
User's Manual



YHLS Master Module

IM 34M6H46-01E

Applicable Modules:

Model Code	Model Name
F3LH02-0N	YHLS Master Module

Applicable Product:

- **Range-free Multi-controller FA-M3**

Model code : F3LH02-0N

Name : YLHS Master Module

The document number and document model code for this manual are given below.

Refer to the document number in all communications; also refer to the document number or the document model code when purchasing additional copies of this manual.

Document No. : IM 34M6H46-01E

Document Model Code : DOCIM

Important

■ About This Manual

- This Manual should be passed on to the end user.
- Before using the controller, read this manual thoroughly to have a clear understanding of the controller.
- This manual explains the functions of this product, but there is no guarantee that they will suit the particular purpose of the user.
- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
- The contents of this manual are subject to change without prior notice.
- Every effort has been made to ensure accuracy in the preparation of this manual. However, should any errors or omissions come to the attention of the user, please contact the nearest Yokogawa Electric representative or sales office.

■ Safety Precautions when Using/Maintaining the Product

- The following safety symbols are used on the product as well as in this manual.



Danger. This symbol on the product indicates that the operator must follow the instructions laid out in this instruction manual to avoid the risk of personnel injuries, fatalities, or damage to the instrument. Where indicated by this symbol, the manual describes what special care the operator must exercise to prevent electrical shock or other dangers that may result in injury or the loss of life.



Protective Ground Terminal. Before using the instrument, be sure to ground this terminal.



Function Ground Terminal. Before using the instrument, be sure to ground this terminal.



Alternating current. Indicates alternating current.



Direct current. Indicates direct current.

The following symbols are used only in the instruction manual.

**WARNING**

Indicates a “Warning”.

Draws attention to information essential to prevent hardware damage, software damage or system failure.

**CAUTION**

Indicates a “Caution”

Draws attention to information essential to the understanding of operation and functions.

TIP

Indicates a “TIP”

Gives information that complements the present topic.

SEE ALSO

Indicates a “SEE ALSO” reference.

Identifies a source to which to refer.

- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety stated in this manual whenever handling the product. Take special note that if you handle the product in a manner other than prescribed in these instructions, the protection feature of the product may be damaged or impaired. In such cases, Yokogawa cannot guarantee the quality, performance, function and safety of the product.
- When installing protection and/or safety circuits such as lightning protection devices and equipment for the product and control system as well as designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of processes and lines using the product and the system controlled by it, the user should implement it using devices and equipment, additional to this product.
- If component parts or consumable are to be replaced, be sure to use parts specified by the company.
- This product is not designed or manufactured to be used in critical applications which directly affect or threaten human lives and safety — such as nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities or medical equipment. If so used, it is the user’s responsibility to include in the system additional equipment and devices that ensure personnel safety.
- Do not attempt to modify the product.

■ Exemption from Responsibility

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- Yokogawa Electric assumes no liability to any party for any loss or damage, direct or indirect, caused by the use or any unpredictable defect of the product.

■ Software Supplied by the Company

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- Store the original media, such as floppy disks, that contain the software in a safe place.
- Reverse engineering, such as decompiling of the software, is strictly prohibited.
- No portion of the software supplied by Yokogawa Electric may be transferred, exchanged, or sublet or leased for use by any third party without prior permission by Yokogawa Electric.

■ General Requirements for Using the FA-M3 Controller

● Avoid installing the FA-M3 controller in the following locations:

- Where the instrument will be exposed to direct sunlight, or where the operating temperature exceeds the range 0°C to 55°C (32°F to 131°F).
- Where the relative humidity is outside the range 10 to 90%, or where sudden temperature changes may occur and cause condensation.
- Where corrosive or flammable gases are present.
- Where the instrument will be exposed to direct mechanical vibration or shock.
- Where the instrument may be exposed to extreme levels of radioactivity.

● Use the correct types of wire for external wiring:

- Use copper wire with temperature ratings greater than 75°C.

● Securely tighten screws:

- Securely tighten module mounting screws and terminal screws to avoid problems such as faulty operation.
- Tighten terminal block screws with the correct tightening torque as given in this manual.

● Securely lock connecting cables:

- Securely lock the connectors of cables, and check them thoroughly before turning on the power.

● Interlock with emergency-stop circuitry using external relays:

- Equipment incorporating the FA-M3 controller must be furnished with emergency-stop circuitry that uses external relays. This circuitry should be set up to interlock correctly with controller status (stop/run).

● Ground for low impedance:

- For safety reasons, connect the [FG] grounding terminal to a Japanese Industrial Standards (JIS) Class D (earlier called Class 3) Ground^{*1}. For compliance to CE Marking, use braided or other wires that can ensure low impedance even at high frequencies for grounding.

*1 Japanese Industrial Standard (JIS) Class D Ground means grounding resistance of 100 Ω max.

● Configure and route cables with noise control considerations:

- Perform installation and wiring that segregates system parts that may likely become noise sources and system parts that are susceptible to noise. Segregation can be achieved by measures such as segregating by distance, installing a filter or segregating the grounding system.

● Configure for CE Marking Conformance:

- For compliance to CE Marking, perform installation and cable routing according to the description on compliance to CE Marking in the "Hardware Manual" (IM34M6C11-01E).

- **Keep spare parts on hand:**

- Stock up on maintenance parts including spare modules, in advance.

- **Discharge static electricity before operating the system:**

- Because static charge can accumulate in dry conditions, first touch grounded metal to discharge any static electricity before touching the system.

- **Never use solvents such as paint thinner for cleaning:**

- Gently clean the surfaces of the FA-M3 controller with a cloth that has been soaked in water or a neutral detergent and wringed.
- Do not use volatile solvents such as benzine or paint thinner or chemicals for cleaning, as they may cause deformity, discoloration, or malfunctioning.

- **Avoid storing the FA-M3 controller in places with high temperature or humidity:**

- Since the CPU module has a built-in battery, avoid storage in places with high temperature or humidity.
- Since the service life of the battery is drastically reduced by exposure to high temperatures, take special care (storage temperature should be from -20°C to 75°C).
- There is a built-in lithium battery in a CPU module and temperature control module which serves as backup power supply for programs, device information and configuration information. The service life of this battery is more than 10 years in standby mode at room temperature. Take note that the service life of the battery may be shortened when installed or stored at locations of extreme low or high temperatures. Therefore, we recommend that modules with built-in batteries be stored at room temperature.

- **Always turn off the power before installing or removing modules:**

- Failing to turn off the power supply when installing or removing modules, may result in damage.

- **Do not touch components in the module:**

- In some modules you can remove the right-side cover and install ROM packs or change switch settings. While doing this, do not touch any components on the printed-circuit board, otherwise components may be damaged and modules may fail to work.

- **Do not use unused terminals:**

- Do not connect wires to unused terminals on a terminal block or in a connector. Doing so may adversely affect the functions of the module.

Introduction

■ Overview of the Manual

This manual describes the specifications, operations, and communications protocol of the YHLS (Yokogawa High-speed Link System) master module F3LH02-0N.

■ Related Instruction Manuals

The manuals to be read depend on the CPU module to be used.

You should read the latest versions of the following instruction manuals, as required.

● F3SP28, F3SP38, F3SP53, F3SP58, or F3SP59

For information on sequence CPU functions, refer to:

- Sequence CPU Instruction Manual - Functions (for F3SP28-3N/3S, F3SP38-6N/6S, F3SP53-4H/4S, F3SP58-6H/6S, F3SP59-7S)(IM34M6P13-01E)

For information on sequence CPU instructions, refer to:

- Sequence CPU Instruction Manual - Instructions (IM34M6P12-03E)

For information on creating ladder programs, refer to:

- FA-M3 Programming Tool WideField2 (IM34M6Q15-01E)

● F3SP21, F3SP25, F3SP35, F3SP05, or F3SP08

For information on sequence CPU functions, refer to:

- Sequence CPU Instruction Manual – Functions (for F3SP21, F3SP25, and F3SP35) (IM34M6P12-02E)

For information on sequence CPU instructions, refer to:

- Sequence CPU Instruction Manual – Instructions (IM34M6P12-03E)

For information on creating ladder programs, refer to:

- FA-M3 Programming Tool WideField2 (IM34M6Q15-01E)

All sequence CPU modules

For the FA-M3 specifications and configurations^{*1}, installation and wiring, test run, maintenance, and module installation restrictions, refer to:

^{*1}: Refer to the relevant product manuals for specifications except for power supply modules, base modules, input/output modules, cables and terminal units.

- Hardware Manual (IM34M6C11-01E)

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FA-M3

YHLS Master Module

IM 34M6H46-01E 1st Edition

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1. Overview

The Yokogawa High-speed Link System (YHLS) master module F3LH02-0N has two YHLS master interface ports for connecting slave units to perform remote I/O.

Table 1.1 Applicable Module

Model Code	Module Name
F3LH02-0N	YHLS Master Module

1.1 What is YHLS?

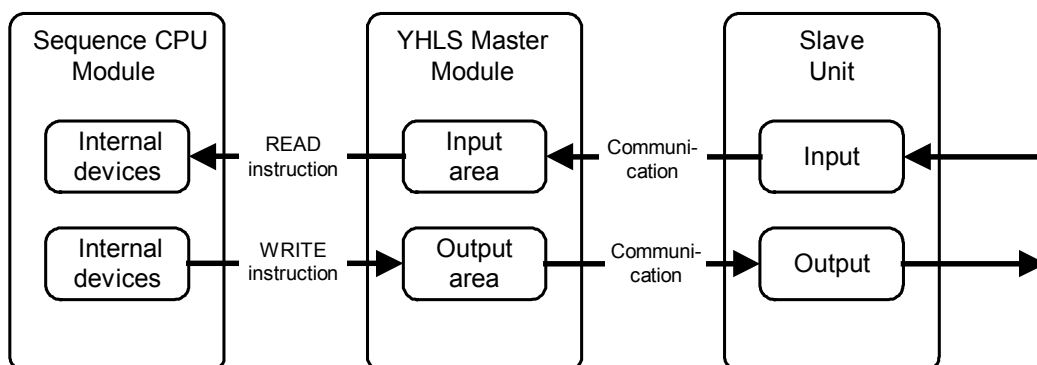
Yokogawa High-speed Link System (YHLS) is designed for implementing high-speed remote I/O in an FA-M3 system. A YHLS system consists of an FA-M3 master module connected to multiple distributed slave units through a communication cable to allow high-speed control of remote I/O units from a sequence CPU. It has the following merits:

- Reduced wiring through use of distributed I/O units within a system
- Simple mechanism for high-speed exchange of ON/OFF signals and numerical data with remote devices.
- Flexibility in building customized application systems using devices from different partner manufacturers.
- Support for user-built devices.

1.2 Features of YHLS

1.2.1 Communications between Sequence CPU Module and Slave Units

The module relays actuator ON/OFF signals from the sequence CPU module to slave units, and relays switch ON/OFF signals from slave units to the sequence CPU module using its input/output memory areas as buffer.



1.2.2 Withdrawal of Slave Unit

YHLS adopts a bus connection so when a slave unit is switched off or otherwise fails to communicate, the master module can continue communicating with other normal slave units.

1.2.3 Automatic Slave Unit Participation

When a withdrawn slave unit is switched on and returns to normal condition, it automatically resumes communications with the master module.

1.2.4 Constant Communication Cycle Time

YHLS features a constant communication cycle time, not affected by automatic participation or withdrawal of slave units, thus delivering reliable communications with constant cycle time under all circumstances.

1.2.5 Control of YHLS Output States when CPU Stops

If the sequence CPU module switches to STOP mode, the YHLS master module also stops communications with the slave units. The YHLS master module can be used to configure the output control function of each slave unit to either reset or hold its outputs when the CPU stops.

2. Specifications

2.1 Standard Specifications

■ Model and Suffix Codes

Model	Suffix Code	Style Code	Option Code	Description
F3LH02	-0N	12 Mbps max., 2 YHLS ports

■ Operating Environment

There is no restriction on the type of CPU module that can be used with the F3LH02-0N module. The F3LH02-0N module may be installed in the main unit but not in a sub-unit.

