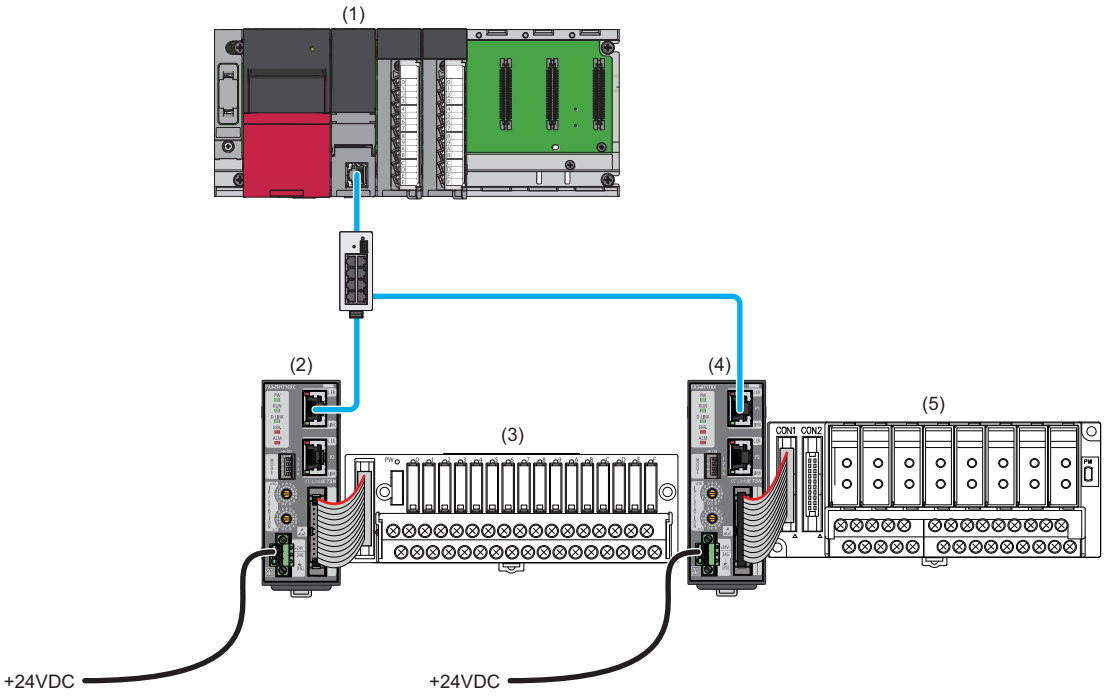
10 MODBUS/TCP COMMUNICATIONS

The network interface module (FA3-TH1M16XC, FA3-TH1M16Y, FA3-TH1M16YE, FA3-AT1M8X, or FA3-AT1M8Y) operates as a MODBUS/TCP slave device.
For details on the MODBUS/TCP protocol, refer to the manual for the MODBUS/TCP master device used.

10.1 System Configuration

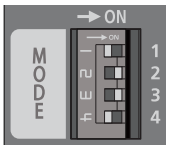


(1) MODBUS/TCP master device
(2), (4) MODBUS/TCP slave device (network interface module)
(3), (5) Converter (☞ Page 16 Connectable Devices)

Precautions

■Network setting switches

Check that the switches are set as follows. (☞ Page 77 Network mode setting)



- Switch 1: Off
- Switch 2: On
- Switch 3: On
- Switch 4: Off

■Wiring

Check that the Ethernet cable is connected to P1. (Do not use P2.)

Supported master module

Before using the MODBUS/TCP device, check the specifications.
When using the RJ71EN71, RnENCPU (network part), or a CPU module (built-in Ethernet port) of the MELSEC iQ-R series as a MODBUS/TCP master device, refer to the following.
📖MELSEC iQ-R Ethernet User's Manual (Application)

Supported Ethernet cable

For the specifications of available Ethernet cables, refer to the manual for the MODBUS/TCP master device used.

