Panasonic®

PROGRAMMABLE CONTROLLER

FP3/FP10S

ET-LAN SYSTEM

Technical Manual

FP3/FP10S ET-LAN SYSTEM Technical Manual
ACG-M0058-1 '95.7

Matsushita Electric Works, Ltd.

Safety Precautions

Observe the following notices to ensure personal safety or to prevent accidents.
To ensure that you use this product correctly, read this User's Manual thoroughly before use.
Make sure that you fully understand the product and information on safe.
This manual uses two safety flags to indicate different levels of danger.

WARNING

If critical situations that could lead to user's death or serious injury is assumed by mishandling of the product.

-Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
-Do not use this product in areas with inflammable gas. It could lead to an explosion.
-Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

CAUTION

If critical situations that could lead to user's injury or only property damage is assumed by mishandling of the product.

-To prevent abnormal exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assure in these specifications.
-Do not dismantle or remodel the product. It could lead to abnormal exothermic heat or smoke generation.
-Do not touch the terminal while turning on electricity. It could lead to an electric shock..
-Use the external devices to function the emergency stop and interlock circuit.
-Connect the wires or connectors securely.
The loose connection might cause abnormal exothermic heat or smoke generation
-Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It might cause exothermic heat or smoke generation.
-Do not undertake construction (such as connection and disconnection) while the power supply is on.

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CHAPTER 1

FEATURES

1-1. Features

- By using the ET-LAN unit, the FP3/FP10S series* of programmable controllers can be connected to Ethernet (10BASE5), IEEE802. 3 conformant CSMA/CD type networks. Using the sockets for the two network protocols, TCP/IP and UDP/IP, data communication with personal computers and workstations can be performed.
  *** ET-LAN unit compatible programmable controllers are:**
  - FP3 series with CPU version 4.5 or later.
  - FP10S with CPU version 1.5 or later.
- Up to 8 communication connections are available with a single ET-LAN unit which allows connections with multiple nodes. Furthermore, since up to 3 ET-LAN units* can be installed on the master backplane, a single FP3/FP10S can be directly connected to multiple Ethernet (10BASE5) networks.
  * For details about link unit availability on a single CPU, refer to page 122, “12-1. Standard and High-level Link Units”.
- Together with the other FP series programmable controller link units, such as the MEWNET-W or MEWNET-P link units, the FP3/FP10S can communicate with other networks for FP series programmable controllers.
- Using the computer link function, you can freely read or write the I/O and register contents of a programmable controller connected to a Ethernet (10BASE5) LAN from a personal computer or workstation at a remote site.

High-level computer	Issues MEWTOCOL-COM commands
FP3/FP10S programmable controllers	Program not required

- Using the data transfer function, you can exchange the I/O and register information between multiple programmable controllers, personal computers and workstations connected to an Ethernet (10BASE5) LAN only with the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions.

F145 (SEND)/P145 (PSEND) instructions	Write the I/O and register information to another nodes
F146 (RECV)/P146 (PRECV) instructions	Read the I/O and register information from another nodes

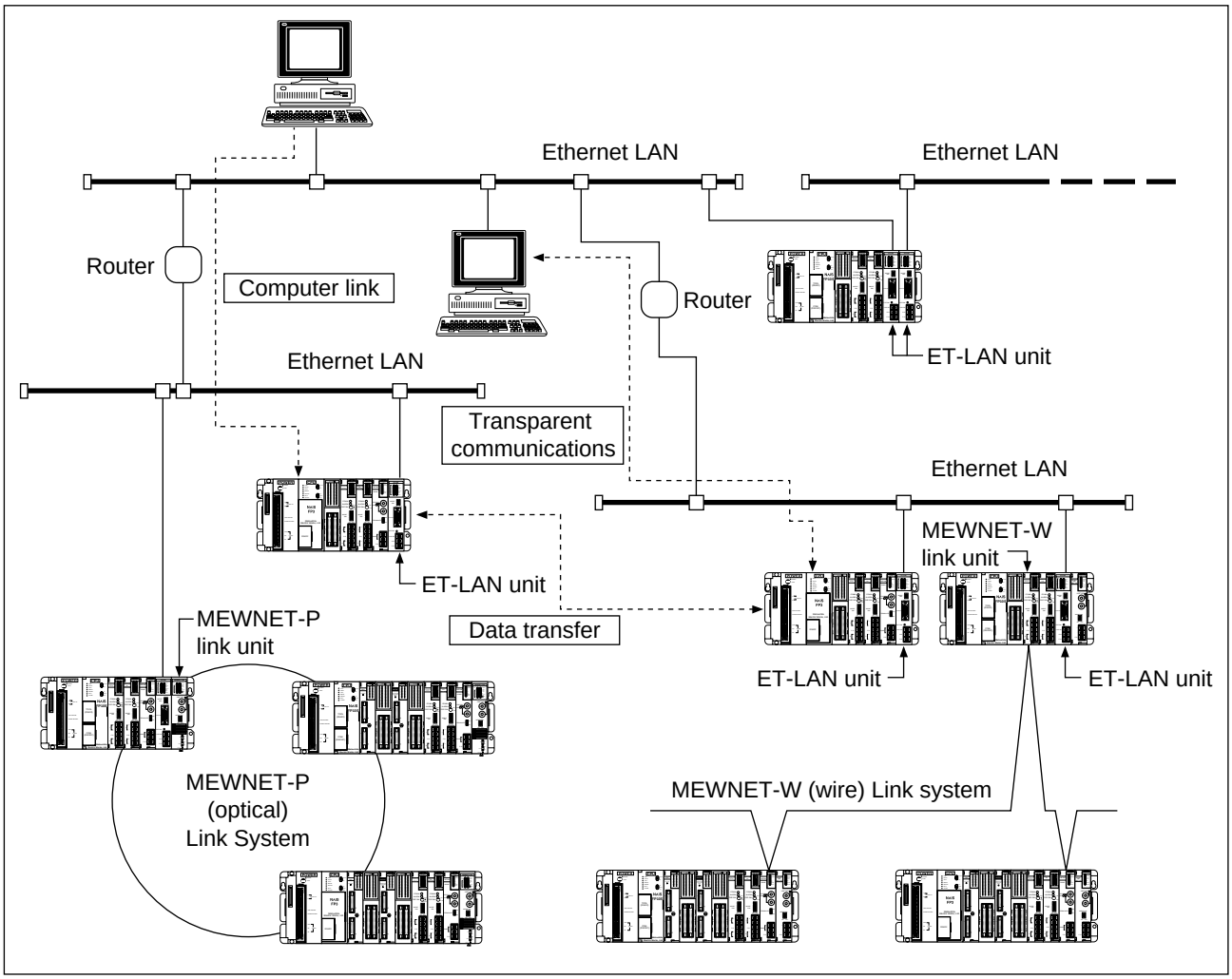
  * For communication with a computer and workstation, a program conforming to the MEWTOCOL-DAT protocol is required.
- Using the transparent communication mode, you can communicate with a computer and workstation in any format you want.
- The ET-LAN unit supports the following self-diagnostic functions, enabling it to respond smoothly even if a program occurs.
  - Hardware and communication status self-diagnosis during operation.
  - Trial operations (test modes 1 and 2) for checking hardware and communication status.
  - An error log function for checking the type of malfunction

Terminology:

- **Connection:** A communication path that is opened with another node using the TCP/IP and UDP/IP protocols. With one ET-LAN unit up to eight simultaneous connections can be opened.

1-2. Network Configurations

When adding the ET-LAN system to conventional link systems, FP3/FP10S series of programmable controllers can be configured as shown in the figure below:



The following three types of communication methods are available by connecting to an Ethernet (10BASE5) LAN using the ET-LAN unit:

- Computer link function (using MEWTOCOL-COM)
- Data transfer function (using MEWTOCOL-DAT)
- Transparent communications

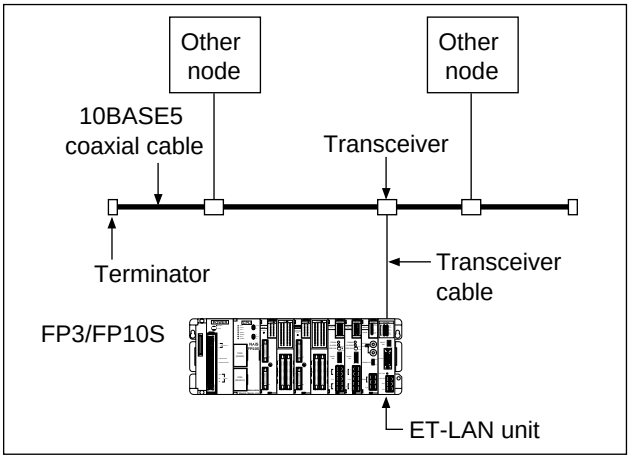
• Since the ET-LAN unit can be used together with other network units, such as MEWNET-W and MEWNET-P link systems, existing networks can be connected to Ethernet (10BASE5) LAN.

Terminology:

• **Router:** A communications station that has the ability to connect to more than one network. A router interprets a received packet IP address and transmits it to another network.

1. Connecting to Ethernet (10BASE5) Network

■ Connecting to Ethernet (10BASE5)

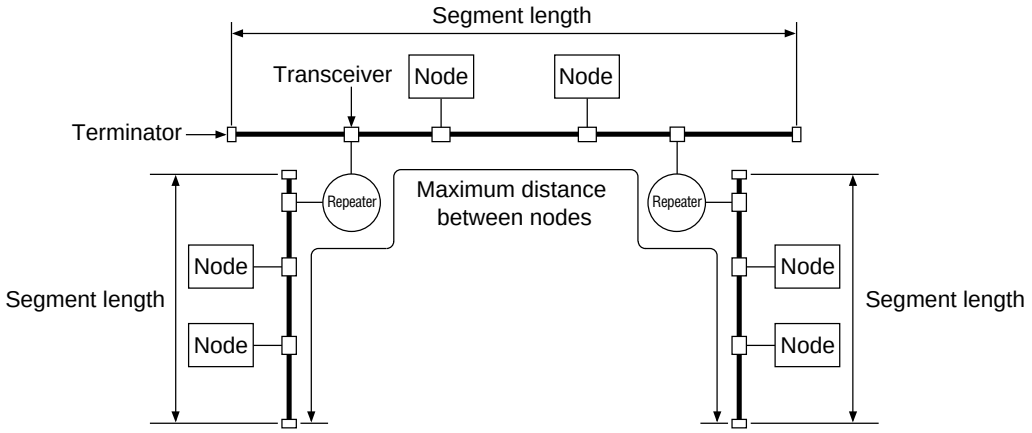


A transceiver and transceiver cable are used to connect to a Ethernet (10BASE5) network. The 12 V DC power for the transceiver is supplied by the power supply terminal on the front panel of the ET-LAN unit.

Item	Ethernet (10BASE5)
Max. distance between nodes	2,500 m/8202.1 ft.
Max. segment length	500 m/1640.4 ft.
Max. number of nodes	100 nodes/segment
Min. distance between nodes	2.5 m/8.2 ft.

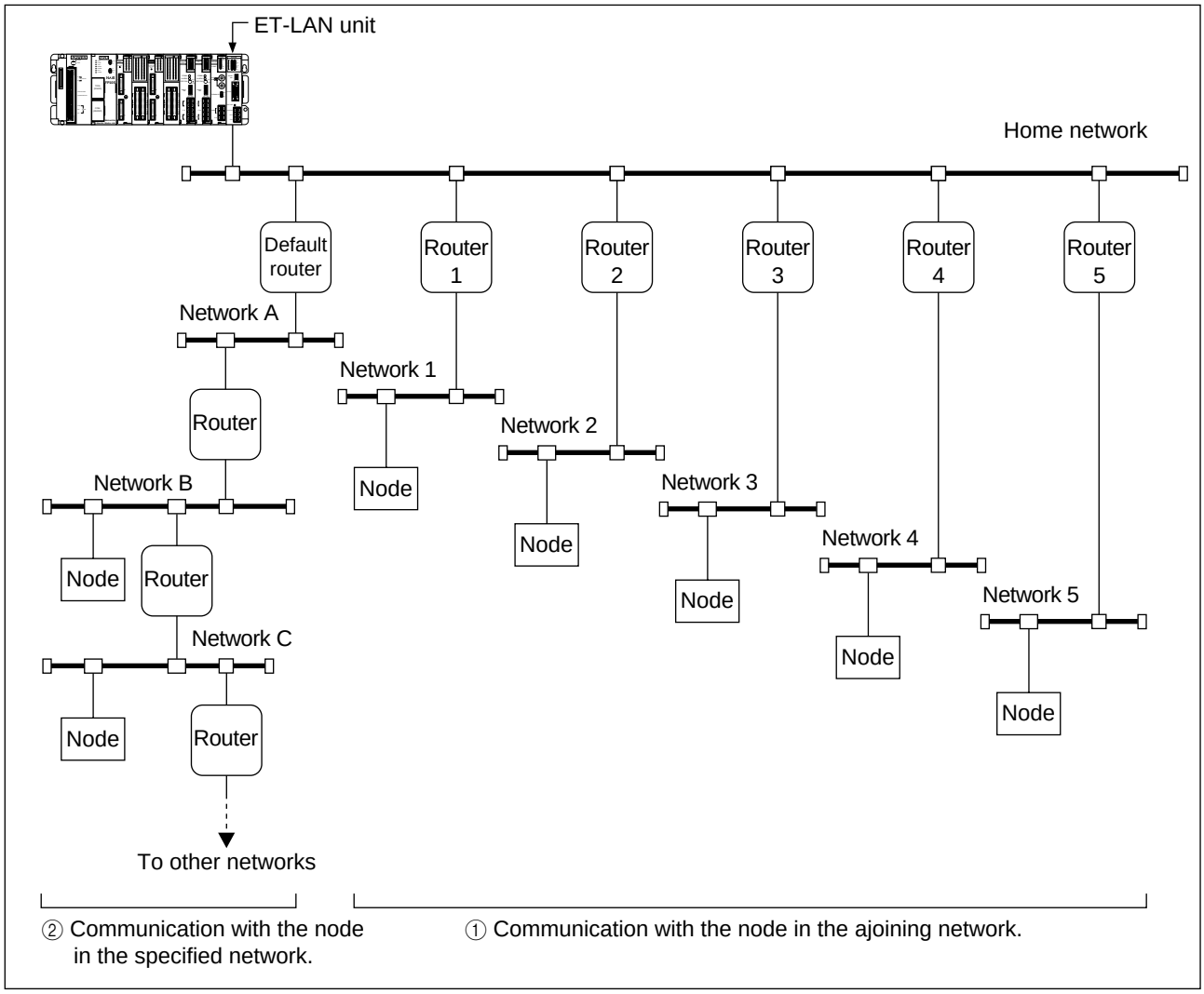
Terminology:

- **Node:** A communications station such as a computer or FP3/FP10S that is connected to a network. Using Ethernet (10BASE5), each node is specified by the IP address.
- **Repeater:** A device that re-sends or relays a signal travelling along a LAN cable. It can remove restrictions to segment lengths.
- **Segment:** Refers to a piece of coaxial cable that is closed on both ends by a terminator. The segment length is the distance between terminators.
- **Max. distance between nodes:**
  The distance between the furthest nodes on the network. If multiple segments are connected using repeaters on the network, then the maximum distance between nodes is longer than any of the segment lengths.



2. Connections between Networks

With Ethernet (10BASE5), you can communicate not only with the node in the home network but also with nodes in other networks as shown below:



• The following two types of routers are available for the ET-LAN unit:

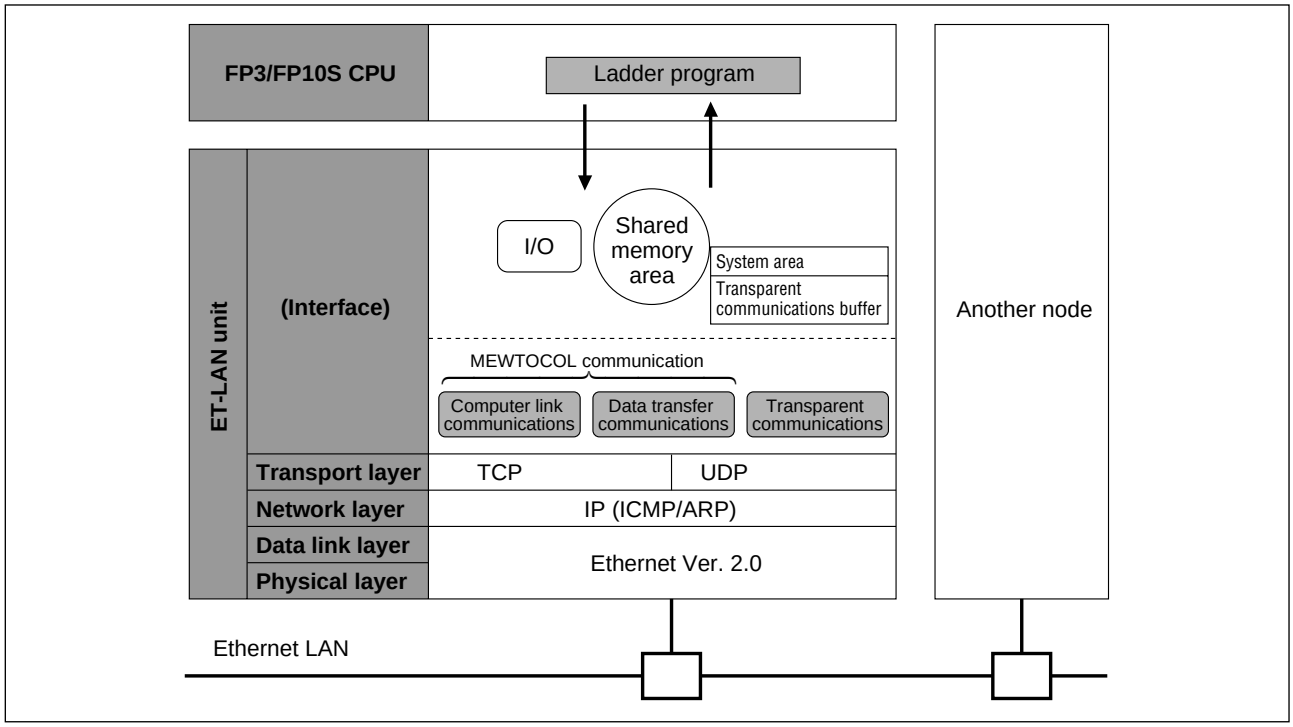
① Communication with the node in the ajoining network (communication via one router):
Up to five routers starting from router 1 through 5 can be registered for ET-LAN unit.
You can communicate with the node in the five ajoining networks through a router.

② Communication with the node in the specified network (communication via the default router):
By using the default router, you can communicate with a node in any network. Only one default router is available for ET-LAN unit. (You can also specify one of routers 1 through 5 as the default router.)

1-3. Overview of Communication Features

1. Basic Configurations of the ET-LAN Unit

The construction of the ET-LAN unit is shown in the figure below. The I/O section and shared memory area are used as the interface to the FP3/FP10S program. A total of eight connections are provided using the computer link, data transfer or transparent communications.



■ Functions of transport layer

In the transport layer of the ET-LAN unit, the following functions are supported:

TCP (Transmission Control Protocol):

• TCP is a connection-based communication method which provides the virtual circuit. In the TCP communication method, since communication services including re-transmission, sequence and flow control for the communication data are provided, high communication reliability is guaranteed at the protocol level.

UDP (User Datagram Protocol):

• UDP is a connectionless communication method which provides only data communication in IP units. In the UDP communication method, since no re-transmission, sequence, or flow control for the communication data is provided, support at the application level is required to guarantee communication reliability.

■ Functions of network layer

In the network layer of the ET-LAN unit, the following functions are supported:

IP (Internet Protocol):

• IP is used to transmit data in units of datagrams to a destination node specified by an IP address. It provides function such as the dividing and reassembling of communication data and communication services between networks via a router.

ICMP (Internet Control Message Protocol):

• ICMP is used to transmit the error message in the network. The ET-LAN unit supports the echo reply option to the ping command.

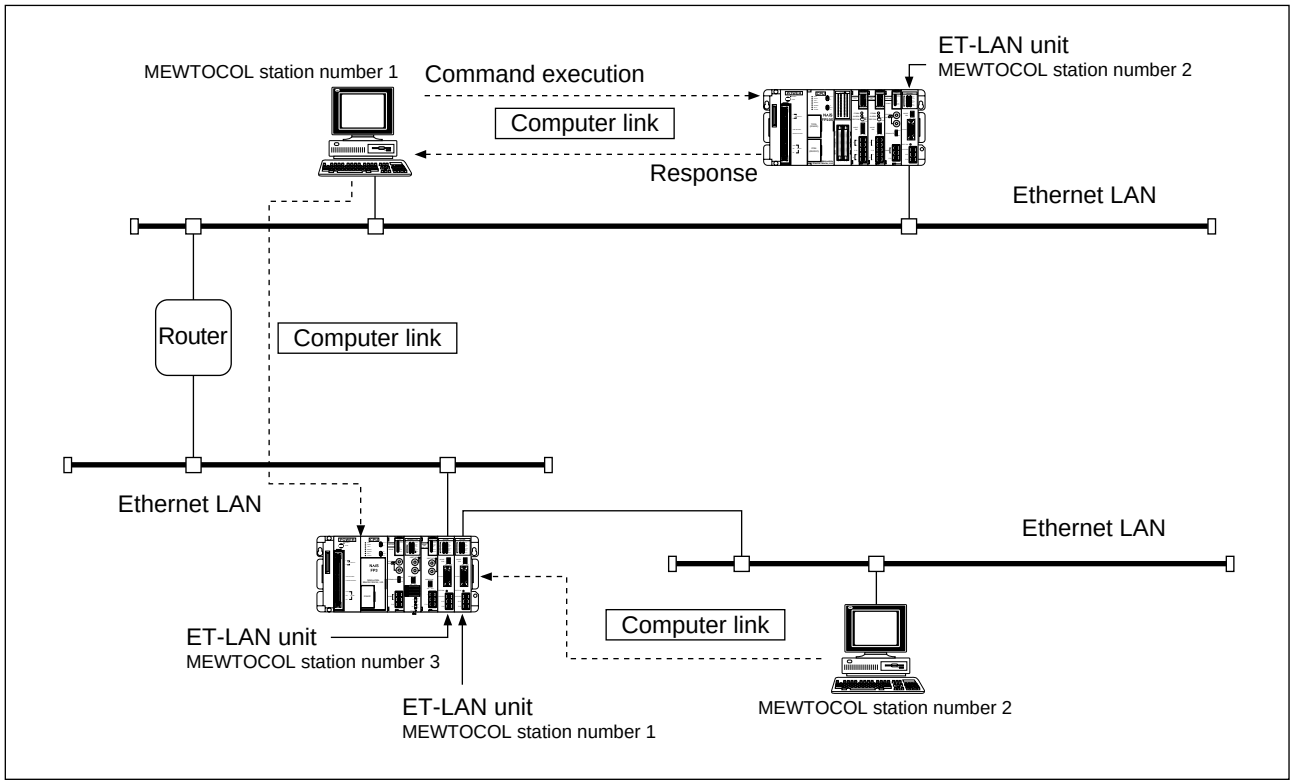
ARP (Address Resolution Protocol):

• ARP is used to transmit the Ethernet (physical) address, which is essential to Ethernet communications, by specifying the IP address. When an ET-LAN unit accesses a station with unknown Ethernet address, you only need to specify its IP address using the broadcast method.

2. Computer Link Function (MEWTOCOL-COM)

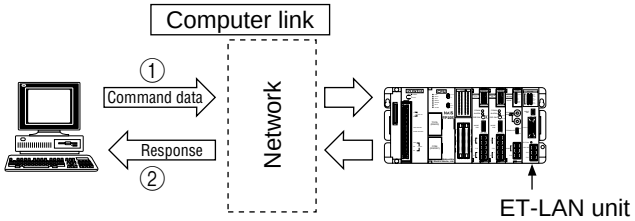
The I/O and register information of the FP3/FP10S can freely be read or written from a high-level computer such as a personal computer or workstation connected to an Ethernet (10BASE5) LAN. In the computer link function, the MEWTOCOL-COM protocol is used for communication. No communication program is required for the FP3/FP10S.

In the computer link, communication is always initiated by a high-level computer.



■ Keys for using the computer link function

- The MEWTOCOL station number for the ET-LAN unit should be specified in the range of 1 to 64 by the initialization, without them overlapping in the same network.
- The FP3/FP10S should open a connection by specifying the IP address and the MEWTOCOL station number of the destination node.
- By issuing the MEWTOCOL-COM formatted message to the FP3/FP10S, a high-level computer can communicate with the FP3/FP10S. Communication is always initiated by a high-level computer:
  ① The high-level computer issues MEWTOCOL-COM command to FP3/FP10S.
  ② The FP3/FP10S will send the response back to the high-level computer.

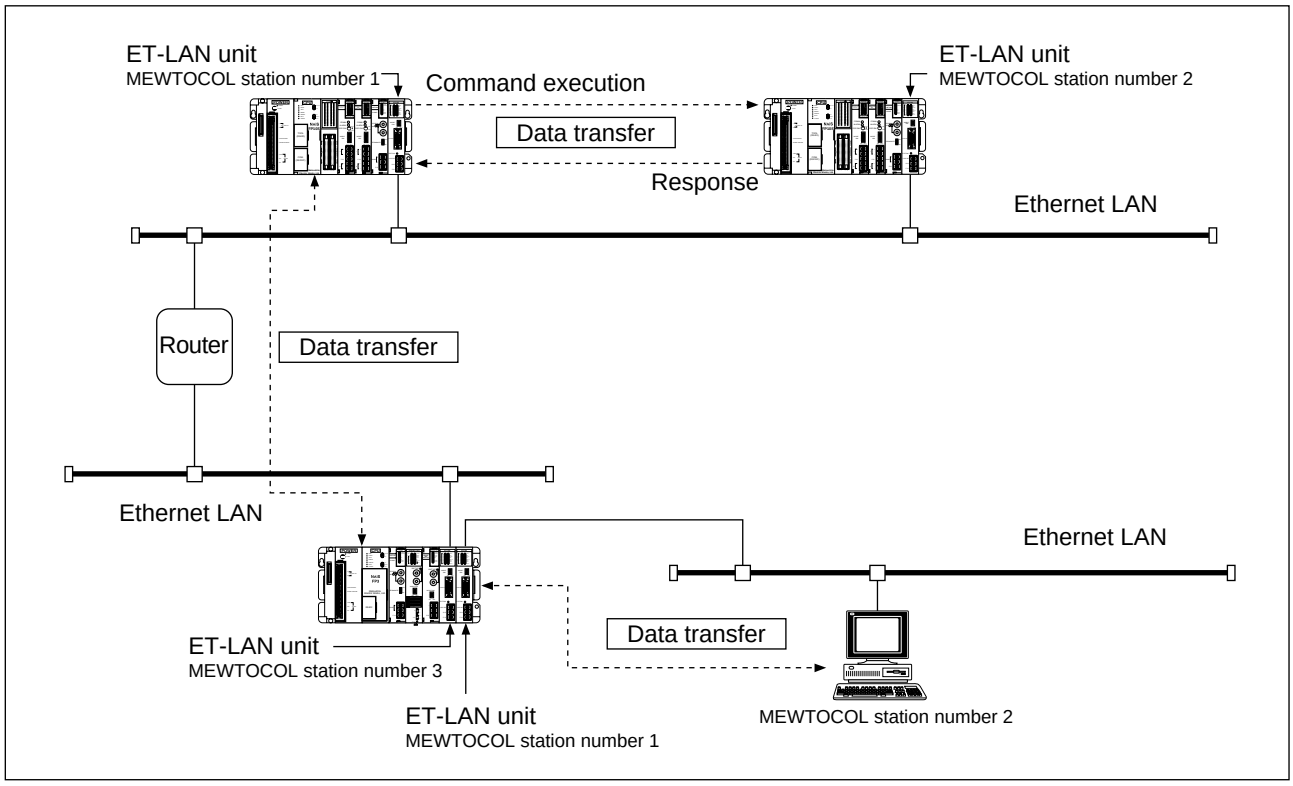


When the FP3/FP10S receives the command data, it automatically returns a response. There is no need to write a communications program for the FP3/FP10S.

- Up to eight connections are available at the same time using the computer link, data transfer and transparent communications.
- Since a maximum of three ET-LAN units can be installed on a single FP3/FP10S, an FP3/FP10S can access up to three Ethernet LANs independently.

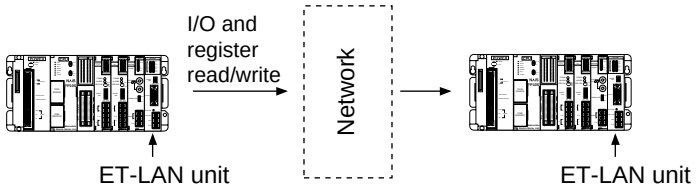
3. Data Transfer Function (MEWTOCOL-DAT)

I/O and register information can be exchanged between FP3/FP10Ses or between an FP3/FP10S and a personal computer or workstation connected to an Ethernet (10BASE5) LAN. With the data transfer function, an FP3/FP10S can read and write the I/O and register information only by executing the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions in the ladder program. If the destination node is an FP3/FP10S in the MEWTOCOL mode, no program is required in the destination node. If the destination node is a computer, you need to prepare a MEWTOCOL-DAT program at that computer.

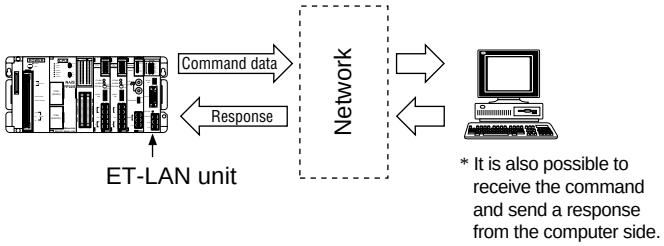


■ Keys for using the data transfer function

- The MEWTOCOL station number for the ET-LAN unit should be specified in the range of 1 to 64 by the initialization, without them overlapping in the same network.
- The FP3/FP10S opens a connection by specifying the IP address and the MEWTOCOL station number of the destination node.
- When communicating between FP3/FP10Ses, information can be exchanged by executing the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions as follows:
  - **F145 (SEND)/P145 (PSEND)** instructions:
    A maximum of 1,020 words of data are written to the destination node.
  - **F146 (RECV)/P146 (PRECV)** instructions:
    A maximum of 1,020 words of data are read from the destination node.



- When an FP3/FP10S communicates with a computer, information can be exchanged using the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions. The computer should send back the response to the FP3/FP10S in the MEWTOCOL-DAT format. A maximum of 1,020 words of data can be handled at a time.



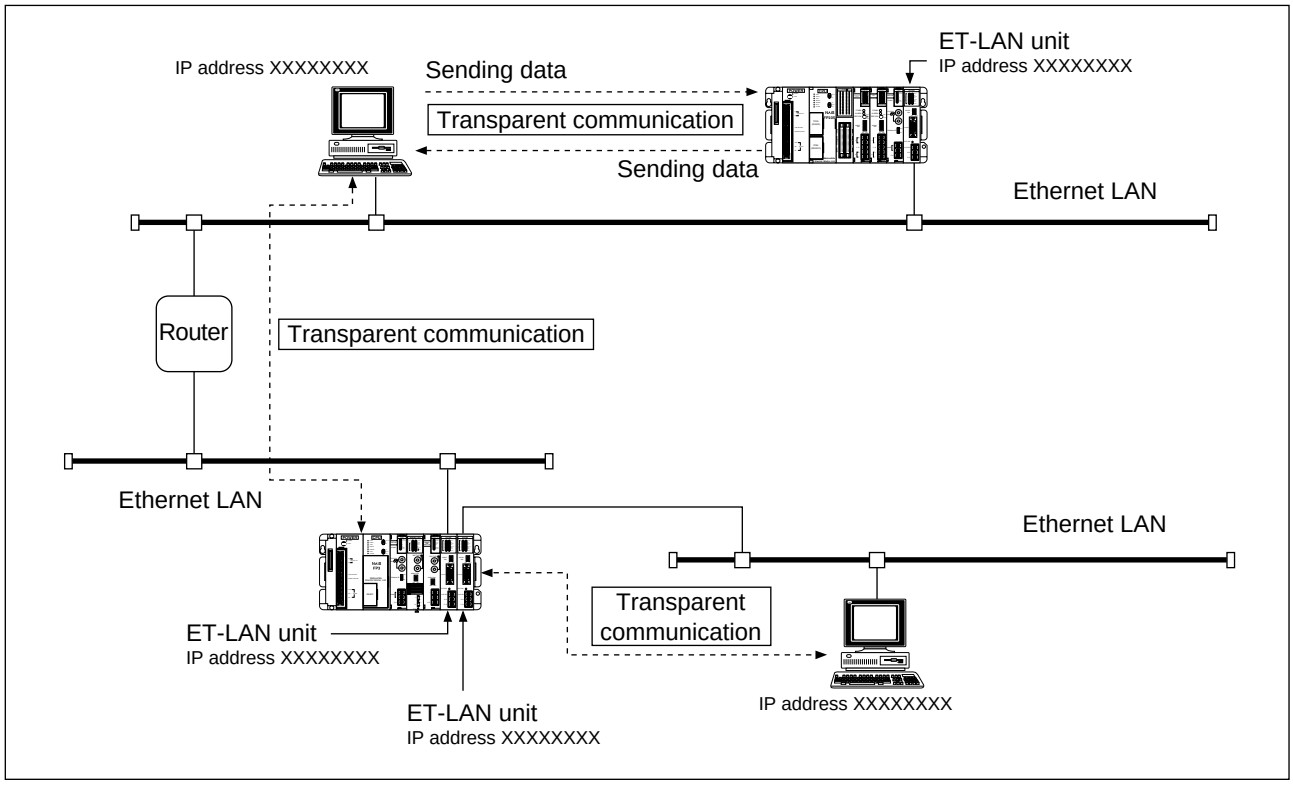
- Up to eight connections are available at the same time using the computer link, data transfer and transparent communications.
- Since a maximum of three ET-LAN units can be installed on a single FP3/FP10S, an FP3/FP10S can access up to three Ethernet LANs independently.

Note:

- When using the data transfer function, the use of the TCP/IP protocol is recommended to prevent communication malfunctions.

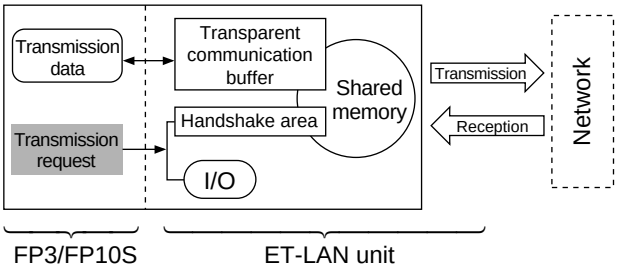
4. Transparent Communication Function

Information can be exchanged between FP3/FP10Ses and between an FP3/FP10S and a computer and workstation connected to an Ethernet (10BASE5) LAN. With the transparent communication function, an FP3/FP10S can communicate with another node regardless of the data format.



■ Keys to using the transparent communication function

- The transparent communication buffer should be allocated for connections used for transparent communications in the initialization stage.
- With transparent communication, open operation should be performed by specifying each destination IP address.
- The FP3/FP10S exchanges data with another node by accessing the shared memory of the ET-LAN unit using the ladder program for control. Actual data exchanges are performed by turning ON or OFF the specified bits for the handshake.



- Up to eight connections are available at the same time using the computer link, data transfer and transparent communications.
- Since a maximum of three ET-LAN units can be installed on a single FP3/FP10S, an FP3/FP10S can access up to three Ethernet LANs independently.

5. Self-diagnostic Functions

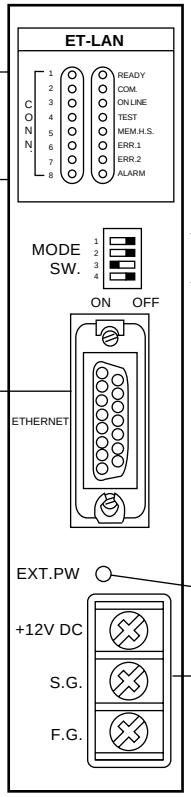
The ET-LAN unit has the following self-diagnostic functions in case something goes wrong.

- **Self-diagnosis of hardware and communication status during operation:**
  The ET-LAN unit is equipped with a function for monitoring and self-diagnosing the operating status of the hardware (CPU, memory, etc.) and communications during operation. The results of the self-diagnostics can be checked via the LEDs on the ET-LAN unit and via the contents of the error log area.
- **Trial operation (test modes 1 and 2) for checking hardware and communication status:**
  The ET-LAN unit is equipped with a test operation mode for checking hardware operation (memory checks and communication operation checks) and to check internal/external loopback. The results of the test mode operation can be checked via the LEDs on the ET-LAN unit and via the contents of the error log area of the shared memory.
- **An error log for checking the type of malfunction:**
  The ET-LAN unit is equipped with an error log function that records the status of hardware problems or communications problems in the order they occur. The contents of the error log can be read from the error log area of the shared memory.

CHAPTER 2

SPECIFICATIONS

2-1. Parts Terminology and Functions



Operation monitor LEDs

(See following page.)

ETHERNET Interface

This is a D-subminiature 15-pin connector used for connecting the ET-LAN unit to a transceiver on an Ethernet (10BASE5) network. The locking fasteners are used to secure the connection.

Mode switches

These switches are used to select the modes of the ET-LAN unit.

Mode switch 1: In the normal mode (when mode switch 4 is set to OFF), be sure to set this switch to OFF. In the test mode (when mode switch 4 is set to ON), test mode 1 or 2 can be selected. The setting of mode switch 1 becomes effective only when power is turned ON. For details about the test modes refer to page 33, “3. Test Mode Setting”.

Mode switch 2: This switch decides the handshake communication method between an FP3/FP10S and an ET-LAN unit. When you select I/O handshake mode, handshake information exchanges between the CPU and the ET-LAN unit can be performed by using I/O points or the **F150 (READ)/P150 (PREAD) and F151 (WRT)/P151 (PWRT)** instructions. When you select memory handshake mode, handshake information exchanges between the CPU and the ET-LAN unit are performed only by using the **F150 (READ)/P150 (PREAD) and F151 (WRT)/P151 (PWRT)** instructions. The setting of mode switch 2 becomes effective only when the power is turned ON. For details about the handshake modes refer to page 25, “1. Handshake Mode Setting”.

Mode switch 3: This switch can disconnect the ET-LAN unit from the network. When the switch is set to OFF, the ET-LAN unit cannot access the network even if the hardware connection is correctly performed. The setting of mode switch 3 becomes effective soon after the setting changes.

Mode switch 4: By setting this switch to ON, you can check the hardware and communication status. The setting of mode switch 4 becomes effective only when power is turned ON. For details about the test modes refer to page 33, “3. Test Mode Setting”.

Switch number	Contents	ON	OFF
1	In normal mode*	———————	Be sure to set this to OFF.
	In test mode	Test mode 2	Test mode 1
2	Handshake mode selector	Memory handshake mode	I/O handshake mode
3	ONLINE/OFFLINE selector	ONLINE	OFFLINE
4	Test/Normal selector	Test mode	Normal mode

* Be sure to set mode switch 1 to OFF when mode switch 4 (Test /Normal selector) is OFF.

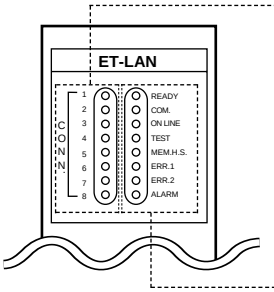
External power supply monitor LED (EXT. PW)

The LED turns ON when 12 V DC is supplied through the external power supply terminals for the ETHERNET (10BASE5) interface.

External power supply terminals for ETHERNET (10BASE5) interface

A 12 V DC power supply should be supplied through the terminals.

■ Operation monitor LEDs



CONN. LEDs 1 through 8:

Each LED shows the condition of each connection as follows:

- ON when the connection with the corresponding number is in the open condition.
- Flashes when an abnormality is detected in the connection with the corresponding number.
- OFF when the connection with the corresponding number is in the not-open condition.

READY LED:

This LED shows the condition for the initialization as follows:

- ON when the initialization has been completed.
- OFF when the initialization has not completed yet.

COM. LED:

This LED shows the data communication condition as follows:

- ON while communicating with another node.
- OFF while not communicating with another node.

ON LINE LED:

This LED shows the mode switch 3 condition as follows:

- ON when the ET-LAN unit is ONLINE mode (when mode switch 3 is ON).
- OFF when the ET-LAN unit is OFFLINE mode (when mode switch 3 is OFF).

TEST LED:

This LED shows whether the ET-LAN unit is operating in the test mode or not.

- ON when the ET-LAN unit is operating in the test mode. If mode switch 4 is ON, the LED turns ON.
- OFF when the ET-LAN unit is operating in the normal mode. If mode switch 4 is OFF, the LED stays OFF.

MEM. H. S. LED:

This LED tells you about the handshake mode as follows:

- ON in the memory handshake mode (when mode switch 2 is ON).
- OFF in the I/O handshake mode (when mode switch 2 is OFF).

ERR. 1 LED:

This LED shows the erroneous condition of the ET-LAN unit as follows:

- ON when an access error occurs.
- Flashes when a transmission error occurs.
- OFF during normal operation or when the request-to-initialize signal is turned OFF.

ERR. 2 LED:

This LED shows erroneous conditions of the ET-LAN unit as follows:

- ON when a system error occurs.
- Flashes when a warning error occurs.
- OFF during normal operation or when the request-to-initialize signal is turned OFF.

ALARM LED:

This LED shows the system condition as follows:

- ON when a system watchdog timer error occurs.
- OFF when condition is normal.

2-2. Specifications

1. General Specifications

Item	Descriptions
Ambient temperature	0 °C to 55 °C/32 °F to 131 °F
Ambient humidity	30% to 85% RH (non-condensing)
Storage temperature	-20 °C to 70 °C/-4 °F to 158 °F
Storage humidity	30 % to 85 % RH (non-condensing)
Unit current consumption (at 5 V DC)	Max. 700 mA
External power supply for ETHERNET (10BASE5) connection	12 V DC (max. 1 A) Voltage drop less than 1 V
Vibration resistance	10 Hz to 55 Hz, 1 cycle/min: double amplitude of 0.75 mm/0.030 in., 10 min on 3 axes
Shock resistance	98 m/s^2 or more, 4 times on 3 axes
Noise immunity	1,000 V p-p with pulse width, 50 ns or 1 µs (based on in-house measurements)
Operating condition	Free from corrosive gases and excessive dust
Weight	Approx. 300 g/10.6 oz.

2. Performance Specifications

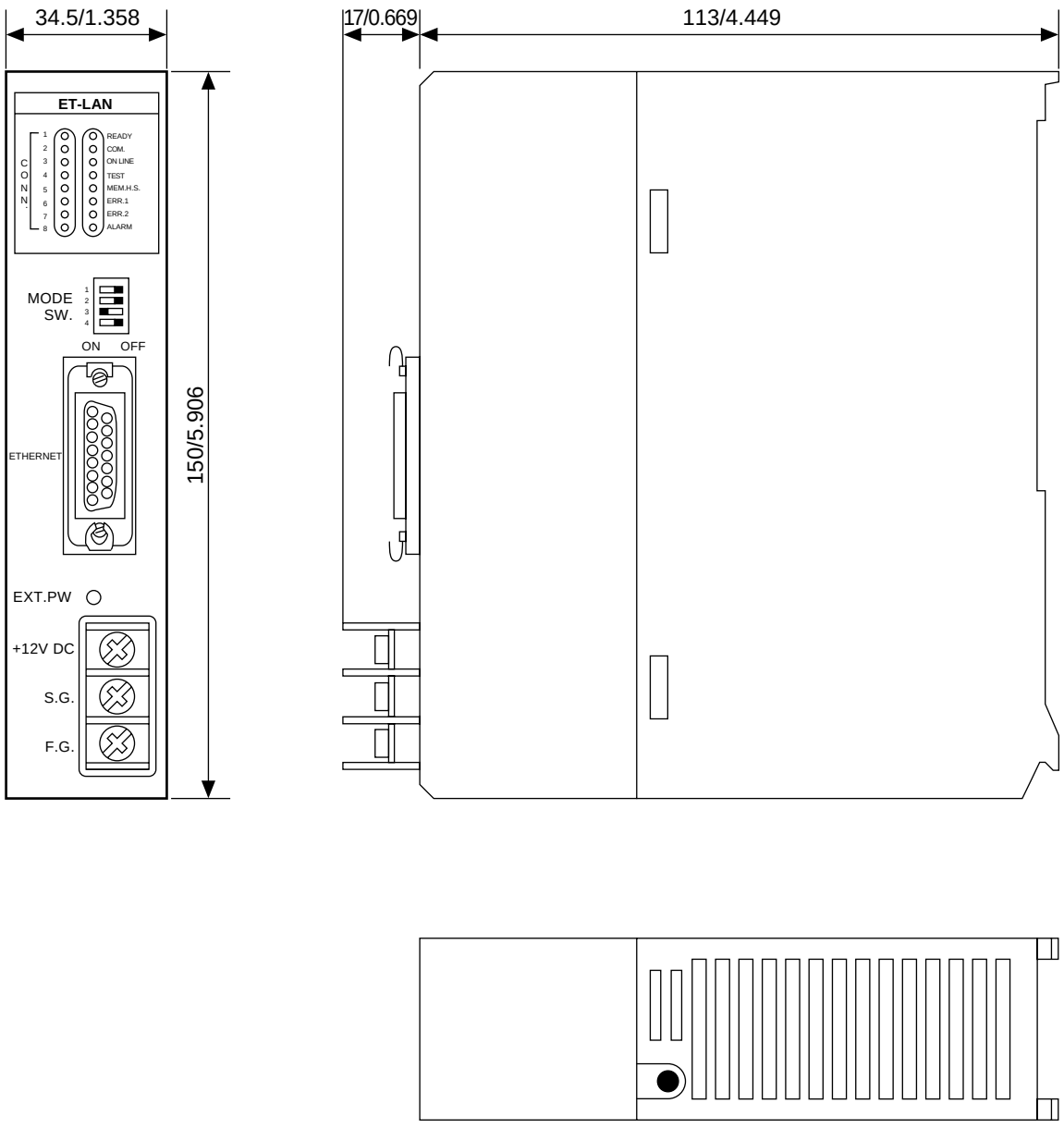
Item		Descriptions
I/O occupation		In I/O handshake mode: 32SX and 32SY In memory handshake mode: 16SE *1 (0SE)
Limitations		Maximum of 3 ET-LAN units on the CPU equipped master backplane (including other high-level link units *2)
Communication function		Computer link (max. 2 K words), data transfer (max. 1,020 words) and transparent communication functions *3
Number of connections per unit		Max. 8 connections
Transparent communications buffer *3	For sending data	Max. 1 K words/connection × 3 connections (default setting)
	For receiving data	Max. 1 K words/connection × 3 connections (default setting)

*1 In the memory handshake mode, you can set the I/O occupation of the unit to 0SE using NPST-GR.
The handshake mode setting can be set by using mode switch 2 on the front panel.
*2 For details about the high-level link units, refer to page 122, “12-1. Standard and High-level Link Units”.
*3 It is possible to assign 6 K words freely to the 8 connections according to your application.

3. Transmission Specifications

Item	Ethernet (10BASE5)
Communication method	Baseband communications
Transmission speed	10 M bps
Maximum distance between nodes	2,500 m/8202.1 ft.
Maximum length between segments	500 m/1640.4 ft.
Maximum number of nodes	100 nodes/segment
Minimum distance between nodes	2.5 m/8.2 ft.