■ Performance Specifications

Item	Specifications
	F3LH02-0N
Transmission speed	3 Mbps, 6 Mbps or 12 Mbps ^{*1}
Maximum total transmission distance	300 m (at 3 Mbps), 200 m (at 6 Mbps) or 100 m (at 12 Mbps) ^{*1}
Number of slave units per module	126 slave units max. ^{*1} (63 slave units per port)
Number of I/O points per module	2016 inputs (1008 inputs/port) 2016 outputs (1008 outputs/port)
Communications mode	4-wire full-duplex or 2-wire half-duplex ^{*1}
Synchronization mode	Bit synchronization
Signal coding	Manchester coding
Networking topology	Bus
Transmission format	YHLS proprietary format
Error detection	RZ check (all-bit check), CRC12
Connection cable	CAT5 or equivalent
Connector	RJ45
RAS functions	- Withdrawal of slave unit - Automatic slave unit participation - Reset/hold outputs when CPU stops - Network quality monitoring
Terminating resistor	Built-in resistor ^{*2}
Current consumption	440 mA max.
External dimensions	28.9 (W) x 100 (H) x 83.2 (D) mm ^{*3}
Weight	105 g

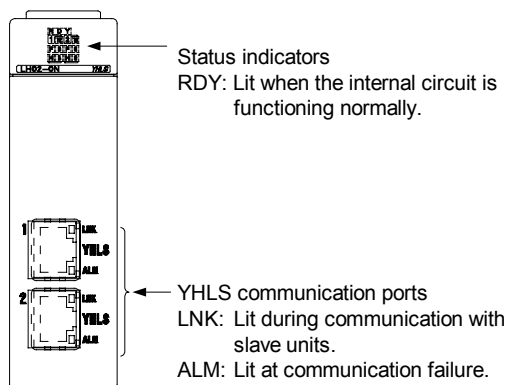
*1: Some slave devices may impose further restrictions. Check the specifications of slave units used.

*2: The YHLS master module has a built-in terminating resistor. It must be installed at the end of the remote I/O system.

*3: Excluding protrusions (see External Dimensions for details).

■ Components and Functions

● Front View

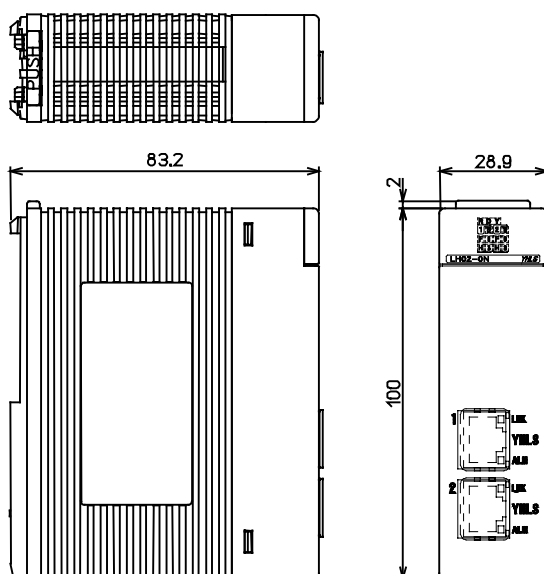


● LED Indicators

Designation (color)	Description	When Lit	When Not Lit
RDY (green)	Internal circuit status	Normal	Error
F/H (red)	Communications mode	F: full duplex; H: half duplex	Communications mode is undefined.
12/6/3 (red)	Transmission speed	12: 12 Mbps, 6: 6 Mbps, and 3: 3 Mbps	Transmission speed is undefined.
LNK (green)	Normal communications	Communicating with one or more slaves.	If the Communicating relay is on: No slave unit is available for communication. If the Communicating relay is off: No communication is in progress.
ALM (yellow)	Communications error	Communication failure has been detected at one or more slave units.	If the Communicating relay is on: No communication failure has been detected at any slave unit.

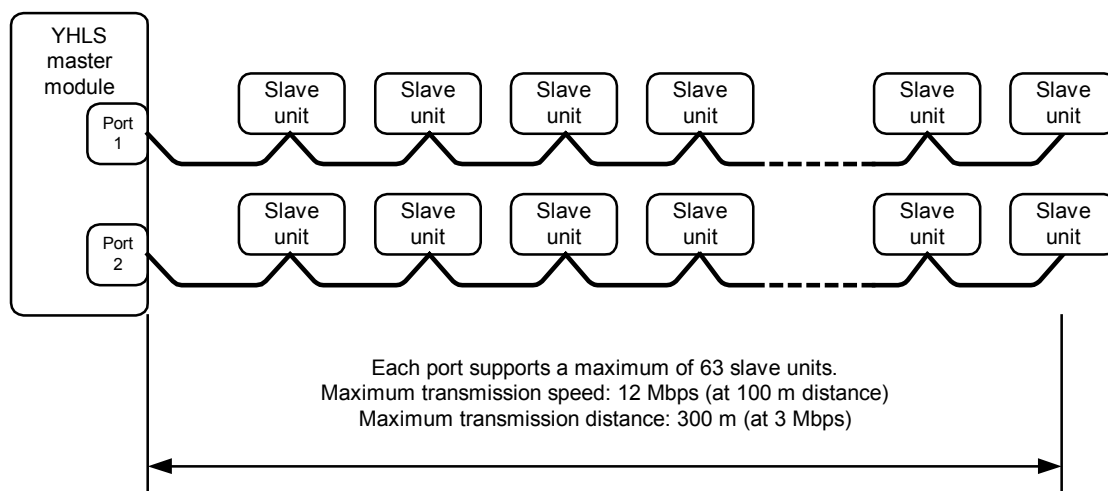
■ External Dimensions

(Unit: mm)



2.2 External Connection

■ Connection Topology



■ Connector Pin Assignment

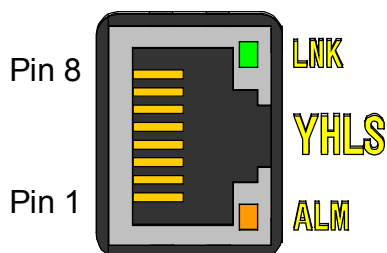


Fig. 2.1 Front View of Module Connector

Pin Number	Full Duplex			Half Duplex		
	Signal Symbol	Signal Flow		Signal symbol	Signal Flow	
		Master	Slave		Master	Slave
1	NC			NC		
2	NC			NC		
3	RXD+		←	TRD+		↔
4	RXD-		←	TRD-		↔
5	TXD+		→	NC		
6	TXD-		→	NC		
7	NC			NC		
8	SHIELD		↔	SHIELD		↔

■ Cables

Prepare a plug-cable set that complies with the connector pin assignment described above. Use cables of the type described below.

● CAT5 shielded cable or equivalent

- Shielded twisted-pair cable
- Impedance: 100 Ω
- Conductor size: AWG24



CAUTION

-
- If a different type of cable is recommended for a slave unit by its manufacturer, use that cable instead.
 - Commercially available Ethernet cables cannot be used for this purpose because its connector pin assignment is different from that of the CAT5 cable.
-

■ Connector

Use plugs of the following type:

- RJ-45 shielded modular plug

■ Shield Treatment

The cable shield must be treated as follows:

- The cable drain must be connected to pin 8 of the RJ-45 modular plug.
- The cable shield must be connected to the shield of the RJ-45 modular plug.

2.3 Attaching/Detaching the Module

■ Attaching the Module

Figure 2.2 shows how to attach this module to the base module. First hook the anchor slot at the bottom of the module to be attached onto the anchor pin on the bottom of the base module. Push the top of the module toward the base module until the anchor/release button clicks into place.



CAUTION

Always switch off the power before attaching or detaching the module.

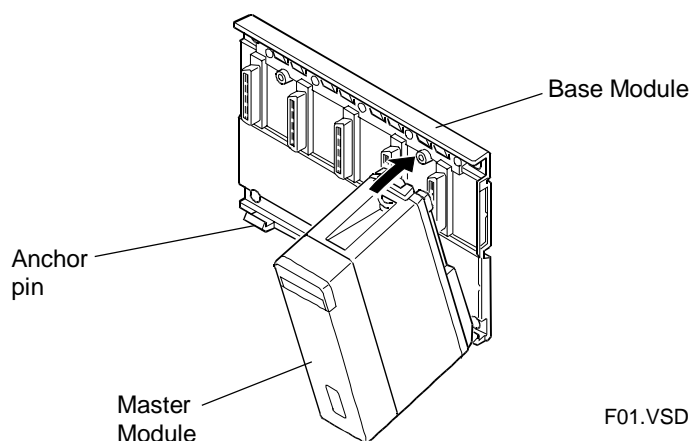


Figure 2.2 Attaching/Detaching the Module



CAUTION

Do not bend the connector on the rear of the module by force during the above operation. If the module is pushed with improper force, the connector may bend causing an error.

■ Detaching the Module

To remove this module from the base module, reverse the above operation.

Press the anchor/release button on the top of this module to unlock it and tilt the module away from the base module.

■ Attaching the Module in Intense Vibration Environments

If the module is used in intense vibration environments, fasten the module with a screw. Use screws of type listed in the table below.

Insert these screws into the screw holes on top of the module and tighten them with a Phillips screwdriver.

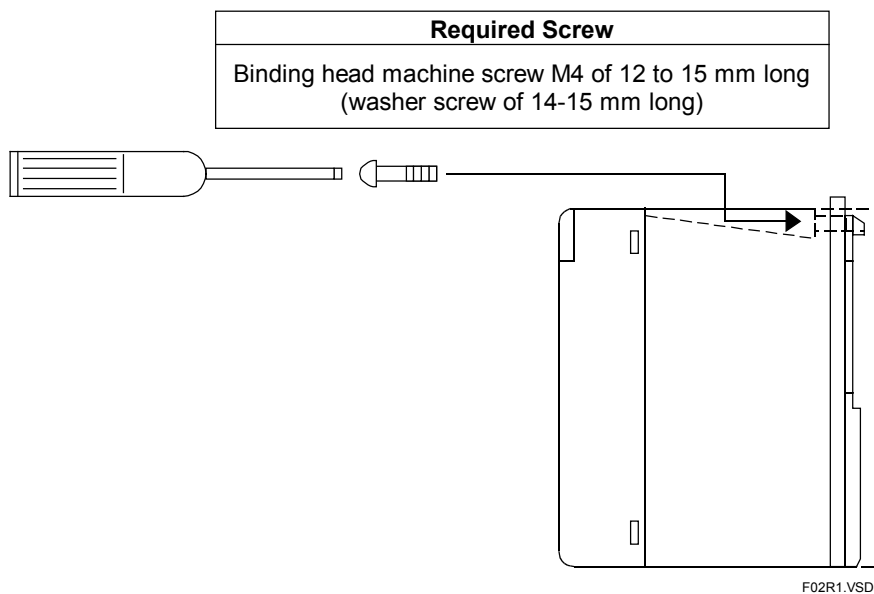


Figure 2.3 Securing Module Using Screws

3. Functions

This chapter describes the functions of the YHLS master module.

3.1 List of Functions

Table 3.1 List of Functions

Functions	Description	See Section:
Communication with slave units	I/O communication with slave units for ON/OFF control and monitoring.	3.2
Withdrawal of slave unit	A slave unit that failed to communicate due to power off or any other reason is withdrawn from the network and communication continues with the remaining normal slave units.	3.3
Automatic slave unit participation	When a slave unit that failed to communicate previously due to power off or any other reason returns to normal condition, it automatically resumes communications with the YHLS master module.	3.4
Stopping communications when CPU stops	If the sequence CPU module enters STOP mode, the YHLS master module suspends communications with slave units.	3.5
Monitoring slave units for error	Error notification may be selectively enabled for individual slave units.	3.6

3.2 Communication with Slave Units

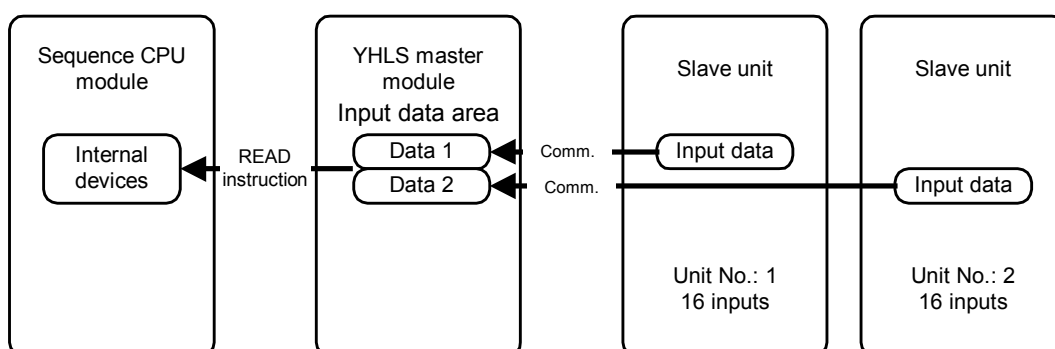
3.2.1 Starting Communications

After setting the transmission speed, communications mode and the slave unit last address for the YHLS master module, turn on the Request to Communicate relay start communication between YHLS master module and the slave units.