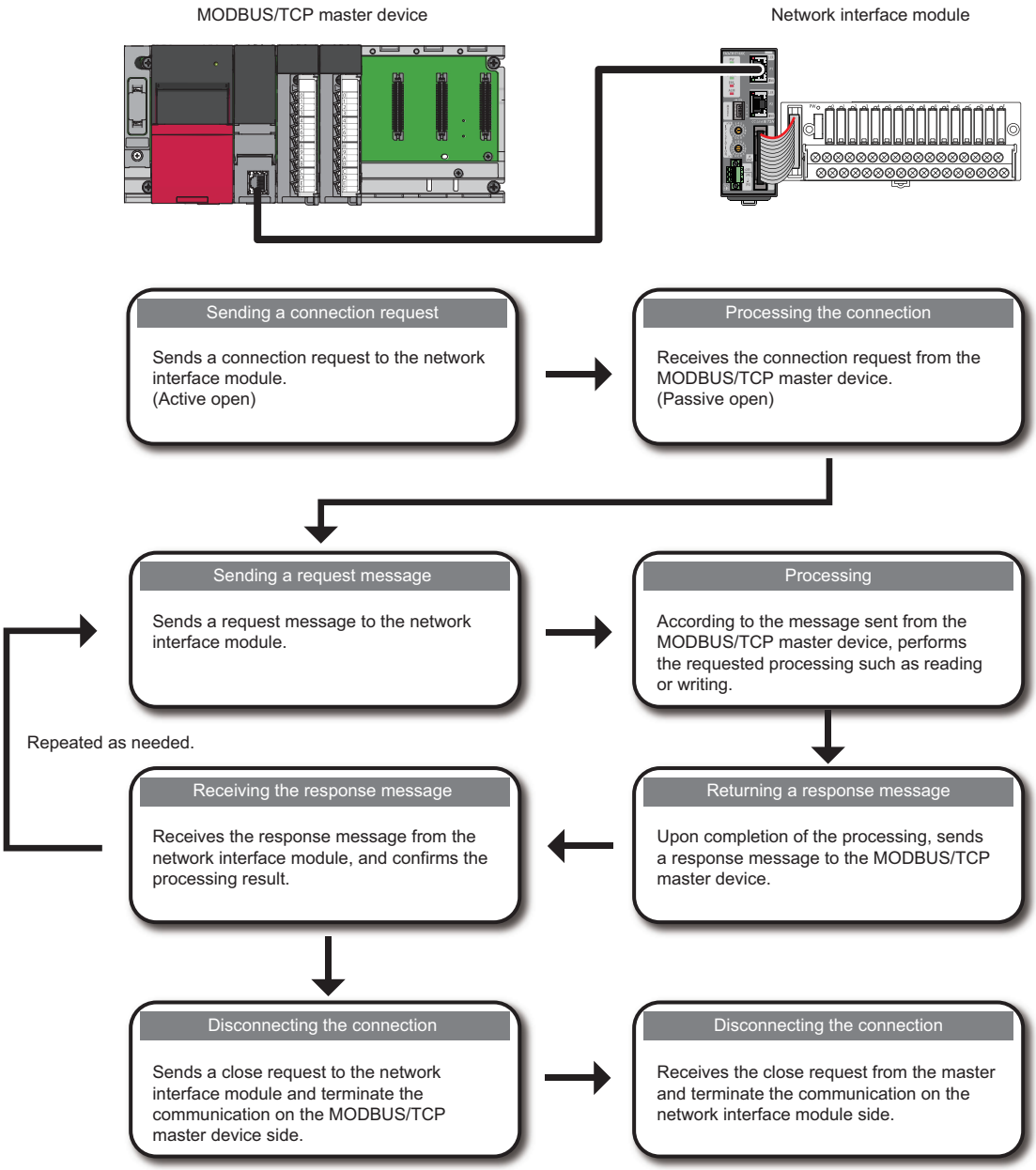
Supported switching hub

For the available switching hubs, refer to the manual for the MODBUS/TCP master device used.

10.2 Communication Procedure

This section describes the MODBUS/TCP communication procedure. For the procedure for connecting the MODBUS/TCP master device, refer to the following.

☞ Page 74 PROCEDURES BEFORE OPERATION



Point

If an additional connection request is sent from the MODBUS/TCP master device to a network interface module that already has established two connections (maximum number of TCP connections), the network interface module establishes the new connection and disconnects the connection for which the longest time has passed after the last communication.

If the network interface module cannot communicate with the MODBUS/TCP master device, it can take 10 seconds to disconnect the connection. During this disconnection processing, if a connection request is sent from the MODBUS/TCP master device again, the network interface module rejects the connection request.

10.3 Functions

This section describes the details of functions that can be used only on MODBUS TCP.
For the common functions of the network interface modules available for MODBUS/TCP communication, refer to the following.
☞ Page 94 Function List

Alive check function

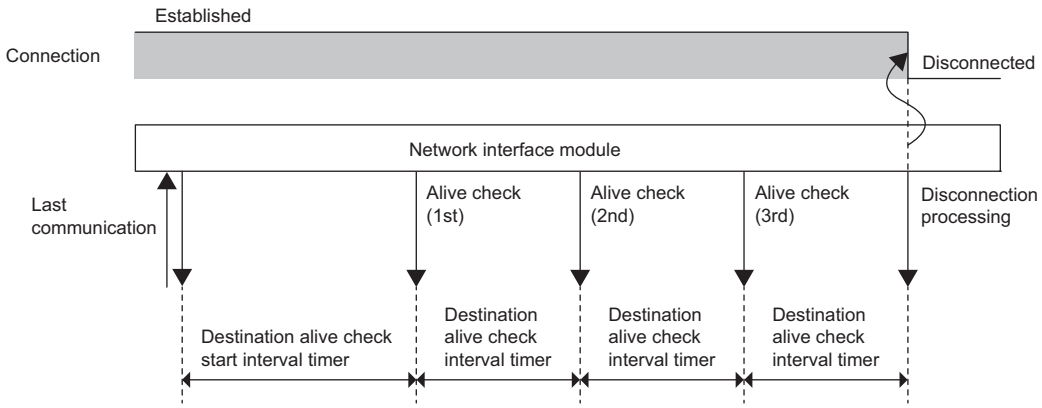
The status of communications with the MODBUS/TCP master device with which the network interface module has established a connection is checked periodically.

