HITACHI PROGRAMMABLE CONTROLLER

HIDIC EH-150

Compact remote2 module
Master: EH-TRME2
Slave: EH-TRLE2
APPLICATION MANUAL

(SERVICE MANUAL)

NJI-585 (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) While efforts have been made to be accurate, if any wrong or missing information is 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 : Identifies information about practice or circumstances, which may lead to personal injury or death, property damage, or economic loss.

CAUTION : Identifies information about practice or circumstances, which may lead to personal injury, property damage, or economic loss.

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

The both marks show important information. Be sure to follow the instructions.

Icons for prohibited items and required items are shown below:

: Identifies prohibition. For example, when open flames are prohibited, is indicated.

: Identifies requirement. For example, when grounding must be performed, is indicated.

1. 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.
- Be sure to install the PLC according to this manual. Failure to do so could result in damage by falling off, failure or malfunction.
- Do not allow foreign objects such as wire chips to enter the unit.
  They may become the cause of fire, malfunction or failure.

2. Wiring

REQUIRED
• The PLC must be grounded (FE terminal). Failure to do so could result in injury to personnel or causing it to malfunction.

⚠ CAUTION
• Always use the power supply voltage listed in specifications. Using other voltage may damage the equipment or present a risk of fire. • The wiring operation should be performed by a qualified personnel. Failure to do so could 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. • Appropriate emergency stop circuit, interlock circuitry and similar safety measures should be added to the PLC system to ensure safety in the event of incorrect, missing or abnormal signals caused by broken signal lines, momentary power interruptions or other causes. Do not share the power supply of relay output module and interlock circuitry because relay output might not work properly due to switching noise from interlock circuitry.

⚠ CAUTION
• When performing program change, forced output, RUN, STOP, etc., while the unit is running, be sure to check system safety carefully. Failure to do so could lead to damage to equipment. • Supply power according to the power-up order. Failure to do so could lead to damage to equipment or malfunction.

⚠ CAUTION
USE POWER SUPPLY UNIT OF EH-PS SERIES FOR SUPPLYING ELECTRIC POWER.

⚠ CAUTION
DO NOT CONNECT EH-PSD DIRECTLY TO LINE VOLTAGE. LINE VOLTAGE MUST BE SUPPLIED BY A SUITABLE, APPROVED ISOLATING TRANSFORMER HAVING SHORT CIRCUIT CAPACITY NOT EXCEEDING 150 VA MAXIMUM.

4. Preventive maintenance

DANGER
• Do not connect the "+/−" of the battery in reverse polarity. Do not recharge, disassemble, heat, place in fire, or short circuit the battery. There is a risk of explosion or fire.

PROHIBITED
• Do not attempt to disassemble, repair or modify any part of the PLC. Electric shock, malfunction or failure may result.

CAUTION
• Turn off power to the PLC before mounting or dismounting the module. Electric shock, malfunction or failure may result.

MEMO

Revision History

No.	Description of Revision	Date of Revision	Manual Number
1	First edition	Mar. 2013	NJI-585 (X)

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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 remote2 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 1.1.1 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)

* The alphabet between the number and (X) means version (A, B…) and the space means the first edition.

1.1 Use combination of products

1.1.1 Available CPU module and programming software

EH-TRME2/EH-TRLE2 is usable in combination with the products of the model as shown in Table 1.1.2.

Table 1.1.2 Usable CPU modules and supported versions of programming software

CPU modules		Programming software			
Model name	Supported version	Product name		Model name	Supported version
EHV-CPU128	"REMOTE2": "ROM VER.*110" or later "REMOTE (RMM)": "ROM VER.*117" or later	Control Editor	Standard Edition	EH-CTE-E	Ver.2.18 or newer
EHV-CPU64					
EHV-CPU32			Variable Name Edition	EH-CTE-EVN	Ver.2.22 or newer
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					

■ I/O assignment by Control Editor and Ladder Editor

When setting I/O assignment of modules by programming software, notation of I/O information to choose at I/O assignment is different from Control Editor and Ladder Editor.

With the following manuals, the I/O information is mentioned the notation of Control Editor as shown in Table 1.1.3.

Table 1.1.3 I/O information notation by the programming software

I/O information that choose in I/O assignment setting	Programming software	
	Ladder Editor	Control Editor
REMOTE (RMM)	Non-support	“EH-TRMM (2048)”, “REMOTE (RMM)”
REMOTE2	“Remote2”	“EH-TRMME (REMOTE2)”, ”REMOTE2”
Input 4 words / Output 4 words	“Word 4W/4W”	“EH-TRMME (X4Y4W)”, ”X4Y4W”
Input 8 words	“Word X8W”	“X8W”
Output 8 words	“Word Y8W”	“Y8W”

■ I/O assignment for remote master with control editor

In the Control Editor, you can set I/O assignment by selecting model name with I/O assignment screen like Figure 1.1.1. In the case of setting “REMOTE (RMM)”, select EH-TRMM (2048) from “Others” tag as shown in Figure 1.1.1.

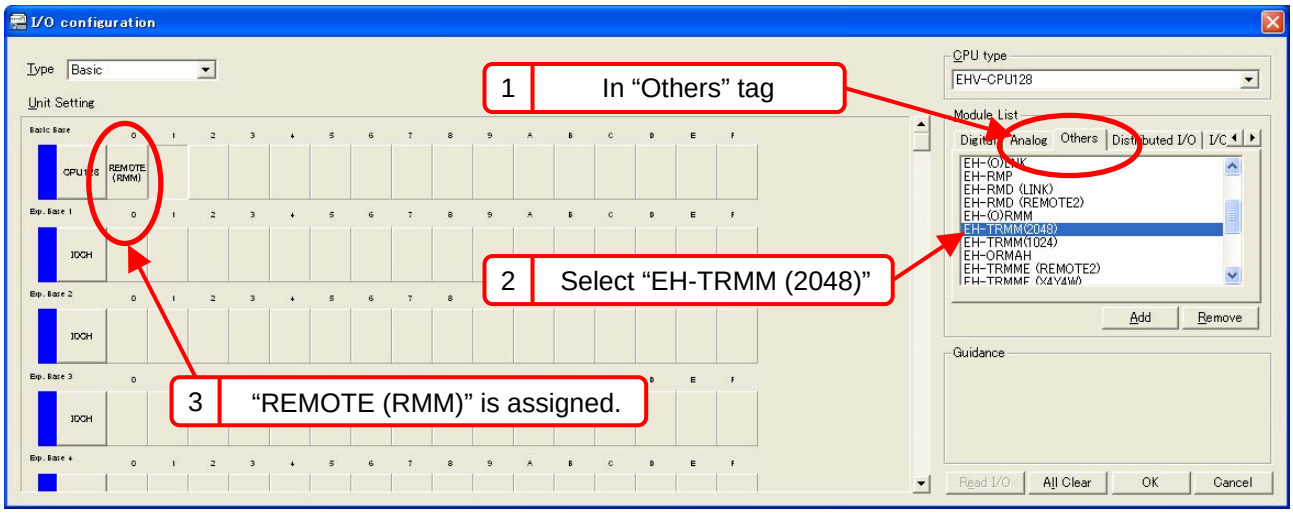


Figure1.1.1 I/O assignment for remote master with control editor (in the case of “REMOTE (RMM)”)

In the case of setting “REMOTE2”, select EH-TRMME (REMOTE2) from “Others” tag as shown in Figure 1.1.2. And in the case of setting I/O assignment “X4Y4W”, select EH-TRMME (X4Y4W) from “Others” tag as shown in Figure 1.1.3.

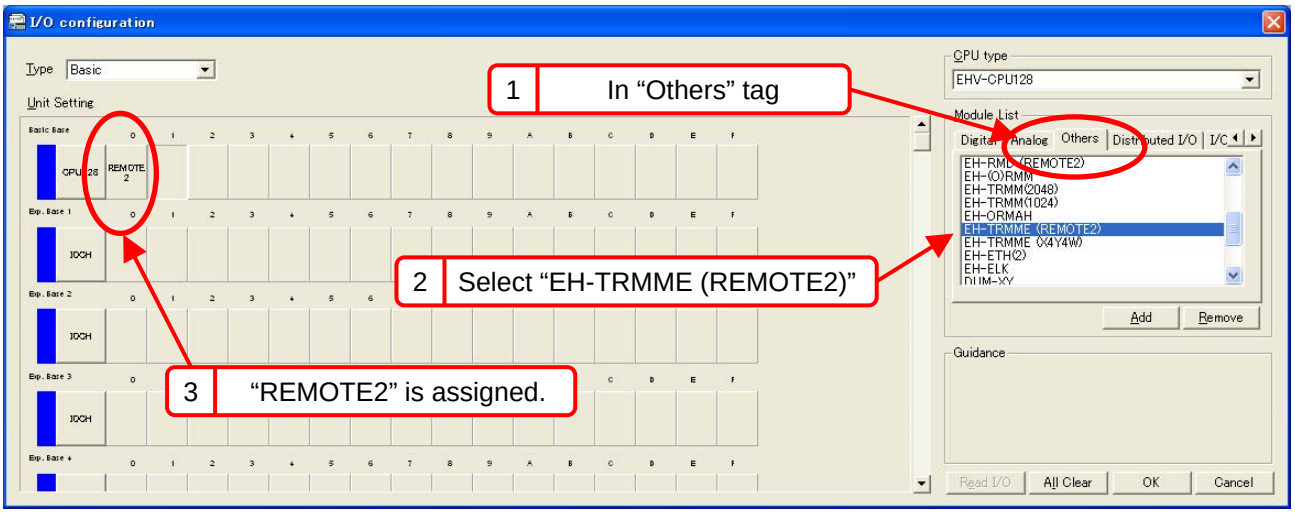


Figure1.1.2 I/O assignment for remote master with control (in the case of “REMOTE2”)

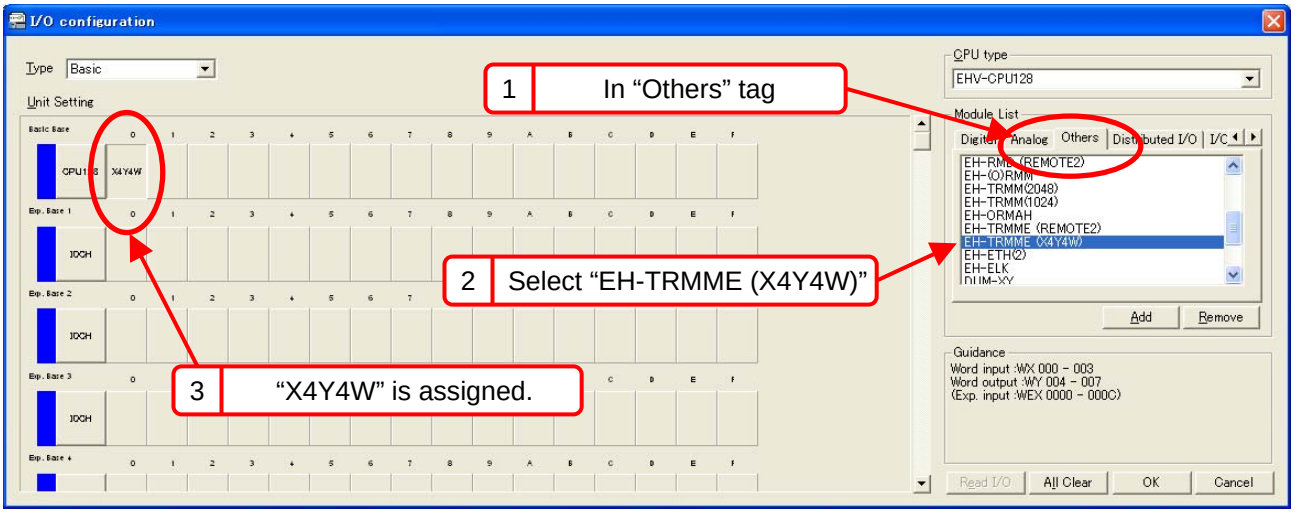


Figure1.1.3 I/O assignment for remote master with control editor (in the case of “X4Y4W”)

In the case of setting I/O assignment “Y8W” or “X8W”, select from “I/O Config” tag as shown in Figure 1.1.4 or Figure 1.1.5.

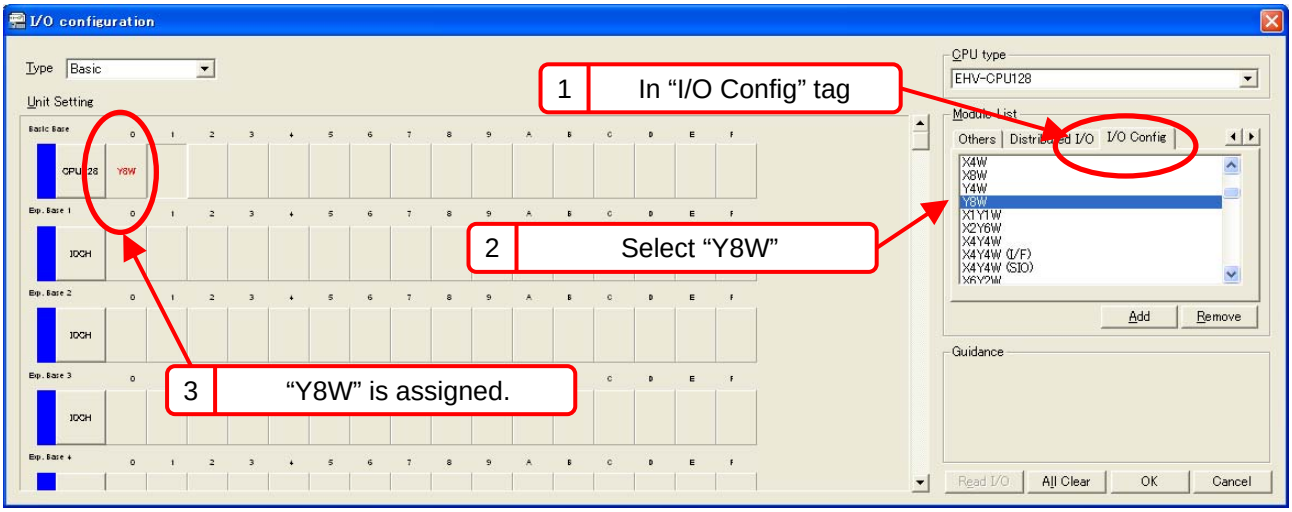


Figure1.1.4 I/O assignment for remote master with control editor (in the case of “Y8W”)

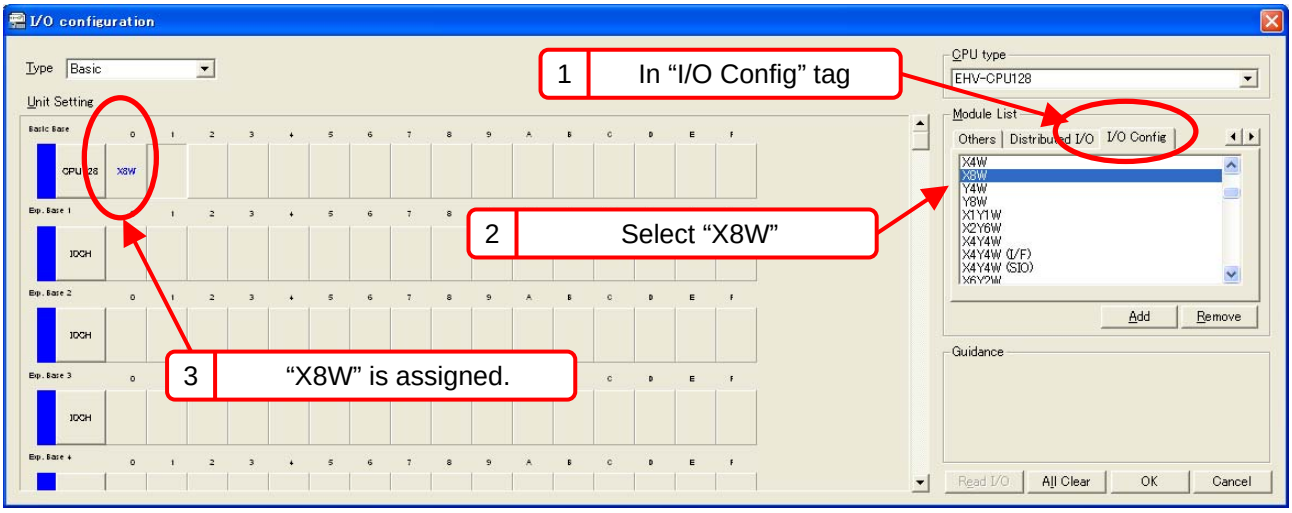


Figure1.1.5 I/O assignment for remote master with control editor (in the case of “X8W”)

1.1.2 Combination of CPU modules and base units

Use EH-TRME2 with products shown in Table 1.1.4.

Table 1.1.4 Supported CPUs and base units

CPU modules	Base units	Limit of mounting for I/O assignment		Remarks
		"REMOTE2" "REMOTE (RMM)"	"Y8W" "X8W" "X4Y4W"	
EHV-CPU128 EHV-CPU64 EHV-CPU32 EHV-CPU16	EH-BS3/ 5/ 8			Not usable. (Note 1)
	EH-BS3A/ 5A/ 6A/ 8A/ 11A	Slot 0 to 7	No limitation	Refer to Table 1.1.5
EH-CPU548 EH-CPU516	EH-BS3/ 5/ 8	Slot 0 to 2	No limitation	Refer to Table 1.1.5
	EH-BS3A/ 5A/ 6A/ 8A/ 11A	Slot 0 to 7	No limitation	Refer to Table 1.1.5
EH-CPU316A	EH-BS3/ 5/ 8 EH-BS3A/ 5A/ 6A/ 8A	Not usable	No limitation	
	EH-BS11A			Not usable. (Note 2)
EH-CPU208A EH-CPU104A	EH-BS3/ 5/ 8 EH-BS3A/ 5A/ 6A/ 8A	Not usable	No limitation	
	EH-BS11A			Not usable. (Note 2)

(Note 1) EHV-CPU*** can be not used with EH-BS3/BS5/BS8.
(Note 2) EH-BS11A can be not used with EH-CPU104A/208A/316A.

See Table 1.1.5 about specifications of base unit. When using EH-TRME2 by I/O assignment of "REMOTE2" "REMOTE (RMM)", mount EH-TRME2 on module slots that can mount communication modules in the basic base.

Table 1.1.5 Specifications of base units

Base units	The number of mounted modules	Available slot number for communication modules	Remarks
EH-BS3	3 modules	Slot 0 to 2	Discontinued
EH-BS5	5 modules		Discontinued
EH-BS8	8 modules		Discontinued
EH-BS3A	3 modules		
EH-BS5A	5 modules	Slot 0 to 4	
EH-BS6A	6 modules	Slot 0 to 5	
EH-BS8A	8 modules	Slot 0 to 7	
EH-BS11A	11 modules		

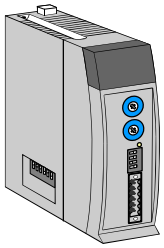
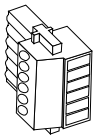
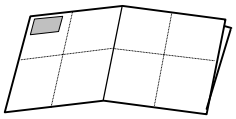
1.2 Before use

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 1.2.1 and Table1.2.2 missing?

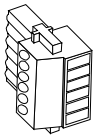
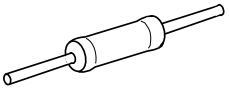
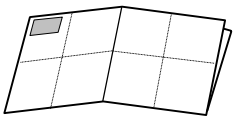
Contact your dealer in the event of any defects being discovered.

Table 1.2.1 List of accessories supplied with the EH-TRME2

No.	Product name	Model name	Appearance	Quantity	Remarks
1	Compact remote2 master module	EH-TRME2		1	
2	Connector	BL3.5/6F		1	Plugged in the connector for communication. Made by Weidmuller
3	Instruction manual	NJI-583* (X)		1	(Note1)

(Note1) The alphabet between the number and (X) means version (A, B…) and the space means the first edition.

Table 1.2.2 List of accessories supplied with the EH-TRLE2

No.	Product name	Model name	Appearance	Quantity	Remarks
1	Compact remote2 slave module	EH-TRLE2		1	
2	Connector	BL3.5/6F		1	Plugged in the connector for communication. Made by Weidmuller
3	External terminator	100Ω		1	Connect it when you use fallback operation. (Note2)
4	Instruction manual	NJI-584* (X)		1	(Note1)

(Note1) The alphabet between the number and (X) means version (A, B…) and the space means the first edition.
(Note2) Please refer to Section 6.5 for fallback operation, and refer to Section 5.4 for connection.

1.3 Features

(1) Maximum remote I/O: 2,048 points

Maximum remote I/O expands to 2,048 points, which enables to structure large-scale control system.

(2) 32-point, 64-point I/O module, and analog I/O modules attachable in each slave station

32-point, 64-point I/O module, and analog I/O modules are attachable to each compact remote 2 slave module, and can control up to 704 points (by using 64-point I/O module) or 88 channels (by using analog module) maximum.

(3) Available to read out I/O assignment information of slave station

Programming of I/O assignment setting becomes easier, since compact remote 2 module can read out I/O assignment information of each slave station in normal mode.

(4) Compatibility with compact remote module

Compact remote 2 modules are functions are compatible with our current compact remote module (EH-TRMME, EH-TRMLE). Kindly recommend each customer to use compact remote 2 modules whenever they install new system.

(5) Available for partial replacement

Since both master and slave modules are available to use with our current models, customer can easily replace to EH150/EHV series by partially replacing its modules without any change of I/O wiring.

(6) Quick response and high reliability

Remote refresh time is approximate 46ms (High-speed mode setting, based on condition of 2,048 I/O points), and also achieve high reliability based on its reverse double-transmission check function, which discard improper communication data.

(7) 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.

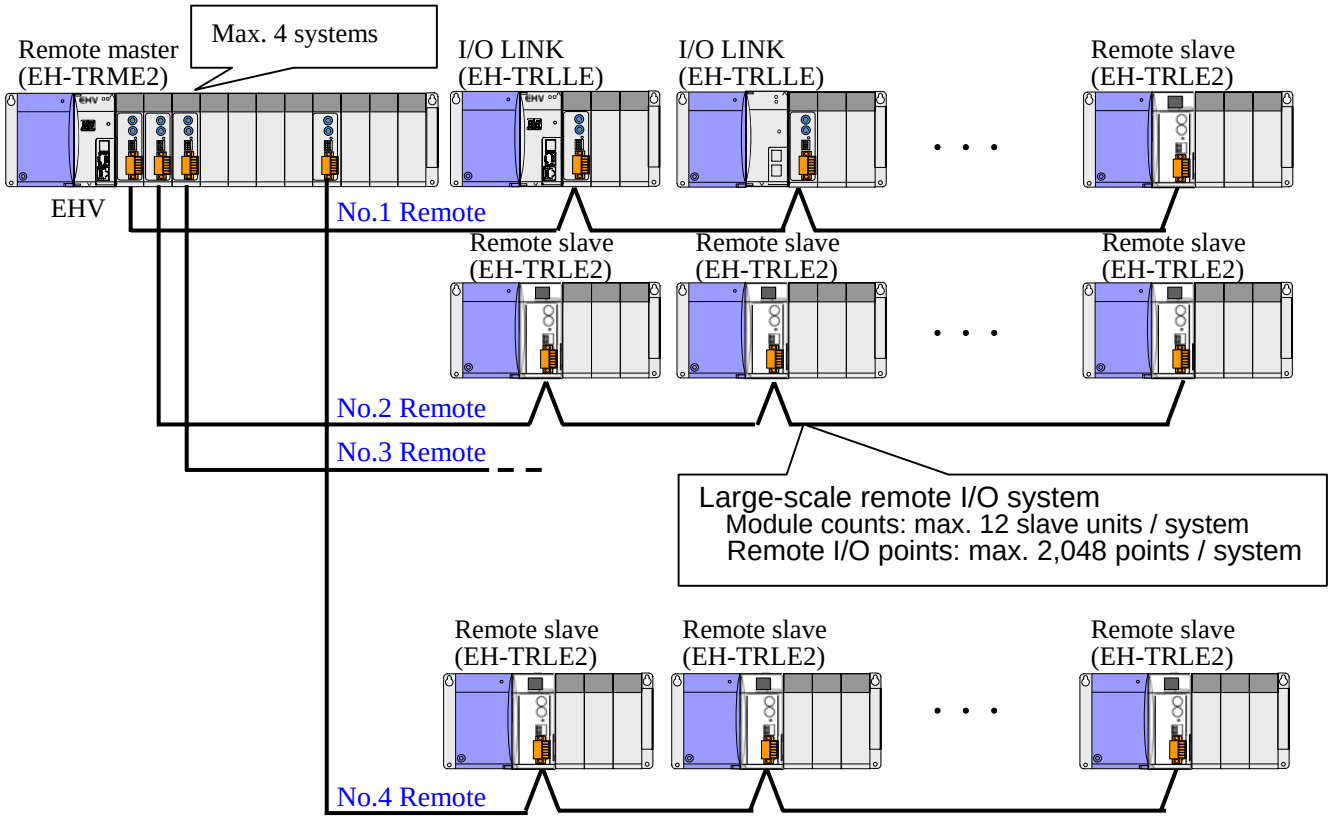
(8) Easy handling

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

The configuration example of the remote I/O system is shown below.

（1） Large-scale remote I/O system (EHV-CPU16/32/64/128, EH-CPU316A/516/548)

You can build the large-scale remote I/O system of maximum 2,048 points / systems in EHV/EH-150 series by the compact remote2 module which a cheap twisted pair cable can use at low cost.



Note) Set “REMOTE (RMM)” to master module in the remote I/O system of maximum 2,048 points / system. Therefore, use EHV-CPU in large-scale remote I/O system

Figure 1.3.1 System configuration example of compact remote module

(2) Low cost remote I/O system (EH-CPU104A/208A/316A)

The CPU (EH-CPU104A/208A/316A) for small-scale control was not able to use a remote module, but compact remote module can build an remote I/O system by the CPU.

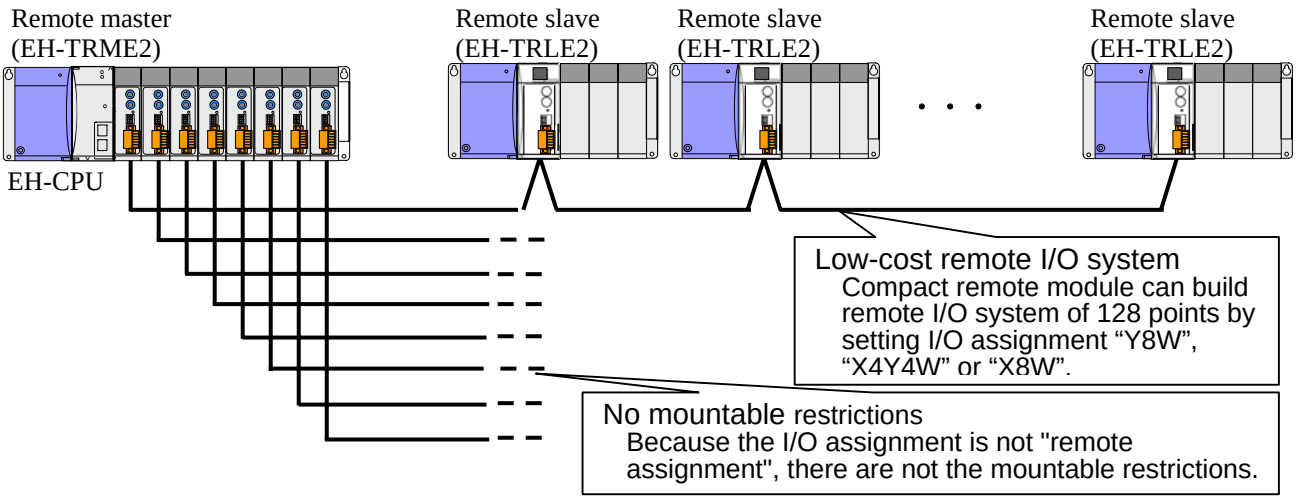


Figure 1.3.2 System configuration example 1 of EH-CPU104A/208A/316A

(3) Small-scale remote I/O system (EH-CPU104A/208A/316A)

EH-CPU104A/ 208A/ 316A can build I/O link system of 128 points / systems by setting I/O assignment of master module in "X4Y4W". In addition, you can build the remote I/O system by adding master module.

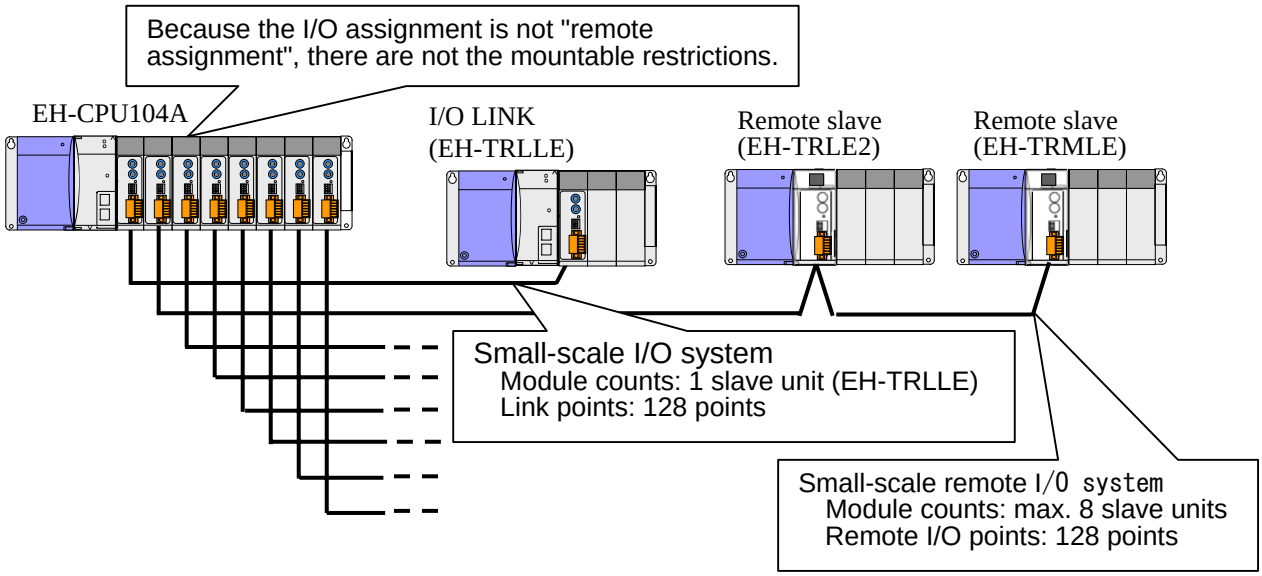


Figure 1.3.3 System configuration example 2 of EH-CPU104A/208A/316A

(4) Remote I/O system with the existing PLC

Since EH-TRME2/TRLE2 has communication-compatibility with current models “REM-MMH/LMH/LH2”, “RIOH-TM/TL” or “RIOM-TM/TL”, it is possible to replace existing PLC by EH-150/EHV series. Therefore you can use compact remote modules with remote I/O system of the existing PLC.

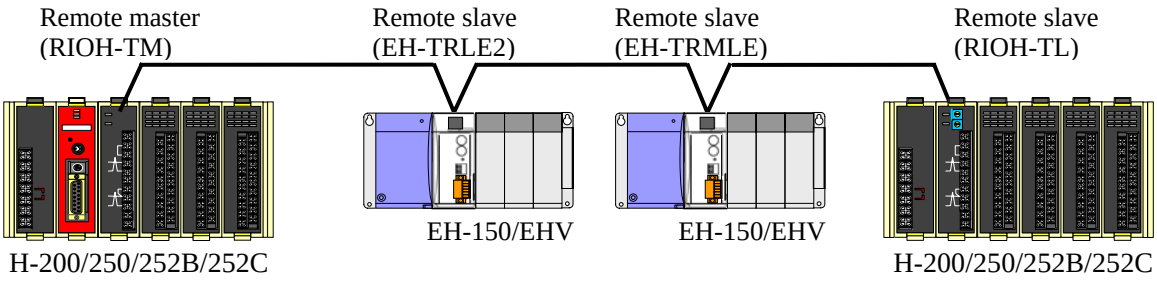


Figure 1.3.4 Replacement configuration example 1 of existing PLC

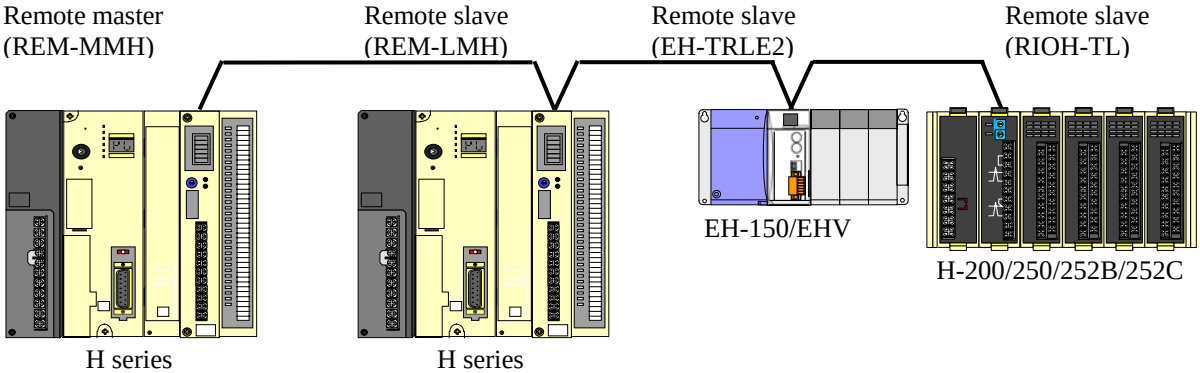


Figure 1.3.5 Replacement configuration example 2 of existing PLC

Refer to Chapter 2 or later for the details of the usage.

MEMO

Chapter 2 Specifications

2.1 General specifications

General specifications are shown in Table 2.1.1. These specifications are common in EH-150 series.

Table 2.1.1 General specifications

Item	Specifications
Operating ambient temperature	0 to 55 °C
Storage ambient temperature	－10 to 75 °C
Operating ambient humidity	5 to 95 % RH (no condensation)
Storage ambient humidity	5 to 95 % RH (no condensation)
Vibration resistance	Conforms to 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 IEC61131-2 ○ 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 2.2.1. The compact remote2 modules have the functions to almost equal with current remote modules as shown in section 2.3.

The compact remote2 modules have communication-compatibility with current remote I/O, and you can use an existing cable. And you can do replacement from existing PLC.

Table 2.2.1 Functional specifications

Item			Specifications
Functional specifications	Usable CPU		EH-CPU104A/208A/316A/516/548, EHV-CPU16/32/64/128
	Number of mountable master modules		Remote master module: MAX. 4 units / CPU (I/O assignment: “REMOTE2”, “REMOTE (RMM)”)
	Number of connectable slave modules		MAX. 4 units/1 master (I/O assignment: “X4Y4W”)
			MAX. 8 units/1 master (I/O assignment: “REMOTE2” “Y8W” “X8W”)
			MAX. 12 units/1 master (I/O assignment: “REMOTE (RMM)”)
	Number of I/O points		128 points/master module (I/O assignment: “Y8W” “X4Y4W” “X8W”)
			1,024 points/master module (I/O assignment: “REMOTE2”)
			2,048 points/master module (I/O assignment: “REMOTE (RMM)”)
	Refresh time		46ms/2,048 points (HS: ON), 94ms/2,048 points (HS: OFF)
	Self-diagnosis		SRAM check, WDT check, Loop back check
	Fallback operation (Note 1)		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 2)		Master module: ”REMOTE (RMM)” “REMOTE2” “Y8W” “X4Y4W” “X8W” Slave module: No configuration code
	Mountable module on slave base (Note 3)		8-point, 16-point, 32-point, 64-point I/O module or Dummy module (I/O assignment: “X16” “Y16” “X32” “Y32” “X64” “Y64” or “Empty 16”) Analog I/O module (I/O assignment: “X4W” “X8W” “Y4W” “Y8W” etc.)
	Consumption current		EH-TRME2: Approximately 200mA, EH-TRLE2: Approximately 200mA
Transmission specifications	Communication speed		768kbps
	Transfer method		Half-duplex serial transfer, frame synchronization
	Insulation, modulation method		Trans insulation, bipolar pulse modulation
	Transmission error check		Reverse double-transmission, time-out
	Error indication		LED, Special internal output
Transmission line	Connection mode		Multi-drop connection
	Cable length (Note 4)		Between stations: 150m (0.3mm^2) / 300m (0.5mm^2, 0.75mm^2)
			Total length: 150m (0.3mm^2) / 300m (0.5mm^2, 0.75mm^2)
	Error station processing		Slave station: Bypass system
	Cable		Shielded twisted 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-EV-SX-1P-0.75SQ (Terminator 150Ω)
		New	0.3mm^2 cable: CO-SPEV-SB (A)-1P-0.3SQ LF (Terminator 100Ω) 0.5mm^2 cable: CO-SPEV-SB (A)-1P-0.5SQ LF (Terminator 100Ω)
	Applicable connector		BL3.5/6F attached (made by Weidmuller)

(Note 1) Please connect external terminator to the terminated compact remote 2 slave module instead of using built-in terminator when you use fallback operation.

(Note 2) The I/O assignment of "REMOTE2" and "X4Y4W" is compatible operation mode to compact remote master module (EH-TRMME). On the other hand, remote I/O was expanded to 1,024 points (64 words) in the I/O assignment of "REMOTE2".

(Note 3) High-performance modules and communication modules, etc. cannot be mounted on the slave base.

(Note 4) Maximum-length of cable becomes as below.

No. of connected stations	0.3mm^2 cable	0.5mm^2, 0.75mm^2 cable
1 to 8 units	150m	300m
9 to 12 units	130m	260m

2.3 Units that can be connected to compact remote2 module

Compact remote2 modules have the compatible communication with "REM-MMH/LMH" for H series, the slave station "REM-LH2" for H-200/250/252B/252C, or the slave station "HL-40DR/64DR and HR-40DR/64DR" for H-board. Furthermore, compact remote2 modules are compatible with the compact remote modules for EH-150/EHV in transmission specifications.

When EH-TRME2 is set to compatible mode, it can connect current slave module and EH-TRMLE for EH-150/EHV series. In addition, when EH-TRLE2 is set to compatible mode, it can connect to EH-TRMME and EH-TRLLE. When compact remote2 modules are connected with current model, please turn off high-speed refresh mode (HS) of a front DIP switch of the module. In high-speed refresh mode (HS:ON), communication error (CERR LED turn on) occurs. In case that compact remote2 modules are connected with EH-TRLLE, please turn on high-speed refresh mode (HS) of a front DIP switch of the module.

2.3.1 Remote slaves that can be connected to remote master (EH-TRME2)

Remote slaves that can be connected to remote master module (EH-TRME2) are shown in Table 2.3.1.

Table 2.3.1 Slave list that can be connected to remote master module (EH-TRME2)

Series of PLC	Product name	Model name	Specifications (Maximum I/O points/slave)	Remarks
EH-150/ EHV	Remote slave	EH-TRMLE	128points (8words) (8slots/slave)	
		EH-TRLE2	1,408points (88words) (11slots/ slave)	
	I/O LINK	EH-TRLLE	Linkage capacity: send 64words, receive 64words	(Note 1)
Large H	Remote I/O MINI slave	REM-LMH	Linkage capacity: send 64words, receive 64words	(Note 1)
H-200/250/ 252B/252C	Remote slave	RIOH-TL	128points (8words) (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) (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

(Note 1) It can use I/O to 1,024 points at total of input and output (64 words).