3.2.2 Input

Input statuses of slave units are transmitted to the YHLS master module and stored in its input area according to slave unit number during a communication cycle.

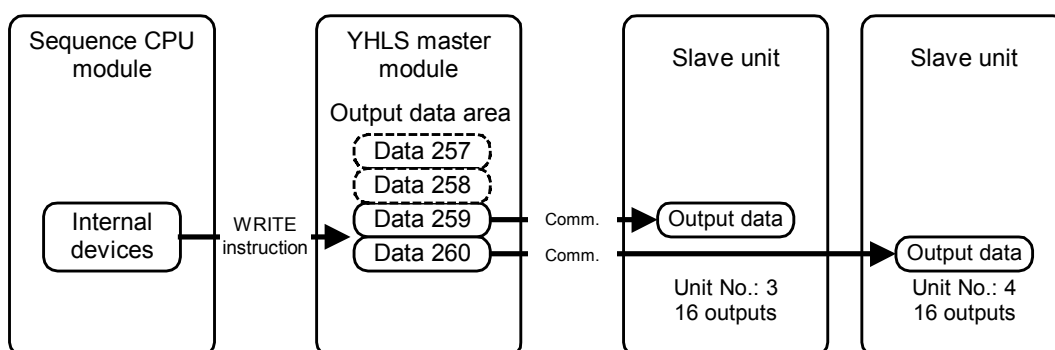
The sequence CPU module then issues a read command at its own timing to read the input status of a slave unit from the input area of the YHLS master module into its internal device.



3.2.3 Output

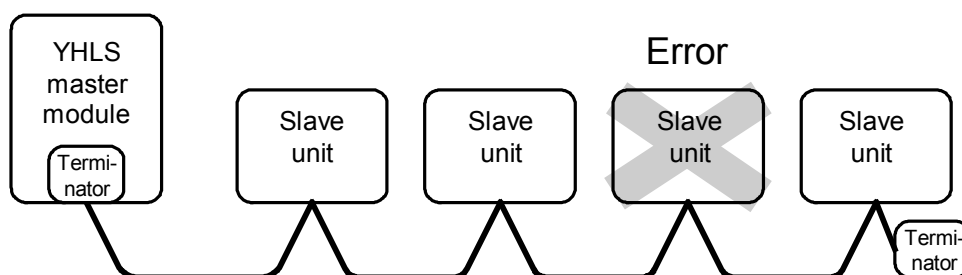
The sequence CPU module issues a write command to send and store the data of its internal device to the output area of the YHLS master module.

Data stored in data positions corresponding to each slave unit number within the output area of the YHLS master module is transmitted to the respective slave units during a communication cycle.



3.3 Withdrawal of Slave Unit

A slave unit that is no longer available for communication due to power off or any other reason is withdrawn from the network and communication continues with the remaining normal slave units.



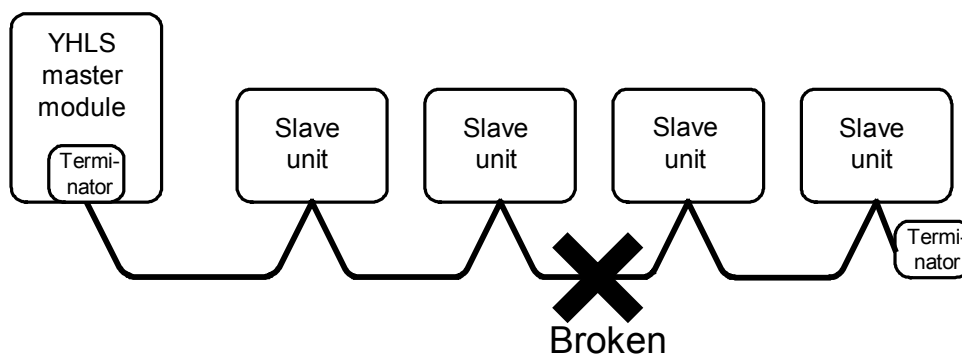
TIP

Withdrawal of an unavailable slave unit does not affect the remote scan time.



CAUTION

If a communication cable is broken, communication fails due to line instability caused by the loss of the terminating resistor.



3.4 Automatic Slave Unit Participation

When a slave unit that has been unavailable due to power off or any other reason returns to normal condition, it automatically resumes communication with the YHLS master module.

TIP

Automatic participation by a slave unit does not affect the remote scan time.

3.5 Stopping Communications when CPU Stops

If the sequence CPU module stops, the YHLS master module stops communication with slave units.

Before using this function, you should set the output at CPU failure to 'RESET' in the DIO setup for the slot installed with the F3LH02-0N master module in the configuration setup of the CPU module.

The output condition (reset or hold) of a slave unit when the YHLS master module suspends communication depends on the Reset/Hold setting for the slave unit.

SEE ALSO

For details on the sequence CPU module configuration, see:

- Sequence CPU Instruction Manual - Functions (IM 34M6P13-01E)
Section 1.2.3, Configuration
Chapter 8, RAS Features
 - FA-M3 Programming Tool WideField2 (IM 34M6Q15-01E)
Section B6.1.3, Configuration Setup
-



CAUTION

In the event of a moderate or fatal failure of the sequence CPU module, the YHLS master module stops communications with slave units.

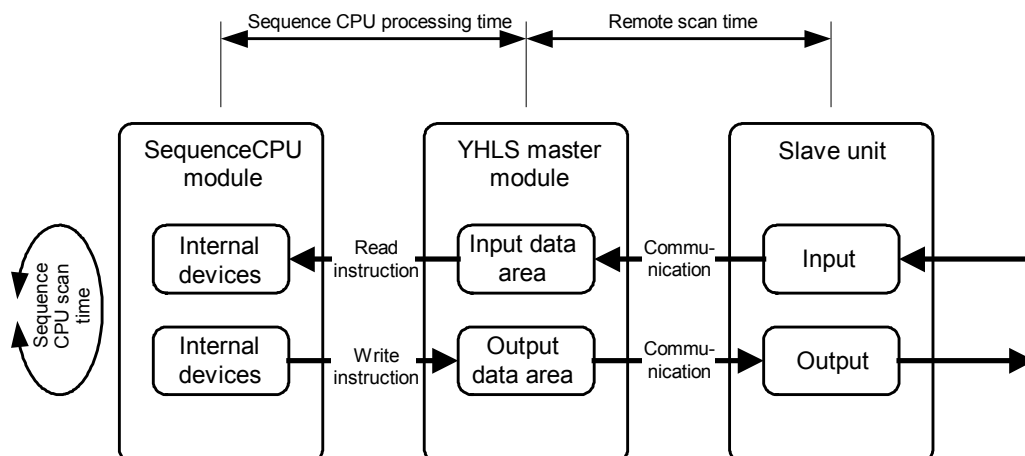
The output condition of a slave unit when the master module suspends communications can be specified using the Reset/Hold setting for the slave unit.

3.6 Monitoring Slave Units for Error

If a slave unit becomes unavailable for communications due to power off or any other reason, the master module may or may not report this condition as an error depending on the value of the bit corresponding to the slave unit in the Monitored Slave List setting (no error is reported if the bit is set to 0).

4. Response Time

This chapter describes the response time of a remote I/O system.



4.1 Remote Scan time (RST)

Remote scan time is the time required by the YHLS master module to update the I/O status of all slave units connected to each port. The remote scan time depends on communications mode (full- or half-duplex), transmission speed, and last address of slave units as shown below.

- **RST for full-duplex communication**

$RST = 182 \times FA \times Tbps$ (seconds)

RST : Remote scan time
 182 : Constant
 FA : Slave unit last address
 Tbps : 1/transmission speed

Calculation example:

Suppose that 8 slave units are connected to a port for communication at 12 Mbps.

FA : Slave unit last address = 8
 Tbps : 1/transmission speed = 1/12 Mbps = 0.083×10^{-6}

Thus, $RST = 182 \times 8 \times 0.083 \times 10^{-6}$
 $= 121.3 \times 10^{-6} \text{ s}$

- **RST for half-duplex communication**

$RST = 354 \times FA \times Tbps$ (s)

RST : Remote scan time
 354 : Constant
 FA : Slave unit last address
 Tbps : 1/transmission speed

Calculation example:

Suppose that 16 slave units are connected to a port for communication at 6 Mbps.

FA : Slave unit last address = 16

Tbps : $1/\text{transmission speed} = 1/6 \text{ Mbps} = 0.167 \times 10^{-6}$

Thus, $\text{RST} = 354 \times 16 \times 0.167 \times 10^{-6}$
 $= 944 \times 10^{-6}$ (seconds)

TIP

Slave unit withdrawal or automatic slave unit participation does not affect the remote scan time.

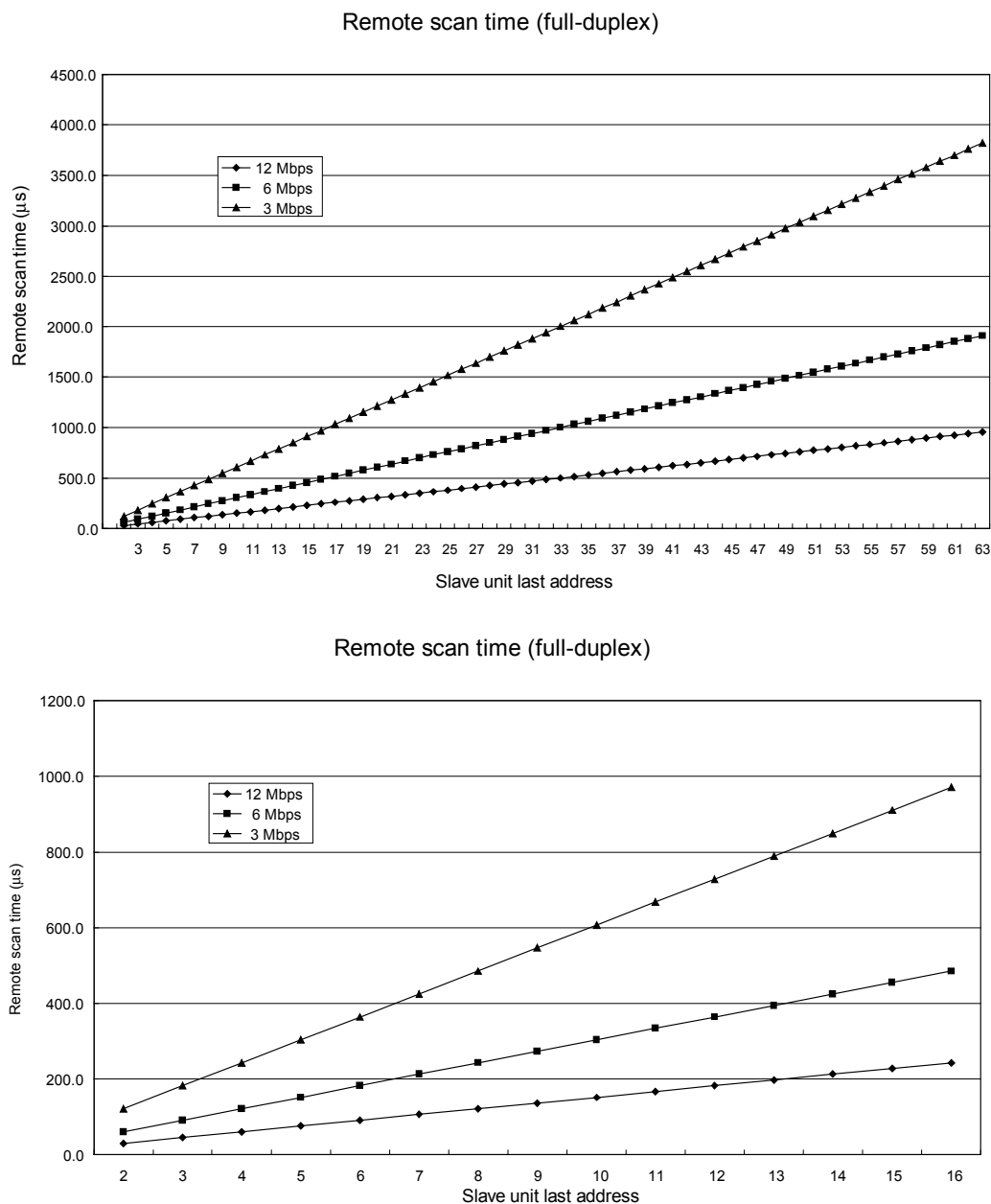


Fig. 4.1 Remote Scan time (for full-duplex communication)

4.2 Response Time

The response time of a remote I/O system is the sum of the CPU scan time, remote scan time and slave unit internal processing time.