2-3. Dimensions



(unit: mm/in.)

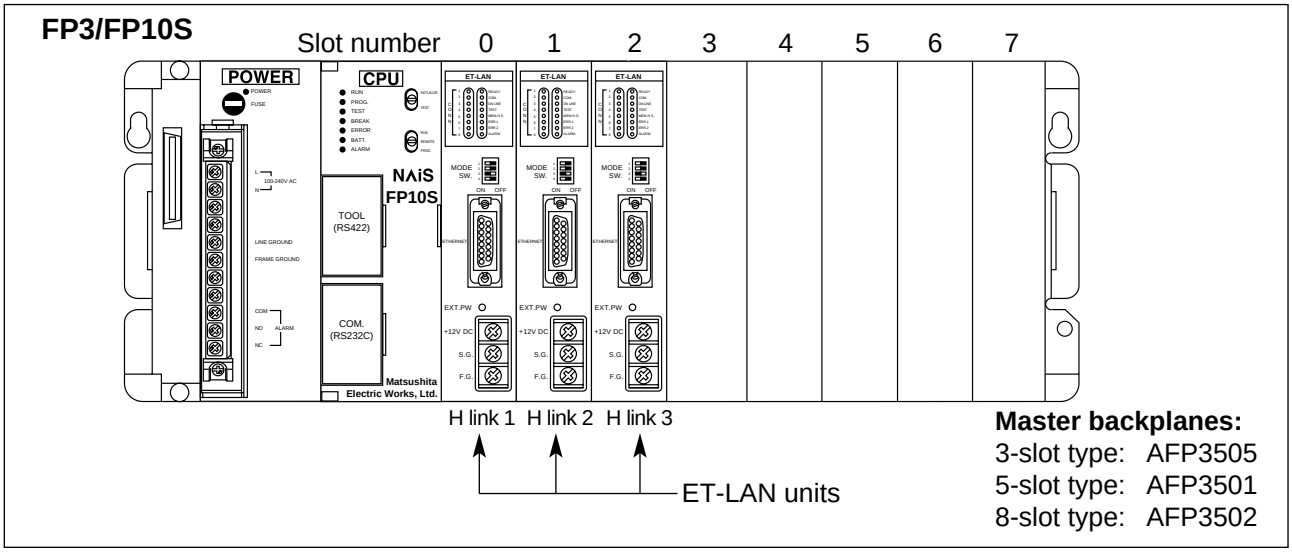
CHAPTER 3

INSTALLATION AND SETTING

3-1. Installing an ET-LAN Unit

1. Basic Configurations

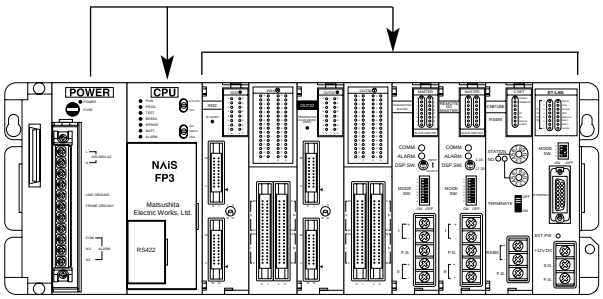
■ Locations and restrictions



- Since the ET-LAN unit is classified as a unit for the high-level link system*, it must follow the following system restrictions:
  - A maximum of three high-level link units*, including ET-LAN units, can be installed on a CPU equipped master backplane.
  - The ET-LAN unit cannot be installed on the expansion backplanes nor on the master backplanes for the slave station of the MEWNET-F system.
  - In order to identify the unit installed, a number is assigned to each high-level link unit* starting from the high-level link unit* nearest to the CPU, for example, H link 1, H link 2 and H link 3 .

  * For details about the high-level link system, refer to page 122, “12-1. Standard and High-level Link Systems”.
- When building up an FP3/FP10S system, be sure to take current consumption into consideration as follows:

The internal power supply (5 V) goes to each unit via the backplane bus.



Power Supply Unit	Rated output current (5 V)
AFP3631	2.4 A
AFP3636	6 A
AFP3634	2.4 A

■ I/O allocation

- I/O allocations for the ET-LAN unit are selected according to the settings of the handshake mode as follows:
  - When mode switch 2 is set to OFF (I/O handshake mode is selected):
    32SX and 32SY are required for each ET-LAN unit.
  - When mode switch 2 is set to ON (memory handshake mode is selected):
    A default setting of 16SE is required for each ET-LAN unit. Using NPST-GR, you can also change I/O allocation 16SE to 0SE.

■ IP and MEWTOCOL station number addressing

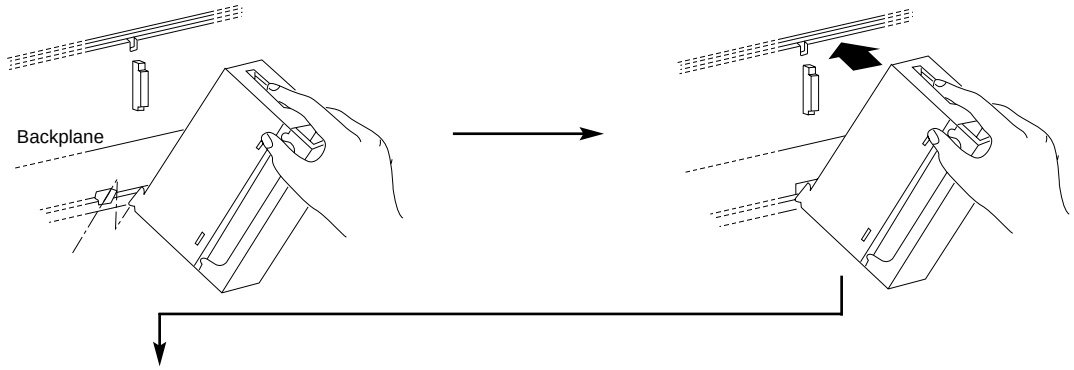
Assigning an IP address to each ET-LAN unit is essential for Ethernet (10BASE5) and the assigning of MEWTOCOL station numbers to each ET-LAN unit is required when using the computer link and data transfer functions. The settings for assigning the IP addresses and MEWTOCOL station numbers for each ET-LAN unit are performed by the initialization.

- **IP address:**
  Set different IP addresses for every ET-LAN unit and computer on the Ethernet LAN. Set different IP addresses even for each ET-LAN unit on the same master backplane when there is more than one installed.
- **MEWTOCOL station number:**
  Set the station number so that it is different from another station number on the same network (subnet). Identical station numbers may exist if they are on different networks.

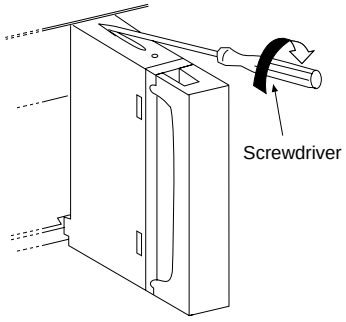
2. How to Install an ET-LAN Unit

Before installing the unit, remove the connector cover on the master backplane.

1. Fit the unit tabs (two) into the unit holes on the backplane.
2. Push the unit in the direction of the arrow and install onto the backplane.



3. After properly installing the unit to the backplane, secure the mounting screw at the top.



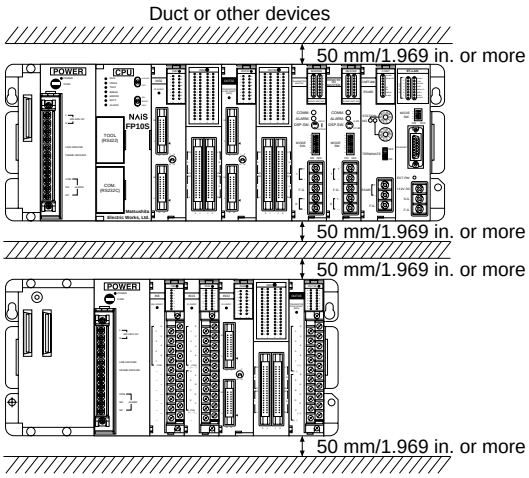
Notes:

- Be sure to turn OFF the power of the FP3/FP10S system before installing units.
- Do not drop the unit or apply excessive force on it.
- Be sure to secure the mounting screw at the top.
- Do not allow parts or other objects to fall into the unit while making wiring connections.
- Leave the dust proofing label on the upper surface of the unit until the wiring is finished.
- Do not touch the connectors on the rear side of the unit. Static electricity may damage the ET-LAN unit.

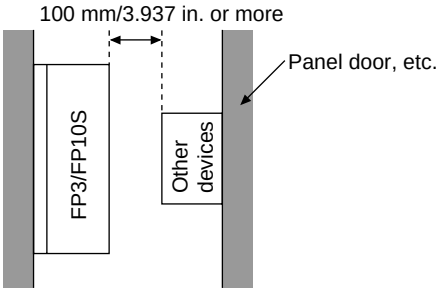
3. Installation Environment

■ Installation space

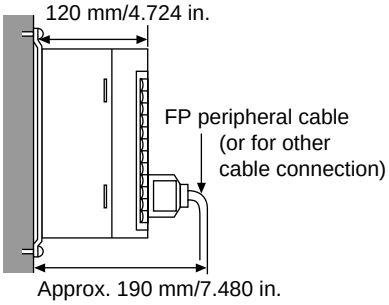
• Leave at least 50 mm/1.969 in. of space between the upper and lower section and the FP3/FP10S system to allow heat to radiate and to facilitate unit replacement.



• When installing devices facing the FP3/FP10S such as on the door of the panel, leave a space of at least 100 mm/3.937 in. between that device and the unit to avoid the effects of heat or radiated noise.



• Although the depth of the unit is 120 mm/4.724 in., leave a space of at least 200 mm/7.874 in. from the mounting surface for tool connections and wiring.



■ Notes on usage

The unit should be used within the following conditions.

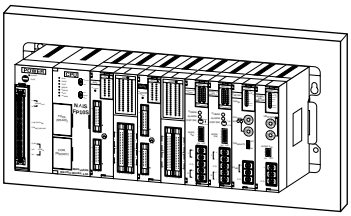
- At ambient temperatures of 0 ˚C to 55 ˚C/32 ˚F to 131 ˚F.
- At ambient humidity of 30 % to 85 % RH.

It should be used in a place where it will not be exposed to:

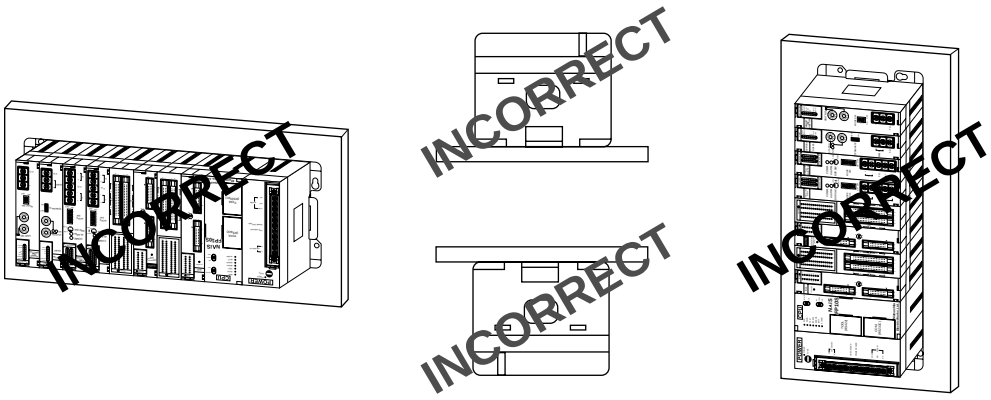
- Sudden temperature change causing dew condensation.
- Inflammable or corrosive gas.
- Excessive airborne dust or iron particles.
- Benzine, paint thinner, alcohol, other organic solvents or strong alkaline solutions of ammonia or caustic soda.
- Excessive vibration or shock.
- Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters or any other equipment that generates high switching surges.
- Water splashes.
- Direct sunlight.

■ Notes on installation

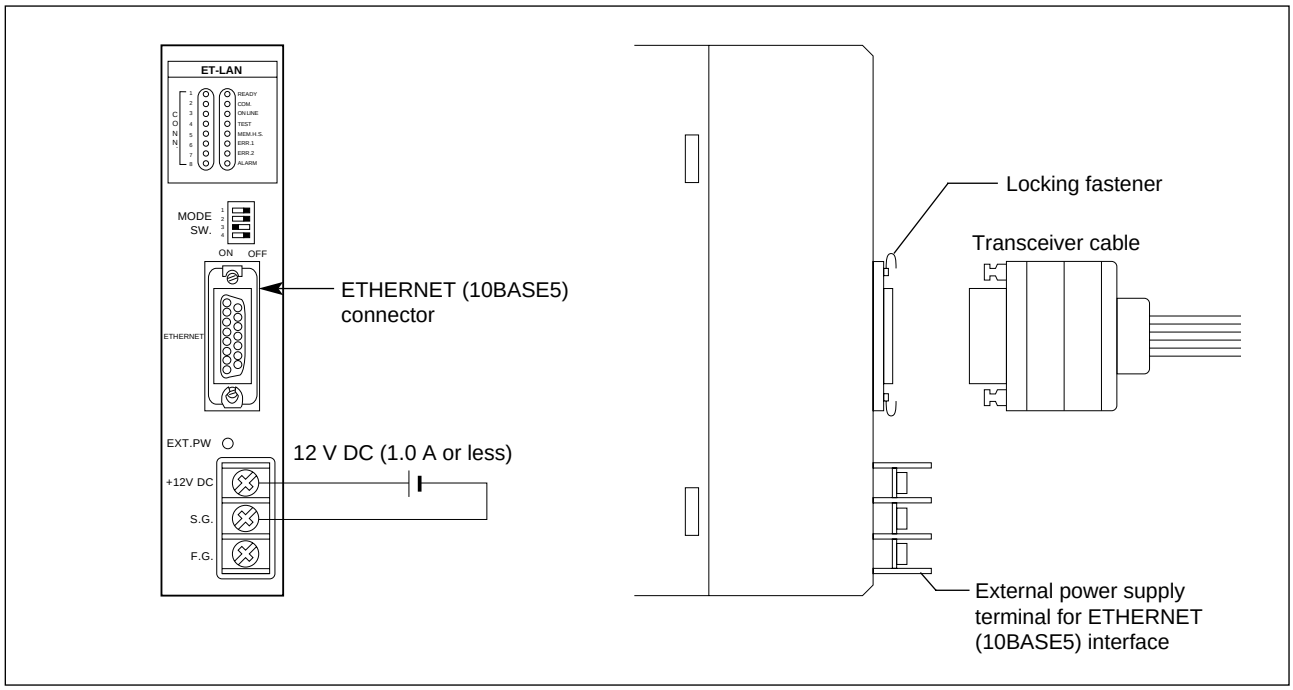
- Do not install the programmable controller vertically or horizontally since it may cause abnormal heat generation within the programmable controller above devices which generate large amounts of heat such as heaters, transformers or power resistors.
- Keep the surface of each unit at least 100 mm/3.937 in. away from power lines and electromagnetic switching devices to prevent the influence of noise radiation. In particular, observe this distance when installing control panel doors.
- Install the unit only as shown below.



- Do not install as shown below.



3-2. Connecting to an Ethernet (10BASE5) LAN



■ Connecting a transceiver cable

- Connect the transceiver cable to the ETHERNET interface of the ET-LAN unit. Then, secure the connection using the locking fasteners.
- Be sure to set a terminator at both ends of the segment.

Notes:

- Be sure to use a transceiver cable that conforms to the IEEE802. 3 standard.
- Use of a transceiver cable less than 5 m/16.4 ft. long is recommended. (The standard maximum length of a transceiver cable is 50 m/164.0 ft. However, in some environments, such as in a factory, a long transceiver cable may cause communication errors.)
- Use of a transceiver cable with a highly reliable connector is recommended.
- Keep the transceiver cable as far as possible away from power transmission lines, high voltage equipment, radio transmitters or any other equipment that generates high switching surges.

■ Supplying 12 V DC to the external power terminals for ETHERNET interface

- 12 V DC should be supplied to the external power supply terminals when the ET-LAN unit is used. It is used to supply power to the transceiver cable.
- Be sure to take voltage drop (max. 1 V) into the consideration when preparing the power.

■ Grounding

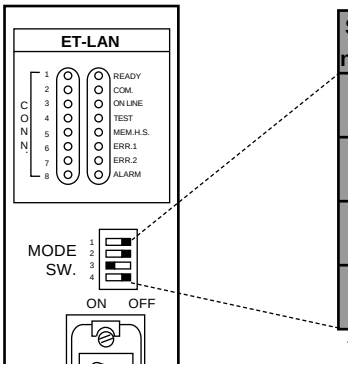
- The frame ground terminal (F.G.) of the ET-LAN unit and the base of the ETHERNET (10BASE5) interface are internally connected to each other. Be sure to ground the frame ground terminal (F.G.) together with the frame ground terminal (F.G.) of the power supply unit.

Note:

- Be sure to contact a professional for transceiver and transceiver cable installation. Incorrect installation will lead to network failure.

3-3. Mode Setting

The basic operation modes for the ET-LAN unit are selected by setting mode switches 1 to 4 as shown in the table below.



Switch number	Contents	ON	OFF
1	In normal mode*	———————	Be sure to set this to OFF.
	In test mode	Test mode 2	Test mode 1
2	Handshake mode selector	Memory handshake mode	I/O handshake mode
3	ONLINE/OFFLINE selector	ONLINE	OFFLINE
4	Test/Normal selector	Test mode	Normal mode

* Be sure to set mode switch 1 to OFF when mode switch 4 (Test /Normal selector) is OFF.

Mode switch 1: In the normal mode (when mode switch 4 is set to OFF), be sure to set this switch to OFF. In the test mode (when mode switch 4 is set to ON), test mode 1 or 2 can be selected. For details about the settings, refer to page 33, “3. Test Mode Setting”.

Mode switch 2: This switch decides the handshake communication mode between an FP3/FP10S and an ET-LAN unit. When you select I/O handshake mode, communication between the CPU and the ET-LAN unit can be performed by using the I/O points or the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions. When you select memory handshake mode, the CPU can communicate with the ET-LAN unit only by using the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions. For details about the settings, refer to the following section “1. Handshake Mode Setting”.

Mode switch 3: This switch can disconnect the ET-LAN unit from the network. When the switch is set to OFF, the ET-LAN unit cannot access the network even if the hardware connection is correctly performed. For details about the settings, refer to page 33 “2. ONLINE/OFFLINE Mode Setting”.

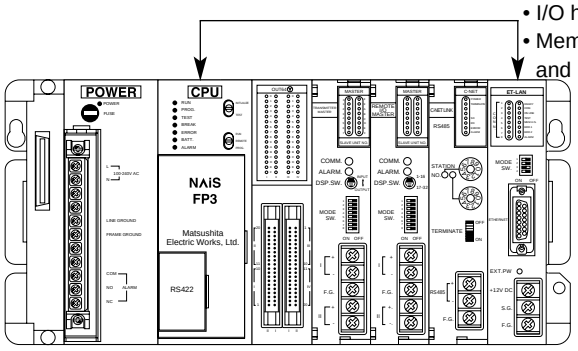
Mode switch 4: By setting this switch to ON, you can check the hardware and communication status. For details about the settings, refer to page 33 “3. Test Mode Setting”.

1. Handshake Mode Setting

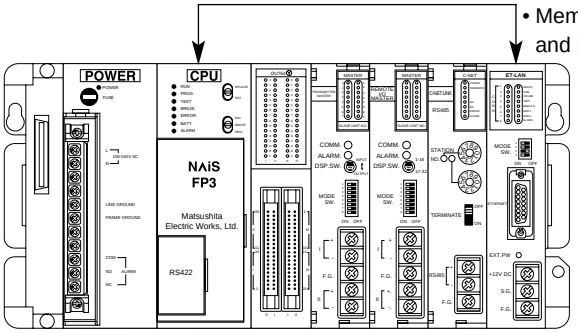
The handshake mode setting can be performed by turning mode switch 2 ON or OFF:

- **I/O handshake mode (setting the mode switch 2 to OFF):**

  In the I/O handshake mode, handshake information exchange can be performed using both I/O and memory handshake communication. If the I/O handshake mode is selected, 32SX and 32SY are allocated for an ET-LAN unit.



• **Memory handshake mode (setting the mode switch 2 to ON):**
In the memory handshake mode, handshake information exchange can be performed using only memory handshake communication. If the memory handshake mode is selected, 16SE is allocated for an ET-LAN unit. By using NPST-GR, you can also set the allocation to 0SE.



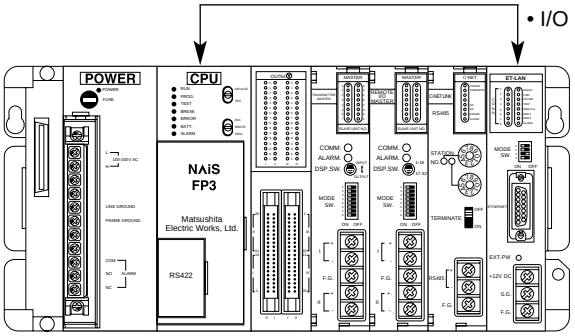
Notes:

- Since the handshake mode setting is updated at the moment the power of the FP3/FP10S system turns ON, turn the power of the FP3/FP10S OFF and then ON to change it.
- When changing handshake modes, be sure to also change the I/O allocation map for the system, according to the revision.
- For details about I/O and memory handshake communication, refer to the following sections.

1) I/O and Memory Handshake Communication

Basic information exchange between a CPU and an ET-LAN unit, such as initialization and connection open triggers and status monitoring, is referred to as handshake information exchange. Two types of handshake information exchange between an FP3/FP10S and an ET-LAN unit are available, as follows:

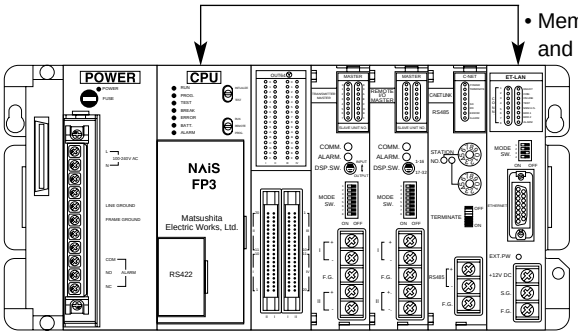
• **I/O handshake communications:**
With I/O handshake communication, handshake information exchange is performed by turning ON the external output relays Y and monitoring the status of the external input relays X allocated for the ET-LAN unit. The external input relays are used by the CPU to monitor the ET-LAN unit status and the external output relays Y are used to trigger the event to the ET-LAN unit.
Handshake information exchanges available using I/O handshake communication are:
- All the handshake communication types for MEWTOCOL communication,
- All the handshake communication types for transparent communication of connections 1 through 3.
- Open operation for transparent communication of connections 4 through 8.



Notes:

- With I/O handshake communication, handshake information exchange for sending and receiving data through connections 4 through 8 cannot be performed.
- Since all of external output relays Y are used for controlling connections during I/O handshake communication, all connections are closed when the mode of the FP3/FP10S is changed from RUN to PROG.

• **Memory handshake communication:**
With memory communications, handshake information exchange is performed by accessing the system setting area of the ET-LAN unit shared memory with the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions. The **F150 (READ)/P150 (PREAD)** instructions read the conditions of the ET-LAN unit shared memory and the **F151 (WRT)/P151 (PWRT)** instructions write the settings there. Using memory communication, all basic communication types can be changed.



Note:

• Even if the mode of the FP3/FP10S is changed from RUN to PROG., the settings for the shared memory of the ET-LAN unit are kept. Since shared memory is used for controlling connections during memory handshake communication, all connections are maintained as they were in the RUN mode when the mode of the FP3/FP10S is changed from RUN to PROG. For cautions about changing the FP3/FP10S mode from PROG. to RUN, refer to page 32, "■ Cautions when using memory handshake communication".

■ Available functions for I/O and memory handshake communications

Type of communication	Using I/O handshake communication	Using memory handshake communication
MEWTOCOL communication	All handshake information exchange types for connections 1 through 8 are available.	All handshake information exchange types for connections 1 through 8 are available.
Transparent communication	All handshake information exchange types for connections 1 through 3 are available.	
	All the handshake information exchange* types for connections 4 through 8 are not available.	

* Open operations for connections 4 through 8 with transparent communication can be performed using I/O handshake communication. However, operations for sending and receiving data cannot be controlled.

2) Specifications for I/O Handshake Communication

External input and output relays used for I/O handshake communication are specified by the I/O allocated for the ET-LAN unit. In this manual, explanations are based on the assumption that an ET-LAN unit is installed in slot number 0 and WX0, WX1, WY2 and WY3 and are allocated to it.

■ Specifications of external input relays X (signals from the ET-LAN unit)

Address	Description		Address	Description	
X0	Signals for connection 1	Wait-to-receive signal	X10	Signals for connection 1	Complete-to-open signal
X1		Complete-to-receive signal	X11		Open error signal
X2		Complete-to-send signal	X12	Signals for connection 2	Complete-to-open signal
X3		Send error signal	X13		Open error signal
X4	Signals for connection 2	Wait-to-receive signal	X14	Signals for connection 3	Complete-to-open signal
X5		Complete-to-receive signal	X15		Open error signal
X6		Complete-to-send signal	X16	Signals for connection 4	Complete-to-open signal
X7		Send error signal	X17		Open error signal
X8	Signals for connection 3	Wait-to-receive signal	X18	Signals for connection 5	Complete-to-open signal
X9		Complete-to-receive signal	X19		Open error signal
XA		Complete-to-send signal	X1A	Signals for connection 6	Complete-to-open signal
XB		Send error signal	X1B		Open error signal
XC	Complete-to-initialize signal		X1C	Signals for connection 7	Complete-to-open signal
XD	Initialize error signal		X1D		Open error signal
XE	I/O handshake mode signal		X1E	Signals for connection 8	Complete-to-open signal
XF	Error logging complete signal		X1F		Open error signal

Note:

- Wait-to-receive, complete-to-receive, complete-to-send and send error signals are used only for transparent communication. For MEWTOCOL communication using MEWTOCOL-COM or MEWTOCOL-DAT, they are not used. For details about usage, refer to page 89, “CHAPTER 9. TRANSPARENT COMMUNICATION FUNCTION”.

■ Specifications of external output relays Y (signals to the ET-LAN unit)

Address	Description		Address	Description	
Y20	Signals for connection 1	Request-to-receive signal	Y30	Signals for connection 1	Request-to-open signal
Y21		————————	Y31		————————
Y22		Request-to-send signal	Y32	Signals for connection 2	Request-to-open signal
Y23		————————	Y33		————————
Y24	Signals for connection 2	Request-to-receive signal	Y34	Signals for connection 3	Request-to-open signal
Y25		————————	Y35		————————
Y26		Request-to-send signal	Y36	Signals for connection 4	Request-to-open signal
Y27		————————	Y37		————————
Y28	Signals for connection 3	Request-to-receive signal	Y38	Signals for connection 5	Request-to-open signal
Y29		————————	Y39		————————
Y2A		Request-to-send signal	Y3A	Signals for connection 6	Request-to-open signal
Y2B		————————	Y3B		————————
Y2C	Request-to-initialize signal		Y3C	Signals for connection 7	Request-to-open signal
Y2D	————————		Y3D		————————
Y2E	ERR. LED no-flash signal		Y3E	Signals for connection 8	Request-to-open signal
Y2F	Error logging request signal		Y3F		————————

Notes:

- Request-to-receive and request-to-send signals are used only for transparent communication. For MEWTOCOL communication using MEWTOCOL-COM or MEWTOCOL-DAT, they are not used. For details about usage, refer to page 89, “CHAPTER 9. TRANSPARENT COMMUNICATION FUNCTION”.
- Request-to-receive and request-to-send signals for connections 4 through 8 are not available in I/O handshake communication.
- When “ERR. LED not-flash signal Y2E” is turned ON, the ERR. 1 and 2 LEDs, which are flashing, are turned OFF. If the “ERR. LED non-flash signal ” is ON, the ERR. 1 and 2 LEDs do not flash if an error such as a transmission or warning error occurs. However, this function does not affect the error log functions.

3) Specifications for Memory Handshake Communication

The memory handshake area of the ET-LAN unit shared memory is used for memory handshake communication. The memory handshake area is allocated in address H360 through H37F of the ET-LAN unit shared memory bank H0 and in the memory handshake area. The areas below are used for communication as follows:

- H360 and H361: Complete signal area for monitoring the basic status of the ET-LAN unit
- H364 and H365: Expanded complete signal area for monitoring the connection status of the ET-LAN unit
- H368 and H369: Request signal area for setting the basic status of the ET-LAN unit
- H36C and H36D: Expanded request signal area for setting the connection status of the ET-LAN unit

■ H360 and H361 of bank H0 (complete signal area for monitoring basic status of the ET-LAN unit)

H360 bit position	Description		H361 bit position	Description	
0	Signals for connection 1	Wait-to-receive signal	0	Signals for connection 1	Complete-to-open signal
1		Complete-to-receive signal	1		Open error signal
2		Complete-to-send signal	2	Signals for connection 2	Complete-to-open signal
3		Send error signal	3		Open error signal
4	Signals for connection 2	Wait-to-receive signal	4	Signals for connection 3	Complete-to-open signal
5		Complete-to-receive signal	5		Open error signal
6		Complete-to-send signal	6	Signals for connection 4	Complete-to-open signal
7		Send error signal	7		Open error signal
8	Signals for connection 3	Wait-to-receive signal	8	Signals for connection 5	Complete-to-open signal
9		Complete-to-receive signal	9		Open error signal
10		Complete-to-send signal	10	Signals for connection 6	Complete-to-open signal
11		Send error signal	11		Open error signal
12	Complete-to-initialize signal		12	Signals for connection 7	Complete-to-open signal
13	Initialize error signal		13		Open error signal
14	I/O handshake mode signal		14	Signals for connection 8	Complete-to-open signal
15	Error logging complete signal		15		Open error signal

■ H364 and H365 bank H0 (expanded complete signal area for monitoring connection status of the ET-LAN unit)

H364 bit position	Description		H365 bit position	Description	
0	Signals for connection 1	Wait-to-receive signal	0	Signals for connection 5	Wait-to-receive signal
1		Complete-to-receive signal	1		Complete-to-receive signal
2		Complete-to-send signal	2		Complete-to-send signal
3		Send error signal	3		Send error signal
4	Signals for connection 2	Wait-to-receive signal	4	Signals for connection 6	Wait-to-receive signal
5		Complete-to-receive signal	5		Complete-to-receive signal
6		Complete-to-send signal	6		Complete-to-send signal
7		Send error signal	7		Send error signal
8	Signals for connection 3	Wait-to-receive signal	8	Signals for connection 7	Wait-to-receive signal
9		Complete-to-receive signal	9		Complete-to-receive signal
10		Complete-to-send signal	10		Complete-to-send signal
11		Send error signal	11		Send error signal
12	Signals for connection 4	Wait-to-receive signal	12	Signals for connection 8	Wait-to-receive signal
13		Complete-to-receive signal	13		Complete-to-receive signal
14		Complete-to-send signal	14		Complete-to-send signal
15		Send error signal	15		Send error signal

Notes:

- Wait-to-receive, complete-to-receive, complete-to-send and send error signals are used only for transparent communication. For MEWTOCOL communication using MEWTOCOL-COM or MEWTOCOL-DAT, they are not used. For details about usage, refer to page 89, “CHAPTER 9. TRANSPARENT COMMUNICATION FUNCTION”.
- The wait-to-receive, complete-to-send and send error signals for connections 1 through 3 can be monitored by using either H360 or H364.

■ H368 and H369 of bank H0 (request signal area for setting the basic status of the ET-LAN unit)

H368 bit position	Description		H369 bit position	Description	
0	Signals for connection 1	Request-to-receive signal	0	Signals for connection 1	Request-to-open signal
1		————————	1		————————
2		Request-to-send signal	2	Signals for connection 2	Request-to-open signal
3		————————	3		————————
4	Signals for connection 2	Request-to-receive signal	4	Signals for connection 3	Request-to-open signal
5		————————	5		————————
6		Request-to-send signal	6	Signals for connection 4	Request-to-open signal
7		————————	7		————————
8	Signals for connection 3	Request-to-receive signal	8	Signals for connection 5	Request-to-open signal
9		————————	9		————————
10		Request-to-send signal	10	Signals for connection 6	Request-to-open signal
11		————————	11		————————
12	Request-to-initialize signal		12	Signals for connection 7	Request-to-open signal
13	————————		13		————————
14	ERR. LED no-flash signal		14	Signals for connection 8	Request-to-open signal
15	Error logging request signal		15		————————

■ H36C and H36D bank H0 (expanded request signal area for setting the connection status of the ET-LAN unit)

H36C bit position	Description		H36D bit position	Description	
0	Signals for connection 1	Request-to-receive signal	**0**	Signals for connection 5	Request-to-receive signal
1		————————	**1**		————————
2		Request-to-send signal	**2**		Request-to-send signal
3		————————	**3**		————————
4	Signals for connection 2	Request-to-receive signal	**4**	Signals for connection 6	Request-to-receive signal
5		————————	**5**		————————
6		Request-to-send signal	**6**		Request-to-send signal
7		————————	**7**		————————
8	Signals for connection 3	Request-to-receive signal	**8**	Signals for connection 7	Request-to-receive signal
9		————————	**9**		————————
10		Request-to-send signal	**10**		Request-to-send signal
11		————————	**11**		————————
12	Signals for connection 4	Request-to-receive signal	**12**	Signals for connection 8	Request-to-receive signal
13		————————	**13**		————————
14		Request-to-send signal	**14**		Request-to-send signal
15		————————	**15**		————————

Notes:

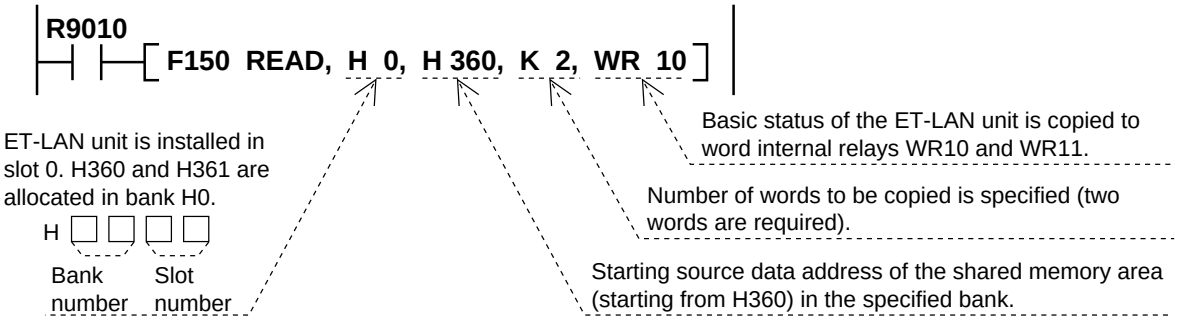
- Request-to-receive and request-to-send signals are used only for transparent communication. For MEWTOCOL communication using MEWTOCOL-COM or MEWTOCOL-DAT, they are not used. For details about usage, refer to page 89, “CHAPTER 9. TRANSPARENT COMMUNICATION FUNCTION”.
- Request-to receive and request-to-send signals for connections 1 through 3 can be set by using either H368 or H36C.
- When “ERR. LED not-flash signal (bit position 14 of H368)” is turned ON, the ERR. 1 and 2 LEDs, which are flashing, are turned OFF. If “ERR. LED non-flash signal” is ON, the ERR. 1 and 2 LEDs do not flash if an error such as a transmission or warning error occurs. However, this function does not affect the error log functions.

■ How to access the memory handshake area

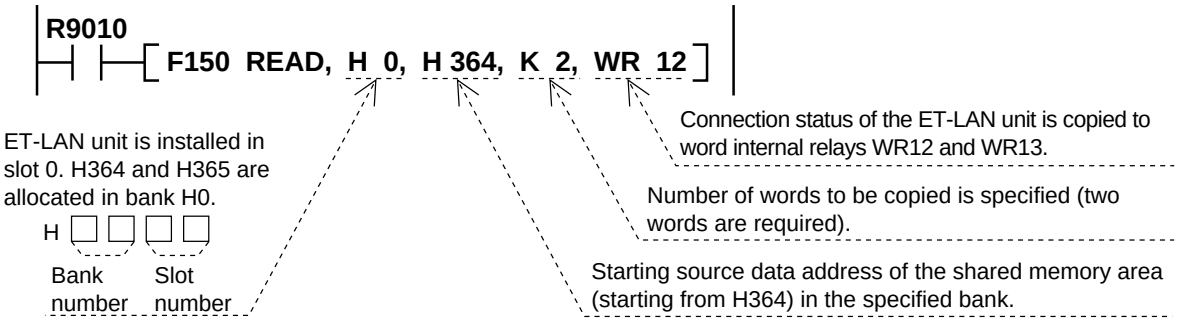
Memory handshake communications are performed by using the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions as shown in the examples* below:

* In the examples, the explanations are based on the assumption that an ET-LAN unit is installed in slot number 0.

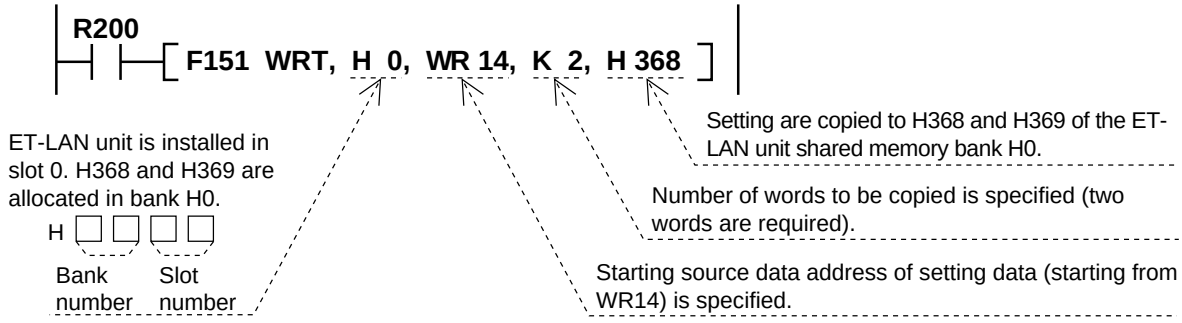
① **Reading the complete signal area for monitoring basic condition of the ET-LAN unit (H360 and H361 of bank H0)**



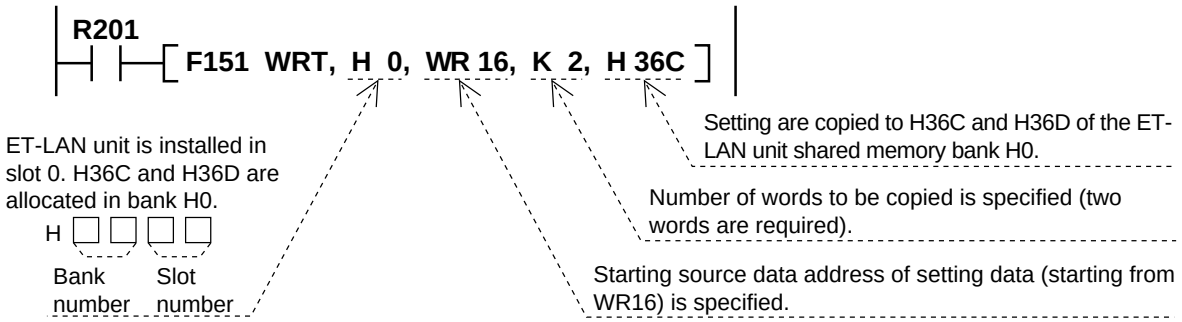
② **Reading the expanded complete signal area for monitoring the connection status of the ET-LAN unit (H364 and H365 of bank H0)**



③ **Updating the request signal area for setting the basic status of the ET-LAN unit (H368 and H369 of bank H0)**

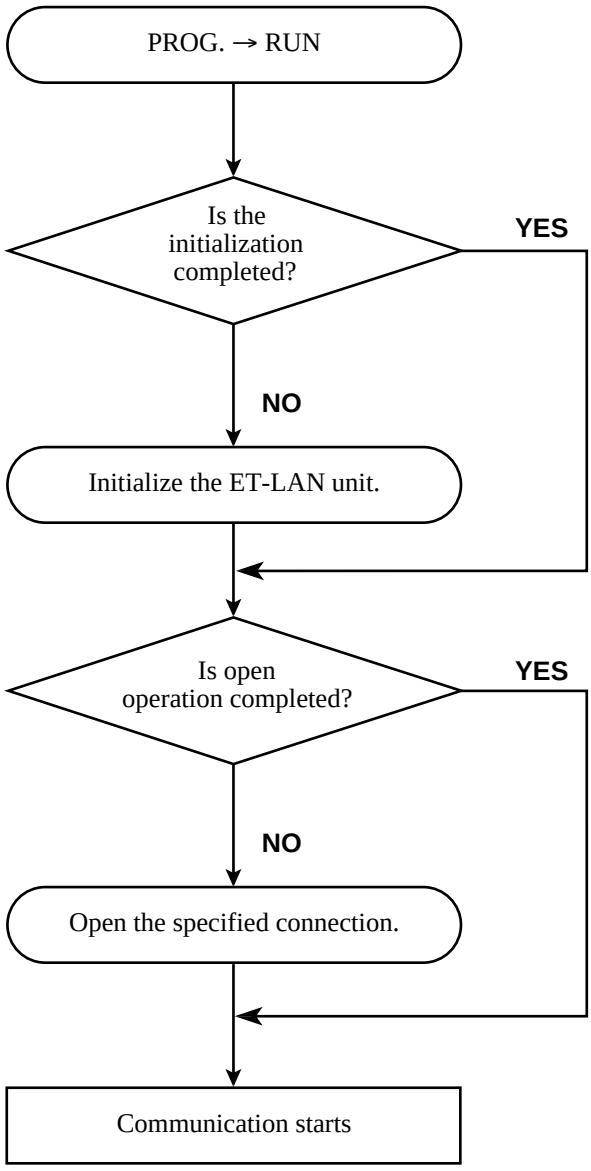


④ **Updating the expanded request signal area for setting the connection status of the ET-LAN unit (H36C and H36D of bank H0)**



■ Cautions when using memory handshake communication

Since data in the shared memory is not lost even in the PROG. mode, connections are maintained as they were in the RUN mode if the FP3/FP10S is changed from RUN to PROG. Therefore, when you make a program for memory handshake communication, refer to the flowchart below.



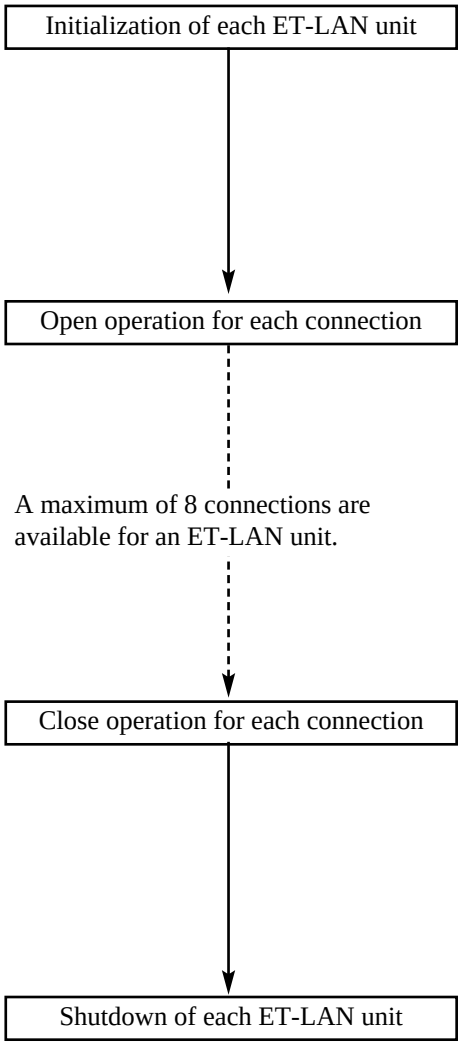
- Make a program to check whether bit position 12 at address H360 of bank H0 is ON or OFF.
- Make a program to check whether the complete-to-open signal at each connection at address H361 of bank is ON or OFF.

CHAPTER 4

BEFORE SETTING COMMUNICATION PARAMETERS

4-1. Overview of Communication Procedures

FP3/FP10S communicates with other nodes on an Ethernet (10BASE5) LAN through the ET-LAN unit using the following communication procedures:



For details about initialization, refer to page 41, “CHAPTER 5. ET-LAN INITIALIZATION AND SHUTDOWN”.

① Initialization settings
② Routing settings
③ ET-LAN unit initialization
④ Confirm the completion of initialization

For details about the open operation, refer to page 51, “CHAPTER 6. OPEN AND CLOSE OPERATIONS”.

① Connection information settings
② Open requests
③ Confirm that the connections are open
④ Start data exchanges with other nodes
- Computer link function (MEWTOCOL-COM)
- Data transfer function (MEWTOCOL-DAT)
- Transparent communication function

For details about the close operation, refer to page 51, “CHAPTER 6. OPEN AND CLOSE OPERATIONS”.

① Confirm that all communication processes have been completed.
② Close the connections
③ Confirm that the connections are closed

For details about ET-LAN shutdown operation, refer to page 41, “CHAPTER 5. ET-LAN INITIALIZATION AND SHUTDOWN”.

① Confirm that all connections are closed.
② Shutdown the ET-LAN unit
③ Confirm the completion of the shutdown

■ Initialization

Initialization sets the main communication parameters and boots up the ET-LAN unit with the specified settings. The settings are performed by writing the parameters using the **F151 (WRT)/P151 (PWRT)** instructions, and the handshake communication is performed by I/O or memory handshake communication.
The communication parameters set in the initialization stage are described in the table below:

Area used for setting communication parameters	Setting
Initialization setting area (H200 to H22F of ET-LAN unit bank H0)	Source IP address for the ET-LAN unit
	Use of router function (communication between networks)
	Source MEWTOCOL station number for the ET-LAN unit
	TCP ULP (packet existence duration)
	TCP zero-window timer (window resending timer from the zero-window status)
	TCP resending timer
	Starting address for transparent communication receive-buffer
	Size for transparent communication receive-buffer
	Starting address for transparent communication send-buffer
	Size for transparent communication send-buffer
Routing setting area (H230 to H24F of ET-LAN unit bank H0)	Router network (subnet) mask status
	IP address for the default router
	Number of routers used for accessing the ajoining network
	Router network (subnet) address
	IP address for routers used for accessing the ajoining network

① **Initialization settings**
Parameters for the ET-LAN unit are set in the initialization setting area of shared memory (bank H0: H200 to H22F) by executing the **F151 (WRT)/P151 (PWRT)** instruction.

② **Routing settings**
Parameters for the ET-LAN unit are set in the routing setting area of shared memory (bank H0: H230 to H24F) by executing the **F151 (WRT)/P151 (PWRT)** instruction.

③ **ET-LAN unit initialization**
The ET-LAN unit is booted up with the initialization and routing settings by turning ON the request-to-initialize signal.

Handshake communication method	Request-to-initialize signal
I/O handshake	Y2C (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 12 of address H368 in bank H0

④ **Confirm the completion of initialization**
Be sure to confirm that the ET-LAN unit is properly initialized by monitoring the complete-to-initialize signal.