2.3.2 Remote masters that can be connected to remote slave (EH-TRLE2)

Remote masters that can be connected to remote slave module (EH-TRLE2) are shown in Table 2.3.2.

Table 2.3.2 Master list that can be connected to remote slave module (EH-TRLE2)

Series of PLC	Product name	Model name	Specifications					Remarks
			Mode	I/O assignment of master	Not using image slot	Using image slot		
EH-150/ EHV	Remote master	EH-TRMME	Compatible mode	REMOTE2	I/O: 256points	Input: 128points Output: 128points	Total: 256points	
				X4Y4W	I/O: 64points	Input: 64points Outputs: 64points	Total: 128points	
		EH-TRME2	Compatible mode	REMOTE2	I/O: 1,024points	Input: 512points Output: 512points	Total: 1,024points	
				Y8W	Output: 128points	Not available		
				X4Y4W	I/O: 64points	Input: 64points Output: 64points	Total: 128points	
				X8W	Input: 128points	Not available		
			Normal mode	REMOTE2	I/O: 1,024points	Not available		
				REMOTE (RMM)	I/O: 2,048points	Not available		
	I/O Linkage (Master)	EH-TRLLE	Mode0	LINK	I/O: 1,024points	Input: 1,024points Output: 1,024points	Total: 2,048points	
			Mode0c	LINK	I/O: 128points	Not available		
			Mode1	Y8W	Output: 128points	Not available		
			Mode2	X4Y4W	I/O: 64points	Input: 64points Output: 64points	Total: 128points	
			Mode2c	LINK				
			Mode3	X8W	Input: 128points	Not available		
Large H	Remote I/O MINI	REM-MMH	Mode0	X4Y4W	I/O: 1,024points	Input: 1,024points Output: 1,024points	Total: 2,048points	
			Mode1	Y8W	Output: 128points	Not available		
			Mode2	X4Y4W	I/O: 64points	Input: 64points Output: 64points	Total: 128points	
			Mode3	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	

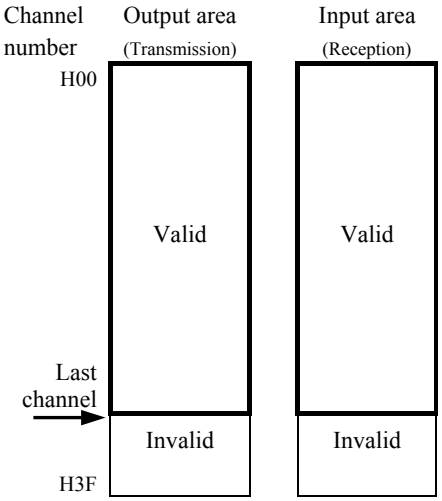
2.3.3 Occupied channels of the conventional product

The number of data transferred between remote I/O module master and slave stations is called the "channel". A channel means that the pair of an input word (data sent to the master station by the slave station) and an output word (data sent to the slave station by the master station) is allocated to one address. Therefore, one channel is 32 points (2 words). The number of channels occupied by the station is determined by the setting of operation mode for station. As seen from the slave station, the output area (transmission) from the master station is the input area (reception) to the slave station, and the input area (reception) to master station is the output area (transmission) from the slave station.

Some current models don't use the remote I/O number. The way of occupied channels for them is shown below.

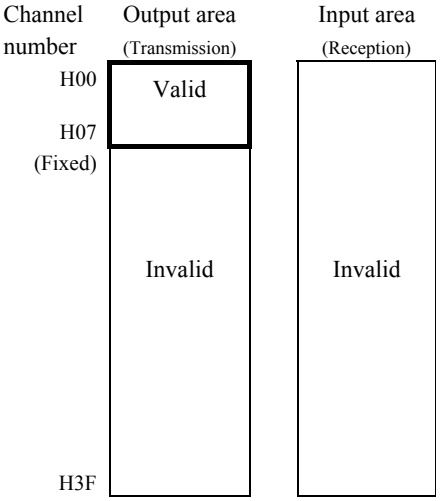
(1) Occupied channels in REM-MMH

Mode0
(I/O assignment "X4Y4W")



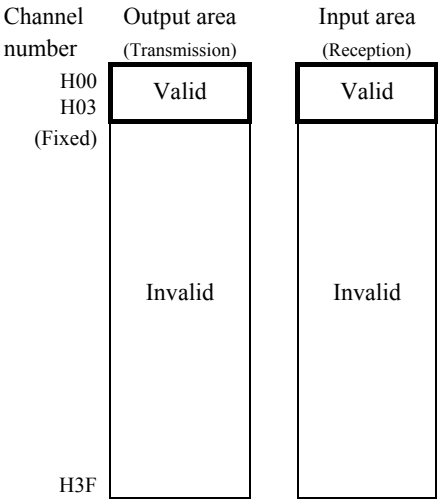
The remote I/O area has H00 to H3F channels (64 channels). The area to be used is secured by setting the last channel number using the dipswitch on the module.

Mode1
(I/O assignment "Y8W")



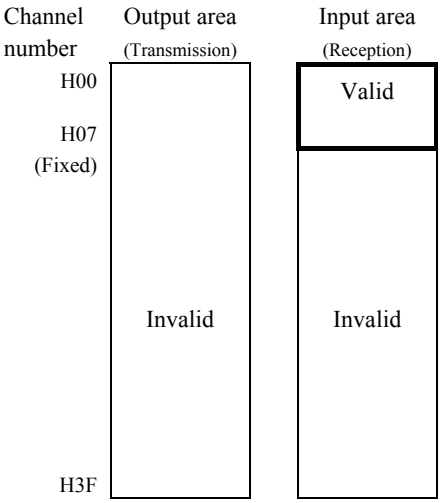
Only the output area uses 0 to 7 channels (8 channels). The number of channels and areas are fixed.

Mode2
(I/O assignment "X4Y4W")



Both input and output areas use 0 to 3 channels (4 channels). The number of channels and areas are fixed.

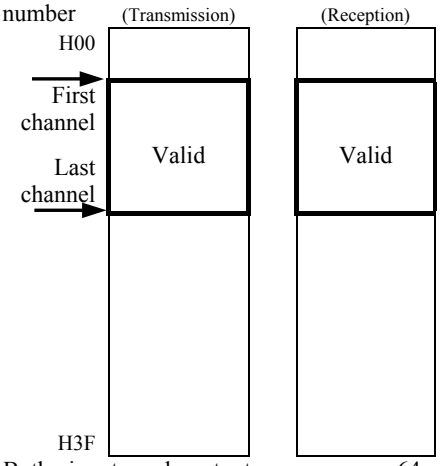
Mode3
(I/O assignment "X8W")



Only the input area uses 0 to 7 channels (8 channels). The number of channels and areas are fixed.

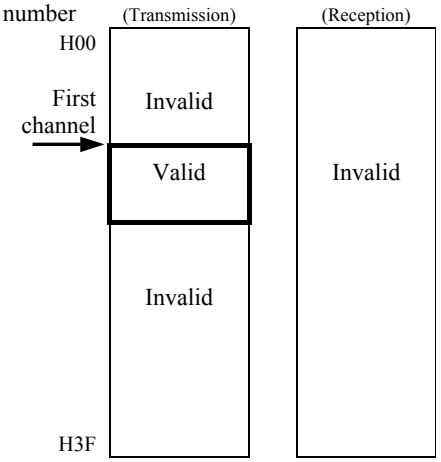
(2) Occupied channels in REM-LMH

Mode0
(I/O assignment “X4Y4W”)



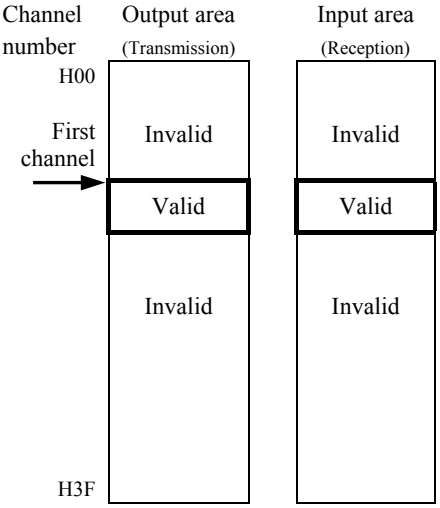
Both input and output area owns 64 channels from H00 to H3F. Using dipswitch on the module and user’s application program, set the number of channels and secure valid areas. The area that isn't occupied is valid.

Mode1
(I/O assignment “Y8W”)



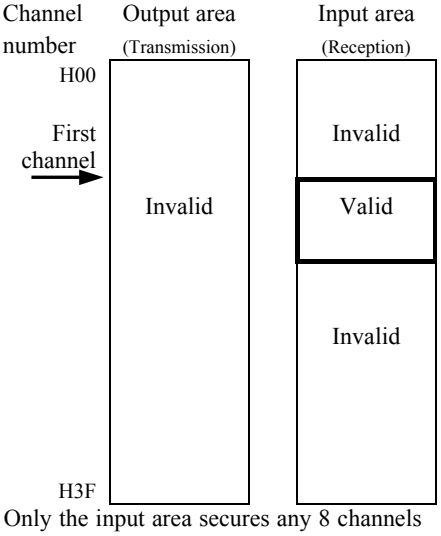
Only the output area secures any 8 channels from H00 to H3F. The area that isn't occupied is invalid.

Mode2
(I/O assignment “X4Y4W”)



Both input and output area secures any 4 channels from H00 to H3F. The area that isn't occupied is invalid.

Mode3
(I/O assignment “X8W”)



Only the input area secures any 8 channels from H00 to H3F. The area that isn't occupied is invalid.

In operation mode "Mode1", "Mode2" or "Mode3" of REM-MMH/LMH, the number of the occupied channel uses an external input and output number allocated for the slot which implemented product. REM-MMH/LMH secures transmission data area in the internal output of the CPU in operation mode "Mode0". The control method of REM-MMH/LMH is an indirect refresh method to perform the internal output of the CPU module and the data refreshment of the module by the exclusive command in user's program.

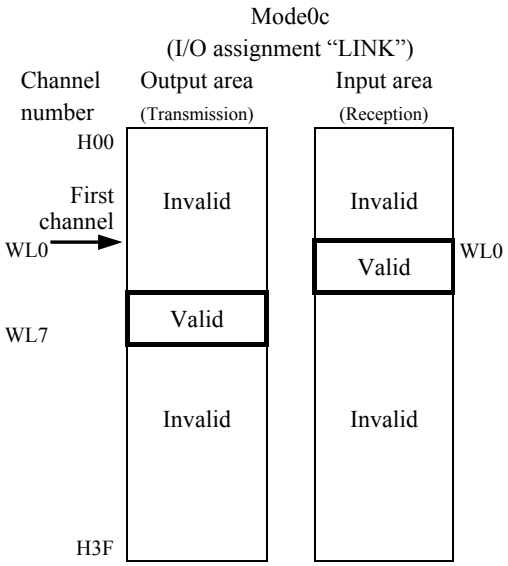
When compact remote2 modules are connected with REM-MMH/LMH, please turn off high-speed refresh mode (HS) of a front Dipswitch of the product.

(3) Occupied channels in REM-LH2 and HL-40DR/64DR

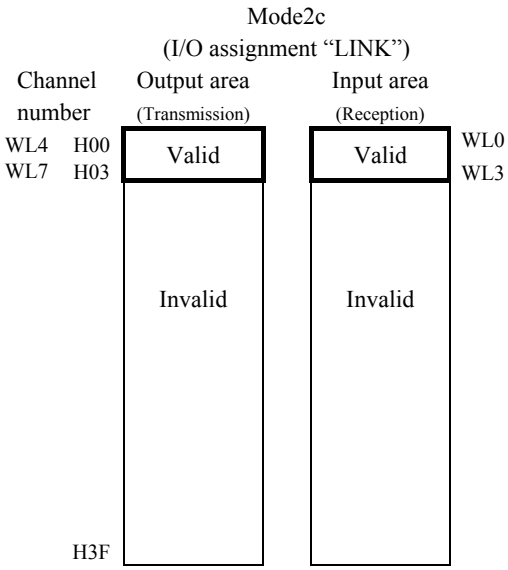
The CPU link area from WL0 to WL7 is used for the I/O link in REM-LH2 and HL-40DR/64DR. Set first channel number is allocated for WL0. The output area of the slave station is the link area set by link parameter.

In this operation mode "Mode0c", the output area of the slave station is the link area set by link parameter, and others are input areas. The input area of the channels set the output area and the output area of the channels set the input area are invalid with this mode. Therefore the CPU module can't write and read the data of the area.

In this operation mode "Mode2c", the output area of the slave station sets the link area from WL4 to WL7 by link parameter, and the input area becomes the link area from WL0 to WL3. The output area and the input area are assigned to the same channel number. The input is the reception from the master station, and the output is the transmission to the master station. The each channel of link area means that the each pair of the input area from WL0 to WL3 and the output area from WL4 to WL7 is allocated to one address. This mode is usable, when the master station is set to the operation mode "Mode2". In the case of compact remote2, set I/O assignment “X4Y4W” in compatible mode.



Both input and output area secures any 8 channels from H00 to H3F. The area that isn't occupied is invalid.



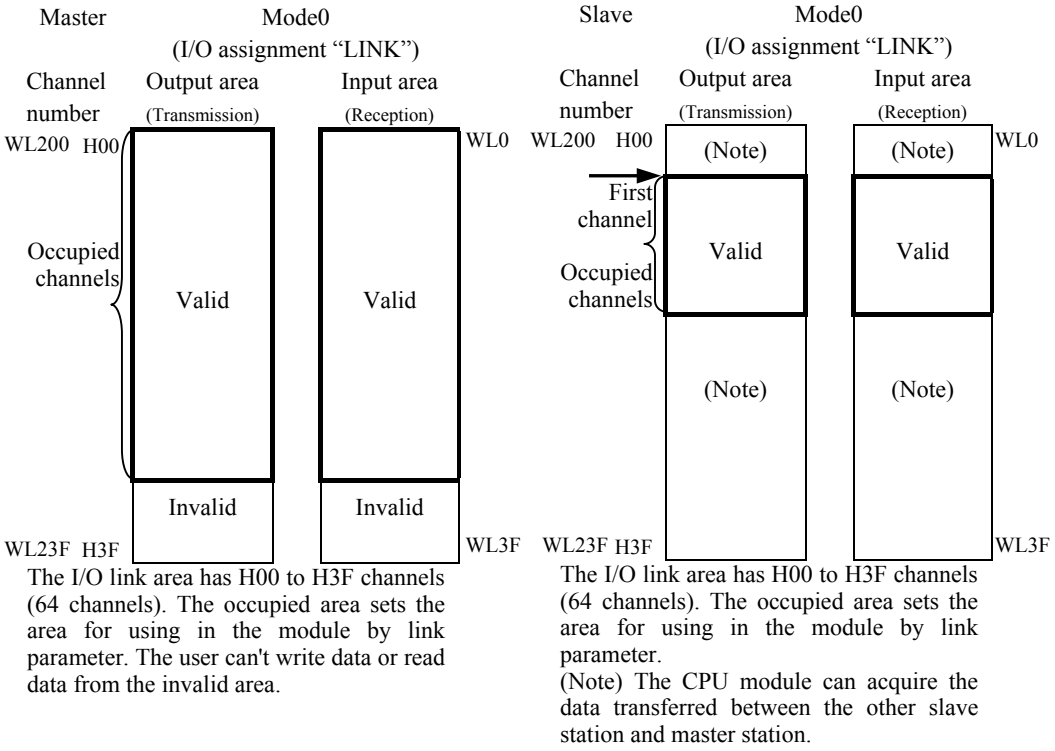
Both input and output area secures any 4 channels from H00 to H3F. The area that isn't occupied is invalid.

When compact remote module is connected with REM-LH2 and HL-40DR/64DR, please turn off high-speed refresh mode (HS) of a front Dipswitch of the product.

(4) Occupied channels in EH-TRLLE

Each operation mode of the current products is usable in the compact remote2 module.

Refer to below about the operation mode “Mode0” that is different from REM-MMH/LMH.



The I/O link area has H00 to H3F channels (64 channels). The occupied area sets the area for using in the module by link parameter. The user can't write data or read data from the invalid area.

The I/O link area has H00 to H3F channels (64 channels). The occupied area sets the area for using in the module by link parameter.
(Note) The CPU module can acquire the data transferred between the other slave station and master station.

The output area and the input area are secured in the internal outputs of CPU module in REM-MMH/LMH of the current product. The control method of REM-MMH/LMH is an indirect refresh method to perform the internal output of the CPU module and the data refreshment of the module by the exclusive command in user's program. In contrast, because the I/O assignment of the compact link module is "LINK", the programming makes use of the link number in the user's program. Therefore, the exclusive control program is not necessary.

In the master and the slave station, the input area owns the link area from WL0 to WL3F, and the output area owns the link area from WL200 to WL23F. Each area owns 64 channels. The output area of the master station sets the area for using in the I/O link system by link parameter. In the slave station, the occupied area sets the area by link parameter.

The output area data of the master station are stored in the input area of the slave station, and the output data of the slave station are stored in the input area of the master station. The output data from other slave stations are stored in the output area that each slave station does not occupy. Therefore you can refer to the data that is sent from master station to other slave stations and from other slave stations to master station when CPU module reads the area that is not set by the link parameter in each slave station.

2.4 Difference with the compact remote module

Compact remote2 is remote I/O module using the twisted pair cables.

2.4.1 Specifications comparison of master module

Refer to Table 2.4.1 about the difference of the communication functional specifications with the compact remote master module.

Table 2.4.1 Specifications comparison (Master)

Item			EH-TRMME	EH-TRME2	Remarks
Communication mode	High speed		Available		
	Low speed				
Number of connectable slave module			MAX. 8 units / system	MAX. 12 units / system	(Note 1)
I/O assignment and remote I/O points	REMOTE (RMM)	Input	—	2,048 points as total I/O	
		Output			
	REMOTE2	Input	256 points as total I/O	1,024 points as total I/O	
		Output			
	Y8W	Input	—	—	
		Output		128 points	
	X4Y4W	Input	64 points		
		Output	64 points		
	X8W	Input	—	128 points	
		Output		—	
Refresh time	High speed		Approx. 2.5ms		Compatible mode 256 points / Master
	Low speed		Approx. 5.4ms		
Fallback operation (Note 2)			Available (Except for master station)		
Reset switch			Available		
Remote error flag	Module information		Available		
	Slave station participation flag		Not available	Available	
	Slave station error flag		Not available	Available	
	Number of times transmission errors		Available		
	Refresh time		Available		
Overlap check (Note 3)			Available		
Peripheral device functions			Not available		
Terminator (Note 2)			100Ω/150Ω (built in)		Change by switch

(Note 1) Slave modules can connect up to 12 units / system, only when EH-TRME2 is set I/O assignment "REMOTE (RMM)". EH-TRME2 can connect up to 8 units / system in other I/O assignments.

(Note 2) Please connect external terminator to the terminated compact remote2 slave module instead of using built-in terminator when you use fallback operation.

(Note 3) When EH-TRME2 is used with conventional products, they will detect the overlap error for duplicated channel number. When remote I/O system made construction only in compact remote modules, there is a possibility that the area overlap error can't detect.

2.4.2 Specifications comparison of slave module

Refer to Table 2.4.2 about the difference of the communication functional specifications with the compact remote slave module.

Table 2.4.2 Specifications comparison (Slave)

Item		EH-TRMLE	EH-TRLE2	Remarks
Usable base units (Note 1)		EH-BS3/BS5/BS8 EH-BS3A/BS5A/BS6A/BS8A/BS11A		
Maximum I/O points		128 points (8 slots)	1,408 points (11 slots)	(Per slave module)
Usable modules	4points / 8 points I/O	Available		
	12 points / 16 points I/O	Available		
	32 points /64 points I/O	Not available	Available	
	Analog I/O	Not available	Available	
Communication mode	High speed	Available		
	Low speed			
	Compatible	Available	Available	
	Normal	Not available		
Number of connectable slave module (Note 2)		MAX. 8 units / system	MAX. 12 units / system	
I/O compression function (Note3)		Available	Available	
Fallback operation (Note 4)		Available		
Reset switch		Available		
Overlap check (Note 5)		Available		
Peripheral device functions		Not available		
Terminator (Note 4)		100Ω/150Ω (built in)		Change by switch

(Note 1) When EH-TRMLE is installed to EH-BS11A, there is usable slots from slot0 to slot7.

(Note 2) In the case of REM-MMH, always slave module can connect up to 12 units / system.
EH-TRLE2 can connect up to 8 units / system when EH-TRME2 is set I/O assignment "REMOTE2".

(Note 3) Only when EH-TRLE2 sets operation mode as compatible mode, you can use compression mode.

(Note 4) Please connect external terminator to the terminated compact remote2 slave module instead of using built-in terminator when you use fallback operation.

(Note 5) There is a possibility that the area overlap error can't detect. When remote I/O system made construction only in compact remote modules, there is a possibility that the area overlap error can't detect.

2.5 List of mountable modules of slave module (EH-TRLE2)

Modules and units that can be used with remote2 slave module (EH-TRLE2) are shown in Table 2.5.1. You cannot implement high-performance modules or communication modules in base unit that mounted remote slave module.

Table 2.5.1 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.	－	
	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	
	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	
	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, 5/12/24 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	
Mixed I/O module	EH-MTT32	16 points, TTL input, 4 to 27 V DC 16 points, TTL output, 4 to 27 V DC	X1Y1W (B1/1)	Don't mount on the slave base. (Note 1)
Analog input module	EH-AX44	12 bits analog input (4 to 20mA, 0 to 10V) each 4ch.	X8W	
	EH-AX8V	12 bits analog input 8ch., Voltage (0 to +10V)	X8W	
	EH-AX8H	12 bits analog input 8ch., Voltage (-10 to +10V)	X8W	
	EH-AX8I	12 bits analog input 8ch., Current (4 to 20mA)	X8W	
	EH-AX8IO	12 bits analog input 8ch., Current (0 to 22mA)	X8W	
	EH-AXH8M	14 bits analog input 8ch. (0 to 22mA, 4 to 22mA, -10 to +10V, 0 to 10V)	X8W	
	EH-AXG5M	Isolation between channels, 16 bits analog input 8ch. (0 to 22mA, 4 to 22mA, -10 to +10V, 0 to 10V)	X8W	

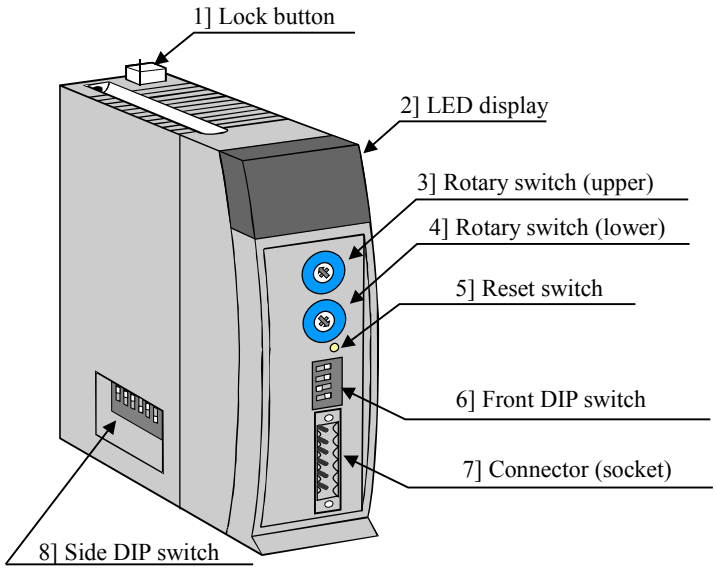
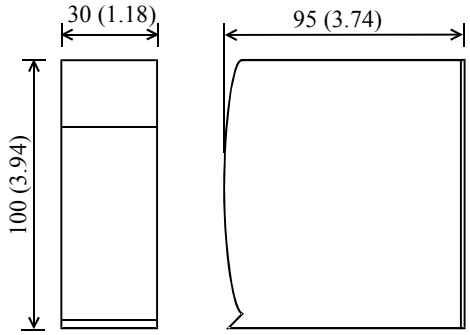
Product name	Model name	Specifications	I/O assignment symbol	Remarks
Analog output module	EH-AY22	12 bits analog output (4 to 20mA, 0 to 10 V) each 2ch.	Y8W	
	EH-AY2H	12 bits analog output 2ch., Voltage (-10 to +10 V)	Y8W	
	EH-AY4V	12 bits analog output 4ch., Voltage (0 to +10 V)	Y8W	
	EH-AY4H	12 bits analog output 4ch., Voltage (-10 to +10 V)	Y8W	
	EH-AY4I	12 bits analog output 4ch., Current (4 to 20mA)	Y8W	
	EH-AYH8M	14 bits analog output 8ch., (0 to 22mA, 4 to 22mA, 0 to 10V)	Y8W	
	EH-AYG4M	Isolation between channels, 16 bits analog output 8ch. (0 to 22mA, 4 to 22mA, -10 to +10V, 0 to 10V)	Y8W	
RTD input module	EH-PT4	4 channels resistance bulb input, Signed 15 bits Platinum (Pt 100Ω / Pt 1000Ω)	X4W	
Thermocouple input module	EH-TC8	Signed 15 bits, Thermocouple input (K, E, J, T, B, R, S, N) 8 points	X8W	
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	Don't 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-SIO	Serial communication module, RS-232C / RS-422 / RS-485 general-purpose, Modbus protocol, Hi-Protocol, Simple data link	X4Y4W (SIO)	Don't mount on the slave base. (Note 1)
	EH-ETH2	Ethernet module, 10BASE-T, 8 units per CPU	COMM (ETH)	
	EH-LNK	CPU link module (coaxial), 8 units per CPU	LINK	
	EH-OLNK	CPU link module (optical fiber), 8 units per CPU	LINK	
	EH-OLNKG	CPU link module (support optical fiber GI50/125μm cable), 8 units per CPU	LINK	
	EH-OLNKE	CPU link module (support optical fiver GI62.5/125μm cable), 8 units per CPU	LINK	
	EH-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-IOCD	Device Net slave module, 256 words input/256 words output	—	
	EH-RMP	PROFIBUS-DP master module, 256/256 words I/O, 8 units per CPU can be installed	LINK	
	EH-IOCP	PROFIBUS-DP slave controller, 208 words I/O	—	
	EH-TRMME	Compact remote master module	REMOTE2/ X4Y4W	
	EH-TRMLE	Compact remote slave module	—	
	EH-TRME2	Compact remote2 master module	REMOTE (RMM) REMOTE2 etc.	
	EH-TRLE2	Compact remote2 slave module	—	
	EH-TLNKE	Compact CPU link module	LINK / X4Y4W Y8W / X8W etc.	
	EH-TRLLE	Compact I/O link module	LINK / X4Y4W Y8W / X8W etc.	
Dummy module	EH-DUM	Module for an opened slot	Empty16 (Note 2)	

(Note 1) If you implement high-performance modules or communication modules in base unit that mounted remote slave module, products may malfunction.

(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. In the case of setting module in normal mode, I/O assignment of the "Empty" slot is set "Y16" when you operate I/O information reading.

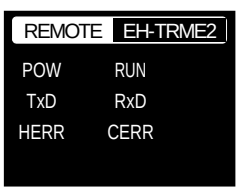
Chapter 3 Name and function of each part

3.1 Name and function of each part in master module

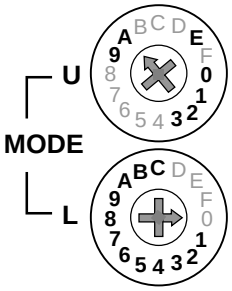
Name and function of each part	Model name	EH-TRME2
	Weight	Approx. 0.12 kg (0.26 lb)
	Consumption current (5VDC)	Approx. 200mA
	Dimensions (mm (in.))	

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 or later.
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
(Note 1)</td><td>I/O assignment of master module is set.
<table>
<tr><th>Set</th><th>I/O assignment of master</th><th>Remarks</th></tr>
<tr><td>0</td><td>REMOTE (RMM)</td><td>Maximum I/O points: 2,048 points / master
Available to EHV-CPU16/32/64/128</td></tr>
<tr><td>1</td><td>Y8W</td><td>Maximum output points: 128 points / master</td></tr>
<tr><td>2</td><td>X4Y4W</td><td>Maximum I/O points: 128 points / master</td></tr>
<tr><td>3</td><td>X8W</td><td>Maximum input points: 2,048 points / master</td></tr>
<tr><td>4 to 8</td><td>Undefined</td><td>-</td></tr>
<tr><td>9</td><td>X4Y4W</td><td>Maximum I/O points: 128 points / master
Also available to EH-CPU104A/208A/316A</td></tr>
<tr><td>A</td><td>REMOTE2</td><td>Maximum I/O points: 1,024 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>REMOTE2</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
(Note2)</td><td>Set the number of connected slave stations. Up to 12 units can be connected. Set the number of the range from 1 to C.</td></tr>
</table>

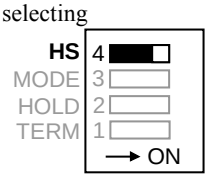
(Note 1) The setting “9”, “A” and “E” are compatible operation mode with compact remote master module (EH-TRMME).
And the setting “A” is operation mode that was expanded to 1,024 points (64 words).
(Note 2) In case of setting “A” and “E”, connectable remote slave modules are maximum 8 units.

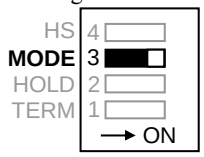
Choose I/O assignment, depending on its CPU, master module operation mode, and slave module connection. Master module operation mode can be changed using the DIP switch on the module front.

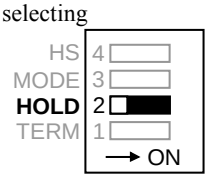
I/O assignment / CPU model	REMOTE (RMM)	REMOTE2 (Note 1)	Y8W	X4Y4W	X8W
EH-CPU104A EH-CPU208A			Compatible mode	Compatible mode	Compatible mode
EH-CPU316A			Compatible mode	Compatible mode	Compatible mode
EH-CPU516 EH-CPU548		Compatible or normal mode	Compatible mode	Compatible mode	Compatible mode
EHV-CPU16 EHV-CPU32 EHV-CPU64 EHV-CPU128	Normal mode	Compatible or normal mode	Compatible mode	Compatible mode	Compatible mode

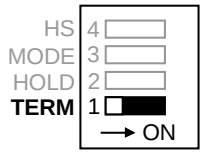
(Note 1) In case of an I/O assignment of "REMOTE2" for master module, if this module is mixed together the slave module of the EM/EM-II series, set it in a compatible mode.

■ 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
 

<table>
<tr><th>MODE</th><th>HS</th><th>Transmission interval</th></tr>
<tr><td rowspan="2">Normal mode</td><td>OFF</td><td>Approx. 100μs</td></tr>
<tr><td>ON</td><td>Approx. 6μs</td></tr>
<tr><td rowspan="2">Compatible mode</td><td>OFF</td><td>Approx. 100μs</td></tr>
<tr><td>ON</td><td>Approx. 6μs</td></tr>
</table>
[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/TRLE2, the high-speed refresh mode can be selectable.
The transmission interval of data changes by the setting of the refresh operation mode. Refer to Section 4.8 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 remote modules for EH-150/EHV series)</td></tr>
</table></td></tr>
<tr><td>MODE</td><td>MODE (communication mode) selecting
 

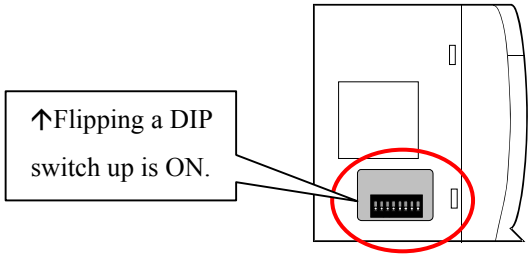
[Default setting: ON]</td><td>Operation mode on remote communication for remote master module is set. Compatible mode allows master module (EH-TRME2) to connect with slave stations for series other than EH-150.
<table>
<tr><th>MODE</th><th>Position</th><th>Communication mode selection</th></tr>
<tr><td>OFF</td><td> </td><td>Normal mode</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
 

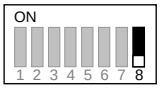
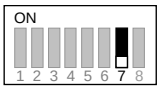
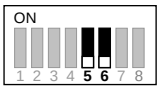
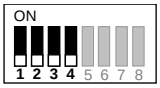
[Default setting: OFF]</td><td>It is selected whether the terminator build in the master module is inserted between A and B terminals of the communication connector. The terminator has to be inserted in both ends of master or slave module connected through a twist-pair cable. 2 types of terminator “100Ω 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

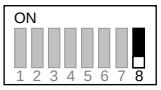
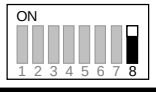
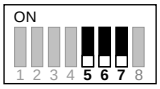
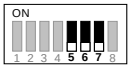
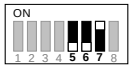
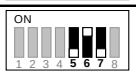
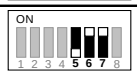
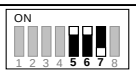
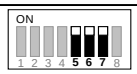
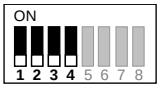
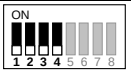
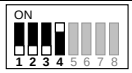
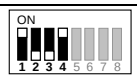
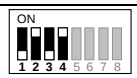
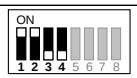
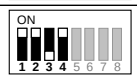
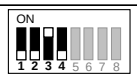
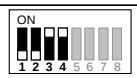
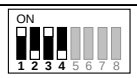
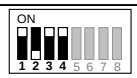
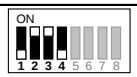
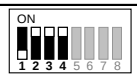
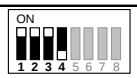
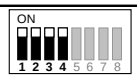
When flipping a DIP switch up, it means ON as the figure shown in the right side.



Compatible mode setting

No.	Setting description	Details
1	Selecting 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 0.3mm^2 or 0.5mm^2 recommended twist-pair cable) ON — 150 Ω (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 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 — Y8W, X4Y4W, X8W — Unnecessary OFF — Disable of compression mode — REMOTE2 — Depends on the I/O assignment of the modules ON — Enable of compression mode — REMOTE2 — X1Y1W (B1/1) in all slots
3	Setting the last channel number of master (Upper)  [Default setting: all OFF]	Upper digit of the last channel number for the master station is set. Set it in H00 to H3F ranges. Refer to Chapter 4 for details. **Bit5** / **Bit6** / Position / Last channel No. / **Bit5** / **Bit6** / Position / Last channel No. OFF OFF — 0 — OFF ON — 2 ON OFF — 1 — ON ON — 3
4	Setting the last channel number of master (Lower)  [Default setting: all OFF]	Lower digit of the last channel number for the master station is set. **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / Last channel No. / **Bit1** / **Bit2** / **Bit3** / **Bit4** / Position / Last channel No. OFF OFF OFF OFF — 0 — OFF OFF OFF ON — 8 ON OFF OFF OFF — 1 — ON OFF OFF ON — 9 OFF ON OFF OFF — 2 — OFF ON OFF ON — A ON ON OFF OFF — 3 — ON ON OFF ON — B OFF OFF ON OFF — 4 — OFF OFF ON ON — C ON OFF ON OFF — 5 — ON OFF ON ON — D OFF ON ON OFF — 6 — OFF ON ON ON — E ON ON ON OFF — 7 — ON ON ON ON — F

Normal mode setting

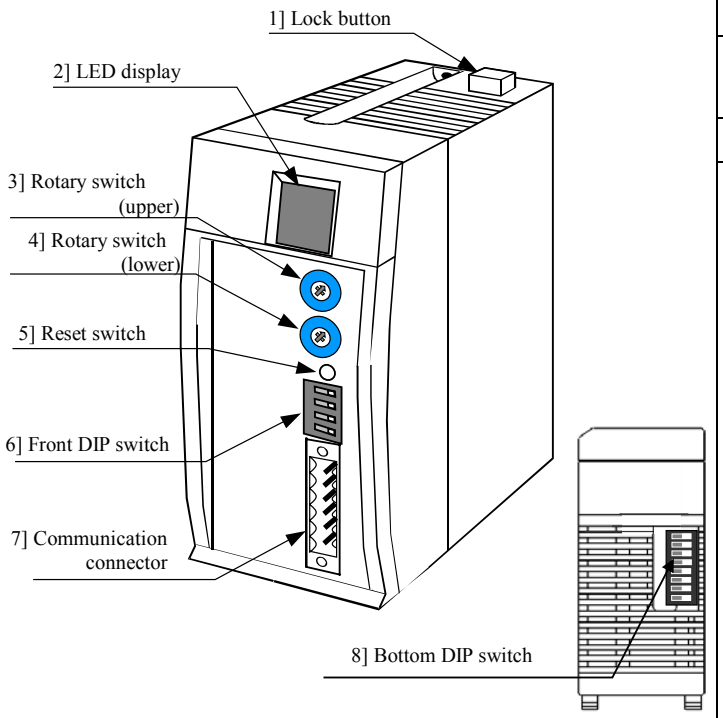
<table>
<tr><th>No.</th><th>Setting description</th><th>Details</th></tr>
<tr><td>1</td><td>Selecting the built-in terminator value
 
[Default setting: OFF]</td><td>100Ω or 150Ω terminator build in a master module, it is chosen which terminator is inserted between A and B terminals of communication connector.
<table>
<tr><th>Bit8</th><th>Position</th><th>Selection of built-in terminator</th></tr>
<tr><td>OFF</td><td> </td><td>100 Ω (for 0.3mm^2 or 0.5mm^2 recommended twist-pair cable)</td></tr>
<tr><td>ON</td><td>  </td><td>150 Ω (for 0.75mm^2 recommended twist-pair cable)</td></tr>
</table></td></tr>
<tr><td>2</td><td>Setting the last channel number of master (Upper)
 
[Default setting: all OFF]</td><td>Upper digit of the last channel number for the master station is set. Set it in H00 to H7F ranges. Refer to Chapter 4 for details.
<table>
<tr><th>Bit5</th><th>Bit6</th><th>Bit7</th><th>Position</th><th>Last channel No.</th><th>Bit5</th><th>Bit6</th><th>Bit7</th><th>Position</th><th>Last channel No.</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>  </td><td>0</td><td>OFF</td><td>OFF</td><td>ON</td><td>  </td><td>4</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td> </td><td>1</td><td>ON</td><td>OFF</td><td>ON</td><td> </td><td>5</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>  </td><td>2</td><td>OFF</td><td>ON</td><td>ON</td><td>  </td><td>6</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>  </td><td>3</td><td>ON</td><td>ON</td><td>ON</td><td>  </td><td>7</td></tr>
</table></td></tr>
<tr><td>3</td><td>Setting the last channel number of master (Lower)
 
[Default setting: all OFF]</td><td>Lower digit of the last channel number for the master station is set.
<table>
<tr><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Position</th><th>Last channel No.</th><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Position</th><th>Last channel No.</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>  </td><td>0</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>  </td><td>8</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td> </td><td>1</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>  </td><td>9</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td> </td><td>2</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>  </td><td>A</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>  </td><td>3</td><td>ON</td><td>ON</td><td>OFF</td><td>ON</td><td>  </td><td>B</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>  </td><td>4</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>  </td><td>C</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>  </td><td>5</td><td>ON</td><td>OFF</td><td>ON</td><td>ON</td><td>  </td><td>D</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>  </td><td>6</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>  </td><td>E</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td>  </td><td>7</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>  </td><td>F</td></tr>
</table></td></tr>
</table>

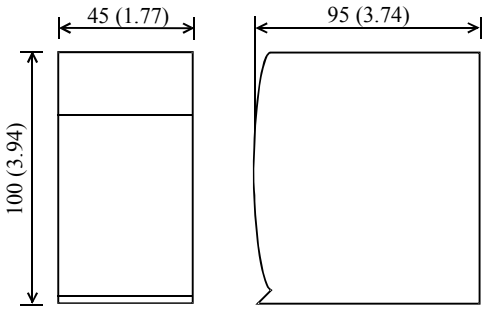
[Caution of the switch setting]

- The setting of the compression mode is not possible with the normal mode.
- In case that the switch setting is the undefined, HERR LED may light up.
- In case that the I/O assignment is "X4Y4W" or "Y8W" in the master station, the external outputs on slave station may not be maintained regardless of HOLD selecting when power supply turns off in the master station.