- **Response time for output from CPU module to slave unit**

The output response time is the maximum time delay before an output of a slave unit turns on after the corresponding internal device of the sequence CPU module turns on.

Output response time = SPST + RST + SUI

SPST : Sequence CPU scan time

RST : Remote scan time

SUI : Internal processing time of slave unit

- **Response time for input from slave unit to CPU module**

The input response time is the maximum time delay before an internal device of the sequence CPU module turns on after the corresponding input of a slave unit turns on.

Input response time = SPST + RST + SUI

SPST : Sequence CPU scan time

RST : Remote scan time

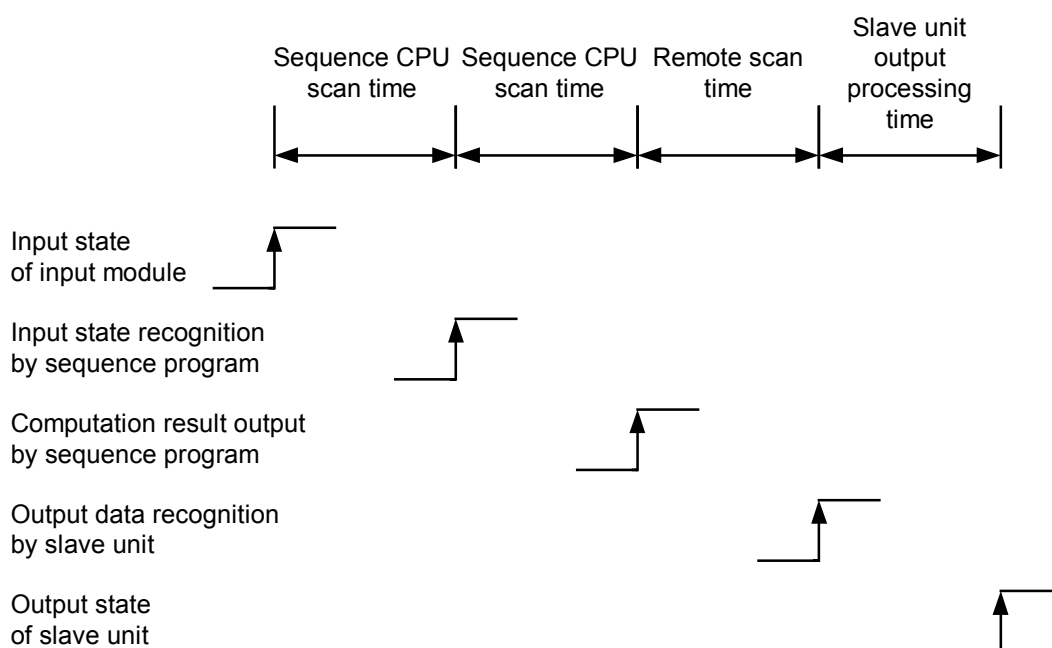
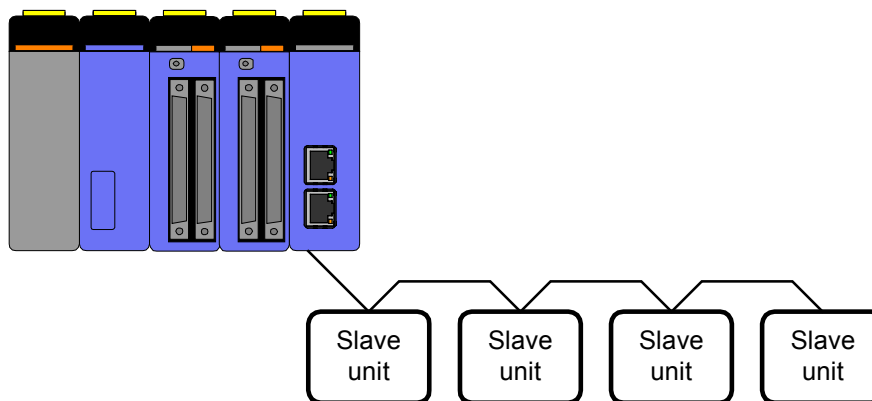
SUI : Internal processing time of slave unit

An example of response time calculation is given on the next page.

● Calculation example

Let us calculate the output response time from the CPU module to slave units under the following conditions:

Number of slave units	:	4
Output processing time of slave unit	:	1 ms max.
Sequence CPU scan time	:	1 ms
Master module transmission speed and mode	:	12 Mbps, full-duplex



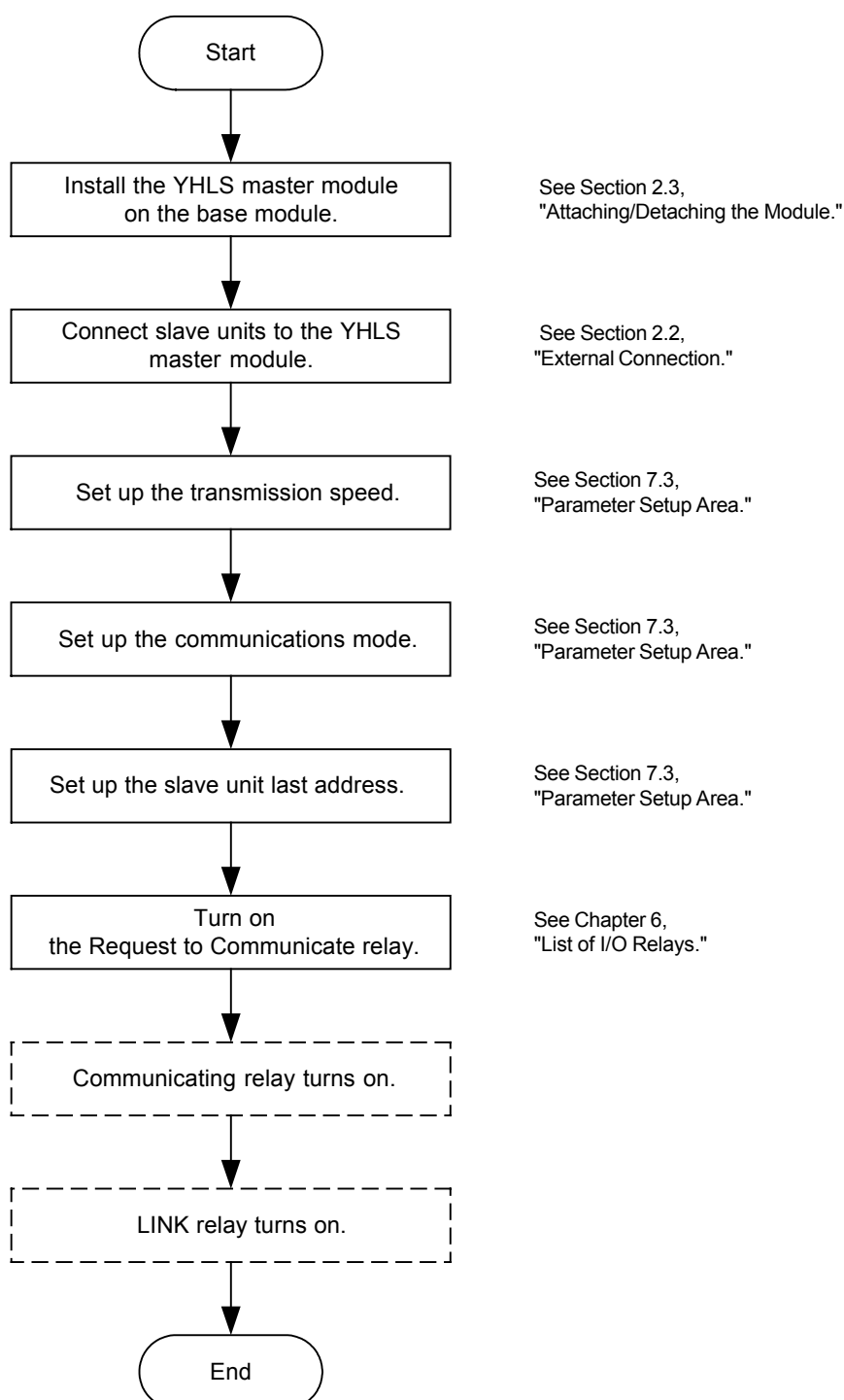
Response time = SPST (maximum time for CPU to recognize input)
 + SPST (maximum time for CPU to compute and output according to input)
 + RST (remote scan time)
 + SUI (internal processing time of slave unit)

where $RST = 182 \times FA \times Tbps = 182 \times 4 \times 1/12 \times 10^{-6} = 61 \times 10^{-6}$ (s)

Thus, response time = $1 \times 10^{-3} + 1 \times 10^{-3} + 61 \times 10^{-6} + 1 \times 10^{-3}$ (s)
 = 3.061 ms

5. Communication Preparation Flow

The following flowchart shows how to prepare for communications.



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6. List of I/O Relays

The YHLS master module has 32 input and 32 output relays for interfacing with the sequence CPU module. Each of the input relays can be set to raise an interrupt.

6.1 Output Relays

Table 6.1 Output Relays

Output Relay Number	Output Relay Name	Description
Y□□□33	Request to Communicate relay ^{*1}	Turn on this relay to start communication. Once communication is started, input relay X□□□01 (Communicating relay) turns on. Turn off this relay to stop communication.
Y□□□34 to Y□□□40	Reserved	
Y□□□41	Request to Communicate relay ^{*2}	Turn on this relay to start communication. Once communication is started, input relay X□□□09 (Communicating relay) turns on. Turn off this relay to stop communication.
Y□□□42 to Y□□□64	Reserved	

*1 : For port 1

*2 : For port 2

□□□ : Slot number

6.2 Input Relays

Table 6.2 Input Relays

Input Relay Number	Input Relay Name	Description
X□□□01	Communicating ^{*1}	Turns on when communication is started by Y□□□33. Turns off when Y□□□33 is turned off.
X□□□02	Link ^{*1}	Turns on when communication is started if one or more slave units are available for communication. Turns off when Y□□□33 is turned off.
X□□□03	Alarm ^{*1}	Turns on when one or more slave units that were previously available for communication are no longer available. Turns off when Y□□□33 is turned off or when there is no failed slave unit.
X□□□04 to X□□□08	Reserved	
X□□□09	Communicating ^{*2}	Turns on when communication is started by Y□□□41. Turns off when Y□□□41 is turned off.
X□□□10	Link ^{*2}	Turns on when communication is started if one or more slave units are active. Turns off when Y□□□41 is turned off.
X□□□11	Alarm ^{*2}	Turns on when one or more slave units that were previously available for communication are no longer available. Turns off when Y□□□41 is turned off or when there is no failed slave unit.
X□□□12 to X□□□32	Reserved	

*1 : For port 1

*2 : For port 2

□□□ : Slot number

TIP

The Link and Alarm relays are not mutually exclusive, and may turn on at the same time.

The Link relay turns on if at least one slave unit is available for communication.

The Alarm relay turns on when one or more slave units that were previously available for communication are no longer available.