Handshake communication method	Complete-to-initialize signal
I/O handshake	XC (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 12 of address H360 in bank H0

■ Open operation procedures

The open operation sets the communication parameters required for each connection and opens the connection. The settings are performed by writing the parameters using the **F151 (WRT)/P151 (PWRT)** instructions, and the handshake communication is performed by I/O or memory handshake communication. The communication parameters set in the open operation stage are described in the table below:

Area used for setting communication parameters	Setting
Connection information setting area (H250 to H2CF of ET-LAN unit bank H0)	Communication method TCP/IP or UDP/IP
	Open method for TCP/IP Active, fullpassive, or unpassive
	Communication functions MEWTOCOL or transparent communication function
	Port number for source node
	IP address for destination node
	Port number for destination node
	MEWTOCOL address for destination node
	Ethernet (physical) address for destination node
	Requested receive-data size for transparent communication function*
	Requested send-data size for transparent communication function*

* Settings for the requested receive-data and send-data size should be specified when the transparent communication function is selected for the connection.

① **Connection information settings**
Parameters for the connection are set in the connection information setting area of shared memory (bank H0: H250 to H2CF) by executing the **F151 (WRT)/P151 (PWRT)** instruction.

② **Open requests**
Turning ON the request-to-open signal initiates a call for connection open with the parameters specified in the connection information.

Handshake communication method	Request-to-open signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	Y30	Y32	Y34	Y36	Y38	Y3A	Y3C	Y3E
Memory handshake	Address H369 in bank H0							
	Bit position 0	Bit position 2	Bit position 4	Bit position 6	Bit position 8	Bit position 10	Bit position 12	Bit position 14

③ **Confirm that the connections are open**
The establishment of the connection is confirmed by monitoring the complete-to-open signals.
(Turns ON when connection is established.)

Handshake communication method	Complete-to-open signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	X10	X12	X14	X16	X18	X1A	X1C	X1E
Memory handshake	Address H361 in bank H0							
	Bit position 0	Bit position 2	Bit position 4	Bit position 6	Bit position 8	Bit position 10	Bit position 12	Bit position 14

■ Close operation procedures

① **Confirm that all communication processes have been completed.**

② **Close the connections**
Connections are closed by turning OFF the request-to-open signals.

Handshake communication method	Request-to-open signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	Y30	Y32	Y34	Y36	Y38	Y3A	Y3C	Y3E
Memory handshake	Address H369 in bank H0							
	Bit position 0	Bit position 2	Bit position 4	Bit position 6	Bit position 8	Bit position 10	Bit position 12	Bit position 14

③ **Confirm that the connections are closed**
The close operation for each connection is confirmed by monitoring the complete-to-open signals. (Turns OFF when connection is closed.)

Handshake communication method	Complete-to-open signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	X10	X12	X14	X16	X18	X1A	X1C	X1E
Memory handshake	Address H361 in bank H0							
	Bit position 0	Bit position 2	Bit position 4	Bit position 6	Bit position 8	Bit position 10	Bit position 12	Bit position 14

■ Shutdown procedures

① **Confirm that all connections are closed.**

② **Shutdown the ET-LAN unit**
The operation of ET-LAN unit is stopped by turning OFF the request-to-initialize signal.

Handshake communication method	Request-to-initialize signal
I/O handshake	Y2C (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 12 of address H368 in bank H0

③ **Confirm the completion of the shutdown**
The shutdown operation is confirmed by monitoring the complete-to-initialize signal. (Turns OFF when the ET-LAN unit operation is shutdown.)

Handshake communication method	Complete-to-initialize signal
I/O handshake	XC (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 12 of address H360 in bank H0

4-2. ET-LAN Unit Shared Memory Overview

The shared memory of the ET-LAN unit is used for communication between the FP3/FP10S CPU and ET-LAN unit. For accessing the ET-LAN unit, the CPU should execute the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions, specifying the slot number of the unit and combination of bank number and address. For details about the configurations and functions of user system area, refer to:

- Initialization setting area: page 41, “CHAPTER 5. ET-LAN INITIALIZATION AND SHUTDOWN”
- Routing setting area: page 41, “CHAPTER 5. ET-LAN INITIALIZATION AND SHUTDOWN”
- Connection information setting area: page 51, “CHAPTER 6. OPEN AND CLOSE OPERATIONS”.
- Initialization report area: page 41, “CHAPTER 5. ET-LAN INITIALIZATION AND SHUTDOWN”
- Connection information report area: page 51, “CHAPTER 6. OPEN AND CLOSE OPERATIONS”.
- Memory handshake area: page 29, “3) Specifications for Memory Handshake Communication”.
- Error log area: page 116, “11-2. Troubleshooting”.

For details about the configurations and functions of transparent communication buffer area, refer to page 81, “CHAPTER 9. TRANSPARENT COMMUNICATION FUNCTION”.

Absolute address	Bank number	Address	Configuration
H 0000 H 01FF	H 00 H 00	H 0000 H 01FF	Area reserved for system use
H 0200 H 03FF	H 00 H 00	H 0200 H 03FF	User system area (512 words)
H 0400 H 27FF	H 01 H 09	H 0000 H 03FF	Area reserved for system use
H 2800 H 3FFF	H 0A H 0F	H 0000 H 03FF	Transparent communication buffer area (6 K words)

Name of area	Bank number	Address
Initialization setting area (48 words)	H 00	H 0200 H 022F
Routing setting area (32 words)	H 00	H 0230 H 024F
Connection information setting area (128 words)	H 00	H 0250 H 02CF
Initialization report area (16 words)	H 00	H 02D0 H 02DF
Connection information report area (128 words)	H 00	H 02E0 H 035F
Memory handshake area (32 words)	H 00	H 0360 H 037F
Error log area (128 words)	H 00	H 0380 H 03FF

Name of area		Bank number	Address
Connection 1	Receive-buffer (1 K words)	H 0A	H 0000 H 03FF
	Send-buffer (1 K words)	H 0B	H 0000 H 03FF
Connection 2	Receive-buffer (1 K words)	H 0C	H 0000 H 03FF
	Send-buffer (1 K words)	H 0D	H 0000 H 03FF
Connection 3	Receive-buffer (1 K words)	H 0E	H 0000 H 03FF
	Send-buffer (1 K words)	H 0F	H 0000 H 03FF

Notes:

- The absolute address, bank number and address for the ET-LAN unit shared memory are expressed in hexadecimal. (an H prefix indicates that a number is hexadecimal).
- Combined with slot number, the bank number and address of the ET-LAN unit are used for specifying the destination or source area when you write **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions.
- The allocations for the transparent communication buffer area described above are the default settings. You can change the size for each connection at your option. To change a buffer size, set the parameters in the ET-LAN initialization stage using the absolute address.

CHAPTER 5

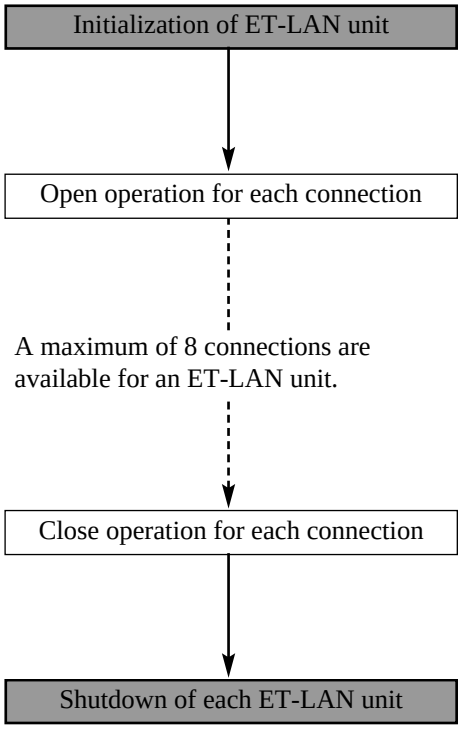
ET-LAN INITIALIZATION AND SHUTDOWN

5-1. Initialization and Shutdown of the ET-LAN Unit

Setting the main communication parameters and booting up the ET-LAN unit are called initialization. In the initialization stage, parameters are set in the initialization and routing setting areas as shown below.
Stopping the operation of the ET-LAN unit is called shutdown. After closing all connections, you can shutdown the ET-LAN unit.

Area used for setting communication parameters	Setting
Initialization setting area (H200 to H22F of ET-LAN unit bank H0)	Source IP address for the ET-LAN unit
	Use of router function (communication between networks)
	Source MEWTOCOL station number for the ET-LAN unit
	TCP ULP (packet existence duration)
	TCP zero-window timer (window resending timer from the zero-window status)
	TCP resending timer
	Starting address for transparent communication receive-buffer
	Size for transparent communication receive-buffer
	Starting address for transparent communication send-buffer
	Size for transparent communication send-buffer
Routing setting area (H230 to H24F of ET-LAN unit bank H0)	Router network (subnet) mask status
	IP address for the default router
	Number of routers used for accessing the ajoining network
	Router network (subnet) address
	IP address for routers used for accessing the ajoining network

■ ET-LAN unit operation



Before starting communication, preset the system parameters of the ET-LAN unit.

Communication function
- Computer link function (MEWTOCOL-COM)
- Data transfer function (MEWTOCOL-DAT)
- Transparent communication function

Shutdown the operation of the ET-LAN unit after all connections are closed.

5-2. Initialization and Shutdown Procedures

■ Initialization procedures

① **Initialization settings**
Parameters for the ET-LAN unit are set in the initialization setting area

② **Routing settings**
Parameters for the ET-LAN unit are set in the routing setting area

③ **ET-LAN unit initialization**
The ET-LAN unit is booted up with the initialization and routing settings by turning ON the request-to-initialize signal.

Handshake communication method	Request-to-initialize
I/O handshake	Y2C (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 12 of address H368 in bank H0

④ **Confirm the completion of initialization**
ET-LAN unit initialization is confirmed by the complete-to-initialize signal. When the complete-to-initialize signal turns ON, initialization is successfully completed.

Handshake communication method	Request-to-initialize
I/O handshake	XC (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 12 of address H360 in bank H0

Note:

- Be sure to set the initialization and routing parameters to the ET-LAN unit shared memory before turning ON the request-to-initialize signal. The setting changes during its ON state are not effective for the ET-LAN unit operation.

■ Shutdown procedures

1 **Confirm that all connections are closed.**

2 **Shutdown the ET-LAN unit**
The operation of ET-LAN unit is stopped by turning OFF the request-to initialize signal.

Handshake communication method	Request-to-initialize
I/O handshake	Y2C (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 12 of address H368 in bank H0

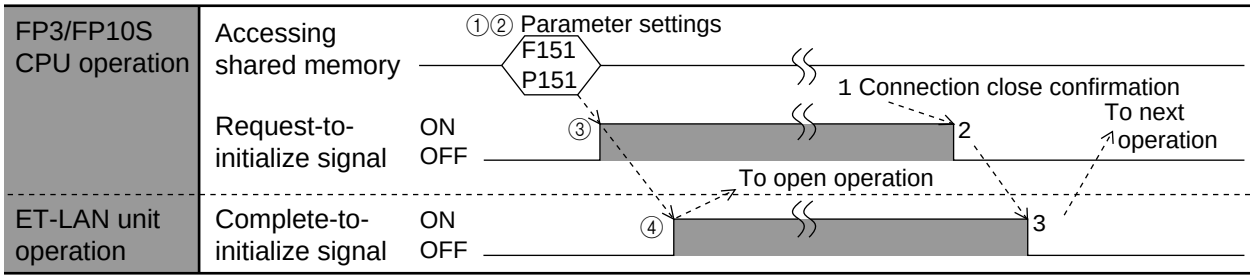
3 **Confirm the completion of the shutdown**
ET-LAN unit shutdown is confirmed by the complete-to-initialize signal. When the complete-to-initialize signal turns OFF, the shutdown operation is completed.

Handshake communication method	Request-to-initialize
I/O handshake	XC (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 12 of address H360 in bank H0

Note:

- If the request-to-initialize signal is turned OFF before the connection is closed, all the connections are forcibly closed.

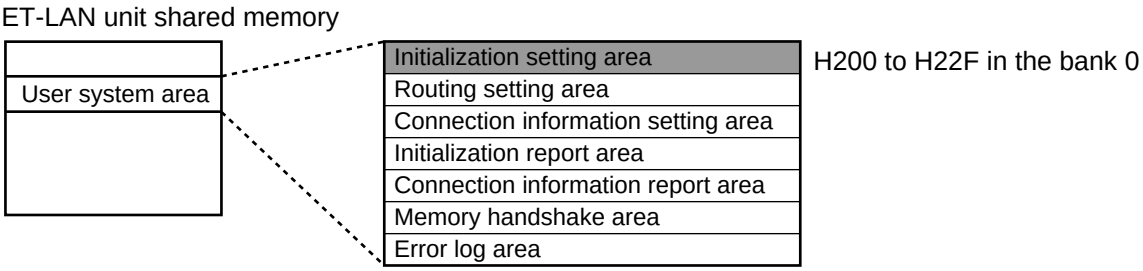
■ Timing chart for the ET-LAN initialization and shutdown



5-3. Setting Parameters for Initialization

1. Initialization Setting Area

Using the **F151 (WRT)**/**P151 (PWRT)** instructions, the parameters are set in the initialization setting area (addresses H200 to H22F in the bank H0) of the ET-LAN unit shared memory.



■ Specifications of initialization setting area

Address in the bank H0	Name	Default value	Description
H200	Source IP address (lower word)	H0	Source IP address is specified using two words. [EXAMPLE] When source IP address is 128. 1. 2. 10, set - H20A to the address H200 - H8001 to the address H201 Settings of H0 and HFFFFFFFF are ignored.
H201	Source IP address (higher word)		
H202	Router function availablity	H0	This specifies communication availability between networks, including subnets. • **Settings** - K0: router function is not used. network (subnet) communication not available - K1: router function is used. network (subnet) communication available When using communication between networks (subnets), be sure to set necessary parameters in the routing setting area.
H203	Source MEWTOCOL station number	K0	Source MEWTOCOL station number must be specified in the range of **K1 to K64**. Be sure to set the MEWTOCOL station number without overlap in the same network.
H204 through **H209**	Area reserved for system use	H0	Be sure to set H0 to these addresses.
H20A	TCP ULP (user layer protocol) duration	HF (30 s)	TCP packet available duration in the network is specified. • Setting range: **H1 to HFFFF (2 s to 131,070 s)** • Set time is obtained by formula: **decimal converted set value (1 to 65,535) × 2 s**
H20B	TCP zero-window confirmation timer	H5 (10 s)	This specifies interval for re-sending the TCP window size confirmation packet after receive-window size of the destination node is recognized as 0. • Setting range: **H1 to HFFFF (2 s to 131,070 s)** • Set time is obtained by formula: **decimal converted set value (1 to 65,535) × 2 s**
H20C	TCP re-send timer	H5 (10 s)	This specifies time waiting for the TCP acknowledgement (ACK) response when the TCP data is transmitted. If the ET-LAN unit does not receive an ACK response even after the specified time, the ET-LAN unit re-send the data. • Setting range: **H1 to HFFFF (2 s to 131,070 s)** • Set time is obtained by formula: **decimal converted set value (1 to 65,535) × 2 s**
H20D	TCP re-open timer	HA (20 s)	This specifies time waiting for re-transmitting an open call to the same port after receiving the acknowledgement (ACK) response to TCP closing call command. • Setting range: **H1 to HFFFF (2 s to 131,070 s)** • Set time is obtained by formula: **decimal converted set value (1 to 65,535) × 2 s**
H20E	IP reassembling timer	HF (30 s)	This specifies time waiting for the next segmented data coming when segmented data is received. If proceeding data is not received within the specified time, the ET-LAN unit abandons the segmented data received before. • Setting range: **H1 to HFFFF (2 s to 131,070 s)** • Set time is obtained by formula: **decimal converted set value (1 to 65,535) × 2 s**
H20F	Area reserved for system use	H0	Be sure to set H0 to these addresses.

Address in the bank H0	Name			Default value	Description
H210	Connection 1 transparent communication buffer setting	Receive-buffer area settings	Starting address	H2800	These areas are used for specifying the starting address of the receive- and send-buffers for each connection when the transparent communication function is used for the connection. For specifying the starting addresses, the absolute addresses of the ET-LAN unit shared memory are used in the range of **H2800 to H3FFF**. Be sure not to overlap one buffer area with another.
H211			Buffer size	H0400	
H212		Send-buffer area settings	Starting address	H2C00	
H213			Buffer size	H0400	
H214	Connection 2 transparent communication buffer setting	Receive-buffer area settings	Starting address	H3000	
H215			Buffer size	H0400	
H216		Send-buffer area settings	Starting address	H3400	
H217			Buffer size	H0400	
H218	Connection 3 transparent communication buffer setting	Receive-buffer area settings	Starting address	H3800	
H219			Buffer size	H0400	
H21A		Send-buffer area settings	Starting address	H3C00	
H21B			Buffer size	H0400	
H21C	Connection 4 transparent communication buffer setting	Receive-buffer area settings	Starting address	HFFFF	
H21D			Buffer size	H0	
H21E		Send-buffer area settings	Starting address	HFFFF	
H21F			Buffer size	H0	
H220	Connection 5 transparent communication buffer setting	Receive-buffer area settings	Starting address	HFFFF	
H221			Buffer size	H0	
H222		Send-buffer area settings	Starting address	HFFFF	
H223			Buffer size	H0	
H224	Connection 6 transparent communication buffer setting	Receive-buffer area settings	Starting address	HFFFF	
H225			Buffer size	H0	
H226		Send-buffer area settings	Starting address	HFFFF	
H227			Buffer size	H0	
H228	Connection 7 transparent communication buffer setting	Receive-buffer area settings	Starting address	HFFFF	
H229			Buffer size	H0	
H22A		Send-buffer area settings	Starting address	HFFFF	
H22B			Buffer size	H0	
H22C	Connection 8 transparent communication buffer setting	Receive-buffer area settings	Starting address	HFFFF	
H22D			Buffer size	H0	
H22E		Send-buffer area settings	Starting address	HFFFF	
H22F			Buffer size	H0	

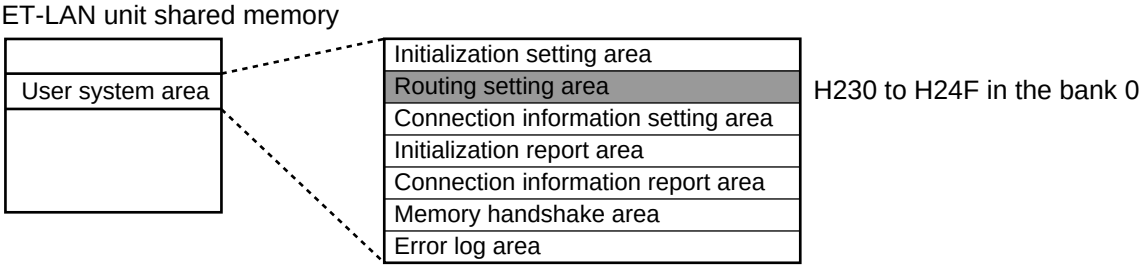
■ **Transparent communication buffer area (default)**

Specifications		Absolute address	Bank number	Address
Connection 1	Receive-buffer (1 K words)	**H 2800** **H 2BFF**	H 0A H 0A	H 0 H 03FF
	Send-buffer (1 K words)	**H 2C00** **H 2FFF**	H 0B H 0B	H 0 H 03FF
Connection 2	Receive-buffer (1 K words)	**H 3000** **H 33FF**	H 0C H 0C	H 0 H 03FF
	Send-buffer (1 K words)	**H 3400** **H 37FF**	H 0D H 0D	H 0 H 03FF
Connection 3	Receive-buffer (1 K words)	**H 3800** **H 3BFF**	H 0E H 0E	H 0 H 03FF
	Send-buffer (1 K words)	**H 3C00** **H 3FFF**	H 0F H 0F	H 0 H 03FF

Maximum of 6 K words (6 × 1,024 words) are available for the transparent communication buffers.

2. Routing Setting Area

When the ET-LAN unit communicates with other networks (subnets) using IP routers, set the necessary parameters in the routing setting area of the ET-LAN unit shared memory. Using the **F151 (WRT)/P151(PWRT)** instruction, the parameters are set in the routing setting area (addresses H230 to H24F in the bank H0) of the ET-LAN unit shared memory.



Note:

- In order to make the parameters set in the routing setting area effective, be sure to set K0 in the address H202 of ET-LAN unit bank H0 (initialization setting area). When K1 is set there, all parameters in the routing setting area are ignored.

■ Specifications of routing setting area

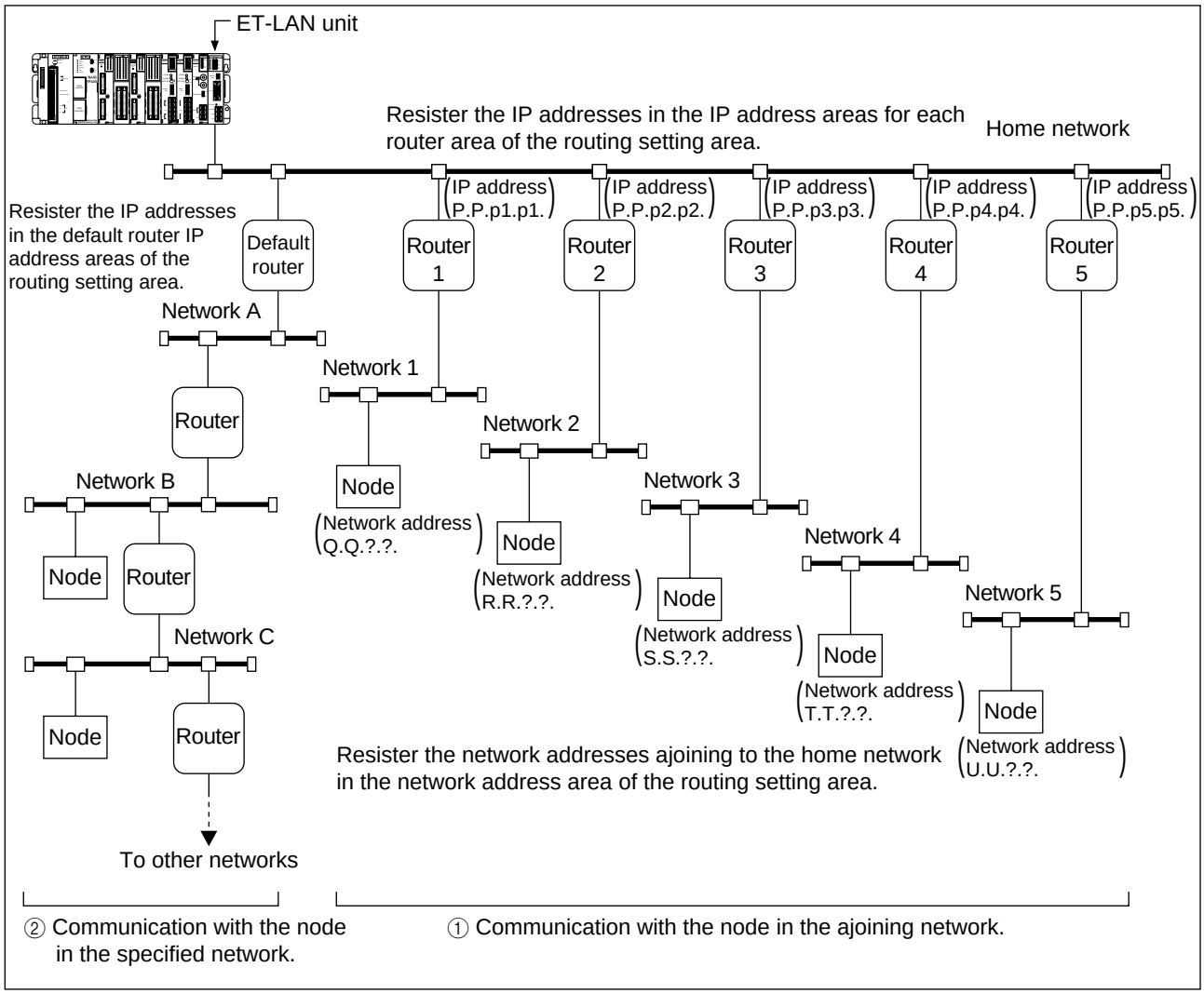
Address in the bank H0	Name	Default value	Description
H230	Network (subnet) masking (lower word)	H0	In an IP address, some bits, always starting from the MSB, are used for identifying the network (subnet). These words are used for getting the network (subnet) address part from the IP address and for judging whether or not the destination network (subnet) of data sent is in the same network (subnet). • **Setting method and range:** These words are specified by setting 1 in the bit positions used for identifying the network (subnet) address part. The available setting range is: **H C000 0000 to H FFFF FFFC** - If a value, outside the range of **H C000 0000 to H FFFF FFFC (excluding H0)** is specified, an error occurs. - If **H 0** is set in these areas, the router function cannot be used. • **Setting examples:** ① In the CLASS A network, 8 bits starting from the MSB are used for identifying the network. This case, set **H FF00 0000 (1111 1111 0000 0000 0000 0000 0000 000)** ② When two bits are used for identifying subnet in the CLASS A network, 10 bits starting from the MSB are used for identifying the subnet. This case, set **H FFC0 0000 (1111 1111 1100 0000 0000 000 0000 000)** ③ In the CLASS B network, 16 bits starting from the MSB are used for identifying the network. This case, set **H FFFF 0000 (1111 1111 1111 1111 0000 0000 0000 000)** ④ When four bits are used for identifying subnet in the CLASS B network, 20 bits starting from the MSB are used for identifying the subnet. This case, set **H FFFF F000 (1111 1111 1111 1111 1111 0000 0000 000)** ⑤ In the CLASS C network, 24 bits starting from the MSB are used for identifying the network. This case, set **H FFFF FF00 (1111 1111 1111 1111 1111 1111 0000 000)** ⑥ When three bits are used for identifying subnet in the CLASS C network, 27 bits starting from the MSB are used for identifying the subnet. This case, set **H FFFF FFE0 (1111 1111 1111 1111 1111 1111 1110 000)** • **Logic for getting network (subnet) address** Network (subnet) address is obtained by performing AND operation with the IP address and the network (subnet) masking data as shown below: **"H 5901 0201" AND "H FF00 0000" ⟶ "H 5900 0000"** **IP address** **Network masking data** **Network address**
H231	Network (subnet) masking (higher word)		

Address in the bank H0	Name		Default value	Description
H232	Default router IP address (lower word)		H0	The router whose IP address is set here is regarded as a default router. By registering a default router, the ET-LAN unit can access an node even in a different network class or in a different subnet. • **Notes:** - If a value here does not conform to the network (subnet) address to which the ET-LAN unit is affiliated, the default router function is not used. In such case, if the ET-LAN unit initiates an open call to a destination node, whose IP address cannot be found neither in the home network nor in other networks registered by routers 1 through 5, an error is reported to the ET-LAN unit. - If H 0 is set in the H230 and H231 in the bank H0 (routing setting area), the registration is ignored.
H233	Default router IP address (higher word)			
H234	Number of registering routers		K0	The number of routers used for the ET-LAN unit is specified here. The registration of the default router is not included in the number. • **Setting range:** **K0 to K5:** If a value other than K0 through K5 is specified, the setting value is automatically corrected to K5. • **Notes:** - The specified number of IP address for routers and network (subnet) address sets should be registered in the following addresses in the routing setting area. - If H 0 is set in H230 and H231 in bank 0 (routing setting area), the value specified here is ignored.
H235	Router 1	Network (subnet) address (lower)	H0	**[NETWORK (SUBNET) ADDRESS]** In the area for network (subnet) address, the ajoining network (subnet) address, where the specified router exists, should be registered. **[ROUTER IP ADDRESS]** In the IP address area, the IP address of the specified router for the home network (subnet) should be registered. • **Notes:** - Be sure to confirm the router IP address and its ajoining network (subnet) address combination. - For the router IP address, never use H 0000 0000 or H FFFF FFFF. Even if its network address meets with the home network address, an error occurs in the ET-LAN unit.
H236		Network (subnet) address (higher)		
H237		IP address (lower)	H0	
H238		IP address (higher)		
H239	Router 2	Network (subnet) address (lower)	H0	
H23A		Network (subnet) address (higher)		
H23B		IP address (lower)	H0	
H23C		IP address (higher)		
H23D	Router 3	Network (subnet) address (lower)	H0	
H23E		Network (subnet) address (higher)		
H23F		IP address (lower)	H0	
H240		IP address (higher)		
H241	Router 4	Network (subnet) address (lower)	H0	
H242		Network (subnet) address (higher)		
H243		IP address (lower)	H0	
H244		IP address (higher)		
H245	Router 5	Network (subnet) address (lower)	H0	
H246		Network (subnet) address (higher)		
H247		IP address (lower)	H0	
H248		IP address (higher)		
H249 through H24F	Area reserved for system use		H0	Be sure to set H0 to these addresses.

■ How to register routers 1 through 5 and a default router

- The following two types of routers are available for the ET-LAN unit:
  - ① Communication with the node in the ajoining network (communication via one router):
    Up to five routers starting from router 1 through 5 can be registered for ET-LAN unit.
    You can communicate with nodes in the five ajoining networks through a router.
  - ② Communication with nodes in the specified network (communication via the default router):
    By using the default router, you can communicate with a node in any network. Only one default router is available for the ET-LAN unit. (You can also specify one of routers 1 through 5 as the default router.)

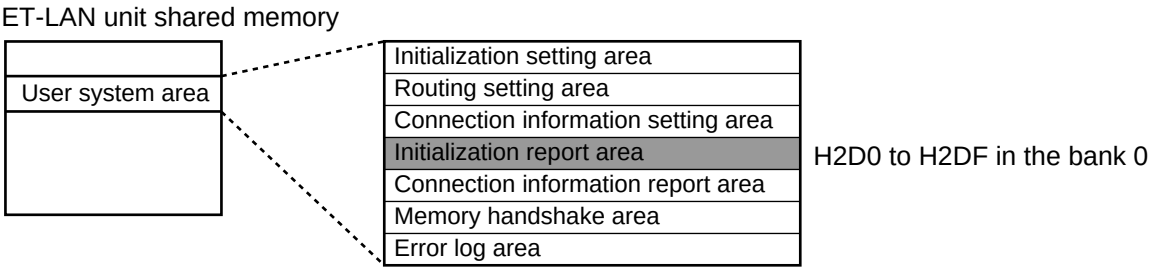
  In case ①, the router IP addresses for up to five routers on the ET-LAN unit's network, and the network (subnet) addresses of the connected ajoining networks, are registered in the routing setting area. In case ②, the default router's IP address are registered in the routing setting area.



- If a communication node exists in any one of the networks 1 to 5 in the diagram above, communication takes place via one of the five routers. In this case, the network (subnet) address is consistent with the network (subnet) addresses registered in the routing setting area for routers 1 to 5 (refer to the IP address for routers 1 to 5, and the network address for networks 1 to 5 in the diagram above). For cases other than this, communication takes place via the default router (nodes in networks A, B, and C in the diagram above).

5-4. Monitoring Initialization Status of an ET-LAN Unit

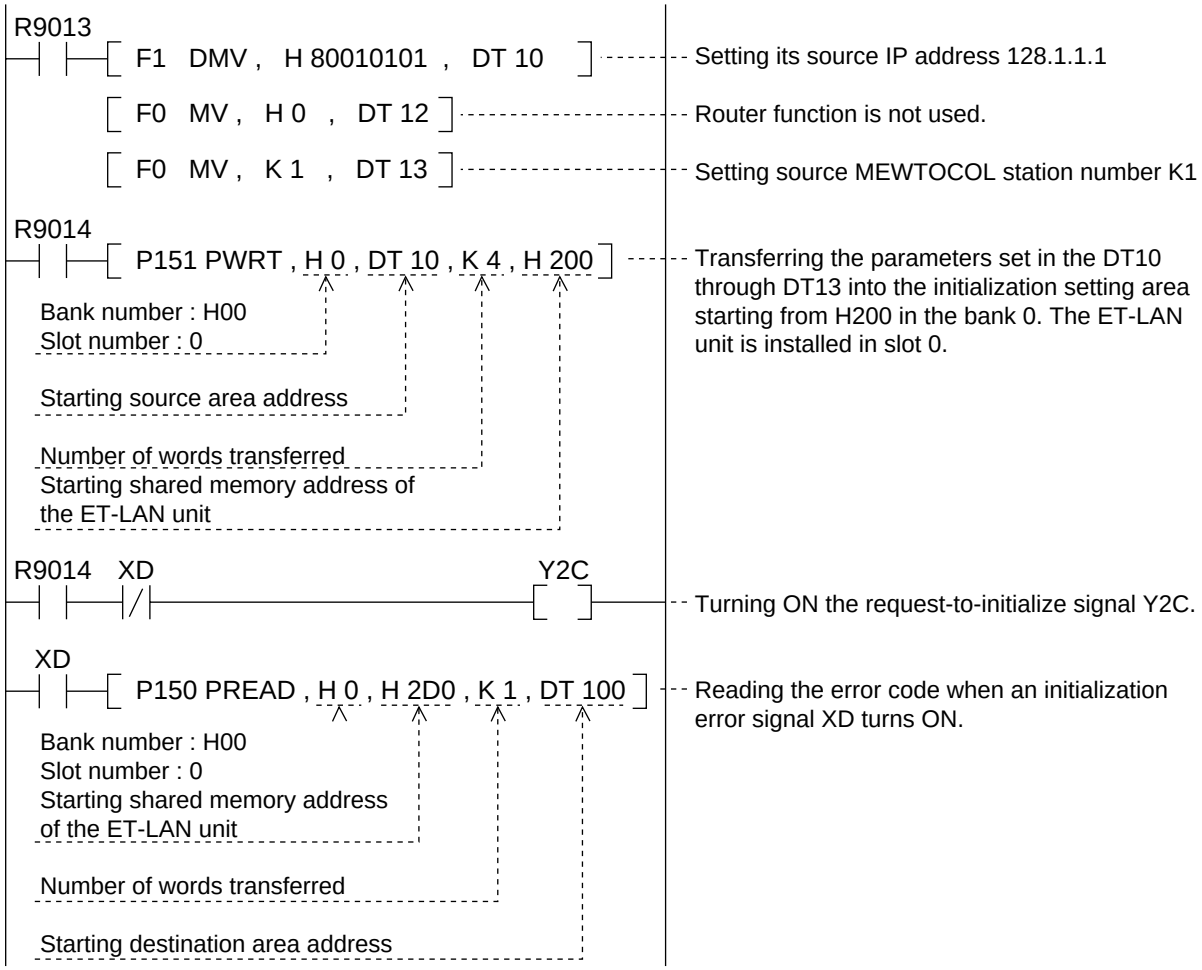
After the initialization procedures, some parameters set in the initialization stage can be monitored by accessing the initialization report area (addresses H2D0 to H2DF in the bank H0) of the ET-LAN unit shared memory with the **F150 (READ)/P150 (PREAD)** instruction.



■ Specifications of initialization report area

Address in the bank H0	Name	Description
H2D0	Initialization complete code	An initialization error code is stored here when the initialization is not successfully completed. - **H0:** Initialization is successfully completed. - **Other than H0:** Initialization error code is stored. For details about the initialization error code, refer to page 116, "11-2. Troubleshooting."
H2D1	Source IP address (lower word)	Source IP address stored in the initialization setting area is monitored here after the initialization is successfully completed. • **Notes:** - IP address set in the initialization setting area is not reflected here while the complete-to-initialize signal is in the OFF state. - The value here is also changed when the source IP address in the initialization setting area is revised after initialization. In this case, the source IP address monitored may be different from that used for the actual communication.
H2D2	Source IP address (higher word)	
H2D3	Router function setting	This is used for monitoring the router function availability referring to the setting in the router availability setting in the initialization setting area and to the network (subnet) masking setting in the routing setting area. - **H0 :** the router function is set. - **H1 :** the router function is not set. • **Note:** IP address set in the initialization setting area is not reflected here while the complete-to initialize signal is in the OFF state.
H2D4	Source MEWTOCOL station number	Source MEWTOCOL station number set in the initialization setting area is monitored here after the initialization is successfully completed. • **Notes:** - MEWTOCOL station number set in the initialization setting area is not reflected here while the complete-to-initialize signal is in the OFF state. - The value here is also changed when the source MEWTOCOL station number in the initialization setting area is revised after initialization. In this case, the own MEWTOCOL address monitored is different from that used for the actual communication.
H2D5	Ethernet (physical) address monitoring area	This is used for monitoring the Ethernet (physical) address of the ET-LAN unit after the initialization is successfully completed. An Ethernet (physical) address is given to each ET-LAN unit and it occupies three words. • **Example:** - when the given Ethernet (physical) address is 1.2.3.4.5.6., data is stored in these areas as: at address H2D5.....H 0506 at address H2D6.....H 0304 at address H2D7.....H 0102 • **Note:** The Ethernet (physical) address is monitored while the complete-to-initialization signal is in the ON state.
H2D6		
H2D7		
H2D8 through **H2DF**	Area reserved for system use	These areas are not used for monitoring.

5-5. Program Example for ET-LAN Initialization



■ Reference

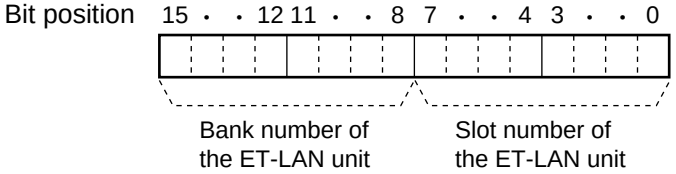
- Relays for I/O handshake communication
  - XC : complete-to-initialize signal
  - XD : initialize error signal
  - Y2C : request-to-initialize signal

Note:

• The allocations above are for when the ET-LAN unit is installed in slot 0.

- Special internal relays
  - R9013 : initial ON relay (Turns ON only at the first scan in the operation.)
  - R9014 : initial OFF relay (Turns OFF only at the first scan in the operation.)

- How to specify the bank and slot numbers of the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions



CHAPTER 6

OPEN AND CLOSE OPERATIONS

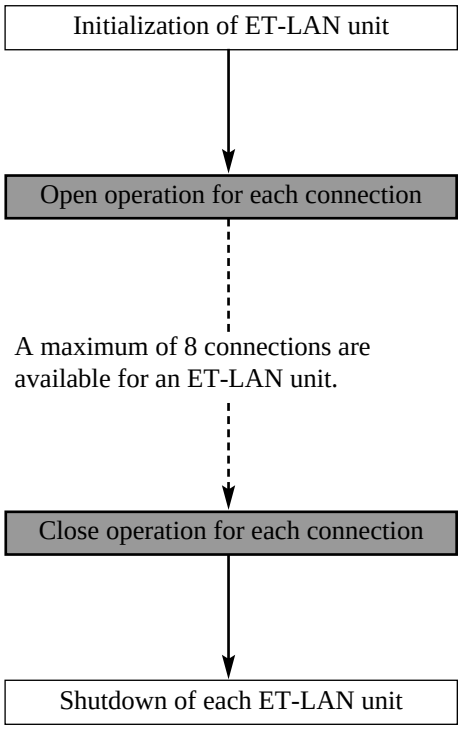
6-1. What Are ET-LAN Unit Open and Close Operations

The setting of communication parameters for each communication line and the accessing of Ethernet (10BASE5) network are called open operations. During open operations, parameters are set in the connection information setting area as shown below.
The releasing of the connection from the communication line is called a close operation.

Area used for setting communication parameters	Setting
Connection information setting area (H250 to H2CF of ET-LAN unit bank H0)	Communication method TCP/IP or UDP/IP
	Open method for TCP/IP Active, fullpassive, or unpassive
	Communication functions MEWTOCOL or transparent communication function
	Port number for source node
	IP address for destination node
	Port number for destination node
	MEWTOCOL address for destination node
	Ethernet (physical) address for destination node
	Requested receive-data size for transparent communication function*
	Requested send-data size for transparent communication function*

* Settings for the requested receive-data and send-data size should be specified when the transparent communication function is selected for the connection.

■ ET-LAN unit operation



After specifying parameters for each communication line, the connection is established.

Communication function
- Computer link function (MEWTOCOL-COM)
- Data transfer function (MEWTOCOL-DAT)
- Transparent communication function

Release the communication line connection after the data exchanges are finished.

■ Opening connections for TCP/IP and UDP/IP communications

Open connection methods for TCP/IP and UDP/IP communications differ in their procedures and definitions as follows:

- Open connection for TCP/IP communication:

Since TCP/IP is a connection-based communication method, the ET-LAN unit must harmonize with the destination port in order to open a connection.

There are three open methods for TCP/IP, given below.

- Active open method
- Fullpassive open method
- Unpassive open method

After the virtual circuit is established by one of the three methods between the ET-LAN unit and destination port, communication starts.

- Open connection for UDP/IP communication:

Since UDP/IP is a connectionless communication method, opening an ET-LAN unit connection is performed only in order to establish the connection between the ET-LAN unit and the Ethernet (10BASE5) LAN. After opening the connection, data can be transferred to the destination port, which is set in the connection information setting area.

■ Explanation on opening connections for TCP/IP communication

1) Active open method (destination: fullpassive or unpassive open method)

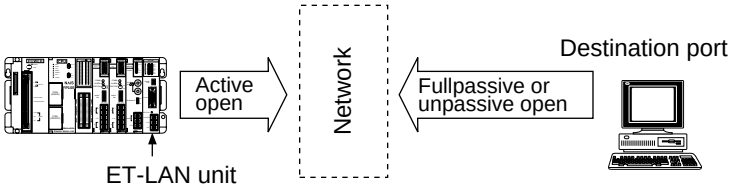
In the active open method, the ET-LAN unit should open a connection according to the following procedure.

① Set up communication parameters in the connection information setting area of the ET-LAN unit shared memory according to your specifications.

② Confirm that the destination port is open in the fullpassive or unpassive mode.

③ Start the connection open operation of the ET-LAN unit by turning ON the request-to-open signal of the specified connection.

④ The establishment of the virtual connection is confirmed by the complete-to-open signal of the specified connection.



2) Fullpassive open method (destination: active open method)

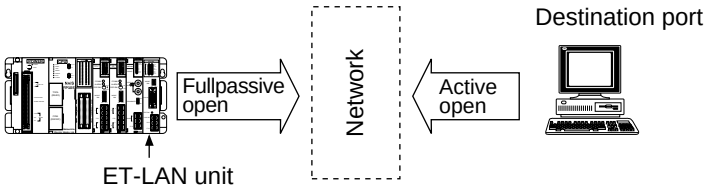
In the fullpassive open method, the ET-LAN unit waits for the open call from the specified port of the destination node and establishes the virtual connection according to the following procedure.

① Set up communication parameters in the connection information setting area of the ET-LAN unit shared memory according to your specifications.

② Start the connection open operation of the ET-LAN unit by turning ON the request-to-open signal of the specified connection.

③ Wait for the active open operation from the destination port preset in the connection information setting area.

④ The establishment of the virtual connection is confirmed by the complete-to-open signal of the specified connection.



Note:

• On some computers, it is impossible to specify the port number. In such a case, open the connection to the ET-LAN unit using the unpassive method.

3) Unpassive open method (destination: active open method)

With the unpassive open method, the ET-LAN unit waits for the open call from a non-specific destination node and establishes the virtual connection according to the following procedure.

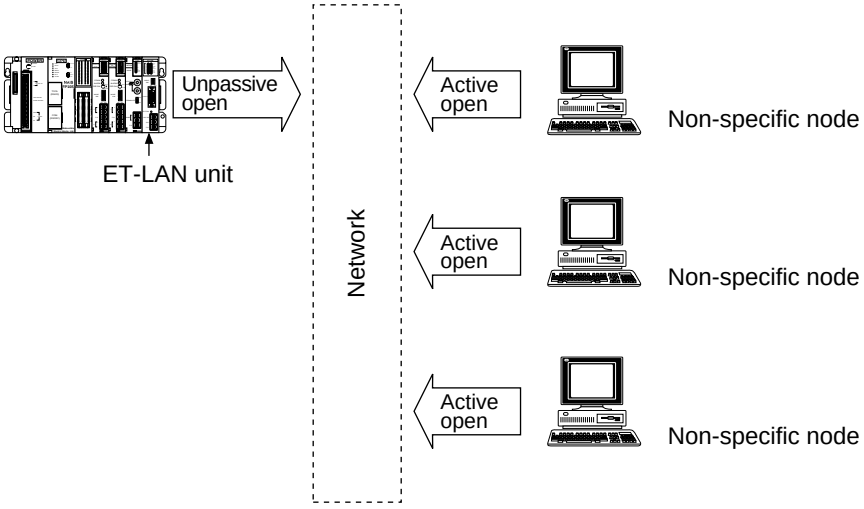
① Set up communication parameters in the connection information setting area of the ET-LAN unit shared memory according to your specifications.

② Start the connection open operation of the ET-LAN unit by turning ON the request-to-open signal of the specified connection.

③ Wait for the active open operation from the non-specific node.

④ The establishment of the virtual connection is confirmed by the complete-to-open signal of the specified connection.

Information about the destination node can be obtained by reading the connection information report area of the ET-LAN unit's shared memory.



6-2. Open and Close Operation Procedures

■ Open operation procedure

① **Connection information settings**
Parameters for the connection are set in the connection information setting area.

② **Open requests**
Turn ON the request-to-open signal according to the communication method you set in the connection information setting stage (UDP/IP or TCP/IP). For details about connection open procedures for TCP/IP communication, refer to page 53, "■ Explanation on opening connections for TCP/IP communication".

Handshake communication method	Request-to-open signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	Y30	Y32	Y34	Y36	Y38	Y3A	Y3C	Y3E
Memory handshake	Address H369 in bank H0							
	Bit position 0	Bit position 2	Bit position 4	Bit position 6	Bit position 8	Bit position 10	Bit position 12	Bit position 14

③ **Confirm that the connections are open**
Establishment of the connection is confirmed by monitoring the complete-to-open signals.
(Turns ON when connection is established.)

Handshake communication method	Complete-to-open signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	X10	X12	X14	X16	X18	X1A	X1C	X1E
Memory handshake	Address H361 in bank H0							
	Bit position 0	Bit position 2	Bit position 4	Bit position 6	Bit position 8	Bit position 10	Bit position 12	Bit position 14

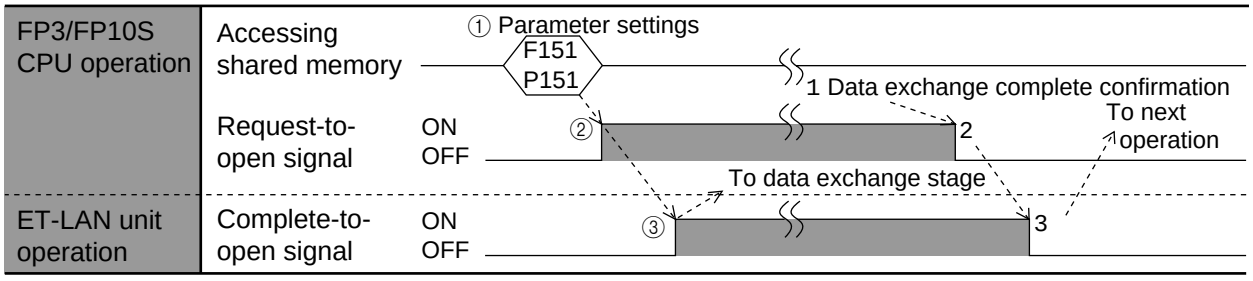
■ Close operation procedure

1 **Confirm that all communication has been completed.**

2 **Close the connections**
Connections are closed by turning OFF the request-to-open signals.

