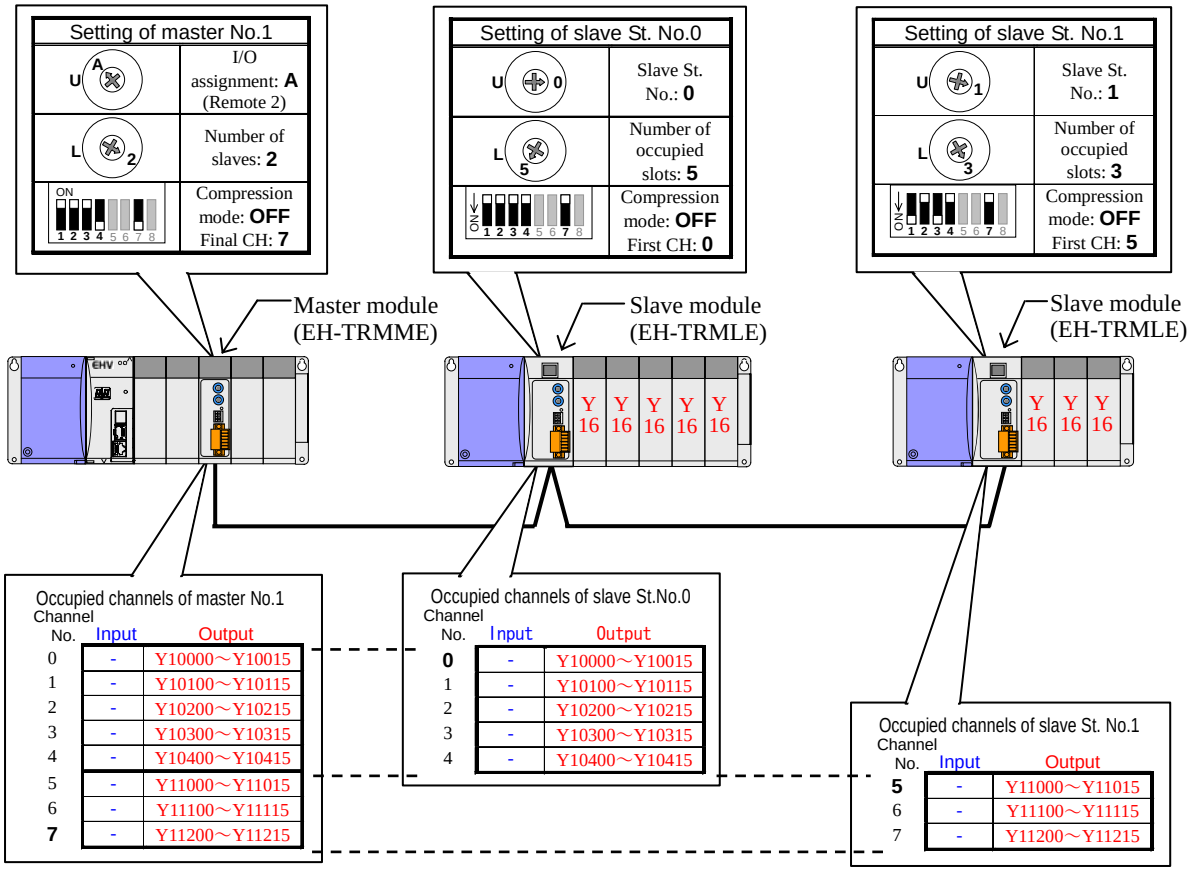


Figure 4.22 Replaced system configuration example-8 of the EH-150

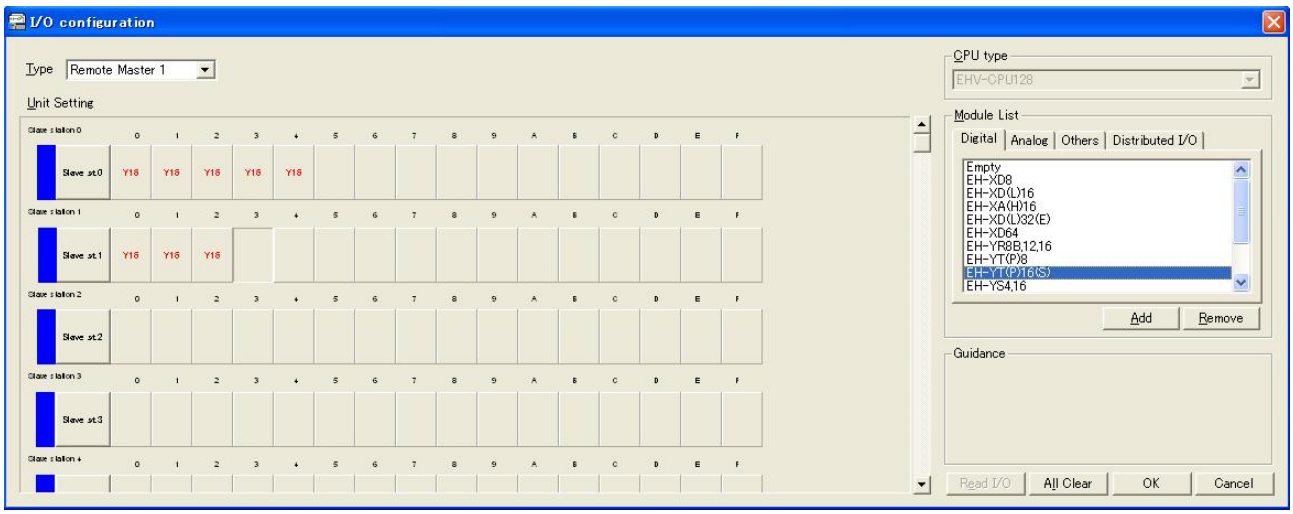


Figure 4.23 Example of I/O assignment for slave bases (with Control editor in system configuration example-8)

4.5.2 Replacement from Remote I/O MINI with mode-2

Mode-2 of remote I/O MINI is a mode that uses the remote input in 64 points and remote output in 64 points.

Figure 4.24 shows the system configuration example of Remote I/O MINI with mode-1 for Large H series.

Figure 4.25 shows replaced system configuration example with compact remote.

In this case, you need not change I/O assignment of master module from “Word 4W/4W”.

Moreover, when the slot number of master module is not changed, you need not change also I/O numbers in program. Master module is mountable on any slot on basic base and expansion bases because master module with I/O assignment “Word 4W/4W” is not treated as remote module. You can use the number of master modules up to ability of CPU by same reason.

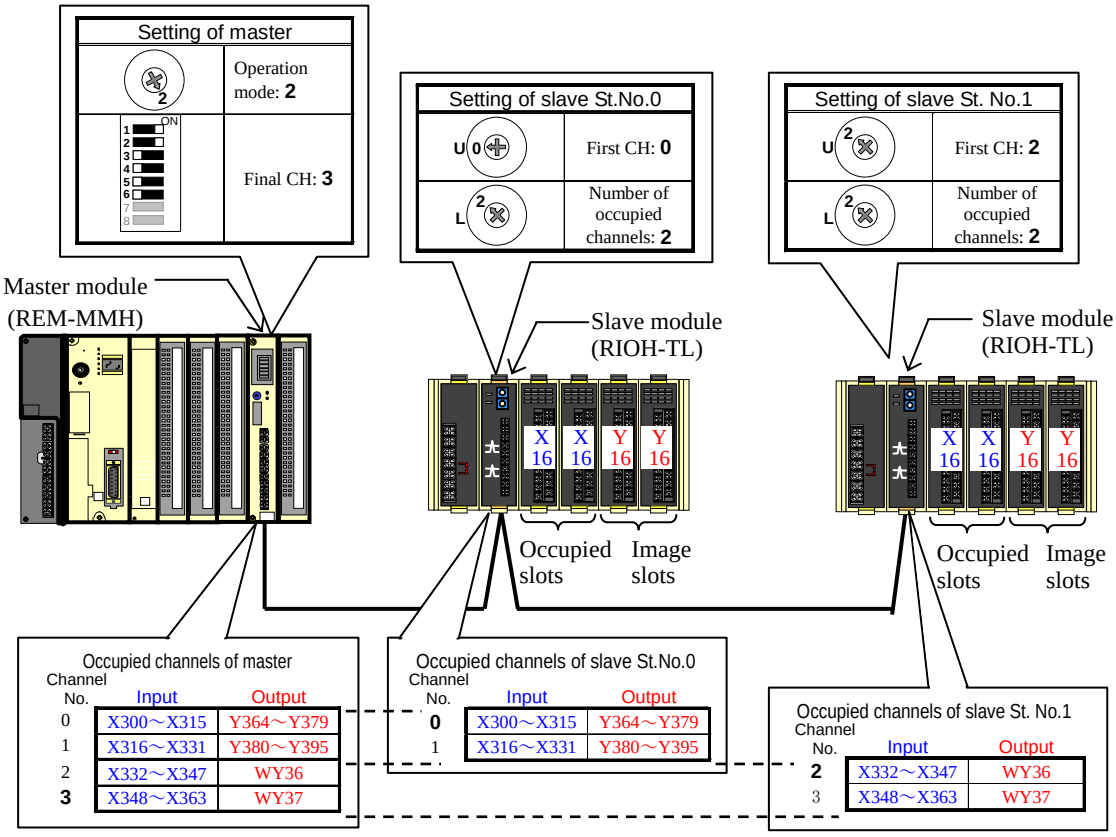


Figure 4.24 System configuration example-9 of Remote I/O MINI with mode-2

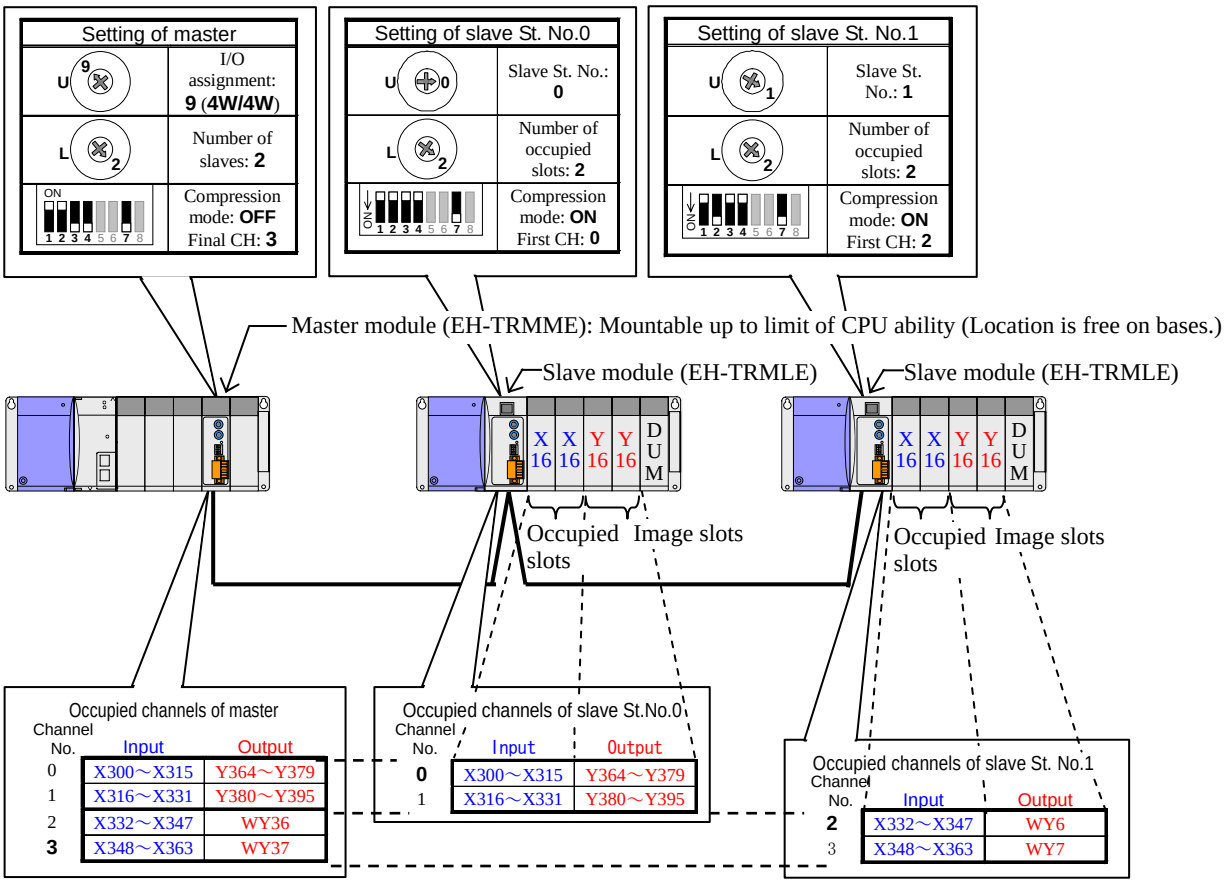


Figure 4.25 Replaced system configuration example-10 of the EH-150

In this case, you need not assign I/O assignment for I/O module on slave bases, because master module with I/O assignment “Word 4W/4W” is not treated as remote module.

Figure 4.25 is an example of replacing all of master and slave modules with the EH-150 series. It is also possible to leave all or partially slave modules like the H-200 series in order to postpone the wiring work of slaves. In this case, please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules.

4.5.3 Replacement from Remote I/O MINI with mode-3

Mode-3 of remote I/O MINI is a mode that uses the remote input in 128.

Figure 4.26 shows the system configuration example of Remote I/O MINI with mode-1 for Large H series.

Figure 4.28 shows replaced system configuration example with compact remote.

In this case, it is necessary to change I/O assignment of master module from "Word X8W" to "Remote 2".

Please set I/O assignment “X16” for all input modules on slave bases, and change I/O numbers to its on remote slave bases in program by using I/O No. batch change function.

Master module (EH-TRMME) of replaced system must be mounted on slot from 0 to 7 of base unit because master module is treated as remote module. Moreover one CPU allows maximum 4 master modules in remote system, it is necessary to change I/O assignment of master module to “Word 4W/4W” to use the number exceeding 4 of master module per CPU. But in this case, it is necessary to make the number of output modules below 4 per master module.

Figure 4.28 is an example of replacing all of master and slave modules with the EH-150 series. It is also possible to leave all or partially slave modules like the H-200 series in order to postpone the wiring work of slaves. In this case, please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules.