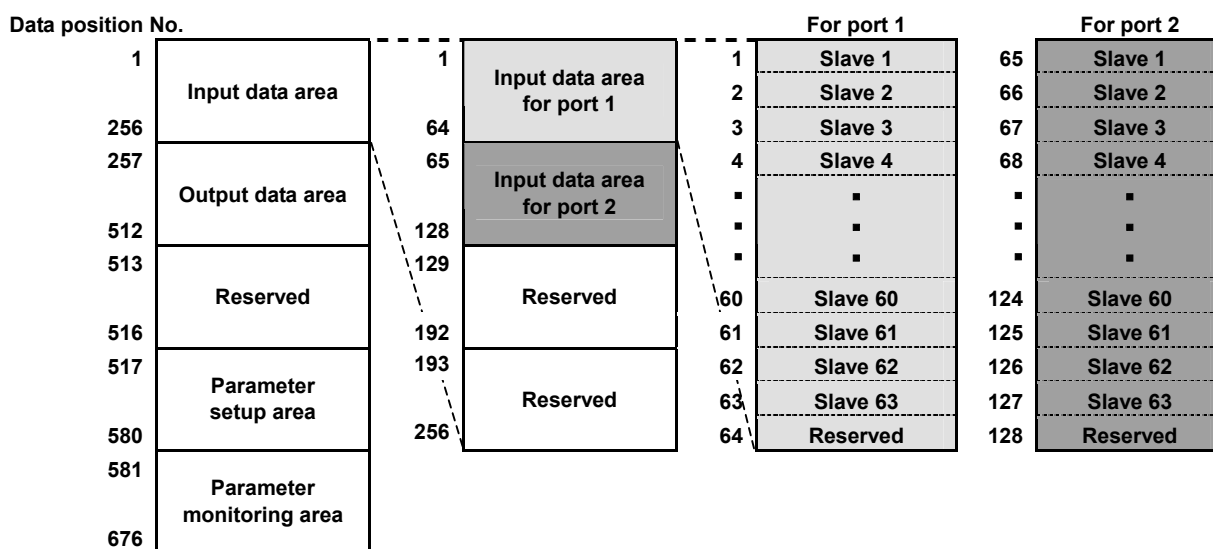
7. List of Registers

The YHLS master module has registers for interfacing with the sequence CPU module. They are grouped into the following four areas:

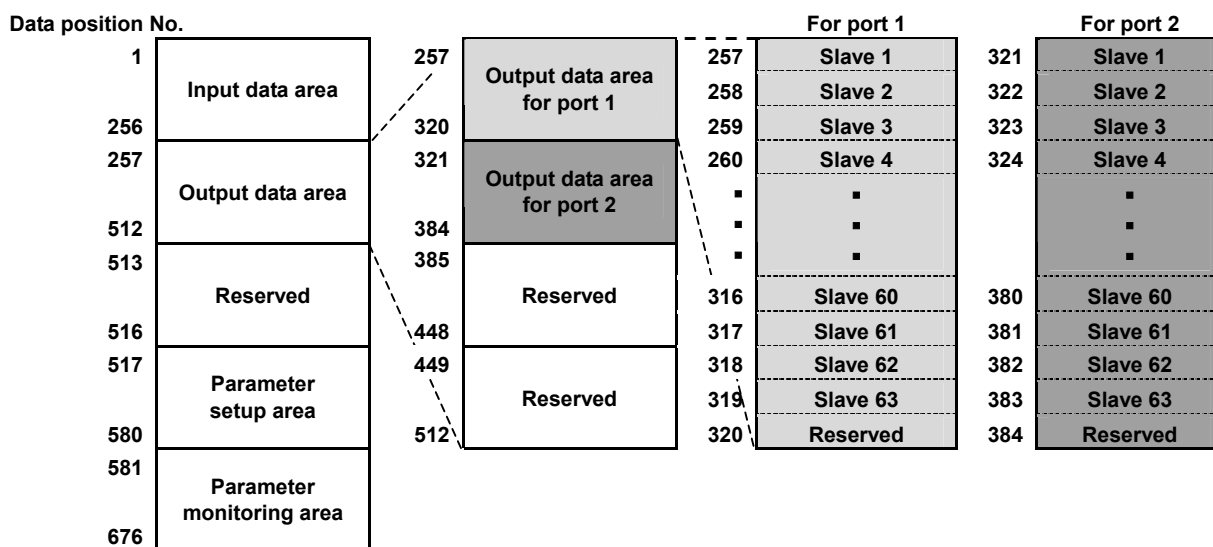
- Input data area : For storing data read from slave units
- Output data area : For storing data to be written to slave units
- Parameter setup area : For YHLS parameter setup
- Parameter monitoring area : For YHLS parameter monitoring

Data position No.	
1	Input data area
256	
257	Output data area
512	
513	Reserved
516	
517	Parameter setup area
580	
581	Parameter monitoring area
676	

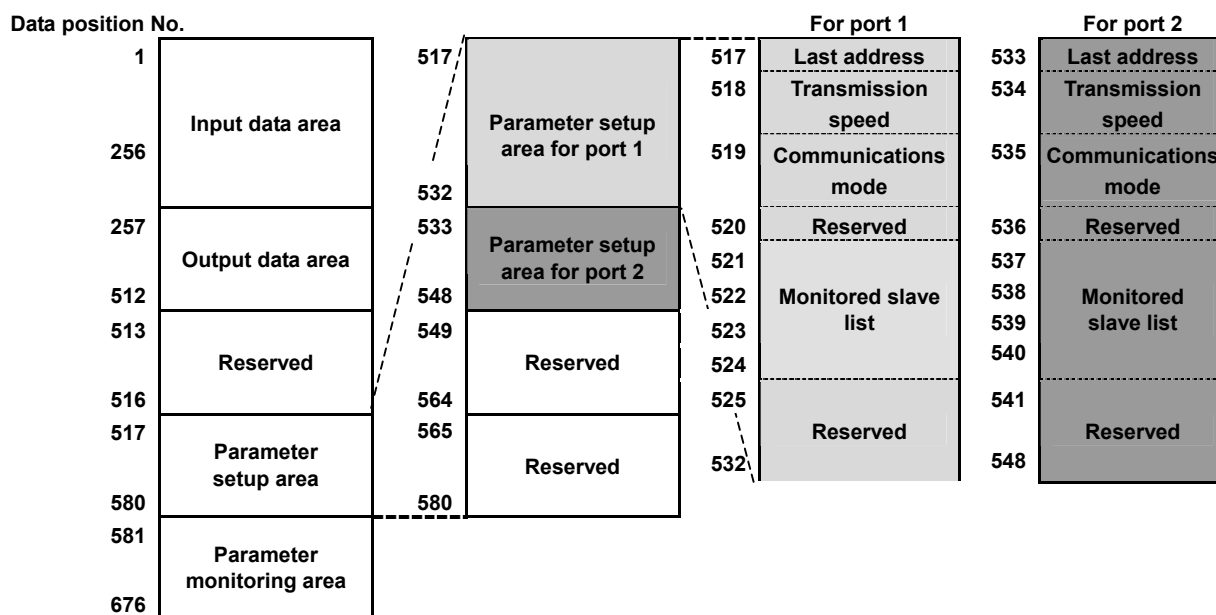
7.1 Input Data Area



7.2 Output Data Area



7.3 Parameter Setup Area



Data Position No.		Description		Default
Port 1	Port 2			
517	533	Last address	Between 1 and 63 Other values are treated as 63.	63
518	534	Transmission speed	0 : 12 Mbps 1 : 6 Mbps 2 : 3 Mbps Others values are treated as 0.	0
519	535	Communications mode	0 : Full-duplex 1 : Half-duplex Other values are treated as 0.	0
520	536	Reserved		
521 to 524	537 to 540	Monitored slave list	0 : Not monitored 1 : Monitored	1 (monitored)
525 to 532	541 to 548	Reserved		

7.3.1 Last Address

The Last Address parameter specifies the maximum slave unit address value that can be specified for communication. It must be between 1 and 63. If the specified last address is beyond this range, it is assumed to be 63.



CAUTION

- A slave unit whose address is larger than the specified last address cannot be specified for communication with the master module and, therefore, its input/output data, alive list or error monitoring information is not updated.
- Beware that setting the last address to a number larger than the number of slave units actually used lengthens remote scan time unnecessarily.
- Full-duplex transmission is not available if the last address is set to 1. In this case, specify half-duplex transmission instead.
- The last address setting is enabled when the Request to Communicate relay is turned on.

7.3.2 Transmission Speed

There are three transmission speed options:

- 0: 12 Mbps
- 1: 6 Mbps
- 2: 3 Mbps

The default is 0 (=12 Mbps). If a number other than 0, 1 or 2 is specified, 0 (=12 Mbps) is assumed.



CAUTION

The transmission speed setting is enabled when the Request to Communicate relay is turned on.

Total transmission distance and remote scan time depend on the transmission speed setting: the total transmission distance is 100 m at 12 Mbps, 200 m 6 Mbps, or 300 m at 3 Mbps. For details on remote scan time, see Chapter 4, "Response Time."

7.3.3 Communications mode

There are two communications mode options:

- 0: Full-duplex
- 1: Half-duplex

The default is 0 (= full-duplex). If a number other than 0 or 1 is specified, 0 (= full-duplex) is assumed.



CAUTION

- **Full-duplex and half-duplex communications modes have the following differences:**
 - Remote scan time is shorter for full-duplex mode.
 - Full-duplex mode uses a 4-wire (2-pair) communication cable, while half-duplex mode uses a 2-wire (1-pair) communication cable.
 - Only half-duplex mode is available if the slave unit last address is set to 1.
- **The communications mode setting is enabled when the Request to Communicate relay is turned on.**

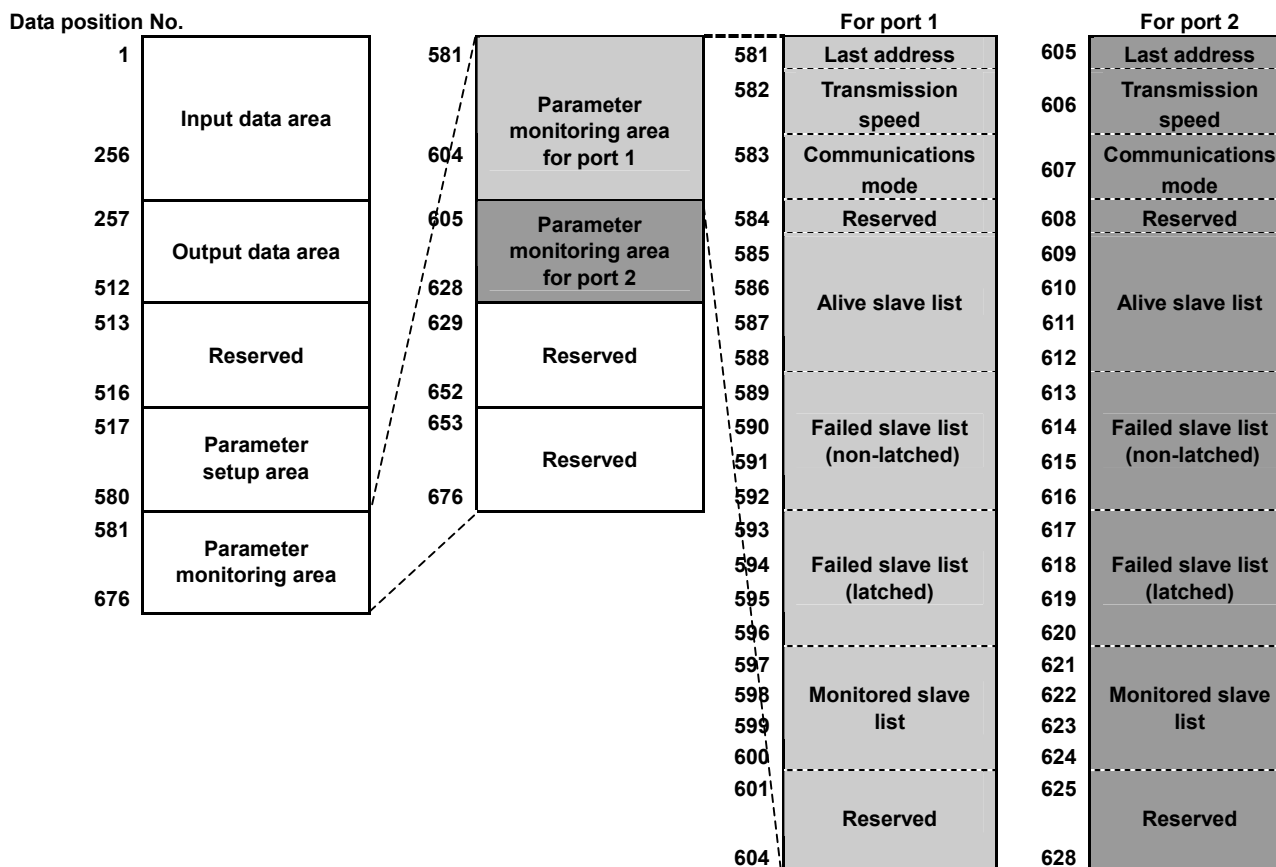
7.3.4 Monitored Slave List

You can specify which slave units are to be monitored for communication error. To monitor error for a specific slave unit, set its corresponding bit to 1. Bit values for slave units beyond the Last Address setting are ignored. When a communication error with a monitored slave unit is detected, the ALM LED lights up and the ALARM relay turns on.

Data position No.	15														0	
521	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
522	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
523	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
524		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Note: The data positions shown in the table are for port 1.