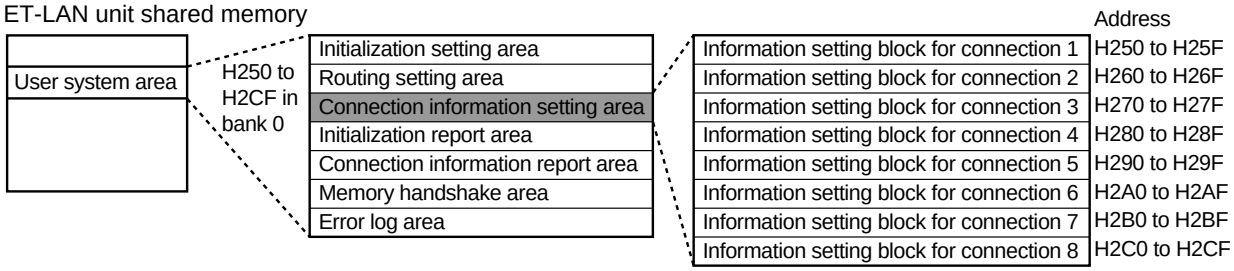
3 **Confirm that the connections are closed.**
The close operation for each connection is confirmed by the complete-to-open signals.
(Turns OFF when connection is released.)

■ Timing chart for the ET-LAN unit open and close operations



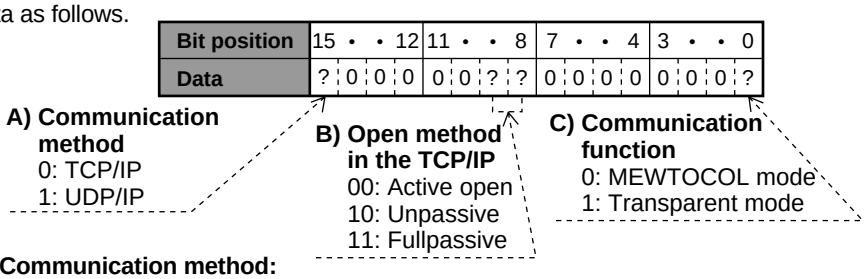
6-3. Setting Parameters for Open Operation

Using the **F151 (WRT)/P151 (PWRT)** instructions, the parameters are set in the connection information setting area (addresses H250 to H2CF in bank 0) of the ET-LAN unit shared memory.



■ Specifications for connection information setting area

Offset address in the setting block	Name	Description
H0	Open method setting area	This area specifies the open and communication method for each connection using 16 bit data as follows.



A) Communication method:
Data in bit position 15 specifies which of the two communication methods is used, TCP/IP or UDP/IP. When you use the data transfer function (MEWTOCOL-DAT), be sure to use the TCP/IP communication method.

B) Open method in TCP/IP:
Data in bit positions 8 and 9 specify the open method when the TCP communication method is selected in bit position 15. If the UDP/IP communication method is selected in bit position 15, the setting in bit positions 8 and 9 is ignored.

- **Active open:** In the active open method, the connection open operation of the ET-LAN unit is started after the connection open operation of the destination port is started using the fullpassive or unpassive open method.
- **Fullpassive open:** In the full passive open method, after turning ON the request-to-open signal, the ET-LAN unit waits for reception of the active open request from the destination port specified in the connection information setting area.
- **Unpassive open:** In the unpassive open method, after turning ON the request-to-open signal, the ET-LAN unit waits for reception of the active open request from the non-specific node.

For details about the open methods of TCP/IP, refer to page 53, "■ Explanation on opening connections for TCP/IP communication".

C) Communication function:
Data in bit position 0 specifies which of the two communication functions is used for the connection.

- **MEWTOCOL mode:** In the MEWTOCOL mode, the computer link (MEWTOCOL-COM) and data transfer (MEWTOCOL-DAT) functions are available.
- **Transparent mode:** In the transparent mode, the transparent communication function, which enables you to communicate in any kind of format, is available.

Notes:

- The actual address can be obtained by adding an offset address to the starting address of each information setting block.
- Be sure to set the parameters in offset addresses H0 through H8 before turning ON the request-to-open signal and set the data in offset addresses HD and HF before starting data exchanges.

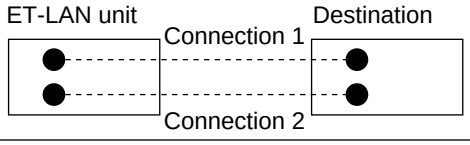
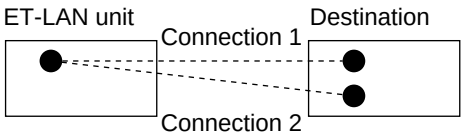
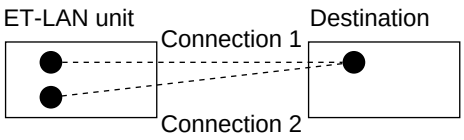
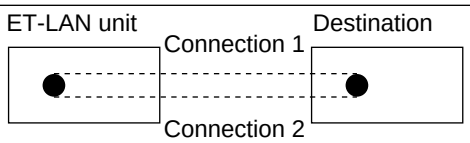
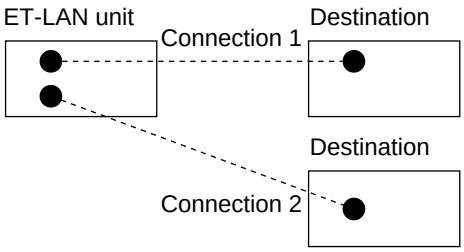
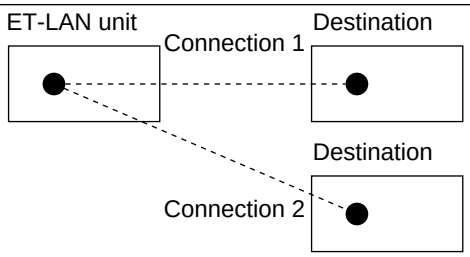
Offset address in the setting block	Name	Description
H1	Source port number	This area specifies the port number used for TCP/IP or UDP/IP communication processes. A port number should be set for each connection so that each node with multiple connections available can recognize the communication data supplied by TCP/IP and UDP/IP. • **Settings:** A value other than H0. • **Note:** For details about limitations of port number settings, refer to page 58, "■ Port number settings".
H2	Destination IP address (lower word)	These areas specify the IP address of the destination node. • **Settings:** - When establishing a connection using the fullpassive or active open method of TCP/IP communication, a destination IP address in the same network class, except for H0 and HFFFFFFFF, must be set. - When establishing a connection in the unpassive open method of TCP/IP communication, there is no need to specify an IP address. - When accessing during UDP/IP communication, a destination IP address in the same network, except for H0, must be set.
H3	Destination IP address (higher word)	
H4	Destination port number	This specifies the port number of the destination port. • **Settings:** A value other than H0. • **Notes:** - When a connection is opened using the unpassive method, there is no need to specify the port number. - For details about port number settings, refer to page 58, "■ Port number settings".
H5	Destination MEWTOCOL station number	This specifies the MEWTOCOL station number of the destination node. • **Settings:** In the range of K1 to K64 without overlap in the same network. • **Note:** When not communicating using the MEWTOCOL function, the settings in this area are ignored.
H6	Destination Ethernet (physical) address	This is used for registering the Ethernet (physical) address of the destination node if the active open method is performed with the node without ARP (address resolution protocol) during TCP/IP communication. • **Note:** If the destination node is equipped with ARP, set H0 or HFFFFFFFFFFFF.
H7		
H8		
H9 through HC	Area reserved for system use	Be sure to set H0 to these addresses.
HD	Request-to-receive data size (for transparent communication function)	This is used for setting the data size to be received from another node (number of bytes), when the transparent communication function is used. A complete-to-receive signal will not turn ON until the amount of data received reaches the number specified here. • **Settings:** - Set value (number of bytes) ≦ Receive-buffer size (number of words) × 2 - If the value HFFFF is set here, the ET-LAN unit turns ON the complete-to-receive signal each time a packet is received.
HE	Area reserved for system use	Be sure to set H0 to this address.
HF	Request-to-send data size (for transparent communication function)	This is used for setting the data size to be sent to another node (number of bytes), when the transparent communication function is used. • **Settings:** Set value (number of bytes) ≦ Send-buffer size (number of words) × 2

Notes:

- The actual address can be obtained by adding an offset address to the starting address of each information setting block.
- Be sure to set the parameters in offset addresses H0 through H8 before turning ON the request-to-open signal and set the data in offset addresses HD and HF before starting data exchanges.

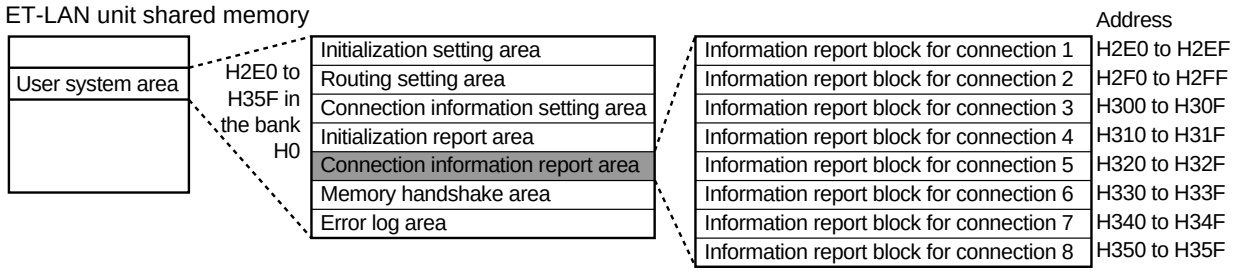
■ Port number settings

Port numbers are used to distinguish each of the various communication processes that TCP or UDP provide for programmable controllers or computers. Limitations regarding port numbers which can be set differ for TCP/IP and UDP/IP, as shown below. The same port number can be used for TCP and UDP and also for the source and destination nodes.

Combination			Availability	
Destination configuration	Port number settings ●: means one port number	Description	Communication method	
			TCP/IP	UDP/IP
When an ET-LAN is accessing one destination node		• ET-LAN unit side: - multiple port numbers • Destination node side: - multiple port numbers	Available	Available
		• ET-LAN unit side: - single port number • Destination node side: - multiple port numbers	Available	Not-available
		• ET-LAN unit side: - multiple port numbers • Destination node side: - single port number	Available	Not-available
		• ET-LAN unit side: - single port number • Destination node side: - single port number	Not-available	Not-available
When an ET-LAN is accessing multiple destination node		• ET-LAN unit side: - multiple port numbers	Available	Available
		• ET-LAN unit side: - single port number	Available	Not-available

6-4. Monitoring the Connection Information Status of an ET-LAN Unit

After the open procedures, some parameters set in the open operation stage can be monitored by accessing the connection information report area (addresses H2E0 to H35F) of the ET-LAN unit's shared memory with the **F150 (READ)/P150 (PREAD)** instruction.



■ Specifications for connection information report area

Offset address in the setting block	Name	Description
H0	Open complete code	An open error code is stored here when the open operation is not successfully completed. - H0: Open is successfully completed. - Other than H0: Open error code is stored here. For details about the open error code, refer to page 109, "4. Tables of Access Error Codes".
H1	Source port number	Source port number set in the connection information setting area is monitored here after the open operation is successfully completed. • **Note:** Port number set in the connection information setting area is not reflected here while the complete-to-open signal is in the OFF state.
H2	Destination IP address (lower word)	IP address of the destination node is monitored here after the open operation is successfully completed. • **Note:** Destination IP address is not reflected here while the complete-to-open signal is in the OFF state.
H3	Destination IP address (higher word)	
H4	Destination port number	Port number of the destination node is monitored here after the open operation is successfully completed. • **Note:** Destination port number is not reflected here while the complete-to-open signal is in the OFF state.
H5	Destination MEWTOCOL station number	MEWTOCOL station number of the destination node is monitored here after the open operation is successfully completed. • **Note:** Destination station number is monitored here while the complete-to-open signal is in the OFF state.
H6 through HD	Area reserved for system use	These areas are not used for monitoring.
HE	Send operation end code (for transparent communication function)	A send operation error code is stored here when the send operation is not successfully completed in the transparent communication function. - H0: Send operation is successfully completed. - Other than H0: Send operation error code is stored. For details about the send operation error of the transparent communication function, refer to page 109, "4. Tables of Access Error Codes". • **Note:** This area is updated by the latest condition. If another send operation is performed, the value in the area is overwritten.

Note:

• The actual address can be obtained by adding an offset address to the starting address of each information report block.

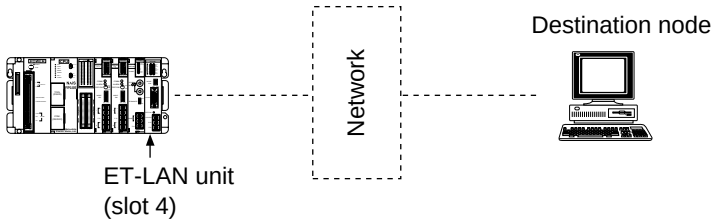
Offset address in the setting block	Name	Description
HF	Send operation complete data size (for transparent communication function)	The size of the data, which was transmitted to the destination node in the transparent communication function, is monitored here in units of bytes after the send operation is completed. • **Notes:** - If a connection close is initiated by the destination node, the send operation may be stopped while it is in progress. In this case, the number of bytes stored here is less than the value specified in the connection information setting area. - If a connection close is initiated by the source node, the connection is closed after sending all the data. - Even if the connection is abnormally closed, the quantity of data stored here is transmitted to the destination node without fail.

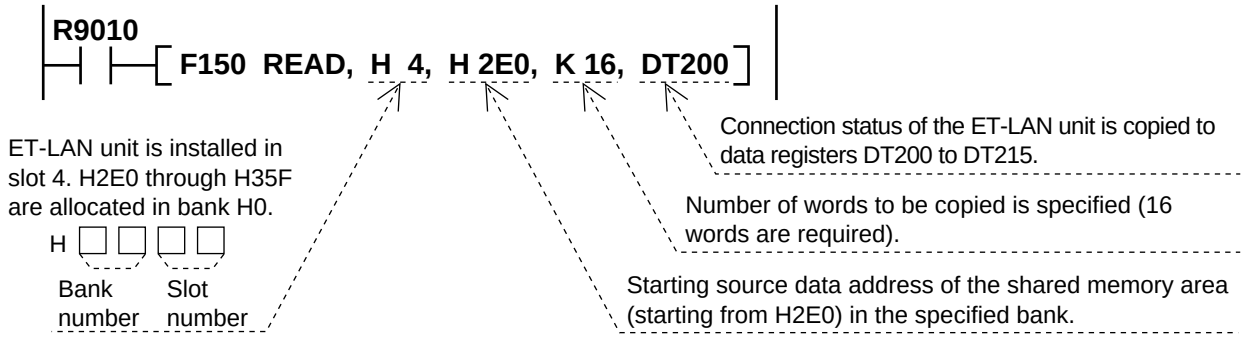
Notes:

- The actual address can be obtained by adding an offset address to the starting address of each information report block.
- The data in offset addresses H0 through H4 can be monitored after the complete-to-open signal turns ON.
- The data in offset addresses HD through HF can be monitored after the send operation is finished.

■ Program example for monitoring connection information report area

This is an example of a connection information read program. The figure below shows a program that reads the connection information of connection 1 when using an ET-LAN unit installed in slot No. 0.





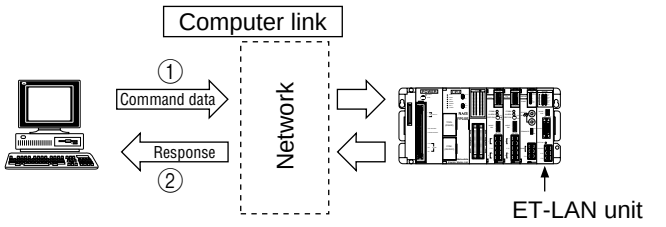
CHAPTER 7

COMPUTER LINK FUNCTION (MEWTOCOL-COM)

7-1. What is the Computer Link Function (MEWTOCOL-COM)

The FP3/FP10S I/O and register information can be freely read or written from a high-level computer such as a personal computer or workstation connected to an Ethernet (10BASE5) LAN. In the computer link function, the MEWTOCOL-COM protocol is used for communication.
Computer link communication is always initiated by a high-level computer that issues a MEWTOCOL-COM formatted message which the FP3/FP10S sends back to it in response through the ET-LAN unit as follows:

① The high-level computer issues a MEWTOCOL-COM command to FP3/FP10S.
② The FP3/FP10S sends a response back to the high-level computer.



When the FP3/FP10S receives the command data, it automatically returns a response. There is no need to write a communications program for the FP3/FP10S.

■ Keys for using the computer link function

- The MEWTOCOL station number for the ET-LAN unit should be specified at the time of the initial information setting operation in the range of 1 to 64. Station numbers should not overlap themselves in the same network.
- The FP3/FP10S should open a connection by specifying the IP address and the MEWTOCOL station number of the destination node.
- Up to 8 connections are available at the same time using computer link, data transfer and transparent communications.
- Since a maximum of 3 ET-LAN units can be installed on a single FP3/FP10S, an FP3/FP10S can access up to 3 Ethernet LANs independently.

■ List of MEWTOCOL-COM commands

Name	Command code (ASCII HEX code)	Description	Memory area code in MEWTOCOL-COM
Read contact	**RC (H52) (H43)**	Reads the contents stored in external input and output relays, internal relays, link relays and timer/counter contacts. Read-out data can be selected in single-bit units, an optional number of bits (up to 8) or word units.	External input relay: X External output relay: Y Internal relay: R Link relay: L Timer contact: T Counter contact: C
Write contact	**WC (H57) (H43)**	Writes data into external output, internal and link relays. Written data can be selected in single-bit units, an optional number of bits (up to 8) or word units.	External output relay: Y Internal relay: R Link relay: L
Set contact	**SC (H53) (H43)**	Sets a data pattern in external output, internal and link relays in word units.	External output relay: Y Internal relay: R Link relay: L
Read registers	**RD (H52) (H44)**	Reads the contents stored in data, link data, file and index registers.	Data register: D Link data register: L File register: F Index register IX: IX Index register IY: IY Index registers IX & IY: ID

Name	Command code (ASCll HEX code)	Description	Memory area code in MEWTOCOL-COM
Write registers	**WD (H57) (H44)**	Writes data into data, link data, file and index registers.	Data register: D Link data register: L File register: F Index register IX: IX Index register IY: IY Index registers IX & IY: ID
Set registers	**SD (H53) (H44)**	Sets a data pattern in data, link data and file registers.	Data register: D Link data register: L File register: F
Read SV of a timer/counter	**RS (H52) (H53)**	Reads the set value area SV for the timer/counter.	No need to specify the memory area code.
Write a value of a timer/counter to SV	**WS (H57) (H53)**	Writes data into the set value area SV for the timer counter.	No need to specify the memory area code.
Read EV of a timer/counter	**RK (H52) (H4B)**	Reads the elapsed value area EV for the timer/counter.	No need to specify the memory area code.
Write a value of a timer/counter to EV	**WK (H57) (H4B)**	Writes data into the elapsed value area EV for the timer/counter.	No need to specify the memory area code.
Specify contacts monitored	**MC (H4D)(H43)**	Registers or resets the addresses of external input and output relays, internal relays, link relays and timer/counter contacts, which will be monitored by the “MG” command.	External input relay: X External output relay: Y Internal relay: R Link relay: L Timer contact: T Counter contact: C
Specify registers monitored	**MD (H4D)(H44)**	Registers or resets the addresses of data, link data, file and index registers, word external input and output relays, word internal relays, and timer/counter set and elapsed value areas, which will be monitored by the “MG” command.	Data register: D Link data register: L File register: F Index register IX: IX Index register IY: IY Word external input relay: WR Word external output relay: WY Word internal relay: WR Timer/counter set value area: S Timer/counter elapsed value area: K
Monitoring start	**MG (H4D)(H47)**	Monitors the points specified in the “MC” and “MD” commands.	No need to specify the memory area code.
Read system registers	**RR (H52)(H52)**	Reads parameters stored in system registers of the programmable controller.	No need to specify the memory area.
Write a value to system register	**WR (H57)(H52)**	Writes parameters into system registers of the programmable controllers.	No need to specify the memory area.
Read the status of the programmable controller	**RT (H52)(H54)**	Reads the status of the programmable controller such as PLC type and program capacity.	No need to specify the memory area.
Read a program block of the programmable controller for backup	**RP (H52)(H50)**	Reads a program block stored in the programmable controller. The program read function must be used only for backup purpose.	No need to specify the memory area.
Write a program block read by WP command	**WP (H57)(H50)**	Write the program block read out by the “RP” command.	No need to specify the memory area.
Change the mode of the programmable controller	**RM (H52)(H4D)**	Remotely controls the mode of the programmable controller (PROG. or RUN).	No need to specify the memory area.
Abort a series of responce message	**AB (H41)(H42)**	Aborts a series of message sent in multiple frames.	No need to specify the memory area.

7-2. How to Use the Computer Link Function

Open a connection to the destination node with the open operation after the unit's initial operation finishes in order to perform computer link communication at the programmable controller. It is not necessary to execute a communications program at the programmable controller because the programmable controller automatically issues a response message by receiving a command message from the destination node computer after the connection is opened with that computer.

1. Setting Connection Information for the Computer Link Function

In order to use connections for the computer link function, the setting of parameters in each information setting block is required as follows:

- 6 words: when the destination node has the ARP function.
- 9 words: when the destination node does not have the ARP function.

To set parameters in the information setting block, first set the data to the memory areas such as data registers of the FP3 or FP10S and then transfer data in the specified memory areas to the information setting block of the ET-LAN unit shared memory. For details about the information setting block, refer to the table below.

■ Settings for each information setting block of the connection information setting area

<table>
<tr><th>Address for setting data</th><th>Set value</th><th>Description</th><th>Name of setting area</th></tr>
<tr><td rowspan="4">DTn</td><td>H8000</td><td>When UDP/IP is used,
<table><tr><td>Bit position</td><td>15 • • 12</td><td>11 • • 8</td><td>7 • • 4</td><td>3 • • 0</td></tr><tr><td>Data in DTn</td><td>1 0 0 0</td><td>0 0 0 0</td><td>0 0 0 0</td><td>0 0 0 0</td></tr></table></td><td rowspan="4">Open method setting area</td></tr>
<tr><td>H0000</td><td>When TCP/IP with active open method is used,
<table><tr><td>Bit position</td><td>15 • • 12</td><td>11 • • 8</td><td>7 • • 4</td><td>3 • • 0</td></tr><tr><td>Data in DTn</td><td>0 0 0 0</td><td>0 0 0 0</td><td>0 0 0 0</td><td>0 0 0 0</td></tr></table></td></tr>
<tr><td>H0300</td><td>When TCP/IP with fullpassive open method is used,
<table><tr><td>Bit position</td><td>15 • • 12</td><td>11 • • 8</td><td>7 • • 4</td><td>3 • • 0</td></tr><tr><td>Data in DTn</td><td>0 0 0 0</td><td>0 0 1 1</td><td>0 0 0 0</td><td>0 0 0 0</td></tr></table></td></tr>
<tr><td>H0200</td><td>When TCP/IP with unpassive open method is used,
<table><tr><td>Bit position</td><td>15 • • 12</td><td>11 • • 8</td><td>7 • • 4</td><td>3 • • 0</td></tr><tr><td>Data in DTn</td><td>0 0 0 0</td><td>0 0 1 0</td><td>0 0 0 0</td><td>0 0 0 0</td></tr></table></td></tr>
<tr><td>DTn+1</td><td>⇨</td><td>Specify source port number other than H0.</td><td>Source port number</td></tr>
<tr><td>DTn+2</td><td rowspan="2">⇨</td><td rowspan="2">Specify the IP address of the destination node.
• Example:
- When 128. 1. 2. 10 is registered, set as: H020A in the DTn+2
H8001 in the DTn+3
• Note: When TCP/IP with the unpassive open method is used, there is no need to set the IP address.</td><td>Destination IP address (lower word)</td></tr>
<tr><td>DTn+3</td><td>Destination IP address (higher word)</td></tr>
<tr><td>DTn+4</td><td>⇨</td><td>Specify a destination port number other than H0.</td><td>Destination port number</td></tr>
<tr><td>DTn+5</td><td>⇨</td><td>Specify destination MEWTOCOL station number.
• Settings: In the range of K1 to K64 without overlapping in the same network.</td><td>Destination MEWTOCOL station number</td></tr>
<tr><td>DTn+6
DTn+7
DTn+8</td><td>⇨</td><td>Specify the Ethernet (physical) address of the destination node if the active open method is performed with the node without ARP (address resolution protocol) during TCP/IP communication.
• Note: If the destination node is equipped with ARP, set H0 or HFFFFFFFFFFF.</td><td>Destination Ethernet (physical) address</td></tr>
</table>

Note:

• For details about the connection information setting area, refer to page 56, "■ Specifications for connection information setting area".

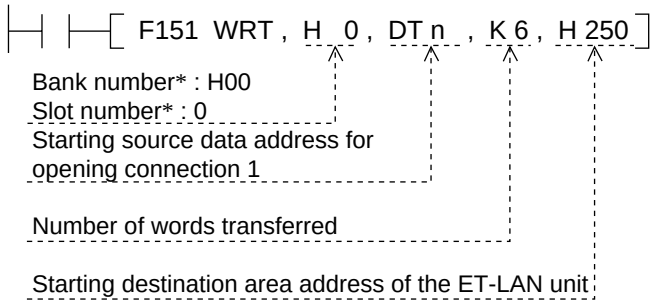
2. Setting Parameters in the ET-LAN Unit Shared Memory

The parameters are set in the connection information setting area of the ET-LAN unit shared memory using the **F151 (WRT)/P151 (PWRT)** instructions.

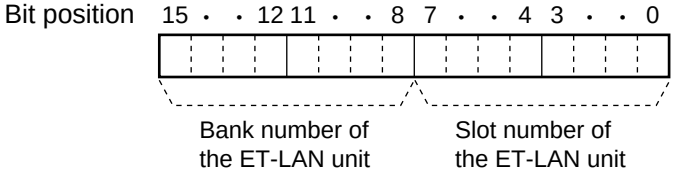
■ Program example

The program below is made on the following assumptions:

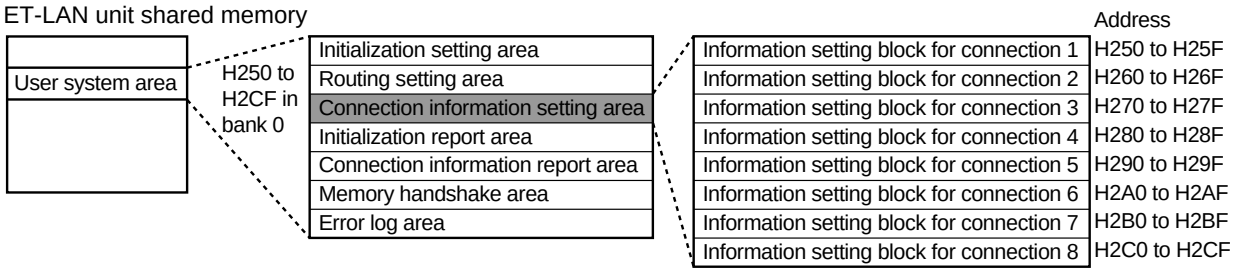
- the ET-LAN unit installed in slot 0.
- connection 1 is used.
- the starting address of the data register storage parameters is DTn.
- the destination node has the ARP function.



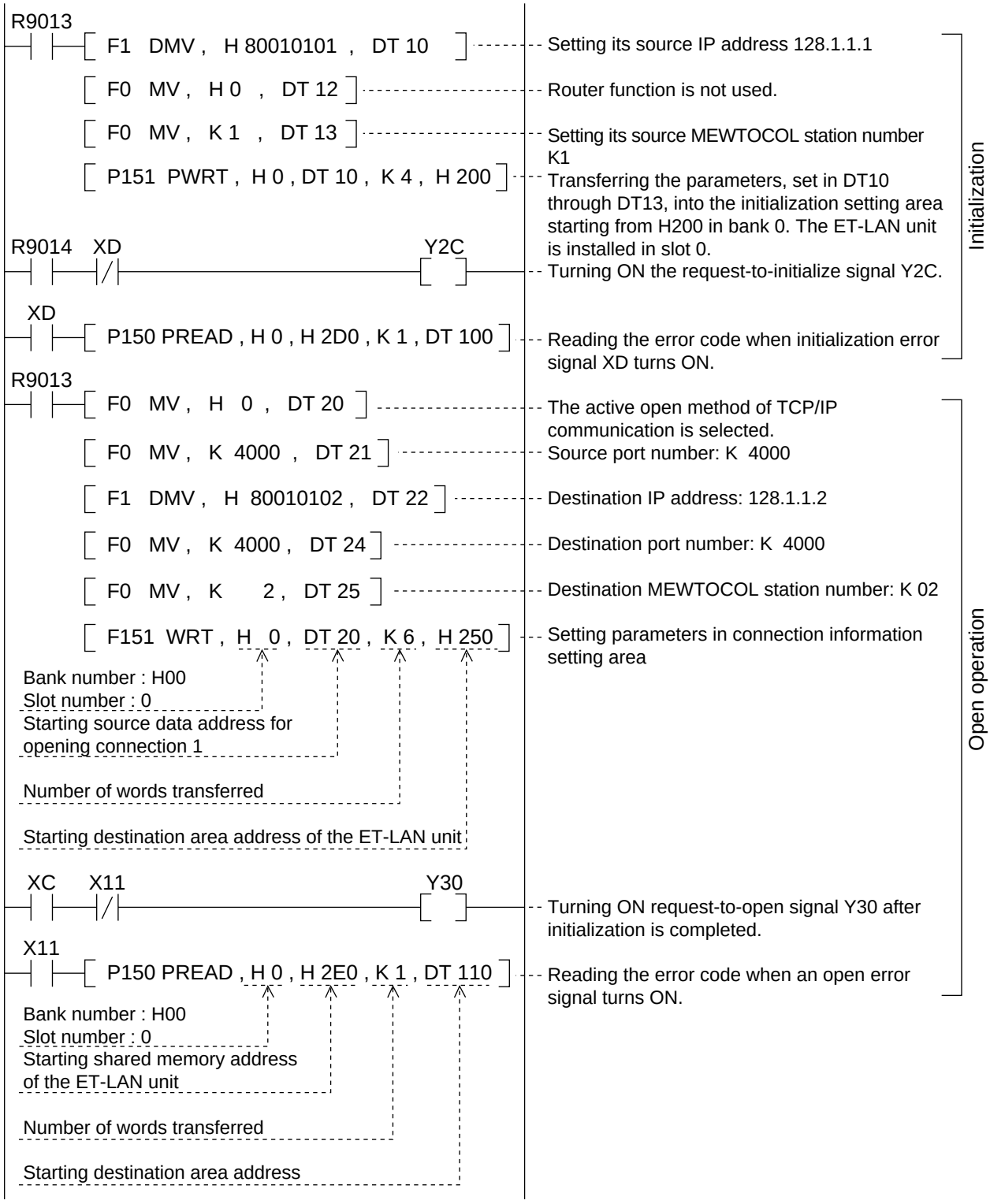
* The bank and slot number is specified as:



■ Connection information setting area of the ET-LAN unit shared memory



3. Program Example for Computer Link Open Operation



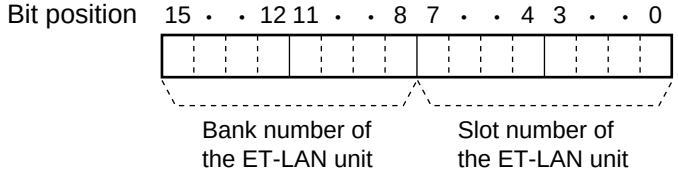
■ Reference

- Relays for I/O handshake communication
  - XC: complete-to-initialize signal
  - XD: initialize error signal
  - X11: open error signal for connection 1
  - Y2C: request-to-initialize signal
  - Y30: request-to-open signal for connection 1

Note:

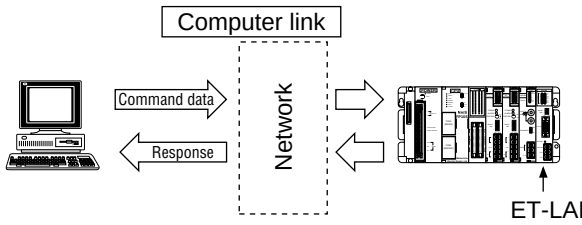
- The allocations above apply when the ET-LAN units is installed in slot 0.

- Special internal relays
  - R9013: initial ON relay (Turns ON only at the first scan in the operation.)
  - R9014: initial OFF relay (Turns OFF only at the first scan in the operation.)
- How to specify the bank and slot number of the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions.

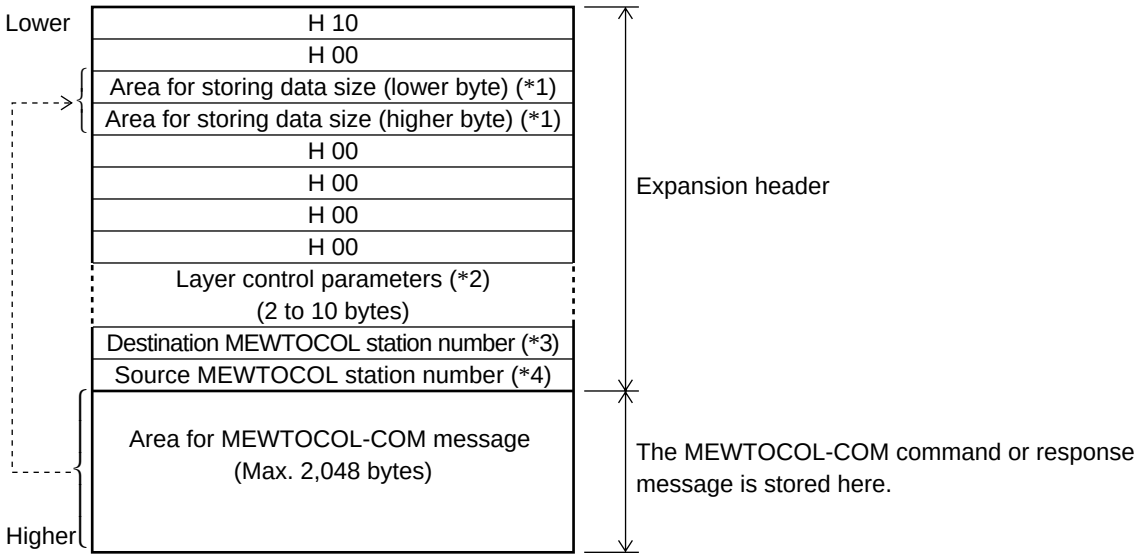


7-3. MEWTOCOL-COM Expansion Header Format for Computer

The MEWTOCOL-COM command and response messages for the computer connected to an Ethernet LAN are handled with the expansion header. Using the expansion header, a computer can also communicate with a programmable controller in other layers (up to depth layer 3) through relay stations. The basic format for the MEWTOCOL-COM expansion header is as shown below.



When the FP3/FP10S receives the command data, it automatically returns a response. There is no need to write a communications program for the FP3/FP10S.



Notes:

- For inter-layer communication, there are limitations on link unit installation as follows.
  - When all inter-layer communication is performed only via high-level link units:
    You can install as many high-level and standard link units on relay stations as the CPU can handle.
  - When inter-layer communication is performed via high-level and standard link units:
    No more than 3 link units can be installed in each relay station.
- For details about link units, refer to page 122, “12-1. Standard and High-level Link Units”.

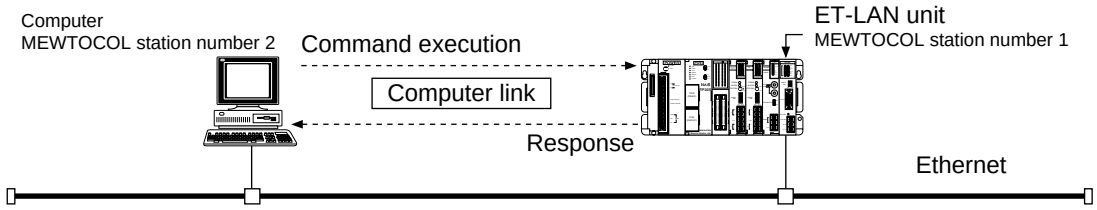
*1 The data size stored here is the number of bytes used in the area for the MEWTOCOL-COM message.

*2 For details about the layer control parameters, refer to “■ MEWTOCOL-COM message format for communication in the same layer” and “■ MEWTOCOL-COM message format for inter-layer communication”, in this section.

*3 The MEWTOCOL station number of the final destination programmable controller should be set in a command message to a programmable controller. The MEWTOCOL station number of the computer itself is stored in a response message from the computer.

*4 The MEWTOCOL station number of the computer itself should be stored in a command message to a programmable controller. The MEWTOCOL station number of the source programmable controller is stored in a response message from the programmable controller.

■ MEWTOCOL-COM message format for communication in the same layer



Lower	H 10
	H 00
	Area for storing data size (lower byte)
	Area for storing data size (higher byte)
	H 00
	H 00
	H 00
	H 00
	H 00
	H 00
	Destination MEWTOCOL station number
	Source MEWTOCOL station number
Higher	Area for MEWTOCOL-COM message (Max. 2,048 bytes)

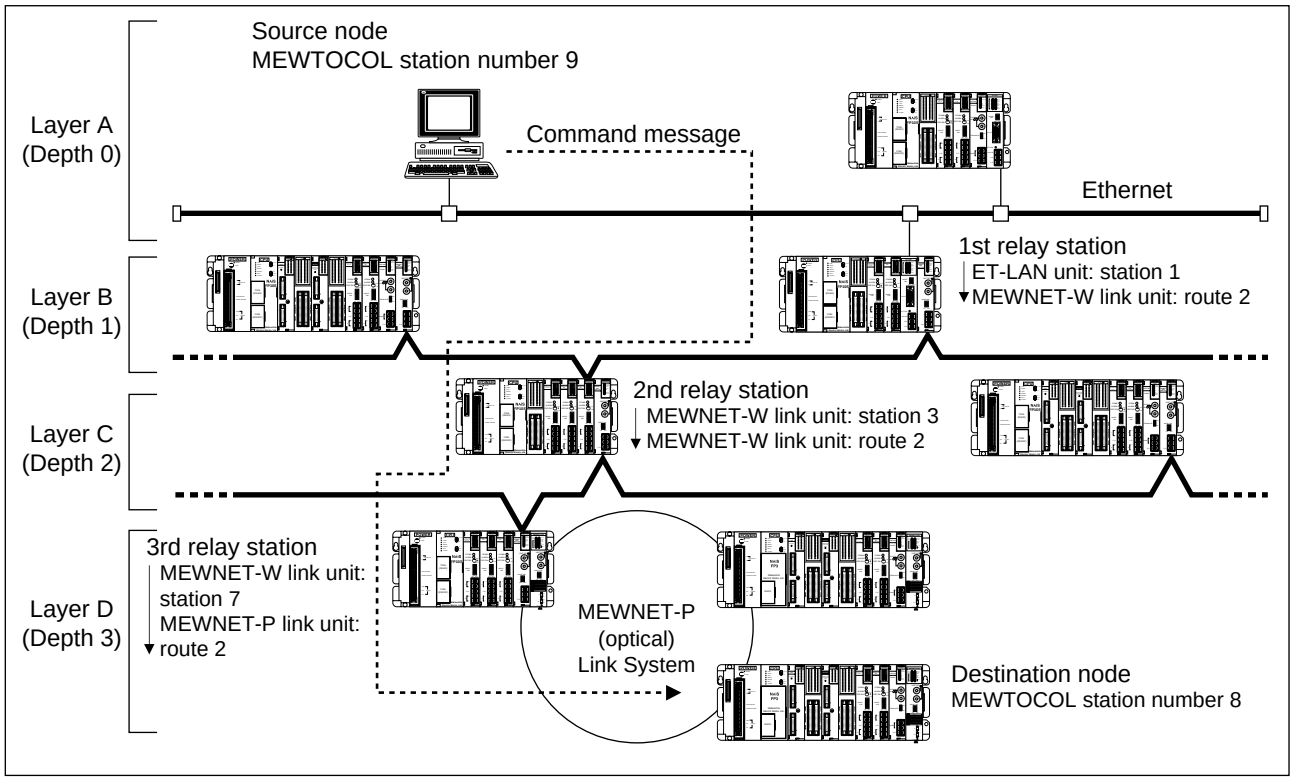
H 00 are set in two bytes of the area as layer control parameters.

■ MEWTOCOL-COM message format for inter-layer communication

For inter-layer communication, be sure to pay attention to the following limitations:

- When all inter-layer communication is performed only via high-level link units:
  You can install as many high-level and standard link units on relay stations as the CPU can handle.
- When inter-layer communication is performed via high-level and standard link units:
  No more than 3 link units can be installed in each relay station.

For details about link units, refer to page 122, “12-1. Standard and High-level Link Units”.



Lower	H 10	Expansion header
	H 00	
	Area for storing data size (lower byte)	
	Area for storing data size (higher byte)	
	H 00	
	H 00	
	H 00	
	H 00	
	Depth of the destination node H01 to H03	Area for layer control parameters (6 to 10 bytes)
	Depth of the destination node (same value as above)	
	MEWTOCOL station number for the 1st relay station	--- Existing in depth layer 0
	MEWTOCOL station number for the 2nd relay station (*1)	--- Existing in depth layer 1
	MEWTOCOL station number for the 3rd relay station (*2)	--- Existing in depth layer 2
	Destination MEWTOCOL station number	
	Source MEWTOCOL station number (*3)	
	Link unit’s route number in the 1st relay station	--- Existing in depth layer 1
	Link unit’s route number in the 2nd relay station (*1)	--- Existing in depth layer 2
	Link unit’s route number in the 3rd relay station (*2)	--- Existing in depth layer 3
	Destination MEWTOCOL station number	
	Source MEWTOCOL station number	
Higher	Area for MEWTOCOL-COM message (Max. 2,048 bytes)	

Notes:

- Depending on the depth where the destination node exists, the size of the expansion header (size of the area for the layer control parameters) differs as follows:

*1 The area marked with *1 must be removed from the expansion header when the destination node is in depth layer 1.

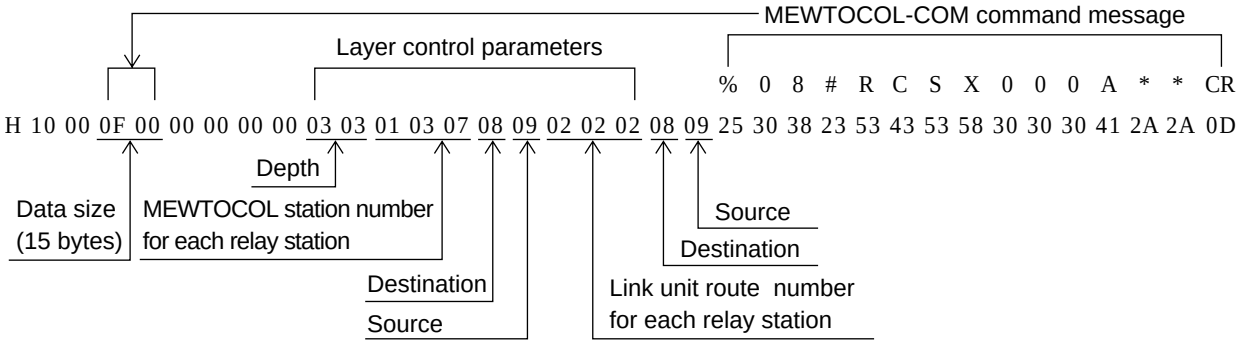
*2 The areas marked with *2 must be removed from the expansion header when the destination node is in depth layer 1 or 2.

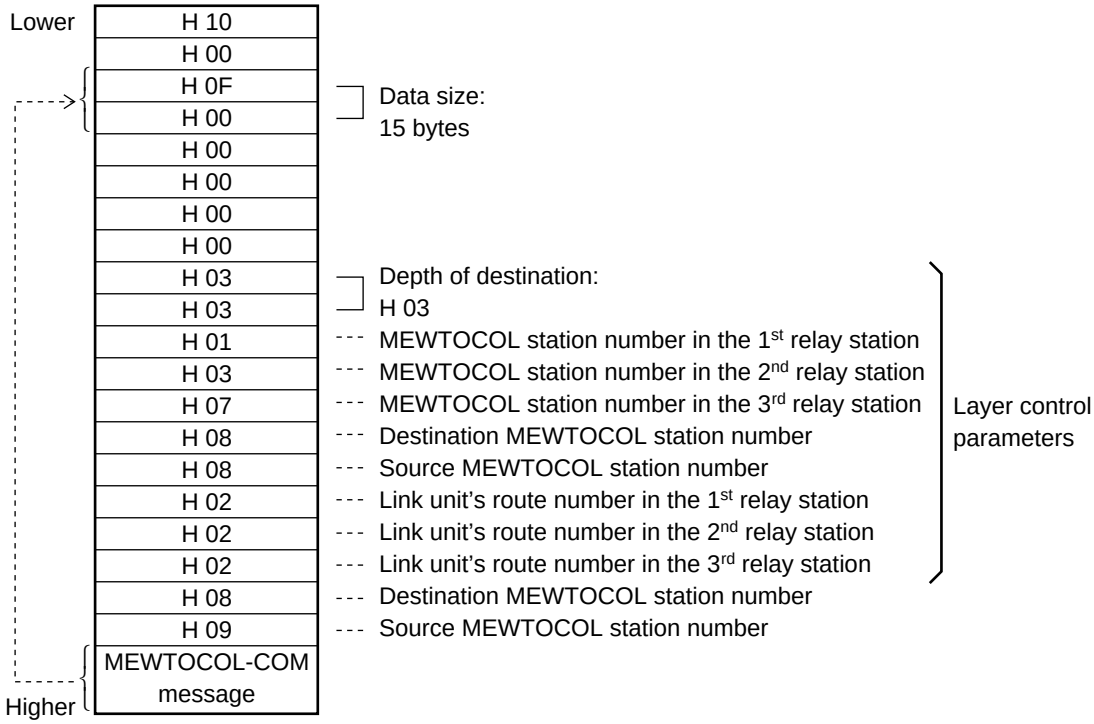
*3 In the area for the layer control parameters, only the value in the area marked with *3 is changed when a response message is sent back to the computer. The other values in the area for layer control are unchanged.

■ Example for command and response messages

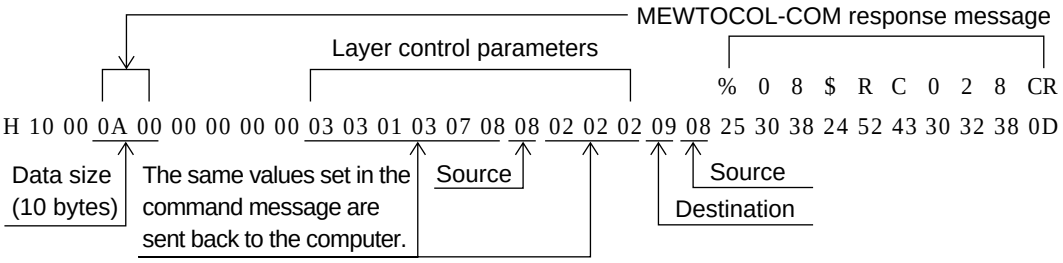
- This example is based on the assumption that the computer connected to the Ethernet LAN sends a command message to the node in the MEWNET-P link unit in order to read the condition of XA in the destination. The network configuration in "■ MEWTOCOL-COM message format for inter-layer communication" in this chapter is used here.