Operation

If there is no communication with the MODBUS/TCP master device for a certain period of time, an alive check message is sent from the network interface module to the MODBUS/TCP master device. The connection with the MODBUS/TCP master device is checked by confirming whether it receives the message.

1. The Destination alive check start interval timer is started every time the network interface module communicates with the MODBUS/TCP master device with which the connection has been established.
2. If the next communication is not established within the time period set in the Destination alive check start interval timer, the network interface module sends an alive check message to the MODBUS/TCP master device.
3. If the network interface module cannot receive a response message from the MODBUS/TCP master device, the module sends alive check messages for the specified number of times at the interval specified by the Destination alive check start interval timer.
4. If the module still cannot receive a response message from the MODBUS/TCP master device, an alive check error occurs. The connection is disconnected forcibly and the alarm code (0E30H) is stored in Latest alarm code (RWr1). (☞ Page 308 List of Alarm Codes)

Ex.
The following shows an example of the timing chart from error detection by the alive check function to communication disconnection. In this example, the number of alive check resends is set to three.



- If the MODBUS/TCP master device does not support the TCP KeepAlive function (response for an ACK message for KeepAlive), the connection may be disconnected.
- If there is no MODBUS/TCP master device with which the network interface module has established a communication, the D LINK LED is turned off. For the FA3-TH1M16Y, FA3-TH1M16YE, or FA3-AT1M8Y, the status of the output signal changes to HOLD or CLEAR according to the output HOLD/CLEAR function. Once a connection is established, the D LINK LED is turned on and the HOLD/CLEAR status of the output signal is cleared.

Setting

Set data for the alive check function to the remote buffer memory (MODBUS device: holding register, address: 0000F2H to 00F4H) to specify the interval and number of alive checks.

The setting values are saved in the non-volatile memory. Therefore, even when the network interface module is restarted, the setting values are held.

Address	Item	Size	Description
00F2H	Destination Alive Check Start Interval Timer	1 word	Specify the time from reception of the last message from the MODBUS/TCP master device to start of the alive check. • Specification range: 1 to 14400 (second) • Default: 600 (second)
00F3H	Destination Alive Check Interval Timer	1 word	Specify the interval to send alive check messages when a response message is not received from the MODBUS/TCP master device to which the alive check message was sent. • Specification range: 1 to 60 (second) • Default: 10 (second)
00F4H	Destination Alive Check Count	1 word	Specify the number of alive checks to be performed until detection of an error. • Specification range: 1 to 100 (times) • Default: 3 (times)

Point

If any value below the lower limit of the setting range is set, the module operates with the lower limit. If any value above the upper limit of the setting range is set, the module operates with the upper limit.

Split reception monitoring function

When the network interface module receives a split request message divided into TCP packets and cannot receive the last part within the specified period of time after receiving the first part, the module disconnect the connection.

Operation

When the connection is disconnected by the split reception monitoring function, the D LINK LED is turned off and the alarm code (0E40H) is stored in Latest alarm code (RWr1). (☞ Page 308 List of Alarm Codes)

For the FA3-TH1M16Y, FA3-TH1M16YE, or FA3-AT1M8Y, the status of the output signal changes to HOLD or CLEAR according to the output HOLD/CLEAR function at the disconnection.

When a connection is established again, the D LINK LED is turned on and the HOLD/CLEAR status of the output signal is cleared.

- If the connection is disconnected during monitoring of split reception, the monitoring is terminated.
- If there is no MODBUS/TCP master device with which the network interface module has established a communication, the D LINK LED is turned off.

Setting

Set the Split Reception Monitoring Timer to remote buffer memory (MODBUS device: holding register, address: 0000F5H) to specify the time from reception of the first part to the last part of a split message.

The setting values are saved in the non-volatile memory. Therefore, even when the network interface module is restarted, the setting values are held.

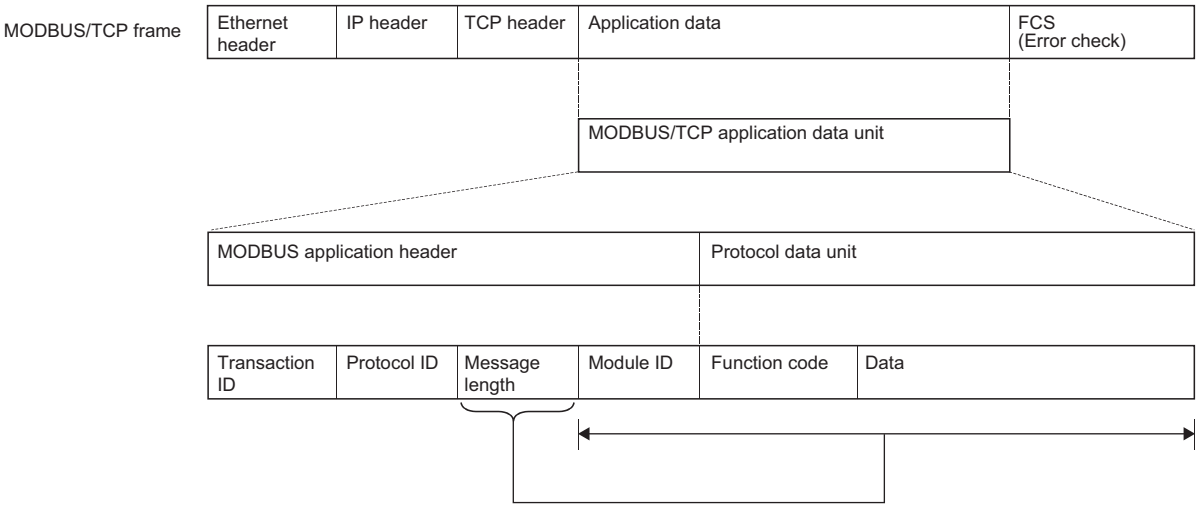
Address	Item	Size	Description
00F5H	Split Reception Monitoring Timer	1 word	Specify the time from reception of the first part to the last part of a split message divided into TCP packets. • Specification range: 1 to 1200 (second) • Default: 30 (second)