7.4 Parameter Monitoring Area



Data Position No.		Description	
Port 1	Port 2		
581	605	Last address	Between 1 and 63
582	606	Transmission speed	0 : 12 Mbps 1 : 6 Mbps 2 : 3 Mbps
583	607	Communications mode	0 : Full-duplex 1 : Half-duplex
584	608	Reserved	
585 to 588	609 to 612	Alive slave list	0 : Error 1 : Normal
589 to 592	613 to 616	Failed slave list (non-latched)	0 : Normal 1 : Error
593 to 596	617 to 620	Failed slave list (latched)	0 : Normal 1 : Error
597 to 600	621 to 624	Monitored slave list	0 : Not monitored 1 : Monitored
601 to 604	625 to 628	Reserved	

7.4.1 Last Address

This parameter monitors the last address setting for the current communication cycle.

7.4.2 Transmission Speed

This parameter monitors the transmission speed setting for the current communication cycle.

7.4.3 Communications mode

This parameter monitors the communications mode setting for the current communication cycle.

7.4.4 Alive Slave List

This parameter monitors the statuses of connected slave units. A slave unit is considered alive if it is powered on and available for communication. The bit corresponding to an alive slave unit is set to 1.

Data position No.	15															0	
585	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
586	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	
587	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	
588		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	

Note: The data positions shown in the table are for port 1.

7.4.5 Failed Slave List (non-latched)

If an error is detected during communication with a slave unit specified for error monitoring, its corresponding bit in the Failed Slave List (non-latched) is set to 1. When the error condition is removed, the bit is automatically reset to 0. If the bit of any slave unit is set to 1, the ALM LED lights up and the ALARM relay turns on.

Data position No.	15															0	
589	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
590	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	
591	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	
592		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	

Note: The data positions shown in the table are for port 1.

7.4.6 Failed Slave List (latched)

If an error is detected during communication with a slave unit specified for error monitoring, its corresponding bit in the Failed Slave List (latched) is set to 1. Once turned on, a bit is not reset to 0 even when the error condition is removed. To reset a bit, you must overwrite the bit with 0 using a program.

Data position No.	15														0	
593	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
594	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
595	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
596		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Note: The data positions shown in the table are for port 1.

7.4.7 Monitored Slave List

This parameter indicates which slave units are currently monitored for error. Bits corresponding to slave units that are currently monitored for error are set to 1.

Data position No.	15														0	
597	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
598	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
599	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
600		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Note: The data positions shown in the table are for port 1.

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8. Troubleshooting

This chapter describes how to troubleshoot communication failure and other problems.

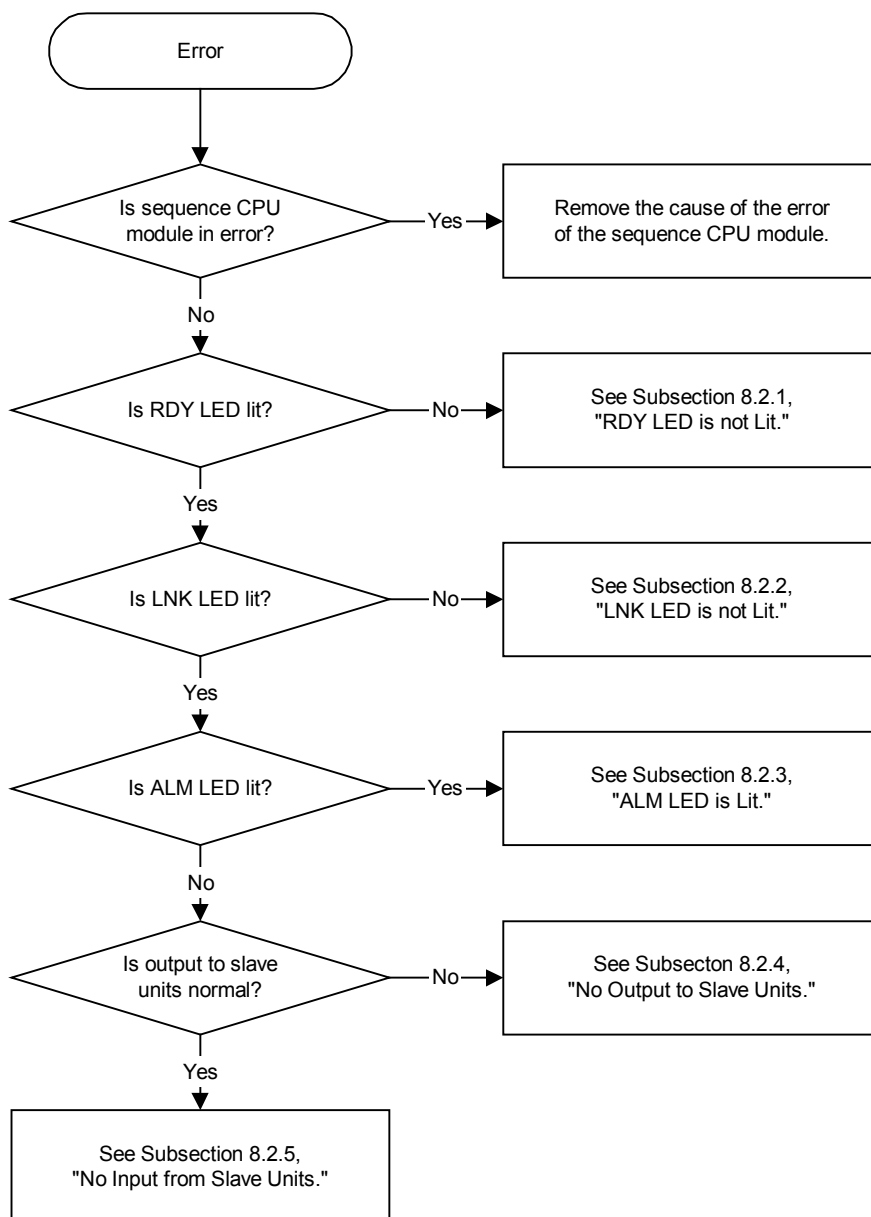
8.1 Hardware or Setup Error?

Check for the following setup errors before proceeding with troubleshooting:

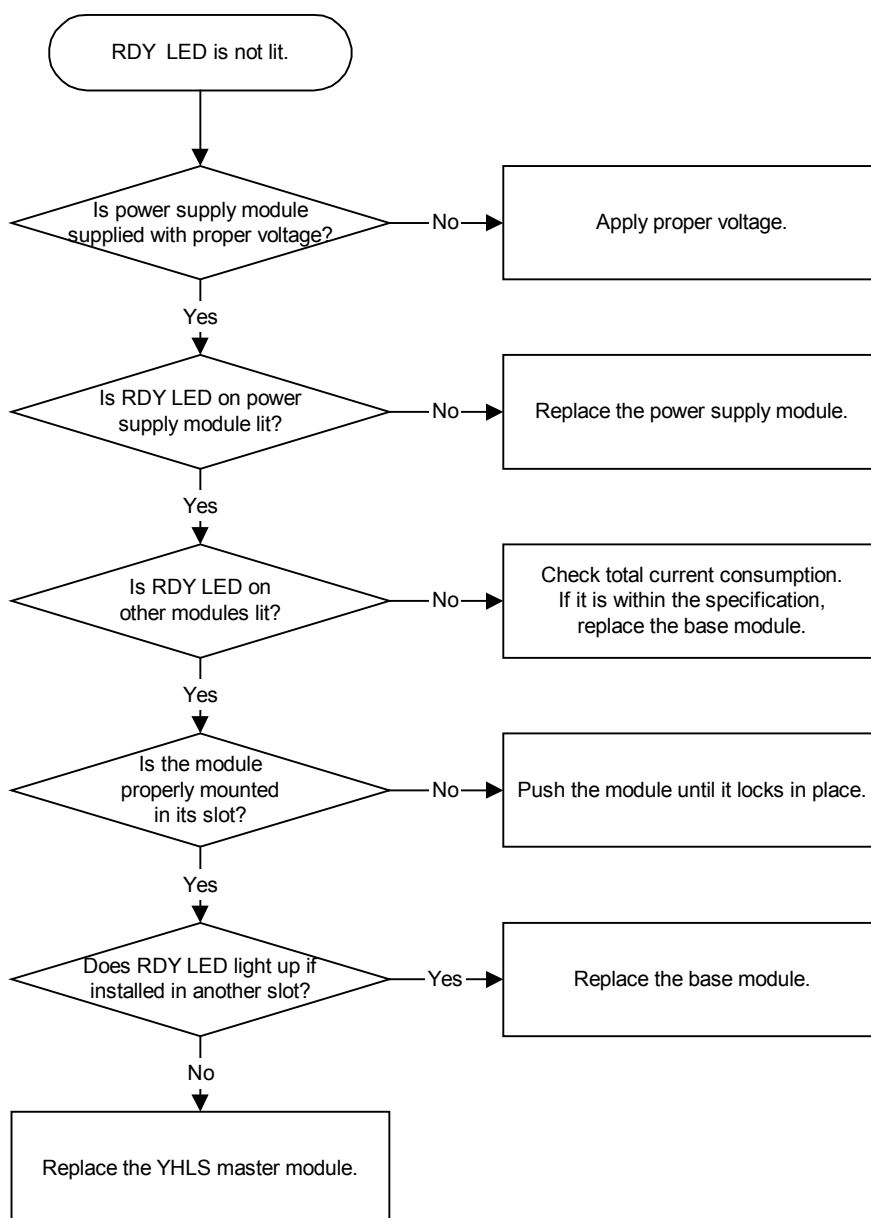
- Are the modules installed correctly?
- Are the conditions set correctly?
- Is the communication cable correct?
- Is the YHLS master module configured correctly?
- Are the settings on slave units correct?
- Are the power supplies of slave units correct?

8.2 Troubleshooting Common Problems

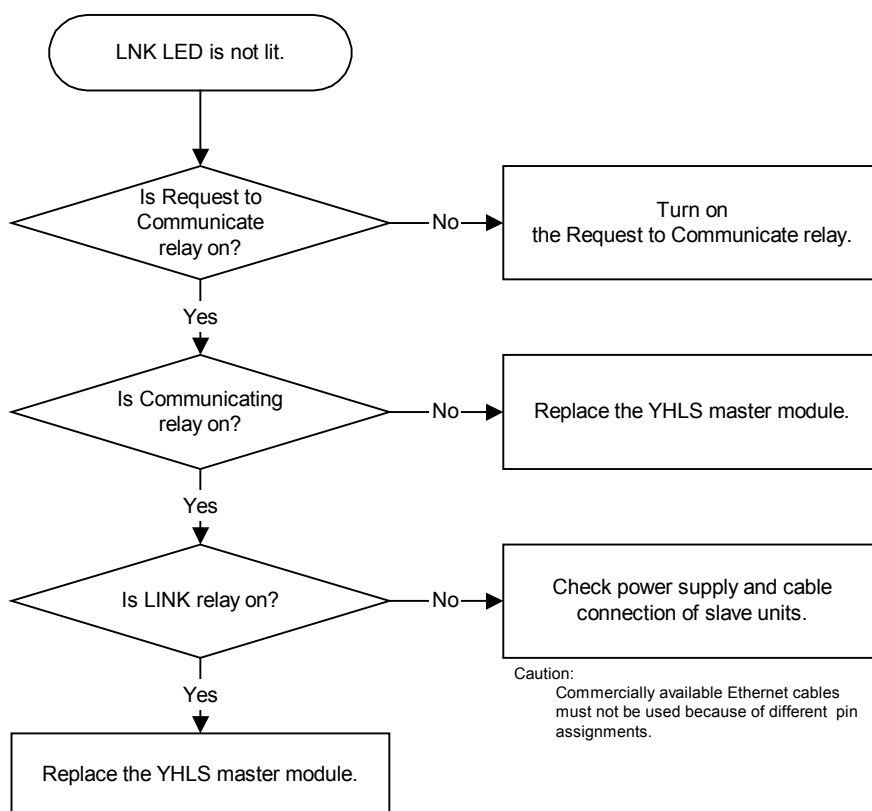
This section shows troubleshooting flowcharts for various error scenarios that may occur when using the YHLS master module.