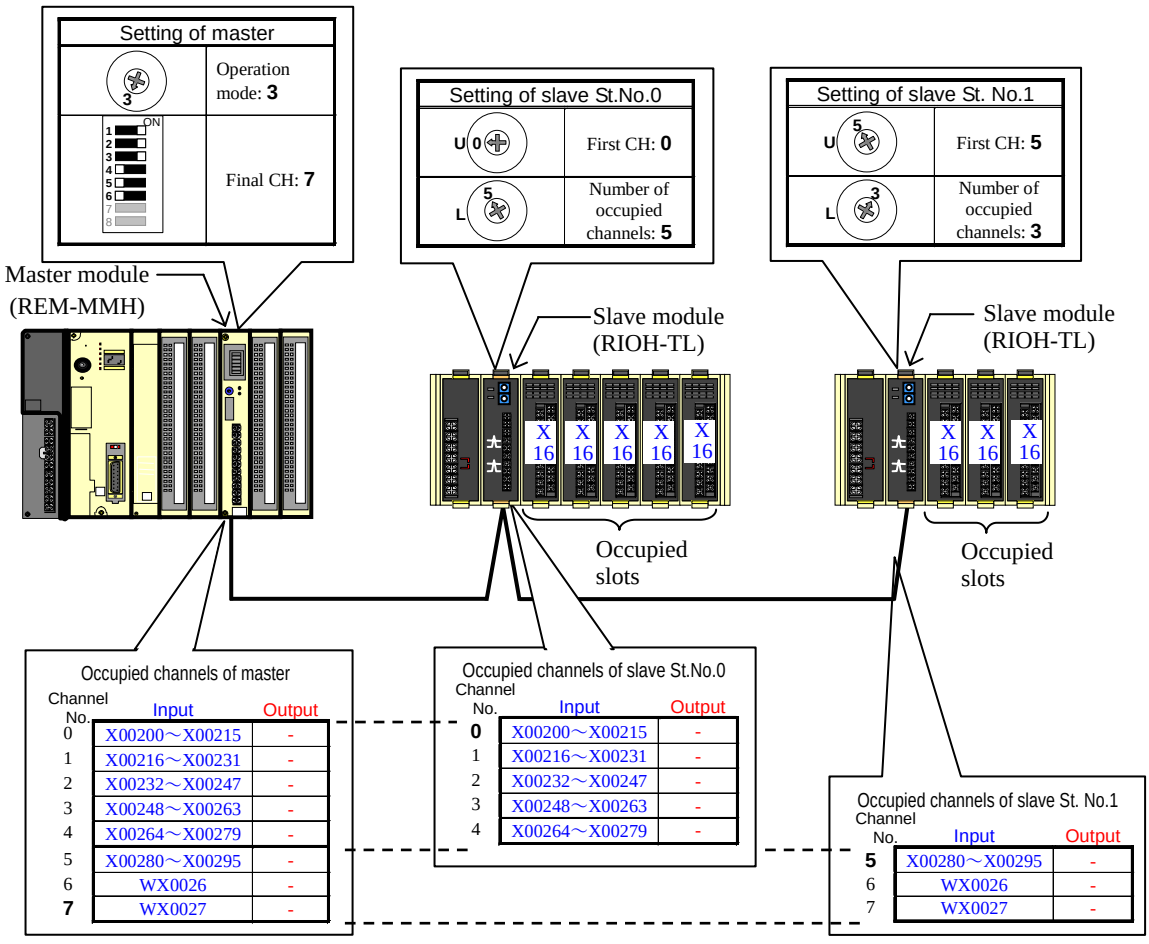


Figure 4.26 System configuration example-11 of Remote I/O MINI with mode-3

Figure 4.27 Example of I/O assignment for slave bases (with Control editor in system configuration example-12)

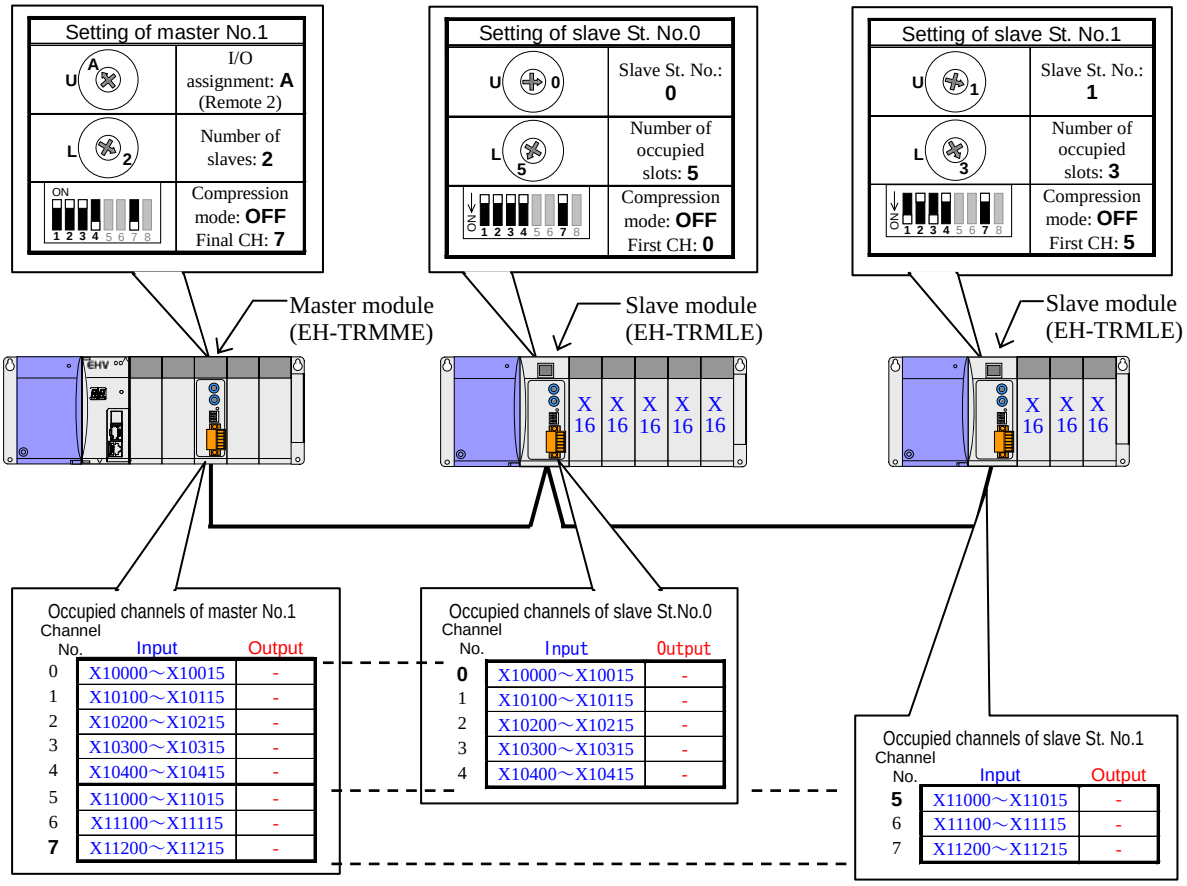


Figure 4.28 Replaced system configuration example-12 of the EH-150

4.5.4 Replacement from Remote I/O MINI with mode-0

Mode-0 of remote I/O MINI is a mode that uses the remote input in 352 points (704 points in the case of using image slots).

Transfer command (TRNS1, QTRNS1) or a handshake program was necessary in the ladder program for handing over the data Remote I/O MINI and CPU while a lot of remote I/O numbers were able to be used.

Figure 4.29 shows the system configuration example of Remote I/O MINI with mode-1 for Large H series.

Figure 4.31 shows replaced system configuration example with compact remote.

In this case, it is necessary to change I/O assignment of master module from "Word 4W/4W" to "Remote 2".

Please set I/O assignment “X16”, “Y16” for all input modules and output modules on slave bases as shown in Figure 4.30, and change I/O numbers in program from internal outputs for communication area to remote I/O numbers on remote slave bases by using I/O No. batch change function.

In the case of replaced compact remote system, it is not necessary to use transfer command (TRNS1, QTRNS1) or handshake program, but you can use remote I/O numbers directly in ladder program. Please delete these transfer command or handshake program for normal operation of compact remote system.

Figure 4.31 is an example of replacing all of master and slave modules with the EH-150 series. It is also possible to leave all or partially slave modules like the H-200 series in order to postpone the wiring work of slaves. In this case, please set the same value of first channel number and number of occupied channels with Figure 4.31, and please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules.

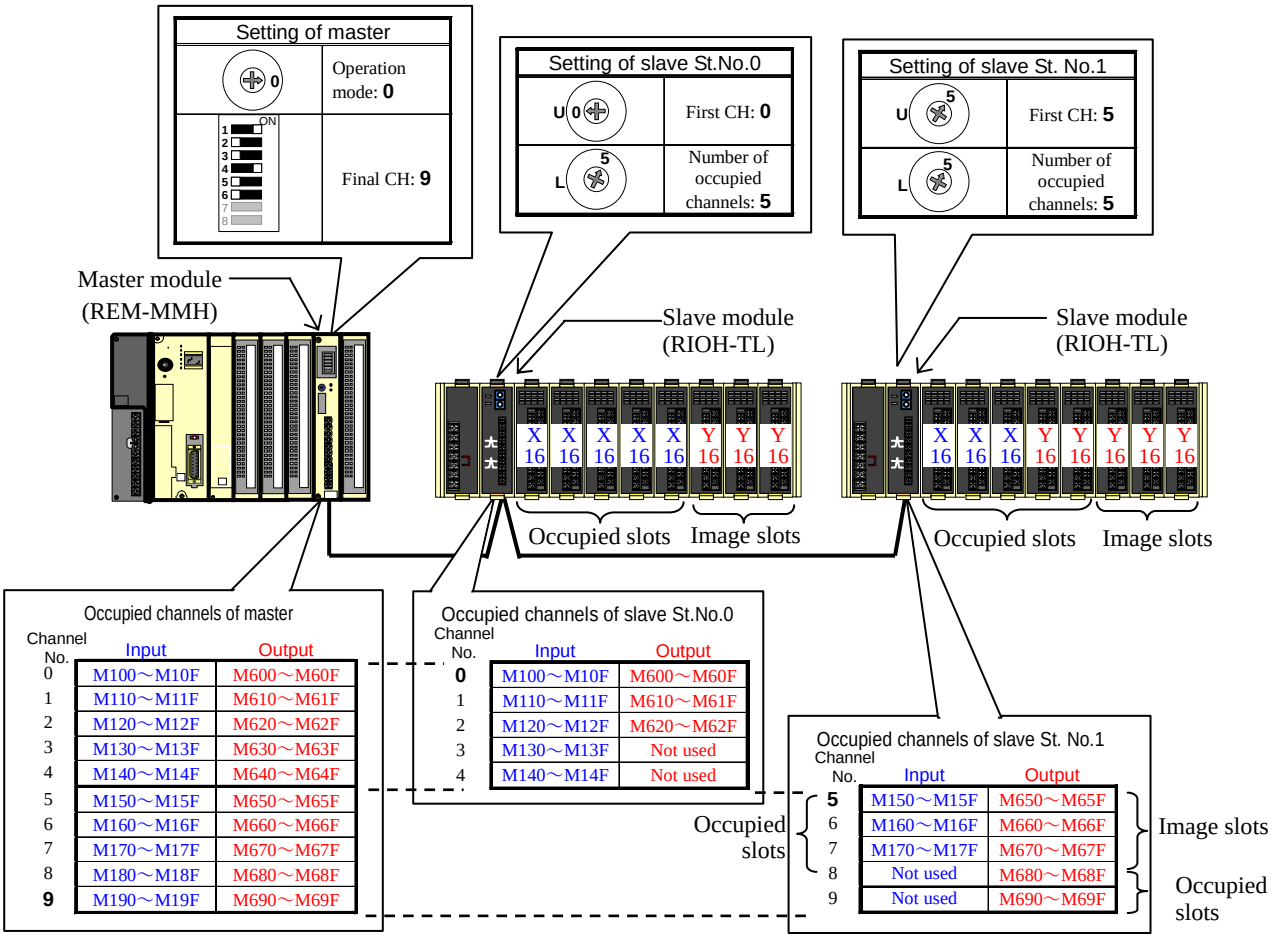


Figure 4.29 System configuration example-13 of Remote I/O MINI with mode-0

Remote I/O MINI master module is mountable on any slot on basic base and expansion bases because I/O assignment of master module is “Word 4W/4W”. But compact remote master module is mountable on only slots 0 to 7 on basic base because I/O assignment of master is “REMOTE 2”.