Point

If any value lower than the lower limit of the setting range is set, the module operates with the lower limit. If any value upper than the upper limit of the setting range is set, the module operates with the upper limit.

10.4 Message Format

This section describes the format of message to be used for operating the network interface module on MODBUS/TCP.



Area name		Area size	Description
Ethernet header		—	Added by the module that sends a request message or response message.
IP header			
TCP header			
MODBUS application header	Communication ID	2 bytes	Specify any value. It is used to determine which request message the response message corresponds to on the MODBUS/TCP master device.
	Protocol ID	2 bytes	Specify 0000H. If any value other than 0000H is specified, the network interface module does not send a response message.
	Message length	2 bytes	The total number of bytes of module ID, function code, and data.
	Module ID	1 byte	Specify 00H. The module operates without errors even if any value other than 00H is specified.
Protocol data unit	Function code	1 byte	■When the MODBUS/TCP master device sends a request message Specify the content of processing for the network interface module. For the function codes that can be specified, refer to the following. ☞ Page 271 Function code and data ■When the MODBUS/TCP master device receives a response message When the processing is completed normally, the requested function code is stored. When the processing is completed abnormally, the requested function code with the most significant bit turned on is stored.
	Data	1 byte to 252 bytes	■When the MODBUS/TCP master device sends a request message Specify the content of request. For the data format to be specified, refer to the following. ☞ Page 271 Function code and data ■When the MODBUS/TCP master device receives a response message When the processing is completed normally, the execution result is stored. When the processing is completed abnormally, an error response code is stored. (☞ Page 273 Abnormal response code)
FCS (error check)		—	Added by the module that sends a request message or response message.

Function code and data

The following table lists the function codes that can be used in the protocol data unit of the message format and the data format.

Function code	Function	Description	Data
01H	Read coils	Reads the status (ON/OFF) of one or multiple coils.	This is a standard function for MODBUS. For details of the request message format and response message format, refer to the following. 📖MELSEC iQ-R MODBUS/TCP Reference Manual For details of the MODBUS device address that can be specified in the request message, refer to the following. ☞ Page 272 MODBUS device
02H	Read discrete inputs	Reads the status (ON/OFF) of one or multiple inputs.	
03H	Read holding registers	Reads one or multiple holding register values.	
04H	Read input registers	Reads one or multiple input register values.	
05H	Write single coil	Writes a value (ON/OFF) to one coil.	
06H	Write single register	Writes a value to one holding register area.	
0FH	Write multiple coils	Writes values (ON/OFF) to multiple coils.	
10H	Write multiple registers	Writes values to multiple holding register areas.	
41H	Remote reset	Perform the remote reset to the network interface module.	Specify 00H to the request message data. If reset succeeds normally, a response message is not sent. The connection is disconnected after the request message is sent, and a connection is not established for two seconds after disconnection.
42H	Read model name	Reads the model code of the network interface module.	Specify 00H to the request message data. Two bytes of model code of the network interface module is stored in the response message data. The model code corresponds to the model name as follows. • 0013H: FA3-TH1M16XC • 0014H: FA3-TH1M16Y • 0015H: FA3-TH1M16YE • 0016H: FA3-AT1M8X • 0017H: FA3-AT1M8Y
43H	Error clear	Clears the error/alarm that has occurred in the network interface module.	Specify 00H to the request message data. The request message is returned as a response message as is.
44H	Error history clear	Clears the error history in the network interface module.	Specify 00H to the request message data. The request message is returned as a response message as is.