3.2 Name and function of each part in slave module

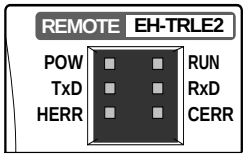
Name and function of each part	Model name	EH-TRLE2
	Weight	Approx. 0.14 kg (0.30 lb)
	Consumption current (5VDC)	Approx. 200mA
	Dimensions (mm (in.))	



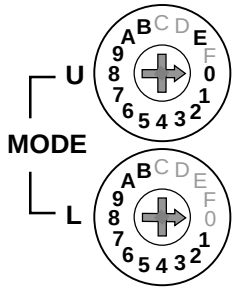


No.	Name	Function	Remarks
1]	Lock button	This is used when removing the module from base unit. After it is installed to the base unit, the fixation can be reinforced using screws. In this case, use M4 × 10 mm (0.39 in.) screw.	
2]	LED display	The status of module is displayed on this LED.	See a table 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.

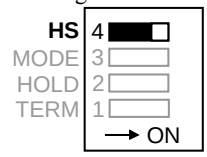
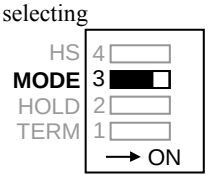
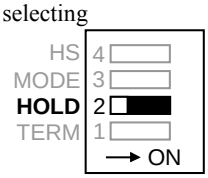
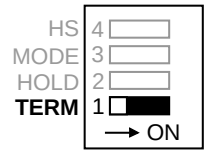
■ Description of LED display

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.)

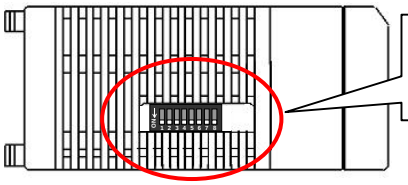
■ Description of Rotary switch

Rotary switch	Symbol	Meaning	Details of setting
 [Default setting: U=0, L=0]	U (Upper)	Station No. (0 to B) Mix with EM mode (E)	The station No. of the slave modules is set from 0 to B (Hex). 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 B units)	The number of occupancy slots used in the slave station is set from 1 to B.

■ Description of Front DIP switch

Symbol	Setting description	Details
HS	HS (high-speed refresh mode) selecting  MODE / HS / Transmission interval Normal mode: OFF — Approx. 100μs; ON — Approx. 6μs Compatible mode: OFF — Approx. 100μs; ON — Approx. 6μs [Default setting: ON]	Refresh operation mode on remote communication is set (High-speed or Low-speed). In the case of all stations consist from remote modules for EH-150/EHV series, the high-speed refresh mode can be selectable. The transmission interval of data changes by the setting of the refresh operation mode. Refer to Section 4.8 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 for EH-150/EHV series)
MODE	MODE (communication mode) selecting  [Default setting: ON]	Operation mode on remote communication for remote slave module is set. Compatible mode allows slave module (EH-TRLE2) to connect with master/slave stations for series other than EH-150. **MODE** / Position / Communication mode selection OFF: Normal mode 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 built in the slave module. It is possible to select which to insert by the bottom DIP switch. The built-in terminator is disconnected when power supply is turned off. So, please set TERM off and connect external terminator to communication connector when you use fallback operation. **TERM** / Position / Selection of insertion / non-insertion of terminator OFF: Not insert a built-in terminator. (in unnecessary case because it is not both ends of a twist-pair cable) ON: Insert a built-in terminator. (when it is both ends of a twist-pair cable)

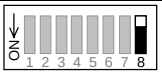
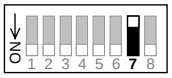
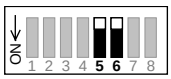
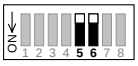
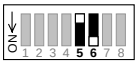
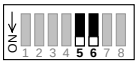
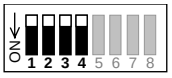
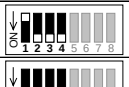
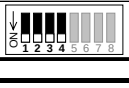
■ Description of Bottom DIP switch



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

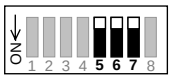
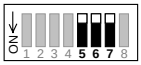
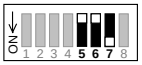
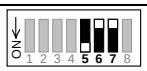
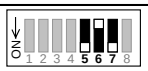
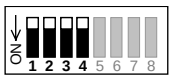
Compatible mode setting

<table>
<tr><th>No.</th><th>Setting description</th><th>Details</th></tr>
<tr><td>1</td><td>Selecting built-in terminator value

[Default setting: OFF]</td><td>100Ω or 150Ω terminator build in a slave module, it is chosen which terminator is inserted between A and B terminals of a connection connector.
<table>
<tr><th>Bit8</th><th>Position</th><th>Selection of built-in terminator</th></tr>
<tr><td>OFF</td><td>  </td><td>100Ω (for 0.3mm^2 or 0.5mm^2 recommended twist-pair cable)</td></tr>
<tr><td>ON</td><td> </td><td>150Ω (for 0.75mm^2 recommended twist-pair cable)</td></tr>
</table></td></tr>
<tr><td>2</td><td>Compression mode selecting
 
[Default setting: OFF]</td><td>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.
<table>
<tr><th>Bit7</th><th>Position</th><th>Selection of compression mode</th></tr>
<tr><td>OFF</td><td> </td><td>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)</td></tr>
<tr><td>ON</td><td> </td><td>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.)</td></tr>
</table></td></tr>
<tr><td>3</td><td>Setting the first channel number of slave (Upper)
 
[Default setting: all OFF]</td><td>Upper digit of the first channel number for the slave station is set. Set it in H00 to H3F ranges. Refer to Chapter 4 for details.
<table>
<tr><th>Bit5</th><th>Bit6</th><th>Position</th><th>First channel No.</th><th>Bit5</th><th>Bit6</th><th>Position</th><th>First channel No.</th></tr>
<tr><td>OFF</td><td>OFF</td><td>  </td><td>0</td><td>OFF</td><td>ON</td><td>  </td><td>2</td></tr>
<tr><td>ON</td><td>OFF</td><td> </td><td>1</td><td>ON</td><td>ON</td><td>  </td><td>3</td></tr>
</table></td></tr>
<tr><td>4</td><td>Setting the first channel number of slave (Lower)
 
[Default setting: all OFF]</td><td>Lower digit of the first channel number for the slave station is set.
<table>
<tr><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Position</th><th>First channel No.</th><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Position</th><th>First channel No.</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td> </td><td>0</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td> </td><td>8</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td> </td><td>1</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td> </td><td>9</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td> </td><td>2</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td> </td><td>A</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td> </td><td>3</td><td>ON</td><td>ON</td><td>OFF</td><td>ON</td><td> </td><td>B</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td> </td><td>4</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td> </td><td>C</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td> </td><td>5</td><td>ON</td><td>OFF</td><td>ON</td><td>ON</td><td> </td><td>D</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td> </td><td>6</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>  </td><td>E</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td> </td><td>7</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>  </td><td>F</td></tr>
</table></td></tr>
</table>

Normal mode setting

<table>
<tr><th>No.</th><th>Setting description</th><th>Details</th></tr>
<tr><td>1</td><td>Selecting built-in terminator value

[Default setting: OFF]</td><td>100Ω or 150Ω terminator build in a slave module, it is chosen which terminator is inserted between A and B terminals of a connection connector.
<table>
<tr><th>Bit8</th><th>Position</th><th>Selection of built-in terminator</th></tr>
<tr><td>OFF</td><td> </td><td>100Ω (for 0.3mm^2 or 0.5mm^2 recommended twist-pair cable)</td></tr>
<tr><td>ON</td><td> </td><td>150Ω (for 0.75mm^2 recommended twist-pair cable)</td></tr>
</table></td></tr>
<tr><td>2</td><td>Setting the first channel number of slave (Upper)
 
[Default setting: all OFF]</td><td>Upper digit of the first channel number for the slave station is set. Set it in H00 to H7F ranges. Refer to Chapter 4 for details.
<table>
<tr><th>Bit5</th><th>Bit6</th><th>Bit7</th><th>Position</th><th>First channel No.</th><th>Bit5</th><th>Bit6</th><th>Bit7</th><th>Position</th><th>First channel No.</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>  </td><td>0</td><td>OFF</td><td>OFF</td><td>ON</td><td>  </td><td>4</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>  </td><td>1</td><td>ON</td><td>OFF</td><td>ON</td><td>  </td><td>5</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td> </td><td>2</td><td>OFF</td><td>ON</td><td>ON</td><td> </td><td>6</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td> </td><td>3</td><td>ON</td><td>ON</td><td>ON</td><td> </td><td>7</td></tr>
</table></td></tr>
<tr><td>3</td><td>Setting the first channel number of slave (Lower)
 
[Default setting: all OFF]</td><td>Lower digit of the first channel number for the slave station is set.
<table>
<tr><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Position</th><th>First channel No.</th><th>Bit1</th><th>Bit2</th><th>Bit3</th><th>Bit4</th><th>Position</th><th>First channel No.</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td> </td><td>0</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td> </td><td>8</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td> </td><td>1</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td> </td><td>9</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td> </td><td>2</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td> </td><td>A</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td> </td><td>3</td><td>ON</td><td>ON</td><td>OFF</td><td>ON</td><td> </td><td>B</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td> </td><td>4</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td> </td><td>C</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td> </td><td>5</td><td>ON</td><td>OFF</td><td>ON</td><td>ON</td><td> </td><td>D</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td> </td><td>6</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td> </td><td>E</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td> </td><td>7</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td> </td><td>F</td></tr>
</table></td></tr>
</table>

[Caution of the switch setting]

- The setting of the compression mode is not possible with the normal mode.
- In case that the switch setting is the undefined, HERR LED may light up.
- In case that the I/O assignment is "X4Y4W" or "Y8W" in the master station, the external outputs on slave station may not be maintained regardless of HOLD selecting when power supply turns off in the master station.

MEMO

Chapter 4 Basic functions and System configuration

4.1 Method of using compact remote2 and selection of CPU

There are three methods to use compact remote2 system by I/O assignment of master or slave module.

(1) Normal remote method

(2) Compression remote method

(3) External I/O method

Differences between these methods are shown in Table 4.1.1. I/O assignment of master or slave module determines the number of maximum mountable master modules on basic unit, the number of maximum slave stations per master module and maximum remote I/O points. Normal remote method has 2,048 points per master module for remote I/O and free location of input modules and output modules on slave station. I/O assignment “REMOTE (RMM)” is usable up to 2,048 points, and is supported by EHV-CPU. Therefore we recommend EHV-CPU for compact remote2 system.

Table 4.1.1 Using method of compact remote2 for each CPU

CPU module		EHV-CPU16/32/64/128					
			EH-CPU516/548				
					EH-CPU104A/208A/316A		
Method of using compact remote2		Normal remote method		Compression remote method	External I/O method		
Selection purpose		For new design, and replacement without image slot		For replacement with image slot	For mounting 5 or more master modules, or using of EH-CPU104A/208A/316A		
Communication mode		OFF (Normal mode)		ON (Compatible mode)			
Compression mode setting	Master	OFF		ON	OFF		
	Slave	OFF		ON	ON	OFF	
I/O assignment of master		REMOTE (RMM)	REMOTE2		X4Y4W	Y8W	X8W
I/O assignment of slave		X16, X32, X64, Y16, Y32, Y64, X4W, X8W, Y4W, Y8W, Empty		X1Y1W (B1/1) for all slots	Unnecessary		
Number of mountable master module		4 units / CPU			Not limited (according to CPU)		
Number of connectable slave modules		12 units / master	8 units / master		4 units / master	8 units / master	
Number of occupied channels in master		128	64	32	4	8	
Number of I/O points	Input	I/O 2,048 points (Free location)	I/O 1,024 points (Free location)	512 points	64 points		128 points
	Output			512 points	64 points	128 points	
Special internal outputs for remote function		Available (Note 1)			Not available		
Operation parameters for remote function		Not available (Note 2)			Not available		
Reference section	Basic system	Section 4.3.1	Section 4.3.2	—	Section 4.3.4	Section 4.3.3	Section 4.3.5
	Replace of H-200	—	Section 4.4.1	Section 4.4.2	—	—	—
	Replace of large H	—	Section 4.5.4	—	Section 4.5.2	Section 4.5.1	Section 4.5.3
	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

(Note 2) Please refer to Section 6.3 for detail of operation parameters for remote function.

In the case of using EH-CPU516/548 for cost reduction, please set “REMOTE2” for I/O assignment of master module as normal remote method. You can build the remote system to 1,024 points if you do so. In addition, choose external I/O method when you build the small scale system or build external I/O in the slightly remote place in EH-CPU104A/208A/316A.

In the case of I/O assignment for external I/O method "Y8W", “X4Y4W” or "X8W" there is a disadvantage of not using special internal outputs indicating remote refresh cycle time and so on. On the other hand, there is an advantage of not limiting it to the number of mounting of master modules per CPU. Therefore, you can construct large-scale remote system with twisted pair cable by use many master modules per CPU.

4.2 Basic functions of compact remote2

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-TRME2) and slave module (EH-TRLE2). One channel consists from 16 bit (1 word) input area and 16 bit (1 word) output area as shown in Figure 4.2.1.

(2) Remote I/O area

The master module (EH-TRME2) and the slave module (EH-TRLE2) have remote I/O area as shown in Figure 4.2.1.

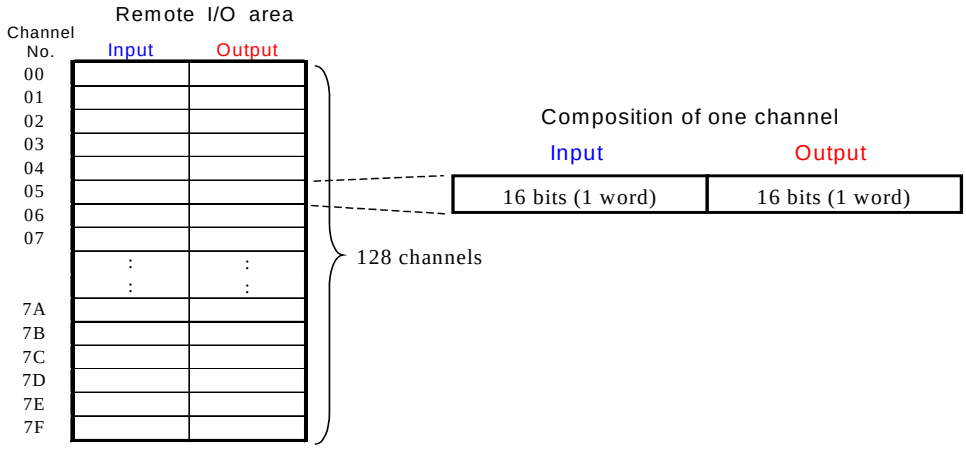


Figure 4.2.1 Composition of remote I/O area and one channel

The configuration of the remote I/O area of master station is different by a set I/O assignment. Refer to Section 4.2.4 or later about the details of the remote I/O area in each I/O assignment.

4.2.2 Master number and slave station number

(1) Master number (Master No.)

Maximum four compact remote2 master modules (EH-TRME2) can be mounted on slots those slot number are 0 to 7 as shown in Figure 4.2.2 in the case of setting I/O assignment “REMOTE2”, “REMOTE (RMM)” of master module. 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.

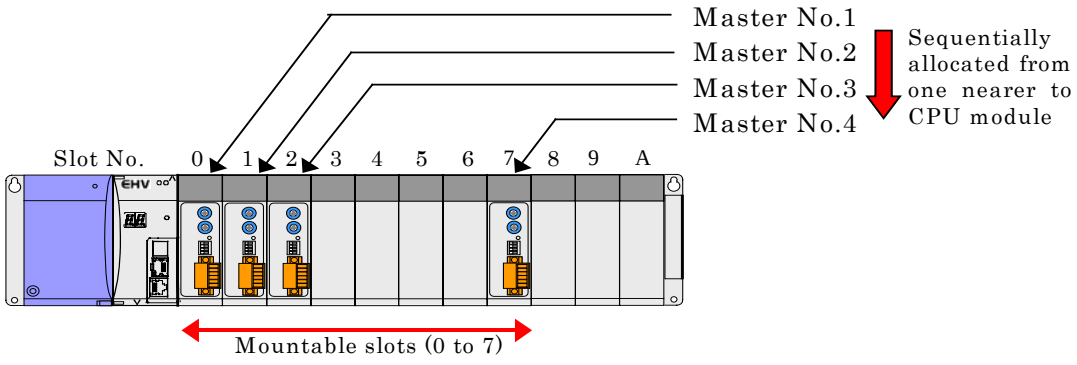


Figure 4.2.2 Mountable slots for master module and master number

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

Please set slave station number 0 to B to compact remote2 slave module (EH-TRLE2) 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.".

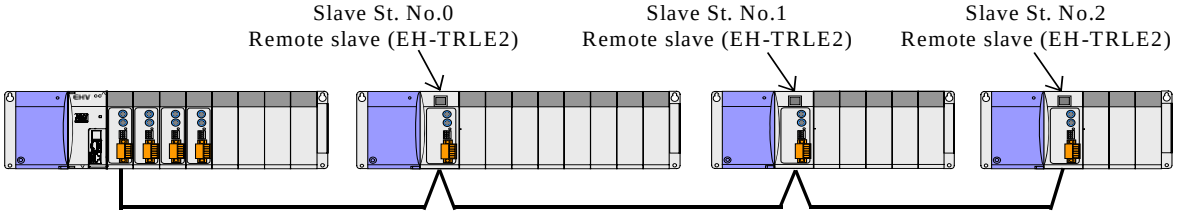


Figure 4.2.3 Slave station number (Slave St. No.)

4.2.3 Occupied channels and method of appointing

(1) Occupied channels

The area used respectively in compact remote2 master module (EH-TRME2) and slave module (EH-TRLE2) is called an occupied channels. Figure 4.2.4 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 last 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.

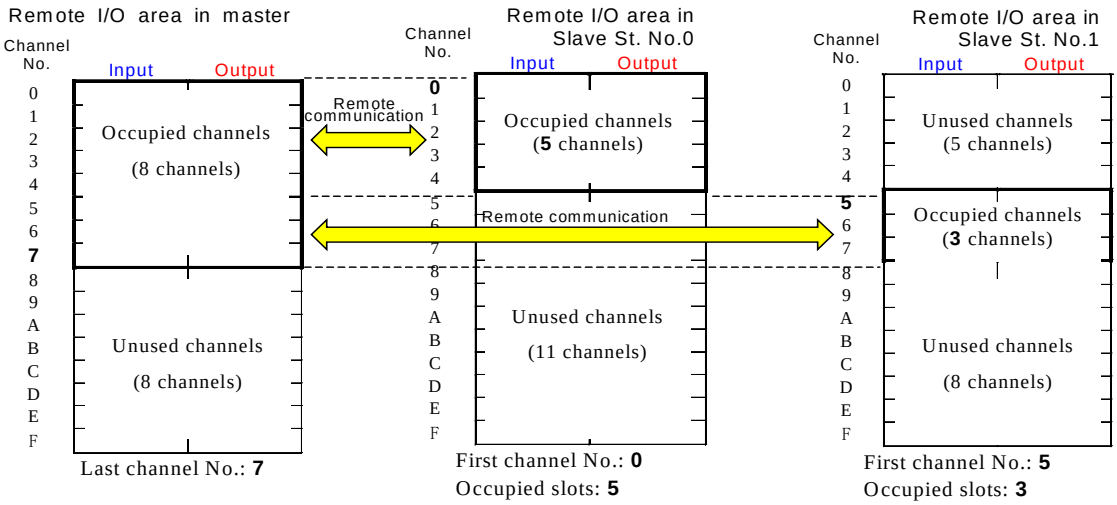


Figure 4.2.4 Occupied channels and remote communication

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 shown in Figure 4.2.5. One channel corresponds to one word 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 11 I/O modules can be mounted on the one slave base

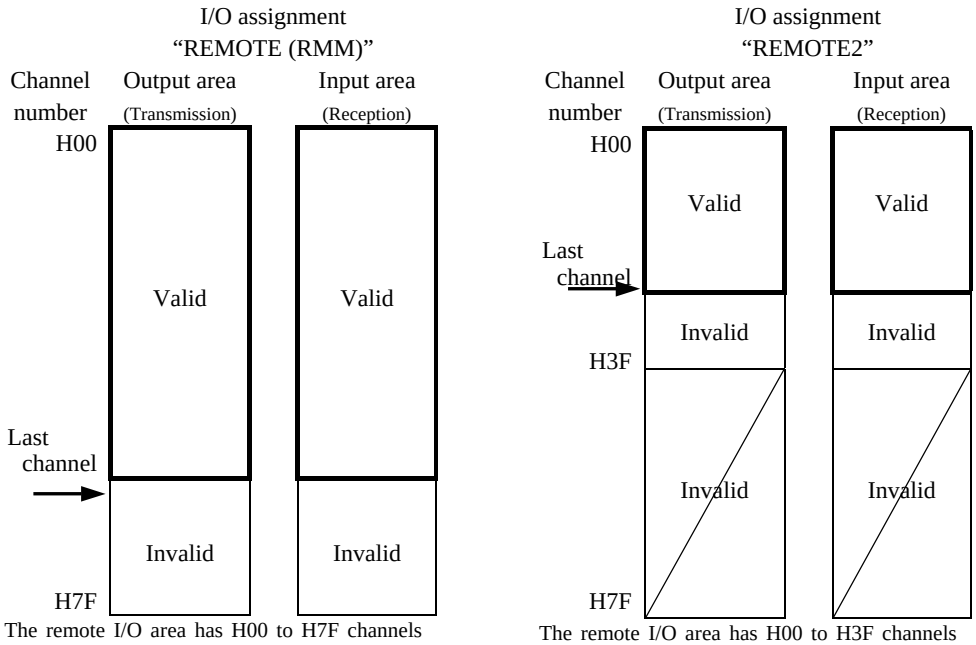


Figure 4.2.5 Configuration of normal remote method

In the normal remote method, I/O is occupied according to I/O assignment of the slave station in turn from first channel. You cannot use the input area of the channel occupied as output or the output area of the channel occupied as input.

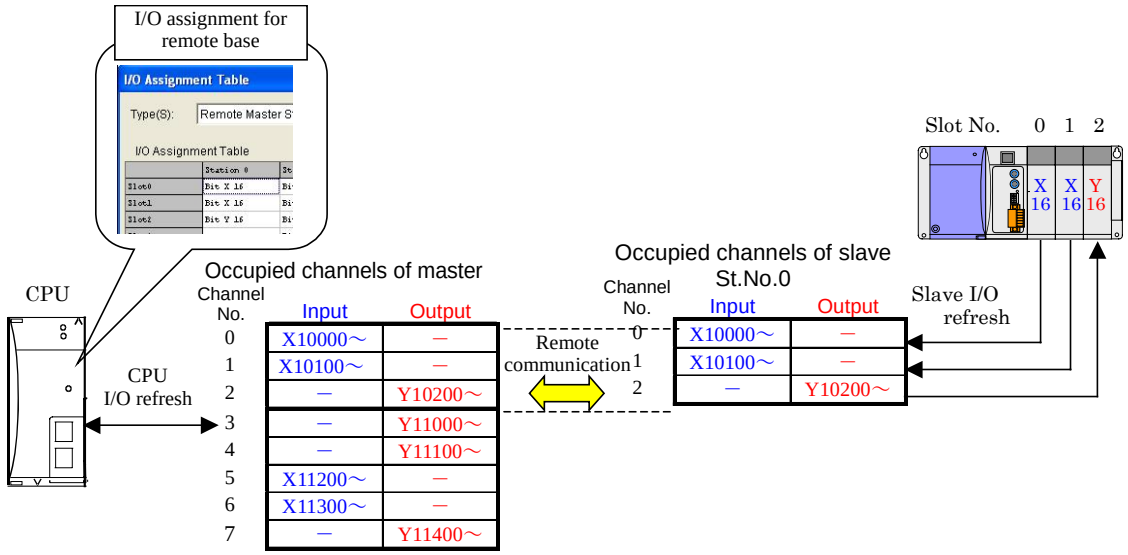


Figure 4.2.6 Correspondence of occupied channels and I/O slots

4.2.5 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 “X1Y1W (B1/1)” as shown in left side of Figure 4.2.8. In the case of EH-150 (include EHV) series, input data and output data are stored in separate channel by setting I/O assignment “X1Y1W (B1/1)” as shown in right side of Figure 4.2.8. 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 4.2.9. 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.

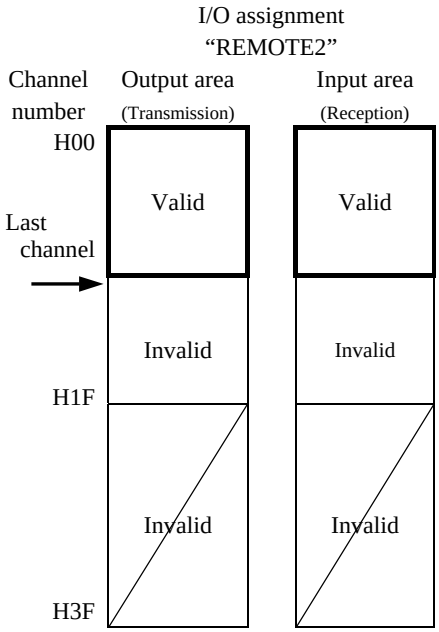


Figure 4.2.7 Configuration of compression remote method

The compression remote method is operation mode handling the output and input as pair in the same channel. Therefore the number of the channels is 32, but remote I/O points are 1,024 points. Therefore, transmission refreshment time is half because the number of channels is reduced to half.

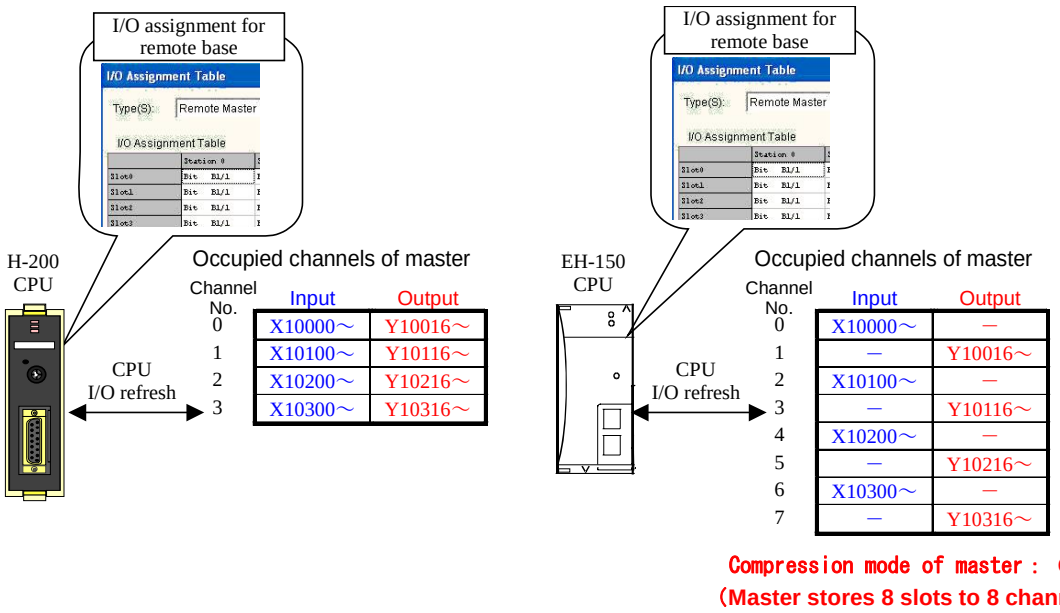


Figure 4.2.8 Difference point of H-200 and EH-150 in the case of assignment “X1Y1W (B1/1)” for remote base

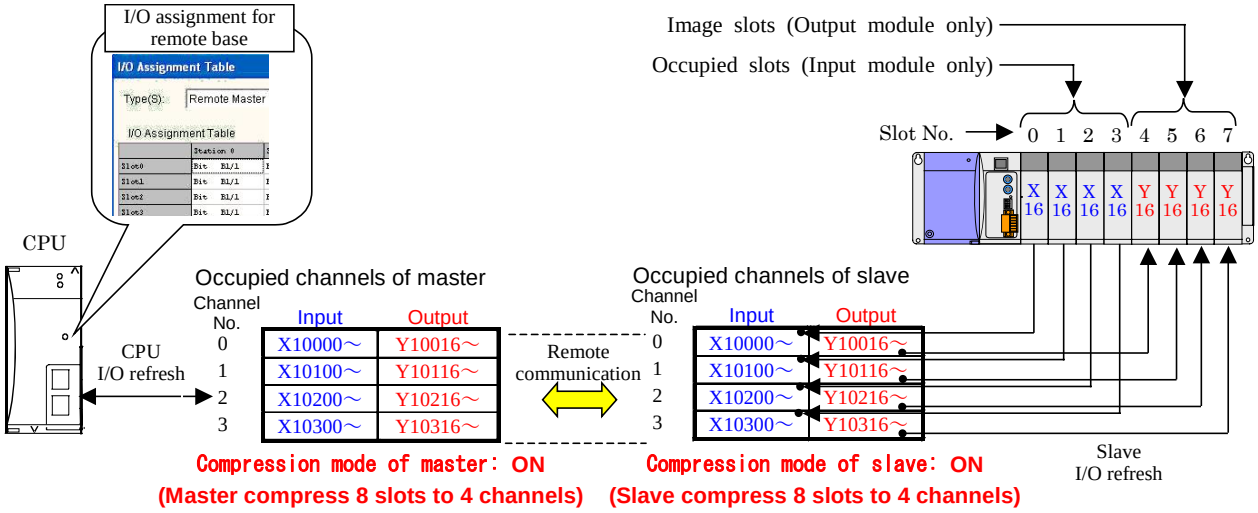
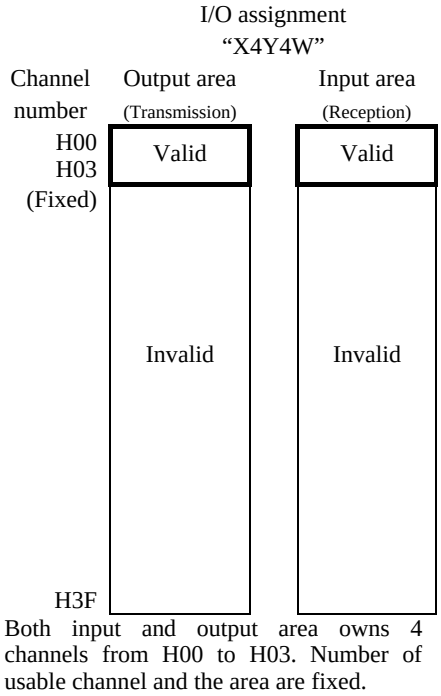


Figure 4.2.9 Correspondence of occupied channels and I/O slots (Compression remote method)

4.2.6 External I/O method (X4Y4W) (Compression mode of slave module)

In the case of external I/O method (X4Y4W), CPU module stores I/O data in occupied channels of master module as shown in Figure 4.2.11. Data is stored in both the input and the output in one channel unlike a normal remote method. The compression mode of slave module 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 4.2.11. 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.



The external I/O method (X4Y4W) is operation mode handling the output and input as pair in the same channel. The number of the usable channels is 4. In this mode, the output area is from WY*4 to WY*7, and the input area is from WX*0 to WX*3.

Figure 4.2.10 Configuration of external I/O method (X4Y4W)

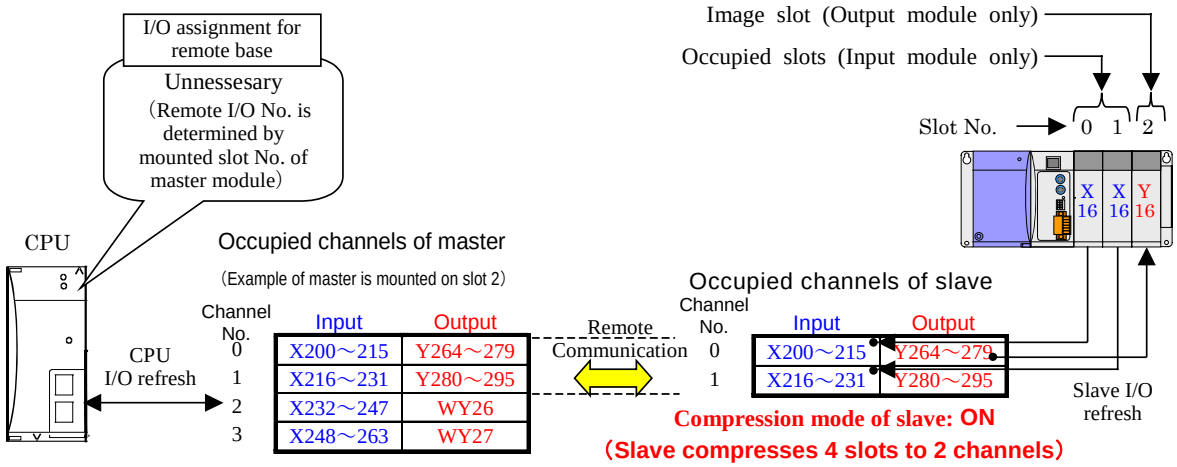


Figure 4.2.11 Correspondence of occupied channels and I/O slots in slave with compression mode

4.2.7 External I/O method (Y8W, X8W)

In the case of external I/O method (Y8W, X8W), CPU module stores I/O data in occupied channels of master module as shown in Figure 4.2.13 or Figure 4.2.14.

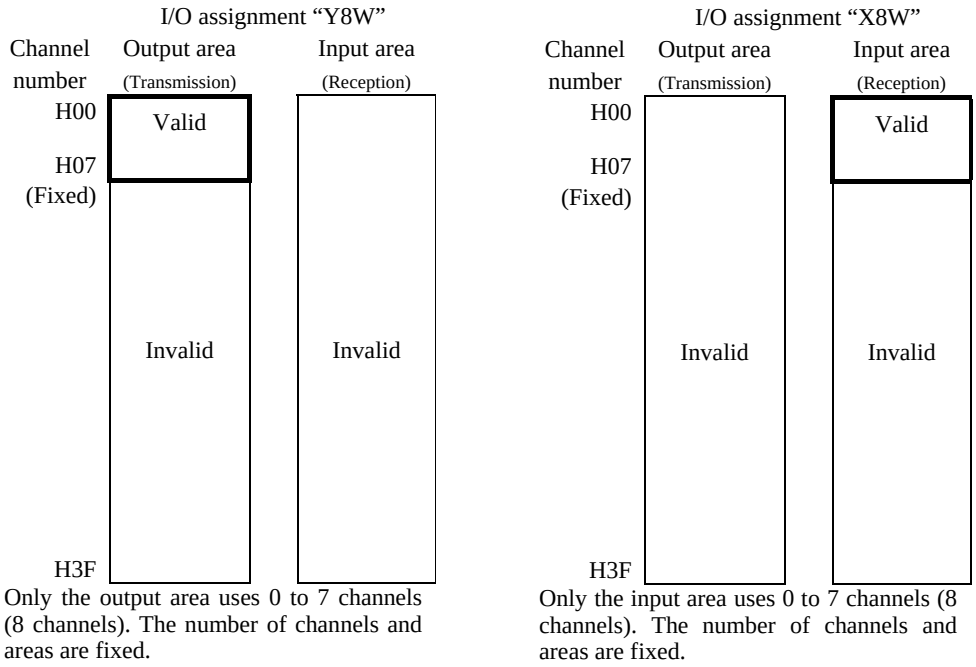


Figure 4.2.12 Configuration of external I/O method (Y8W, X8W)

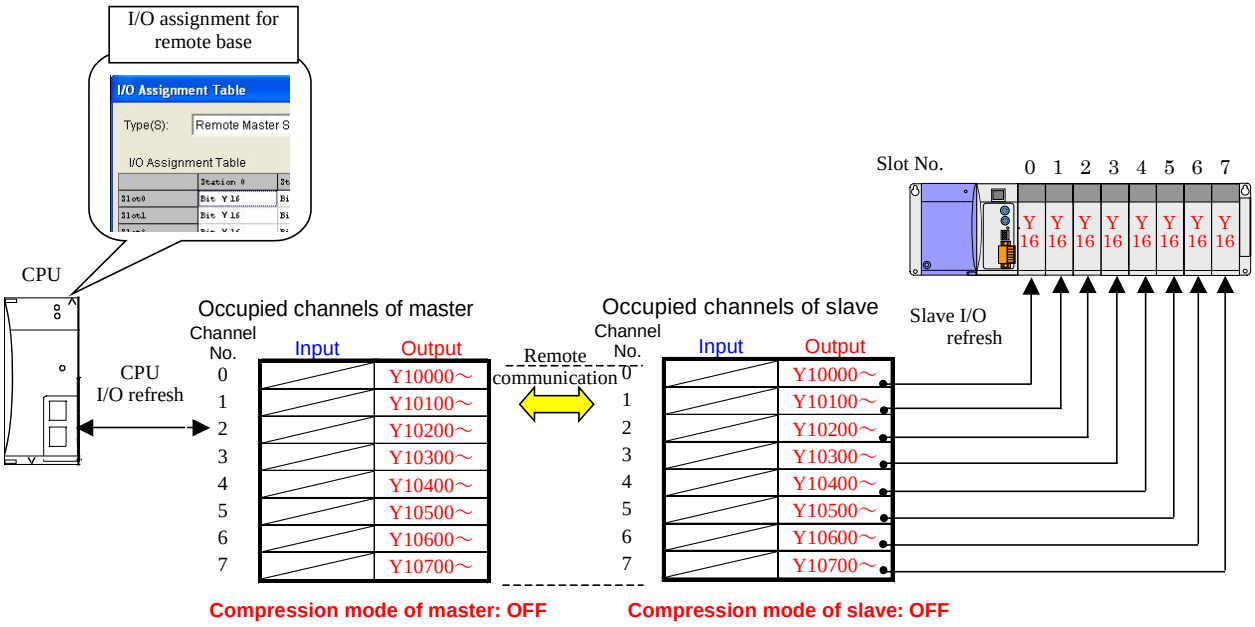


Figure 4.2.13 Correspondence of occupied channels and I/O slots in slave with external I/O method (Y8W)

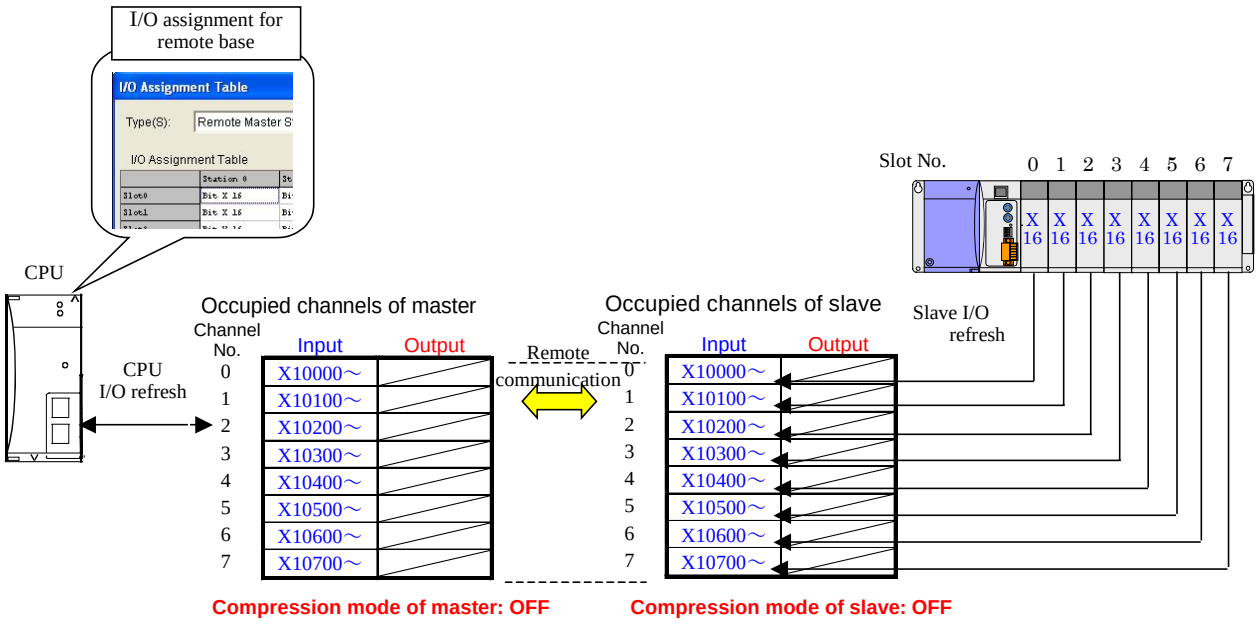


Figure 4.2.14 Correspondence of occupied channels and I/O slots in slave with external I/O method (X8W)

4.2.8 Occupied channels of EH-TRLE2

EH-TRLE2 occupies allocated total channels from set first channel number according to the I/O assignment of modules implemented.