Figure 4.30 Example of I/O assignment for slave bases (with Control editor in system configuration example-14)

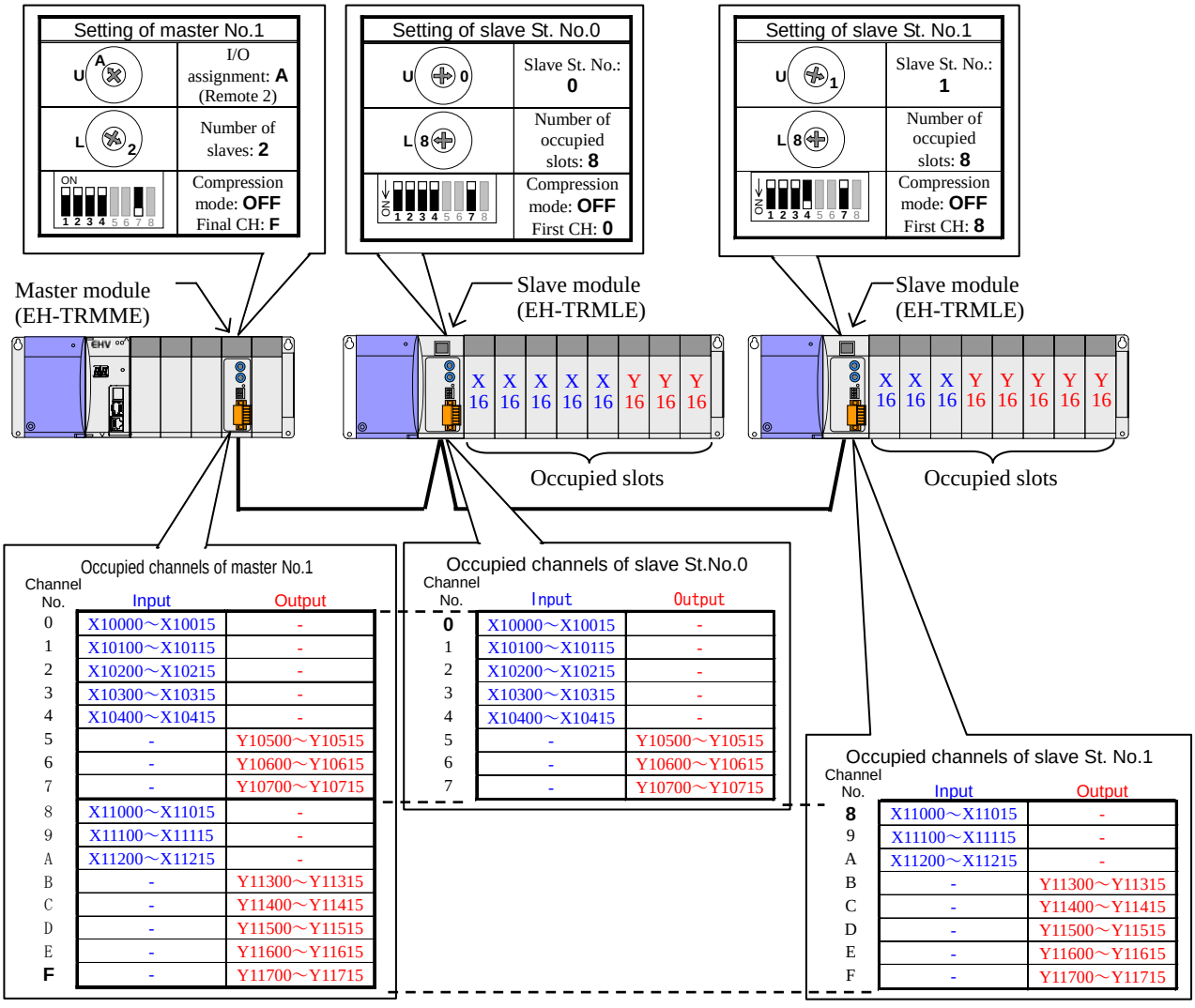


Figure 4.31 Replaced system configuration example-14 of the EH-150

4.6 Replacement from EM/EM-II series

This remote module has communication-compatibility with remote I/O for EM/EM-II series, you can use an existing cable in replacement. But there are differences with lineup of I/O modules, specifications, dimensions, I/O assignment, and program language, please consider these differences in replacement.

And you must set compression mode according to usage of image slots in EM/EM-II series.

It explains around the content concerning the replacement of a remote system as follows.

4.6.1 Replacement with normal remote method

Figure 4.32 shows the system configuration example of the EM/EM-II series using no image slot. Figure 4.34 shows the replaced system configuration example of the EH-150 series. In the case of EM/EM-II series, it is not necessary to set I/O assignment for I/O modules. But it is necessary to set I/O assignment “REMOTE 2” for master module in replaced system with EH-150. Figure 4.33 shows I/O assignment for remote bases of this replaced system.

Figure 4.34 is an example of replacing all of master and slave modules with the EH-150 series. It is also possible to leave all or partially slave modules like the EM/EM-II series in order to postpone the wiring work of slaves. In this case, please set rotary switch (upper) “E” for master module and all slave modules in order to match communication protocol. Please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules.

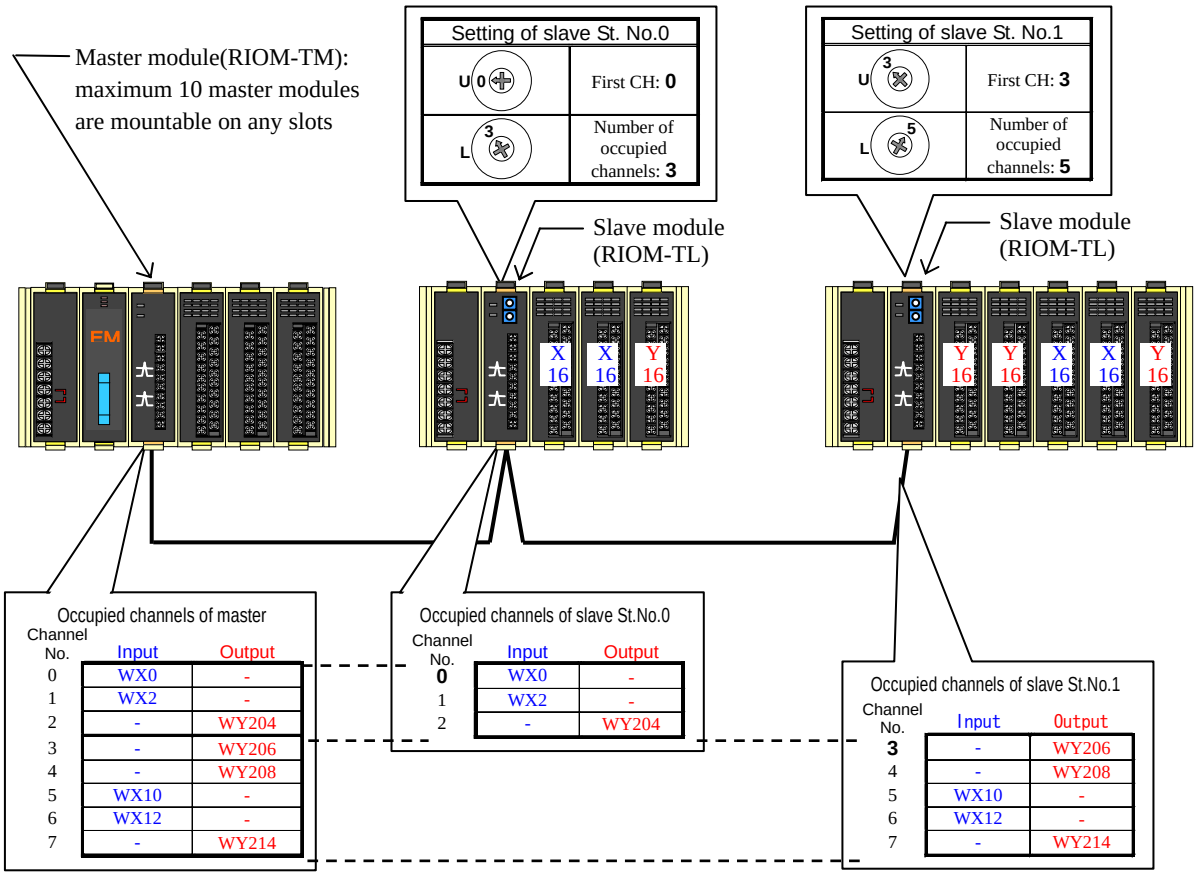


Figure 4.32 System configuration example-15 of the EM/EM-II series (Not using image slot)

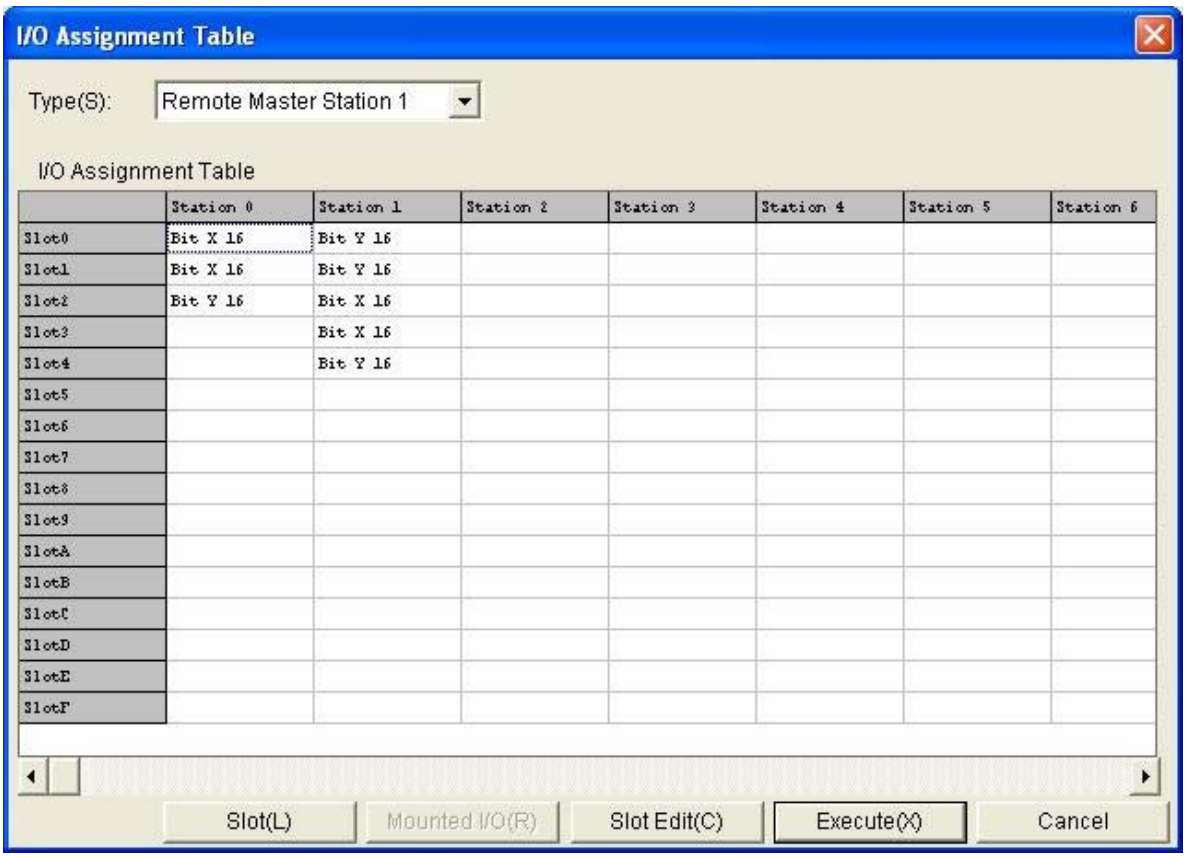


Figure 4.33 Example of I/O assignment for slave bases (with Ladder editor in system configuration example-16)

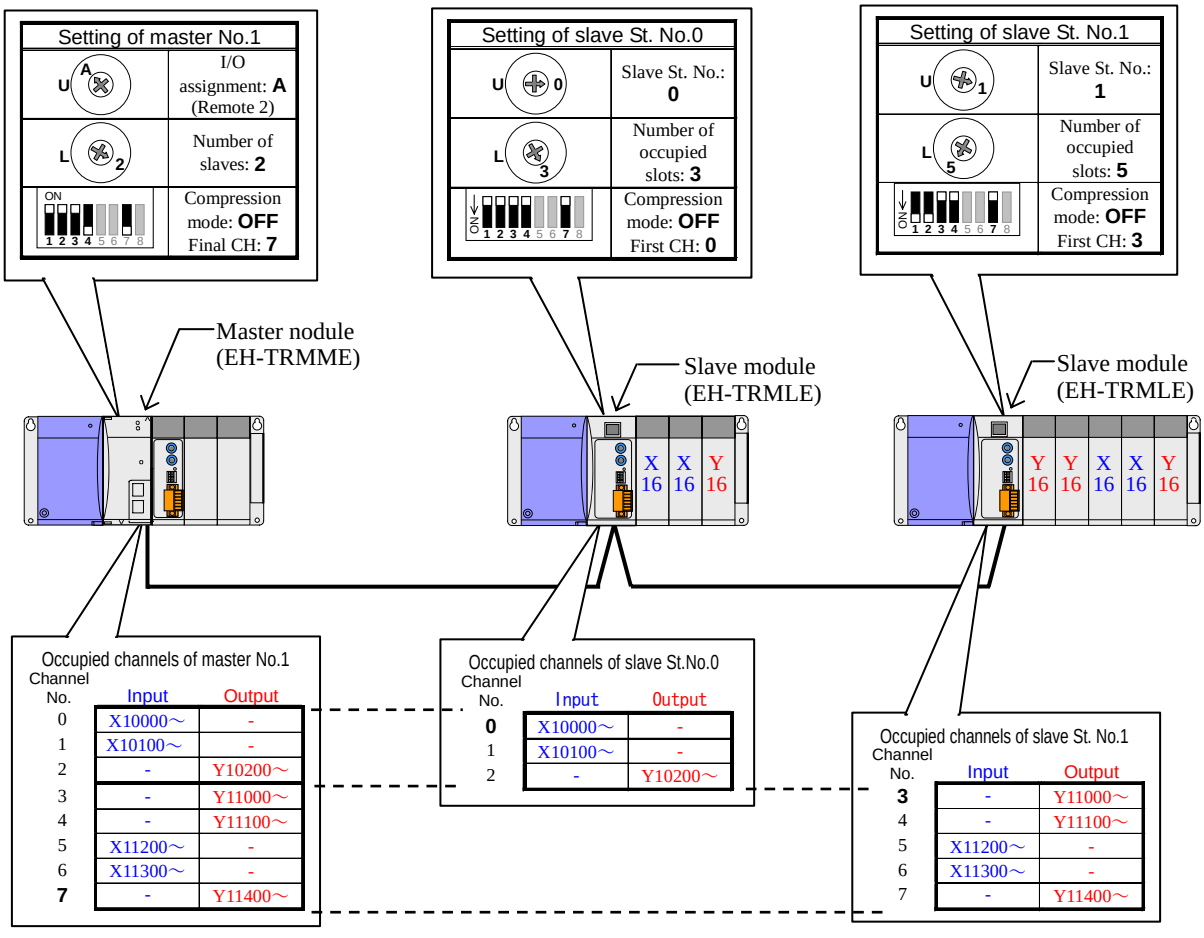


Figure 4.34 Replaced system configuration example-16 of the EH-150 with normal remote method

4.6.2 Replacement with compression remote method

In the case of EM/EM-II series, image slots those number are same as occupied channels can be used. In this case, I/O modules twice the number of occupied channels can be used.

This system configuration example is shown in Figure 4.35. I/O assignment of this system is shown in Figure 4.36. Figure 4.37 shows the system configuration example replaced to EH-150.

In this case, it is necessary to set I/O assignment for master module "Remote 2", too.

And make sure to set compression mode of master and slave modules ON with front DIP switch.