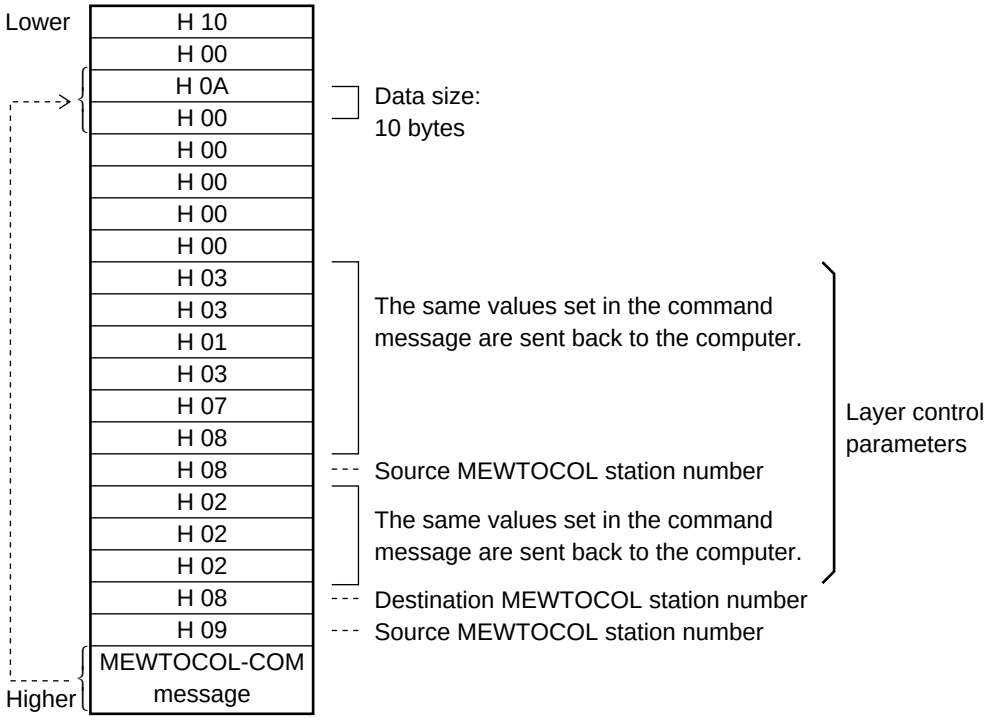
Command message example:





Response message example:





CHAPTER 8

DATA TRANSFER FUNCTION (MEWTOCOL-DAT)

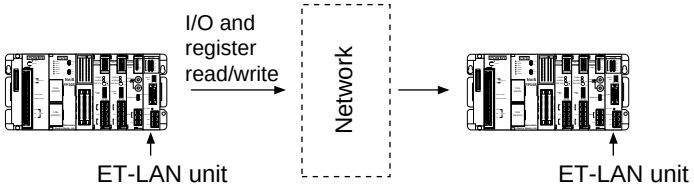
8-1. What is the Data Transfer Function (MEWTOCOL-DAT)

The I/O and register information can be freely read or written between FP3/FP10Ses or an FP3/FP10S and a personal computer or workstation connected to an Ethernet (10BASE5) LAN. With the data transfer function, an FP3/FP10S can read and write the I/O and register information only by executing the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions in the ladder program. If the destination node is an FP3/FP10S in the MEWTOCOL mode, no program is required at the destination node. If the destination node is a computer, you need to prepare a MEWTOCOL-DAT program at that computer.

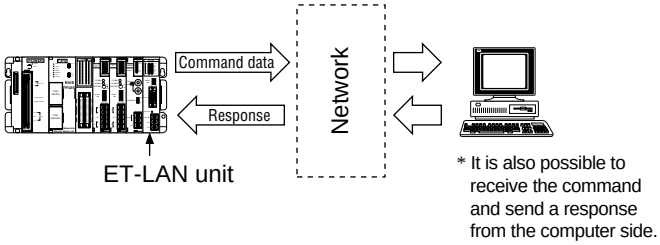
■ Keys for using the data transfer function

- The MEWTOCOL station number for the ET-LAN unit should be specified in the range of 1 to 64 during initialization, without it overlapping another station number in the same network.
- The FP3/FP10S should open a connection by specifying the IP address and the MEWTOCOL station number of the destination node.
- When communicating between FP3/FP10Ses, information can be exchanged by executing the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions as follows:

- **F145 (SEND)/P145 (PSEND)** instructions : A maximum of 1,020 words of data are written to the destination node.
- **F146 (RECV)/P146 (PRECV)** instructions : A maximum of 1,020 words of data are read from the destination node.



- When an FP3/FP10S communicates with a computer, information can be exchanged using the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions. The computer should send back the response to the FP3/FP10S in the MEWTOCOL-DAT format. A maximum of 1,020 words of data can be handled at a time.



- Up to eight connections are available at the same time using computer link, data transfer and transparent communications.
- Since a maximum of three ET-LAN units can be installed on a single FP3/FP10S, an FP3/FP10S can access up to three Ethernet LANs independently.

Note:

- When using the data transfer function, the use of the TCP/IP protocol is recommended to prevent communication malfunctions.

■ List of MEWTOCOL-DAT commands

Name	Command code	Description	Memory area code in MEWTOCOL-DAT
Write data in word units	**H50**	Sends the data to word external input and output relays, word internal relays, word special internal relays, link relays, timer/counter set and elapsed value areas, data registers, special data registers, link data registers and file registers of the destination node.	Word external input relay: H03 Word external output relay: H02 Word internal relay: H01 Word special internal relay: H07 Word link relay: H00 Timer/counter set value: H04 Timer/counter elapsed value: H05 Data register: H09 Special data register: H08 Link data register: H06 File register: H0A
Read data in word units	**H51**	Requests to send back the data stored in word external input and output relays, word internal relays, word special internal relays, link relays, timer/counter set and elapsed value areas, special data registers, link data registers and file registers from the destination node.	
Write a bit data	**H52**	Sends a bit data to word external input and output relays, word internal relays, word special internal relays, link relays, timer/counter set and elapsed value areas, data registers, special data registers, link data registers and file registers of the destination node.	Word external input relay: H03 Word external output relay: H02 Word internal relay: H01 Word special internal relay: H07 Word link relay: H00 Timer/counter set value: H04 Timer/counter elapsed value: H05 Data register: H09 Special data register: H08 Link data register: H06 File register: H0A
Read a bit data	**H53**	Requests to send back a bit data stored in word external input and output relays, word internal relays, word special internal relays, link relays, timer/counter set and elapsed value areas, special data registers, link data registers and file registers from the destination node.	

8-2. How to Use the Data Transfer Function

To set a data transfer with the programmable controller, open a connection node with the open process after the initial process of the ET-LAN unit has finished. After the connection has opened with the destination node, execute the data transfer instruction on the ladder program.

1. Setting Connection Information for the Data Transfer Function

In order to use connections for the data transfer function, the setting of parameters in each information setting block is required as follows:

- 6 words: when the destination node has the ARP function.
- 9 words: when the destination node does not have the ARP function.

To set parameters in the information setting block, first set the data to the memory areas, such as data registers of the FP3 or FP10S, and then transfer data in the specified memory areas to the information setting block of the ET-LAN unit shared memory. For details about the information setting block, refer to the table below.

■ Setting for each information setting block of the connection information setting area

Address for setting data	Set value	Description	Name of setting area
DTn	H0000	When TCP/IP with active open method is used, Bit position: 15 • • 12 | 11 • • 8 | 7 • • 4 | 3 • • 0 Data in DTn: 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0	Open method setting area
	H0300	When TCP/IP with fullpassive open method is used, Bit position: 15 • • 12 | 11 • • 8 | 7 • • 4 | 3 • • 0 Data in DTn: 0 0 0 0 | 0 0 1 1 | 0 0 0 0 | 0 0 0 0	
	H0200	When TCP/IP with unpassive open method is used, Bit position: 15 • • 12 | 11 • • 8 | 7 • • 4 | 3 • • 0 Data in DTn: 0 0 0 0 | 0 0 1 0 | 0 0 0 0 | 0 0 0 0	
DTn+1	⇨	Specify source port number other than H0.	Source port number
DTn+2	⇨	Specify the IP address of the destination node. • Example: - When 128.1.2.10 is registered, set as: H020A in the DTn+2 H8001 in the DTn+3 • Note: When TCP/IP with the unpassive open method is used, there is no need to set the IP address.	Destination IP address (lower word)
DTn+3			Destination IP address (higher word)
DTn+4	⇨	Specify a destination port number other than H0.	Destination port number
DTn+5	⇨	Specify destination MEWTOCOL station number. • Settings: In the range of K1 to K64 without overlapping in the same network.	Destination MEWTOCOL station number
DTn+6	⇨	Specify the Ethernet (physical) address of the destination node if the active open method is performed with the node without ARP (address resolution protocol) during TCP/IP communication. • Note: If the destination node is equipped with ARP, set H0 or HFFFFFFFFFFFF.	Destination Ethernet (physical) address
DTn+7			
DTn+8			

Notes:

- When using the data transfer function, be sure to select the TCP/IP communication method in order to prevent a communication malfunction.
- For details about the connection information setting area, refer to page 56,"■ Specifications for connection information setting area".

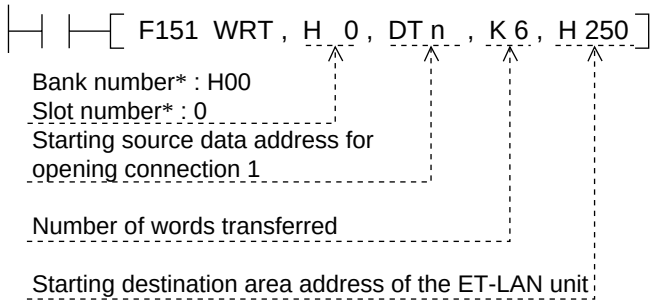
2. Setting Parameters in the ET-LAN Unit Shared Memory

The parameters are set in the connection information setting area of the ET-LAN unit shared memory using the **F151 (WRT)/P151 (PWRT)** instructions.

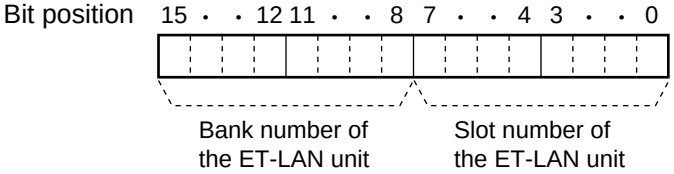
■ Program example

The program below is made on the following assumptions:

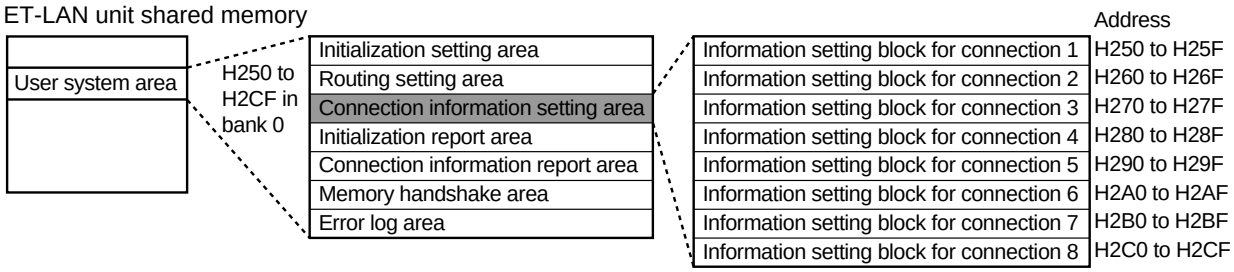
- the ET-LAN unit installed in slot 0.
- connection 1 is used.
- the starting address of the data register storage parameters is DTn.
- the destination node has the ARP function.



* The bank and slot number is specified as:



■ Connection information setting area of the ET-LAN unit shared memory



3. Instructions for Data Transfer Functions

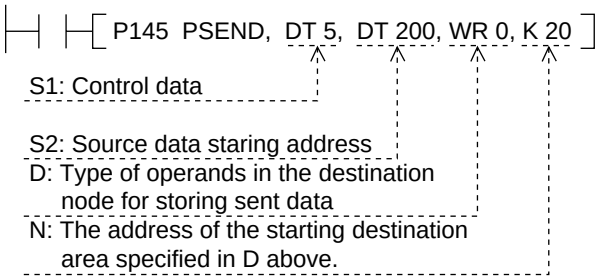
To use the data transfer function, the **F145 (SEND)/P145 (PSEND)** and **F145 (RECV)/P146 (PRECV)** instructions should be prepared in the FP3/FP10S program. Refer to the following descriptions.

■ F145 (SEND)/P145 (PSEND) instructions

Outline

- These instructions send data stored in the relays and registers of the FP3/FP10S to the specified areas of the destination node.
- The **F145 (SEND)** instruction is executed while its trigger is in the ON state.
- The **P145 (PSEND)** instruction is executed only when the leading edge of the trigger is detected.

Program example



Operand

Operand	Relay				Timer/ Counter		Register			Index register		Constant		Index modifier
	WX	WY	WR	WL	SV	EV	DT	LD	FL	IX	IY	K	H	
S1	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A
S2	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A
D	N/A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A
N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A

A: available, N/A: not available

Explanation of the example

- The program sends the data, stored in the areas starting from DT200 of its source node, to the area starting from WR20 in the destination node.
- The instruction is executed only when the leading edge of the trigger.

Description

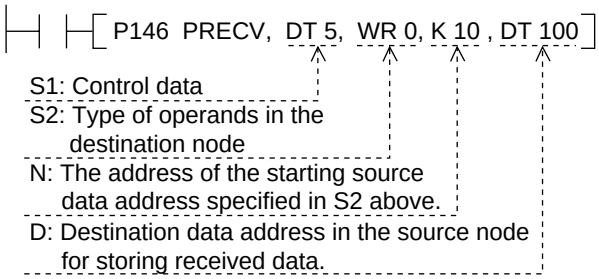
- The data in the source node specified by S2 is written to the area in the destination node specified by D and N.
- D (type of area) is specified by address 0 (e.g., DT0, WR0), and N (leading address) is specified by K (decimal) or H (hexadecimal).
- The destination node MEWTOCOL station number, transfer data size and transfer protocol (transfer in word units or a bit data) are specified by the control data (2 to 6 words data).

■ F146 (RECV)/P146 (PRECV) instructions

Outline

- These instructions request a destination node to send back data stored in the specified area to the specified relays or registers of the FP3/FP10S.
- The **F146 (RECV)** instruction is executed while its trigger is in the ON state.
- The **P146 (PRECV)** instruction is executed only when the leading edge of the trigger is detected.

Program example



Operand

Operand	Relay				Timer/ Counter		Register			Index register		Constant		Index modifier
	WX	WY	WR	WL	SV	EV	DT	LD	FL	IX	IY	K	H	
S1	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A
S2	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A
N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
D	N/A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A

A: available, N/A: not available

Explanation of the example

- The program requests the destination node to send the data stored in the areas starting from WR10, to the area starting from DT100 of source node.
- The instruction is executed only when the leading edge of the trigger.

Description

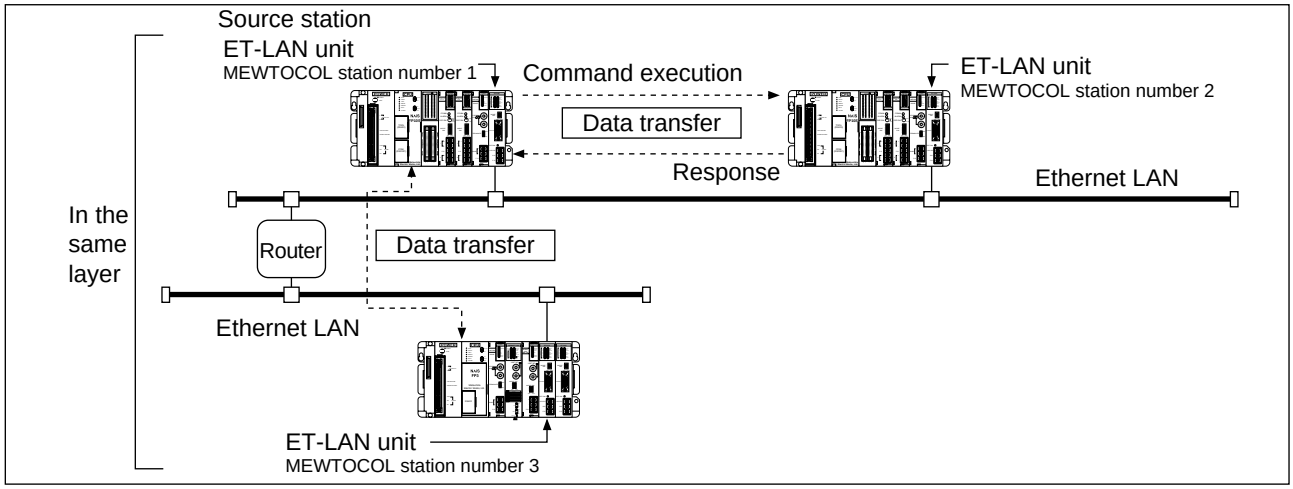
- The data in the destination node specified by S2 and N is read and stored in the source node specified by D.
- S2 (type of area) is specified by address 0 (e.g., DT0, WR0), and N (leading address) is specified by K (decimal) or H (hexadecimal).
- The destination node MEWTOCOL station number, transfer data size and transfer protocol (transfer in word units or a bit data) are specified by the control data (2 to 6 words data).

Notes:

- For details about the control data S1 settings, refer to, "■ Control data S1 settings for the communication in the same layer" and "■ Control data S1 settings for inter-layer communication".
- For details about the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions, refer to page 201, "12-3. Instructions for Communication".

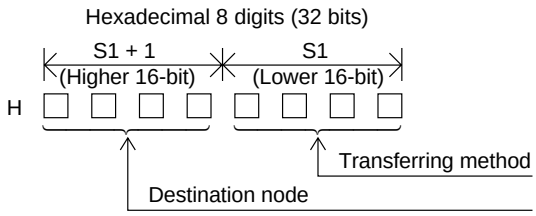
■ Control data S1 settings for communication in the same layer

Communication performed without using a relay unit is referred to as communication in the same layer.



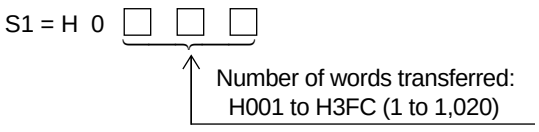
When the FP3/FP10S communicates with a node in the same layer, control data S1 is specified as follows:

- Two words are used as control data, S1 + 1 and S1.
  If the lower 16-bit area, S1, is specified, the higher 16-bit area is automatically decided.

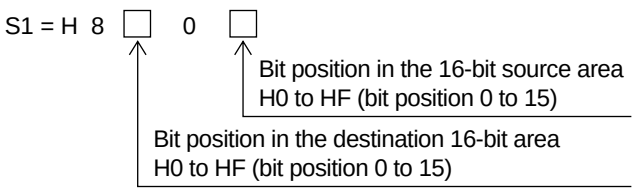


• Specifying the transfer method (lower 16-bit area: S1)

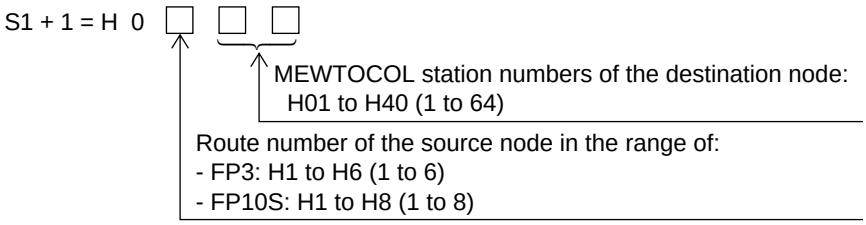
- When sending or receiving data in word units



- When sending or receiving a bit data



• Specifying destination node (higher 16-bit area: S1 + 1)



Notes:

- Route numbers are used to express the position of standard and high-level link units in a master backplane. The route numbers are assigned starting from the link unit in the slot nearest to the CPU.
  - FP3: Routes 1 through 6 are available including 3 standard and 3 high-level link units.
  - FP10S: Routes 1 through 8 are available including 5 standard and 5 high-level link units.

  The units regarded as standard and high-level are:
  - Standard link units: MEWNET-W link unit, MEWNET-P link unit, C.C.U. and C-NET link unit
  - High-level link units: MEWNET-H link unit and ET-LAN unit
- For details about link units, refer to page 122, “12-1. Standard and High-level Link Units”.
- MEWTOCOL station numbers, which can be allocated for each link unit, differ from network system to network system. For details about the MEWTOCOL station number allocation, refer to manuals of each link system.

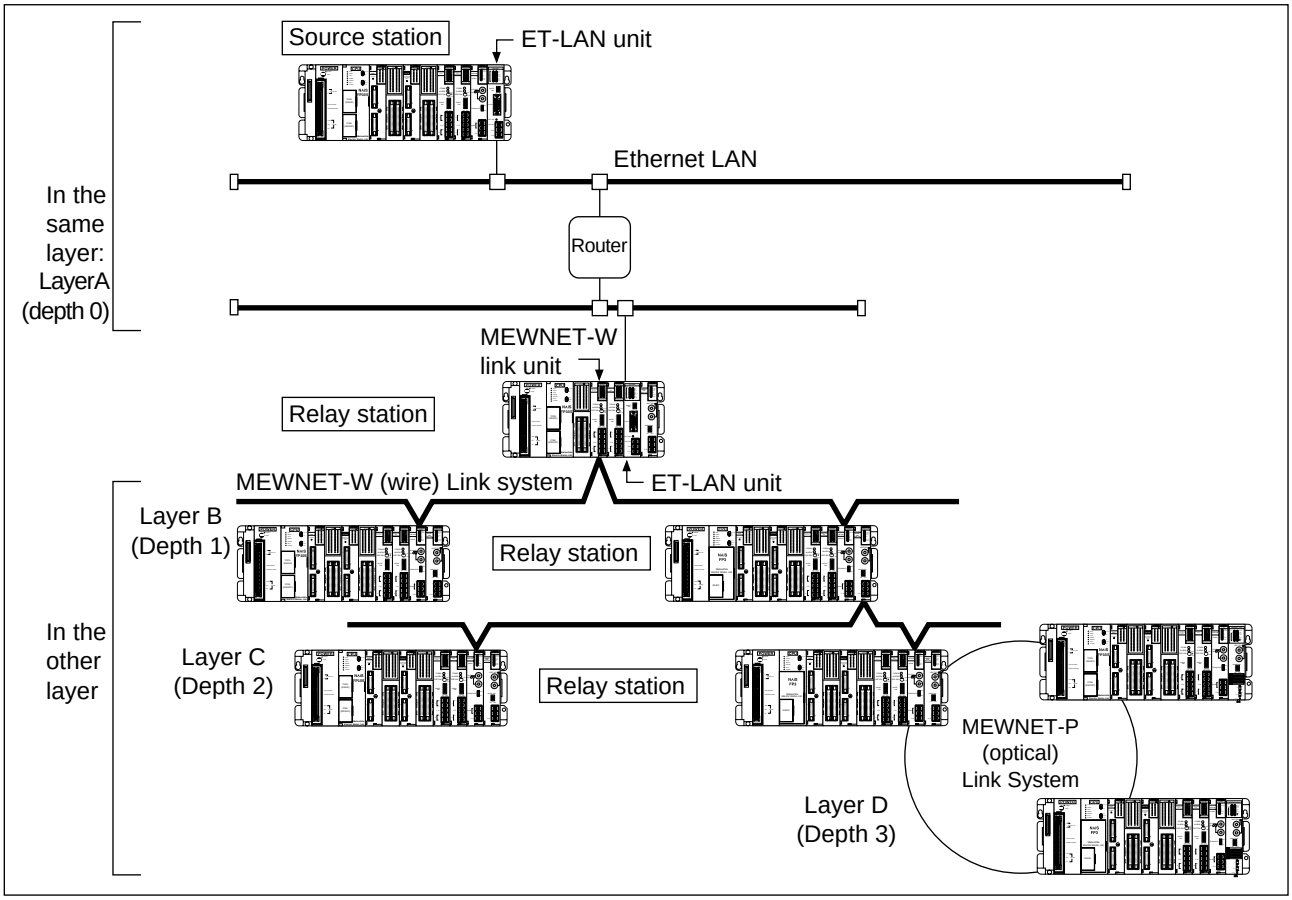
■ Control data S1 settings for inter-layer communication

Communication performed using relay units, such as ET-LAN, MEWNET-H, MEWNET-W and MEWNET-P link units is referred to as inter-layer communication.

When inter-layer communication, be sure to pay attention to the following limitations:

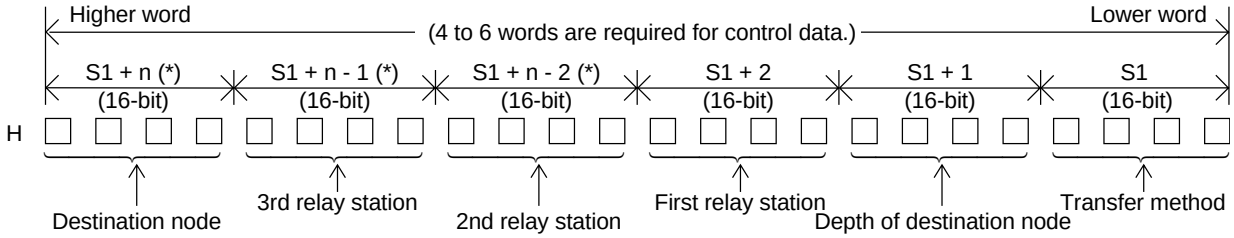
- When all inter-layer communication is performed only via high-level link units:
  You can install high-level and standard link units on relay stations as many as CPU's capability.
- When inter-layer communication is performed via high-level and standard link units:
  In each relay station, no more than 3 link units can be installed.

For details about the link units, refer to page 122, "12-1. Standard and High-level Link Units".



When the FP3/FP10S communicates with a node in another layer, control data S1 is specified as follows:

- Four to six words are used as control data (S1 + n, ..., S1 +1 and S1).
  If the lowest 16-bit S1 area is specified, the higher 16-bit areas are automatically decided.



Note:

- (*) Depending on the depth of the destination node, the number of 16-bit areas used for the control data differs as follows:
  - When depth is 1: n = 3 ("S1 + n - 2" and "S1 + n - 1" are not used.)
  - When depth is 2: n = 4 ("S1 + n - 1" is not used.)
  - When depth is 3: n = 5 (All the areas described above are used.)

• Specifying the transfer method (lower 16-bit area: S1)

- When sending or receiving data in word units

S1 = H 0 □ □ □

Number of words transferred:
- When transferring via only high-level link units:
  H001 to H3FC (1 to 1,020)
- When transferring using a standard link unit:
  H001 to H010 (1 to 16)

- When sending or receiving a bit

S1 = H 8 □ 0 □

Bit position in the source 16-bit area :
H0 to HF (bit position 0 to 15)

Bit position in the destination 16-bit area:
H0 to HF (bit position 0 to 15)

• Specifying the destination node (16-bit area: S1 + 1)

S1 + 1 = H 8 □ □ □

Depth of the destination node from the source node:
H01 to H03 (1 to 3)

Route number of the source node (See notes below.)

• Specifying the relay station and destination node (16-bit areas: S1 + 2 to S1 + n)

S1 + 2 = H □ □ □ □

Route number of the link unit in the nearest relay station which exists in depth layer 1 (See notes below.)

MEWTOCOL station number of the link unit in the nearest relay station which exists in the same layer as the source node:
H01 to H40 (1 to 64)

S1 + n - 2 = H □ □ □ □

Route number of the link unit in the 2nd nearest relay station which exists in depth layer 2 (See notes below.)

MEWTOCOL station number of the link unit in the 2nd nearest relay station which exists in depth layer 1 (See notes below.)

S1 + n - 1 = H □ □ □ □

Route number of the link unit in the 3rd nearest relay station which exists in depth layer 3 (See notes below.)

MEWTOCOL station number of the link unit in the 3rd relay station which exists in depth layer 2 (See notes below.)

S1 + n = H □ □ 0 0

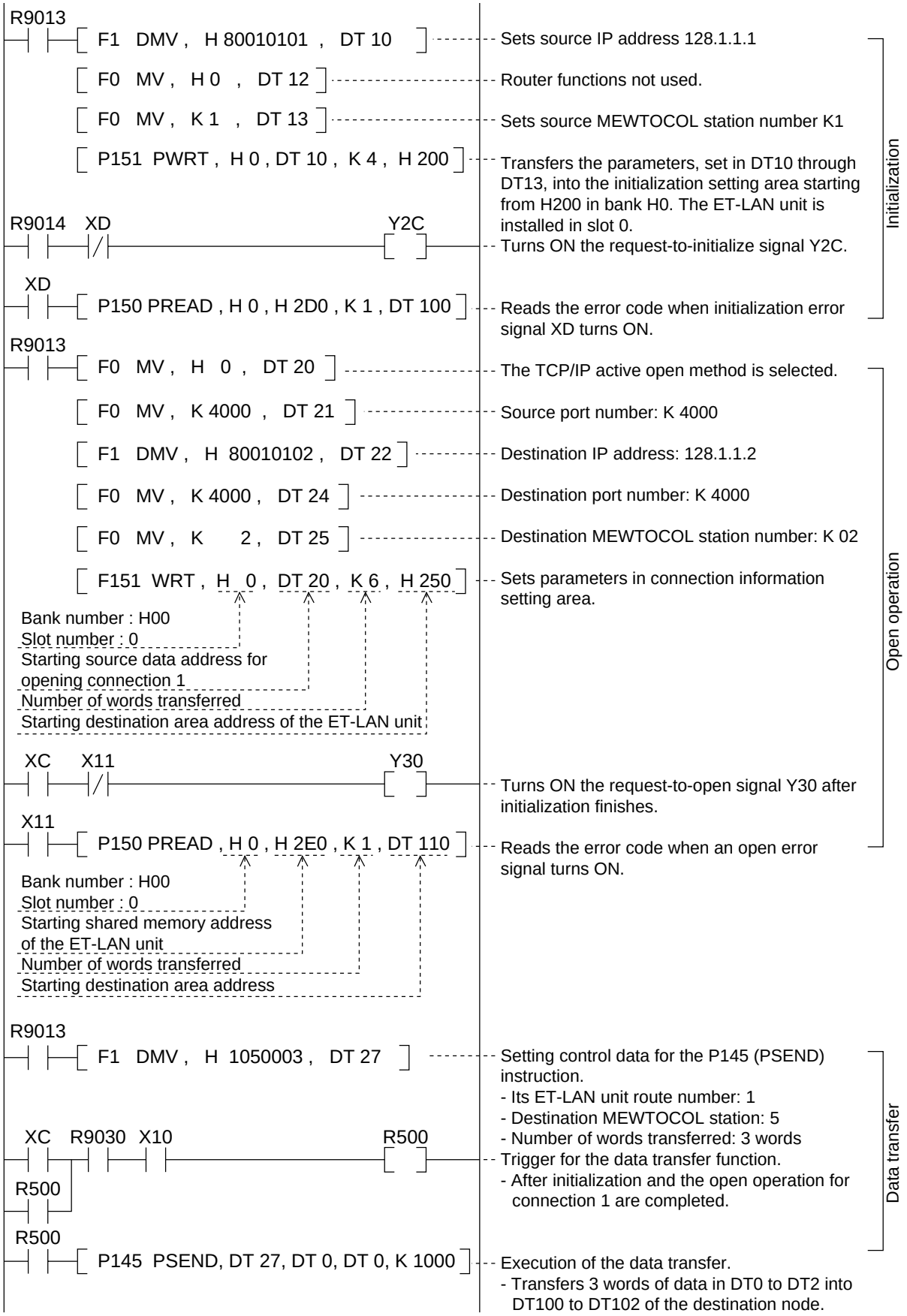
MEWTOCOL station number of the destination node (See notes below.)

Notes:

- Since the range of MEWTOCOL station numbers differs from network system to network system, be sure to check the manuals of each link system for details.
  [EXAMPLES]
  - MEWNET-P link system: 1 to 63
  - MEWNET-W link system: 1 to 32
  - MEWNET-H link system: 1 to 64
  - ET-LAN system: 1 to 64
- The range of route numbers available differs depending on CPU types as:
  - FP3: 1 to 6 using 3 standard and 3 high-level link units.
  - FP10S: 1 to 8 using 5 standard and 3 high-level link units.

  However, if inter-layer communication is performed via a standard link unit, you cannot install no more than 3 link units. This case, route number 1 or 2 is specified.

4. Program Example for the Data Transfer Open Operation



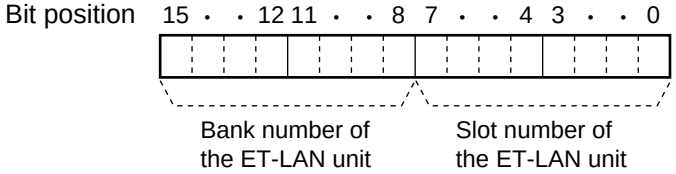
■ Reference

- Relays for I/O handshake communication.
  - XC: complete-to initialize signal
  - XD: initialize error signal
  - X10: complete-to-open signal for connection 1
  - X11: open error signal for connection 1
  - Y2C: request-to-initialize signal
  - Y30: request-to-open signal for connection 1

Note:

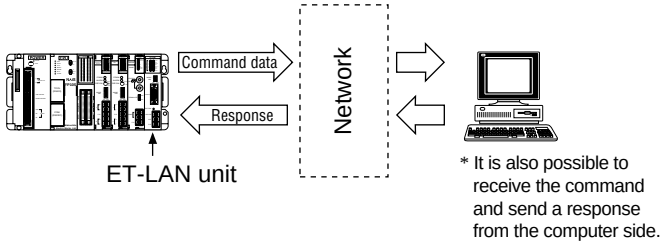
- The allocations above are used when the ET-LAN unit is installed in slot 0.

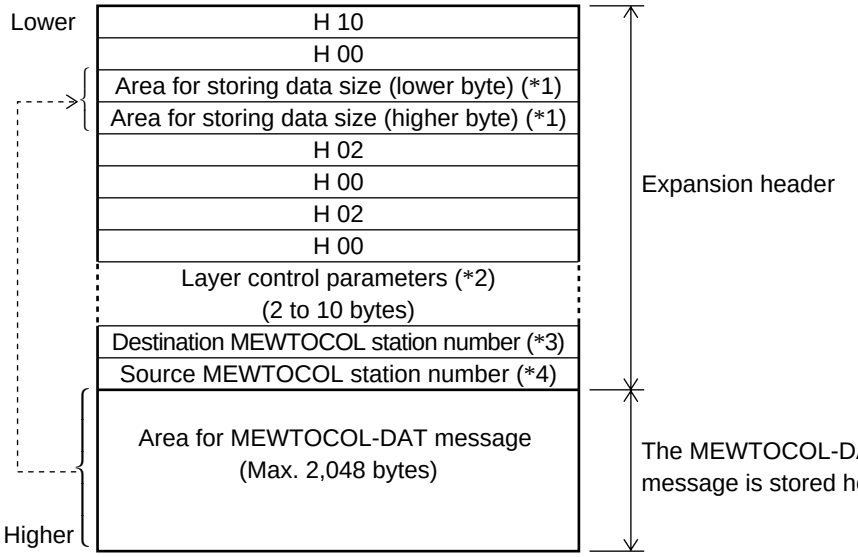
- Special internal relays
  - R9013: initial ON relay (Turns ON only during the first scan in the operation.)
  - R9014: initial OFF relay (Turns OFF only during the first scan in the operation.)
  - R9030: **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instruction execution flag (Turns ON while an **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instruction can be executed.)
- How to specify the bank and slot number of the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions.



8-3. MEWTOCOL-DAT Expansion Header Format for Computer

The MEWTOCOL-DAT command and response messages for the computer connected to an Ethernet LAN are handled with the expansion header. Using the expansion header, a programmable controller can also take the initiative for exchanging data with a computer connected to the Ethernet LAN in other layers (up to depth layer 3) through relay stations. The basic format for the MEWTOCOL-DAT expansion header is as shown below.





Notes:

- For inter-layer communication, there are limitations on link unit installation as follows.
  - When all inter-layer communication is performed only via high-level link units:
    You can install as many high-level and standard link units on relay stations as the CPU can handle.
  - When inter-layer communication is performed via high-level and standard link units:
    No more than 3 link units can be installed in each relay station.
- For details about link units, refer to page 122, “12-1. Standard and High-level Link Units”.

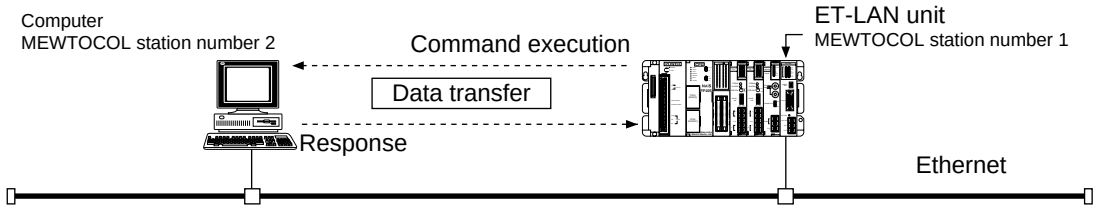
*1 The data size stored here is the number of bytes used in the area for the MEWTOCOL-DAT message.

*2 For details about the layer control parameters, refer to “■ MEWTOCOL-DAT message format for communication in the same layer” and “■ MEWTOCOL-DAT message format for inter-layer communication” in this section.

*3 The MEWTOCOL station number of the computer is stored in the command message to that computer. The MEWTOCOL station number of the final destination programmable controller should be set in a response message to the programmable controller.

*4 The MEWTOCOL station number of a source programmable controller is stored in a command message from a computer. The MEWTOCOL station number of the computer itself should be stored in a response message from that computer.

■ MEWTOCOL-DAT message format for communication in the same layer



Lower	H 10
	H 00
	Area for storing data size (lower byte)
	Area for storing data size (higher byte)
	H 02
	H 00
	H 02
	H 00
	H 00
	H 00
	Destination MEWTOCOL station number
	Source MEWTOCOL station number
Higher	Area for MEWTOCOL-DAT message (Max. 2,048 bytes)

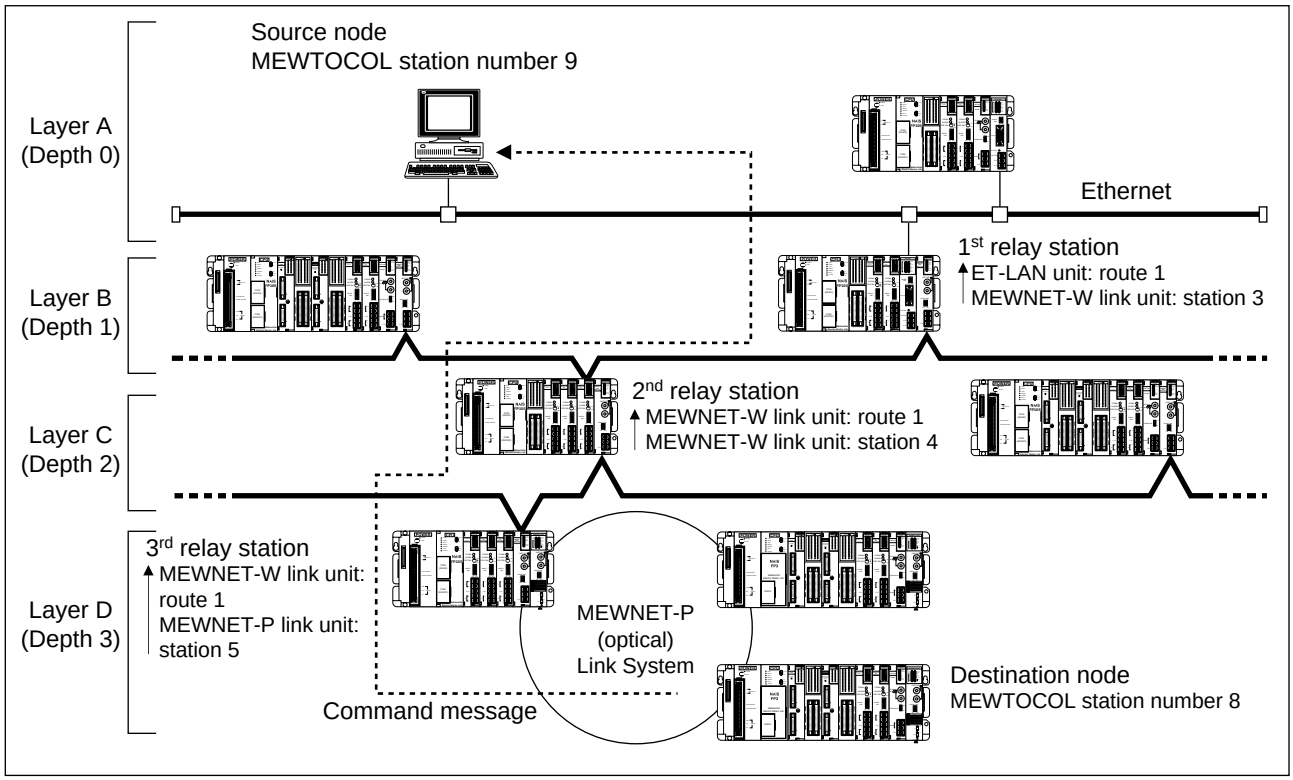
H 00 is set in two bytes of the area as layer control parameters.

■ MEWTOCOL-DAT message format for inter-layer communication

For inter-layer communication, be sure to pay attention to the following limitations:

- When all inter-layer communication is performed only via high-level link units:
  You can install as many high-level and standard link units on relay stations as the CPU can handle.
- When inter-layer communication is performed via high-level and standard link units:
  No more than 3 link units can be installed in each relay station.

For details about link units, refer to page 122, “12-1. Standard and High-level Link Units”.



Lower	H 10	Expansion header
	H 00	
	Area for storing data size (lower byte)	
	Area for storing data size (higher byte)	
	H 00	
	H 00	
	H 00	
	H 00	
	Depth of the destination node H01 to H03	Area for layer control parameters (6 to 10 bytes)
	Depth of the destination node (same value as above)	
	MEWTOCOL station number for the 1st relay station	--- Existing in depth layer 0
	MEWTOCOL station number for the 2nd relay station (*1)	--- Existing in depth layer 1
	MEWTOCOL station number for the 3rd relay station (*2)	--- Existing in depth layer 2
	Destination MEWTOCOL station number	
	Source MEWTOCOL station number (*3)	
	Link unit’s route number in the 1st relay station	--- Existing in depth layer 1
	Link unit’s route number in the 2nd relay station (*1)	--- Existing in depth layer 2
	Link unit’s route number in the 3rd relay station (*2)	--- Existing in depth layer 3
	Destination MEWTOCOL station number	
	Source MEWTOCOL station number	
Higher	Area for MEWTOCOL-DAT message (Max. 2,048 bytes)	

Note:

- Depending on the depth where the source node exists, the size of the expansion header (size of the area for the layer control parameters) sent to a computer differs as follows:

*1 The area marked with *1 must be removed from the expansion header when the destination node is in depth layer 1.

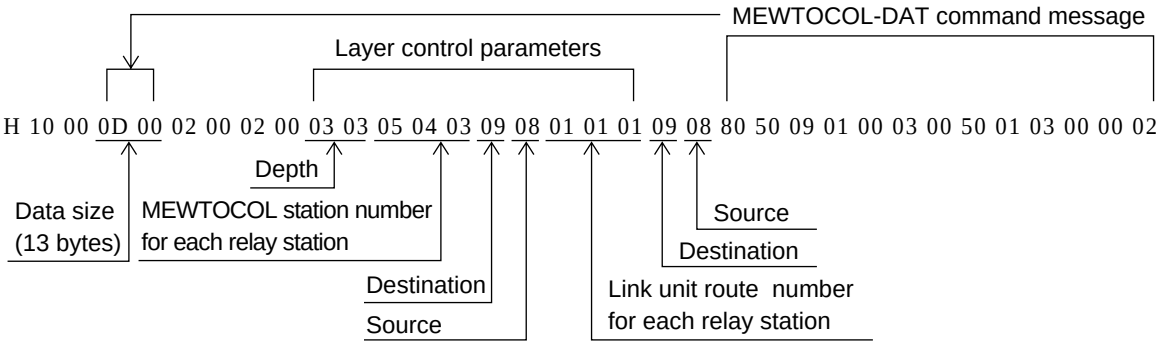
*2 The areas marked with *2 must be removed from the expansion header when the destination node is in depth layer 1 or 2.

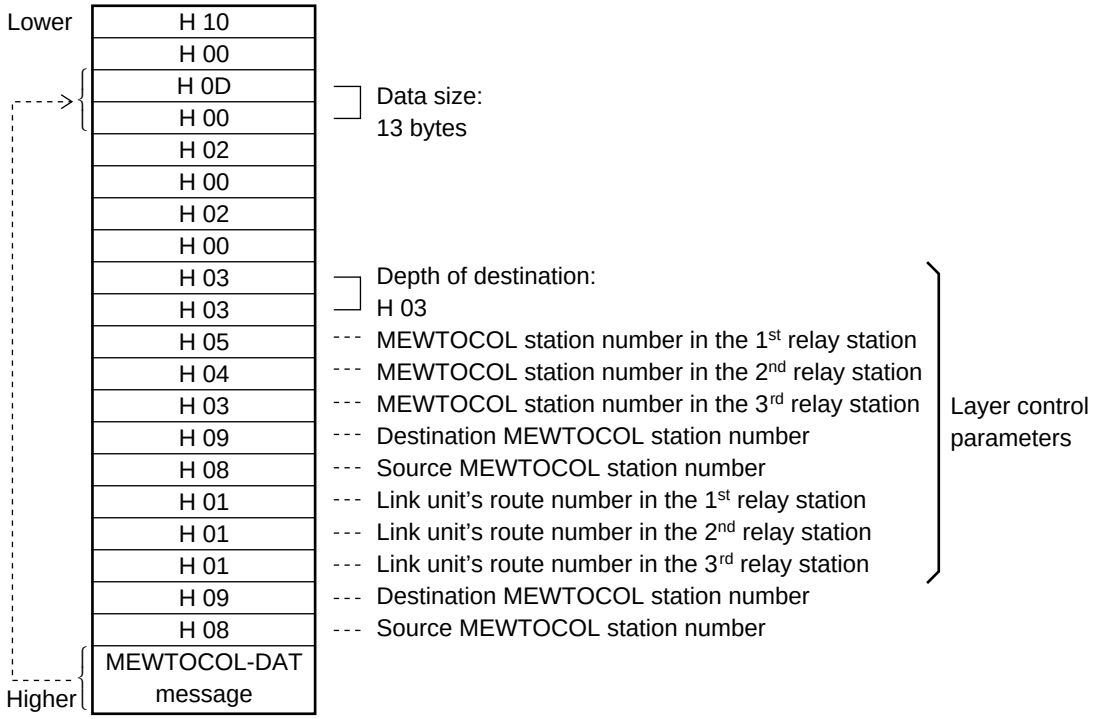
*3 In the layer control parameters, the value you need to change when sending a response message back to the programmable controller is in the area marked with *3. The other values in the area for layer control should be unchanged.