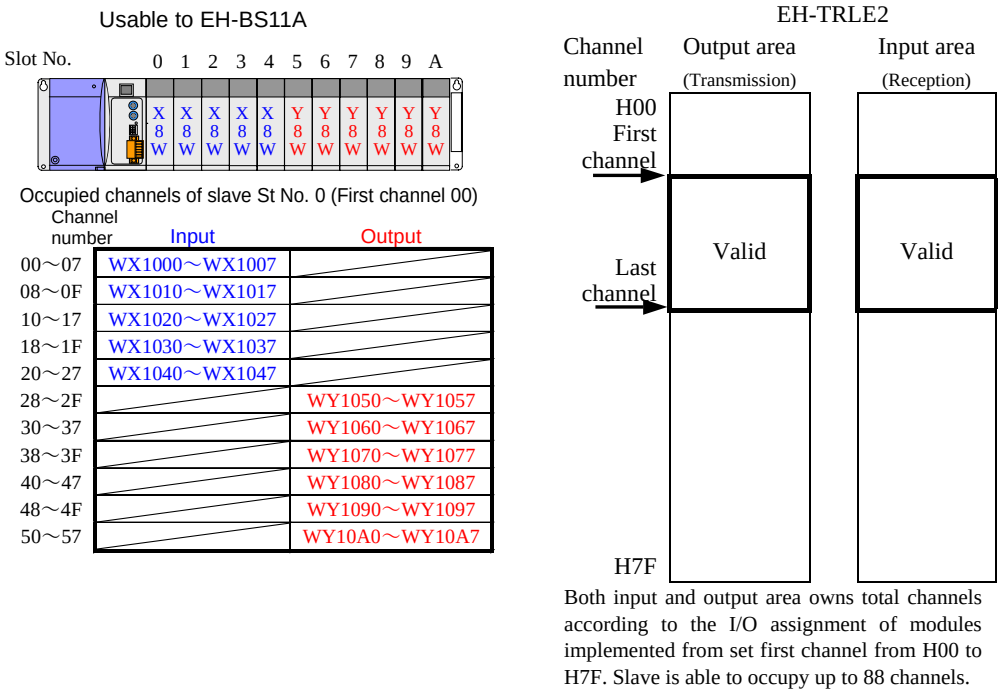


Figure 4.2.15 Correspondence of occupied channels and I/O slots in slave

4.3 Basic system configuration

Basic system configurations consist from remote master module (EH-TRME2) and remote slave modules (EH-TRLE2) are shown in Section 4.3.1 and 4.3.2.

4.3.1 Basic system configuration (REMOTE(RMM) method)

Basic system configuration example that I/O assignment of master module (EH-TRME2) is “REMOTE (RMM)” is shown in Figure 4.3.1. The last channel number is abbreviated to “Last CH.”, and the first channel number is abbreviated to “First CH” in the following figures of setting for DIP switch.

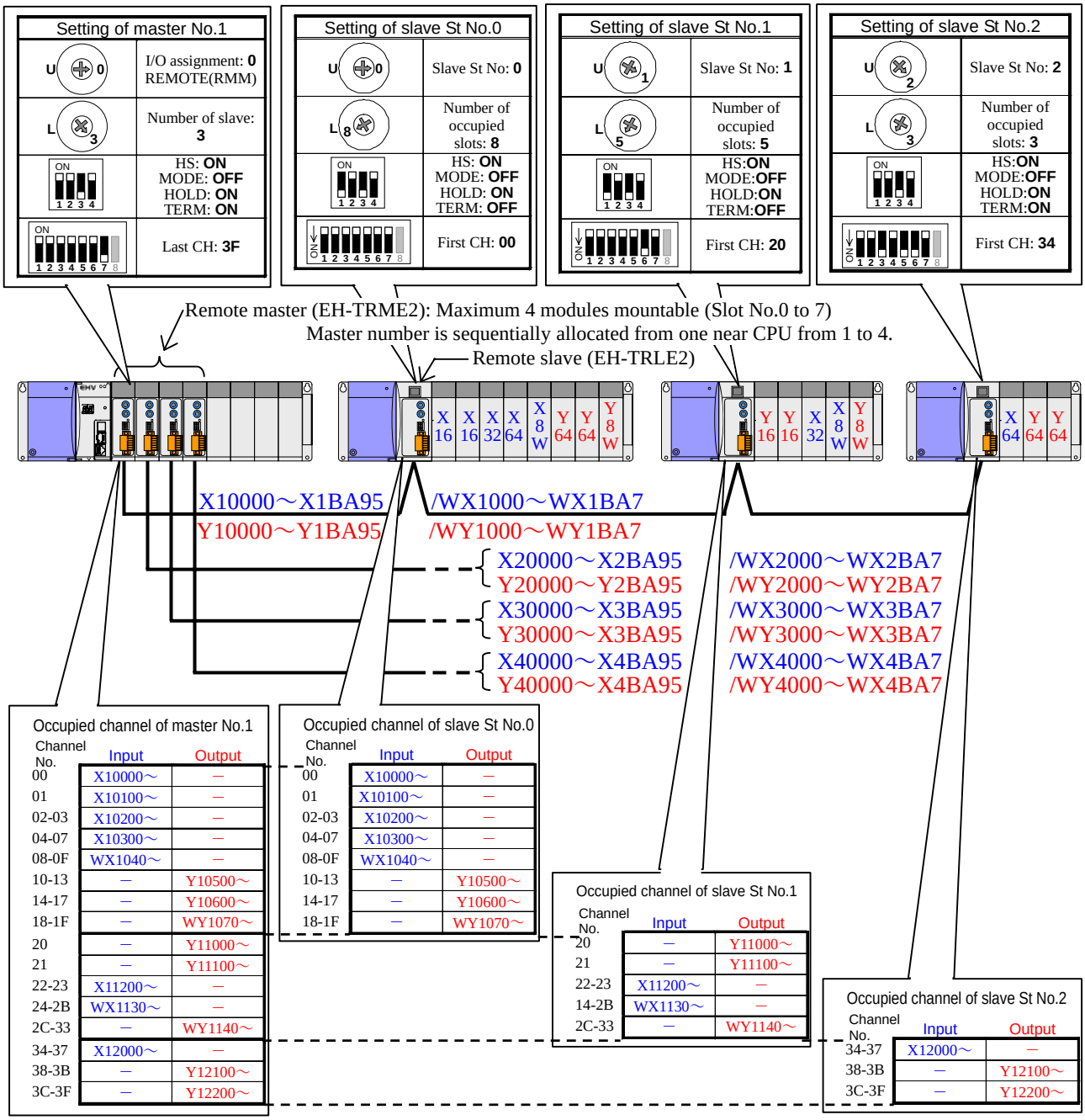


Figure 4.3.1 System configuration example (I/O assignment of master: “REMOTE (RMM)”)

[Explanations]

1) Master module (EH-TRME2) has remote I/O area of 128 channels (00 to 7F). Each channel is assigned from slot 0 to A in turn on remote slave bases according to remote I/O assignment as Figure 4.3.3.

2) Each channel consists from input area of 16 bits and output area of 16 bits. In the case of I/O assignment “REMOTE (RMM)” of master, either input area or output area in one channel is used by I/O assignment on remote slave bases as Figure 4.3.3.
3) One master module can communicate maximum 2,048 points data with 128 channels between slave modules.
4) Maximum 12 slave modules can be connected to one master module. (Example of Figure 4.3.1 is 3 slaves.)
5) Slave module must be mounted right side of power supply module.
6) Maximum 11 slots are available on slave base. As for mountable modules on slave base, refer to Table 2.5.1.
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 is as follows.

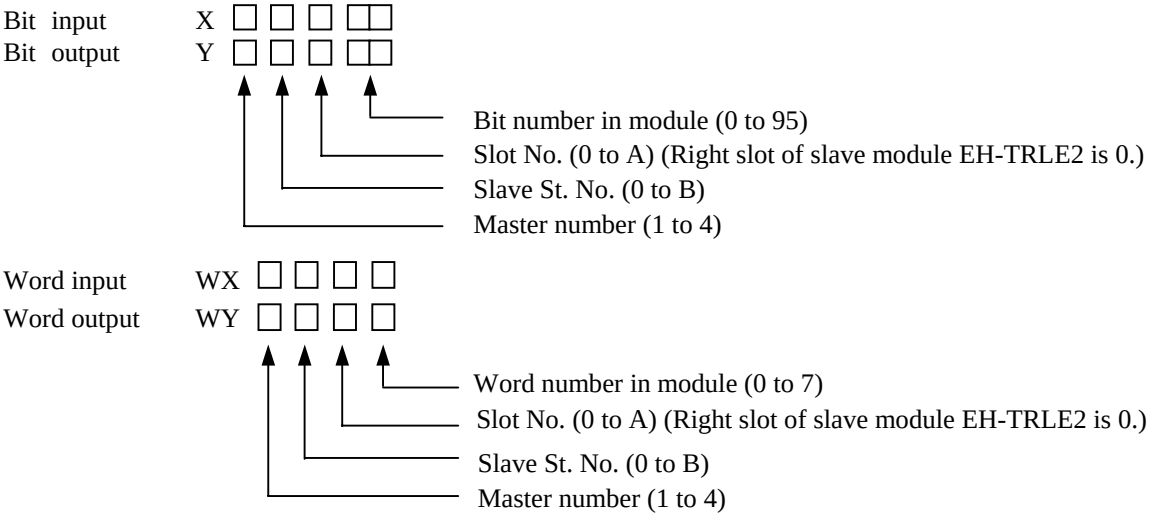


Figure 4.3.2 I/O number of I/O module on remote slave base

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 by "Read I/O" as shown in Figure 4.3.3. Compact remote2 support copy function of I/O assignment for mounted modules in normal mode.

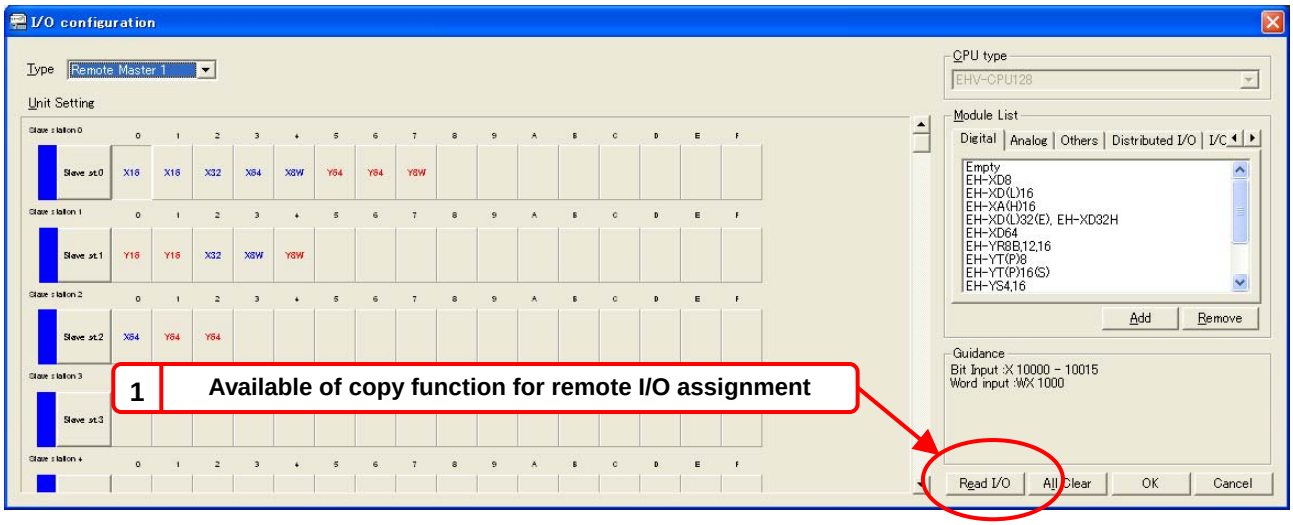


Figure 4.3.3 I/O assignment example of remote slave (REMOTE (RMM))
(Assignment of Figure 4.3.1 configuration example by Control editor)

12) Empty slots and the dummy modules on the remote slave are converted into "Y16". If you set I/O assignment "Empty", I/O No. of the subsequent slot are wrong.

4.3.2 Basic system configuration (Normal remote method)

Basic system configuration example that I/O assignment of master module (EH-TRME2) is “REMOTE2” is shown in Figure 4.3.4.

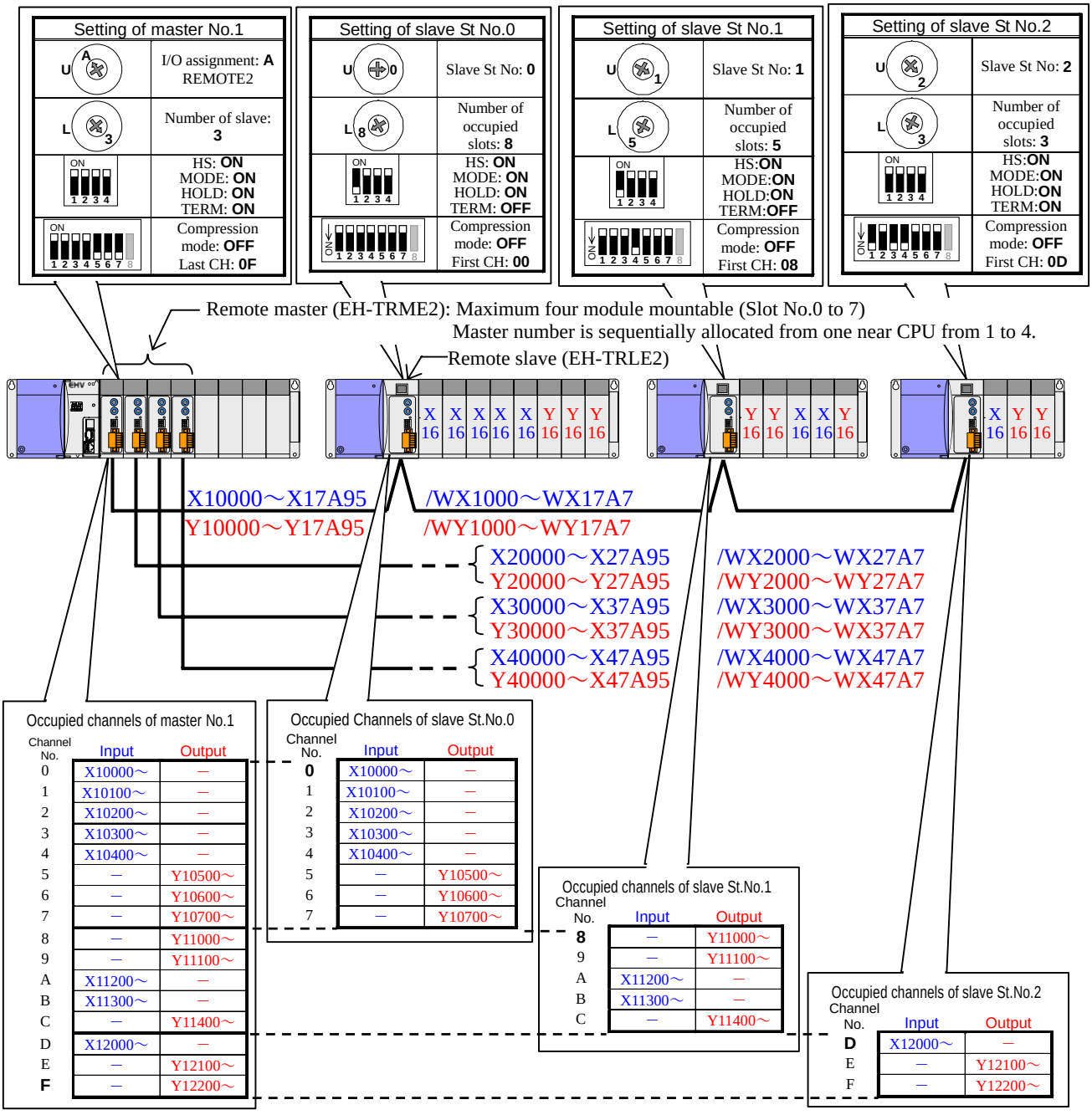


Figure 4.3.4 System configuration example (I/O assignment of master: “REMOTE2”)

[Explanations]

1) Master module (EH-TRME2) has remote I/O area of 64 channels (0 to 3F). Each channels is assigned from slot 0 to A in turn on remote slave bases according to remote I/O assignment as Figure 4.3.5.
2) Each channel consists from input area of 16 bits and output area of 16 bits. In the case of I/O assignment “REMOTE2”, either of input area or output area in one channel is used by I/O assignment on remote slave bases as Figure 4.3.5.
3) One master module can communicate maximum 1,024 points data with 64 channels between slave modules.
4) Maximum 8 slave modules can be connected to one master module. (Example of Figure 4.3.4 is 3 slaves.)

5) Slave module must be mounted right side of power supply module.
6) Maximum 11 slots are available on slave base. You can mount modules shown in Table 2.5.1 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) Refer to Figure 4.3.2 about I/O number of modules 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. Set I/O assignment for all slots one by one as Figure 4.3.5 because compact remote2 at compatible mode doesn't support copy function of I/O assignment from mounted modules. In the case of normal mode, EH-TRME2 supports the copy function of I/O assignment.

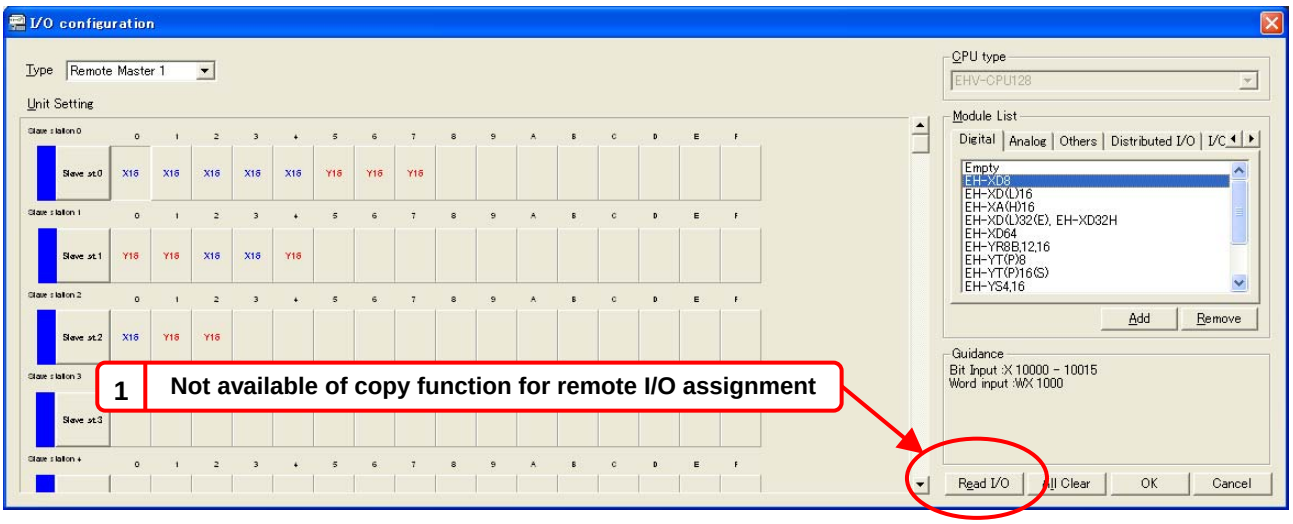


Figure 4.3.5 I/O assignment example of remote slave (Compact remote2 at compatible mode)
(Assignment of Figure 4.3.4 configuration example by Control editor)

12) Empty slots and the dummy modules on the remote slave are converted into "Y16". If you set I/O assignment "Empty", I/O No. of the subsequent slot are wrong.

4.3.3 Basic system configuration (Y8W method)

Basic system configuration example that I/O assignment of master module (EH-TRME2) is “Y8W” is shown in Figure 4.3.6.

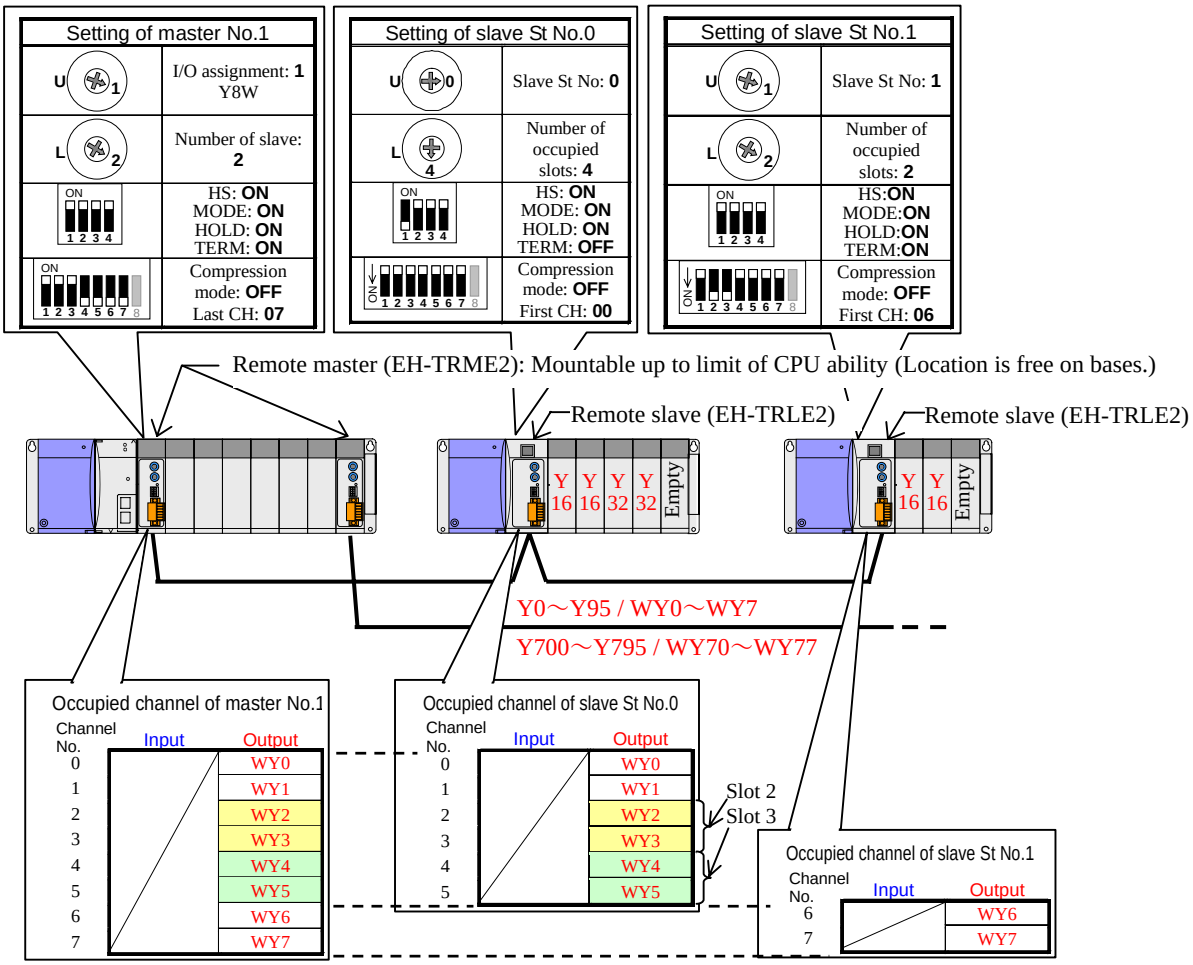


Figure 4.3.6 System configuration example (I/O assignment of master: “Y8W”)

[Explanations]

1) Master module (EH-TRME2) has 8 channels for remote I/O area (0 to 7).
2) One channel consists from 16 bits (1 word) output area. In the case of I/O assignment for master module is “Y8W”, I/O number of slot that master module mounted is assigned to each channel as shown in Figure 4.3.6.
3) One master module can communicate maximum 128points data with 8 channels between slave modules.
4) Set compression mode of slave module OFF. Slave station occupies channels from set first channel according to I/O assignment of modules implemented in occupied slots. Usable I/O modules mounted on occupied slots are 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 2.5.1 on slave base.
5) Maximum 8 slave modules can be connected to one master module. (Example of Figure 4.3.6 is 2 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) Refer to Figure 4.3.7 about I/O number of modules on remote slave base. In case that I/O assignment of master is “Y8W”, I/O number for I/O module on remote slave base becomes the I/O number of slot mounted master module.

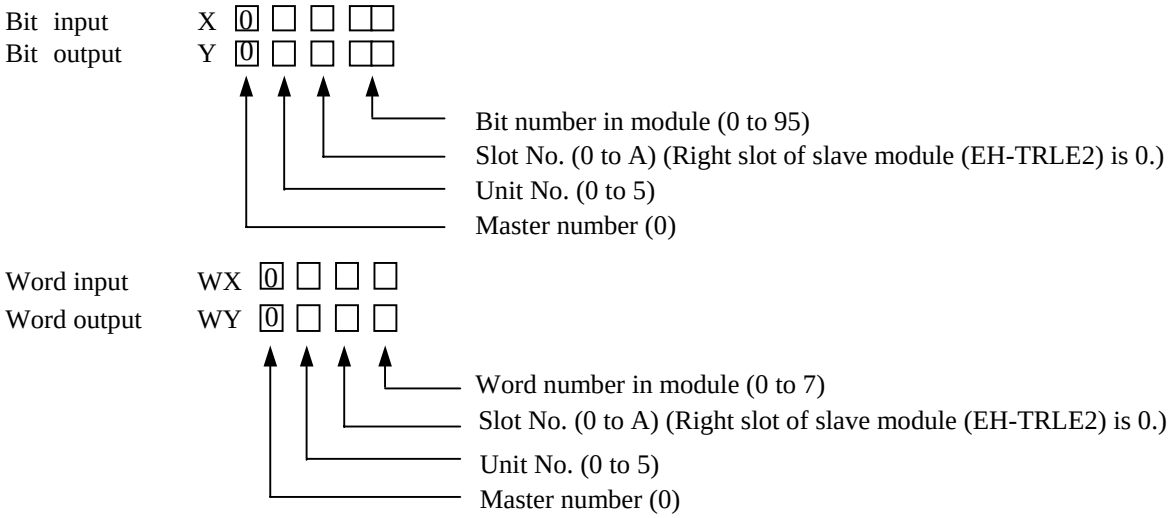


Figure 4.3.7 I/O number of I/O module on remote slave base
(I/O assignment of master: “Y8W”, “X4Y4W”, “X8W”)

10) Bit number in module is from 0 to 95. Therefore, please use the word number such as WY6 and WY7 in Figure 4.3.6 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 as shown in Figure 4.3.8.

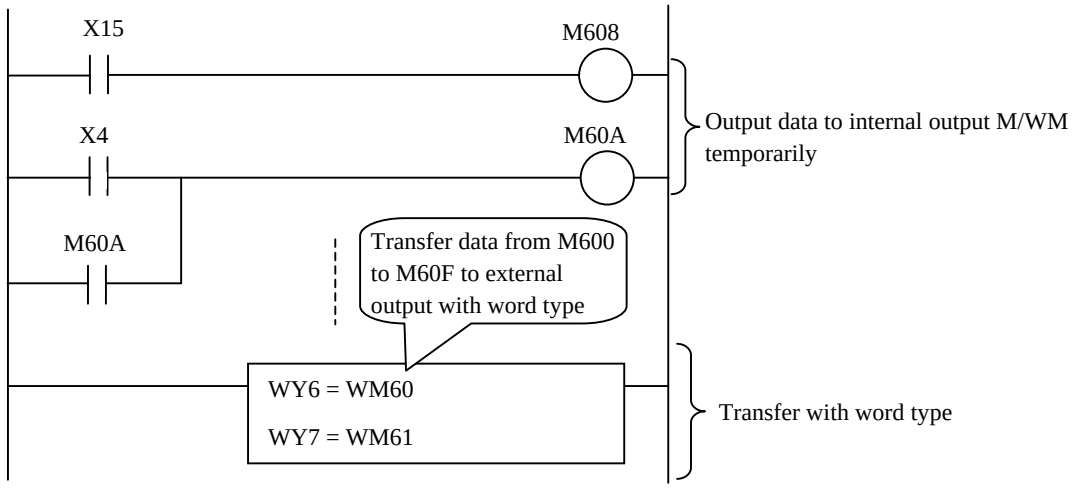


Figure 4.3.8 Sample program with bit I/O numbers that exceed 95 (WY6, WY7)

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 “Y8W”.

4.3.4 Basic system configuration (X4Y4W method)

Basic system configuration example that I/O assignment of master module (EH-TRME2) is “X4Y4W” is shown in Figure 4.3.9.

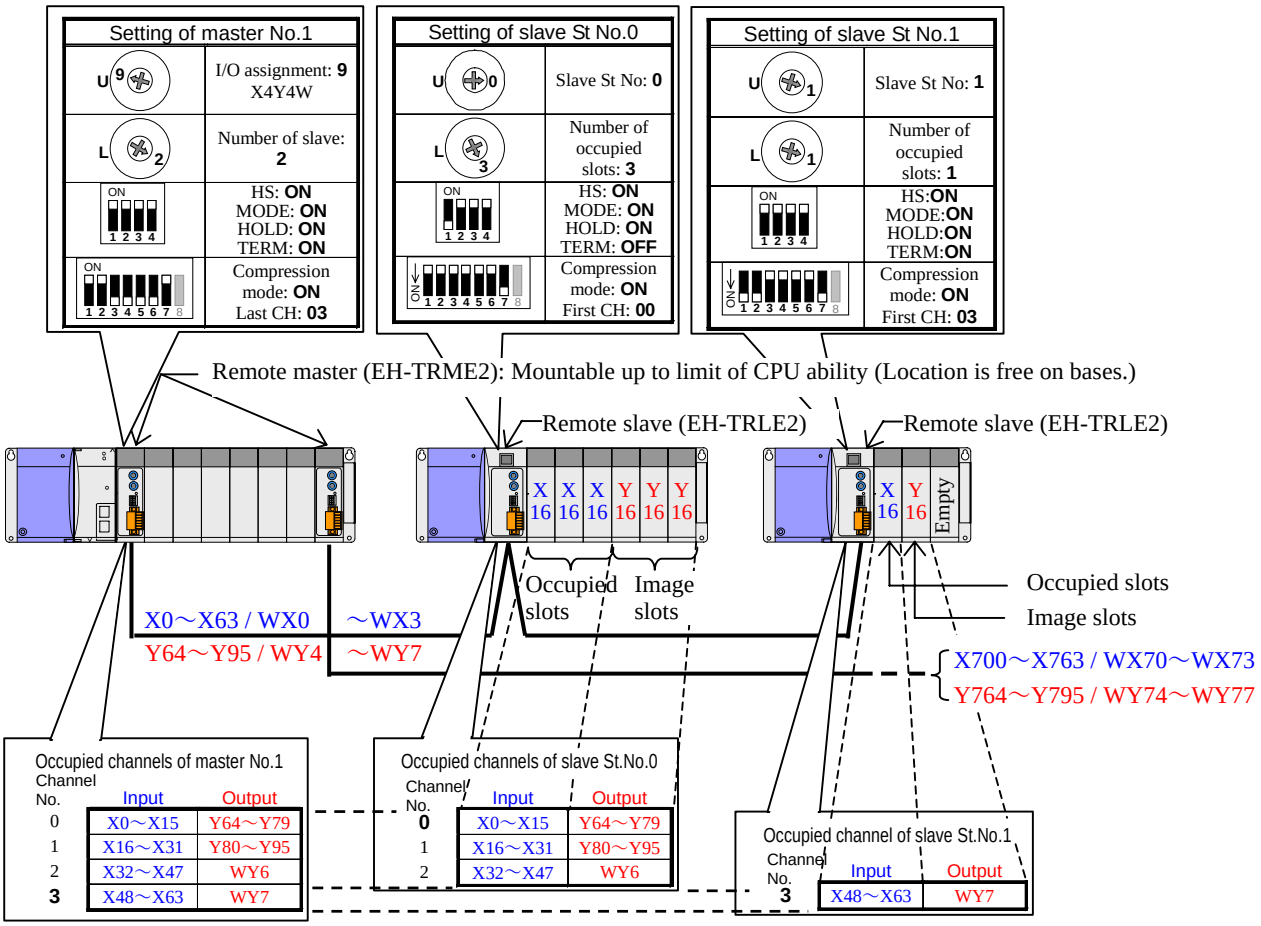


Figure 4.3.9 System configuration example (I/O assignment of master: “X4Y4W”)

[Explanations]

1) Master module (EH-TRME2) has 4 channels for remote I/O area (0 to 3).

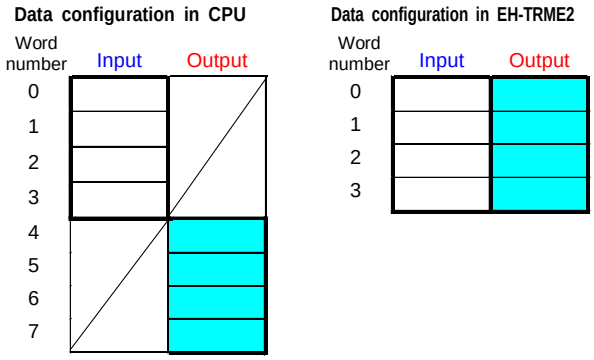


Figure 4.3.10 Data configuration with I/O assignment “X4Y4W”

2) One channel consists from 16bits (1 word) input area and 16bits (1 word) output area. In the case of I/O assignment for master module is “X4Y4W”, I/O number of slot that master module mounted is assigned to each channel as shown in Figure 4.3.9.

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 2.5.1 on slave base.
5) Maximum 4 slave modules can be connected to one master module. (Example of Figure 4.3.9 is 2 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) Refer to Figure 4.3.7 about I/O number of modules on remote slave base. In case that I/O assignment of master is “X4Y4W”, I/O number for I/O module on remote slave base becomes the I/O number of slot mounted master module.
10) Bit number in module is from 0 to 95. Therefore, please use the word number such as WY6 and WY7 in Figure 4.3.9 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 as shown in Figure 4.3.8.
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 “X4Y4W”.

4.3.5 Basic system configuration (X8W method)

Basic system configuration example that I/O assignment of master module (EH-TRME2) is “X8W” is shown in Figure 4.3.11.

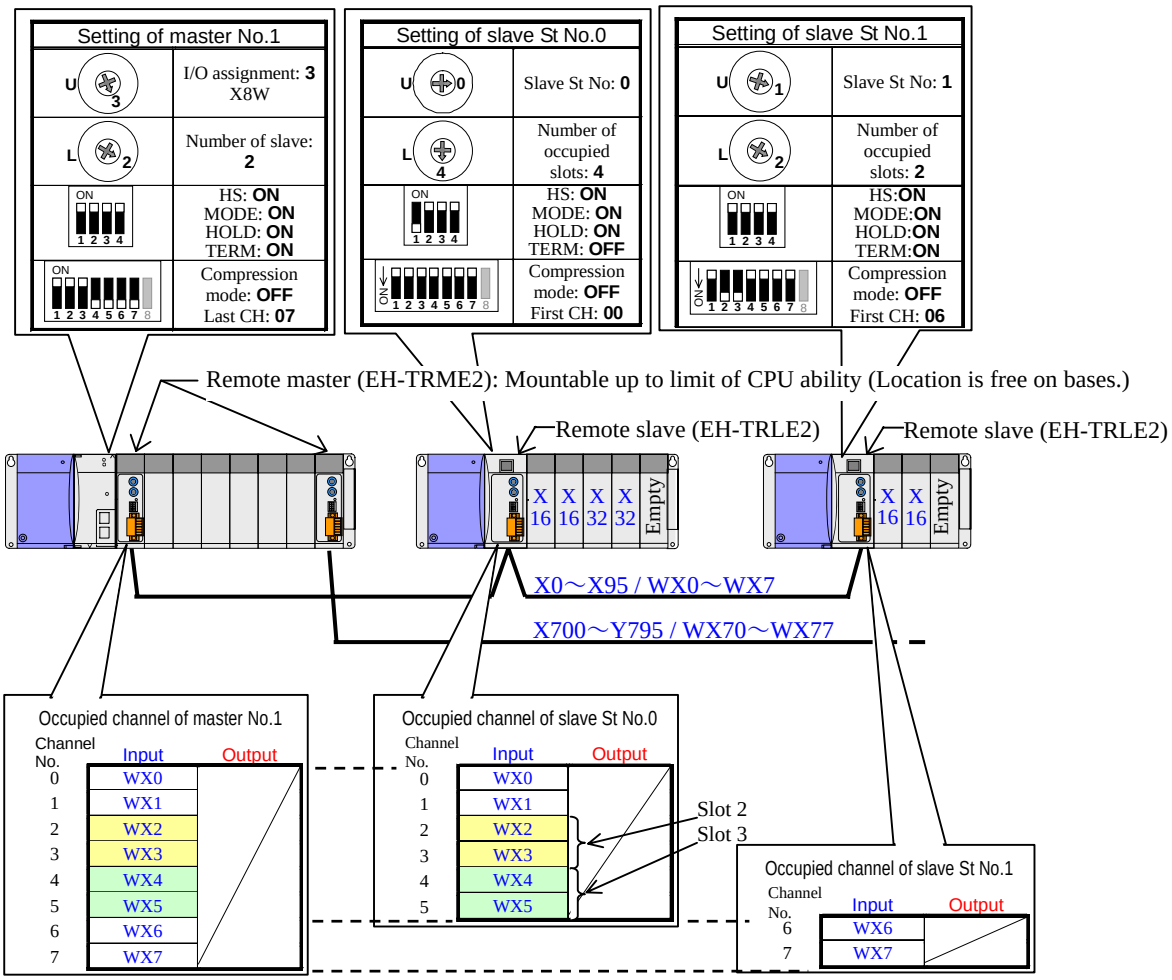


Figure 4.3.11 System configuration example (I/O assignment of master: “X8W”)

[Explanations]

1) Master module (EH-TRME2) has 8 channels for remote I/O area (0 to 7).
2) One channel consists from 16 bits (1 word) input. In the case of I/O assignment for master module is “X8W”, I/O number of slot that master module mounted is assigned to each channel as shown in Figure 4.3.10.
3) One master module can communicate maximum 128points data with 8 channels between slave modules.
4) Set compression mode of slave module OFF. Slave station occupies channels from set first channel according to I/O assignment of modules implemented in occupied slots. Usable I/O modules mounted on occupied slots are only input 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 2.5.1 on slave base.
5) Maximum 8 slave modules can be connected to one master module. (Example of Figure 4.3.11 is 2 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) Refer to Figure 4.3.7 about I/O number of modules on remote slave base. In case that I/O assignment of master is “X8W”, I/O number for I/O module on remote slave base becomes the I/O number of slot mounted master module.