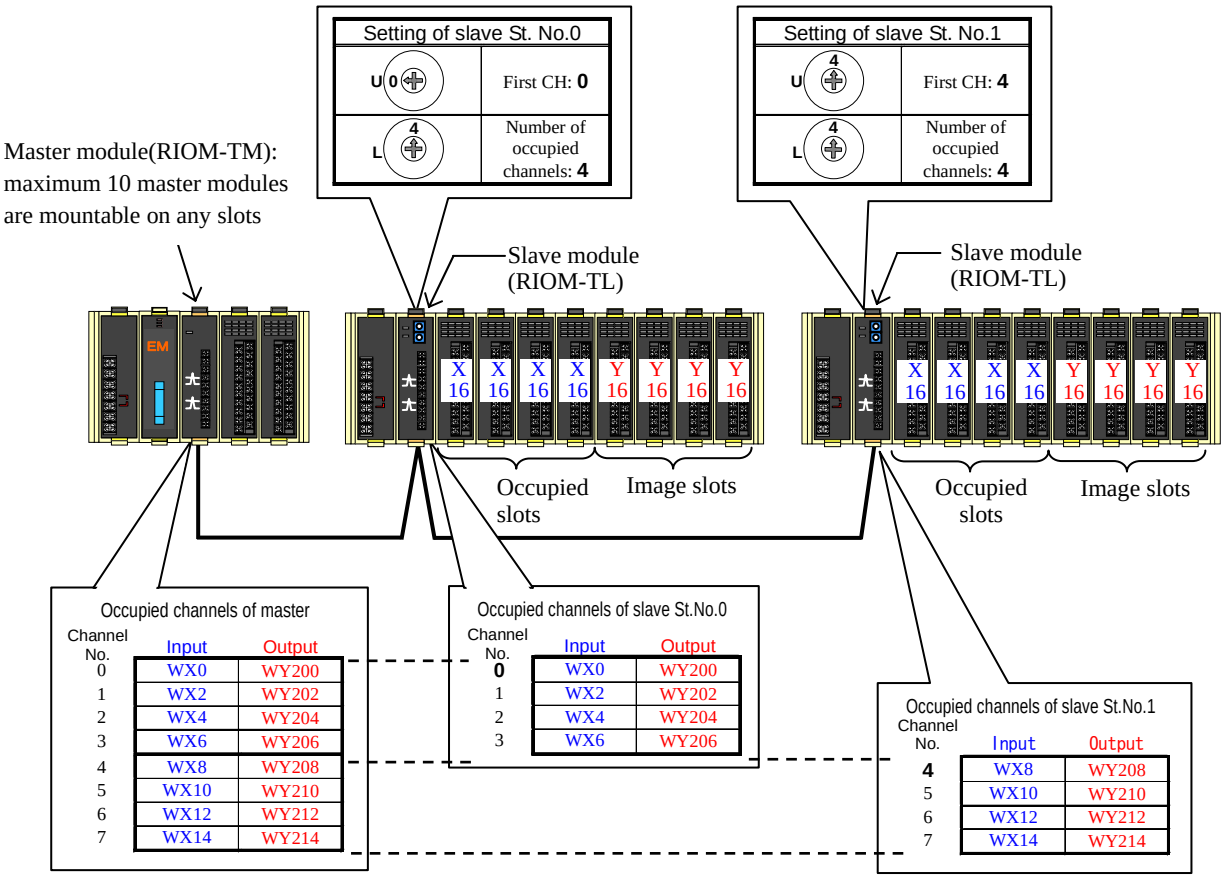


Figure 4.35 System configuration example-17 of the EM/EM-II series (Using image slot)

Only input modules are mountable on occupied slots of slave base, and only output modules are mountable on image slots normally. But in the case of the number of output modules is more than number of input modules for EM/EM-II series, output modules can be mounted in occupied slots as shown as Figure 4.40 in order to exclude empty slot.

If you replace this system to EH-150 series with compression remote method, output modules on occupied slots don't operate normally. Please use normal remote method for this case as shown in Figure 4.34, and set compression mode OFF for master module and all slave modules.

Figure 4.37 is an example of replacing all of master and slave modules with the EH-150 series. It is also possible to leave all or partially slave modules like the EM/EM-II series in order to postpone the wiring work of slaves. In this case, please set rotary switch (upper) "E" for master module and all slave modules in order to match communication protocol. Please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules when new remote module and old remote module are used in same system.

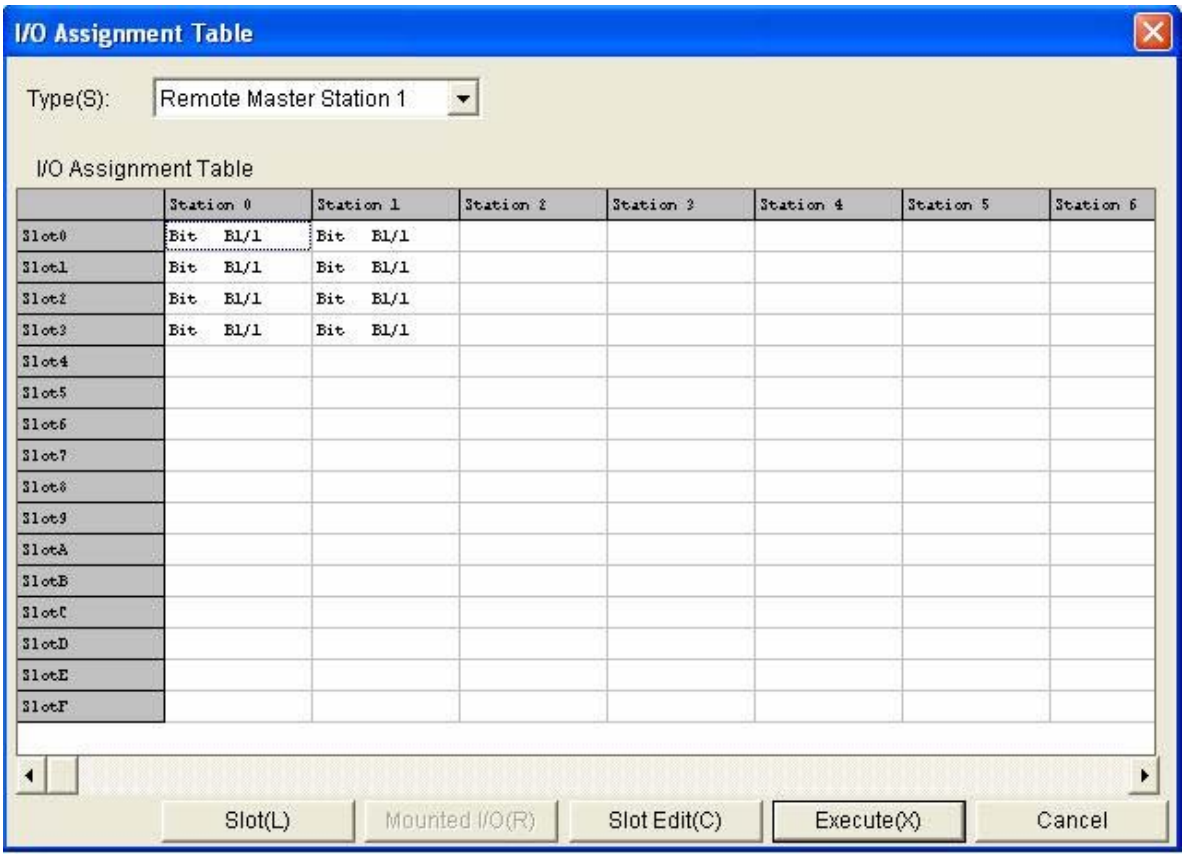


Figure 4.36 Example of I/O assignment for slave bases (with Ladder editor in system configuration example-18)

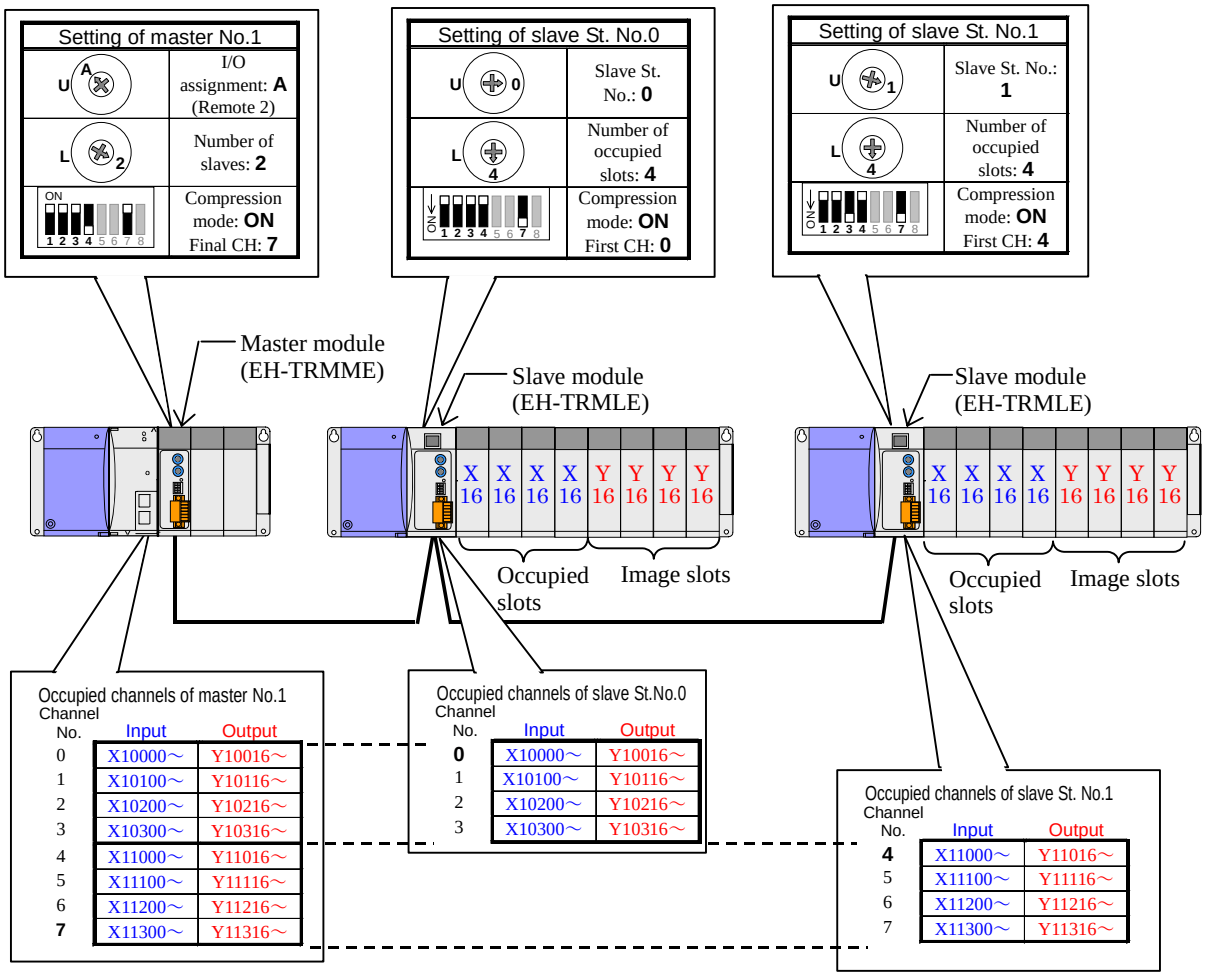


Figure 4.37 Replaced system configuration example-18 of the EH-150 (Using image slot)

4.7 Replacement of slave station only

In the case of replacement from old series such as EM/EM-II, H-200/250/252B/252C, and current large H series, it is possible to replace only slave station in order to postpone the transformation and debug for ladder program in CPU.

In this case it becomes significant whether image slot is used or not in slave bases.

The image slot is not used when the number of I/O modules mounted on slave base is equal or less than the number of occupied channels with rotary switch as shown in Figure 4.38. Please turn off the compression mode of replaced slave module from slave not using image slot. And set the same value on first channel, but pay attention difference method of setting first channels. Setting method is changed from rotary switch on RIOH-TL/RIOM-TL to bottom DIP switch on EH-TRMLE as Figure 4.38.

Please turn off high-speed refreshing mode (HS) of a front DIP switch of the master module and the slave modules when new remote module and old remote module are used in same system.

In the case of mix with EM/EM-II station and EH-150 station, please set “E” on rotary switch (upper) of slave module (EH-TRMLE) in order to match communication protocol.

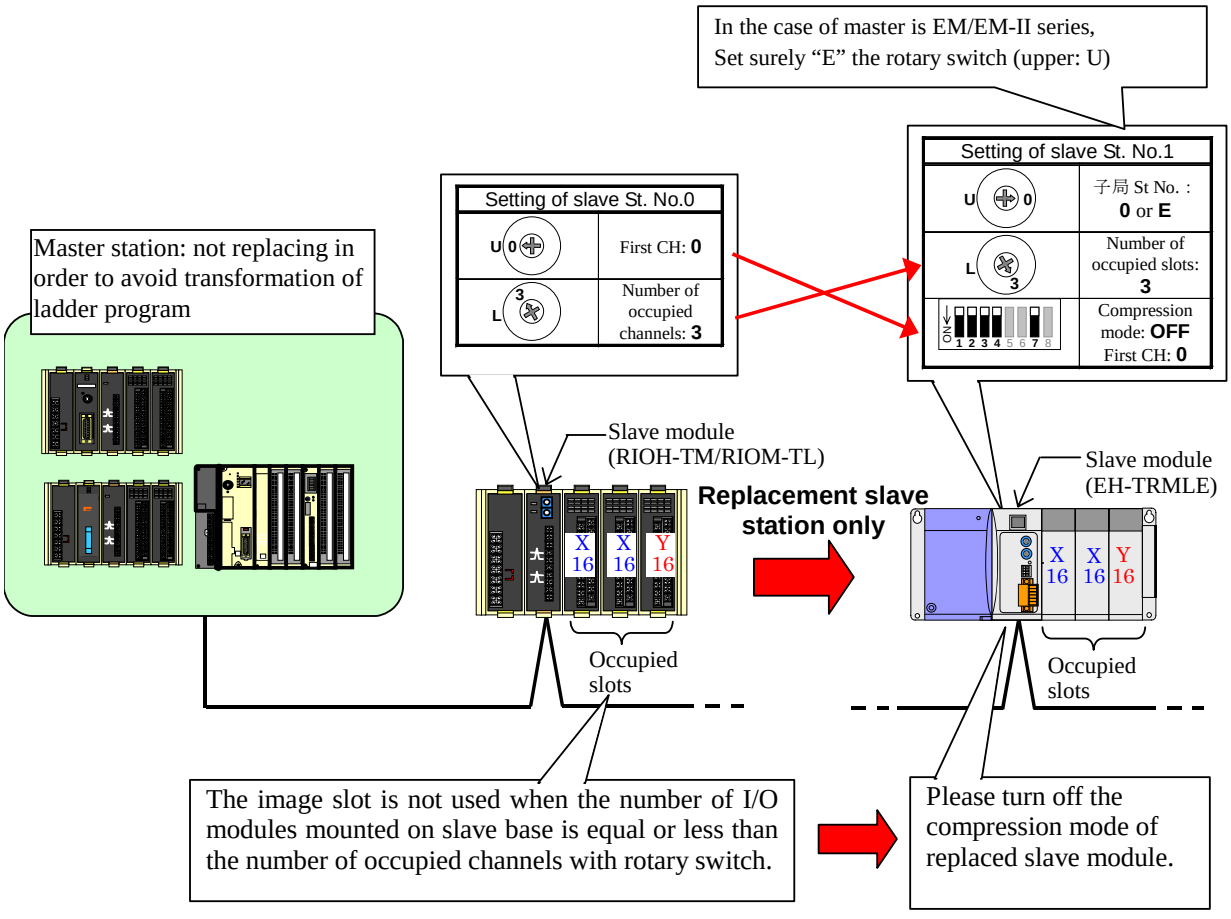


Figure 4.38 Replacement of only slave station in the case of using no image slot (compression mode: OFF)

The image slot is used when the number of I/O modules mounted on slave base is more than the number of occupied channels with rotary switch as shown in Figure 4.39. Please turn on the compression mode of replaced slave module (EH-TRMLE) in this case. Please set similar with Figure 4.38 except for compression mode.