■ Example for command and response messages

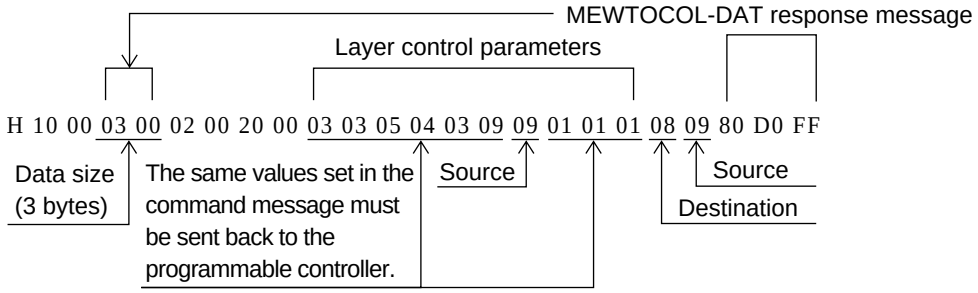
- This example is based on the assumption that the computer connected to the Ethernet LAN receives a command message from the node in the MEWNET-P link unit 3 layers away from the computer in order to receive the data condition of DT1 to DT3 in the source.
  The network configuration in "■ MEWTOCOL-DAT message format for inter-layer communication" in this chapter is used here.

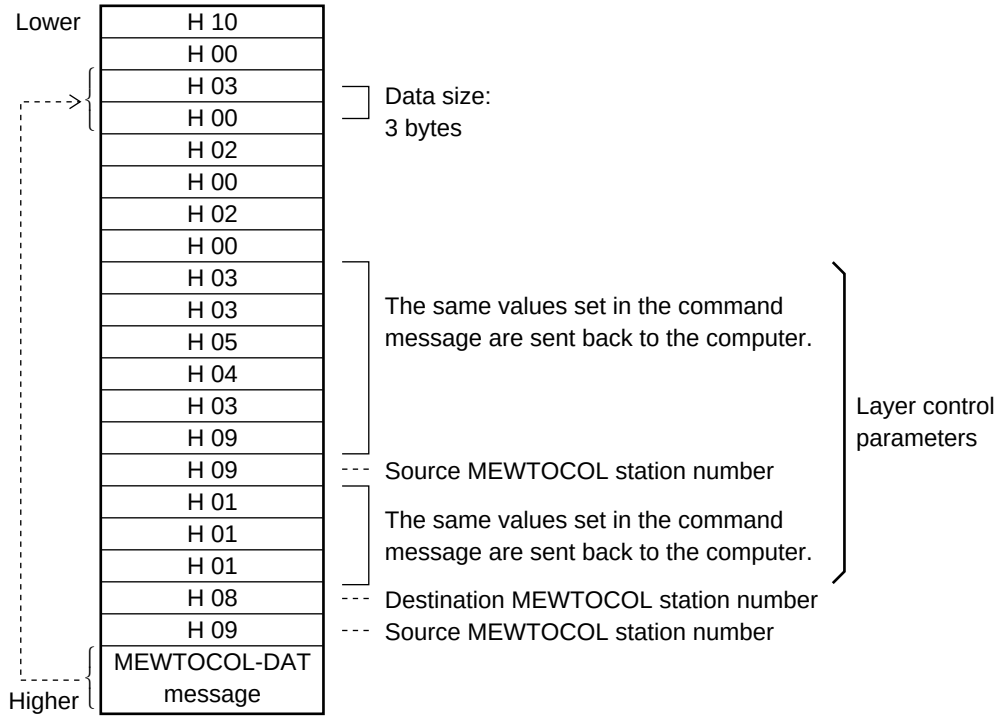
Command message example: (received by the computer)





Response message example:



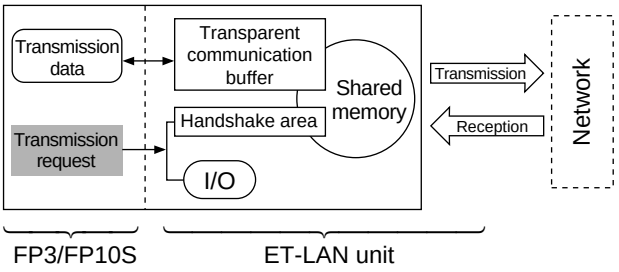


CHAPTER 9

TRANSPARENT COMMUNICATION FUNCTION

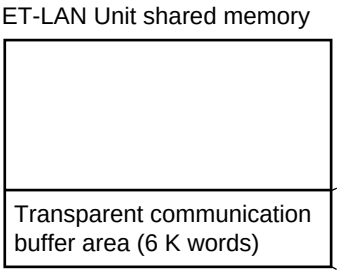
9-1. What is the Transparent Communication Function

Information can be exchanged between FP3/FP10Ses and between FP3/FP10S and a computer or workstation connected to an Ethernet (10BASE5) LAN. With the transparent communication function, an FP3/FP10S can communicate with another node regardless of the data format.



■ Keys to using the transparent communication function

• The transparent communication buffer should be allocated for connections used for transparent communications in the initialization stage.



Name of area		Absolute address	Bank number	Address
Connection 1	Receive buffer (1 K words)	H 2800 H 2BFF	H 0A	H 0 H 03FF
	Send buffer (1 K words)	H 2C00 H 2FFF	H 0B	H 0 H 03FF
Connection 2	Receive buffer (1 K words)	H 3000 H 33FF	H 0C	H 0 H 03FF
	Send buffer (1 K words)	H 3400 H 37FF	H 0D	H 0 H 03FF
Connection 3	Receive buffer (1 K words)	H 3800 H 3BFF	H 0E	H 0 H 03FF
	Send buffer (1 K words)	H 3C00 H 3FFF	H 0F	H 0 H 03FF

Notes:

- The buffer size can be changed by setting the parameters during the ET-LAN initialization stage. To change the allocation, the absolute address is used.
- To write data into send buffers and read data from receive buffers, the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions are used. The combination of the bank number and address is used to specify the destination or source area in the instructions.

• With transparent communication, the open operation should be performed by specifying each destination IP address.
• The FP3/FP10S exchanges data with another node by accessing the shared memory of the ET-LAN unit using the ladder program for control. Actual data exchanges are performed by turning ON or OFF the specified bits for the handshake.
• Up to eight connections are available at the same time using the computer link, data transfer and transparent communications.
• Since a maximum of three ET-LAN units can be installed on a single FP3/FP10S, an FP3/FP10S can access up to three Ethernet LANs independently.

9-2. How to Use the Transparent Communication Function

To perform transparent communication using the ET-LAN unit, open a connection to the destination node with the open process after the unit initialization has finished. After the connection has opened with the destination node, execute the send/receive process on the ladder program.

1. Setting Connection Information for the Transparent Communication Function

In order to use connections for the transparent communication function, the setting of parameters in each information setting block is required as follows:

- 6 words: when the destination node has the ARP function.
- 9 words: when the destination node does not have the ARP function.

To set parameters in the information setting block, first set the data to a memory area, such as the data registers, of the FP3 or FP10S and then transfer the data in the specified memory areas to the information setting block of the ET-LAN unit shared memory. For details about the information setting block, refer to the table below.

■ Setting for each information setting block of the connection information setting area

<table>
<tr><th>Address for setting data</th><th>Set value</th><th>Description</th><th>Name of setting area</th></tr>
<tr><td>DTn</td><td>H8001</td><td>When UCP/IP is used,
<table><tr><td>Bit position</td><td>15 • • 12</td><td>11 • • 8</td><td>7 • • 4</td><td>3 • • 0</td></tr><tr><td>Data in DTn</td><td>1 0 0 0</td><td>0 0 0 0</td><td>0 0 0 0</td><td>0 0 0 1</td></tr></table></td><td rowspan="5">Open method setting area</td></tr>
<tr><td></td><td>H0001</td><td>When TCP/IP with an active open method is used,
<table><tr><td>Bit position</td><td>15 • • 12</td><td>11 • • 8</td><td>7 • • 4</td><td>3 • • 0</td></tr><tr><td>Data in DTn</td><td>0 0 0 0</td><td>0 0 0 0</td><td>0 0 0 0</td><td>0 0 0 1</td></tr></table></td></tr>
<tr><td></td><td>H0301</td><td>When TCP/IP with fullpassive open method is used,
<table><tr><td>Bit position</td><td>15 • • 12</td><td>11 • • 8</td><td>7 • • 4</td><td>3 • • 0</td></tr><tr><td>Data in DTn</td><td>0 0 0 0</td><td>0 0 1 1</td><td>0 0 0 0</td><td>0 0 0 1</td></tr></table></td></tr>
<tr><td></td><td>H0201</td><td>When TCP/IP with unpassive open method is used,
<table><tr><td>Bit position</td><td>15 • • 12</td><td>11 • • 8</td><td>7 • • 4</td><td>3 • • 0</td></tr><tr><td>Data in DTn</td><td>0 0 0 0</td><td>0 0 1 0</td><td>0 0 0 0</td><td>0 0 0 1</td></tr></table></td></tr>
<tr><td>DTn+1</td><td>⇨</td><td>Specify source port number other than H0.</td><td>Source port number</td></tr>
<tr><td>DTn+2</td><td rowspan="2">⇨</td><td rowspan="2">Specify the IP address of the destination node.
• Example:
- When 128.1.2.10 is registered, set as: H020A in the DTn+2
H8001 in the DTn+3
• Note: When TCP/IP with the unpassive open method is used, there is no need to set the IP address.</td><td>Destination IP address (lower word)</td></tr>
<tr><td>DTn+3</td><td>Destination IP address (higher word)</td></tr>
<tr><td>DTn+4</td><td>⇨</td><td>Specify a destination port number other than H0.</td><td>Destination port number</td></tr>
<tr><td>DTn+5</td><td>⇨</td><td>Not used for the transparent communication function.</td><td>Destination MEWTOCOL station number</td></tr>
<tr><td>DTn+6</td><td rowspan="3">⇨</td><td rowspan="3">Specify the Ethernet (physical) address of the destination node if the active open method is performed with a node without ARP (address resolution protocol) during TCP/IP communication.
• Note: If the destination node is equipped with ARP, set H0 or HFFFFFFFFFFFF.</td><td rowspan="3">Destination Ethernet (physical) address</td></tr>
<tr><td>DTn+7</td></tr>
<tr><td>DTn+8</td></tr>
</table>

Note:

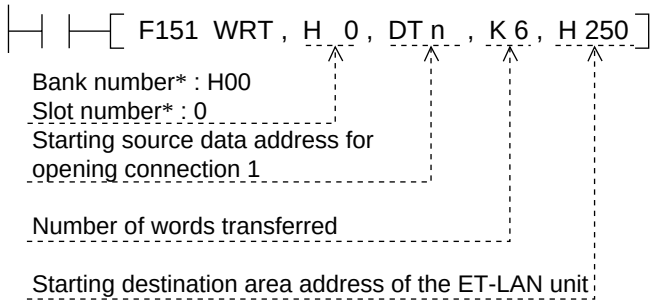
• For details about the connection information setting area, refer to page 56, "■ Specifications for connection information setting area".

2. Setting Parameters in the ET-LAN Unit Shared Memory

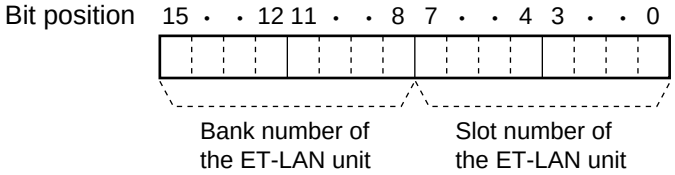
The parameters are set in the connection information setting area of the ET-LAN unit shared memory using the **F151 (WRT)/P151 (PWRT)** instructions.

■ Program example

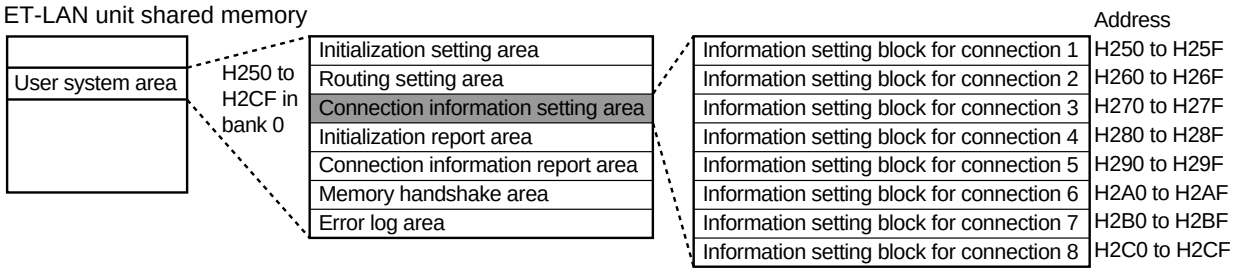
The program below is made on the following assumptions:
- the ET-LAN unit installed in slot 0.
- connection 1 is used.
- the starting address of the data register storage parameters is DTn.
- the destination node has the ARP function.



* The bank and slot number is specified as:



■ Connection information setting area of the ET-LAN unit shared memory

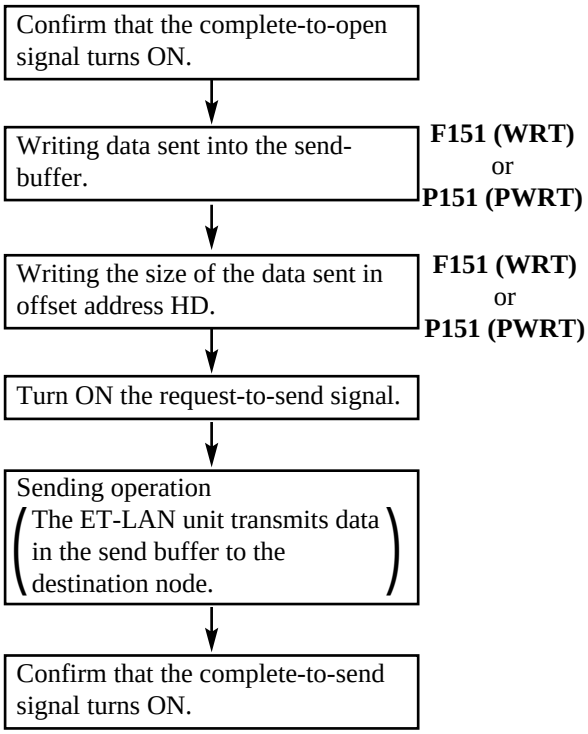


3. Sending and Receiving Operations for Transparent Communication

In the transparent communication function, sending and receiving operations are performed with the transparent communication buffer area in the ET-LAN unit shared memory as follows:

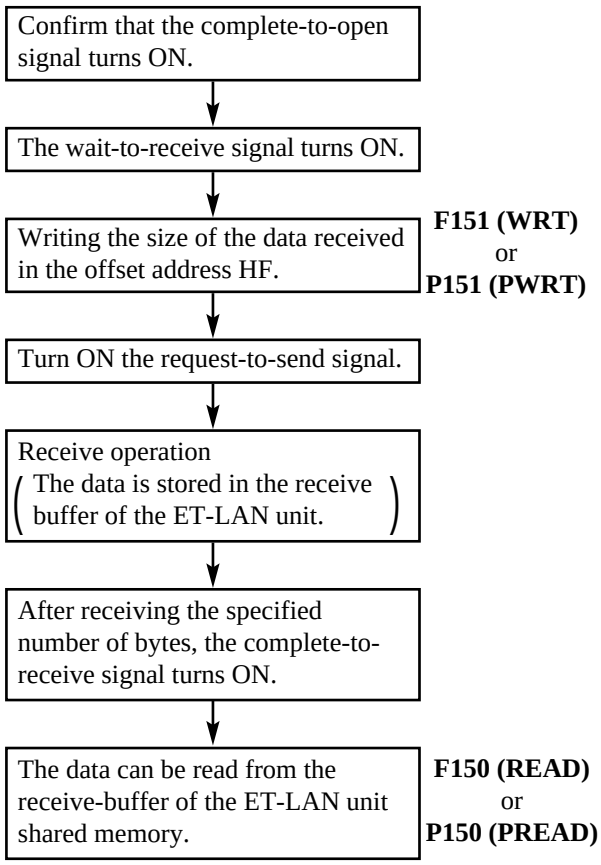
■ Sending operation procedure

After the open operation, data is written into the send-buffer of the ET-LAN unit shared memory and the size of the data is sent into offset address HD of the information setting block.



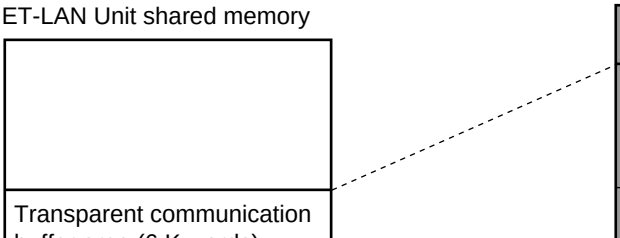
■ Receiving operation procedure

When data is sent to the ET-LAN unit, the wait-to-receive signal turns ON. After writing the size of the data received into offset address HF of the information setting block, turn ON the request-to receive signal. The receive operation is complete when the number of bytes specified is stored in the receive buffer.



■ Send and receive buffers for transparent communication

The send and receive buffers for transparent communication are initially allocated as shown below:



Name of area		Absolute address	Bank number	Address
Connection 1	Receive buffer (1 K words)	H 2800 H 2BFF	H 0A	H 0 H 03FF
	Send buffer (1 K words)	H 2C00 H 2FFF	H 0B	H 0 H 03FF
Connection 2	Receive buffer (1 K words)	H 3000 H 33FF	H 0C	H 0 H 03FF
	Send buffer (1 K words)	H 3400 H 37FF	H 0D	H 0 H 03FF
Connection 3	Receive buffer (1 K words)	H 3800 H 3BFF	H 0E	H 0 H 03FF
	Send buffer (1 K words)	H 3C00 H 3FFF	H 0F	H 0 H 03FF

Notes:

- The buffer size can be changed by setting the parameters during the ET-LAN initialization stage. To change the allocation, the absolute address is used.
- To write data into send buffers and read data from receive buffers, the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions are used. The combination of the bank number and address is used to specify the destination or source area in the instructions.

4. Explanation for Sending Operation

Each stage of the sending operation for transparent communication is controlled by turning ON or OFF the handshake signals.

1) Handshake Signals for Sending Operation

Three types of signals are used for performing the sending operation as request-to-send, complete-to-send and send error signals as follows.

■ Request-to-send signals

The request-to-send signals are used as triggers for sending data stored in the send buffer of the ET-LAN unit shared memory.

Handshake communication method	Request-to-send signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	Y22	Y26	Y2A	—	—	—	—	—
Memory handshake	Address H368 in bank H0							
	Bit position 2	Bit position 6	Bit position 10	—	—	—	—	—
	Address H36C in bank H0				Address H36D in bank H0			
	Bit position 2	Bit position 6	Bit position 10	Bit position 14	Bit position 2	Bit position 6	Bit position 10	Bit position 14

■ Complete-to-send signals

The ET-LAN informs of the completion of the data send operation to the FP3/FP10S CPU by using the compete-to-send signals.

Handshake communication method	Complete-to-send signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	X2	X6	XA	—	—	—	—	—
Memory handshake	Address H360 in bank H0							
	Bit position 2	Bit position 6	Bit position 10	—	—	—	—	—
	Address H364 in bank H0				Address H365 in bank H0			
	Bit position 2	Bit position 6	Bit position 10	Bit position 14	Bit position 2	Bit position 6	Bit position 10	Bit position 14

■ Send error signals

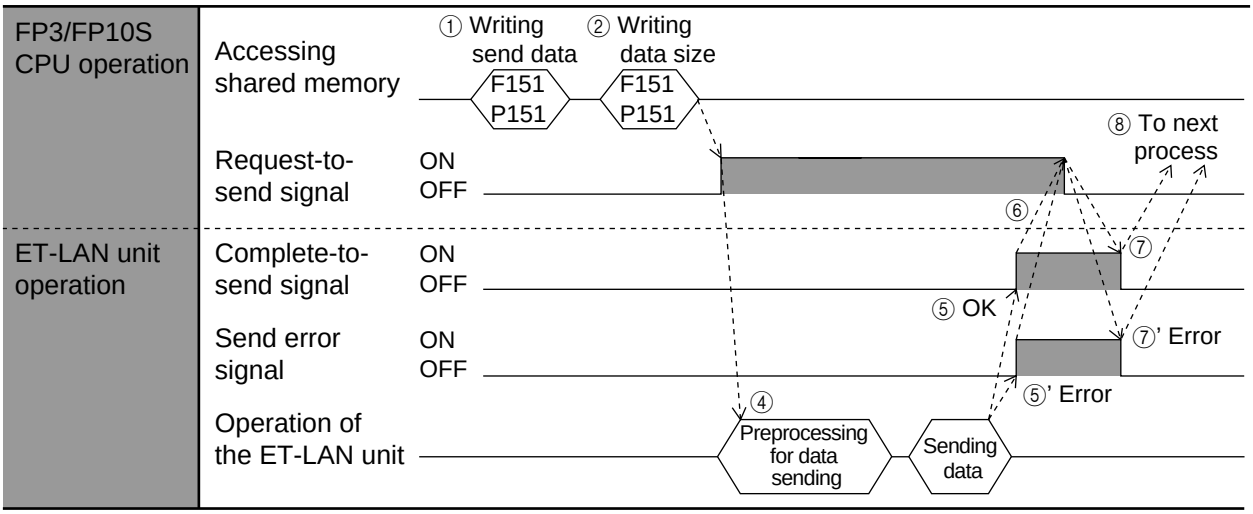
The ET-LAN informs of an error occurrence in the data send operation to the FP3/FP10S CPU by using the send error signals.

Handshake communication method	Send error signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	X3	X7	XB	—	—	—	—	—
Memory handshake	Address H360 in bank H0							
	Bit position 3	Bit position 7	Bit position 11	—	—	—	—	—
	Address H364 in bank H0				Address H365 in bank H0			
	Bit position 3	Bit position 7	Bit position 11	Bit position 15	Bit position 3	Bit position 7	Bit position 11	Bit position 15

2) Explanation of Data Sending Procedures

The data sending operation during transparent communication is performed during the procedure shown in the time chart below after the connection is opened.

■ Time chart for sending operation



• Explanation of the time chart

① Data to be sent to another node are set in the send buffer of the connection by using the **F151 (WRT)/P151 (PWRT)** instructions.

② Set the data size for sending (in byte units) into the information setting block (HF of each information setting block).

Set value (number of bytes) ≦ send buffer size (number of words) × 2

③ Turn ON the request-to-send signal.

④ The ET-LAN unit transmits the data stored in the send buffer.

⑤ When the specified number of data are successfully sent to the destination node, the complete-to-send signal turns ON.

⑤' When the data cannot be sent properly to the destination node, the send error signal turns ON and the error code is stored in the send operation end code area of the connection information report area (HE of the information report block).

⑥ Turn OFF the request-to-send signal.

⑦ The complete-to-send signal is turned OFF.

⑦' The send error signal is turned OFF.

⑧ After confirming that the complete-to-send and send error signals are in the OFF state, step to the next operation.

5. Explanation of Receiving Operation

Each stage of the receiving operation for transparent communication is controlled by turning ON or OFF the handshake signals.

1) Handshake Signals for Receiving Operation

Three types of signals are used to perform the receive operation, the wait-to-receive, the request-to-receive and the complete-to-receive signals.

■ Wait-to-receive signals

The ET-LAN informs the FP3/FP10S CPU that data was sent from another node using the wait-to receive signals.

Handshake communication method	Wait-to-receive signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	X0	X4	X8	—	—	—	—	—
Memory handshake	Address H360 in bank H0							
	Bit position 0	Bit position 4	Bit position 8	—	—	—	—	—
	Address H364 in bank H0				Address H365 in bank H0			
	Bit position 0	Bit position 4	Bit position 8	Bit position 12	Bit position 0	Bit position 4	Bit position 8	Bit position 12

■ Request-to-receive signals

The request-to-receive signals are used as triggers for storing data sent from another node into the receive buffer of the ET-LAN unit shared memory.

Handshake communication method	Request-to-receive signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	Y20	Y24	Y28	—	—	—	—	—
Memory handshake	Address H368 in bank H0							
	Bit position 0	Bit position 4	Bit position 8	—	—	—	—	—
	Address H36C in bank H0				Address H36D in bank H0			
	Bit position 0	Bit position 4	Bit position 8	Bit position 12	Bit position 0	Bit position 4	Bit position 8	Bit position 12

■ Complete-to-receive signals

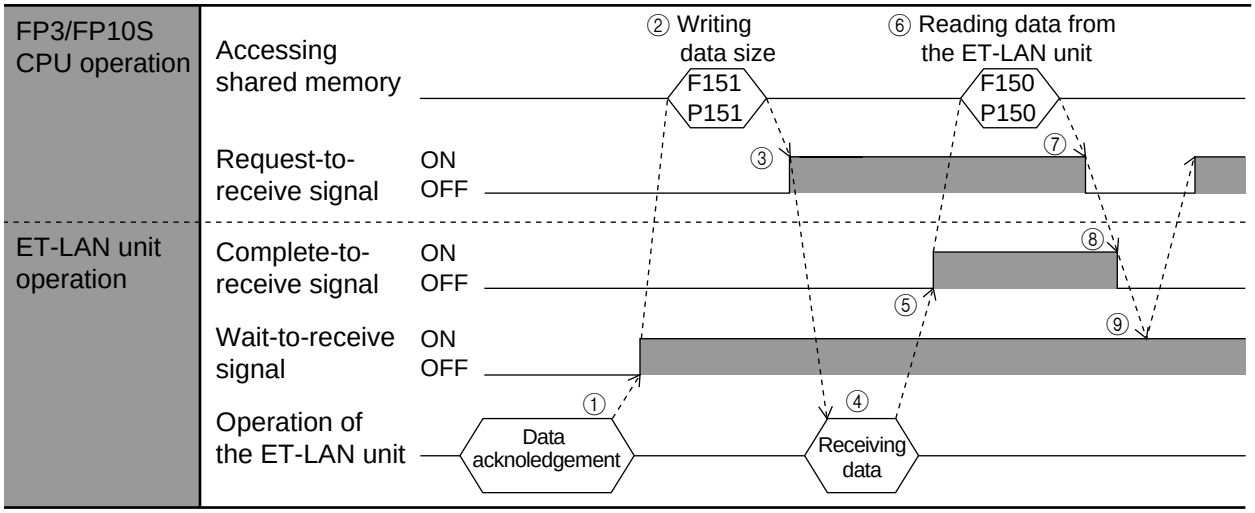
The ET-LAN informs of the completion of the data receive operation to the FP3/FP10S CPU by using the complete-to-receive signals.

Handshake communication method	Complete-to-receive signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	X1	X5	X9	—	—	—	—	—
Memory handshake	Address H360 in bank H0							
	Bit position 1	Bit position 5	Bit position 9	—	—	—	—	—
	Address H364 in bank H0				Address H365 in bank H0			
	Bit position 1	Bit position 5	Bit position 9	Bit position 13	Bit position 1	Bit position 5	Bit position 9	Bit position 13

2) Explanation of Data Receiving Procedures

The data receive operation during transparent communication is performed during the procedure as follows.

■ Time chart for receiving operation



• Explanation of the time chart

① When data sent from another node is recognized, the ET-LAN unit turns ON the wait-to receive signal in order to inform the FP3/FP10S CPU that there are data to be received.

② Set the data size for receiving (in byte units) into the information setting block (HD of each information setting block).
Set value (number of bytes) ≦ receive buffer size (number of words) × 2
See note below.

③ Turn ON the request-to-receive signal.

④ The ET-LAN unit stores the data received in the receive buffer.
See note below.

⑤ When the specified number of data is stored in the receive buffer, the ET-LAN unit informs the FP3/FP10S CPU that the specified number of data was received by turning ON the complete-to-receive signal.

If no other data is sent from another node, the wait-to-receive signal turns OFF.

If additional data remains without being received, the wait-to-receive signal stays ON.

⑥ Read the data stored in the receive buffer by using the **F150 (READ)/P150 (PREAD)** instruction.

⑦ Turn OFF the request-to-receive signal.

⑧ The complete-to-receive signal is turned OFF.

⑨ If the wait-to-receive signal is OFF, step to the next operation.

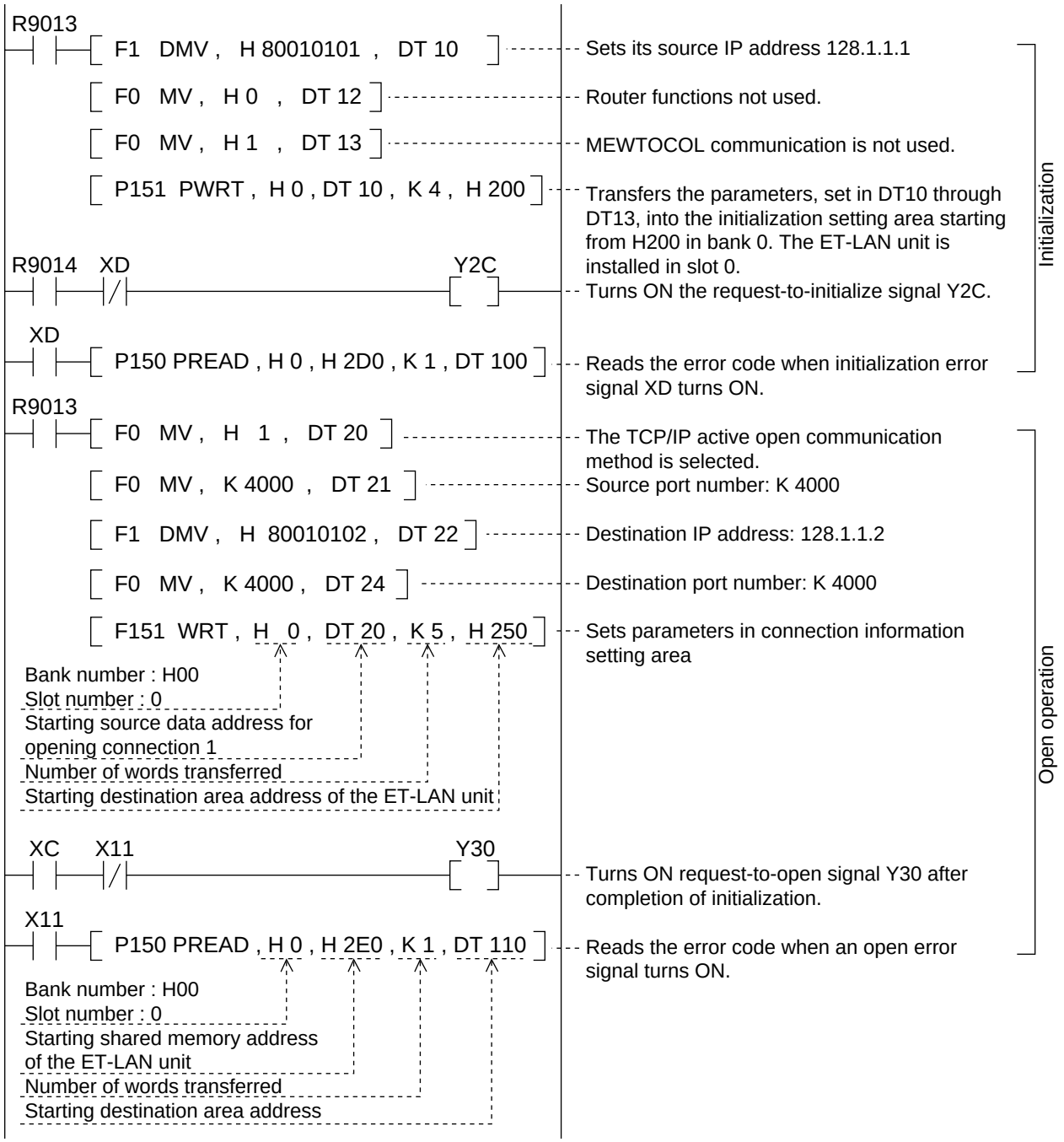
If the wait-to-receive signal remains ON, go to step 3 and continue the same procedure.

Note:

- The data stored in the receive buffer becomes available for the FP3/FP10S CPU after the complete-to-receive signal turns ON. However, since the complete-to-receive signal does not turn ON until the specified number of data is stored in the receive buffer, set the data size in accordance with the following points:
  - You may set the data size to the largest possible setting if you want to receive data without turning ON the request-to-receive signal each time data comes. However, the data received cannot be used by the FP3/FP10S CPU immediately. You need to wait until the specified number of data is stored in the receive buffer.
  - You may set the data size to the smallest possible setting if you want to use the data received in the FP3/FP10S as soon as possible.
  - You may set H FFFF to the request-to-receive size area for processing the data in packet units.

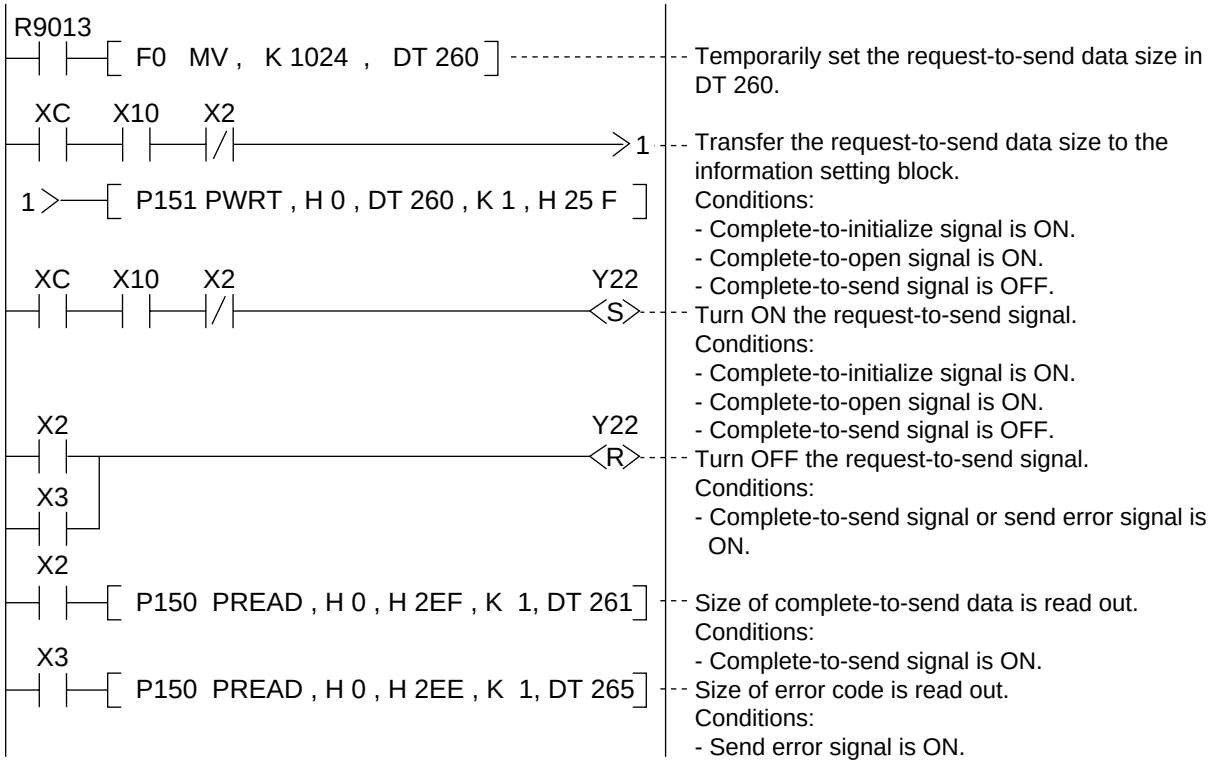
6. Program Example for Transparent Communication

■ Program for initialization and open operation



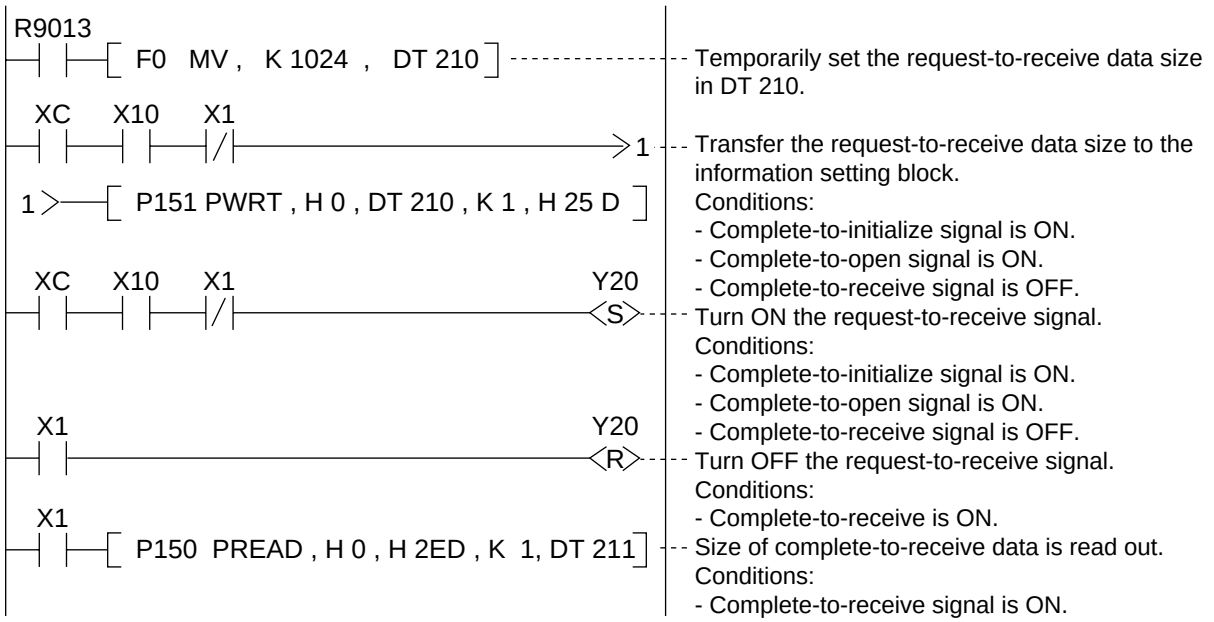
■ Program for send operation

After writing the data to be sent to the send-buffer, execute the following program.



■ Program for receive operation

After executing the program below, read the data received from the receive buffer of the ET-LAN unit.



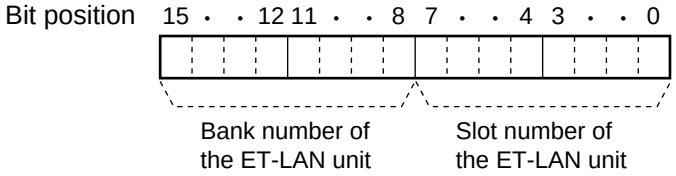
■ Reference

- Relays for I/O handshake communication
  - X0: wait-to-receive signal for connection 1
  - X1: complete-to-receive signal for connection 1
  - X2: complete-to-send signal for connection 1
  - X3: send error signal for connection 1
  - XC: complete-to-initialize signal
  - XD: initialize error signal
  - X10: complete-to-open signal for connection 1
  - X11: open error signal for connection 1
  - Y20: request-to-receive signal for connection 1
  - Y22: request-to-send signal for connection 1
  - Y2C: request-to initialize signal
  - Y30: request-to-open signal for connection 1

Note:

• The allocations above are available when the ET-LAN unit is installed in slot 0.

- Special internal relays
  - R9013: initial ON relay (Turns ON only during the first scan in the operation.)
  - R9014: initial OFF relay (Turns OFF only during the first scan in the operation.)
  - R9030: **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instruction execution flag (Turns ON while an **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instruction is executed.)
- How to specify the bank and slot number of the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instruction.



CHAPTER 10

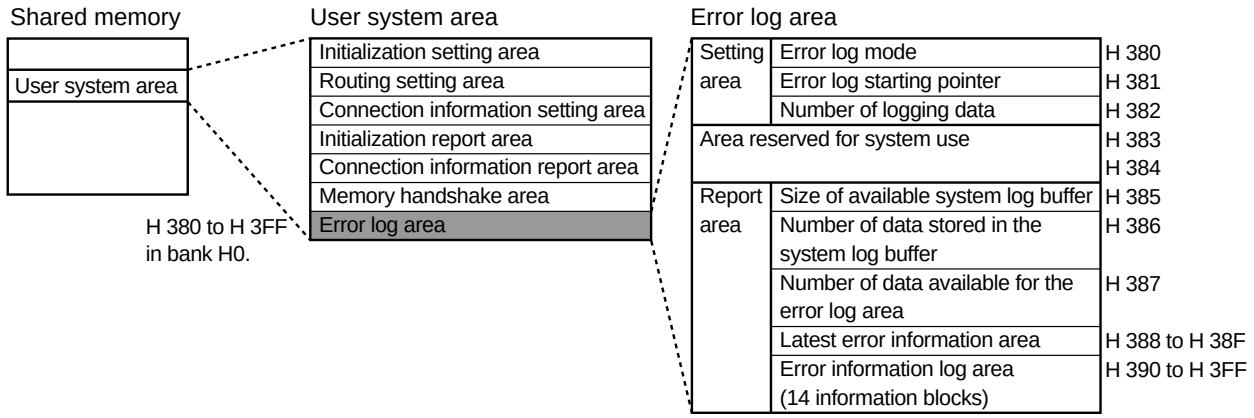
ERROR LOG FUNCTION

10-1. What is the Error Log Function

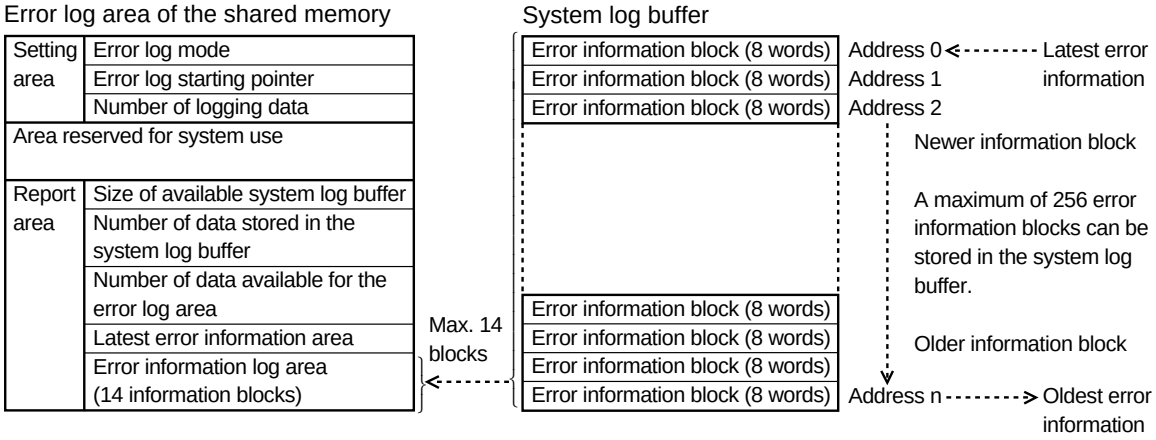
1. Memory Overview for the Error Log Function

The ET-LAN unit has a self-diagnostic function for use when something goes wrong. Each time an error occurs, the ET-LAN unit stores information for up to 256 errors in its system log buffer. Error information stored in the system log buffer can be logged in the error log area of the ET-LAN unit shared memory. The FP3/FP10S CPU can read the error information by accessing the error log area of the ET-LAN unit.
The **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151(PWRT)** instructions are used to set error log parameters and to read error information in the ET-LAN unit shared memory.

■ Overview of error log area



■ Communication between the system log buffer and the error log area



• Explanation of the system log buffer

- Each time an error occurs, the error information (up to 256 errors) is shifted into the system log buffer. If an error occurs when the system log buffer is full, it is shifted in by shifting out the oldest error information block.
- 8 words are used for each error information block. Each block is configured as follows:

Description	Offset address
Connection number	H0
Error code	H1
Area reserved for system use	H2 through H7

Note:

• For details about error codes, refer to page 107, “10-2. Table of Error Codes”.

■ Specifications for setting area of the error log area

Address in the bank H0	Name	Default value	Description
H380	Error log mode	K3	This specifies the type of errors to be recorded in the system log buffer. • Settings: - K0: Only the system errors are recorded. - K1: The system and transmission errors are recorded. - K2: The system, transmission and warning errors are recorded. - K3: The system, transmission, warning and access errors are recorded (all the errors are recorded).
H381	Error log starting pointer	Varies	This specifies the starting address of the information blocks in the system log buffer, which will be stored in the error information log area. • Settings: - Oldest block address ≧ Set value + Number of blocks - In the range of K0 to K255 • Example: When K0 is specified, the information blocks from the latest one are transferred.
H382	Number of logging data	Varies	This specifies the number of error information blocks to be stored in the error information area of the shared memory when the error logging request signal turns ON. • Settings: In the range of K1 to K14 • Note: If it is a value other than K1 through K14, the 14 error information blocks are transferred.
H383 through H384	Area reserved for system use	These areas are not used for setting or monitoring.	

Note:

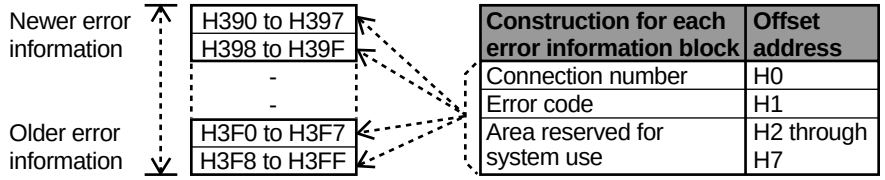
• Be sure to set parameters for the setting area (H380 through H382 in bank H0) before turning ON the error logging request signal.

■ Specifications for report area of the error log area

Address in the bank H0	Name	Description
H385	Size of the system log buffer	This is used for monitoring the size of the system log buffer. The fixed value of K256 is stored here.
H386	Total number of errors	This is used for monitoring how many errors are recorded in the system log buffer after initialization. Note: The ET-LAN unit can count up to 65,535 (HFFFF) errors. However, if more than 65,535 errors occur, the value stops at 65,535.
H387	Number of error information blocks used	This is used for monitoring how many error information blocks are used in the system log buffer. Note: K0 is set here during initialization.
H388 through H38F	Latest error information area	This is used for monitoring the information of the latest error. The latest error information is automatically stored here regardless of the settings in the setting area (H380 through H382 in bank H0). • Note: H0 is set here in the initialization stage. • Construction for the error information block:

Description	Address
Connection number	H388
Error code	H389
Area reserved for system use	H38A through H38F

Address in the bank H0	Name	Description
H390 through H3FF	Error information area	Up to 14 error information blocks can be stored here in accordance with the parameters in the setting area (H380 through 382 in bank H0). The data transfer is triggered by the error logging request signal. • Notes: - H0 is set here in the initialization stage. - Newer error information blocks are stored in the lower addresses and older error information blocks are stored in the higher addresses. • Construction of error information area:



Construction for each error information block	Offset address
Connection number	H0
Error code	H1
Area reserved for system use	H2 through H7

2. How to Use the Error Log Function

■ Reading the latest error information

In order to read the latest error information, you do not have to set the parameters in the error log area of the ET-LAN unit shared memory or turn ON the error logging request signal. You just access the latest error information area (H388 to H38F in bank H0) of the ET-LAN unit shared memory by using the **F150 (READ)/P150 (PREAD)** instructions. The construction of the latest error information area of the ET-LAN unit shared memory is as shown below:

Description	Address
Connection number	H388
Error code	H389
Area reserved for system use	H38A through H38F

■ Reading error information at random

In addition to the latest error information block, you can read up to 14 errors that have occurred in a series. For reading errors at random, you need to set parameters in the error log area (H380 to H382 of bank H0) and then to copy the specified error information of the system log buffer to the error information area (H390 to H3FF of bank H0) by turning ON the error logging request signal. The FP3/FP10S CPU can read information copied to the error information area by executing the **F150 (READ)/P150 (PREAD)** instructions. For details about the procedures, refer to the following charts.