10) Bit number in module is from 0 to 95. Therefore, please use the word number such as WX6 and WX7 in Figure 4.3.11 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 input as shown in Figure 4.3.12.

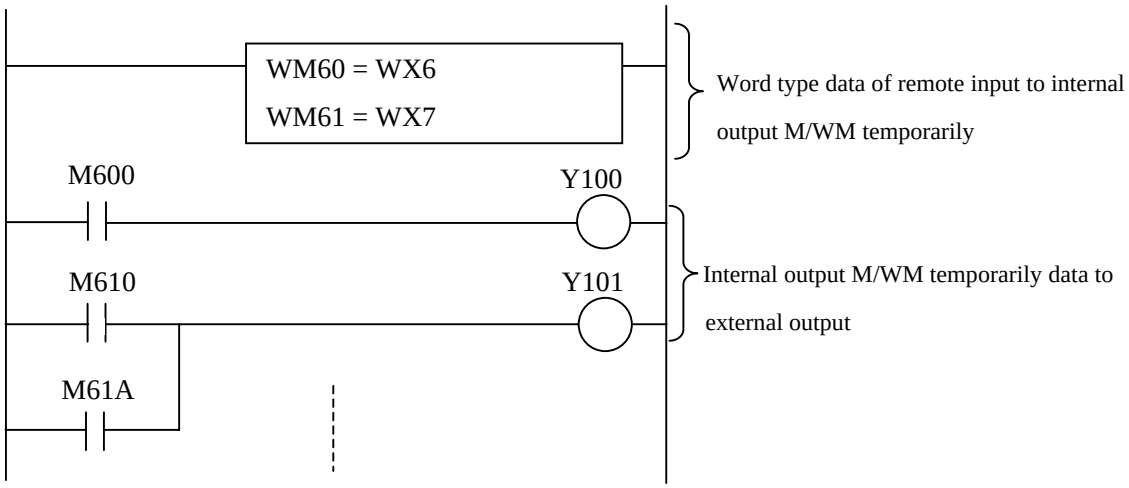


Figure 4.3.12 Sample program with bit I/O numbers that exceed 95 (WX6, WX7)

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 “X8W”.

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. However, there are differences with lineup of I/O modules, specifications, dimensions, I/O assignment, and support of commands, please consider these differences in replacement.

In addition, 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 4.4.1 shows the system configuration example of the H-200 series not using image slot. Figure 4.4.2 shows I/O assignment for remote bases of this system. Figure 4.4.3 shows the replaced system configuration example of the EH-150 series. In this case, it is necessary to change I/O assignment of master module from "Remote" to "REMOTE2".

Figure 4.4.3 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 refresh mode (HS) of a front DIP switch of the master module and the slave modules, and turn on communication mode (MODE) of a front DIP switch of them.

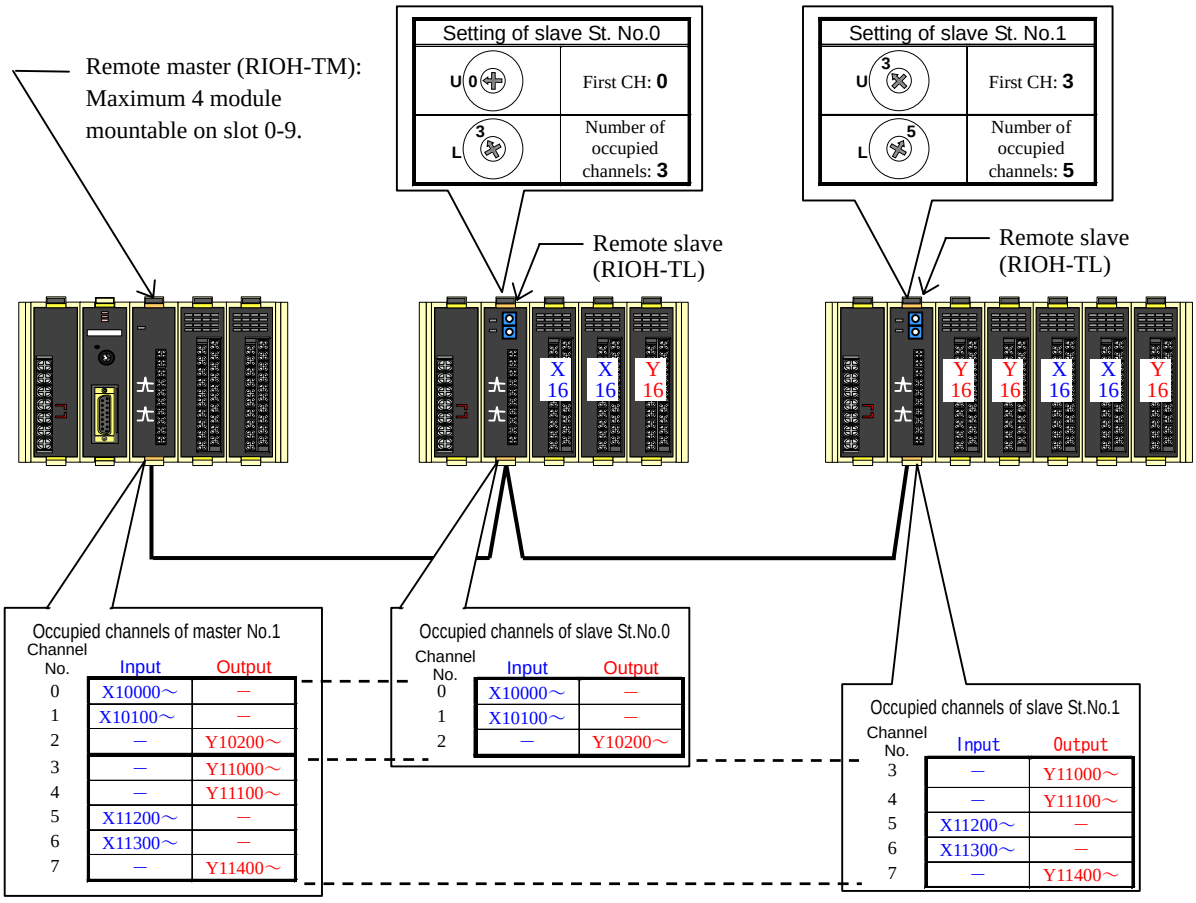


Figure 4.4.1 System configuration example of H-200 series (Not using image slot)

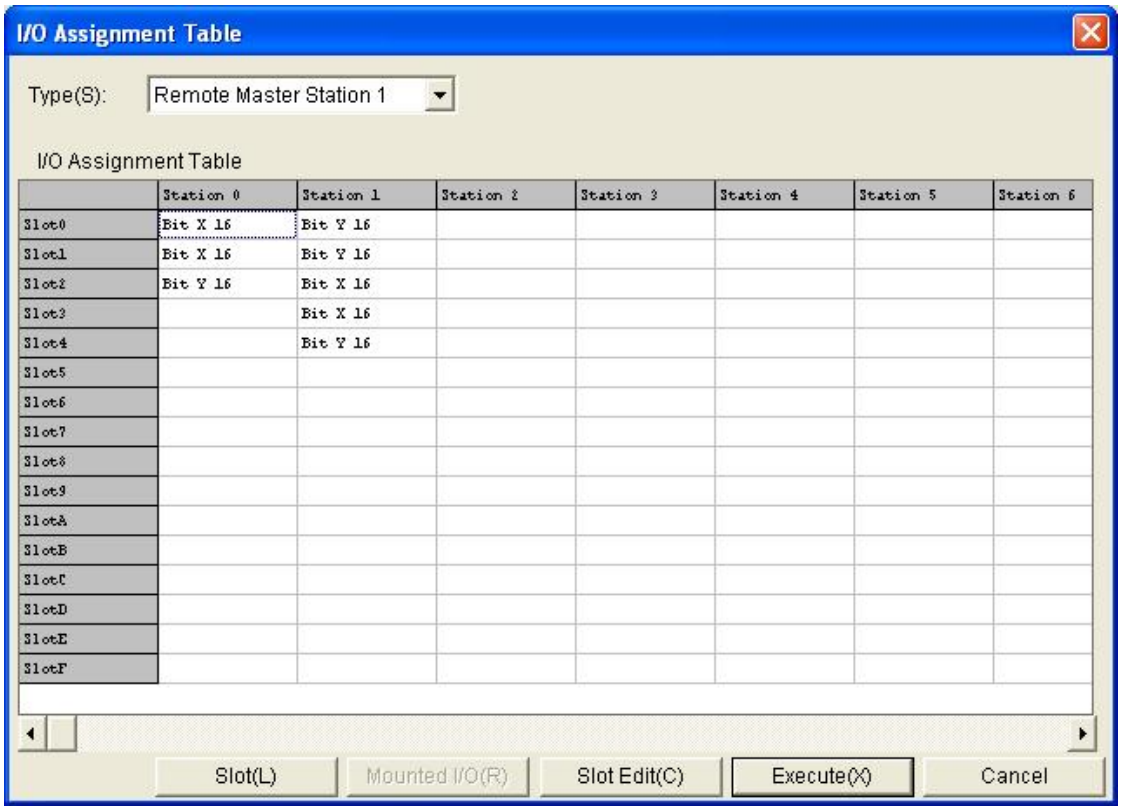


Figure 4.4.2 I/O assignment example of remote I/O
(Assignment of Figure 4.4.1 configuration example by Ladder editor)

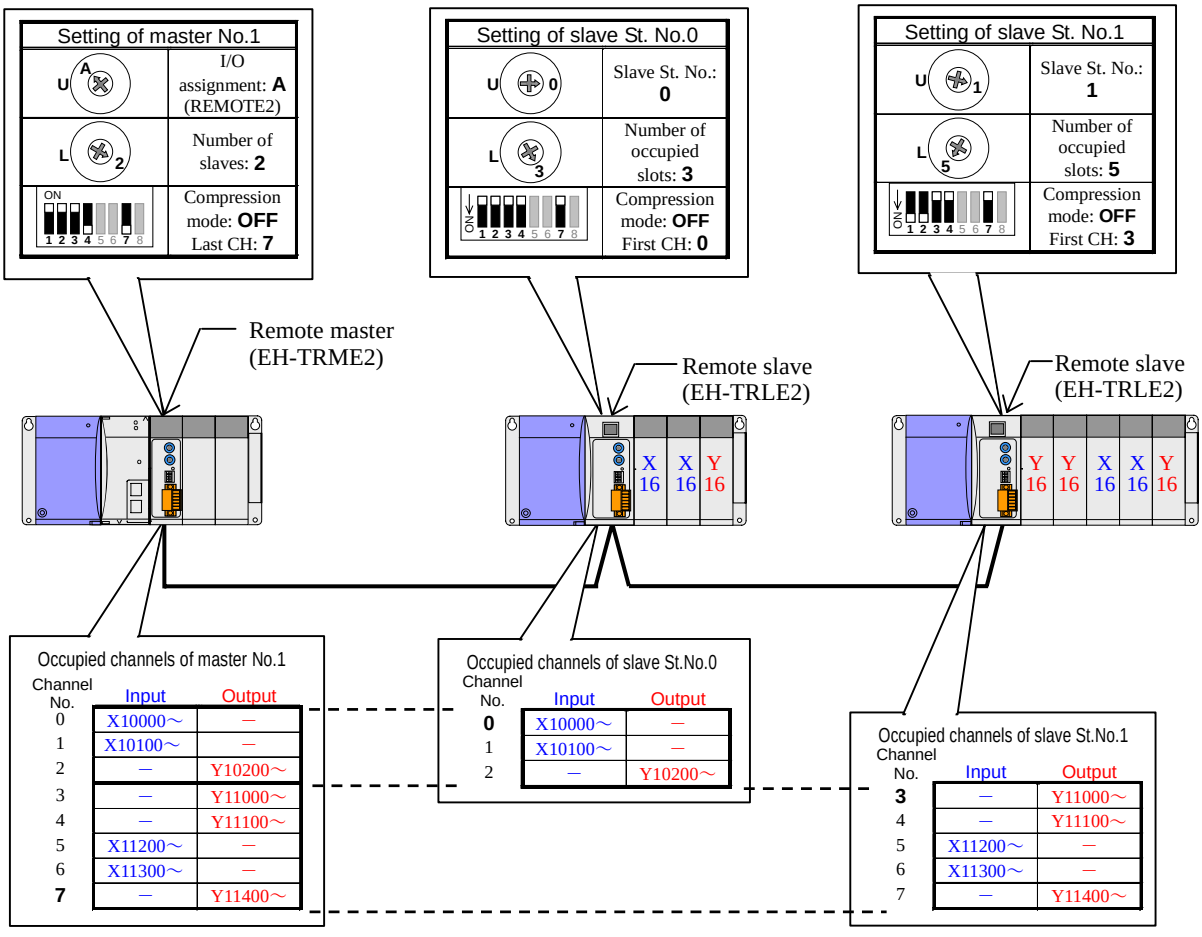


Figure 4.4.3 System configuration example after replacement to EH-150 (Not using image slot)

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 “X1Y1W (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 4.4.4. I/O assignment of this system is shown in Figure 4.4.5. Figure 4.4.6 shows the system configuration example replaced to EH-150.

In this case, it is necessary to change I/O assignment of master module from "Remote" to "REMOTE2".

In addition, turn on compression mode of a side DIP switch of the master module and a bottom DIP switch of the slave modules.

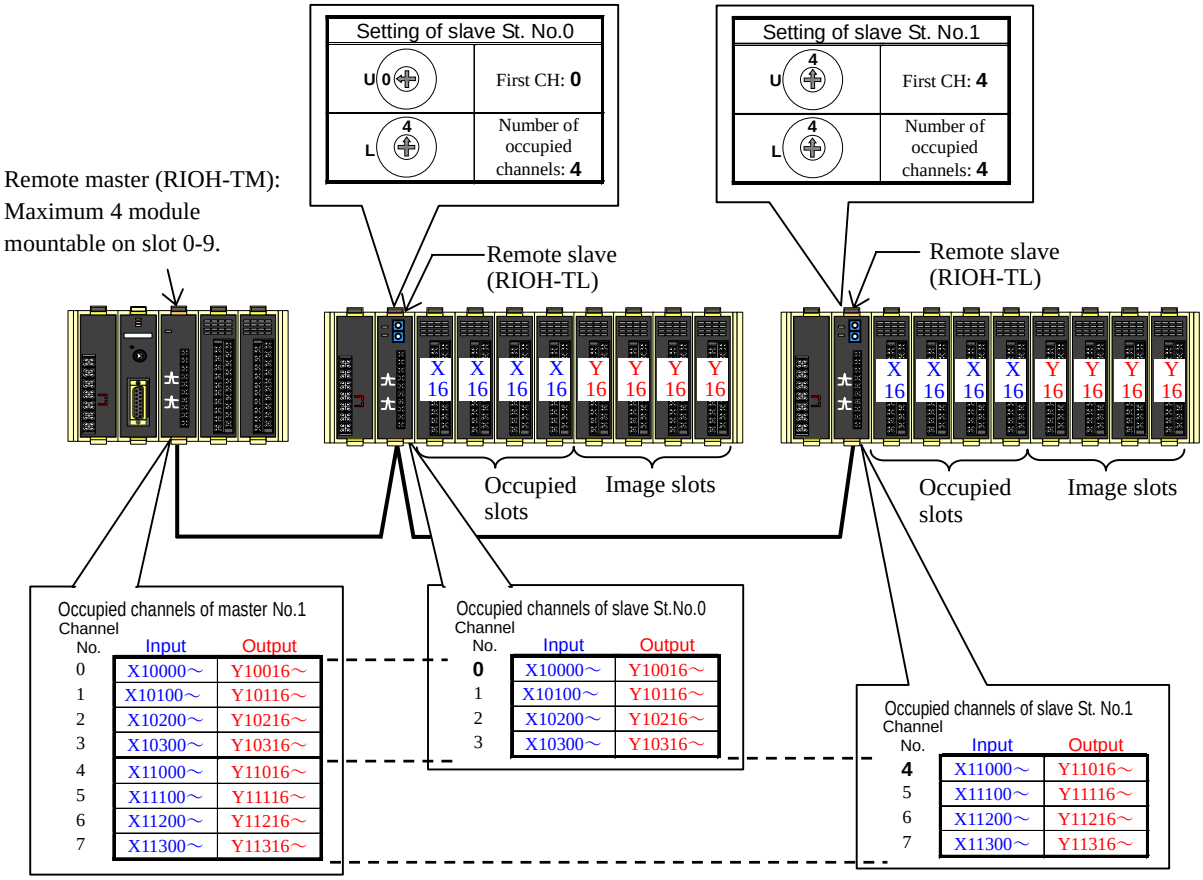


Figure 4.4.4 System configuration example of the H-200 series (Using image slots)

Only input modules are mountable on occupied slots of slave base, and only output modules are mountable on image slots normally. However, in case that 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 in Figure 4.7.3.

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 “X1Y1W (B1/1)” to “X16” or “Y16”, and change related I/O numbers in program. Figure 4.4.6 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 refresh mode (HS) of a front DIP switch of the master module and the slave modules.

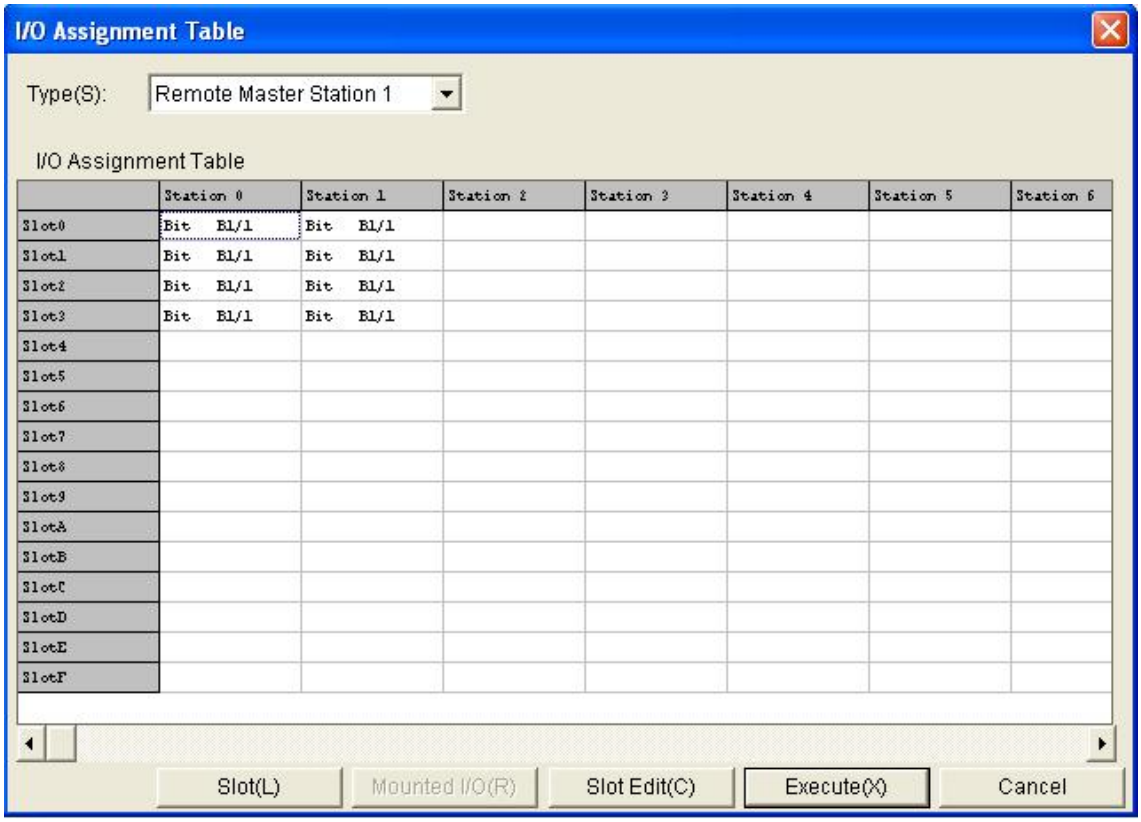


Figure 4.4.5 I/O assignment example of remote I/O
(Assignment of Figure 4.4.4 configuration example by Ladder editor)

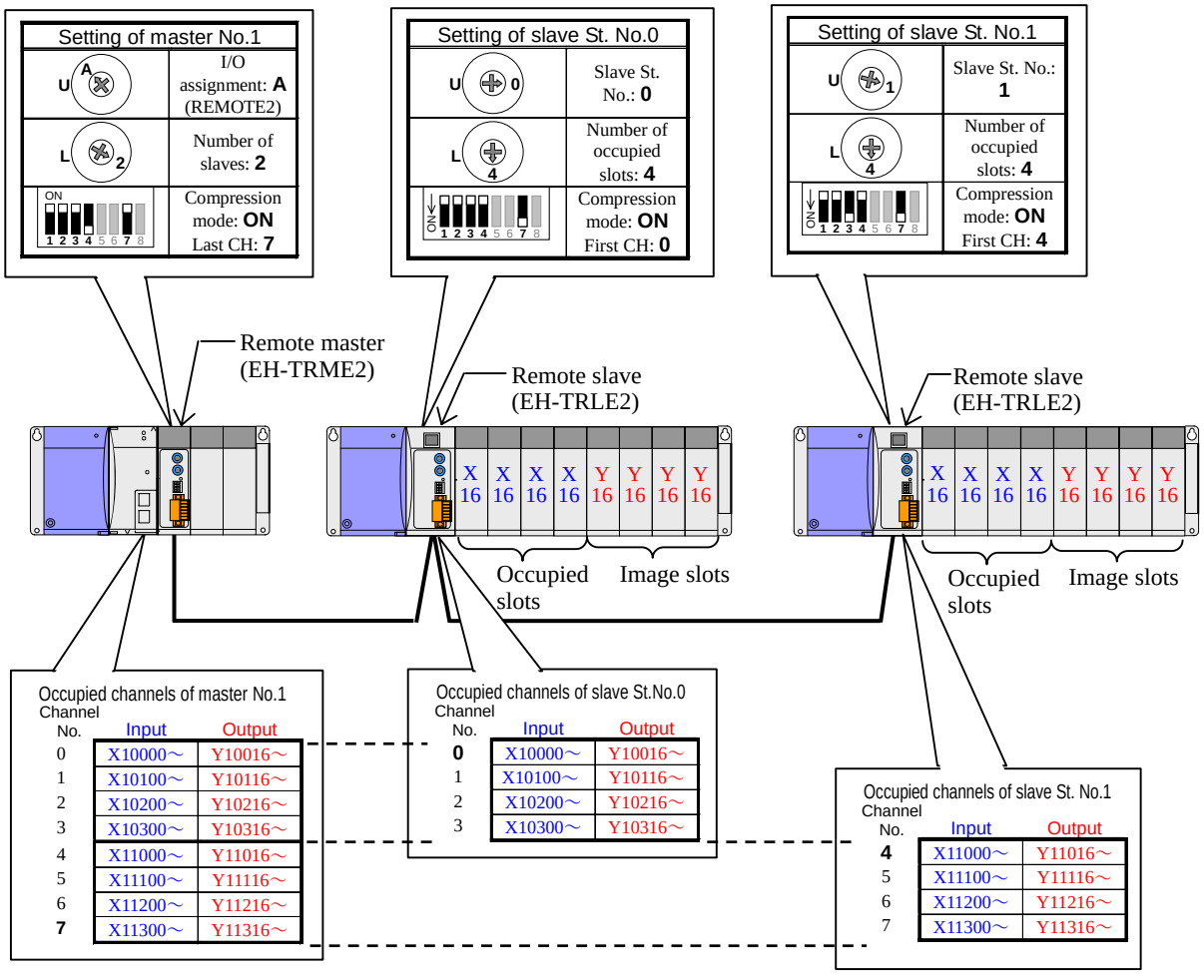


Figure 4.4.6 System configuration example after replacement to EH-150 (Using image slot)

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

Table 4.5.1 shows the outline of replacement from Remote I/O MINI of Large H series to compact remote2 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 as shown in Table 4.5.1.

There is a communication module (EH-TRLLE) that communicate between CPU and remote system like Remote I/O MINI slave (REM-LMH) and H-200 slave (REM-LH2) in EH-150 series.

Table 4.5.1 Replacement from Remote I/O MINI

Remote I/O MINI (Master: REM-MMH)					Compact remote2 (Master: EH-TRME2)			
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	Last channel of master
Mode0	Word 4W/4W	Unnecessary	44	8	REMOTE2	X16, Y16, Empty16	64	3F
			44	12	REMOTE (RMM)	X16, Y16, Empty16	128	7F
Mode1	Word Y8W	Unnecessary	8	8	Y8W	Unnecessary	8	7
Mode2	Word 4W/4W	Unnecessary	8	8	X4Y4W	Unnecessary	8	3
Mode3	Word X8W	Unnecessary	8	8	X8W	Unnecessary	8	7

4.5.1 Replacement from Remote I/O MINI with mode1

Mode1 of Remote I/O MINI is a mode that uses the remote output 128 points. Figure 4.5.1 shows the system configuration example of Remote I/O MINI with mode1 for H-300/700/2000/302/702/1002/2002/4010.

Figure 4.5.2 shows replaced system configuration example with compact remote2.

In this case, you need not change I/O assignment of master module from “Y8W”.

Moreover, when the slot number of master module is not changed, you also need not change 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 “Y8W” is not treated as remote module. You can use the number of master modules up to ability of CPU by same reason.

Figure 4.5.2 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 refresh mode (HS) of a front DIP switch of the master module and the slave modules, and turn on communication mode (MODE) of a front DIP switch of them.

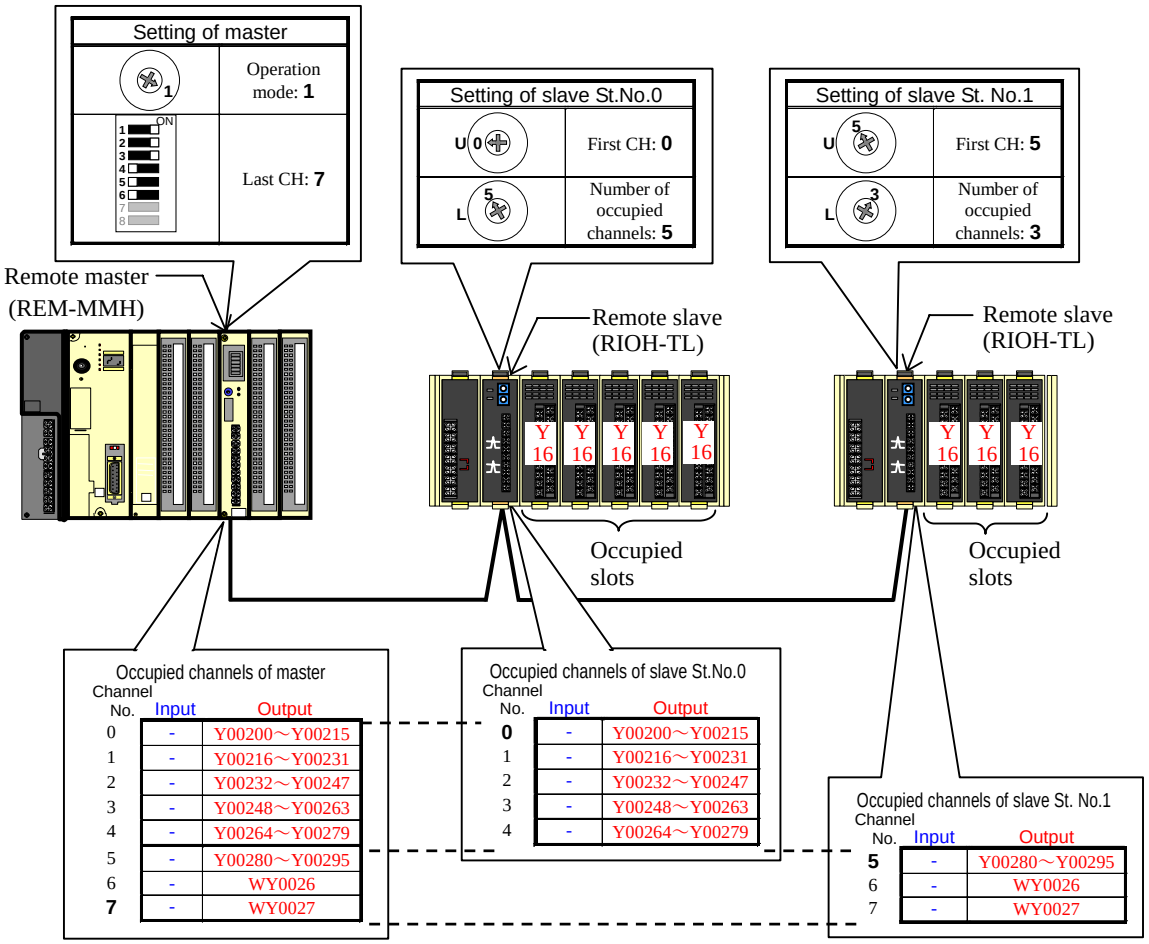


Figure 4.5.1 System configuration example of Remote I/O MINI (Mode 1)

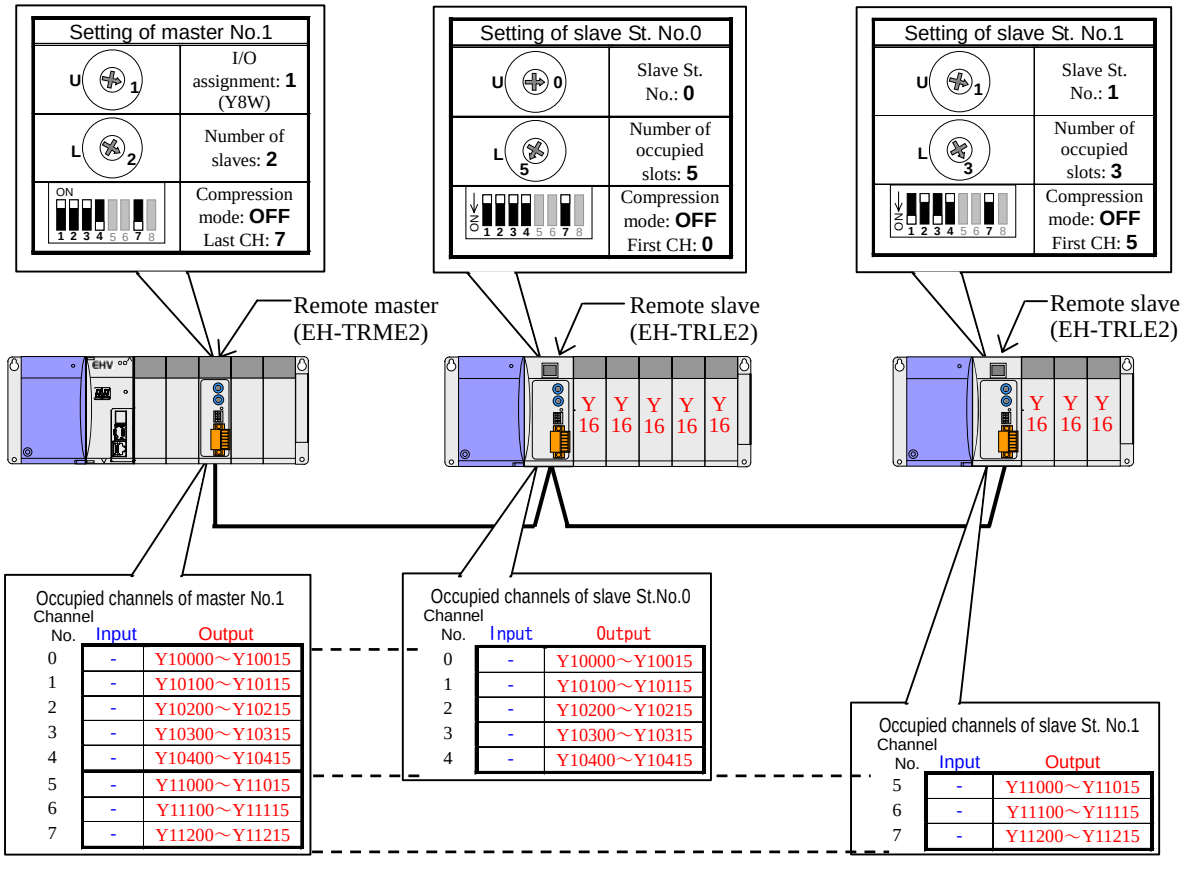


Figure 4.5.2 System configuration example after replacement to EH-150 (Mode1)

4.5.2 Replacement from Remote I/O MINI with mode2

Mode2 of Remote I/O MINI is a mode that uses the remote input in 64 points and remote output in 64 points. Figure 4.5.3 shows the system configuration example of Remote I/O MINI with mode2 for H-300/700/2000/302/702/1002/2002/4010.

Figure 4.5.4 shows replaced system configuration example with compact remote2.

In this case, you need not change I/O assignment of master module from “X4Y4W”.

Moreover, when the slot number of master module is not changed, you also need not change 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 “X4Y4W” is not treated as remote module. You can use the number of master modules up to ability of CPU by same reason.

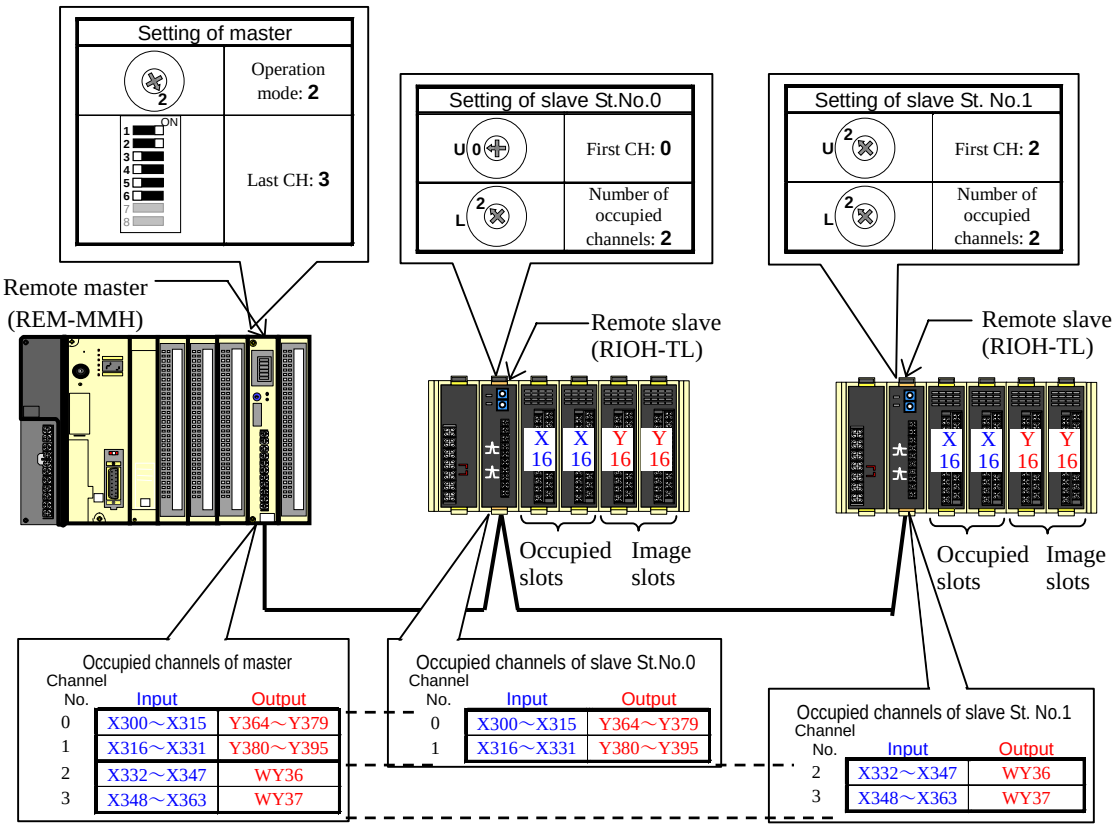


Figure 4.5.3 System configuration example of Remote I/O MINI (Mode2)

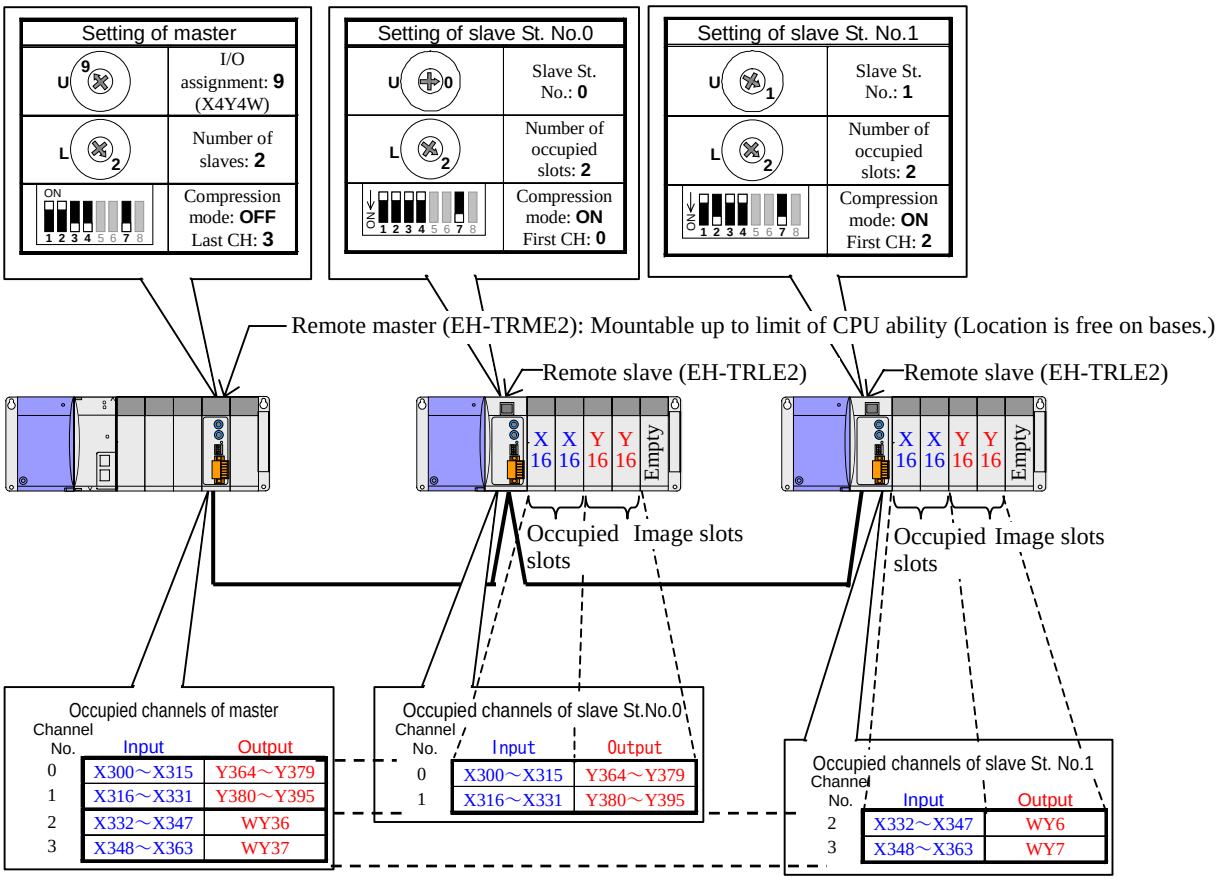


Figure 4.5.4 System configuration example after replacement to EH-150 (Mode2)

In this case, you need not assign I/O assignment for I/O module on slave bases, because master module with I/O assignment “X4Y4W” is not treated as remote module.