But when output module is mounted on occupied slot like as Figure 4.40, you can't replace slave only. In this case, please replace both of master and slave station as shown in Figure 4.31, and use normal remote method with compression mode off.

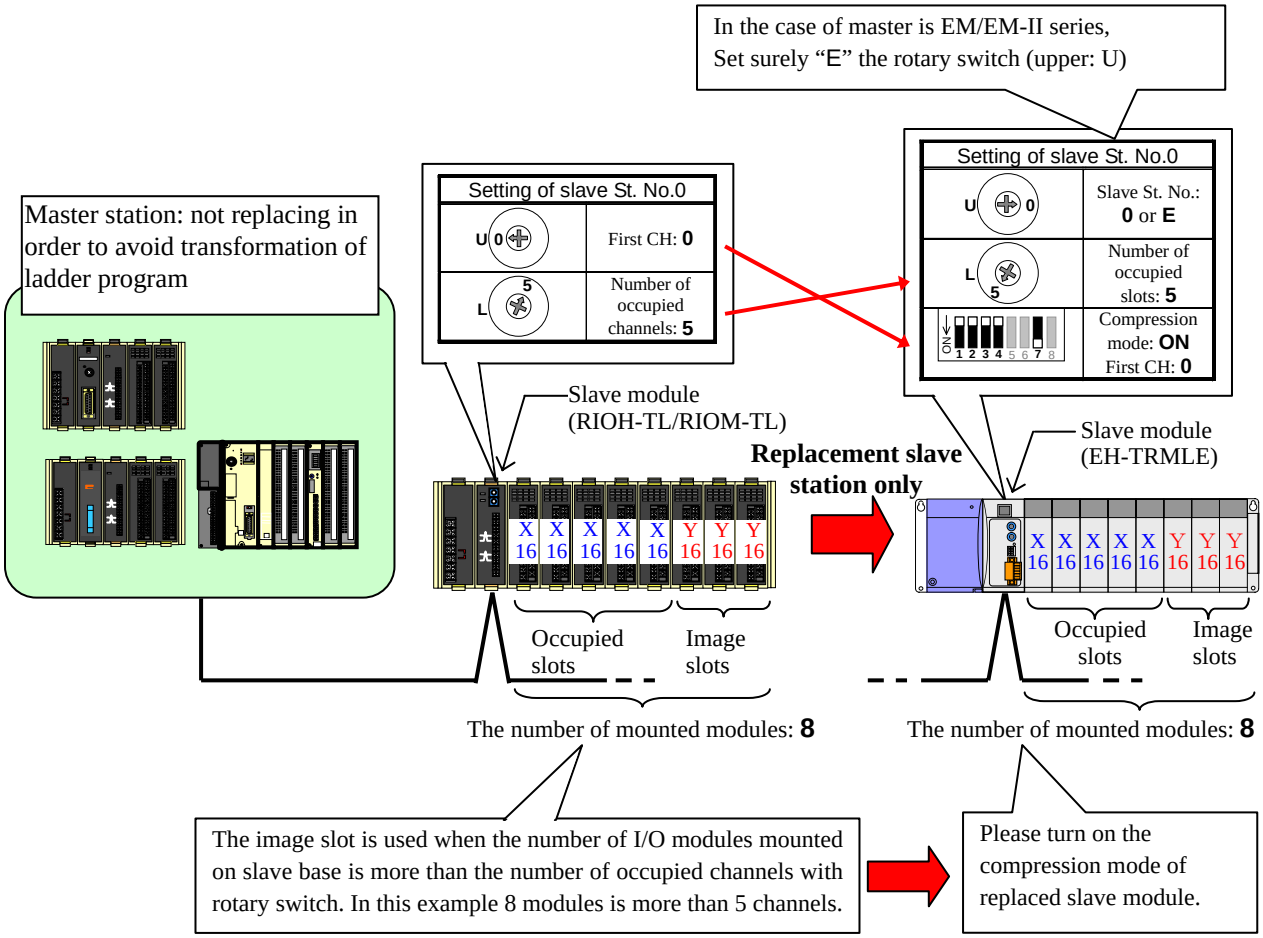


Figure 4.39 Replacement of only slave station in the case of using image slot (compression mode: ON)

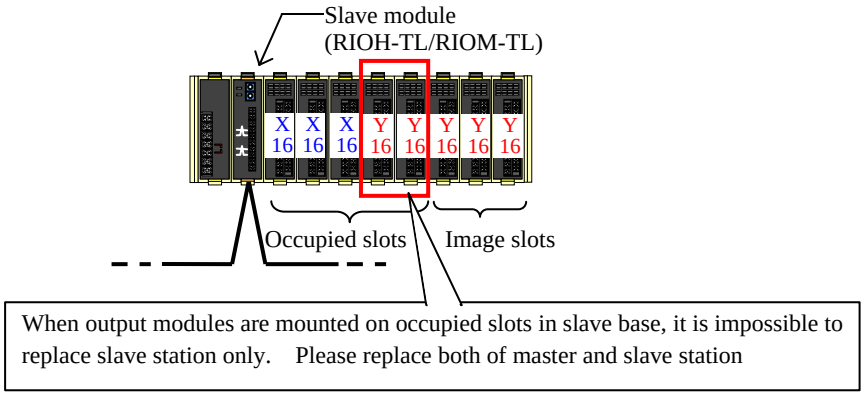


Figure 4.40 Impossible case of replacement with slave station only because output modules are mounted on occupied slots

4.8 Response time

The response time of remote I/O is calculated as follows.

■ Equivalent of response time

Response time: Ta [ms] = [Scan time of CPU]
+ [Remote refresh time] * 2
+ [I/O refresh time in slave module] * 2
+ [Input lag time]
+ [Output response time] ·····(4.1)

where each terms are explained as follows.

[Scan time of CPU]:

The actual measurement value of scan time is stored in WRF010 to WRF012 as shown in Table 4.3. Please refer to EH-150 EHV-CPU PROGRAMMING MANUAL or EH-150 APPLICATION MANUAL for execution time of each command.

[Remote refresh time]:

The remote refresh time changes by setting high-speed refreshing mode (HS).
When there are remote stations of conventional models, please use HS as turn off.
But remote refresh time can be shortened by setting HS turn on, when remote system consist of compact remote only, that is, (master module: EH-TRMME, slave module: EH-TRMLE).

The remote refresh time is:

When HS is on,

[Remote refresh time] = 0.156ms * [number of occupied channels in master] ·····(4.2)

When HS is off

[Remote refresh time] = 0.338ms * [number of occupied channels in master] ·····(4.3)

The remote refresh time doesn't depend on the number of slave stations.

The actual measurement value of remote refresh time is stored in special internal input of CPU module as shown in Table 4.3 when I/O assignment of master module is "REMOTE 2".

[I/O refresh time in slave module]:

It becomes 0.02ms or less. Because I/O refreshing of slave station is high speed, it isn't influence in the response time of remote system.

[Input lag time], [Output response time]:

Please refer to EH-150 EHV-CPU APPLICATION MANUAL or EH-150 APPLICATION MANUAL for these times of I/O modules.

■ Reverse double-transmission check and response time

Compact remote system executes the check to the unit of one word (=16 bits) by reverse double-transmission.

It is a mechanism that only illegal word data is abandoned when the error is detected and correct data before is maintained.

In this case, one remote refreshing time is added to response time in the detected word data.

Moreover, the display of communication error (CERR) doesn't appear to a remote module in this case.

Therefore the delay might occur even if LED in remote shows no error, and have enough margin for response time in designing the system.

■ Number of occupied channels in master and remote refresh time

When number of occupied channels in master is equal to total of occupied channels of all slaves, the remote refresh time is calculated by equations (4.2) and (4.3).

When number of occupied channels in master is more than total of occupied channels of all slaves, the remote refresh time is calculated by equations (4.4) and (4.5) as follows. Because waiting times are added to remote refresh time in the case of time-out error for unused channels, the remote refresh time becomes as follows.

When HS is on,

[Remote refresh time] = 0.156ms * [number of occupied channels in master]
+ 0.5ms * [number of unused channels in master] ·····(4.4)

When HS is off,

[Remote refresh time] = 0.338ms * [number of occupied channels in master]
+ 0.5ms * [number of unused channels in master] ·····(4.5)

Table 4.3 Special internal outputs in CPU concerned with remote response time

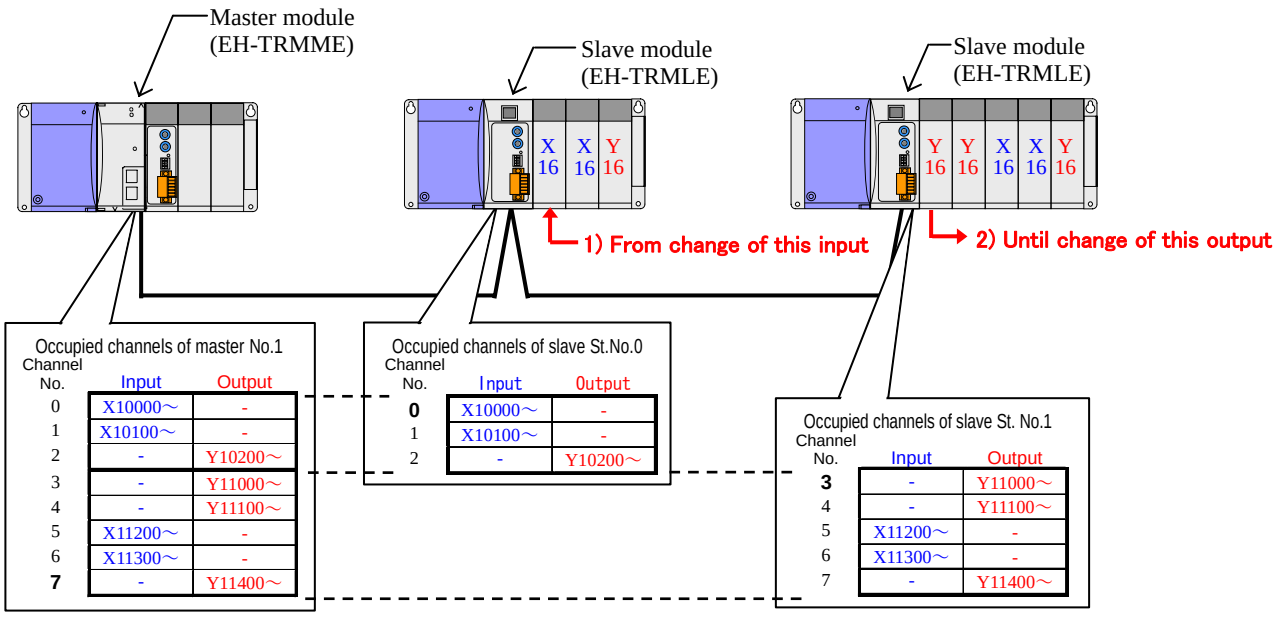
Items	No.	Name	Description	Setting condition	Resetting condition
Scan time of CPU	WRF010	Scan time (maximum value)	The maximum value, present value, and minimum value of execution time of normal scan are stored in the unit of 1ms. (Note 1)	Set by system	Cleared by system (when RUN starts)
	WRF011	Scan time (present value)			
	WRF012	Scan time (minimum value)			
Remote master No.1	WRF095	Remote refresh time (maximum value)	The maximum value, present value, and minimum value of remote refresh time of each master station are stored in the unit of 1ms. (Note2)	Set by system	Cleared by system (when power-up)
	WRF096	Remote refresh time (minimum value)			
	WRF097	Remote refresh time (present value)			
Remote master No.2	WRF0AD	Remote refresh time (maximum value)			
	WRF0AE	Remote refresh time (minimum value)			
	WRF0AF	Remote refresh time (present value)			
Remote master No.3	WRF0C5	Remote refresh time (maximum value)			
	WRF0C6	Remote refresh time (minimum value)			
	WRF0C7	Remote refresh time (present value)			
Remote master No.4	WRF0DD	Remote refresh time (maximum value)			
	WRF0DE	Remote refresh time (minimum value)			
	WRF0DF	Remote refresh time (present value)			

(Note 1) Time base of scan time in EH-CPU104A, 208A, and 316A is 10ms.

(Note 2) The remote refresh times are not stored when "Word 4W/4W" ("X4Y4W" in the control editor) is set with the I/O assignment of master module (EH-TRMME).

■ Example of calculation

Example of calculation for response time is as follows when scan time of CPU is 20ms, and HS is on in system configuration below.