If any function code other than those described above is sent, the processing is completed abnormally and the abnormal response code 01H is stored in the response message data. (☞ Page 273 Abnormal response code)

MODBUS device

The following table lists the remote I/O signals, remote register areas, and remote buffer memory areas that can be specified for a MODBUS device in the data of request message.
If any address other than those described below is specified, the processing is completed abnormally and the abnormal response code 02H is stored in the response message data. (☞ Page 273 Abnormal response code)

Remote I/O signals, remote register, remote buffer memory

R: Read, W: Write

MODBUS device	Address	Item	Type	Access	Function code	Description
Input	■FA3-TH 0000H to 000FH ■FA3-AT 0000H to 001FH	Remote input signal (RX)	Bit	R	02H: Read discrete inputs	☞ Page 27 Remote I/O Signal
Coil	■FA3-TH 0000H to 000FH ■FA3-AT 0000H to 001FH	Remote output signal (RY)	Bit	R/W	01H: Read coils 05H: Write single coil 0FH: Write multiple coils	
Input register	0000H to 001FH	Remote register (RWr) (Slave → Master)	Word	R	04H: Read input registers	☞ Page 38 Remote Register
Holding register	0000H to 000FH	Remote register (RWw) (Master → Slave)	Word	R/W	03H: Read holding registers 06H: Write single register 10H: Write multiple registers	
	0020H to 4FFFH	Remote buffer memory	Word	R/W		☞ Page 51 Remote Buffer Memory

■Remote buffer memory that can be used only on MODBUS/TCP

MODBUS device	Address	Remote buffer memory	Size	Description/reference
Holding register	00F0H	IP address at next startup setting (Third and fourth octets)	1 word	Specify the network interface module IP address when the IP address/station number setting switch is set to 0. The non-volatile memory with the same address as the IP address at next startup setting (remote buffer memory: 0000H, 0001H) is referenced. Default: 192.168.3.250
	00F1H	IP address at next startup setting (First and second octets)	1 word	
	00F2H	Destination Alive Check Start Interval Timer	1 word	☞ Page 268 Setting
	00F3H	Destination Alive Check Interval Timer	1 word	
	00F4H	Destination Alive Check Count	1 word	
	00F5H	Split Reception Monitoring Timer	1 word	☞ Page 269 Setting

Abnormal response code

Abnormal response codes are error codes that are common to the MODBUS protocol and are stored in the response message when the network interface module returns an abnormal response for the request message from the MODBUS/TCP master device.

When the processing is completed abnormally, the most significant bit of function code of the response message is turned on and an abnormal response code is stored in the data.

Abnormal response code	Error name	Description and cause	Corrective action
01H	Function code error	A function code that is not supported is received.	Correct the function code and send the message again.
02H	Device address error	The MODBUS device address is incorrect.	Correct the address and size of the MODBUS device, and send the message again.
03H	Data error	The protocol data unit of the request message is incorrect.	Correct the protocol data unit of the request message and send the message again.

Point

Even when an error response code is stored in the response message from the network interface module, error status does not occur in the module.

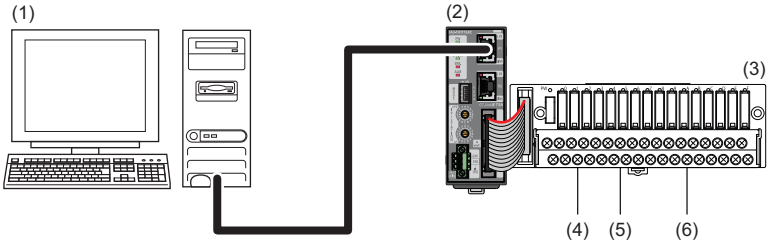
10.5 Programming

This section shows an example of messages to control the network interface module on MODBUS/TCP.
In this example, the communication ID in the request message is fixed to 0000H. The value, however, can be changed.
For details on the specifications of the MODBUS/TCP protocol frame, refer to the following:
📖MELSEC iQ-R MODBUS/TCP Reference Manual

Example of the digital input message

The following is the request message to receive the input signal from the device connected to the FA3-TH1M16XC in the MODBUS/TCP master device.

System configuration



No.	Description
(1)	MODBUS/TCP master device
(2)	FA3-TH1M16XC
(3)	Digital signal converter

• Input signals

No.	Input signals	Description	Status
(4)	X0	Push button switch	On
(5)	X3	Optical sensor	On
(6)	XC to XF	Rotary DIP switch (0H to FH)	BH

Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		02H	Read discrete inputs
Data	Start input number specification	0000H	Device name: X0 to XF
	Number of read points	0010H	In units of bits

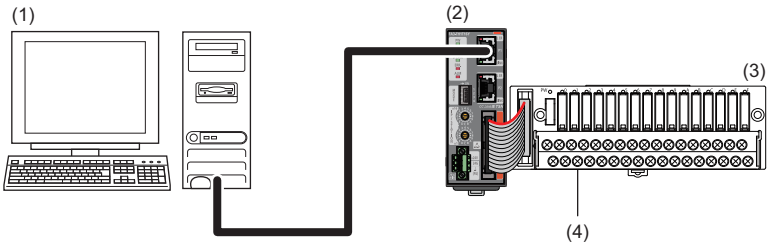
Response message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0005H	The total of the module ID, function code, and data is 5 bytes.
Module ID		00H	Fixed value
Function code		02H	The most significant bit is off.: Normal completion
Data	Number of bytes to be read	02H	2 bytes (16 bits)
	Device data	09B0H	

Example of the digital output message

The following is the request message to turn on the indicator lamp connected to the FA3-TH1M16Y from the MODBUS/TCP master device.