① **Error log parameter settings**

Parameters for the error log function are set in the setting area of the error log area.

Address in the bank H0	Description
H380	Error log mode setting
H381	Error log starting pointer
H382	Number of log data

② **Turn ON the error logging request signal**

The specified error information blocks are copied to the error information area of the ET-LAN unit shared memory by turning ON the error logging request signal.

Handshake communication method	Error logging request signal
I/O handshake	Y2F (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 15 of address H368 in bank H0

③ **Confirm the completion of the error log operation**

The error log operation is confirmed by monitoring the error logging complete signal. When the error logging complete signal turns ON, the error log operation is successfully completed.

Handshake communication method	Error logging complete signal
I/O handshake	XF (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 15 of address H360 in bank H0

④ **Read the error information**

Read the error information blocks stored in the error information area (H390 to H3FF in bank 0) by using the **F150 (READ)/P150 (PREAD)** instructions.

⑤ **Turn OFF the error logging request signal**

After the FP3/FP10S reads the information, turn OFF the error logging request signal.

Handshake communication method	Error logging request signal
I/O handshake	Y2F (when the ET-LAN unit is installed in slot 0)
Memory handshake	Bit position 15 of address H368 in bank H0

10-2.Table of Error Codes

The abnormalities detected by the ET-LAN unit self-diagnostic function are divided into four categories:

• **System error**

This type of error is detected when the following occurs:
- Processing time of the ET-LAN unit is extraordinary long.
- Abnormally in the ET-LAN unit's system is detected.

When this error occurs during normal operation, the ERR. 2 LED of the ET-LAN unit turns ON.
When this error occurs during test mode, the ERR. 1 and/or ERR. 2 LEDs turn ON.

• **Transmission error**

This type of error is detected when an abnormally in the communication control system occurs:
When this error occurs, the ERR. 1 LED flashes.

• **Warning error**

This type of error is detected when the following occurs:
- The ONLINE/OFFLINE selector is changed before shutdown of the ET-LAN unit.
- Additional data is transferred from another node when the receive buffer is full.

When this error occurs, the ERR. 2 LED flashes.

• **Access error**

This type of error is detected when an abnormality is detected during communication between the FP3/FP10S CPU and the ET-LAN unit.
When this error occurs, the ERR. 1 LED turns ON.

1. Table of System Error Codes

- During normal operation, the ERR. 2 LED turns ON.
- During test mode, the ERR. 1 and/or ERR. 2 LEDs turn ON.

Error code (Hexadecimal)	Name of error	Description	Steps to take
H9001	System errors during normal operation (The ERR. 2 LED turns ON.)	Processing time exceeds the fixed settings of the system watchdog timer. The ERR. 2 LED and the ALARM LED turn ON.	Turn OFF the FP3/FP10S power and then turn it ON again.
H9002		An abnormality in the communication system of the ET-LAN unit is detected. The ERR. 2 LED turns ON.	
H9003		Buffer in the application processing system or the ET-LAN unit is insufficient. The ERR. 2 LED turns ON.	
H9004		Buffer in the protocol processing system or the ET-LAN unit is insufficient. The ERR. 2 LED turns ON.	
H9005		The Ethernet (physical) address in the system EEPROM cannot be accessed. The ERR. 2 LED turns ON.	
H9010	System errors during test mode	An abnormality was detected during the ROM test. The ERR. 1 LED turns ON.	
H9011		An abnormality was detected during the RAM test. The ERR. 1 LED turns ON.	
H9012		An abnormality was detected during the shared memory test. The ERR. 1 LED turns ON.	
H9013		An abnormality was detected during the EEPROM checksum test. The ERR. 1 LED turns ON.	
H9014		An abnormality was detected during the internal loop back test. The ERR. 1 and ERR. 2 LEDs turn ON.	
H9015		An abnormality was detected during the external loop back test. The ERR. 1 and ERR. 2 LEDs turn ON.	Check that the Ethernet interface is correctly connected and that mode switch 3 is in the ON position.
H9016		An abnormality was detected during the timer test. The ERR. 2 LED turns ON.	Turn OFF the FP3/FP10S power and then turn it ON again.

2. Table of Transmission Error Codes

- The ERR. 1 LED flashes.

Error code (Hexadecimal)	Name of error	Description	Steps to take
HA001	UDP checksum error	Checksum of the UDP packet received from another node was incorrect.	Re-send data from another node.
HA002	UDP/IP level error	A port, not specified in the open operation stage, was used for communication.	Re-try to perform communication using the correct port number.
HA003	Send error	An abnormality was detected in the transmission unit of the ET-LAN unit.	Re-send data to another node.
HA004	IP processing error	An abnormality was detected in the IP, such as: - When data remaining during assembly of split IP data did not come even after waiting for a fixed period. - When there was no response even though an ARP request was transmitted to the destination IP address. - When the IP header checksum value of the received IP packet was not correct. - When the IP resource is insufficient. - When the subnet address of the IP address specified for the destination node is different from the IP address of the home network. (This does not occur if a router address was specified.)	
HA005	TCP/IP processing error	An abnormality was detected in the TCP, such as: - When a send/receive request was attempted even though a TCP connection has not been established. - When a send/receive request was attempted during a close request of an established connection. - When, after establishing the connection, a new open request was performed with the parameters being the same for the source node port number, the destination node port number, and up to the destination node IP address. - When the TCP send request was continuously performed before the response was returned. - When the checksum value of the received TCP packet was not correct . - When, during TCP packet transmission, a packet was re-transmitted and a normal response was not returned from the transmission source within a fixed period.	
HA006	Protocol error	An abnormality was detected in the protocol processing part.	Re-start operation from the initialization stage.

3. Table of Warning Error Codes

- The ERR. 2 LED flashes.

Error code (Hexadecimal)	Name of error	Description	Steps to take
HB001	ONLINE/ OFFLINE mode switch error	The ONLINE/OFFLINE mode switch (mode switch 3) was changed from ONLINE (ON state) to OFFLINE (OFF state) during operation.	Be sure to switch the ONLINE/OFFLINE mode switch (mode switch 3) before initialization or after shutdown.
HB002		The ONLINE/OFFLINE mode switch (mode switch 3) was changed from OFFLINE (OFF state) to ONLINE (ON state) during operation.	
HB003	Receive buffer full error	The data sent from another node were left aside during transparent communication because the receive-buffer was full.	Re-set the buffer size for the connection by performing an initialization.

4. Tables of Access Error Codes

- The ERR. 1 LED turns ON.

■ Table of access error codes for initialization/shutdown stage (ERR. 1 LED ON)

Error code (Hexadecimal)	Name of error		Description	Steps to take
H8000	Initialization and shutdown errors (Error code is also set in H2D0 in bank H0.)	Source IP address error	Incorrect IP address (H0 or HFFFF FFFF) was set in the initialization setting area (H200 and H201 in bank H0) as source IP address.	Set correct IP address and initialize again.
H8001		Network (subnet) masking error	Incorrect network (subnet) masking data (outside the range of HC000 0000 to HFFFF FFFF) was specified in the routing setting area (H230 and H231 in bank H0) as the network (subnet) masking data.	Set correct network (subnet) masking data and initialize again.
H8002		Default router IP address error	Incorrect router network (subnet) address was set in the routing setting area (H232 and H233 in bank H0) as the default router IP address.	Set correct default router IP address and initialize again.
H8003		Router network (subnet) address error	Incorrect router network (subnet) address (H0 or HFFFF FFFF) was set in the routing setting area (H235 to H248 in bank H0) as network (subnet) addresses for routers 1 to 5.	Set correct router network (subnet) address and initialize again.
H8004		Router IP address error	Incorrect IP address (H0 or HFFFF FFFF) was set in the routing setting area (H235 and H248 in bank H0) as IP address for routers 1 to 5.	Set correct router IP address and initialize again.
H8005		Transparent communication buffer error	The buffers for transparent communication were incorrectly allocated as follows: - The allocated addresses overlapped. - The final address specified was over the limitation for the transparent communication buffer.	Re-configure transparent communication buffers and initialize again.
H8006		OFFLINE error	The request-to-initialize signal was turned ON in the OFFLINE mode.	Turn ON the ONLINE/OFFLINE mode switch (mode switch 3) and initialize again.
H8007		Initialization error	The ET-LAN unit was not correctly initialized.	Initialize again.
H8008		Shutdown error	The ET-LAN unit was not correctly shut down.	Shutdown again.
H8009		ONLINE/ OFFLINE mode switch error	Since the ONLINE/OFFLINE mode switch (mode switch 3) was turned OFF before shutdown, the ET-LAN unit was forcibly shutdown.	Be sure to switch the ONLINE/OFFLINE mode switch (mode switch 3) before initialization or after shutdown.
H800A		Source MEWTOCOL station number error	An incorrect MEWTOCOL station number (other than K1 to K64) was set in the initialization setting area (H203 in bank H0).	Set correct MEWTOCOL station number and initialize again.

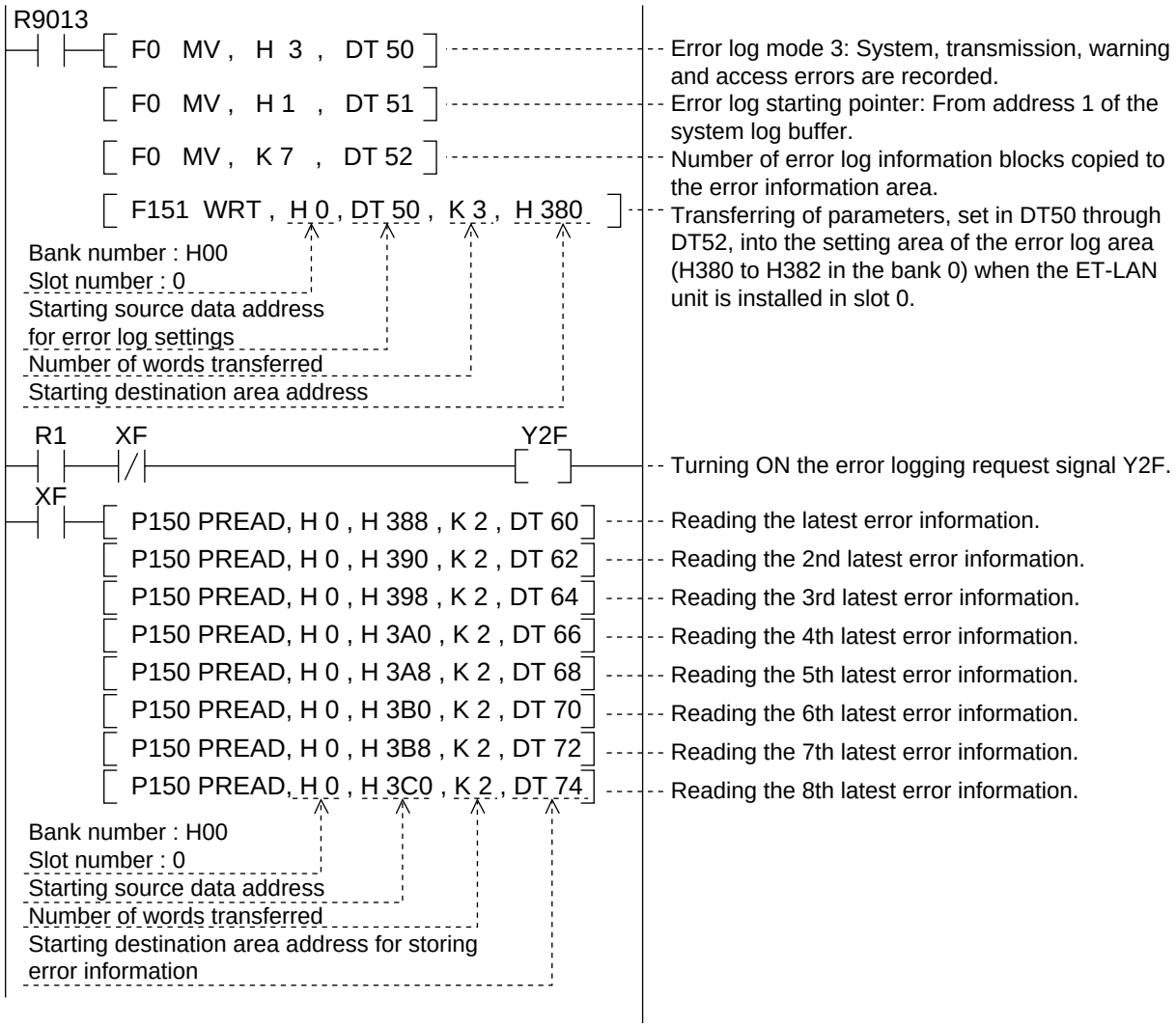
■ Table of access error codes for open/close operation stage (ERR. 1 LED ON)

Error code (Hexadecimal)	Name of error		Description	Steps to take
H8010	Open and close operation errors	Open error	The request-to-open signal was turned ON before the ET-LAN unit was initialized.	Be sure to turn ON the request-to-open signal after ET-LAN unit initialization.
H8011		TCP/IP open method error	Incorrect open method was specified in the connection information setting area (offset address H0 for each information setting block) when using TCP/IP communication. (When using UDP/IP communication, the open method setting is disregarded.)	Set the correct open method in bit positions 8 and 9 (active, unpassive or fullpassive), and then perform the open operation again.
H8012		Source port number error	Incorrect port number (K0) was specified in the connection information setting area (offset address H1 for each information setting block) as source port number.	Set correctly source port number and then perform the open operation again.
H8013		Destination port number error	Incorrect port number (K0) was specified in the connection information setting area (offset address H4 for each information setting block) as the destination port number for the TCP/IP active or fullpassive open method.	Set correctly the destination port number and then perform the open operation again.
H8014		Destination IP address error	Incorrect IP address was specified in the connection information setting area (offset addresses H2 and H3 for each information setting block) as follows: - During UDP/IP communication, H0 was specified. - During TCP/IP communication, H0 or HFFFF FFFF was specified.	Set correctly the IP address for the destination node and then perform the open operation.
H8015		UDP/IP source port number error	The source port number, specified in the connection information setting area (offset address H1 for each information setting block) for the UDP/IP, was the same as that of another UDP/IP connection already open.	Be sure to set different port numbers for source connections when using two or more connections during UDP/IP communication.
H8016		TCP/IP source port number error	The source port number, specified in the connection information setting area (offset address H1 for each information setting block) for the TCP/IP, was the same as that of another TCP/IP connection already open. Even if one port number is allocated for two different connections during TCP/IP communication, it is not an error setting when their destinations are not the same port number of one node.	Be sure to set different port numbers for source connections when using two or more connections during TCP/IP communication.
H8017		Memory error	The connection could not be opened because of low memory capacity.	Re-try to open the connection. If it is impossible, initialize the ET-LAN unit again.
H8018		No destination node error	The destination node, specified by the IP address in the connection information setting area (offset addresses H2 and H3 for each information setting block), was not found in the network for the following reasons: - erroneous setting of the destination IP address - communication error	Check the following: - destination IP address - destination port number - interface selector
H8019		Forced close errors	Since the ONLINE/OFFLINE mode switch (mode switch 3) was turned OFF before the close operation, the connection was forcibly closed.	Be sure to switch the ONLINE/OFFLINE mode switch (mode switch 3) before initialization or after shutdown.
H801A			Since the request-to-initialize signal was turned OFF before the close operation, the connection was forcibly closed.	Be sure to turn OFF the request-to-initialize signal after closing all connections.
H801B		Destination MEWTOCOL station number error	Incorrect destination MEWTOCOL station number (other than K1 to K64) was set in the connection information setting area (offset address H5 for each information setting block). When not communicating using the MEWTOCOL function, this error does not occur.	Set the correct MEWTOCOL station number and open the connection again.
H801C		Mode switch setting error	Incorrect mode switch setting.	Be sure to set the mode switches referring to page 25, “3-3. Mode Setting.”

■ Table of access error codes for communication stage (ERR. 1 LED ON)

Error code (Hexadecimal)	Name of error	Description	Steps to take
H8020	Transparent communication sending errors (Error code is also set in offset address HE of each information report block in the connection information report area.)	The FP3/FP10S turned ON the request-to-send signal before initialization finished.	Be sure to turn ON the request-to-send signal after initialization and the open operation are successfully completed.
H8021		The FP3/FP10S turned ON the request-to-send signal before connection opened.	
H8022		The FP3/FP10S turned ON the request-to-send signal with setting 0 for the request-to-send data size (offset address HF for each information setting block).	Be sure to turn ON the request-to-send signal after the correctly setting the size of send data in byte units.
H8023		The FP3/FP10S turned ON the request-to-send signal with setting more than the send-buffer capacity the request-to-send data size (offset address HF for each information setting block).	
H8024		The FP3/FP10S turned ON the request-to-send signal when the connection was unexpectedly closed.	After opening the connection and send data again.
H8025	Transparent communication receiving errors	The FP3/FP10S turned ON the request-to-receive signal before initialization finished.	Be sure to turn ON the request-to-receive signal after initialization and the open operation are successfully completed.
H8026		The FP3/FP10S turned ON the request-to-receive signal before connection opened.	
H8027		The FP3/FP10S turned ON the request-to-receive signal when no receive-buffer existed.	Be sure to allocate the transparent communication buffer area during the initialization stage.
H8028		The FP3/FP10S turned ON the request-to-receive signal with setting 0 for the request-to-receive data size (offset address HF for each information setting block).	Be sure to turn ON the request-to-receive signal after the correctly setting size of the receive data in byte units.
H8030	MEWTOCOL communication sending errors	The FP3/FP10S sent MEWTOCOL data before initialization finished.	Be sure to send MEWTOCOL data after initialization and the open operation are successfully completed.
H8031		The FP3/FP10S sent MEWTOCOL data before connection opened.	
H8032		The FP3/FP10S sent MEWTOCOL data when the connection was unexpectedly closed.	After opening the connection, send MEWTOCOL data again.
H8033 through H8035		Incorrect MEWTOCOL formatted data was sent.	Re-send the MEWTOCOL command again.
H8040	Forcibly closed error	The connection was forcibly closed by the following methods: - by a command from the destination node. - by a communication error.	Check the Ethernet connection, transmission lines and status of the destination node.
H8041 through H8044	MEWTOCOL communication receiving errors	MEWTOCOL data with a format error was received.	Check the setting of the station which sent the MEWTOCOL data to the ET-LAN unit as follows: - MEWTOCOL format - MEWTOCOL station number
H8045		The received MEWTOCOL station number for the ET-LAN unit was not that same as that specified in the initialization stage.	
H8046		The received MEWTOCOL station number for the ET-LAN unit was not in the proper range (K1 to K64).	
H8047		The MEWTOCOL station number for the destination node did not match the station number specified in the connection information setting area.	

10-3. Program Example for Reading Error Information Blocks



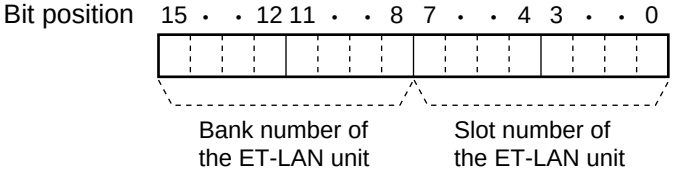
■ Reference

- Relays for I/O handshake communication
  - XF: error logging complete signal
  - Y2F: error logging request signal

Note:

- The allocations above are available when the ET-LAN unit is installed in slot 0.

- Special internal relays
  - R9013: initial ON relay (Turns ON only during the first scan in the operation.)
- How to specify the bank and slot number of the **F150 (READ)/P150 (PREAD)** and **F151 (WRT)/P151 (PWRT)** instructions.



CHAPTER 11

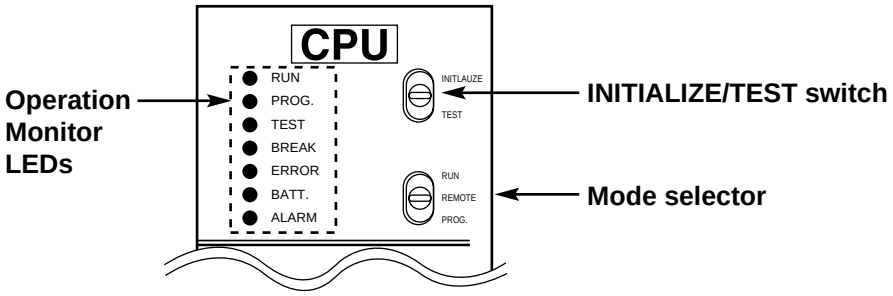
TROUBLESHOOTING

11-1. Check Points for Troubleshooting

When something goes wrong with the FP3/FP10S system connected to the ET-LAN unit or when communication cannot be performed correctly through the ET-LAN unit, check the FP3/FP10S system using the main troubleshooting flowchart in “11-2. Troubleshooting”.
Be sure to check the entire system including peripheral devices, referring to the following:
- Observe what is happening.
- Check for error repetition.
- Check the status of indicators.
- Check that power is properly supplied to the FP3/FP10S system.
- Check whether the trouble detected is in the FP3/FP10S system or in other field device.
- Check whether there is a problem with the program or not.

1. Operation Monitor LEDs of the FP3/FP10S CPU

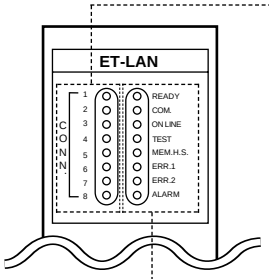
When something goes wrong with the FP3/FP10S system when connected to the ET-LAN unit, the status of the FP3/FP10S CPU should also be checked. The operating monitor LEDs of the FP3/FP10S are helpful when checking. Refer to the LED status table below.



LED status							Description	Program execution status	Condition
RUN LED	PROG. LED	TEST LED	BREAK LED	ERROR LED	BATT. LED	ALARM LED			
ON	OFF	OFF	OFF	OFF	Varies	OFF	Operation in the RUN mode	Executing	Normal condition
OFF	ON	Varies	OFF	Varies	Varies	OFF	Operation in the PROG. mode	Not-executing	
Flashes	OFF	Varies	OFF	Varies	Varies	OFF	Forced ON/OFF in the RUN mode	Executing	
OFF	ON	Varies	OFF	Varies	Varies	OFF	Forced ON/OFF in the PROG. mode	Not-executing	
ON	OFF	ON	ON	Varies	Varies	OFF	TEST/RUN (BREAK condition)	Not-executing	
ON	OFF	ON	OFF	Varies	Varies	OFF	TEST/RUN (operating condition)	Executing	
OFF	Varies	Varies	Varies	ON	Varies	OFF	Self-diagnostic error (stops)	Not-executing	Abnormal condition
ON	OFF	OFF	OFF	ON	Varies	OFF	Self-diagnostic error (continues)	Executing	
Varies	Varies	Varies	Varies	Varies	ON	OFF	CPU back-up voltage lowers	Executing	
Varies	Varies	Varies	Varies	Varies	Varies	ON	System watchdog timer error	Not-executing	
OFF	Flashes	Varies	OFF	Varies	Varies	OFF	MEWNET-F slave waiting condition	Not-executing	

2. Operation Monitor LEDs of the ET-LAN Unit

When something goes wrong with the FP3/FP10S system when connected to the ET-LAN unit, the operation monitor LEDs of the ET-LAN unit are useful for checking the ET-LAN unit. Please refer to description below when checking the system.



CONN. LEDs 1 through 8:
Each LED shows the condition of each connection as follows:
- ON when the connection with the corresponding number is in the open condition.
- Flashes when an abnormality is detected in the connection with the corresponding number.
- OFF when the connection with the corresponding number is in the not-open condition.

READY LED: ON when the initialization has been completed.
COM. LED: ON while communicating with another node.
ON LINE LED: ON when the ET-LAN unit is ONLINE mode.
TEST LED: ON when the ET-LAN unit is operating in the test mode (mode switch 4 is ON).
MEM. H. S. LED: ON in the memory handshake mode (when mode switch 2 is ON).
ERR. 1 LED: This LED shows erroneous conditions of the ET-LAN unit as follows:
- ON when an access error occurs.
- Flashes when a transmission error occurs.
- OFF during normal operation or when the request-to-initialize signal is turned OFF.

ERR. 2 LED: This LED shows erroneous conditions of the ET-LAN unit as follows:
- ON when a system error occurs.
- Flashes when a warning error occurs.
- OFF during normal operation or when the request-to-initialize signal is turned OFF.

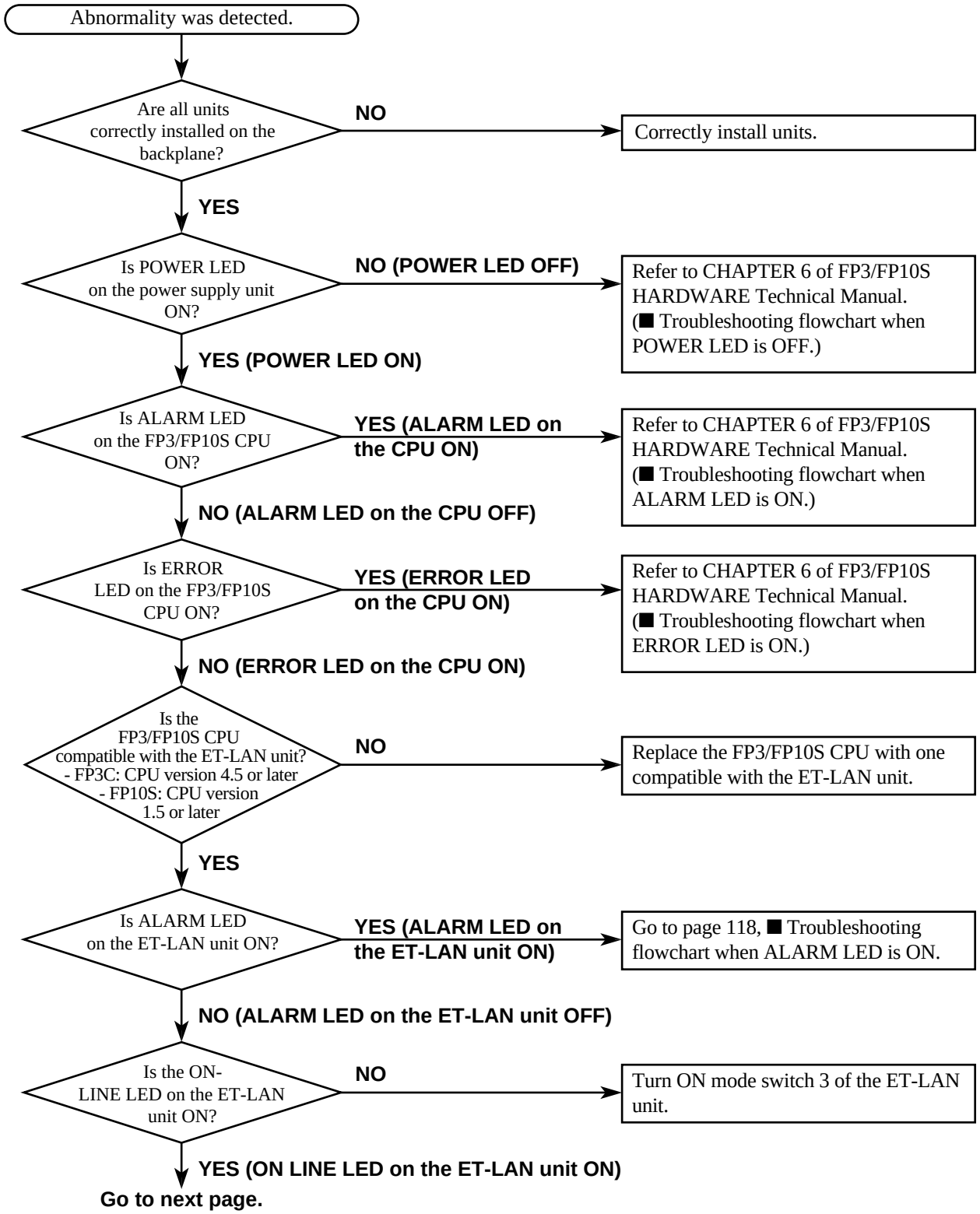
ALARM LED: This LED shows the system condition as follows:
- ON when a system watchdog timer error occurs.
- OFF when condition is normal.

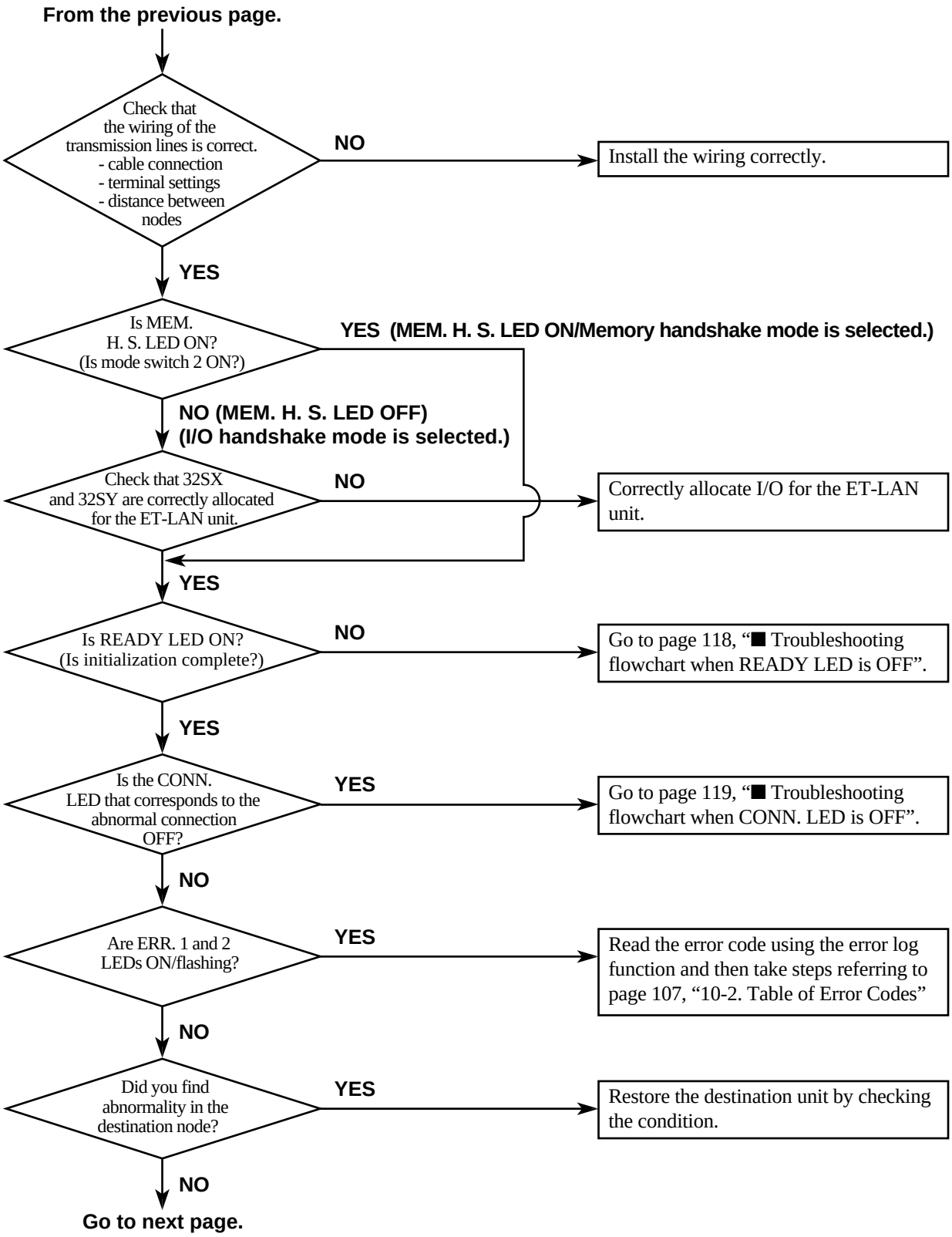
LED status when something goes wrong with an ET-LAN unit								ET-LAN unit condition
READY LED	COM LED	ON LINE LED	TEST LED	MEM. H. S. LED	ERR. 1 LED	ERR. 2 LED	ALARM LED	
Varies	Varies	Varies	OFF	Varies	OFF	ON	ON	System watchdog timer error
Varies	Varies	Varies	OFF	Varies	OFF	ON	OFF	System error in normal operation
Varies	Varies	Varies	ON	Varies	One or both LEDs turn ON.		OFF	System error in test mode
Varies	Varies	Varies	OFF	Varies	Flashes	OFF	OFF	Transmission error
Varies	Varies	Varies	OFF	Varies	OFF	Flashes	OFF	Warning error
Varies	Varies	Varies	OFF	Varies	ON	OFF	OFF	Access error

11-2. Troubleshooting

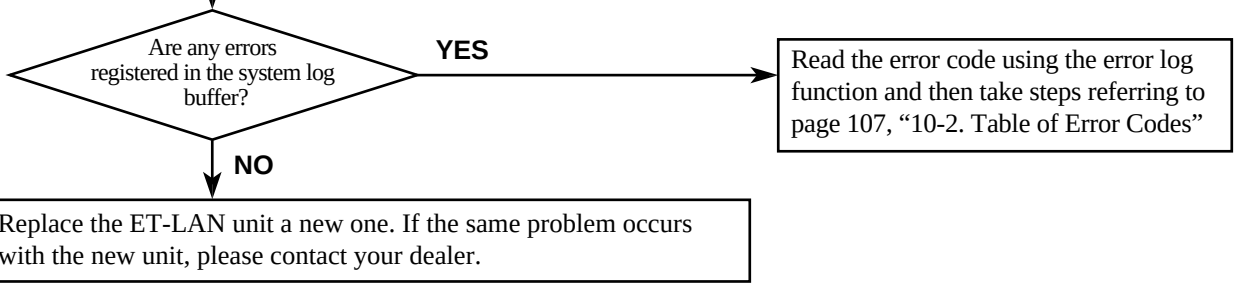
When something goes wrong with the FP3/FP10S system connected to the ET-LAN unit or when communication cannot be performed correctly through the ET-LAN unit, check the FP3/FP10S system referring to the main troubleshooting flowchart below.

■ Main troubleshooting flowchart

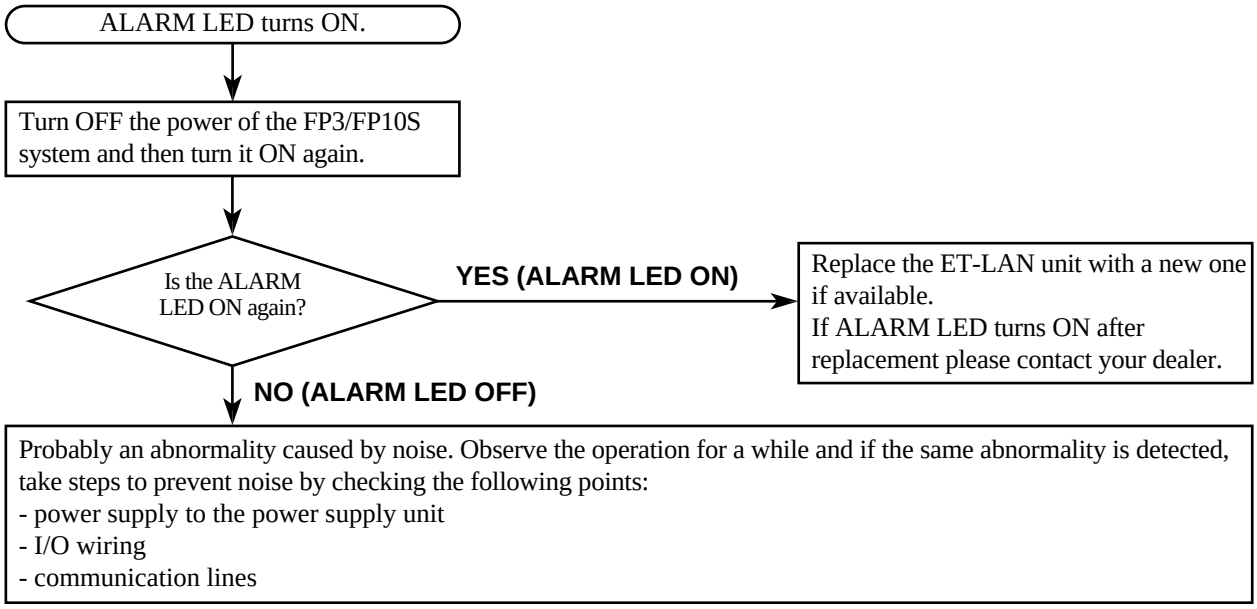



From the previous page.
Check that the wiring of the transmission lines is correct. - cable connection - terminal settings - distance between nodes
NO
Install the wiring correctly.
YES
Is MEM. H. S. LED ON? (Is mode switch 2 ON?)
YES (MEM. H. S. LED ON/Memory handshake mode is selected.)
NO (MEM. H. S. LED OFF) (I/O handshake mode is selected.)
Check that 32SX and 32SY are correctly allocated for the ET-LAN unit.
NO
Correctly allocate I/O for the ET-LAN unit.
YES
Is READY LED ON? (Is initialization complete?)
NO
Go to page 118, "■ Troubleshooting flowchart when READY LED is OFF".
YES
Is the CONN. LED that corresponds to the abnormal connection OFF?
YES
Go to page 119, "■ Troubleshooting flowchart when CONN. LED is OFF".
NO
Are ERR. 1 and 2 LEDs ON/flashing?
YES
Read the error code using the error log function and then take steps referring to page 107, "10-2. Table of Error Codes"
NO
Did you find abnormality in the destination node?
YES
Restore the destination unit by checking the condition.
NO
Go to next page.

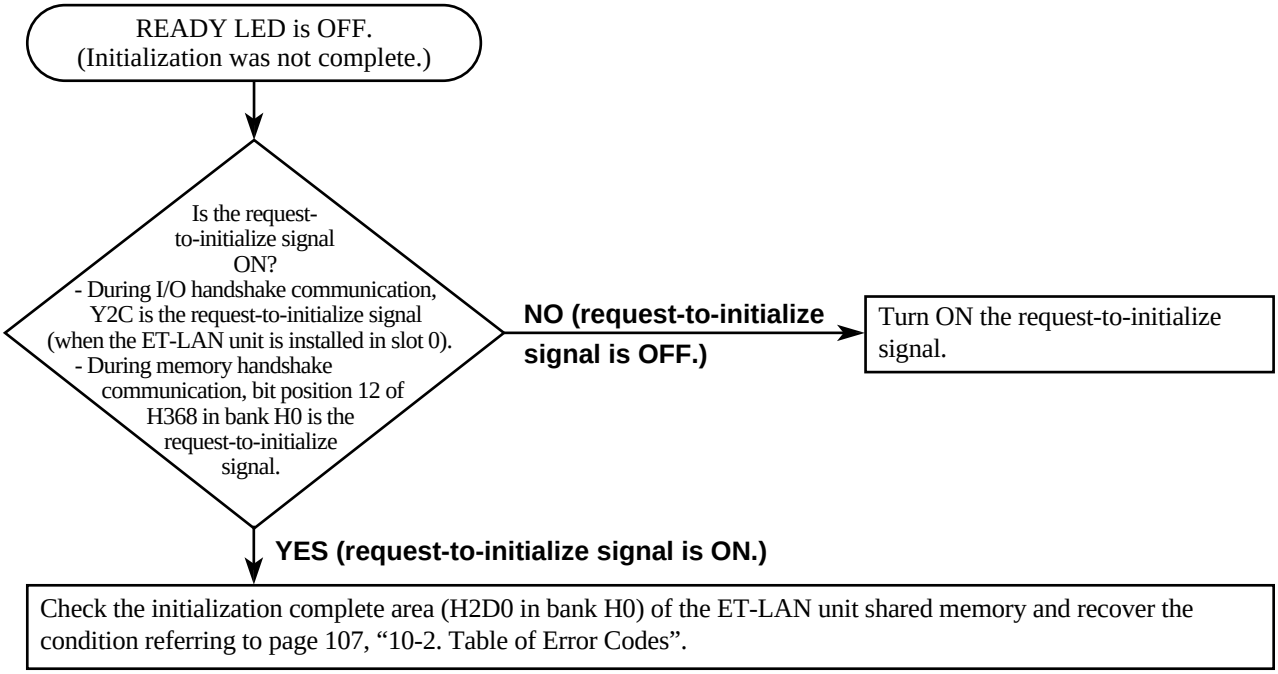
From the previous page.



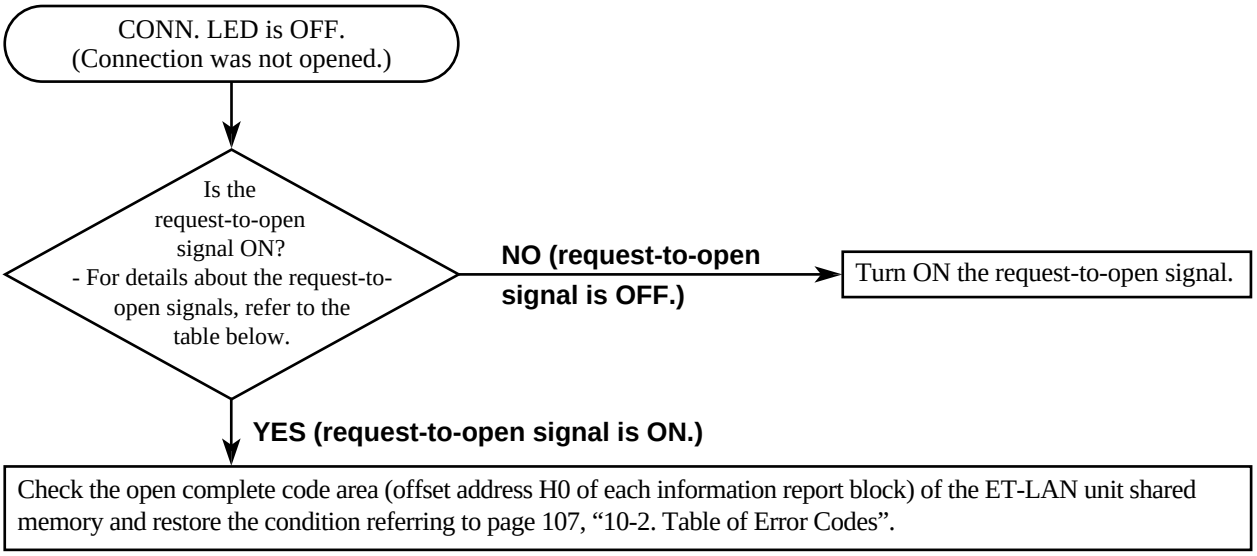
■ Troubleshooting flowchart when ALARM LED is ON.



■ Troubleshooting flowchart when READY LED is OFF.



■ Troubleshooting flowchart when CONN. LED is OFF.



• Table of request-to-open signals

Handshake communication method	Request-to-open signal							
	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Connection 6	Connection 7	Connection 8
I/O handshake (when the ET-LAN unit is installed in slot 0)	Y30	Y32	Y34	Y36	Y38	Y3A	Y3C	Y3E
Memory handshake	Address H369 in bank H0							
	Bit position 0	Bit position 2	Bit position 4	Bit position 6	Bit position 8	Bit position 10	Bit position 12	Bit position 14

CHAPTER 12

APPENDIX

12-1.Standard and High-level Link Units

Link units available for FP3 and FP10S are classified into two types: those for the “standard link system” and those for the “high-level link system”. In this section, these classifications and some basic terms are explained for the purpose of easier understanding of the descriptions in this manual. For details about performance, specifications, and wiring, refer to the manual or data sheets for each unit.

1. Classification of Link Units

- Units for the “standard link system” and “high-level link system” are listed as:
  - Units for the standard link system: C.C.U. (Computer Communication Unit), C-NET Link Unit, MEWNET-P (Optical) Link Unit, MEWNET-W (Wire) Link Unit
  - Units for the high-level link system: ET-LAN Unit, MEWNET-H Link Unit
- Each link unit follows the restrictions for each link system as shown in the tables below.

Table of standard link units

Standard link unit	Main function	Available number of unit		
		FP3		FP10S
		FP3 (without C)	FP3C	
C.C.U. (Computer Communication Unit)	• Computer link • Data transfer function • Modem communication compatibility	Total 3 units	Total 3 units	Total 5 units
C-NET Link Unit	• Computer link			
MEWNET-P (Optical Link Unit)	• Computer link (See notes below.) • PC link function (See notes below.) • Data transfer function • Remote programming			
MEWNET-W (Wire) Link Unit	• PC link function (See notes below.) • Data transfer function • Remote programming			

Notes:

- To perform computer link communication using MEWNET-P (Optical) Link Units, an Optical RS232C Link Unit is required.
- Up to 2 PC links are available per CPU using two MEWNET-P or MEWNET-W link units.

Table of high-level link units

Standard link unit	Main function	Available number of unit		
		FP3		FP10S
		FP3 (without C)	FP3C	
ET-LAN Unit	• TCP/IP or UDP/IP communication	Not available	Total 3 units (See notes below.)	Total 3 units (See notes below.)
MEWNET-H Link Unit	• Computer link • PC link function (See notes below.) • Data transfer function • Remote programming • Serial communication			

Notes:

- ET-LAN unit is available for FP3C with a CPU version 4.5 or later and FP10S with a CPU version 1.5 or later.
- MEWNET-H Link is available for FP3C with a CPU version 4.4 or later and all FP10Ses.
- Up to 2 PC links are available per CPU using two MEWNET-H link units.
- MEWNET-H Link Units are not available in some areas. For details, please contact your dealer.

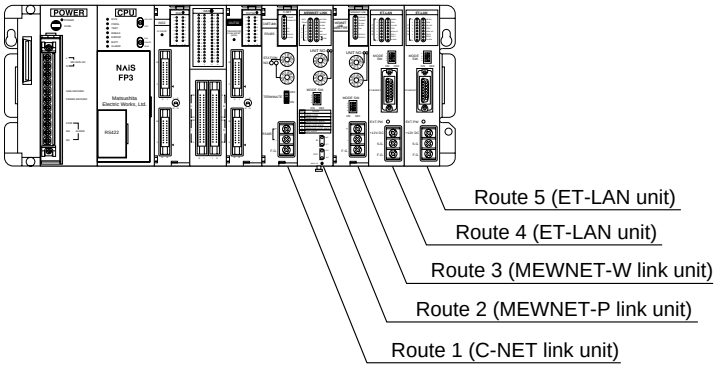
2. Basic for Link System Terms

• For easy understanding about the link systems, some terms are explained here using examples.

• Route number:

Route numbers are used for expressing the position of standard and high-level link units together. This numbering system is used to perform communication over layers, such as when remote programming, etc. The route numberings are assigned starting from the link unit at the slot nearest to the CPU as follows:

- FP3: “route 1”, “route 2”, “route 3”, “route 4”, “route 5” and “route 6” including 3 standard link units and 3 high-level link units
- FP10S: “route1”, “route 2”, “route 3”, “route 4”, “route 5”, “route 6”, “route 7” and “route 8” including 5 standard link units and 3 high-level link units.