Figure 4.5.4 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 refresh mode (HS) of a front DIP switch of the master module and the slave modules, and turn on communication mode (MODE) of a front DIP switch of them.

4.5.3 Replacement from Remote I/O MINI with mode3

Mode3 of Remote I/O MINI is a mode that uses the remote input in 128 points.

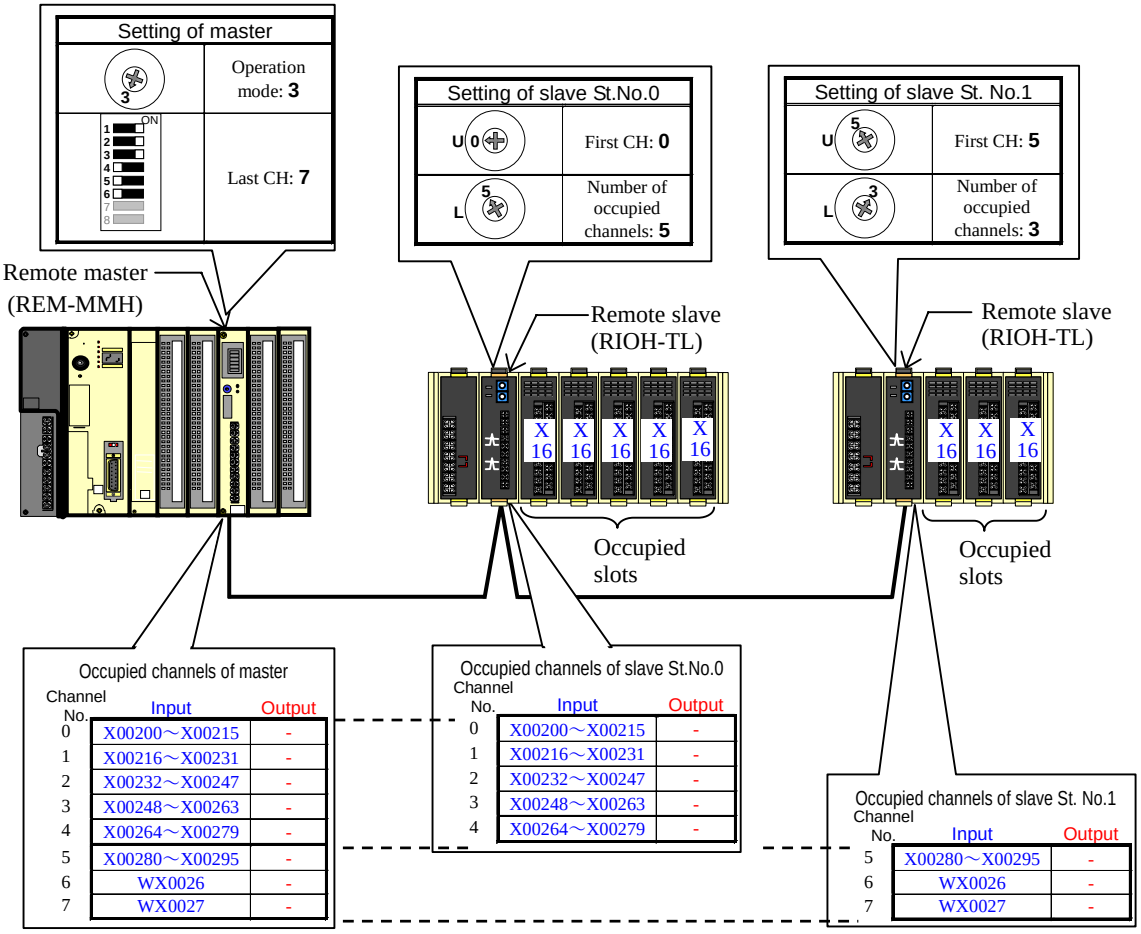
Figure 4.5.5 shows the system configuration example of Remote I/O MINI with mode3 for H-300/700/2000/302/702/1002/2002/4010.

Figure 4.5.6 shows replaced system configuration example with compact remote2.

In this case, you need not change I/O assignment of master module from “X8W”.

Moreover, when the slot number of master module is not changed, you also need not change 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 “X8W” is not treated as remote module. You can use the number of master modules up to ability of CPU by same reason.

Figure 4.5.6 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 refresh mode (HS) of a front DIP switch of the master module and the slave modules, and turn on communication mode (MODE) of a front DIP switch of them.



Channel No.	Input	Output
0	X00200～X00215	-
1	X00216～X00231	-
2	X00232～X00247	-
3	X00248～X00263	-
4	X00264～X00279	-
5	X00280～X00295	-
6	WX0026	-
7	WX0027	-

Figure 4.5.5 System configuration example of Remote I/O MINI (Mode3)

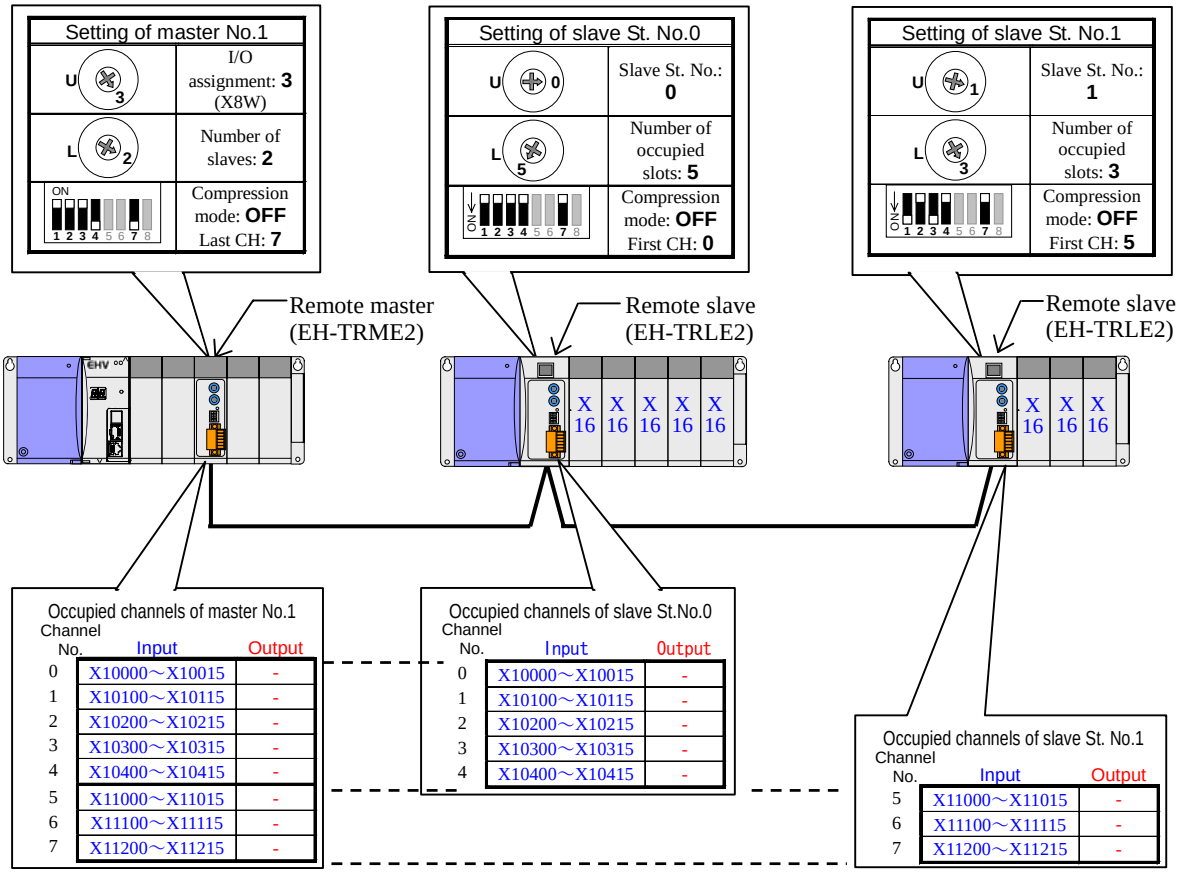


Figure 4.5.6 System configuration example after replacement to EH-150 (Mode3)

4.5.4 Replacement from Remote I/O MINI with mode0

Mode0 of remote I/O MINI is a mode that uses the remote input and output in 1,024 points (2,048 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 between Remote I/O MINI and CPU while a lot of remote I/O numbers were able to be used.

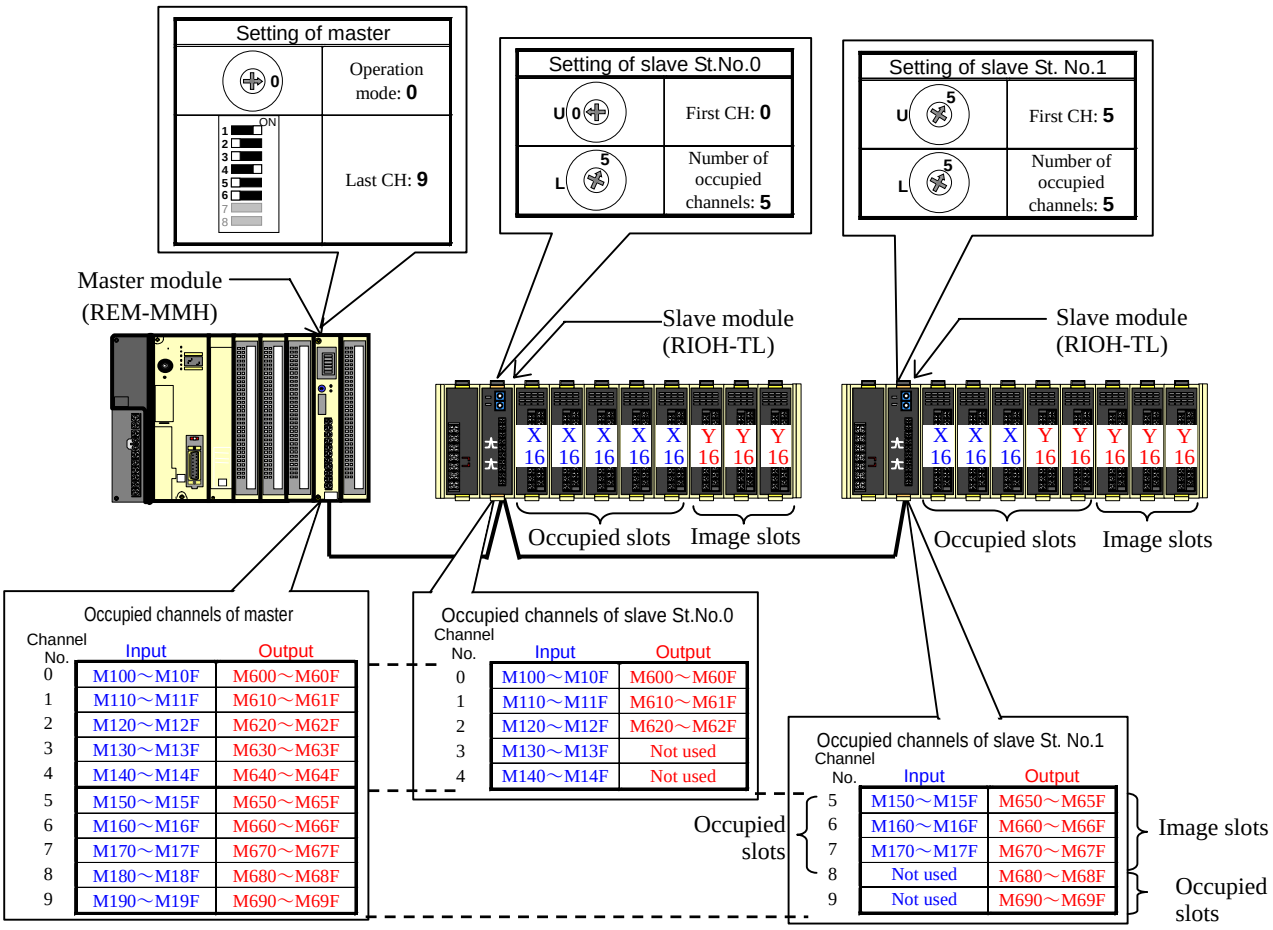
Figure 4.5.7 shows the system configuration example of Remote I/O MINI with mode0 for H-300/700/2000/302/702/1002/2002/4010.

Figure 4.5.9 shows replaced system configuration example with compact remote2.

In this case, it is necessary to change I/O assignment of master module from "X4Y4W" to "REMOTE2".

Please set I/O assignment “X16”, “Y16” for all input modules and output modules on slave bases as shown in Figure 4.5.8, 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 remote2 system, it is not necessary to use transfer command (TRNS1, QTRNS1) or handshake program. You can use remote I/O numbers directly in ladder program. Please delete these transfer command or handshake program for normal operation of compact remote2 system.



Channel No.	Input	Output
0	M100～M10F	M600～M60F
1	M110～M11F	M610～M61F
2	M120～M12F	M620～M62F
3	M130～M13F	M630～M63F
4	M140～M14F	M640～M64F
5	M150～M15F	M650～M65F
6	M160～M16F	M660～M66F
7	M170～M17F	M670～M67F
8	M180～M18F	M680～M68F
9	M190～M19F	M690～M69F

Occupied channels of master

Channel No.	Input	Output
0	M100～M10F	M600～M60F
1	M110～M11F	M610～M61F
2	M120～M12F	M620～M62F
3	M130～M13F	Not used
4	M140～M14F	Not used

Occupied channels of slave St.No.0

Channel No.	Input	Output
5	M150～M15F	M650～M65F
6	M160～M16F	M660～M66F
7	M170～M17F	M670～M67F
8	Not used	M680～M68F
9	Not used	M690～M69F

Occupied channels of slave St. No.1

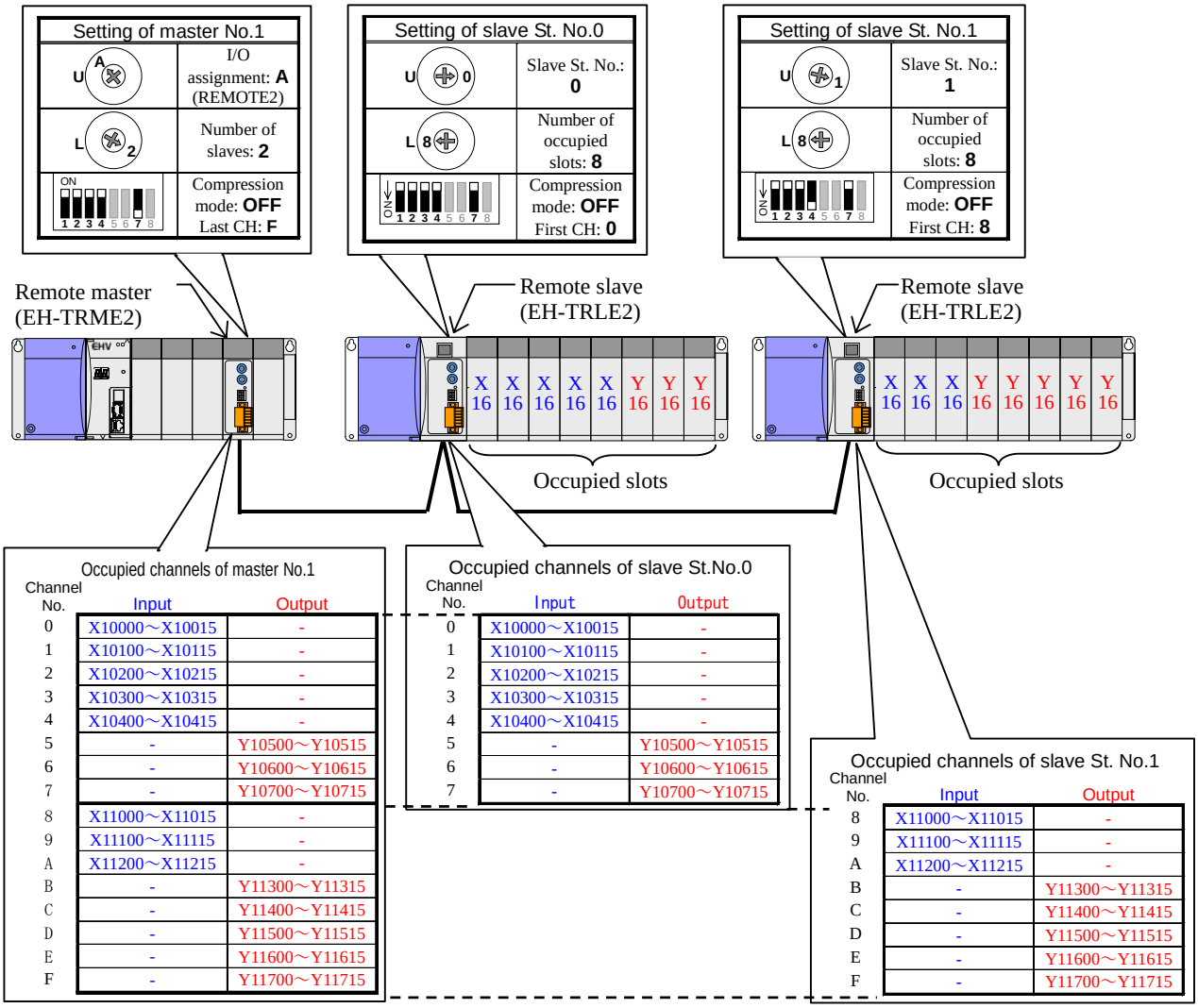
Figure 4.5.7 System configuration example of Remote I/O MINI (Mode 0)

Figure 4.5.9 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 4.5.7, and please turn off high-speed refresh mode (HS) of a front DIP switch of the master module and the slave modules, and turn on communication mode (MODE) of a front DIP switch of them. .

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 “X4Y4W”. On the other hand, compact remote2 master module is mountable on only slots 0 to 7 on basic base because I/O assignment of master is “REMOTE2” or “REMOTE (RMM)”.

Figure 4.5.8 I/O assignment example of remote I/O after the replacement
(Assignment of Figure 4.5.7 configuration example by control editor)

The compact remote2 master module can connect up to 8 slave modules in compatible mode. If there are more than 9 slaves in remote system, you cannot replace partially for master module. In this case, replace all slave modules before replacement of master module. After all replacement, please turn off communication mode (MODE) of a front DIP switch of the master module and the slave modules, and set the I/O assignment to “REMOTE (RMM)”. I/O assignment of “REMOTE (RMM)” supports only in EHV-CPU.



Occupied channels of master No.1

Channel No.	Input	Output
0	X10000～X10015	-
1	X10100～X10115	-
2	X10200～X10215	-
3	X10300～X10315	-
4	X10400～X10415	-
5	-	Y10500～Y10515
6	-	Y10600～Y10615
7	-	Y10700～Y10715
8	X11000～X11015	-
9	X11100～X11115	-
A	X11200～X11215	-
B	-	Y11300～Y11315
C	-	Y11400～Y11415
D	-	Y11500～Y11515
E	-	Y11600～Y11615
F	-	Y11700～Y11715

Occupied channels of slave St.No.0

Channel No.	Input	Output
0	X10000～X10015	-
1	X10100～X10115	-
2	X10200～X10215	-
3	X10300～X10315	-
4	X10400～X10415	-
5	-	Y10500～Y10515
6	-	Y10600～Y10615
7	-	Y10700～Y10715

Occupied channels of slave St. No.1

Channel No.	Input	Output
8	X11000～X11015	-
9	X11100～X11115	-
A	X11200～X11215	-
B	-	Y11300～Y11315
C	-	Y11400～Y11415
D	-	Y11500～Y11515
E	-	Y11600～Y11615
F	-	Y11700～Y11715

Figure 4.5.9 System configuration example after the replacement to EH-150 (Mode0)

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. However, there are differences with lineup of I/O modules, specifications, dimensions, I/O assignment, and program method, please consider these differences in replacement.

In addition, 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 4.6.1 shows the system configuration example of the EM/EM-II series not using image slot. Figure 4.6.3 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, it is necessary to set I/O assignment “REMOTE2” for master module in replaced system with EH-150. Figure 4.6.2 shows I/O assignment for remote bases of this replaced system.

Figure 4.6.3 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 refresh mode (HS) of a front DIP switch of the master module and the slave modules, turn on communication mode (MODE) of a front DIP switch of them.

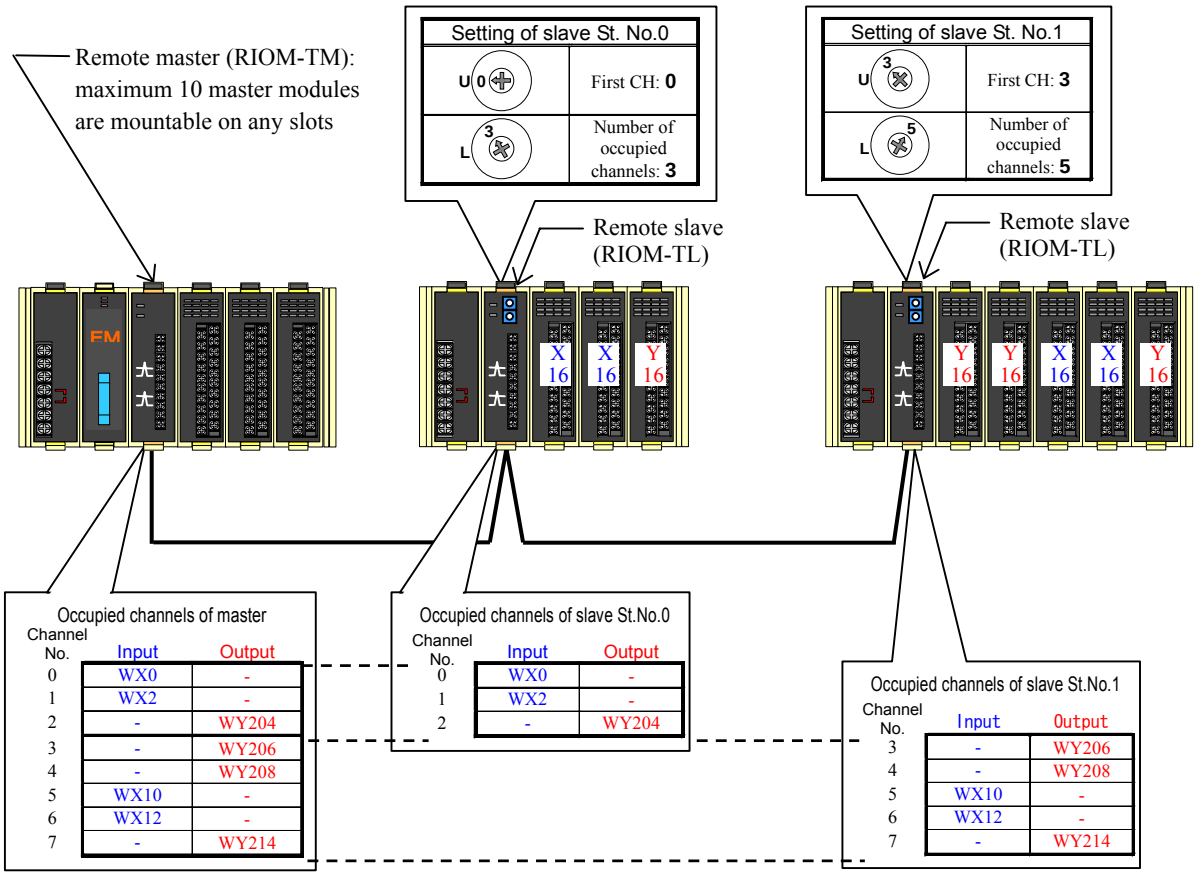


Figure 4.6.1 System configuration example of the EM/EM-II series (Not using image slot)

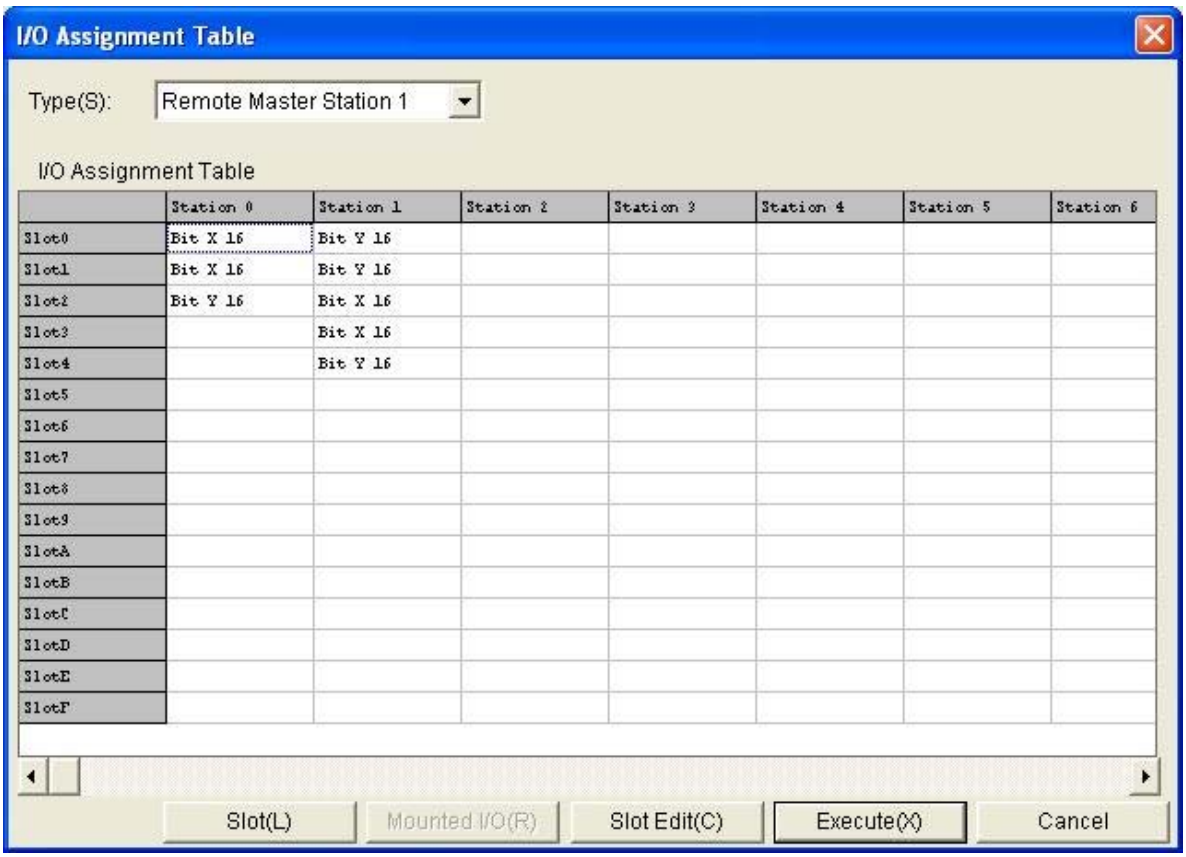


Figure 4.6.2 I/O assignment example of remote I/O
(Assignment of Figure 4.6.1 configuration example by Ladder editor)

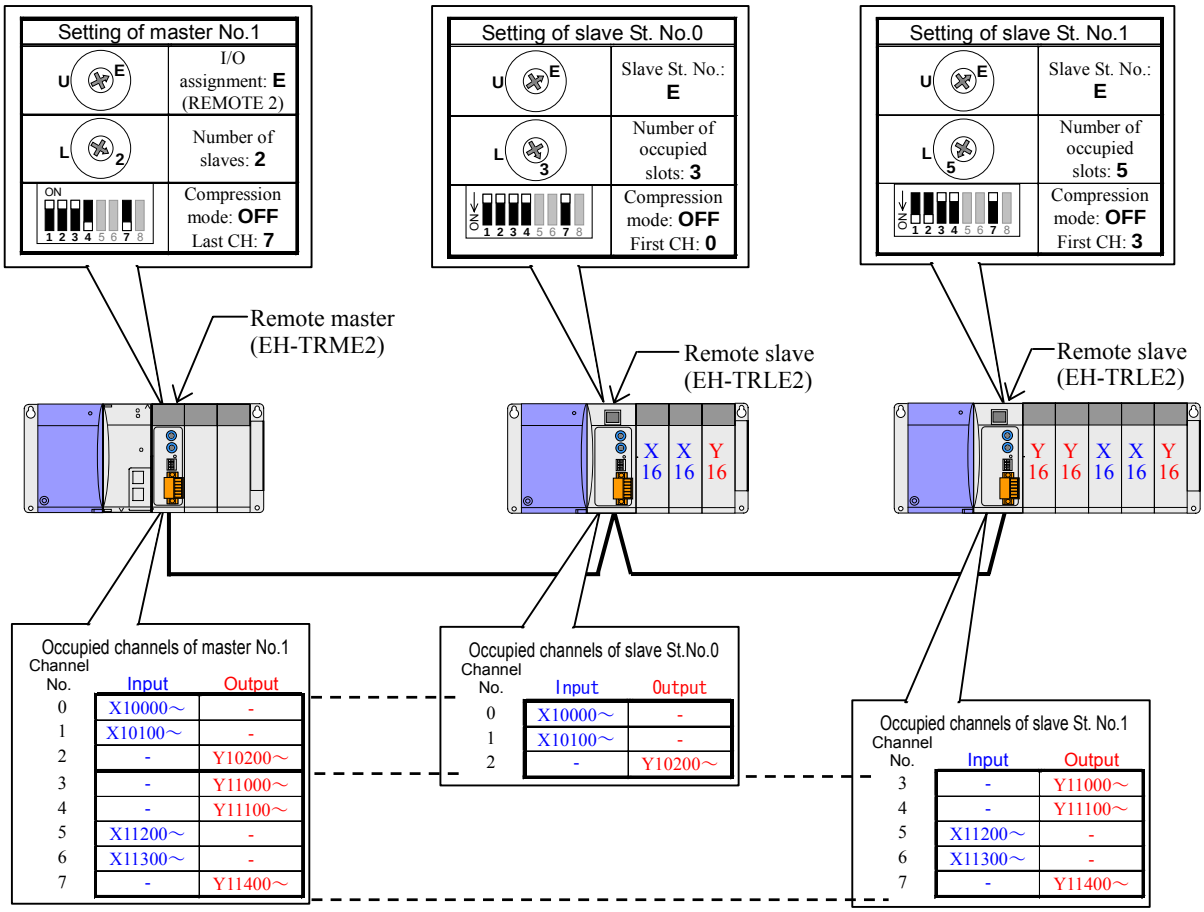


Figure 4.6.3 System configuration example after the replacement to EH-150 (Normal remote method)

4.6.2 Replacement with compression remote method

In the case of EM/EM-II series, you can use the same number of image slots as occupied channels on remote bases. Therefore, you can mount I/O modules twice the number of occupied slots.

This system configuration example is shown in Figure 4.6.4. I/O assignment of this system is shown in Figure 4.6.5. Figure 4.6.6 shows the system configuration example replaced to EH-150.

In this case, it is necessary to set I/O assignment of master module "REMOTE2".

In addition, turn on communication mode of a side DIP switch of the master module and a bottom DIP switch of the slave modules.

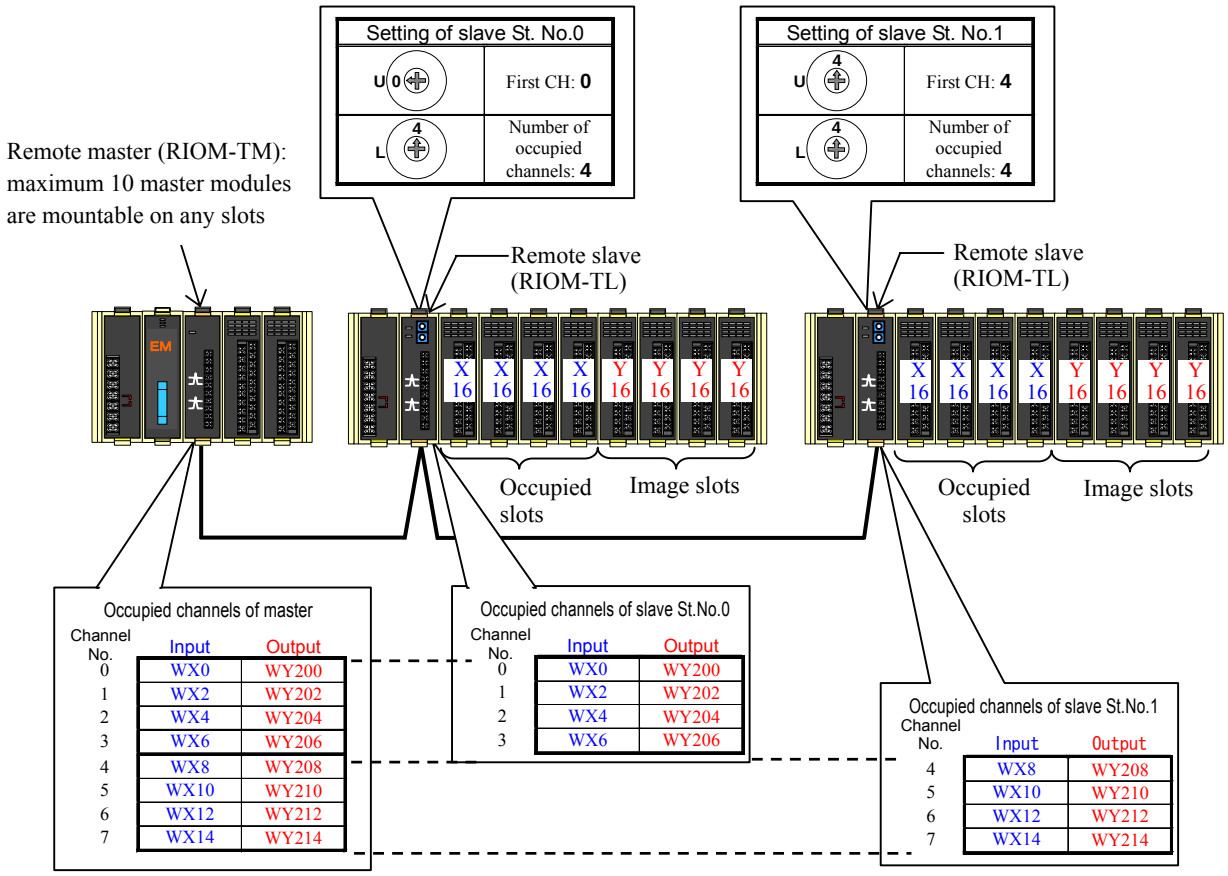


Figure 4.6.4 System configuration example of the EM/EM-II series (Using image slot)

Only input modules are mountable on occupied slots of slave base, and only output modules are mountable on image slots normally. However, 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 in Figure 4.7.3.

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 4.6.3, turn off compression mode of a side DIP switch of the master module and a bottom DIP switch of the slave modules.

Figure 4.6.6 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 refresh mode (HS) of a front DIP switch of the master module and the slave modules, turn on communication mode (MODE) of a front DIP switch of them.

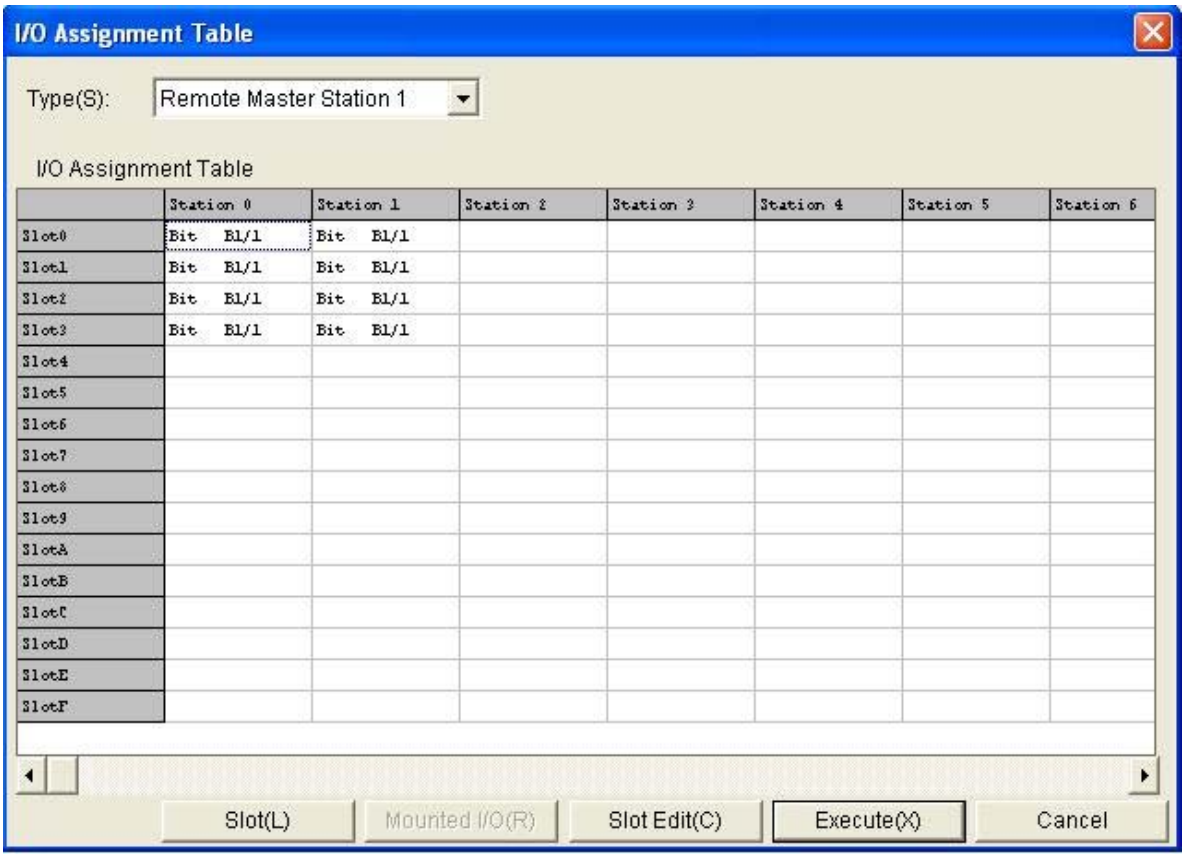


Figure 4.6.5 I/O assignment example of remote I/O
(Assignment of Figure 4.6.4 configuration example by Ladder editor)

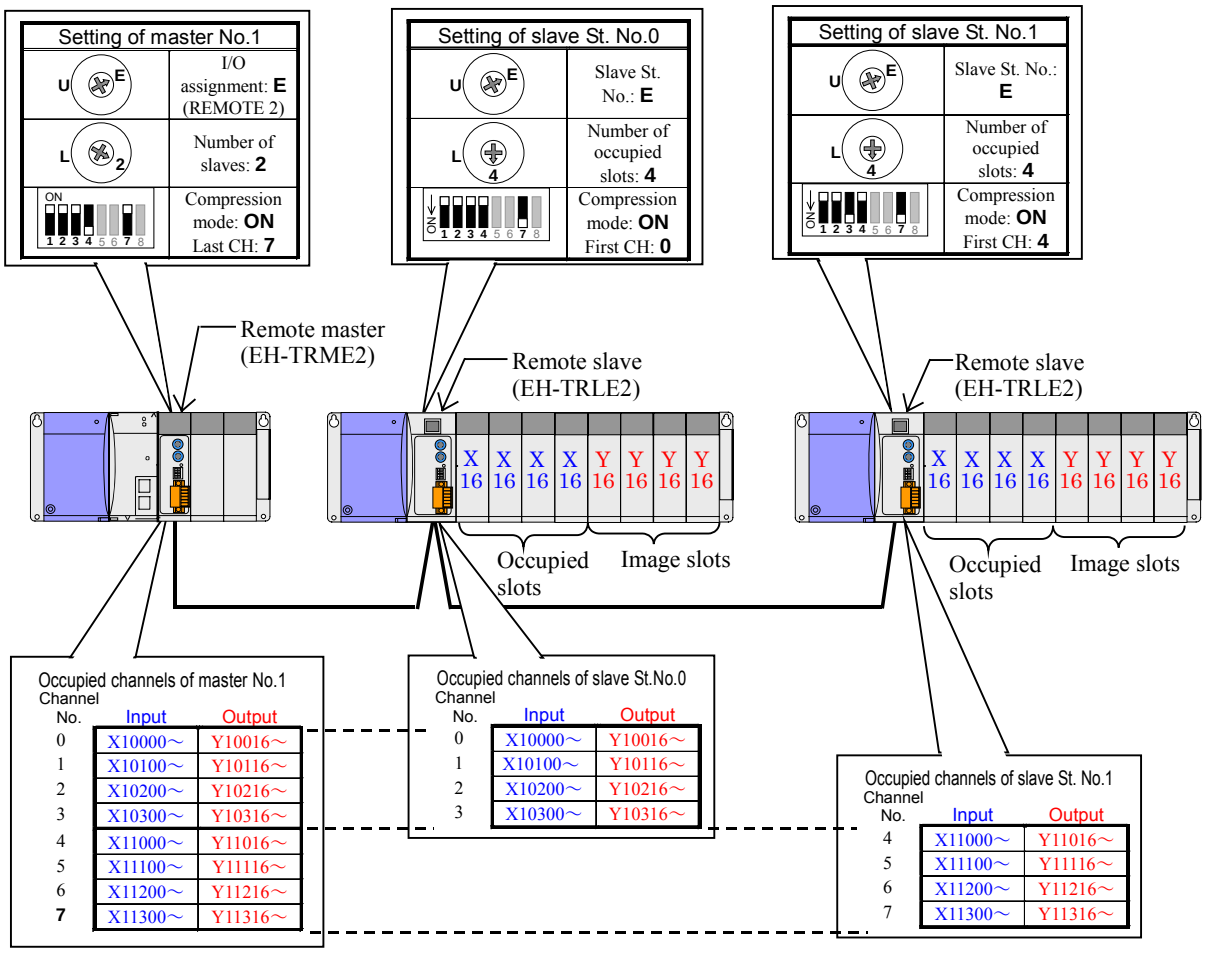


Figure 4.6.6 System configuration example after the replacement to EH-150 (Using image slot)

4.7 Replacement of slave station only

4.7.1 Basic method for 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 4.7.1. Please turn off the compression mode of a side DIP switch of replaced slave module. In addition, set the same value on first channel, with careful attention to difference method of setting first channels. Setting method is changed from rotary switch on RIOH-TL/RIOM-TL to bottom DIP switch on EH-TRLE2 as Figure 4.7.1.