System configuration



No.	Description
(1)	MODBUS/TCP master device
(2)	FA3-TH1M16Y
(3)	Digital signal converter

- Output signals

No.	Output signals	Description	Status
(4)	Y1	Indicator lamp	On

Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		05H	Write single coil
Data	Coil number specification	0001H	Device name: Y1
	On/off specification	FF00H	Status of Y1

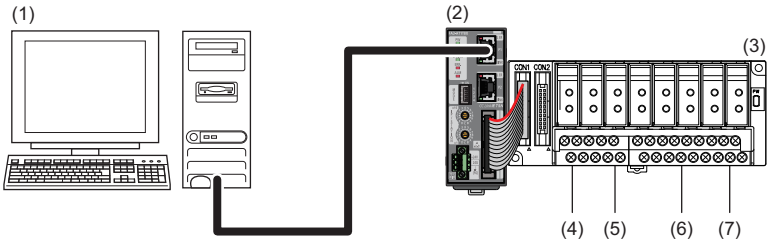
Response message

The request message is returned as a response message as is.

Example of the analog input message

The following is the request message to obtain an analog converted value after the processing starts by the parameter set in the MODBUS master device connected to the FA3-AT1M8X. The parameter write area is divided into three. Write the parameter in three steps.

System configuration



No.	Description
(1)	MODBUS/TCP master device
(2)	FA3-AT1M8X
(3)	Analog signal converter

• Input signals

No.	Description	Conversion module	Input value	Digital operation value
(4)	CH1: Displacement sensor	Voltage conversion module (Voltage: 0 to 10V → Voltage: 1 to 5V)	7.5V	12000
(5)	CH2: Optical sensor measurement distance	Current conversion module (Current: 4 to 20mA → Voltage: 1 to 5V)	8mA	4000
(6)	CH6: K type thermocouple	K type thermocouple conversion module (0 to 400℃ → Voltage: 1 to 5V)	280℃	2700
(7)	CH8: Potentiometer	Signal pass-through module (Pass-through → Voltage: 1 to 5V)	2.5V	37

Writing parameters (A/D conversion enable/disable setting)

■Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		06H	Write single register
Data	Holding register number specification	0102H	☞ Page 66 CH□ A/D conversion enable/disable setting (0102H)
	Write data	005CH	A/D conversion enabled for CH1, CH2, CH6, and CH8

■Response message

The request message is returned as a response message as it is.

Writing parameters (Average processing setting and Time/Count/Moving average)

■Request message

Item			Address	Message	Description
Communication ID				0000H	Fixed value
Protocol ID				0000H	Fixed value
Message length				001BH	The total of the module ID, function code, and data is 27 bytes.
Module ID				00H	Fixed value
Function code				10H	Write multiple registers
Data	Start holding register number specification			0105H	Remote buffer memory 0105H: Averaging processing specification (CH1 to CH4)
	Number of write points			000AH	In units of words
	Number of bytes			14H	20 bytes
	Device data	Averaging process setting (☞ Page 66 CH□ Averaging processing setting (0105H, 0106H))	0105H	0000H	CH1, 2: Sampling processing CH3, 4: Not used
			0106H	2010H	CH5, 7: Not used CH6: Time average CH8: Count average
		Time average/Count average/ Moving average setting (☞ Page 66 CH□ Time average/ Count average/Moving average (0107H to 010EH))	0107H	0000H	CH1: Sampling processing
			0108H	0000H	CH2: Sampling processing
			0109H	0000H	CH3: Not used
			010AH	0000H	CH4: Not used
			010BH	0000H	CH5: Not used
			010CH	1388H	CH6: 5000ms (time for averaging)
			010DH	0000H	CH7: Not used
			010EH	0064H	CH8: 100 times (count for averaging)

■Response message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		10H	The most significant bit is off.: Normal completion
Data	Start holding register number	0105H	Remote buffer memory 0105H: Averaging processing specification (CH1 to CH4)
	Number of write points	000AH	In units of words

Writing parameters (Scaling enable/disable setting and Scaling upper/lower limit value)

■Request message

Item			Address	Message	Description
Communication ID				0000H	Fixed value
Protocol ID				0000H	Fixed value
Message length				0029H	The total of the module ID, function code, and data is 41 bytes.
Module ID				00H	Fixed value
Function code				10H	Write multiple registers
Data	Start holding register number specification			0133H	Remote buffer memory 0133H: Scaling enable/disable setting
	Number of write points			0011H	In units of words
	Number of bytes			22H	34 bytes
	Device data	Scaling enable/disable setting (☞ Page 67 Scaling enable/disable setting (0133H))	0133H	005FH	CH6 and CH8: 0 (Enable) CH1 to CH5 and CH7: 1 (Disable)
		Scaling upper/lower limit value (☞ Page 68 CH□ Scaling upper limit value/lower limit value (0134H to 0143H))	0134H	0000H	CH1: Disable (Scaling lower limit value)
			0135H	0000H	CH1: Disable (Scaling upper limit value)
			0136H	0000H	CH2: Disable (Scaling lower limit value)
			0137H	0000H	CH2: Disable (Scaling upper limit value)
			0138H	0000H	CH3: Disable (Scaling lower limit value)
			0139H	0000H	CH3: Disable (Scaling upper limit value)
			013AH	0000H	CH4: Disable (Scaling lower limit value)
			013BH	0000H	CH4: Disable (Scaling upper limit value)
			013CH	0000H	CH5: Disable (Scaling lower limit value)
			013DH	0000H	CH5: Disable (Scaling upper limit value)
			013EH	0000H	CH6: 0 (Scaling lower limit value)
			013FH	0FA0H	CH6: 4000 (in units of 0.1℃) (Scaling upper limit value)
			0140H	0000H	CH7: Disable (Scaling lower limit value)
			0141H	0000H	CH7: Disable (Scaling upper limit value)
			0142H	0000H	CH8: 0 (Scaling lower limit value)
			0143H	0064H	CH8: 100 (Scaling upper limit value)