According to equation (4.1), the response time is

Ta = 20 + 1.25*2 + 0.02*2 + 5 + 1 = about 28.5 [ms]

- 20 — Scan time of CPU (in the case of 20ms)
- 1.25*2 — Remote refresh time: 1.25ms = 0.156 ms * 8 channels ……from equation (4.2)
- 0.02*2 — I/O refresh time in slave module
- 5 — Input lag time of EH-XD16
- 1 — Output response time of EH-YTP16

Figure 4.41 Example of calculation for response time

MEMO

Chapter 5 Installation and Turning power supply on

5.1 Loading the module

(1) Installing

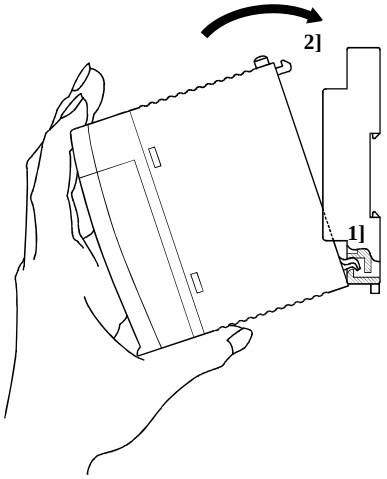


Figure 5.1 Installing the module

1] Hook the bottom part of the module to the hole in the base.

2] Press in the upper side of the module until it clicks.

Note 1: After loading the module, check to make sure it does not come out.

Note 2: Load the power module at the leftmost side of the base unit.

Note 3: Load the CPU module and I/O controller to the left of the power module.

It can reinforce with the screw after installation.

Use M4×10mm screws in this case.

(2) Removing

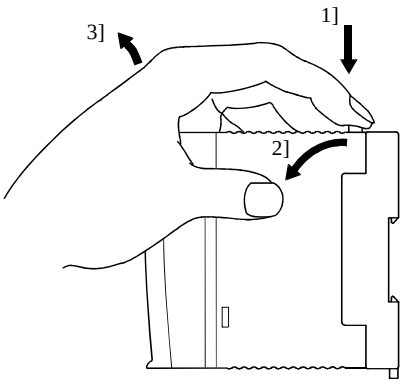


Figure 5.2 Removing the module

1] Push in the lock button.

2] With the lock button pushed in, pull the top of the module toward the front.

3] Raise it toward the top and pull it out.

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

5.2 Mountable slots for remote module

(1) Master module (EH-TRMME)

Maximum 4 master modules (EH-TRMME) can be mounted on slots that's slot number are 0 to 7 as shown as Figure 4.2 in the case of setting I/O assignment of master module "REMOTE 2".

There is no limit in the number of mountable master modules when I/O assignment of master module is "Word 4W/4W", and master module can be mountable on any slots on basic base and expansion bases.

Please note that the master module cannot mount on old model base (EH-BS3, EH-BS5, EH-BS8).

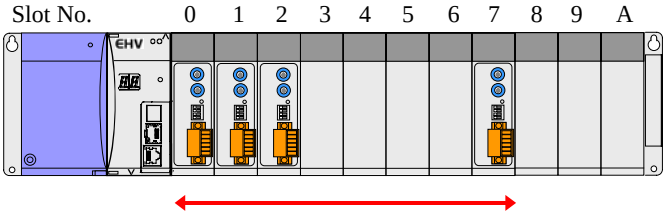


Figure 5.3 Mountable slots for master module with I/O assignment "REMOTE 2"

(2) Slave module (EH-TRMLE)

Slave module is mountable on only slot for CPU (right side of power supply module).

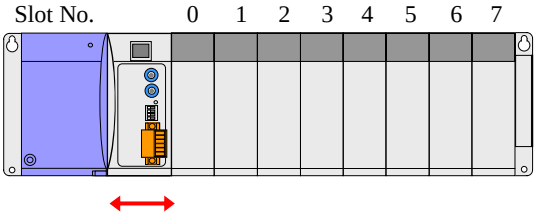
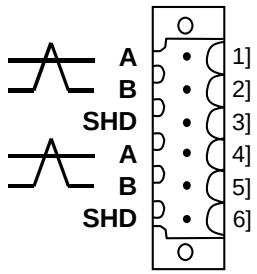
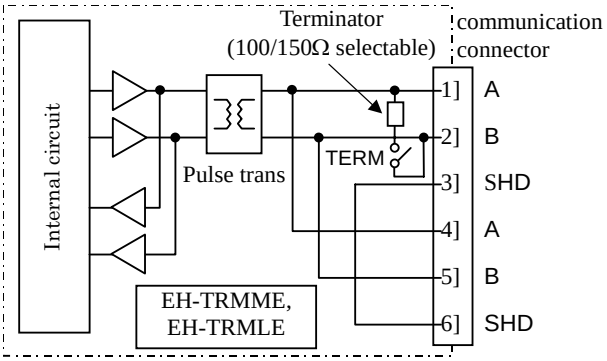


Figure 5.4 Mountable slot for slave module

5.3 Connection of twisted pair cables

(1) Description of Communication connector

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

(Note 1) 2 pairs of A, B, and SHD terminals are internally-connected. Therefore, even if a slave module is powered off, it is possible to continue connection between the master module and other slave modules while operating. However, cables connected to the connector are disconnected (a disconnected state) because of connection inside module if the connector is unplugged. If the slave module is replaced while operating when the slave module breaks down, connect 2 cables to the connector beforehand, following the connection method 2 shown below.

(2) Connection of Communication cable

Use a shielded twist-pair cable for communication and ground the shielded cable at single end as a general rule. However, ground the cable appropriately according to noisy environment because the effect may depend on how to ground. Branch of cable is not allowed. The following figure shows an example that the master module is connected to an end of the twist-pair cables. The master module can be also arranged not to an end but to the middle.

[Connection method 1] Normal connection method

Even if a slave module is powered off, it is possible to continue communication between a master module and other slave modules while operating. Please refer to Section 6.5 for details.

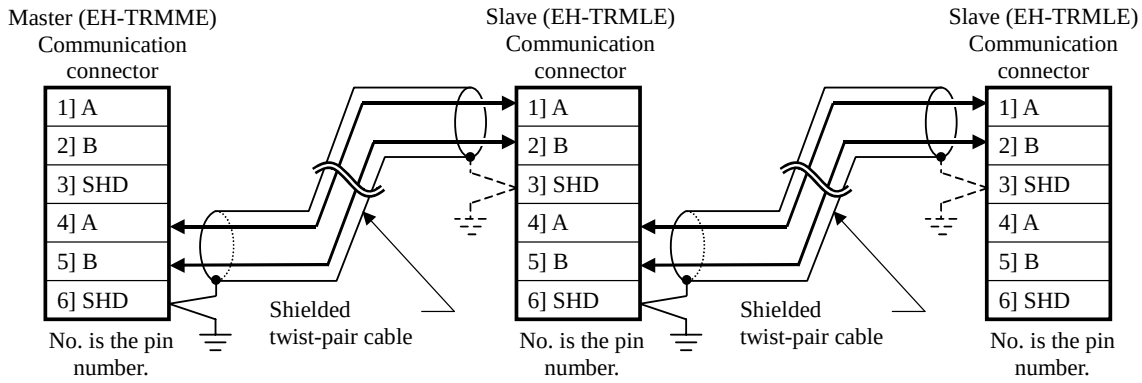


Figure 5.5 Normal connection method

[Connection method 2] Connection method when enabling the replacement of slave module while operating

By plugging 2 cables to the connector beforehand, the disconnected state can be prevented and the operation can be continued even if the connector is pulled out of the slave module.

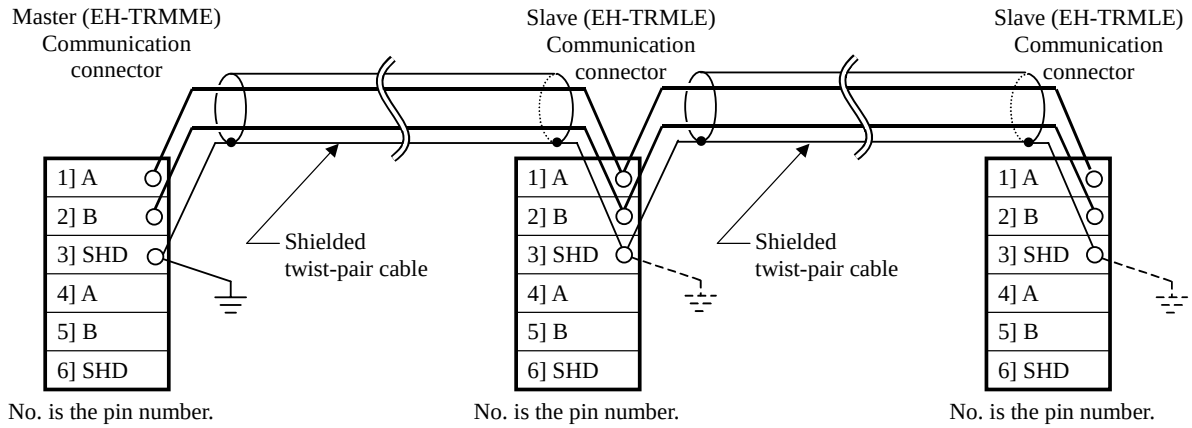


Figure 5.6 Connection method when enabling the replacement of slave module while operating

5.4 The order of turning on power supply

It is not necessary to care about the order of turning on the power supply of master station and slave stations for normal operation.

However, when you turn on the power supply of master station before slave stations, communication time-out error (CERR) is detected in the master module because there is no response from the slave module even if the master module begins communicating when the power supply of master is turned on.

In this case CPU can start operation without error, but history of detection with communication error remains in the special internal output in CPU as shown in Section 6.2. Only turning on again the power supply clears these histories. Therefore please turn on power supply of master and slaves at the same time, or turn on power supply of slaves before turning on power supply of master in order to start operation without that history of error detection.

But communication error (CERR) of slave module lights while master can't start communication after error check of CPU and transmission of I/O assignment data. But this CERR is turned off when the communication is begun, and the error history doesn't remain either.

Table 5.1 shows the typical time until communication error (CERR) of slave module disappears in this case when I/O assignment of master module is "REMOTE 2". The communication error (CERR) of slave module doesn't light even in the same case when I/O assignment of master module is "Word 4W/4W"

Table 5.1 Typical time until communication error (CERR) of slave module disappears after turning on power supply

CPU model	I/O assignment of master: "REMOTE 2"	
	Normal status	After turning power supply off during writing to FLASH memory (Note 1)
EH-CPU516	7 seconds	9 seconds
EH-CPU548	8 seconds	11 seconds
EHV-CPU16	5 seconds	12 seconds
EHV-CPU32	6 seconds	16 seconds
EHV-CPU64	6 seconds	17 seconds
EHV-CPU128	7 seconds	20 seconds

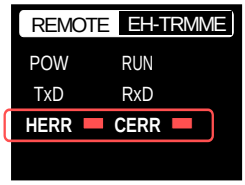
(Note 1) When the power supply will be turned on next time, the writing processing of the backup memory is executed when the power supply is turned off before finish of writing process of the backup memory in program uploading. Therefore the time until CERR disappears becomes long because communication can not start until writing process of the backup memory is finished.

Chapter 6 Error indication and Countermeasure

6.1 Error indication

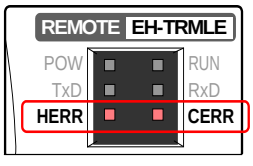
The error indications of LED light when error is detected with remote modules and transmission lines.
Table 6.1 shows error indication of master module, and Table 6.2 shows error indication of slave module.

Table 6.1 Error indication of master module (EH-TRMME)

Error display LED	LED	Name of error	Contents of error	Check timing (clear timing)	Counter measure
	HERR	Wrong setting of rotary switch U (upper)	It lights when setting value to rotary switch U (upper) is not permitted. (Note 1)	(a) When turning on power supply (b) When pushing reset switch	Please set rotary switch U (upper) correctly.
		Hardware error	It lights when hardware error of master module are detected.		Please exchange master module.
	CERR	Communication error	It lights when time –out error occurs. The time-out error is detected when there is no response from all slave stations during 500ms. (Note 2)	Always (Note 3)	Please check the setting and wiring, etc. according to the trouble shoot.

(Note 1) It lights when the set value of rotary switch U (upper) is B or C. Set value of 0 to 8, or F are reserved for enhancing in the future, and master module doesn't detect error for these value. Any setting of rotary switch L (lower) and DIP switches doesn't make error too, so please set correctly these switches.
(Note 2) When the communication error (time-out error) is detected, input data from slave stations are processed as follows according to setting "HOLD" of a front DIP switch.
1) HOLD ON: The last input data received correctly from slave stations are maintained in master module, and CPU read these data.
2) HOLD OFF: All input data from slave stations are cleared in master module, and CPU read these data.
(Note 3) If the communication returns normally, communication error (CERR) is automatically turned off.
Compact remote system executes the check to the unit of one word (=16 bits) by reverse double-transmission. It is a mechanism that only illegal word data is abandoned when the error is detected and correct data before is maintained. And in this case communication error (CERR) is not displayed.

Table 6.2 Error indication of slave module (EH-TRMLE)

Error display LED	LED	Name of error	Contents of error	Check timing (clear timing)	Counter measure
	HERR	Hardware error	It lights when hardware error of slave module are detected.	(c) When turning on power supply (d) When pushing reset switch	Please exchange slave module.
	CERR	Communication error	It lights when time –out error occurs. The time-out error is detected when there is no response from master station during 500ms. (Note 2)	Always (Note 3)	Please check the setting and wiring, etc. according to the trouble shoot.

(Note 1) Any setting of rotary switches and DIP switches doesn't make error, so please set correctly these switches.
(Note 2) When the communication error (time-out error) is detected, output data from master module are processed as follows according to setting "HOLD" of a front DIP switch.
1) HOLD ON: The last output data received correctly from master module are maintained in slave module, and slave module write these data to output modules on slave base.
2) HOLD OFF: All output data from master module are cleared in slave module, and slave module writes these data to output module on the slave base. So, all outputs on slave base turn off in this case.
(Note 3) If the communication returns normally, communication error (CERR) is automatically turned off.
Compact remote system executes the check to the unit of one word (=16 bits) by reverse double-transmission. It is a mechanism that only illegal word data is abandoned when the error is detected and correct data before is maintained. And in this case communication error (CERR) is not displayed.

6.2 Special internal outputs in CPU module

Remote refresh time and information about time-out error are stored in special internal outputs as shown in Table 6.3 when I/O assignment of master module of compact remote is “REMOTE 2”.

Please note that the information to be stored is different from the other remote system. And pay attention that these information are not stored when I/O assignment of master module is “Word 4W/4W”.