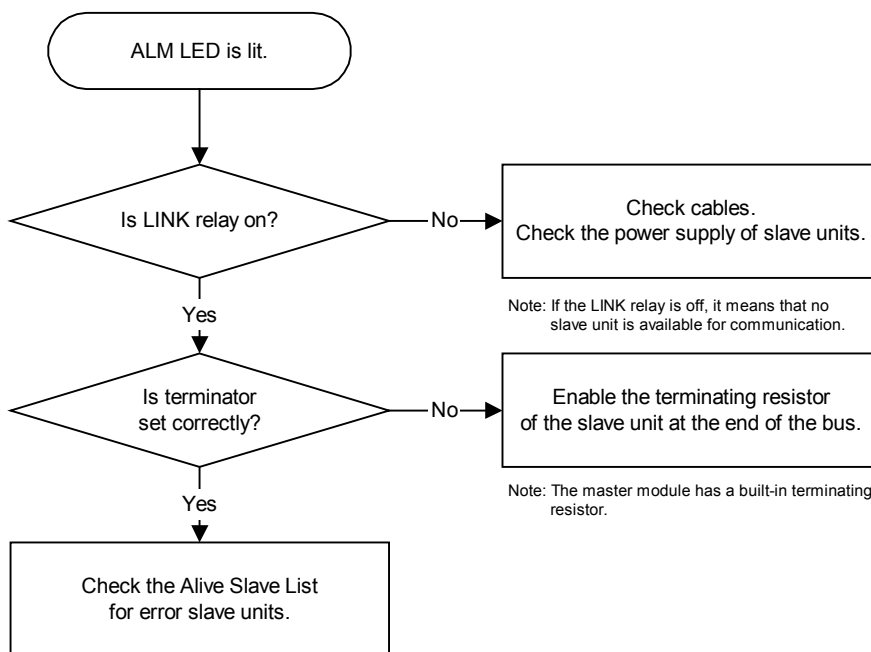
8.2.1 RDY LED is not Lit



8.2.2 LNK LED is not Lit



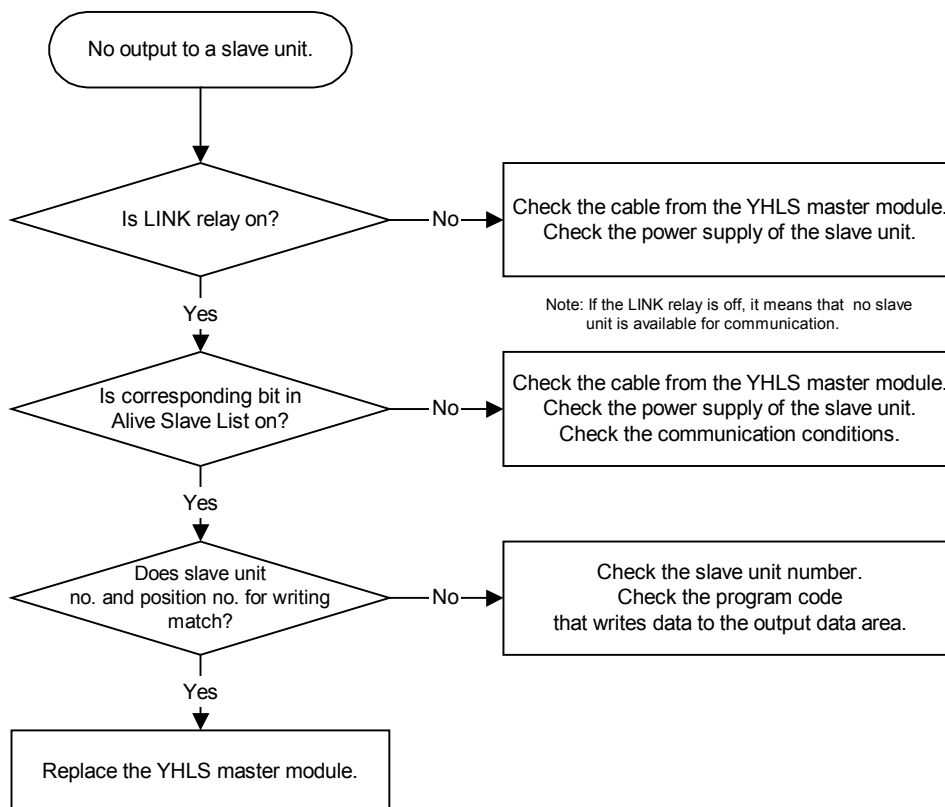
8.2.3 ALM LED is Lit



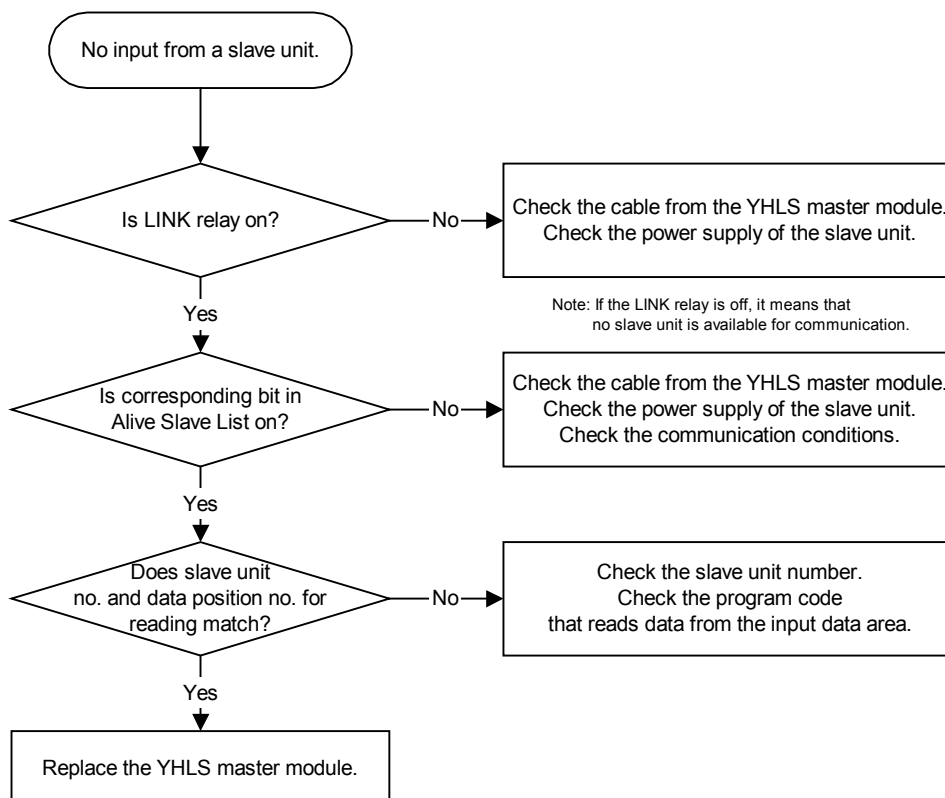
For each error slave unit, check for:

- duplicate address
- cable problems
- power supply problems

8.2.4 No Output to Slave Unit



8.2.5 No Input from Slave Unit



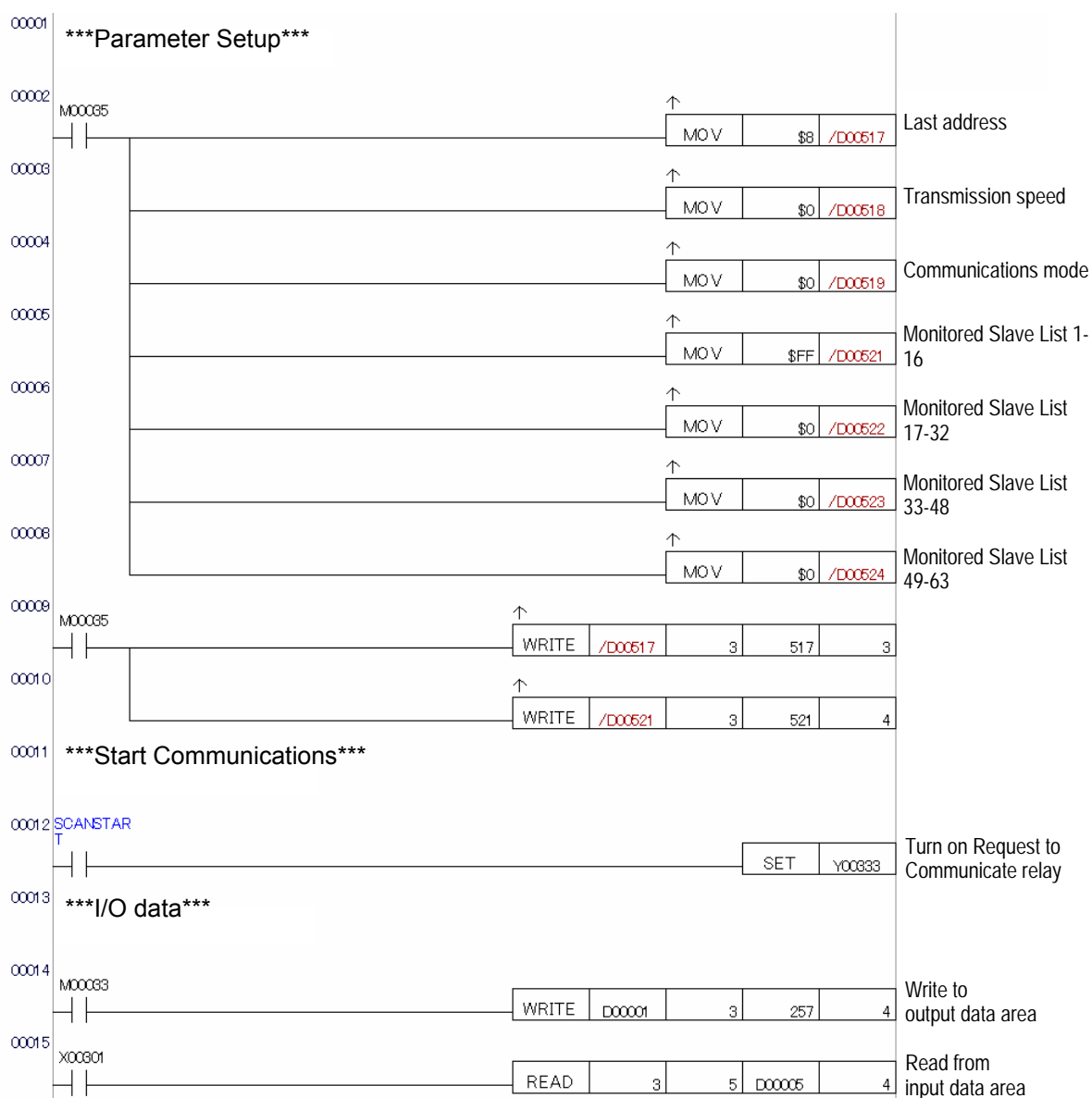
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9. Sample Program

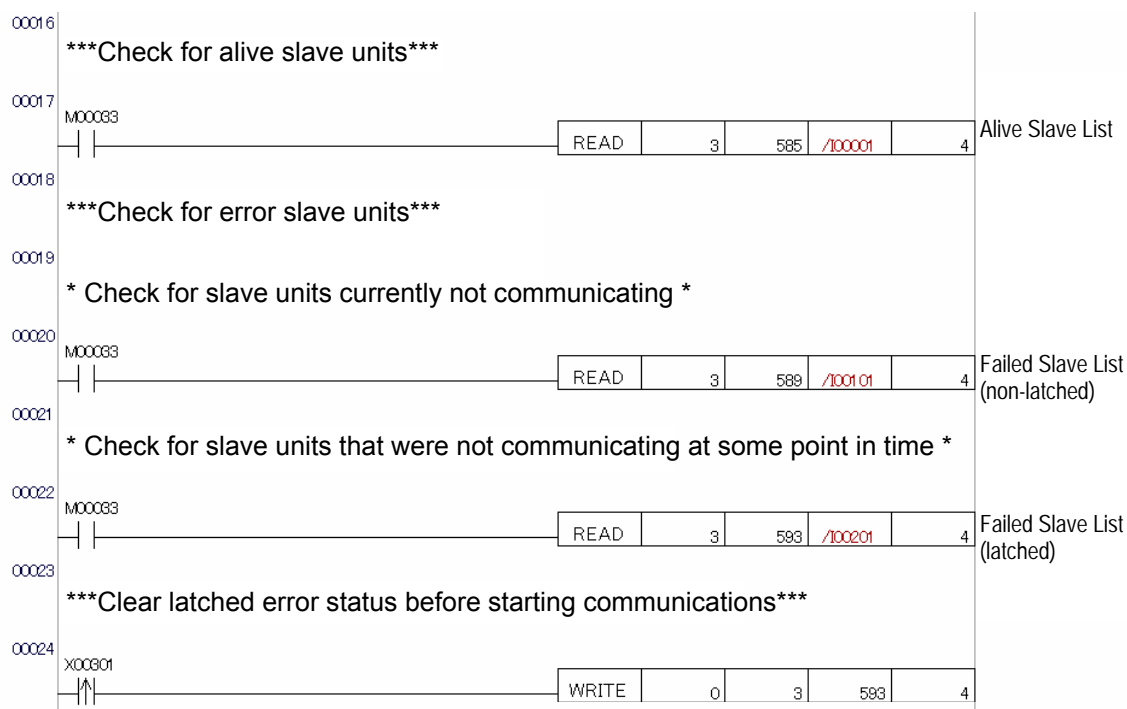
■ Assuming 8 slave units with 16 inputs or outputs are connected

The sample program below assumes that the F3LH02-0N YHLS master module is installed in slot 3 of the main unit, and four slave units (having addresses 1 to 4) with 16 outputs and four slave units (having addresses 5 to 8) with 16 inputs are connected to port 1 of the master module.