■Response message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		10H	The most significant bit is off.: Normal completion
Data	Start holding register number	0133H	Remote buffer memory 0133H: Scaling enable/disable setting
	Number of write points	0011H	In units of words

Initial data setting request

The following is the request message to turn on Initial data setting request flag (MODBUS device: coil, address: 0009H) to start A/D conversion with the written parameters enabled.

■Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		05H	Write single coil
Data	Coil number specification	0009H	Device name: Y9
	On/off specification	FF00H	Status of Y9

■Response message

The request message is returned as a response message as it is.

Initial data setting completion

The following is the request message to turn off Initial data setting request flag (MODBUS device: coil, address: 0009H) when Initial data setting completion flag (MODBUS device: input, address: 0009H) is turned on.
To turn off Initial data setting request flag, set On/off specification of the request message to 0000H and send the message.

■Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		02H	Read discrete inputs
Data	Start input number specification	0009H	Device name: X9
	Number of read points	0001H	In units of bits

■Response message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0004H	The total of the module ID, function code, and data is 4 bytes.
Module ID		00H	Fixed value
Function code		02H	Read discrete inputs
Data	Number of bytes to be read	01H	1 byte (8 bits)
	Device data	01H	0: 0 0 0 0 1: 0 0 0 1 X9 X9: Initial data setting completion flag

Reading A/D conversion completion flag

The following is the request message to read A/D conversion completion flag (MODBUS device: input, address: 0010H to 0017H).

■Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		02H	Read discrete inputs
Data	Start input number specification	0010H	Device name: X10
	Number of read points	0008H	In units of bits

■Response message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0004H	The total of the module ID, function code, and data is 4 bytes.
Module ID		00H	Fixed value
Function code		02H	Read discrete inputs
Data	Number of bytes to be read	01H	1 byte (8 bits)
	Device data	A3H	A: 1 0 1 0, 3: 0 0 1 1 X17 X16 X15 X14 X13 X12 X11 X10 X17: CH8 conversion completion, X15: CH6 conversion completion, X11: CH2 conversion completion, X10: CH1 conversion completion

Reading the digital operation value

The following is the message to read the digital operation value after the completion of A/D conversion (A/D conversion completion flag turns on).

■Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		04H	Read input registers
Data	Start input number specification	0002H	Device name: R2 to R9
	Number of read points	0008H	In units of words

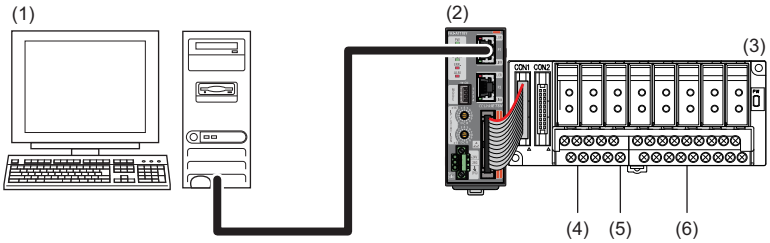
■Response message

Item			Message	Description
Communication ID			0000H	Fixed value
Protocol ID			0000H	Fixed value
Message length			0013H	The total of the module ID, function code, and data is 19 bytes.
Module ID			00H	Fixed value
Function code			04H	Read input registers
Data	Number of bytes to be read		10H	16 bytes
	Device data	CH1 Digital operation value (RWr2)	2EE0H	12000 (Displacement sensor)
		CH2 Digital operation value (RWr3)	0FA0H	4000 (Optical sensor measurement distance)
		CH3 Digital operation value (RWr4)	0000H	Not used
		CH4 Digital operation value (RWr5)	0000H	
		CH5 Digital operation value (RWr6)	0000H	
		CH6 Digital operation value (RWr7)	0A8CH	2700 (K type thermocouple)
		CH7 Digital operation value (RWr8)	0000H	Not used
		CH8 Digital operation value (RWr9)	0025H	37 (Potentiometer)

Example of the analog output message

The following is the request message to output an analog signal after the processing starts by the parameter set in the MODBUS master device connected to the FA3-AT1M8Y. The parameter write area is divided into two. Write the parameter in two steps.