■ Special internal outputs number of each master

Master No.1: WRF080～WRF097
Master No.2: WRF098～WRF0AF
Master No.3: WRF0B0～WRF0C7
Master No.4: WRF0C8～WRF0DF

Table 6.3 Special internal outputs concerning with remote in CPU module

Special internal outputs number				Name	Contents of each bit number		
Master No.1	Master No.2	Master No.3	Master No.4		15	14 8	7 0
WRF080	WRF098	WRF0B0	WRF0C8	Assignment flag of slave	Bit number correspond to slave station number (1: slave is assigned, 0: slave is not assigned)		
WRF081	WRF099	WRF0B1	WRF0C9	Undefined	0		
WRF082	WRF09A	WRF0B2	WRF0CA	Undefined	0		
WRF083	WRF09B	WRF0B3	WRF0CB	Detail information of transmission error in slave ST. No.0 (Note 1)	k	Error channel No.	Number of times transmission error
WRF084	WRF09C	WRF0B4	WRF0CC	Detail information of transmission error in slave ST. No.1 (Note 1)	k	Error channel No.	Number of times transmission error
WRF085	WRF09D	WRF0B5	WRF0CD	Detail information of transmission error in slave ST. No.2 (Note 1)	k	Error channel No.	Number of times transmission error
WRF086	WRF09E	WRF0B6	WRF0CE	Detail information of transmission error in slave ST. No.3 (Note 1)	k	Error channel No.	Number of times transmission error
WRF087	WRF09F	WRF0B7	WRF0CF	Detail information of transmission error in slave ST. No.4 (Note 1)	k	Error channel No.	Number of times transmission error
WRF088	WRF0A0	WRF0B8	WRF0D0	Detail information of transmission error in slave ST. No.5 (Note 1)	k	Error channel No.	Number of times transmission error
WRF089	WRF0A1	WRF0B9	WRF0D1	Detail information of transmission error in slave ST. No.6 (Note 1)	k	Error channel No.	Number of times transmission error
WRF08A	WRF0A2	WRF0BA	WRF0D2	Detail information of transmission error in slave ST. No.7 (Note 1)	k	Error channel No.	Number of times transmission error
WRF08B	WRF0A3	WRF0BB	WRF0D3	Detail information of transmission error in slave ST. No.8 (Note 1)	0		
⟆	⟆	⟆	⟆	⟆	⟆		
WRF092	WRF0AA	WRF0C2	WRF0DA	Detail information of transmission error in slave ST. No.15 (Note 1)	0		
WRF093	WRF0AB	WRF0C3	WRF0DB	I/O verify mismatch slot No.	0		
WRF094	WRF0AC	WRF0C4	WRF0DC	I/O error slot No.	0		
WRF095	WRF0AD	WRF0C5	WRF0DD	Refresh time (Maximum)	Remote refresh time (Maximum) (unit: ms)		
WRF096	WRF0AE	WRF0C6	WRF0DE	Refresh time (Minimum)	Remote refresh time (Minimum) (unit: ms)		
WRF097	WRF0AF	WRF0C7	WRF0DF	Refresh time (Current)	Remote refresh time (Current) (unit: ms)		

(Note 1)The transmission error in slave is time-out error detected when there is no response about same cannel from slave station during 0.5 ms. And following information are stored in each bit.

k: 1 is set when time-out error is detected. Because it is not cleared even if the communication recovers, you can know the presence of past error.

Error channel No.: Channel No. of the time-out error detected at the end is stored.

Number of times transmission error: The number of errors of the accumulation after the power supply on base unit is turned on is stored. It returns to 0 when it exceeds to 255, and count is continued.

These error information are cleared by turning on again the power supply. Please note that these error information are not cleared by pushing the reset switch in master module and slave module.

6.3 Operation parameters related to remote system

Table 6.4 shows operation parameters related to remote system.

Only hard error of master module is informed to CPU. When hard error (HERR) occurs in master module, CPU detect remote error, and error code “43” is set in CPU. You can select whether to continue running or not by setting this parameter with programming software.

Because disagreement of I/O allocation and slave station error is not informed to CPU, CPU doesn’t detect remote error in this case. Therefore CPU continues running regardless of the setting of the remote transmission mode.

Table 6.4 Operation parameters related to remote system

No.	Item		Description	Operation of compact remote	
				Error detection	Error information to CPU
1	Operation mode of CPU at error	At a occurrence of remote error	Specifies run permission/inhibition while error has occurred in remote module.	Hard error in master (Checked When turning on power supply)	Available (It operates according to the setting of the operation parameter.)
2	Remote transmission mode	At a disagreement of I/O allocation	When I/O allocation of remote module is disagreement, it specifies whether remote is abnormal.	No detection	Not available (CPU continues running regardless of the setting of the remote transmission mode.) (Note 2)
3		The slave station error of remote	While error has occurred in remote slave station, it specified whether remote is abnormal.	Check with reverse double-transmission (Note 1)	

(Note 1) When the error is detected in check with reverse double-transmission, only illegal data are abandoned and last correct data is maintained. Regardless of this error detection, communication between master and slaves continues.

(Note 2) Please refer to Section 6.5 when you want to stop running of CPU when power supply OFF, breaking down, and disconnecting about slave stations.

6.4 Function of reset switch

When hard error (HERR) of communication error occurs in master module (EH-TRMME) or slave module (EH-TRMLE), you can reset the error by pushing reset switch in front side of the module. However error is indicated again if error factor is not canceled.

The setting of the rotary switch and the DIP switch is read only when the power supply is turned on. However pushing reset switch allows remote module to restart with new setting even if you don’t turn on power supply again.

Please note that error information shown in Table 6.3 are not cleared by pushing the reset switch in master module and slave module. These error information are cleared by only turning on again the power supply.

If you push reset switch of master module, the communication module transmission error (error code “55”) occurs in CPU module because of no response to CPU during restart processing. This error is warning in classification of error, and CPU can continue to running. Please clear the special internal output related to this error if necessary.

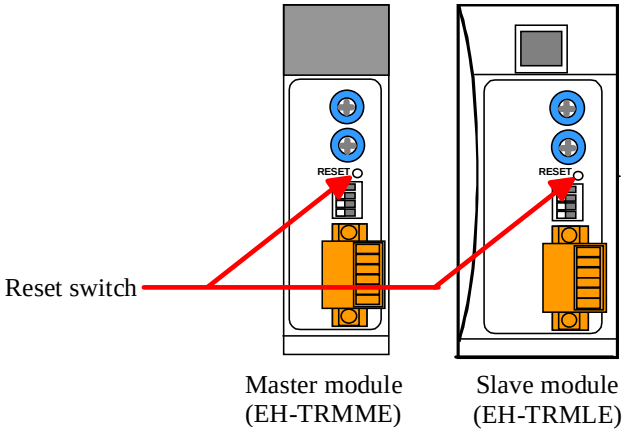


Fig 6.1 Reset switch of remote module

6.5 Error detection and running of CPU

In the case of compact remote system, remote modules continue communication when reverse double-transmission error or time-out error occurs. These errors are not informed to CPU, so CPU continues running normally.

The communication error indication (CERR) is automatically turned off, if the communication returns normally.

And remote operation is continued.

Because transmission line consists of multi-drop system as shown in Figure 6.2, even if the breakdown of slave module occurs, the remote operation between master and the other normal slave module continues and doesn't become a system down. When the power supply in slave station is turned off, it is similar.

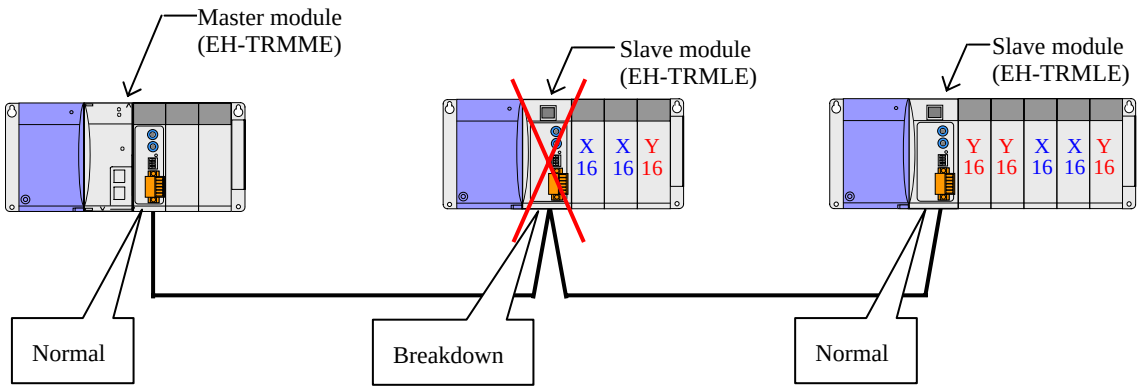


Figure 6.2 Fallback operation when breakdown in slave module occurs

However when the inconvenience is caused in breakdown of slave, cable disconnection, and power supply OFF in slave, please take the following means to detect these abnormalities.

■ Slave abnormal detection method –1: the case unnecessary of HOLD function

When the HOLD function at communication fault (CERR) is unnecessary, please wire one point input in slave station to always become turning on as shown in Figure 6.3. The ladder program observes this, and normality is detected.

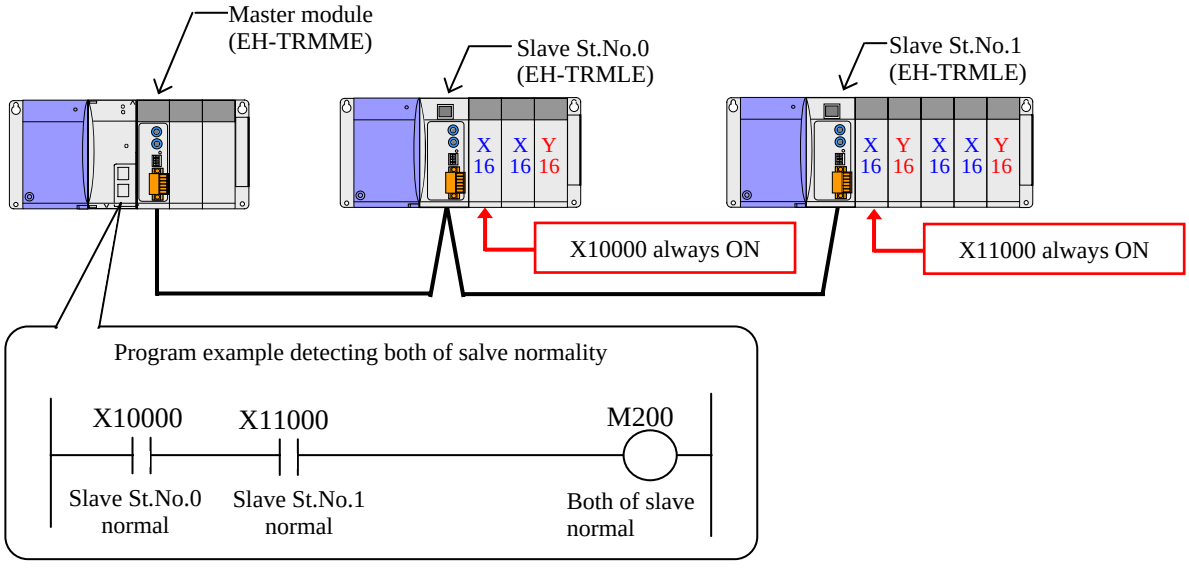


Figure 6.3 Slave abnormal detection method –1 (the case unnecessary of HOLD function)

■ Slave abnormal detection method –2: the case necessary of HOLD function

In the case of setting HOLD function turning on, there is no guarantee that the input from slave is turned off with time-out error. Please control one point of the transistor output in slave station with the clock of one second, etc as shown in Figure 6.4. And please wire this output signal to input in salve station, and the ladder program detects normality whether changing ON/OFF continues.

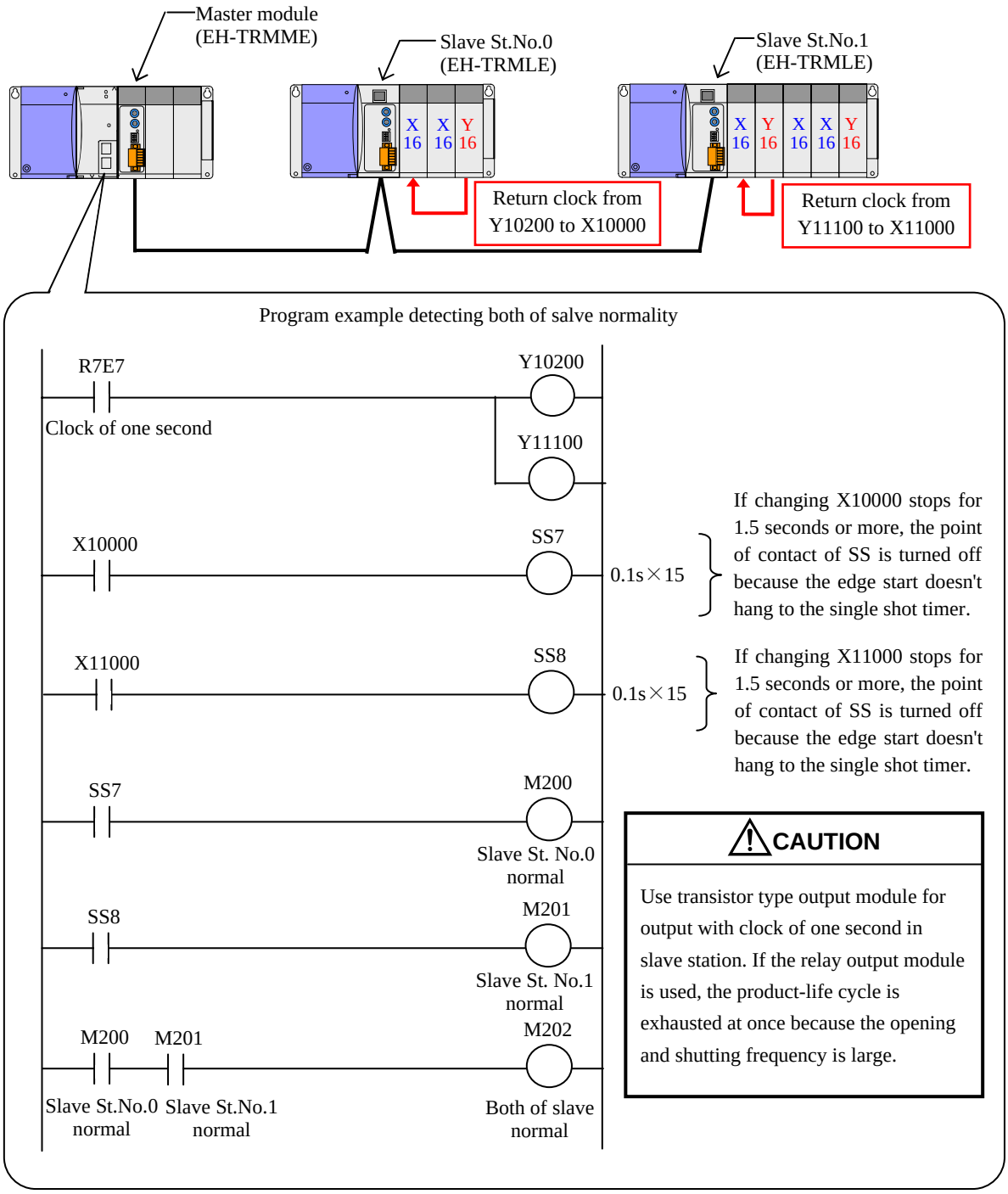
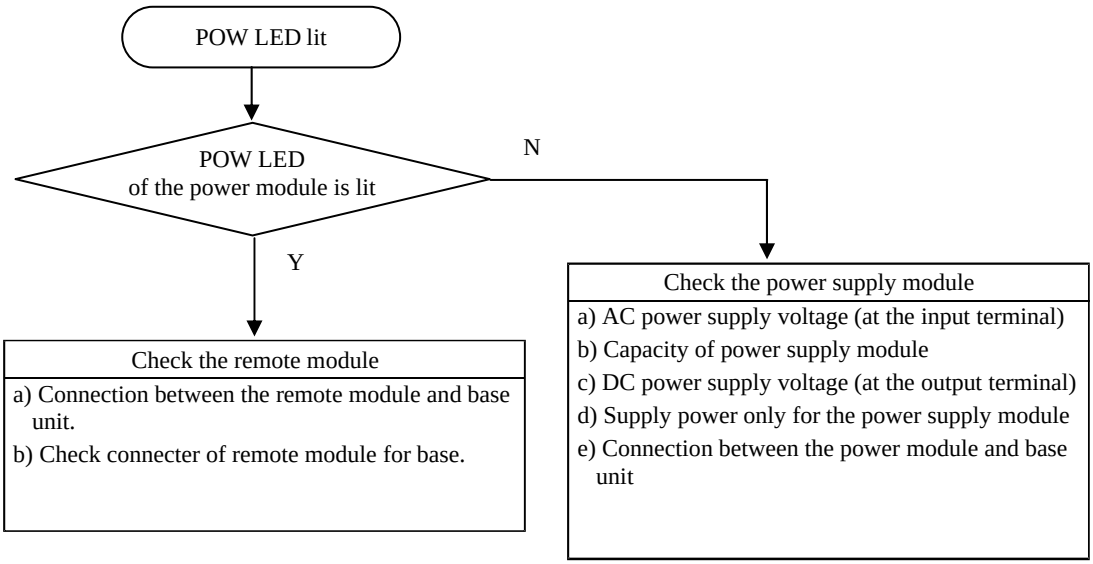