Please turn off high-speed refresh mode (HS) of a front DIP switch of the slave modules, turn on communication mode (MODE) of a front DIP switch of them, 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-TRLE2) in order to match communication protocol.

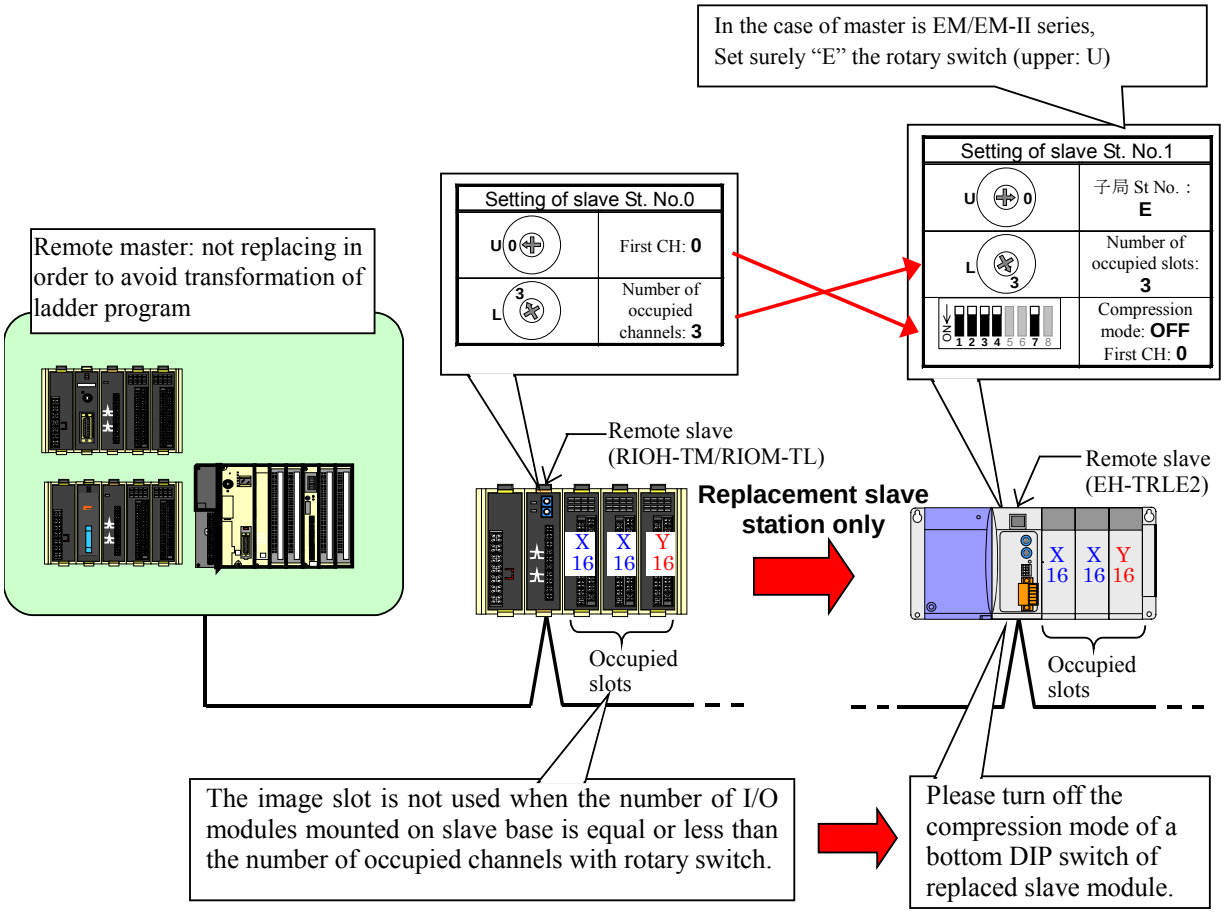


Figure 4.7.1 Replacement of only slave station in the case of not using image slot (compression mode: OFF)

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 4.7.2. Please turn on the compression mode of a bottom DIP switch of replaced slave module (EH-TRLE2) in this case. Please set similar with Figure 4.7.1 except for compression mode.

However, when output module is mounted on occupied slot like as Figure 4.7.3, you can't replace slave only. In this case, please replace both of master and slave station as shown in Figure 4.6.3, and use normal remote method with compression mode off.

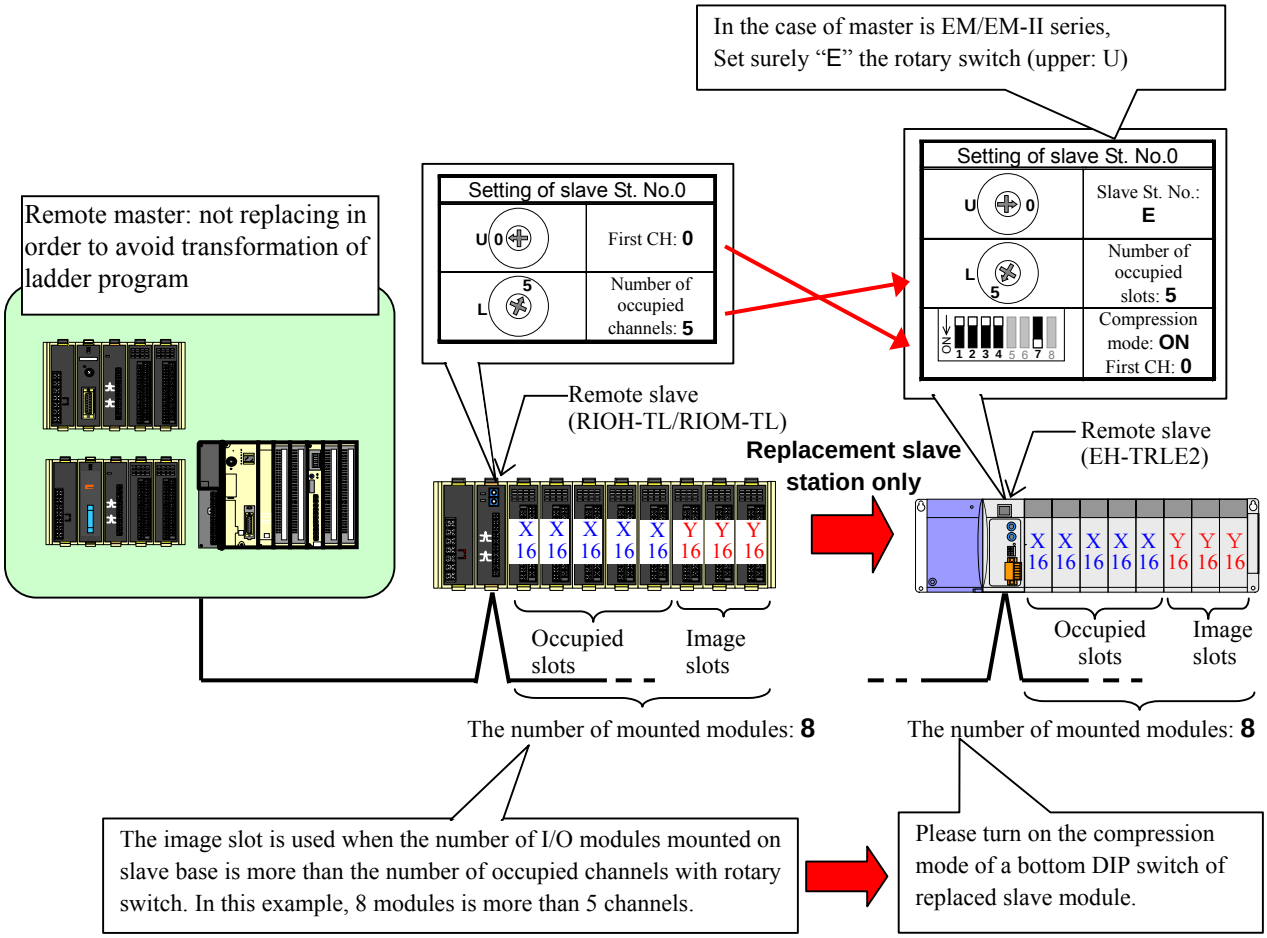


Figure 4.7.2 Replacement of only slave station in the case of using image slot (compression mode: ON)

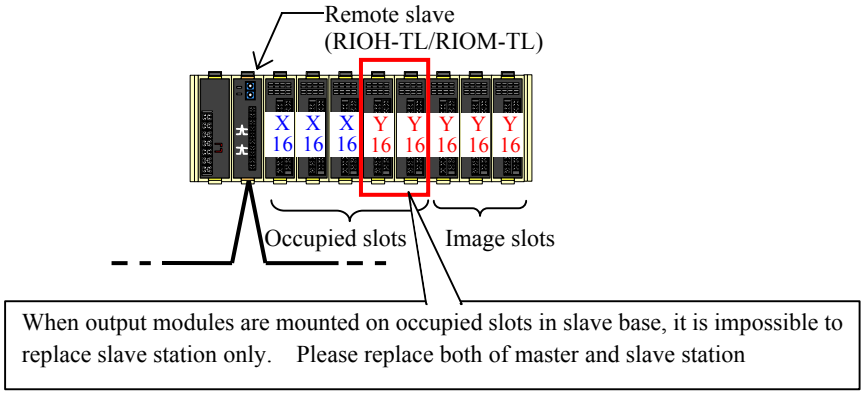


Figure 4.7.3 Impossible case of replacement with slave station only
(Output modules are mounted on occupied slots)

4.7.2 Replacement of slave station only for Remote I/O MINI with mode0

This system configuration example in the replacement of slave station only for Remote I/O MINI with mode0 is shown in Figure 4.7.4. Figure 4.7.5 shows the system configuration example replaced to slave station with EH-150. In this case, it is not necessary to transform and debug for ladder program.

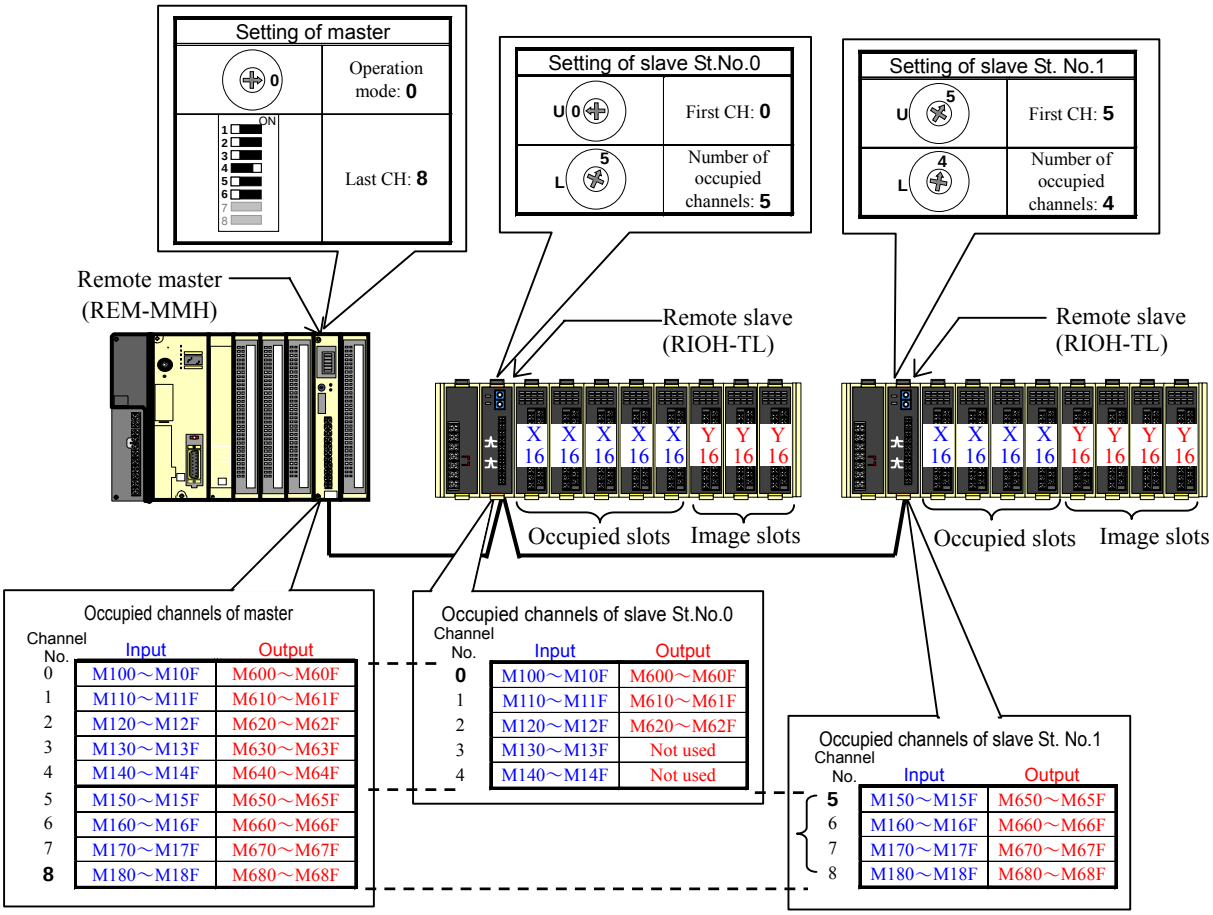


Figure 4.7.4 System configuration example of Remote I/O MINI (Mode 0)

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 4.7.4. For example, St No. 0 in Figure 4.7.4 is mounted 8 I/O modules and set 5 occupied channels, so image slots are used in this station.

Please turn on the compression mode of a bottom DIP switch of replaced slave module (EH-TRLE2) in this case. However, when output module is mounted on occupied slot, you can't replace slave only. In this case, please replace both of master and slave station. Please refer to Section 4.7.1 for details.

In the case of remote slave module for H-200/250/252B/252C (RIOH-TL) and remote slave module for EM/EM-II (RIOM-TL), first channel can be set from 0 to F. On the other hand, first channel of compact remote2 slave module (EH-TRLE2) can be set from 0 to 3F. Therefore all channels of Remote I/O MINI master module (REM-MMH) can be set for first channel of slave module. However maximum 12 slave stations can be connected to one master station, maximum remote I/O points are as follows.

16 points/slot * 8 slots/station * 12 stations/master = 1,536 points/master (96 slots/master)

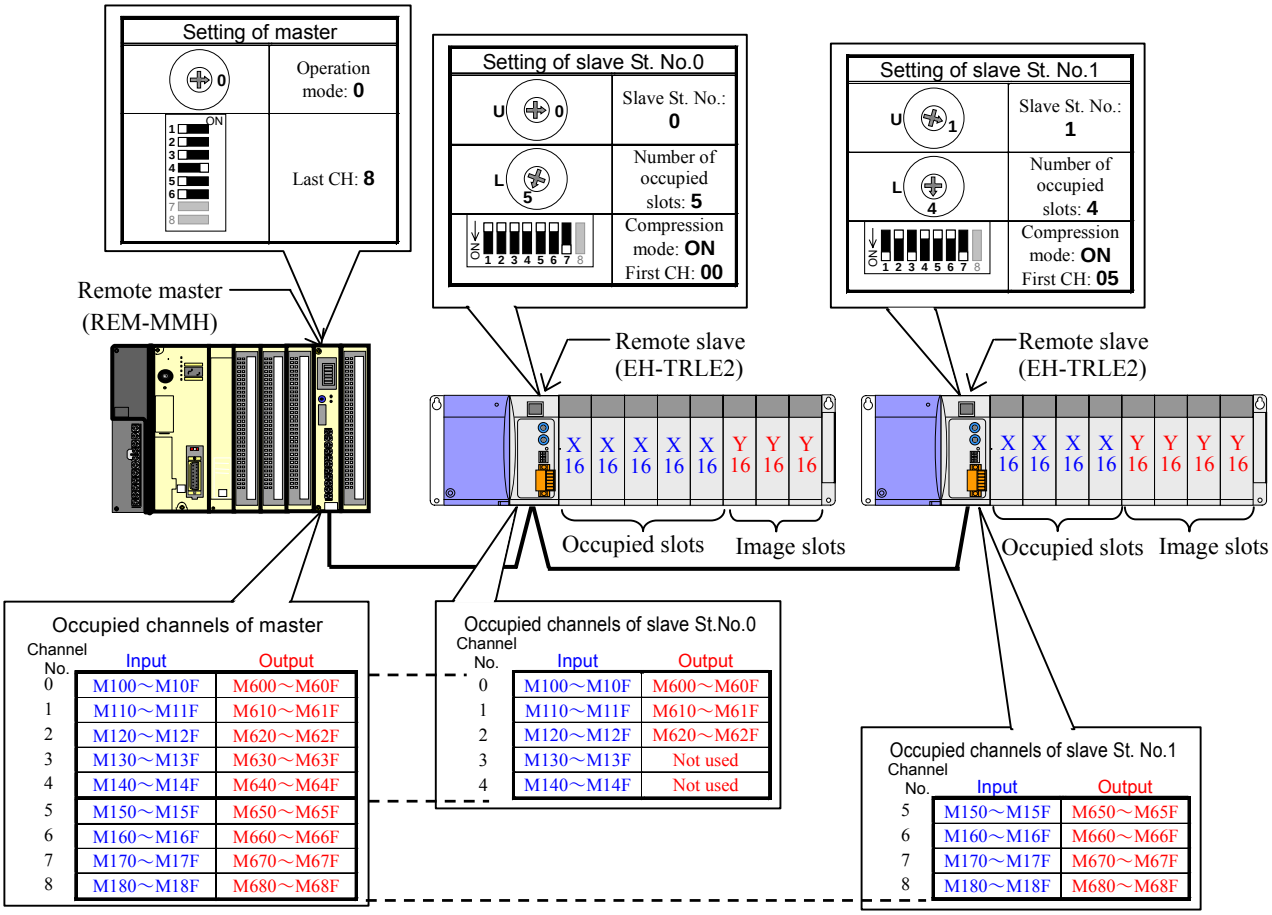


Figure 4.7.5 System configuration example after replacement to EH-150

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 4.8.2. 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 refresh mode (HS).
When there are remote stations of conventional models, please use HS as turn off.
On the other hand, remote refresh time can be shortened by setting HS turn on, when remote system consist of compact remote2 only, that is, (master module: EH-TRME2, slave module: EH-TRLE2).

The remote refresh time is:

[Remote refresh time] = (A + B) * [number of occupied channels in master] * 2·····(4.2)

[Read time of mounted I/O assignment information]

= (A + B) * ([Connected slave-station count] + [Mounted module count on slaves])···(4.3)

In case of the communication mode of compact remote2 modules is set in a normal mode, read time of I/O assignment information is added at remote refresh time.

Refer to Table 4.8.1 about the value of A or B in the calculation.

Table 4.8.1 Data transfer interval and the processing time per a channel

Para meter	Contents	Switch setting			Time (μs)
		MODE	HS	Operation mode	
A	Data transfer interval	OFF	OFF	Normal mode (Slow speed)	100
			ON	Normal mode (High speed)	6
		ON	OFF	Compatible mode (Slow speed)	100
			ON	Compatible mode (High speed)	6
B	Processing time per a channel	OFF	-	Normal mode	84
		ON	-	Compatible mode	63

The actual measurement value of remote refresh time is stored in special internal output of CPU module as shown in Table 4.8.2 when I/O assignment of master module is “REMOTE 2” or “REMOTE (RMM)”.

[I/O refresh time in slave module]:

It becomes 0.3ms or less. It isn’t influence in the response time of remote system, because I/O refreshing of slave station is high speed.

[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 remote2 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 refresh 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 the total of occupied channels of all slaves, the remote refresh time is calculated by equations (4.2) and (4.3).

When the number of occupied channels in master is more than the 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.

[Remote refresh time (Compatible mode)]

= (A + B) * ([Using channel count] * 2) + ([Not using channel count]* 0.5ms) ····· (4.4)

When the slave station leaves remote system in communication mode as normal mode setting, read time of mounted I/O assignment information during the system secession is added to remote refresh time.

Calculate read time of mounted I/O assignment information of system participation slave station by equation (4.3), and calculate read time of mounted I/O assignment information of system secession slave station by equation (4.5). Remote refresh time becomes the value that added equation (4.3) and (4.5) in equation (4.4).

[Read time of mounted I/O assignment information]

= [Secession slave station count] * 0.5ms ·····(4.5)

Table 4.8.2 Special internal outputs in CPU concerned with remote response time

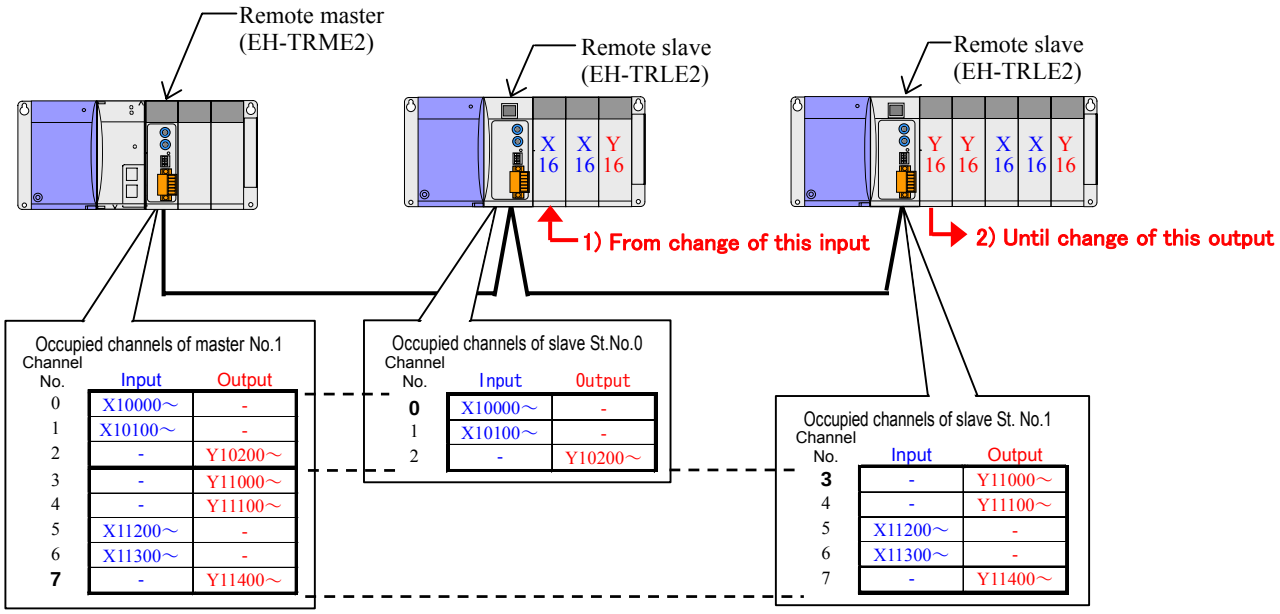
Items	No.	Name	Description	Setting condition	Resetting condition
Scan time of CPU	WRF010	Scan time (maximum value)	The maximum value, present value, and minimum value of execution time of normal scan are stored in the unit of 1ms. (Note 1)	Set by system	Cleared by system (when RUN starts)
	WRF011	Scan 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 " X4Y4W", " Y8W" and " X8W" is set with the I/O assignment of master module (EH-TRME2).

■ Example of calculation in compatible mode

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 + 1.1*2 + 0.3*2 + 5 + 1 = about 28.8 [ms]

- 20 — Scan time of CPU (in the case of 20ms)
- 1.1*2 — Remote refresh time: 1.1ms = (63+6)μs * 8 channels * 2 ……from equation (4.2)
- 0.3*2 — I/O refresh time in slave module
- 5 — Input lag time of EH-XD16
- 1 — Output response time of EH-YTP16

Figure 4.8.1 Example of calculation for response time

MEMO

Chapter 5 Installation and Turning power supply on

5.1 Loading the module

(1) Installing

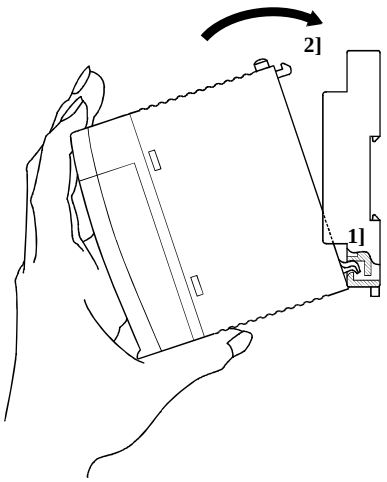


Figure 5.1.1 Installing the module

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 right of the power module.

It can reinforce with the screw after installation.

Use M4×10mm screws in this case.

(2) Removing

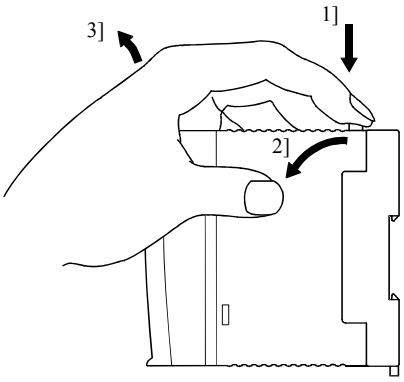


Figure 5.1.2 Removing the module

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-TRME2)

In the case setting I/O assignment “REMOTE2” or “REMOTE (RMM)” in EH-TRME2, EH-TRME2 is available mounting up to 4 units on slots from 0 to 7 as shown in Figure 5.2.1.

When you use EH-TRME2 in combination with EHV-CPU, please note that EH-TRME2 cannot mount on old model base (EH-BS3, EH-BS5, EH-BS8).

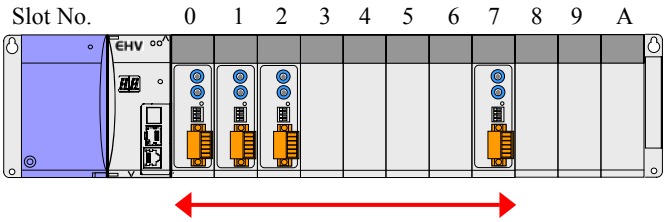


Figure 5.2.1 Mountable slots for master module - 1 (I/O assignment “REMOTE 2” or “REMOTE (RMM)”)

When you use EH-TRME2 in combination with EH-CPU and old model base, EH-TRME2 is available mounting on slots from 0 to 2 as shown in Figure 5.2.2.

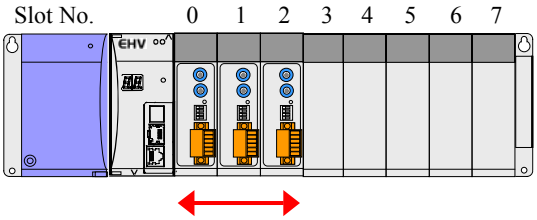


Figure 5.2.2 Mountable slots for master module - 2 (I/O assignment “REMOTE 2” or “REMOTE (RMM)”)

There is no limit in the number of mountable master modules when I/O assignment of master module is “X4Y4W”, "Y8W" or "X8W", and master module can be mountable on any slots on basic base and expansion bases.

(2) Slave module (EH-TRLE2)

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

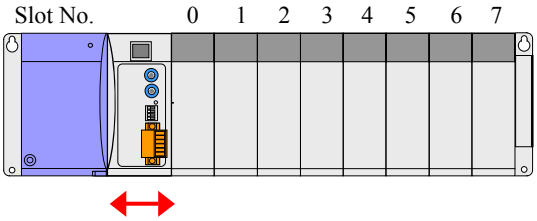
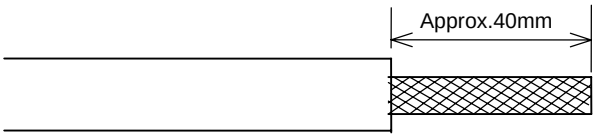


Figure 5.2.3 Mountable slot for slave module

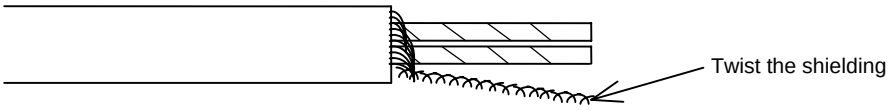
5.3 How to prepare of twisted pair cables

Prepare the twisted pair cables according to the procedure below and attach them to the connector.

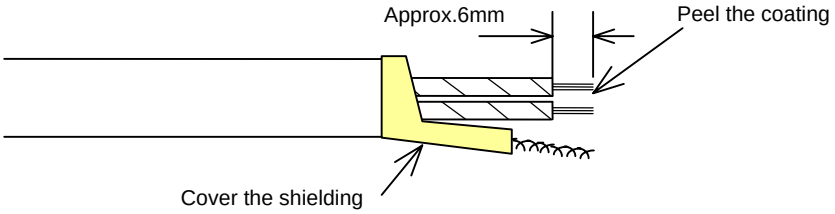
[Procedure 1] Peel approximately 40 mm of the coating off the end of the cable.



[Procedure 2] Loosen the mesh of the shielding, and twist it.



[Procedure 3] Peel approximately 6 mm of the coating in the signal line, cover the shielding in the insulator from the cut end of the coating so that a wiring dreg does not appear.



Do not perform the wiring until the cable has been attached to the clamp terminals. If signal lines and shielding touch, the communication error may occur. Use clamp terminal that there is insulation coating.

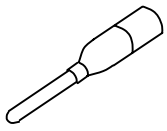
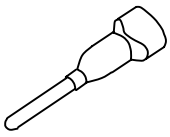
Table 5.3.1 Example of applicable clamp terminals

Type		Electric wire size	Clamp terminals	Remarks
Single	Use to insert 1 cable	0.3 to 1.65 mm^2	TGVTC-1.25-11T	Made by Nichifu
Double	Use to insert 2 cables	0.3 to 1.65 mm^2	TGWVTC-1.25-11T	Made by Nichifu
Single	Use to insert 1 cable	0.34mm^2	H0.34/10	Made by Weidmuller
		0.5mm^2	H0.5/12	Made by Weidmuller
		0.75mm^2	H0.75/12	Made by Weidmuller
Double	Use to insert 2 cables	0.5mm^2	H0.5/15	Made by Weidmuller
		0.75mm^2	H0.75/15	Made by Weidmuller

Table 5.3.2 Applicable clamp tools

Electric wire size	Clamp tools	Remarks
0.3 to 0.5 mm^2	NH-5	Made by Nichifu
0.3 to 2 mm^2	NH-32	Made by Nichifu
0.3 to 0.5 mm^2	NH-60	Made by Nichifu
0.5 to 2.5mm^2	Stripax® plus2.5	Made by Weidmuller
0.14 to 6 mm^2	PZ 6rote	Made by Weidmuller
0.25 to 6 mm^2	PZ 6/5	Made by Weidmuller

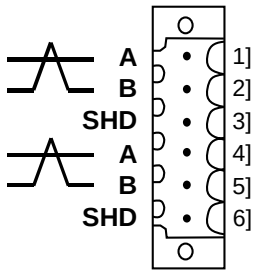
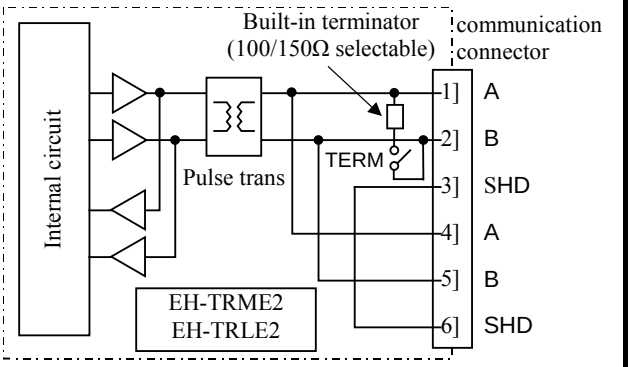
Table 5.3.3 The outline shape of clamp terminal

Use to insert 1 cable	Use to insert 2 cables
	

Push in the coating of the electric wire in the resin cover in clamp terminal surely, and choose the clamp terminal, which matched the using electric wire. Choose the appropriate tool for the using electric wire size and clamp terminal.

5.4 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	

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 same terminals beforehand, following the connection method 2 shown in next page.

The built-in terminator is disconnected when power supply is turned off. So, please set TERM off and connect external terminator to communication connector of end slaves instead of a built-in terminator when you use fallback operation. (Please refer to (4) for connection of external terminator)

(2) Installation method of communications cable

When signal lines are inserted in clamp terminal, regulate length that peel coating by the shape of the using clamp terminal. Use the equivalency Screw Driver (Minus) that is recommended by maker to the driver of straight type shown in Table 5.4.1 for the communication connector. The torque for clamping screw is 0.2 to 0.25Nm.

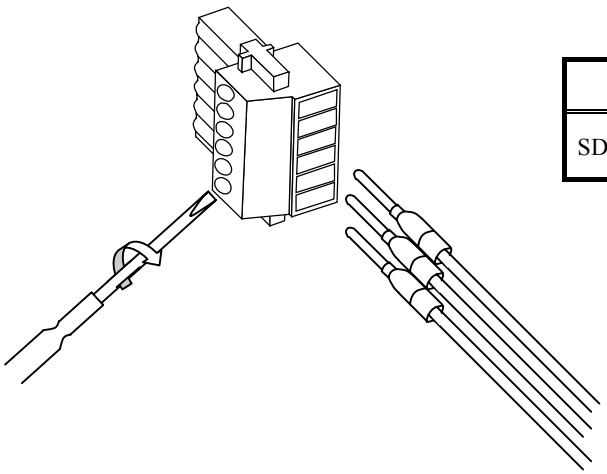


Figure 5.4.1 Installation example of communications cable with the clamp terminal

Table 5.4.1 Screw Driver of maker recommendation

Model	Shape of the tip	Remarks
SD 0.4×2.5×75	Thickness: 0.4mm Width: 2.5mm	Made by Weidmuller

(3) 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

When disabling the replacement of slave module while operating, the following connection is convenient because the connection to each terminal is one.

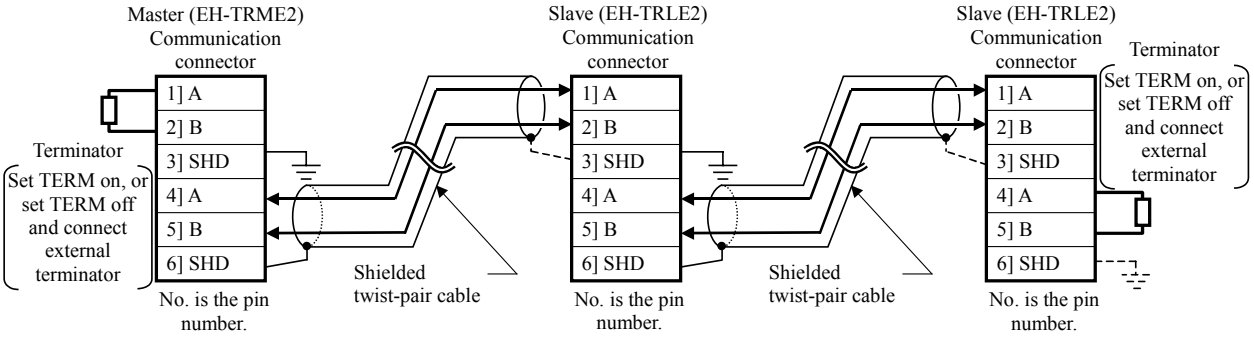


Figure 5.4.2 Normal connection method

[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. Please connect external terminator and signal wire to same terminal of connector in end slaves.