The sample program sends output data stored in registers D00001 to D00004 to the master module for output by the four 16-output slave units, as well as reads input data from the four 16-input slave units into registers D00005 to D00008 via the master module.



Continued on the next page



To check for live slave units, the program reads the live/dead status of slave units 1-63 into /I00001 to /I00063. To check for slave units currently not communicating, the program reads the non-latched error status of slave units 1-63 into /I00101 to /I00163. To check for slave units that were not communicating at some point in time, the program reads the latched error status of slave units 1-63 into /I00201 to /I00263. To clear the latched error status of the slave units, the program writes value 0 to the corresponding bits at communication startup.

Appendix Preparing a Plug-cable Set

(1) Modular plug, material and tool

The following types of modular plug, material and tool are recommended for use:

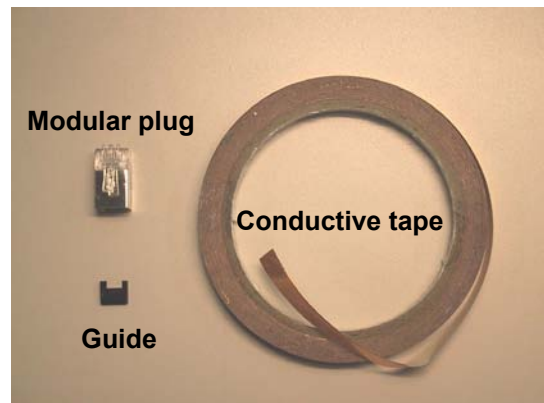
- RJ-45 shielded-modular plug

Example:

Manufacturer: Tyco Electronics AMP K.K.

Model: 5-569550-3

Note: The constructions of some products may differ from the example shown here.



- Conductive tape

Example:

Beaten copper tape

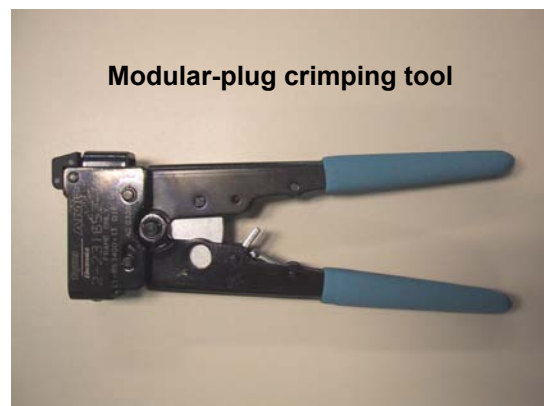
- RJ-45 modular-plug crimping tool

Example:

Manufacturer: Tyco Electronics AMP K.K.

Model: 1-231666-4 (1-853400-0)

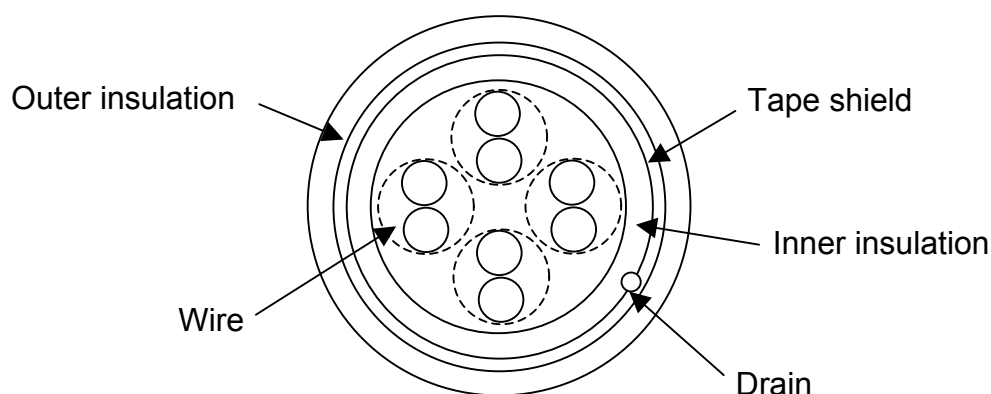
Note: Check for compatibility with the modular plug.



(2) Cable

CAT5 shielded twisted-pair cable is recommended.

The cable shown below uses aluminum tape as its shield.

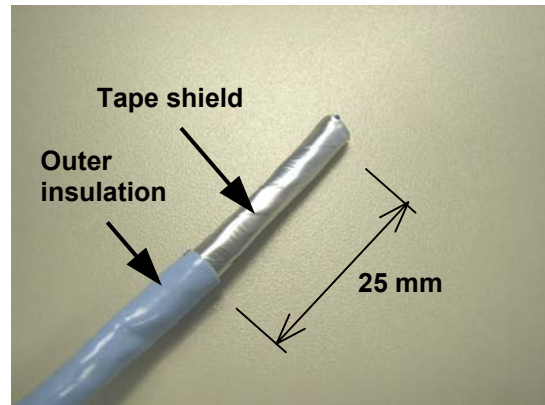


Cable Construction

(3) How to prepare a plug-cable set

- a. Peel off 25-mm length of outer insulation from the cable. Take care not to damage the tape shield underneath.

Check whether the tape shield has its outer surface insulation-coated.



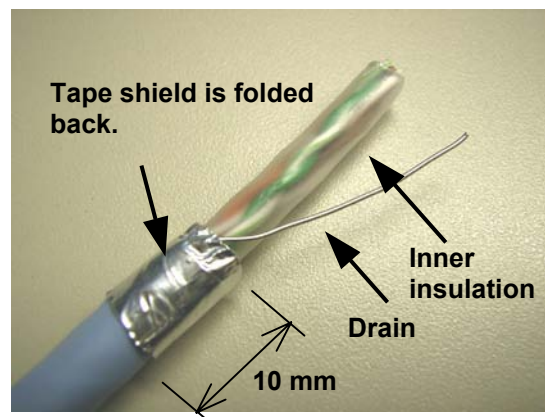
- b. If insulation-coated:

Fold the exposed part of the tape shield backwards over the outer insulation so that the inner conductive surface of the tape shield is exposed.

Note: Cut the folded part of the tape shield to about 10 mm long.

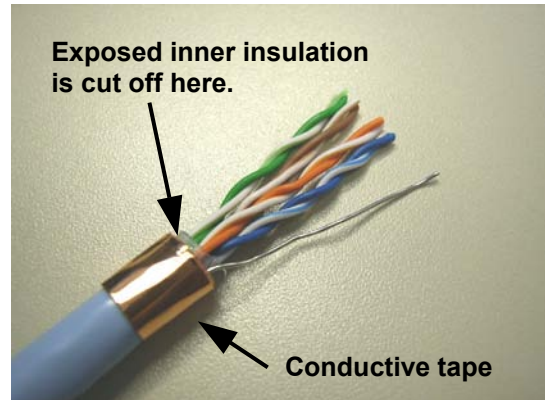
If not insulation-coated:

Cut the exposed part of the tape shield so that it extends 5 mm from the outer insulation.



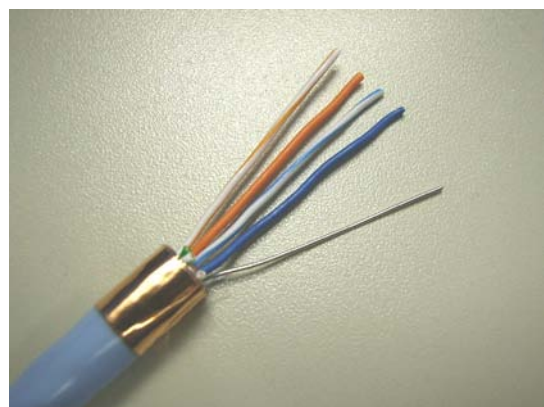
- c. Cut the exposed inner insulation at the end of the tape shield. Take care not to damage the wires underneath.

To reinforce the tape shield, wind about one turn of conductive tape around it. Beware of over-winding.



- d. Select two pairs of wires to be used and cut off the remaining wires. Untwist the two pairs of wires and straighten the wires so that they can be inserted into the guide smoothly.

Note: Never strip the wires of their insulation.



- e. Lead the wires and the drain into the guide and trim to about 12 mm long.

Pin 1: Not used

Pin 2: Not used

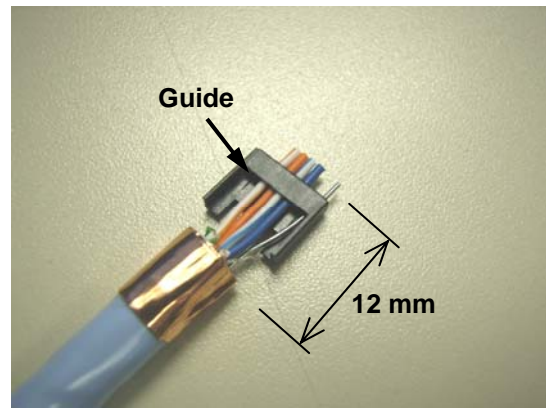
Pin 3: } Twisted pair
Pin 4: }

Pin 5: } Twisted pair
Pin 6: }

Pin 7: Not used

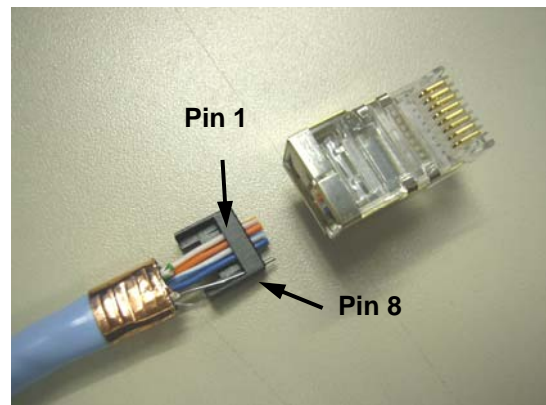
Pin 8: Drain

Note: The two modular plugs to be installed on the cable must have the same pin assignments.



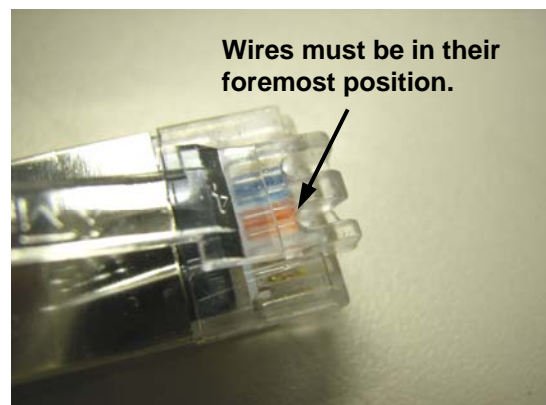
- f. Lead the wires and the drain together with the guide into the modular plug.

Flattening the conductive tape part of the cable slightly using pliers will ease its insertion into the plug.

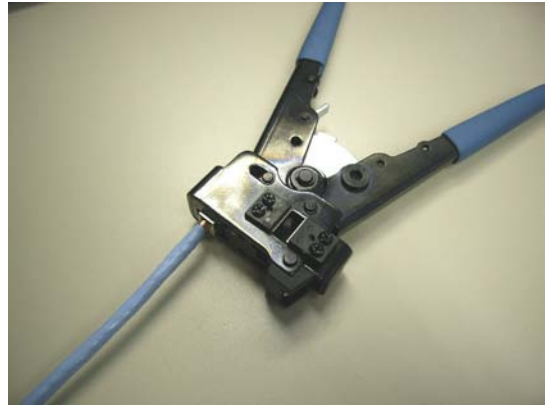


Push the wires and the drain all the way into the modular plug. Verify this visually.

Also verify that the conductive tape part of the cable is about 6 mm into the plug.



- g. Crimp the plug with a modular-plug crimping tool, all the while taking care that the wires and the drain are properly positioned.



- h. The cable is now provided with a plug.
Check the prepared plug-cable set for wrong connection, shorted circuit or open circuit using an ohmmeter or some other appropriate instrument.



FA-M3**YHLS Master Module**

IM 34M6H46-01E 1st Edition

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