Figure 6.4 Slave abnormal detection method –2 (the case necessary of HOLD function)

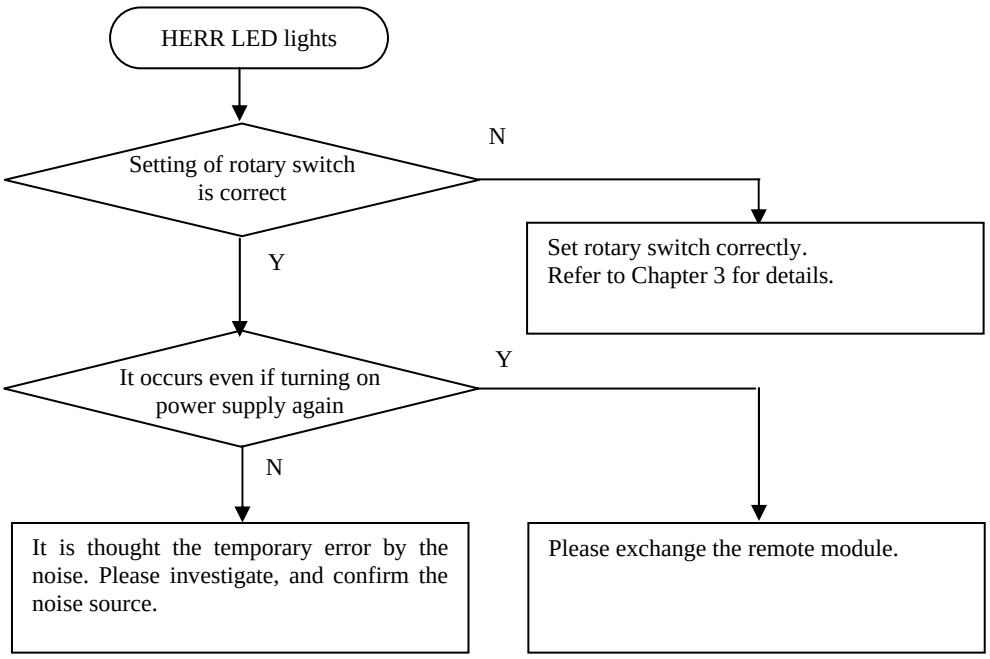
6.6 Troubleshooting

The procedure about troubleshooting is shown by the following flow chart.

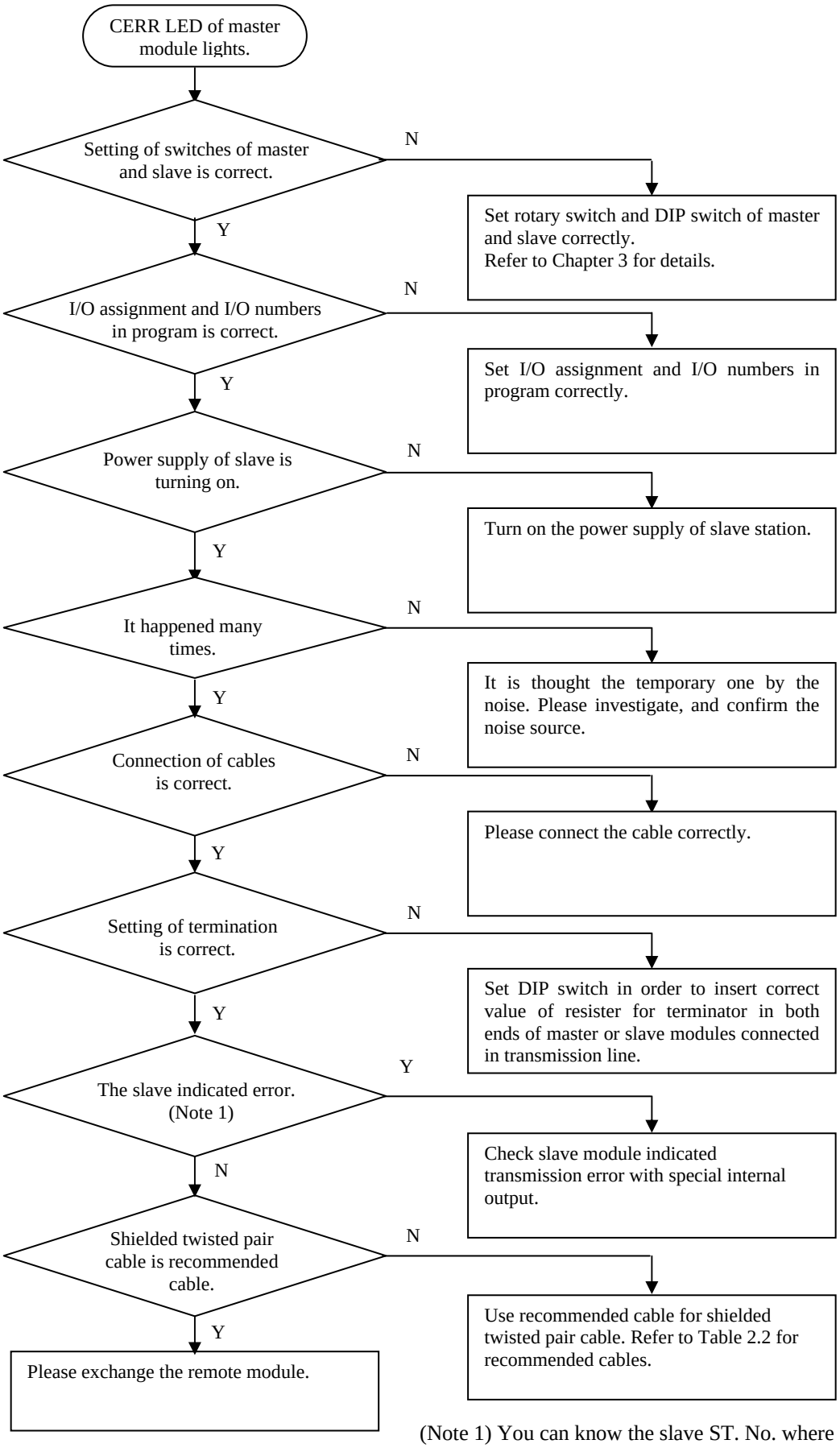
(1) POW LED : as turning off (5V DC power abnormality).



(2) HERR LED lights (hardware abnormality).

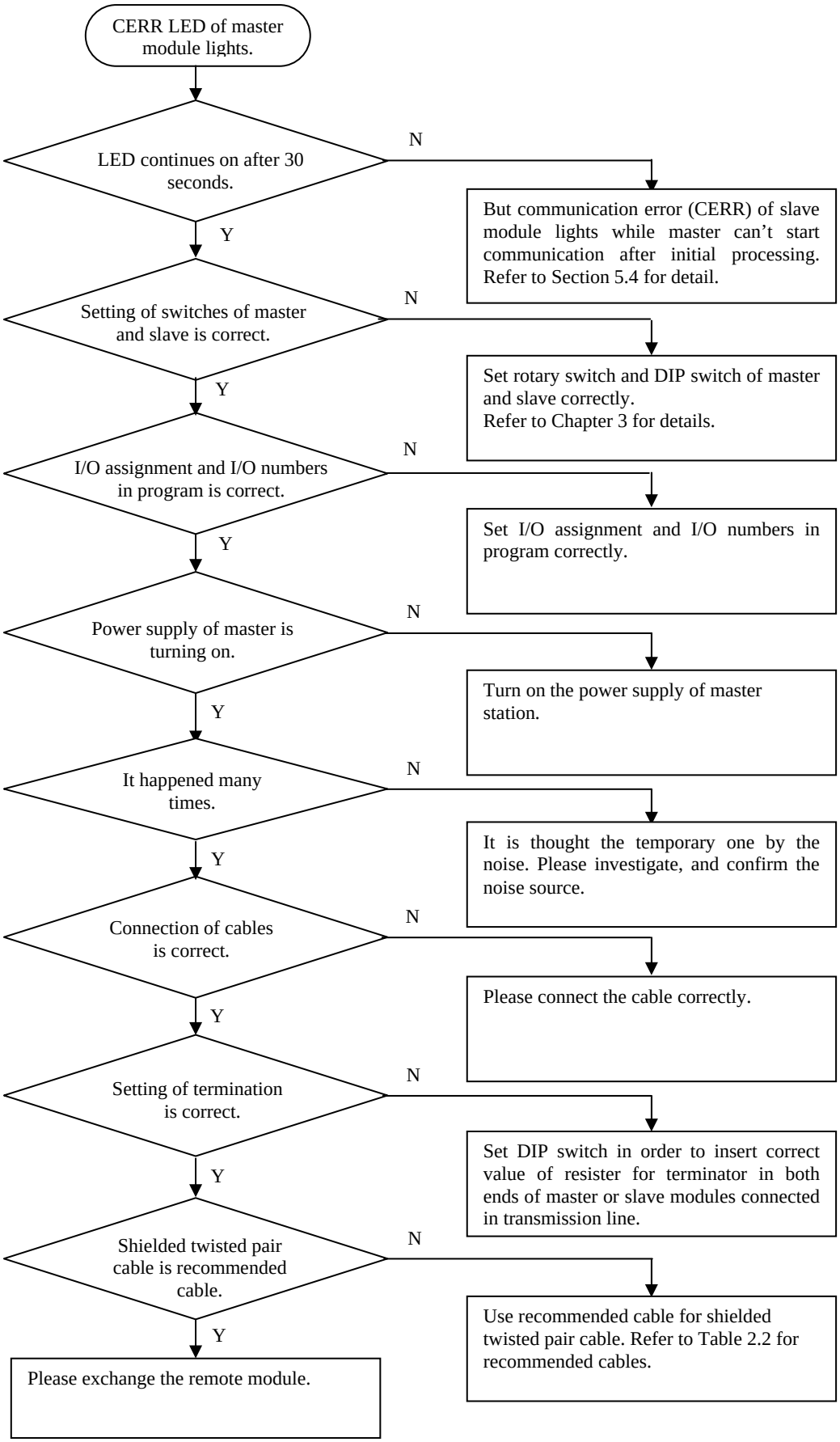


(3) CERR LED of master module lights. (transmission time-out error)
Or, remote I/O doesn't operate.



(Note 1) You can know the slave ST. No. where time-out error occurs by checking special internal output as shown in Table 6.3. (in the case of I/O assignment of master module is “REMOTE 2”)

(4) CERR LED of slave module lights. (transmission time-out error)



Chapter 7 Daily and Periodic Inspection

7.1 Daily inspection

Verify the following items while the system is running. Please refer to Chapter 3 for detail of LED display, and Chapter 6 for detail of error indication and countermeasure.

Table 7.1 Items for daily inspection of remote module

Item	Inspection method	LED	Normal status	Abnormal status	Main cause of error
Confirmation of operation	Watching	POW LED RUN LED	Lighting	Off	• Power LED off: 5V DC power malfunction • RUN LED off: communication is stopped
Confirmation of error	Watching	HERR LED CERR LED	Off	Lighting /blinking	• HERR LED on: breakdown of remote module • CERR LED on: time-out error
Confirmation of communication data	Watching	TxD LED RxD LED	Blinking /lighting thinly	Always on /always off	• TxD LED off: breakdown of remote module etc. • RxD LED off: disconnection of line etc.

7.2 Periodic inspection

Turn off the power for the external I/O circuits and remote system, check the following items.

Table 7.2 Items for periodic inspection of remote module

Item	Method
All screws of connecter for communication are tight.	Tighten surly.
Removal of dust on case and connecter.	Removal with cleaner etc.

Periodic inspection must be done once every 6 months at least. Please bring the check cycle forward with respondent to the installation environments such as the vibration and dust.

MEMO