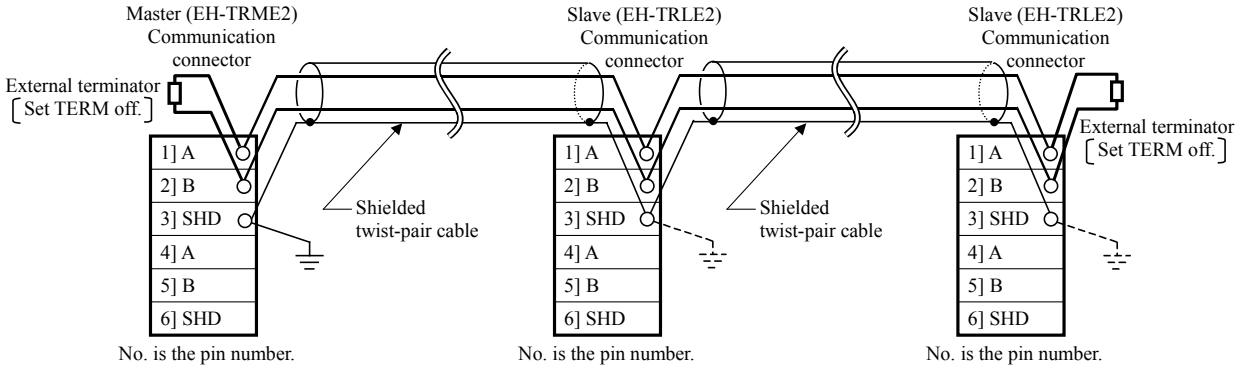


Figure 5.4.3 Connection method when enabling the replacement of slave module while operating

Please use clamp terminals for double cables insertion in order to plug 2 cables to connector and in order to plug cable and external terminator to connector as Figure 5.4.3.

In Figure 5.4.2 and Figure 5.4.3, Signal A is connected to signal A and signal B is connected to signal B. But you can connect signal A to signal B without trouble in remote communication.

(4) Insertion of terminator

The terminator has to be inserted in both ends of master or slave module connected through a twist-pair cable. Please select value of terminator according to recommended cable as shown in Table 2.2.1 in Section 2.2.

Figure 5.4.4 shows example of connecting external terminator. Attached external terminator with product is 100Ω. When you use 0.75SQ recommended cable, please use existing external terminator of 150Ω, or prepare and connect new external terminator of 150Ω.

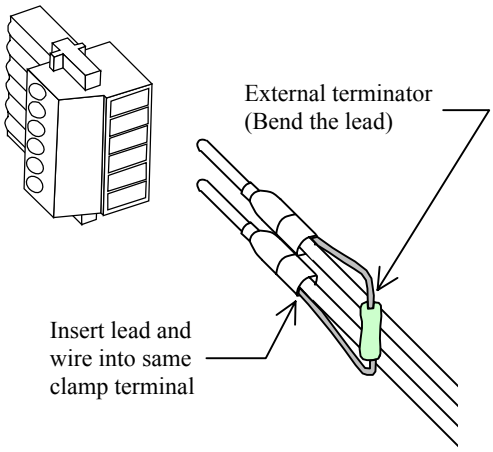


Figure 5.4.4 Example of connecting external terminator

⚠ CAUTION

- Always insert terminators in both ends of master or slave module connected through a twist-pair cable. If there is no terminator, the communication error might occur, and it might cause wrong output and wrong input.
- Do not remove the communication plug of end slave stations using built-in terminator while operating, and do not turn off the power supply of them. The communication error might occur in the master module and other slave modules because it enters the state that the terminator is not in the remote system, and it might cause wrong output and wrong input.
- Cover shielding of twisted pair cable with the insulator so that the signal wire should not come in contact with the shield line. The contact of these lines causes communication error.

(5) Precautions when Connecting to the Network

- When you connect the twisted pair cable to communication connector, do not intersect between the parts of cables, which peeled coating. In the case that cables intersect, a communication error may occur.
- Do not put the communication cable in a duct same as other power lines and a wiring duct of the I/O.
- Separate and lays the communication cables on around 300mm from other ducts.

⚠ CAUTION

- Always turn off the power supply of devices when connecting a communication cable.
- It is recommended to use clamp terminals when plugging a communication cable into a connector. If simply twisting the wires connects the communication cable, it may result in the product malfunction due to cable disconnection.
- Be sure that the connector will not be pulled out by the weight of the cable. Pay full attention to wiring, so that neither signal lines nor the shielding line will be pulled out during communication.
- After wiring the communication cable, be careful not to put excessive stress on the communication cable as well as the connector. It may cause the connector to be pulled out or a broken cable.
- Allow enough bending radius for the communication cable. If forcibly bent, the connector may be pulled out or a broken cable.

5.5 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.

On the other hand, 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. This CERR is turned off when the communication is begun, and the error history doesn't remain either.

Table 5.5.1 shows the typical time until communication error (CERR) of slave module disappears in this case when I/O assignment of master module is "REMOTE2" or "REMOTE (RMM)". The communication error (CERR) of slave module doesn't light even in the same case when I/O assignment of master module is "Y8W", "X4Y4W" or "X8W".

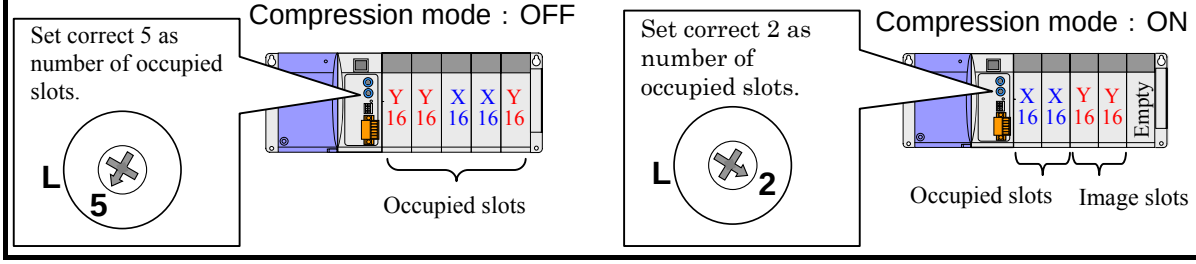
Table 5.5.1 Typical time until communication error (CERR) of slave module disappears after turning on power supply

CPU model	I/O assignment of master: "REMOTE 2" "REMOTE (RMM)"	
	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.

⚠ CAUTION

- Set correct number of occupied slots by rotary switch before turning on the power supply. There is a mis-output possibility when the output module is mounted on the slot set to unused.



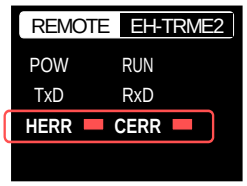
MEMO

Chapter 6 Error indication and Countermeasure

6.1 Error indication

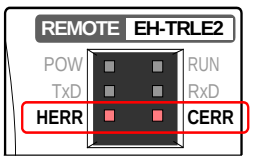
The error indications of LED light when error is detected with remote modules and transmission lines.
Table 6.1.1 shows error indication of master module, and Table 6.1.2 shows error indication of slave module.

Table 6.1.1 Error indication of master module (EH-TRME2)

Error display LED	LED	Name of error	Contents of error	Check timing (clear timing)	Counter measure
	HERR	Wrong setting of switch	It lights when setting value is not permitted. (Note 1)	(a) When turning on power supply (b) When pushing reset switch	Please set 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 correctly any setting of rotary switch and DIP 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 remote2 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 6.1.2 Error indication of slave module (EH-TRLE2)

Error display LED	LED	Name of error	Contents of error	Check timing (clear timing)	Counter measure
	HERR	Hardware error	It lights when setting value is not permitted. (Note 1)	(a) When turning on power supply (b) When pushing reset switch	Please set correctly.
			It lights when hardware error of slave module are detected.		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) Please set correctly rotary switches and DIP 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 switches.
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. As result, 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 remote2 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 last correct data before is maintained. 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 6.2.1 when I/O assignment of master module of compact remote2 is “REMOTE2” or “REMOTE (RMM)”.

Please note that the information to be stored is different from the other remote system. In addition these information are not stored when I/O assignment of master module is “Y8W”, “X4Y4W” or “X8W”.

■ 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 6.2.1 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	Slave participation flag	Bit number correspond to slave station number (1: Participation, 0: Non participation)		
WRF081	WRF099	WRF0B1	WRF0C9	Slave error flag	Bit number correspond to slave station number (1: Error, 0: No error)		
WRF082	WRF09A	WRF0B2	WRF0CA	Detail information of transmission error in master station	0		
WRF083	WRF09B	WRF0B3	WRF0CB	Detail information of transmission error in slave St. No.0 (Note 1)	k	0	Number of times transmission error
WRF084	WRF09C	WRF0B4	WRF0CC	Detail information of transmission error in slave St. No.1 (Note 1)	k	0	Number of times transmission error
WRF085	WRF09D	WRF0B5	WRF0CD	Detail information of transmission error in slave St. No.2 (Note 1)	k	0	Number of times transmission error
WRF086	WRF09E	WRF0B6	WRF0CE	Detail information of transmission error in slave St. No.3 (Note 1)	k	0	Number of times transmission error
WRF087	WRF09F	WRF0B7	WRF0CF	Detail information of transmission error in slave St. No.4 (Note 1)	k	0	Number of times transmission error
WRF088	WRF0A0	WRF0B8	WRF0D0	Detail information of transmission error in slave St. No.5 (Note 1)	k	0	Number of times transmission error
WRF089	WRF0A1	WRF0B9	WRF0D1	Detail information of transmission error in slave St. No.6 (Note 1)	k	0	Number of times transmission error
WRF08A	WRF0A2	WRF0BA	WRF0D2	Detail information of transmission error in slave St. No.7 (Note 1)	k	0	Number of times transmission error
WRF08B	WRF0A3	WRF0BB	WRF0D3	Detail information of transmission error in slave St. No.8 (Note 1)	k	0	Number of times transmission error
WRF08C	WRF0A4	WRF0BC	WRF0D4	Detail information of transmission error in slave St. No.9 (Note 1)	k	0	Number of times transmission error
WRF08D	WRF0A5	WRF0BD	WRF0D5	Detail information of transmission error in slave St. No.10 (Note 1)	k	0	Number of times transmission error
WRF08E	WRF0A6	WRF0BE	WRF0D6	Detail information of transmission error in slave St. No.11 (Note 1)	k	0	Number of times transmission error
WRF08F	WRF0A7	WRF0BF	WRF0D7	Detail information of transmission error in slave St. No.12 (Note 1)	0		
WRF090	WRF0A8	WRF0C0	WRF0D8	Detail information of transmission error in slave St. No.13 (Note 1)	0		
WRF091	WRF0A9	WRF0C1	WRF0D9	Detail information of transmission error in slave St. No.14 (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) When the slave station participates in remote system, the slave participation flag does ON. On the other hand, when the slave station leaves remote system after remote operations have started, the slave error flag does ON.
When the slave station leaves remote system, the following station number of the slave may do ON/OFF in the slave participation flag. The slave participation flag in EH-TRME2 is different from the assignment flag of slave in EH-TRMME. The slave participation flag in EH-TRME2 does OFF when the communication error occurs.

(Note 2) The transmission error in slave is time-out error detected when there is no response about same cannel from slave station during 0.5ms. These 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.
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.
Compact remote2 doesn't store the error channel number in the detail information of transmission error slave St. No.*.
If the communication error occurs without the communication time-out error, remote data is maintained the last received data. The slave error flag and the number of times transmission error become the reference in the status confirmation. Use the slave participation flag for the validation.

(Note 3) 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.

When it was set I/O assignment "REMOTE2" or "REMOTE (RMM)" to EH-TRME2, the status information of EH-TRME2 is stored in the special internal output area of CPU module as shown in Table 6.2.2.

Table 6.2.2 Status information of EH-TRME2 (Special internal outputs number in CPU)

Special internal outputs number	Slot number	Status information (Hex digit)
WRF020	Slot 0	Information of setting to master station
WRF021		FPGA version in master station
～	～	～
WRF02E	Slot 7	Information of setting to master station
WRF02F		FPGA version in master station

Refer to Table 6.2.3 as the details of the status information. You can confirm FPGA logic version or switch-setting of EH-TRME2 in the status information.

Table 6.2.3 Details of the status information

Special internal outputs number (Example: Slot 0)	Contents of each bit number															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
WRF020	I/O assignment				Slave station count				Last channel number etc.							
WRF021	Operation mode				FPGA version											
Explanation																
I/O assignment	This info is setting of rotary switch (U) in the front part of product.															
Slave station count	This info is setting of rotary switch (L) in the front part of product.															
Last channel number etc.	This info is setting of DIP switch in the side part of product.															
Operation mode	This info is setting of DIP switch in the front part of product.															
FPGA version	This info is FPGA logic version of the deployment to product. (3 digit)															

6.3 Operation parameters related to remote system

Table 6.3.1 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.

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

Table 6.3.1 Operation parameters related to remote system

No.	Item		Description	Operation of compact remote2	
				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) occurs in master module (EH-TRME2) or slave module (EH-TRLE2), 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 6.2.1 is 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”) may 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.

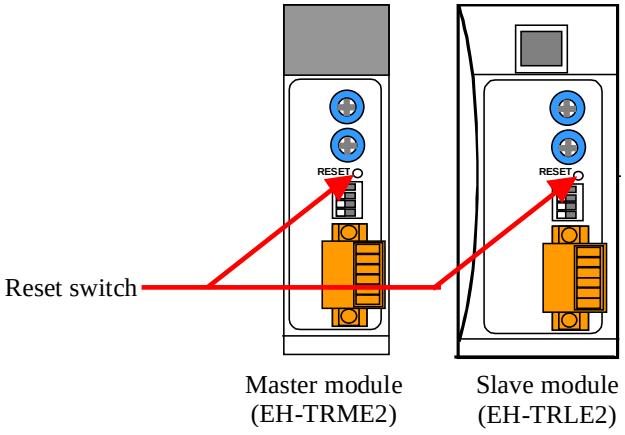


Figure 6.4.1 Reset switch of remote module

6.5 Error detection and running of CPU

In the case of compact remote2 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.

In addition, remote operation is continued.

Because transmission line consists of multi-drop system as shown in Figure 6.5.1, 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. However the built-in terminator is disconnected when power supply is turned off. Please set TERM off and connect external terminator to communication connector instead of a built-in terminator as shown in Figure 6.5.2.

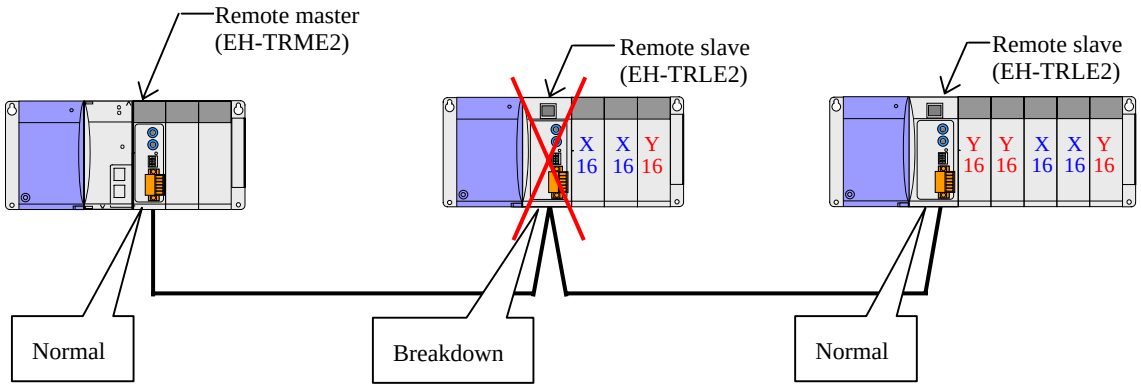


Figure 6.5.1 Fallback operation when breakdown in slave module occurs

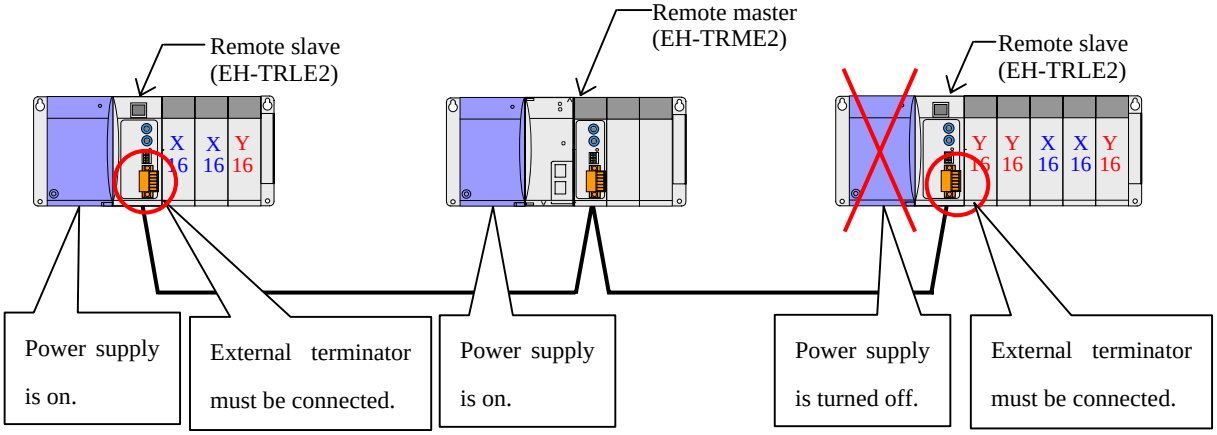


Figure 6.5.2 Fallback operation when power supply of slave is turned off

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 6.5.3. The ladder program observes this, and normality is detected.

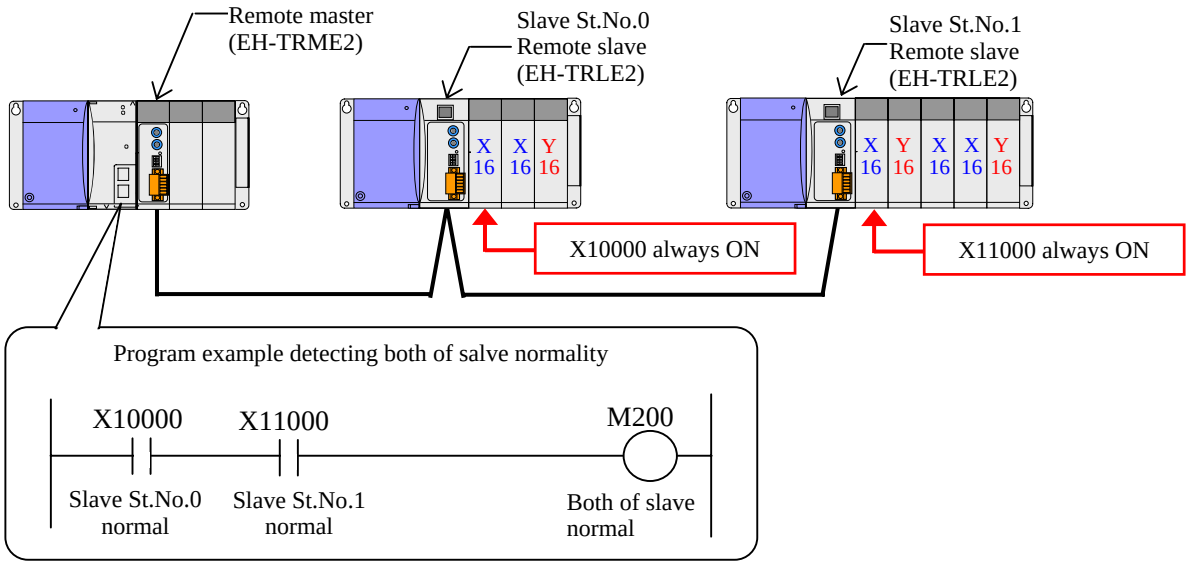


Figure 6.5.3 Slave abnormal detection method –1 (the case unnecessary of HOLD function)

■ 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 6.5.4. Please wire this output signal to input in salve station, and the ladder program detects normality whether changing ON/OFF continues.

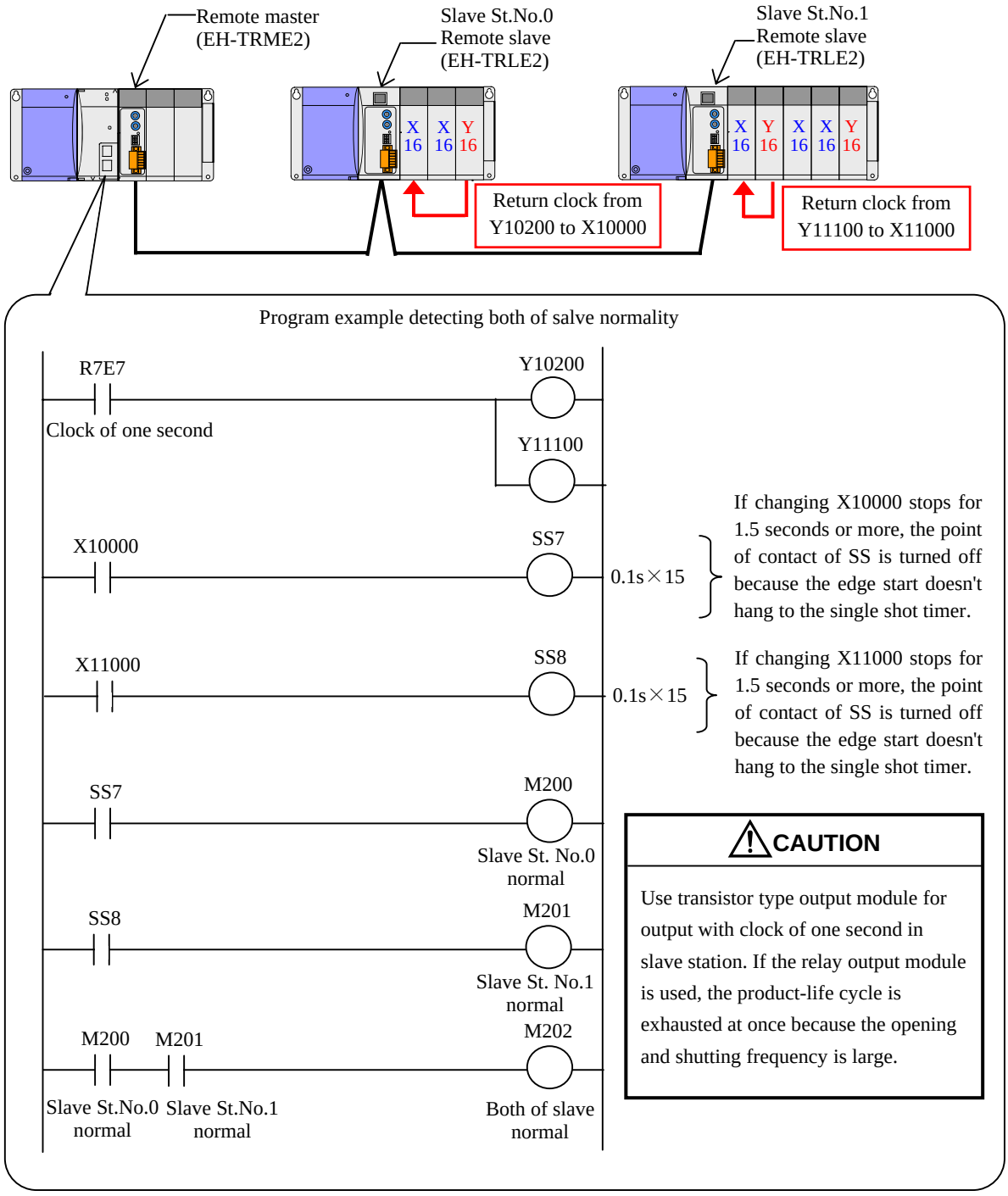
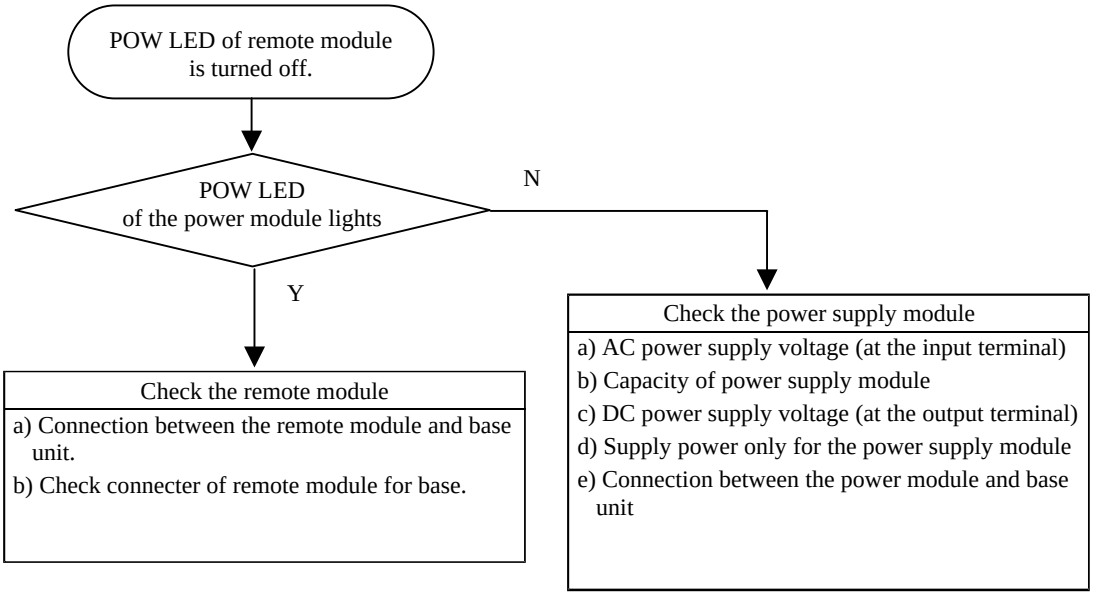


Figure 6.5.4 Slave abnormal detection method –2 (the case necessary of HOLD function)

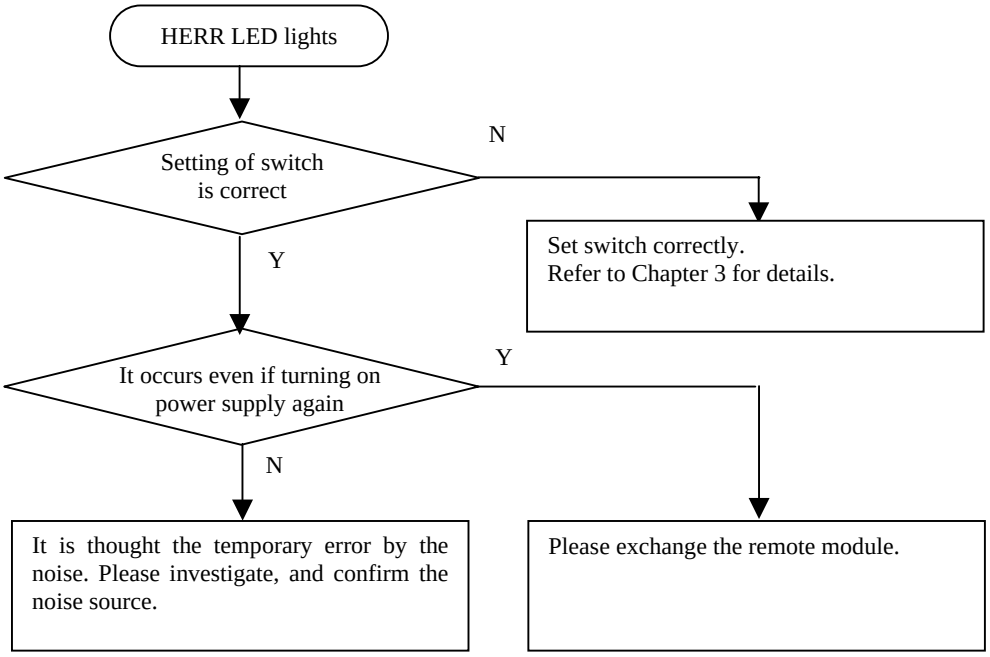
6.6 Troubleshooting

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

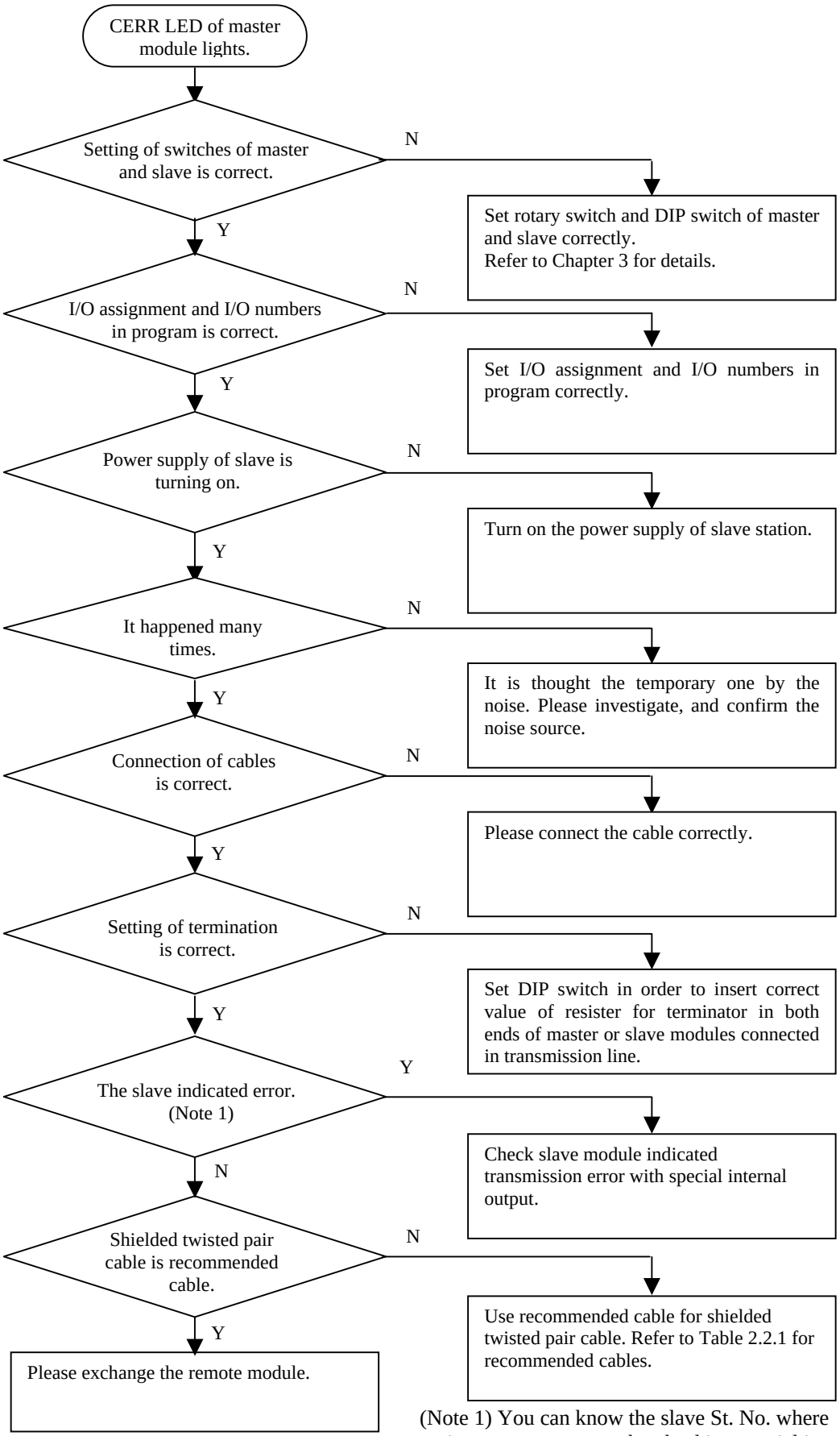
(1) POW LED : as turning off (5V DC power abnormality).



(2) HERR LED lights (hardware abnormality).

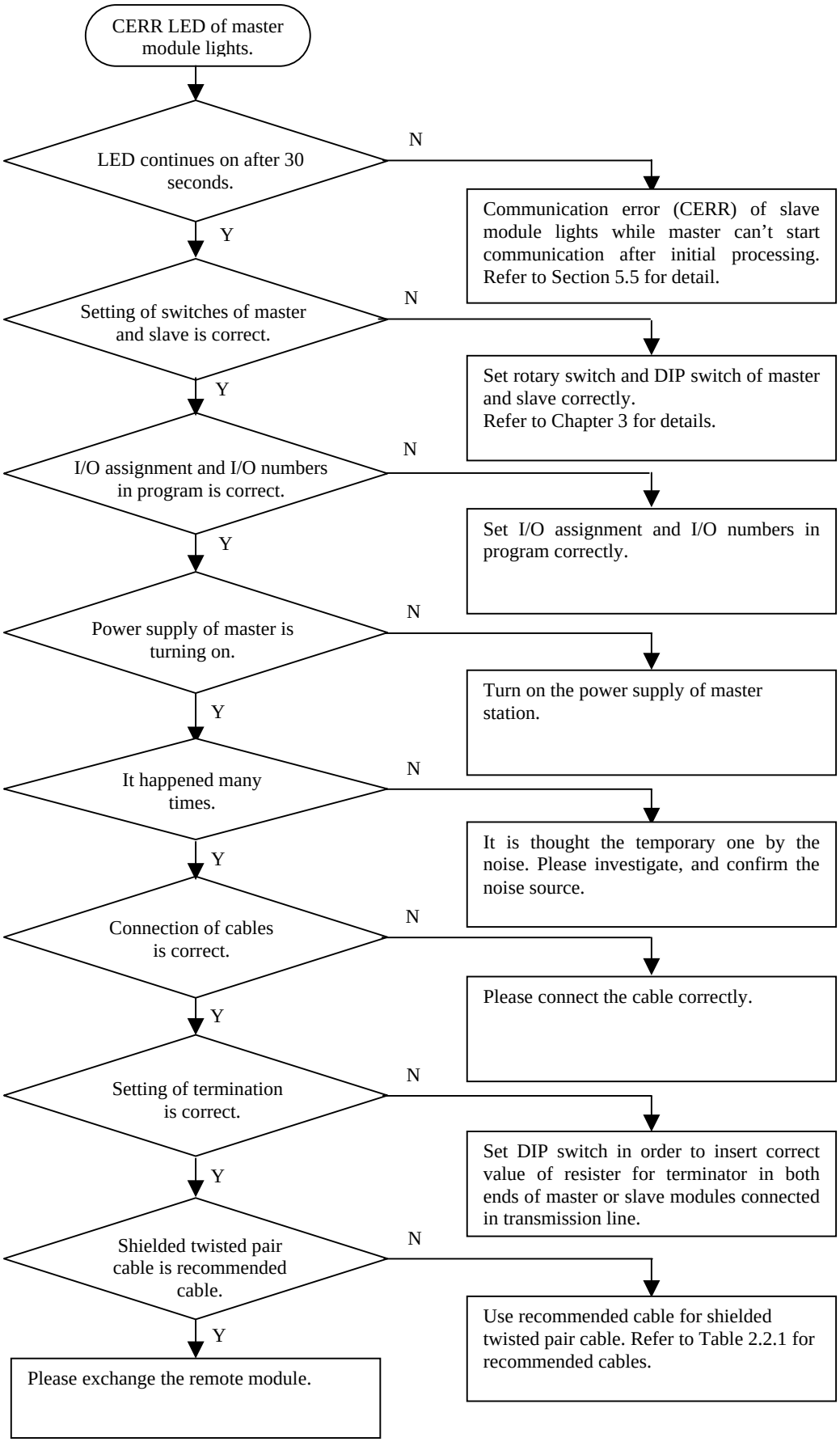


(3) CERR LED of master module lights. (transmission time-out error)
Or, remote I/O doesn't operate.



(Note 1) You can know the slave St. No. where time-out error occurs by checking special internal output as shown in Table 6.2.1. (In the case of I/O assignment of master module is “REMOTE2” or “REMOTE (RMM)”)

(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 7.1.1 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 7.2.1 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

Chapter 8 Appendix

8.1 Choice guideline of the twisted pair cable

A choice guidance of the cable is shown below. The cable should be decided by the environment and terms of use of the real system. It can expect an extensive application by observing the next guidance.

8.1.1 Electrical characteristic

Refer to main cable specifications of the twisted pair cable in Table 8.1.1.

Table 8.1.1 Cable specifications

Item		Condition	Specifications	
Cable type		-	Polyethylene insulated PVC sheathed cable	
Number of a conductor		-	2 conductors (1 pair)	
Conductor	Official cross-section (mm^2)	-	0.3	0.5
	Resistance (Ω/km)	20 degrees Celsius	53.3 or less	35.3 or less
Insulator	Quality of material	-	Polyethylene	
	Standard thickness (mm)	-	0.3	
	Dielectric withstand voltage (V)	-	1 minute or more at 1,500V AC	
	Insulation resistance (MΩ/km)	20 degrees Celsius	1,500 or more	
Characteristic impedance		Sine wave at 1MHz	80	70
Electrostatic capacity (pF/m)		Sine wave at 1kHz	70 or less	75 or less

8.1.2 Cable structure

The twists count of the twisted pair cable with shield is 1 time per 120mm or less.

The 2-lines type twisted pair cable is suitable for low noise environment and a use of the short-range transmission. Because the cable using PVC (Polyvinyl chloride) as the insulator is unstable electrically, it is not suitable for high-speed data communications. In the case of long transmission distance or fast transmission speed, when these cables are used in the system, transmission wave pattern becomes dull remarkably. Therefore, do not choose these cables because products may produce a transmission error or a communication stop.

PE (polyethylene) is used to most of communication cables as an insulator. In the case to choose a cable, be careful about the materials of the insulator.

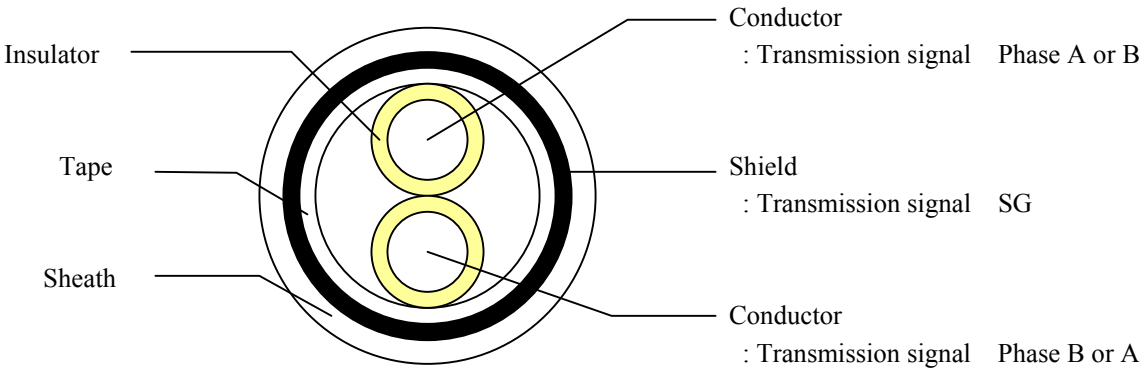


Figure 8.1.1 Twisted pair cable of 2-line type

8.1.3 Cable length

You should choose transmission speed or transmission distance by a system scale and the need ability. The relations between transmission speed and transmission distance is shown in Table 8.1.2. But the value is a reference level, and the transmission distance varies by the use cable or the number of connected apparatus. Refer to the catalogue of the cable maker or the manual of each product for the details.

Table 8.1.2 Transmission speed and Transmission distance

Transmission speed (kbps)	Maximum transmission distance (Reference value) (m)	Maximum transmission distance of representative product (Guarantee value at recommended cable)
125	1,000	Product type: Compact link module Product model: EH-TRLLE Transmission speed: 768kbps Maximum transmission distance: 150m(0.3SQ), 300m(0.5SQ)
250	800	
500	480	
1,000	240	

8.1.4 Terminator

Connect terminator of the characteristic impedance equivalency between the transmission signal A and B at the both ends of the transmission cable. The resistance value of the terminator recommends 100 Ω metal film resistors of 1/4W or more. However, confirm the resistance value of the terminator that a cable maker recommends because it varies by the use cable. In addition, confirm the manual of each product about the recommended resistance value of the terminator because it varies by the connected apparatus.