System configuration



No.	Description
(1)	MODBUS/TCP master device
(2)	FA3-AT1M8Y
(3)	Analog signal converter

• Output signals

No.	Description	Conversion module	Output value	Analog conversion value
(4)	CH1: Temperature control device	Voltage conversion module (Voltage: 1 to 5V → Voltage: 0 to 10V)	3600	1.9V
(5)	CH4: Light brightness	Current conversion module (Voltage: 1 to 5V → Current: 4 to 20mA)	9600	13.6mA
(6)	CH7: Inverter	Current conversion module (Voltage: 1 to 5V → Current: 4 to 20mA)	15000	19mA

Writing parameters (D/A conversion enable/disable setting)

■Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		06H	Write single register
Data	Holding register number specification	0102H	☞ Page 66 CH□ A/D conversion enable/disable setting (0102H)
	Write data	00B6H	CH1, CH4, and CH7 can be used.

■Response message

The request message is returned as a response message as it is.

Writing parameters (Analog output HOLD/CLEAR setting and Warning output setting)

■Request message

Item			Address	Message	Description
Communication ID				0000H	Fixed value
Protocol ID				0000H	Fixed value
Message length				0011H	The total of the module ID, function code, and data is 17 bytes.
Module ID				00H	Fixed value
Function code				10H	Write multiple registers
Data	Start holding register number specification			0105H	Remote buffer memory 0105H: Analog output HOLD/CLEAR setting
	Number of write points			0005H	In units of words
	Number of bytes			0AH	10 bytes
	Device data	Analog output HOLD/CLEAR setting (☞ Page 71 Analog output HOLD/CLEAR setting (0105H, 0106H))	0105H	0101H	CH1 and CH3: HOLD CH2 and CH4: CLEAR
			0106H	1010H	CH5 and CH7: CLEAR CH6 and CH8: HOLD
		Warning output setting (☞ Page 71 Warning output setting (0107H))	0107H	00FEH	CH1: Enable CH2 to CH7: Disable
		Warning output upper/lower limit value (☞ Page 72 CH□ Warning output upper/lower limit value (0108H to 0117H))	0108H	1F40H	CH1: Warning output upper limit value
			0109H	0000H	CH1: Warning output lower limit value

■Response message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		10H	The most significant bit is off.: Normal completion
Data	Start holding register number	0105H	Remote buffer memory 0105H: Analog output HOLD/CLEAR setting
	Number of write points	0005H	In units of words

Initial data setting request

To enable the written parameter to start D/A conversion, Initial data setting request flag (MODBUS device: coil, address: 0009H) is turned on.

For the content of request and response messages, refer to the example of the analog input message. (☞ Page 280 Initial data setting request)

Initial data setting completion

The following is the request message to turn off Initial data setting request flag (MODBUS device: coil, address: 0009H) when Initial data setting completion flag (MODBUS device: input, address: 0009H) is turned on.

For the content of request and response message, refer to the example of the analog input message. (☞ Page 280 Initial data setting completion)

Digital value setting

The following is the message to set a digital value corresponding to the output analog value for CH□ Digital value (MODBUS device: holding register, address: 0002H to 0009H) of the remote register (Master → Slave).

■Request message

Item				Message	Description
Communication ID				0000H	Fixed value
Protocol ID				0000H	Fixed value
Message length				0017H	The total of the module ID, function code, and data is 23 bytes.
Module ID				00H	Fixed value
Function code				10H	Write multiple registers
Data	Start holding register number specification			0002H	Device name: W2 to W9
	Number of write points			0008H	In units of words
	Number of bytes			10H	16 bytes
	Device data	Write data	CH1 Digital value	0E10H	3600
			CH2 Digital value	0000H	D/A conversion disabled
			CH3 Digital value	0000H	D/A conversion disabled
			CH4 Digital value	2580H	9600
			CH5 Digital value	0000H	D/A conversion disabled
			CH6 Digital value	0000H	D/A conversion disabled
			CH7 Digital value	3A98H	15000
			CH8 Digital value	0000H	D/A conversion disabled

■Response message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		10H	The most significant bit is off.: Normal completion
Data	Start holding register number	0002H	Device name: W2 to W9
	Number of write points	0008H	In units of words

D/A conversion output enable/disable setting

The following is the message to turn on D/A conversion output enable/disable setting flag (MODBUS device: coil, address: 0010H to 0017H) and output the analog conversion value.

■Request message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0008H	The total of the module ID, function code, and data is 8 bytes.
Module ID		00H	Fixed value
Function code		0FH	Write multiple coils
Data	Start coil number specification	0010H	Device name: Y10 to Y17
	Number of write points	0008H	In units of bits
	Number of bytes	01H	1 byte
	Device data	49H	4: 0 1 0 0 9: 1 0 0 1 Y17Y16Y15Y14Y13Y12Y11Y10 Y10: D/A conversion enabled for CH1, Y13: D/A conversion enabled for CH4, Y16: D/A conversion enabled for CH7

■Response message

Item		Message	Description
Communication ID		0000H	Fixed value
Protocol ID		0000H	Fixed value
Message length		0006H	The total of the module ID, function code, and data is 6 bytes.
Module ID		00H	Fixed value
Function code		0FH	Write multiple coils
Data	Start coil number	0010H	Device name: Y10 to Y17
	Number of write points	0008H	In units of bits