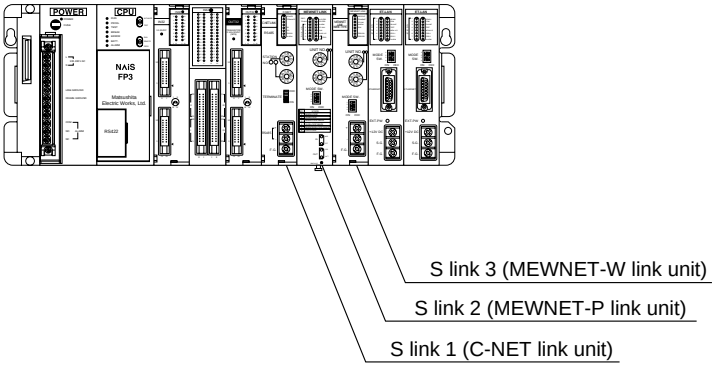


• Link number:

Link numbers are used for expressing the position of link units separately for the standard link system and high-level link system, starting from the link unit at the slot nearest to the CPU as follows:

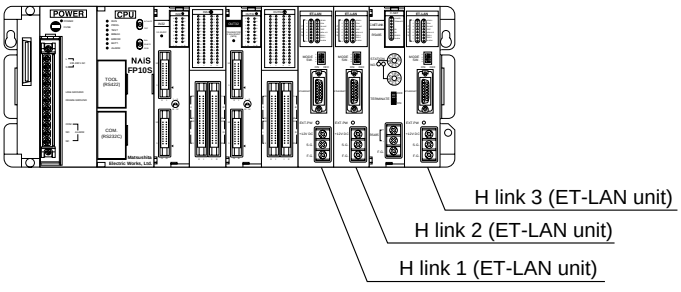
[Link number for standard link system]

- FP3: “S link 1”, “S link 2” and “S link 3”
- FP10S: “S link 1”, “S link 2”, “S link 3”, “S link 4” and “S link 5”



[Link number for high-level link system]

“H link 1”, “H link 2” and “H link 3”



• PC link:

The term “PC link” means one of the link functions between programmable controllers that use specified relays and data registers. In the PC link, you do not have to make a complicated program for communications. The PC link function is available separately for the standard link system and the high-level link system as follows:

[PC link for standard link system]

In the standard link system, a maximum of two PC links are available per CPU using MEWNET-P (Optical) or MEWNET-W (Wire) link units. The two PC links for the standard link systems are called “PC link S0” and “PC link S1”. For each link communication, 1,024 points of link relays L and 128 words of link data registers LD are used for communications.

The PC link S0 and S1 allocations can be set using system register 46* as follows:

- when system register 46 = K0, between two MEWNET-P or MEWNET-W link units used for PC link, PC link S0 is assigned for the unit nearest to the CPU (unit with a smaller S link number).
- when system register 46 = K1, between two MEWNET-P or MEWNET-W link units used for PC link, PC link S0 is assigned for the unit farthest from the CPU (unit with a larger S link number).

* System register 46 is available for FP3C series with CPU version 4.4 or later and all FP10Ses.

[PC link for high-level link system]

In the high-level link system, a maximum of two PC links are available per CPU using MEWNET-H link units. The two PC links for the high-level link systems are called “PC link H0” and “PC link H1”. For each link communication, you can assign relays and registers used for link communications using setting tools.

The PC link H0 and H1 allocations are decided by the position of the MEWNET-H link units. Between the two MEWNET-H link units used for the PC link, PC link H0 is assigned for the unit nearest to the CPU (unit with a smaller H link number), and PC link H1 for the unit farthest from the CPU (unit with a larger H link number).

• Computer link:

The term “computer link” means the link that functions between a programmable controller and a computer. In the computer link, a computer always initiates a communication to a programmable controller and communication is performed using MEWTOCOL-COM protocol for FP series programmable controllers. To perform computer link communication, you need to prepare a program in the computer that conforms to the MEWTOCOL-COM format. You do not have to make a program for the programmable controller.

• Data transfer:

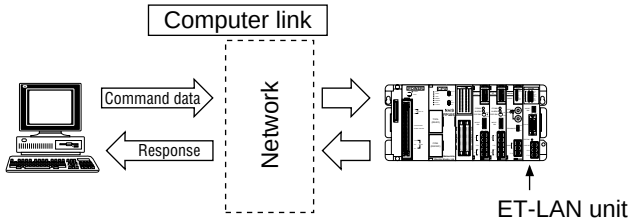
The data transfer function enables a programmable controller to send or get data to/from another programmable controller. This function is usually used between programmable controllers using the **F145 (SEND)/P145 (PSEND)** and **F146(RECV)/P146 (PRECV)** instructions through the link units. If you use this for communication with a computer, you need to prepare programs that conform to the MEWTOCOL-DAT format at the computer.

12-2.MEWTOCOL Format

MEWTOCOL is the communication protocol for FP series programmable controllers of which two types are supported as follows:

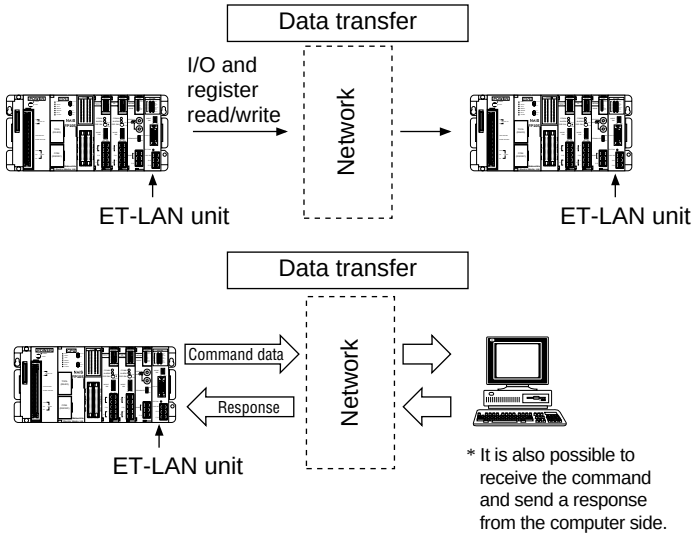
• **MEWTOCOL-COM Protocol:**

MEWTOCOL-COM protocol is used for communication between an FP series programmable controller and a computer. Communication using MEWTOCOL-COM protocol is referred to as the computer link function. In the computer link, a computer always initiates communication by sending a MEWTOCOL-COM command message. The FP series programmable controller then returns back a response message to computer. Using this computer link, you do not need to create a communication program in the FP series programmable controller, but you do need to create a communication program in order to accommodate the MEWTOCOL-COM format. You can use any programming language such as BASIC or C to program the computer.



• **MEWTOCOL-DAT Protocol:**

The MEWTOCOL-DAT protocol is used for communication between FP series programmable controllers or between an FP series programmable controller and a computer. Communication using the MEWTOCOL-DAT protocol is called the data transfer function. The data transfer function is performed through link units, such as the MEWNET-P, MEWNET-W, MEWNET-H and ET-LAN unit, by executing the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions. During a data transfer, communication is usually initiated by the FP3, FP5, FP10S or FP10 with a link unit by executing the instructions, which means sending a MEWTOCOL-DAT command message. Then the response message is received from another FP3/FP5/FP10S/FP10 or a computer. When doing data transfers between FP series programmable controllers, you only need to create a program in one of the programmable controllers for executing the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions. You do not have to make a program in the other FP series programmable controller. For communication between an FP series programmable controller and a computer, you need to execute the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions in the FP series programmable controller and you need to create a program in order to accommodate the MEWTOCOL-DAT format. You can use any program language such as BASIC or C to program the computer.



1. MEWTOCOL-COM Protocol

The MEWTOCOL-COM protocol is used for communication between a computer and an FP series programmable controller (computer link function). During computer link communication, the command is initiated from a computer and the FP series programmable controller sends a response message back to the computer in the MEWTOCOL-COM format.
All messages are transmitted as ASCII codes. Therefore, all characters you send to or receive from an FP series programmable controller should be converted to ASCII code. Regarding ASCII HEX code, refer to page 234, “12-7. ASCII Codes”.

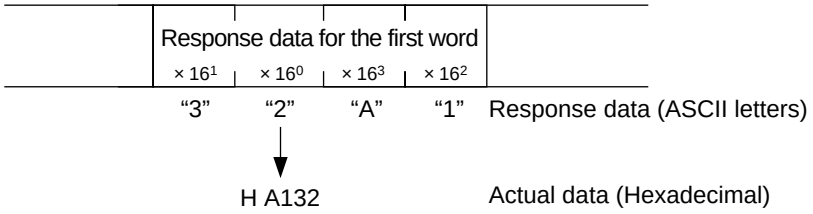
Note:

• Basic MEWTOCOL-COM terminology
- Message: A series of characters combining commands and text which are sent in one or more frames.
- Command message: A message from the computer to the FP series programmable controller.
- Response message: A message from the FP series programmable controller to the computer.
- Frame: A group of not more than 118 (when using % a header) or 2,048 (when using < as header) characters. Note that the < header is available only for high-level link units. For details about high-level link units, refer to page 122, “12-1. Standard and High-level Link Units”.

■ Number systems used in MEWTOCOL-COM messages

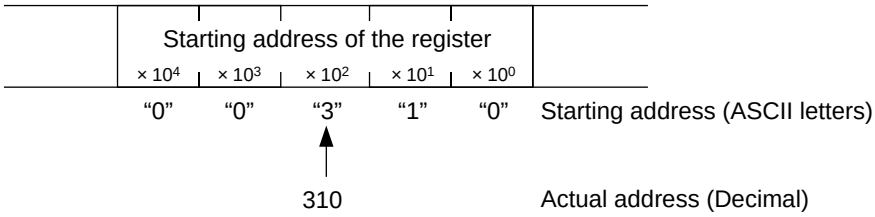
Three types of numbering systems are used for MEWTOCOL-COM messages as follows:
- Hexadecimal numbers
Hexadecimal numbers are used for expressing the contents of the registers or error codes.

[EXAMPLE]
In the response message of the RD command, response data is expressed in hexadecimal numbers.



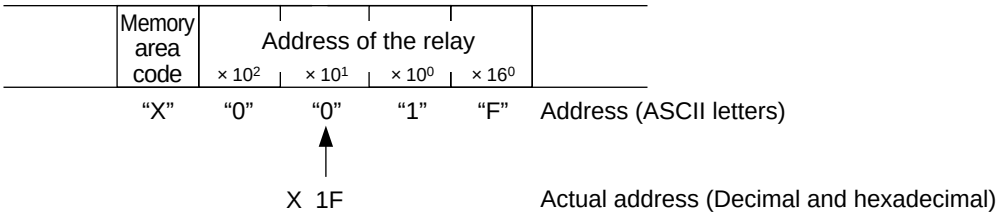
- Decimal numbers
Decimal numbers are used for expressing the addresses for registers and timer/counter contacts.

[EXAMPLE]
In the command message of the RD command, the address is expressed in decimal numbers.



- Combination of decimal and hexadecimal numbers
  Address for relay bits (X, Y, R and L) are expressed as a combination of a word address (decimal) and a hexadecimal number for designating a specific bit. The right most digit is hexadecimal and the rest of the digits are decimal.

[EXAMPLE]
In the RC command message for reading a single data bit, its address is expressed in a combination of decimal and hexadecimal numbers.

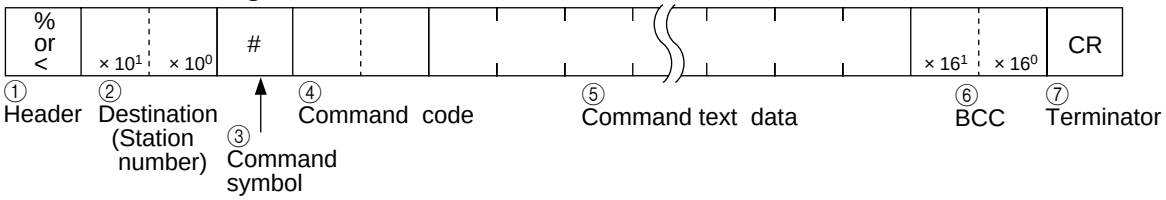


Note:

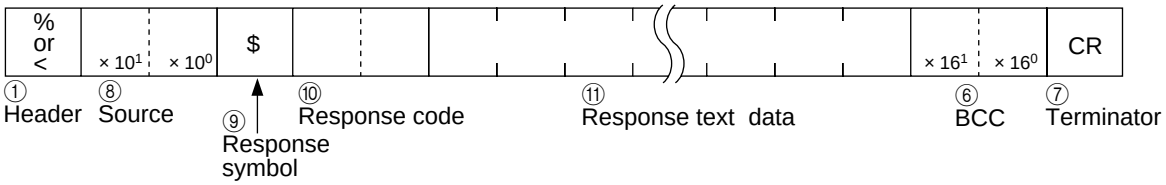
- Since there are restrictions in the digits that can be used for expressing data and addresses, etc., in each command and response message, be sure to refer to each description of MEWTOCOL-COM commands and responses.

1) Basic MEWTOCOL-COM Message Format

■ Command message format

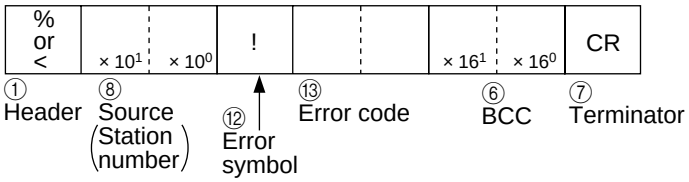


■ Response message format



■ Error response message

When an error occurrs during data transmission, the following response will be returned by a programmable controller.



① Header [“%” (ASCII code : H25) or “<” (ASCII code: H3C)]
The percent character “%” is used for the header in both command and response messages frames, for up to and including 118 characters. The character “<” is used for the header in both command and response message frames for up to and including 2,048 characters. The “<” header is available for high-level link units, such as the ET-LAN unit or MEWNET-H link unit.

② Destination (Station number) [“01” through “64” (decimals) or “FF”]
The station that should read the command message is specified as 2 characters representing a decimal station number. Accordingly, the station number must be specified in the range of “01” to “64”. You also can specify it as “FF” to send the command message to all of the stations. In this case, no response message will be returned.

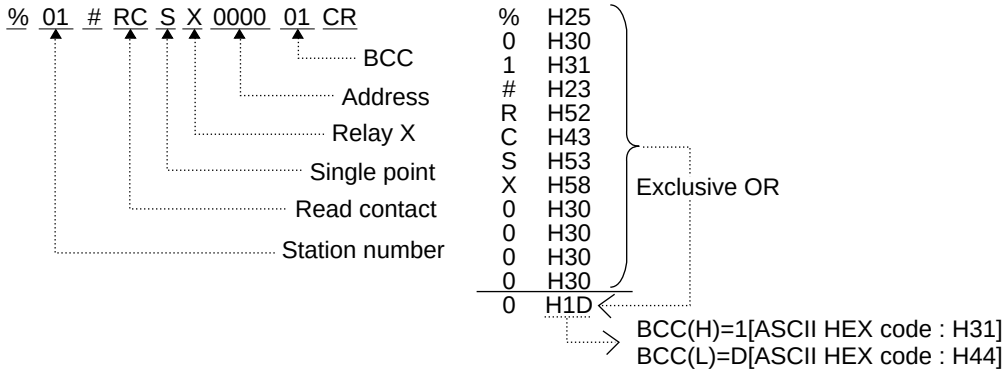
③ Command symbol [“#”(ASCII code : H23)]
The pound sign “#” is used for the command symbol.

④ Command code [2 characters (capital letters)]
The command code is specified as 2 uppercase characters. For details of the command codes, refer to page 135, “5) List of MEWTOCOL-COM Command/Response Codes”.

⑤ Command text data
Depending on the command, the content of text data will vary.
Information such as memory address that subjected to the data transmission, and data (if any), will be specified here.

⑥ Block Check Code (BCC) [2 characters]
This code is used to detect errors in the message transmissions.
If “**” is sent from a computer as the BCC, no block check will be performed on the command message. Even if a computer sending a command message has specified that no BCC is being sent, the receiving station will insert its own BCC in the response message.
It is created by Exclusive ORing all of the codes from the header through the last text character, then translating the resulting 8-bit data into two ASCII characters.

Example :



⑦ Terminator [CR (ASCII code : H0D)]
The carriage return “CR” is used as the terminator in both command and response messages.

⑧ Source (Station number) [“01” through “64” (decimals) or “FF”]
The station number specified in the command message as the destination will be returned as source station number.

⑨ Response symbol [“$” (ASCII code : H24)]
The dollar sign “$” is used in the response message. This indicates that a data transmission was successfully received.

⑩ Response code [2 characters (capital letters)]
The same code as the one sent in the command message will be returned to indicate the programmable controller is responding to the command message.

⑪ Response text data
When data must be returned in the response message, the response text data is added after the response code.
For example, when a register read command (RD) is sent from a computer, the programmable controller will respond with text data.

⑫ Error symbol [“!” (ASCII code : H26)]
The exclamation character “!” is used to identify an error message. This indicates that a data transmission error occurred.

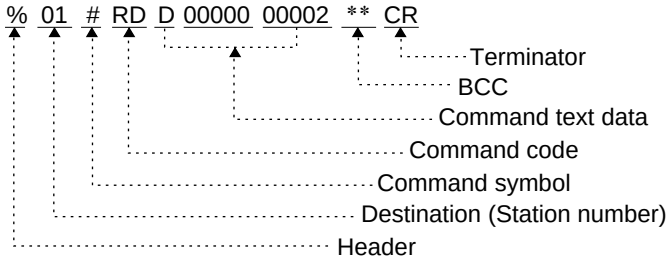
⑬ Error code [2 characters (hexadecimals)]
The error code is specified as 2-character hexadecimal number expressed in ASCII format.
For details about MEWTOCOL-COM error codes, refer to page 197, “3. List of MEWTOCOL Error Codes”.

■ Example

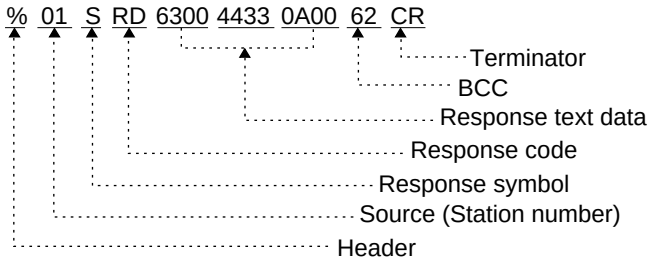
Reading data from data registers, DT0000 through DT0002 in a programmable controller which has assigned number is 01.

The data in the data registers are : DT0000 0063 (Hexadecimal)
DT0001 3344 (Hexadecimal)
DT0002 000A (Hexadecimal)

Command message



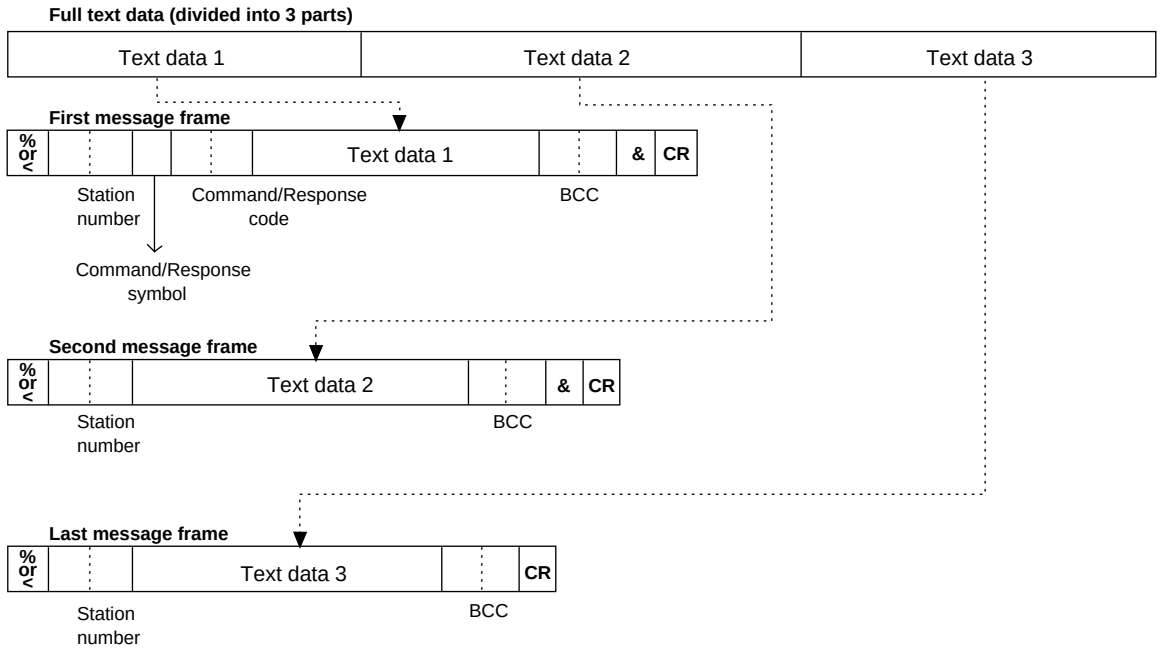
Response message



2) Multiple MEWTOCOL-COM Frames

The maximum of message length that the link unit can receive or send at one time is 118 characters when using the "%" header and 2,048 characters when using the "<" header. If the message to be sent exceeds specified limits, it must be divided into separate frames as shown below.

■ How to divide a message into multiple frames



The characters included in each frame are slightly different.

- 1st frame
  The delimiter character "&" is added after the BCC.
  In all other respects it is just like a single frame message.

- 2nd (and 3rd, etc) frames
  The second, third, etc. frames do not use the command or response symbols ("#", "$"), but the second frame does require the "&" character between the BCC and the terminator (CR).

- Last frame
  The last frame does not use the command or response symbols ("#", "$").
  It also does not include the "&" delimiter character. In other words, it is just like a regular message frame, without a command or response symbol.

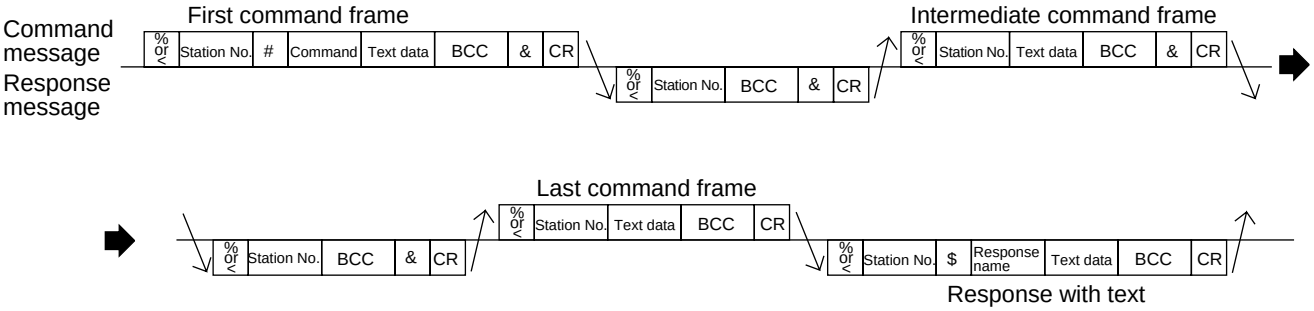
■ Data request message frame

When a programmable controller or a computer receives a message that contains an “&” delimiter, they must send a data request message that contains the station number, the BCC and an “&”. For details, refer to the next sections.

■ Data flow using multiple frame

Using multiple frame command message

After each frame of the command message that contains an “&” delimiter is received, the programmable controller responds with its station number and the BCC. Then the programmable controller waits for the next piece of the command message.

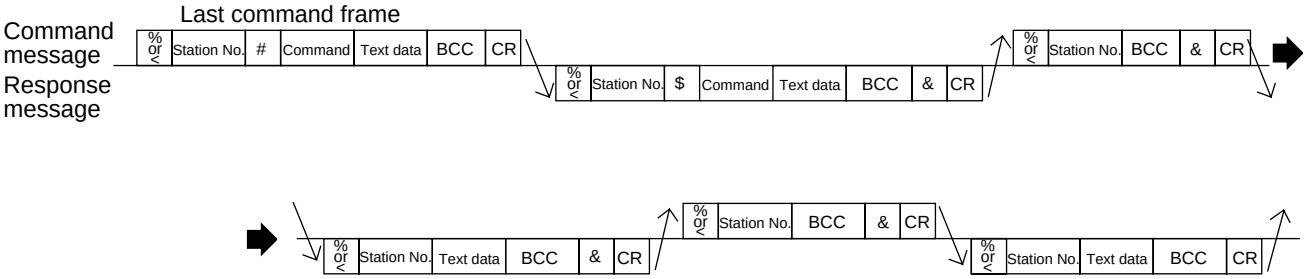


Note:

- The response message frame parentheses with text (“$” response symbol/response code/text data) are not sent back to the computer until all of the command message frames with text have been sent to the programmable controller.

Using a multiple frame response message

After receiving each frame of a response message that contains an “&” delimiter, the computer responds with the station number and the BCC. Then the computer waits for the next piece of the response message.



Notes:

- Command message frames without text (station number/BCC) are sent back to the programmable controller until all the response message frames have been received by computer.
- When a message is divided into multiple frames, the next frame can not be sent without first receiving a confirmation that the most recent frame was received correctly.
- As a message in multiple frames can not be interrupted without the abort (AB) command, it is recommended that the number of frames in one message should be limited to as small a number as possible.

3) List of Main Symbols

Symbol name	Character	ASCII code (Hexadecimal)	Description
Header	%	H25	Indicates the start of a message frame.
Expansion header	<	H3C	Indicates the start of a message frame. This is available for high-level link units, such as the ET-LAN unit and MEWNET-H link unit. (For details about high-level link units, refer to page 122, “12-1. Standard and High-level Link Units”.)
Command symbol	#	H23	Indicates a command message.
Response symbol	$	H24	Indicates a normal response message frame.
Error symbol	!	H21	Indicates a response message when an error has occurred.
Terminator	CR	H0D	Indicates the end of a message frame.
Delimiter	&	H26	Indicates more to follow when a message is sent as several frames.

4) List of MEWTOCOL-COM Memory Area Codes

The memory area codes are specified as 1 or 2 characters (capital letters).
These codes are a little bit different from the names used in the programmable controller for the memory area in numbering or their specifications. Be sure to check the coincidence of each code before use.

Memory Area Name	Memory Area Code (ASCII HEX code)	Description	Applicable command
External input relay	**X (H58)**	• This code is used when the external input relays in the memory area are specified. • In the “RC” command, this code is used also to specify the word units address of the memory.	RC MC
	WX (H57)(H58)	• This code is used only when the word external input relays are specified in the “MD” command. • In other commands, the code “X” is used to specify also word external input relays.	MD
External output relay	**Y (H59)**	• This code is used when the external output relays in the memory area are specified. • In the “RC”, “WC” and “SC” commands, this code is used also to specify the word units address of the memory.	RC WC SC MC
	WY (H57)(H59)	• This code is used only when the word external output relays are specified in the “MD” command. • In other commands, the code “Y” is used to specify also word external output relays.	MD
Internal relay	**R (H52)**	• This code is used when the internal relays in the memory area are specified. • In the “RC” , “WC” and “SC” commands, this code is used also to specify the word units address of the memory.	RC WC SC MC
	WR (H57)(H52)	• This code is used only when the word internal relays are specified in the “MD” command. • In other commands, the code “R” is used to specify also word internal relays.	MD
Link relay	**L (H4C)**	• This code is used when the link relays in the memory area are specified. • In the “RC” , “WC” and “SC” commands, this code is used also to specify the word units address of the memory.	RC, WC, SC, MC
	WL (H57)(H4C)	• This code is used only when the word link relays are specified in the “MD” command. • In other commands, the code “L” is used to specify also word internal relays.	MD
Data register	**D (H44)**	• This code is used when the data registers in the memory area are specified. • Its addresses are expressed as a decimal number.	RS, WD, SD, MD
File register	**F (H46)**	• This code is used when the file registers in the memory area are specified. • Its addresses are expressed as a decimal number.	RS, WD, SD, MD
Link data register	**L (H4C)**	• This code is used when the link data registers in the memory area are specified. • Its addresses are expressed as a decimal number.	RS, WD, SD, MD

Memory Area Name	Memory Area Code (ASCII HEX code)	Description	Applicable command
Index register (IX/IY)	**IX (H49)(H58)**	• This code is used when the index register IX in the memory area are specified. As each programmable controller has only one IX index register, the imaginary address of “0000” or “00000” is specified in the command message.	RD WD MD
	IY (H49)(H59)	• This code is used when the index register IY in the memory area are specified. As each programmable controller has only one IY index register, the imaginary address of “0000” or “00000” is specified in the command message.	RD WD MD
	ID (H49)(H44)	• This code is used when both X type and Y type index registers in the memory area are specified. As each programmable controller has only one set of index registers (IX and IY), the imaginary address of “0000” or “00000” is specified in the command message.	RD WD
Timer/Counter contact	**T (H54)**	• This code is used when the timer contacts in the memory area are specified. As they are expressed in decimal number, be sure to check its contact address when the address should be specified in word units. • Even if you specify “T” in the counter contact area address number, no error will occur.	RC MC
	C (H43)	• This code is used when the counter contacts in the memory area are specified. As they are expressed in decimal number, be sure to check its contact address when the address should be specified in word units. • Even if you specify “C” in the counter contact area address number, no error will occur.	RC MC
Timer/Counter set value area	**S (H53)**	• This code is used when the timer and/or counter set value areas in the memory area are specified in the “MD” command.	MD
Timer/Counter elapsed value area	**K (H4B)**	• This code is used when the timer and/or counter set elapsed value areas in the memory area are specified in the “MD” command.	MD

5) List of MEWTOCOL-COM Command/Response Codes

The command/response codes are specified using two capital letters. The same code as the one sent in the command message will be returned to indicate that the programmable controller is responding to the command message.

Name	Command code (ASCII HEX code)	Description	Memory area code in MEWTOCOL-COM
Read contact	**RC (H53) (H43)**	Read the contents stored in external input and output relays, internal relays, link relays and timer/counter contacts. Read-out data can be selected in single-bit units, an optional number of bits (up to 8) or word units.	External input relay: X External output relay: Y Internal relay: R Link relay: L Timer contact: T Counter contact: C
Write contact	**WC (H57) (H43)**	Writes data into external output, internal and link relays. Written data can be selected in single-bit units, an optional number of bits (up to 8) or word units.	External output relay: Y Internal relay: R Link relay: L
Set contact	**SC (H53) (H43)**	Sets a data pattern in external output, internal and link relays in word units.	External output relay: Y Internal relay: R Link relay: L
Read registers	**RD (H52) (H44)**	Reads the contents stored in data, link data, file and index registers.	Data register: D Link data register: L File register: F Index register IX: IX Index register IY: IY Index registers IX&IY: ID
Write registers	**WD (H57) (H44)**	Writes data into data, link data, file and index registers.	Data register: D Link data register: L File register: F Index register IX: IX Index register IY: IY Index registers IX&IY: ID
Set registers	**SD (H53) (H44)**	Sets a data pattern in data, link data and file registers.	Data register: D Link data register: L File register: F
Read SV of a timer/counter	**RS (H52) (H53)**	Reads the set value area SV for the timer/counter.	No need to specify the memory area code.
Write a value of a timer/counter to SV	**WS (H57) (H53)**	Writes data into the set value area SV for the timer counter.	No need to specify the memory area code.
Read EV of a timer/counter	**RK (H52) (H4B)**	Reads the elapsed value area EV for the timer/counter.	No need to specify the memory area code.
Write a value of a timer/counter to EV	**WK (H57) (H4B)**	Writes data into the elapsed value area EV for the timer/counter.	No need to specify the memory area code.
Specify contacts monitored	**MC (H4E)(H43)**	Registers or resets the addresses of external input and output relays, internal relays, link relays and timer/counter contacts, which will be monitored by the “MG” command.	External input relay: X External output relay: Y Internal relay: R Link relay: L Timer contact: T Counter contact: C
Specify registers monitored	**MD (H4E)(H44)**	Registers or resets the addresses of data, link data, file and index registers, word external input and output relays, word internal relays, and timer/counter set and elapsed value areas, which will be monitored by the “MG” command.	Data register: D Link data register: L File register: F Index register IX: IX Index register IY: IY Word external input relay: WR Word external output relay: WY Word internal relay: WR Timer/counter set value area: S Timer/counter elapsed value area: K

Name	Command code (ASCII HEX code)	Description	Memory area code in MEWTOCOL-COM
Monitoring start	**MG (H4E)(H47)**	Monitors the points specified in the “MC” and “MD” commands.	No need to specify the memory area code.
Read system registers	**RR (H52)(H52)**	Reads parameters stored in system registers of the programmable controller.	No need to specify the memory area.
Write a value to system register	**WR (H57)(H52)**	Writes parameters into system registers of the programmable controllers.	No need to specify the memory area.
Read the status of the programmable controller	**RT (H52)(H54)**	Reads the status of the programmable controller such as PLC type and program capacity.	No need to specify the memory area.
Read a program block of the programmable controller for backup	**RP (H52)(H52)**	Reads a program block stored in the programmable controller. The program read must be used only for backup purpose.	No need to specify the memory area.
Write a program block read by WP command	**WP (H57)(H52)**	Write the program block read out by the “RP” command.	No need to specify the memory area.
Change the mode of the programmable controller	**RM (H52)(H4D)**	Remotely controls the mode of the programmable controller (PROG. or RUN).	No need to specify the memory area.
Abort a series of response message	**AB (H41)(H42)**	Aborts a series of messages sent in multiple frames.	No need to specify the memory area.

6) Description of MEWTOCOL-COM Commands and Responses

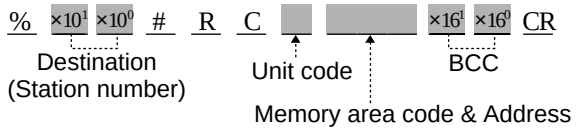
The descriptions for each MEWTOCOL-COM command and response message are explained in pairs in the pages shown below.

RC Read contact (single point/plural points/word units)

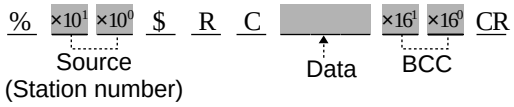
Outline Reads the contents stored in external input relays, external output relays, internal relays, link relays and timer or counter contacts.

Basic message format

Command message



Response message



■ Memory area codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
A	N/A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A

A : Available
N/A : Not Available

Notes:

- The codes “X”, “Y”, “R” and “L” are also used to read data in one word units (1 word = 16 bits).
- Refer to page 133, “4) List of MEWTOCOL-COM Memory Area Codes” for details.

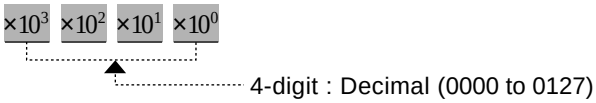
■ Unit codes

A computer can read a single bit of data, an optional number of bits (1 to 8 bits) or in units of words (1 word = 16 bits). In order to set the data size for “RC” command, use the following unit codes.

Unit code	Description	Address numbering system	
		X, Y, R, L	T, C
S	Specify "S" to read a single bit of data.	Relay bit numbering (4-digit)	Decimal numbering (4-digit)
P	Specify "P" to read an optional number of bits (1 to 8 bits).	Relay bit numbering (4-digit)	Decimal numbering (4-digit)
C	Specify "C" to read data in units of words (1 word = 16 bits).	Word numbering (4-digit)	See note

Note:

- You can read timer/counter contacts in units of words. However, since timer/counter contacts are not normally treated in units of words, it is recommended that you do not read them in units of words to avoid any numbering system confusion.
  When you specify the timer/counter contacts in this command, refer to the following.



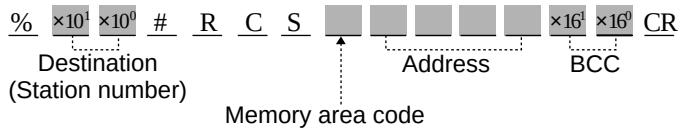
Setting	T/C contact number
0000	0 to 15
0001	16 to 31
⋮	⋮
0127	2032 to 2047

Description

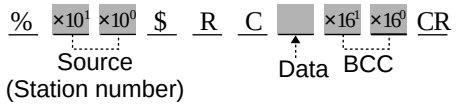
- Reads the contents stored in external input relays, external output relays, internal relays, link relays and timer or counter contacts.
  A computer can read a single bit of data, or an optional number of bits (1 to 8 bits) in one command message.
  It can also read data in units of words (1 word = 16 bits).
- Refer to following pages for detailed explanations.

■ When the unit code "S" is specified. [When you want to read a single bit of data.]

Command message



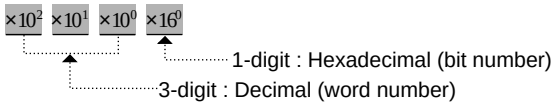
Response message



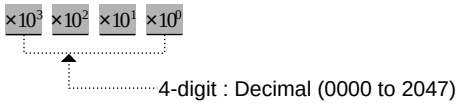
Explanation

① Memory area code: Specify the memory area code of the programmable controller to be read from, referring to the codes given in page 138, "Memory area codes".

② Address: The address for X (external input relay), Y (external output relay), R (internal relay) and L (link relay) is expressed using a relay bit numbering system as follows :



The contact address for T (timer contact) and C (counter contact) is expressed using a decimal numbering system as follows:



When you read a timer contact, specify the contact with "T" and when you read a counter contact, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then a counter contact address, the computer will read the contents of the address specified in the command message.

③ Data: Contact data is specified as :
0 : OFF state
1 : ON state

Program example

Command message

% 0 1 # R C S X 0 0 0 A ✻ ✻ CR

Response message

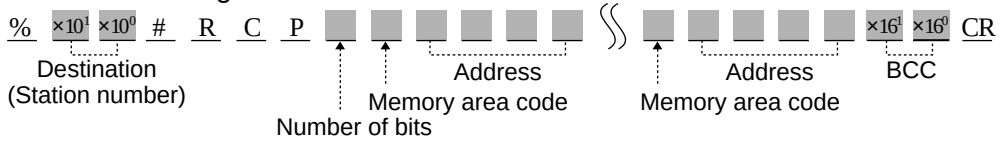
% 0 1 $ R C 0 2 1 CR

The contents of XA are read by the programmable controller whose station number is 01.

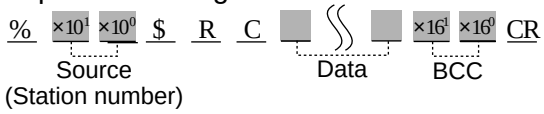
Command message
Destination: 01 station
Point: XA
Response message
Source: 01 station
Data: XA = 0 (OFF)

■ When the unit code "P" is specified. [To read one or more bits of data (1 to 8 bits).]

Command message



Response message



Explanation

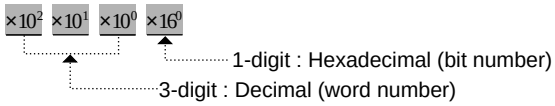
① Number of bits: When you specify "P" in the unit code, you must specify how many bits to read. Specify a number in the range of 1 to 8.

Notes:

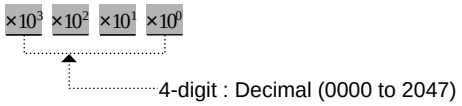
- You must specify a separate memory area code and address for each bit of data you want to access. Thus, you will have to give from 1 to 8 memory area codes and addresses depending on the number of bits you specified.
- A single bit can also be accessed with the unit code "S".

② Memory area code: Specify the memory area code for the programmable controller to be read from, referring to the codes given in page 138, "Memory area codes".

③ Address: The address for X (external input relay), Y (external output relay), R (internal relay) and L (link relay) is expressed using a relay bit numbering system as follows :



The contact address for T (timer contact) and C (counter contact) is expressed using a decimal numbering system as follows:



When you read a timer contact, specify the contact with "T" and when you read a counter contact, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then use a counter contact address, the computer will read the contents of the address specified in the command message.

④ Data: Contact data is specified as :
0: OFF state
1: ON state

Program example

Command message

% 0 1 # R C P 3 X 0 0 0 A Y 0 0 1 F T 0 0 0 5 * * CR

Response message

% 0 1 $ R C 1 0 0 2 0 CR

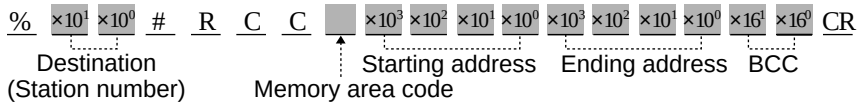
The contents of XA, Y1F and T5 will be read from the programmable controller whose station number is 01.

Command message
- Destination: 01 station
- Number of bits: 3 bits (XA, Y1F, T5)

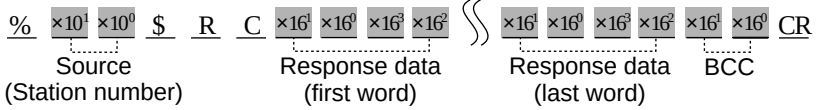
Response message
- Source: 01 station
- Data: XA = 1 (ON), Y1F = 0 (OFF), T5 = 0 (OFF)

■ When the unit code "C" is specified. [To read bit data in units of words (1 word = 16 bits).]

Command message



Response message



Explanation

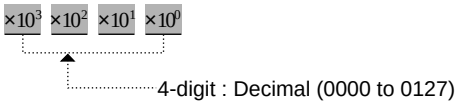
① Memory area code: Specify the memory area code for the programmable controller to read from,ad from, referring to the codes given in page 138, "Memory area codes".

Note:

• The memory area codes used in this command do not have same name as those that are used in programming the programmable controller.

② Starting address
& Ending address: The starting and ending word addresses for X (external input relay), Y (external output relay), R (internal relay) and L (link relay) are expressed using a word numbering system as follows :

You can read timer/counter contacts in units of words. However, since timer/counter contacts are not normally treated in unit of words, it is recommended that you do not read them in units of words to avoid any numbering system confusion.
When you specify the timer/counter contacts in this command, refer to the following.



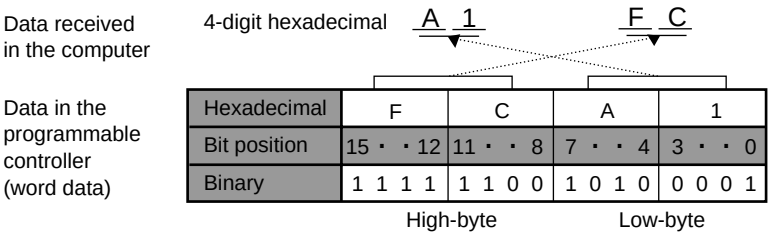
Setting	T/C contact number
0000	0 to 15
0001	16 to 31
⋮	⋮
0127	2032 to 2047

When you read a timer contact, specify the contact with "T" and when you read a counter contact, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then a counter contact address, the computer will read the contents of the address specified in the command message.

Note:

• The ending address must be equal to or larger than the starting address.

③ Response data: 4 characters are returned for each word relay address included in the command in the form shown below.
Data will be returned starting with the data stored in the starting word address specified in the command message.



Notes:

- The number of words of data that are returned is equal to the ending address minus the starting address plus one.
- The programmable controller stores words in low-byte, high-byte order. Thus, data returned by the programmable controller are in that order.

Program example

Command message

% 0 1 # R C C X 0 0 0 0 0 0 0 2 ✻ ✻ CR

Response message

% 0 1 $ R C 6 3 0 0 4 4 3 3 0 A 0 0 6 2 CR

The contents of external input relays [WX0 to WX2 (X0 to X2F)] will be read from the programmable controller whose station number is 01.

Command message
- Destination: 01 station
- Starting address: WX0
- Ending address: WX2
- Read out range: WX0 to WX2 (X0 to X2F)

Response message
- Source: 01 station
- Data received in response message: H6300, H4433, H0A00
- Actual data: WX0 = H0063, WX1 = H3344, WX2 = H000A

Data received in the computer

4-digit hexadecimal 6 3 0 0

Actual data in the programmable controller
WX0

Hexadecimal	0	0	6	3
Bit position	15 ･ ･ 12	11 ･ ･ 8	7 ･ ･ 4	3 ･ ･ 0
Binary	0 0 0 0	0 0 0 0	0 1 1 0	0 0 1 1

XF X0

Data received in the computer

4-digit hexadecimal 4 4 3 3

Actual data in the programmable controller
WX1

Hexadecimal	3	3	4	4
Bit position	15 ･ ･ 12	11 ･ ･ 8	7 ･ ･ 4	3 ･ ･ 0
Binary	0 0 1 1	0 0 1 1	0 1 0 0	0 1 0 0

X1F X10

Data received in the computer

4-digit hexadecimal 0 A 0 0

Actual data in the programmable controller
WX2

Hexadecimal	0	0	0	A
Bit position	15 ･ ･ 12	11 ･ ･ 8	7 ･ ･ 4	3 ･ ･ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	1 0 1 0

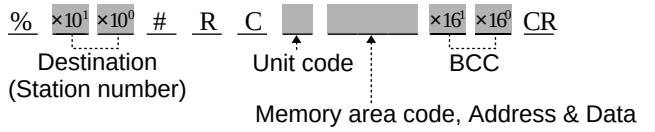
X2F X20

WC Write contact (single point/plural points/word units)

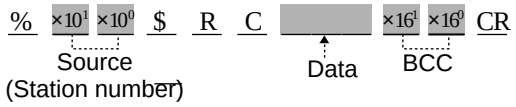
Outline Writes data into external output relays, internal relays and link relays.

Basic message format

Command message



Response message



■ Memory area codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A : Available
N/A : Not Available

Notes:

- The memory area code “X” (external input relay) can be specified only for the FP3.
- The codes “X” (only for the FP3), “Y”, “R” and “L” also are used to write data in units of words (1 word = 16 bits).
- Refer to page 133, “4) List of MEWTOCOL-COM Memory Area Codes” for details.

■ Unit codes

A computer can write a single bit of data, an optional number of bits (1 to 8 bits) or in units of words (1 word = 16 bits). In order to set the data size for “WC” command, use the following unit codes.

Unit code	Description	Address numbering system
		X, Y, R, L
S	Specify “S” to write a single bit of data.	Relay bit numbering (4-digit)
P	Specify “P” to write an optional number of bits (1 to 8 bits).	Relay bit numbering (4-digit)
C	Specify “C” to write data in units of words (1 word = 16 bits).	Word numbering (4-digit)

Description

- Writes data into external output relays, internal relays and link relays.
  A computer can write a single bit of data, or an optional number of bits (1 to 8 bits) in one command message.
  It can also write data in units of words (1 word = 16 bits).
- Refer to the following pages for detailed explanations.

■ When the unit code "S" is specified. [When you want to write a single bit of data.]

Command message

% ×10¹ ×10⁰ # W C S [ ] ×10² ×10¹ ×10⁰ ×16⁰ [ ] ×16¹ ×16⁰ CR

Destination (Station number) — Memory area code — Address — Data — BCC

Response message

% ×10¹ ×10⁰ $ W C ×16¹ ×16⁰ CR

Source (Station number) — BCC

Explanation

① Memory area code: Specify the memory area code for the programmable controller to be written into, referring to the codes given in page 146, "Memory area codes".

② Address: The address for Y (external output relay), R (internal relay) and L (link relay) is expressed using a relay bit numbering system as follows:

×10² ×10¹ ×10⁰ ×16⁰

1-digit : Hexadecimal (bit number)

3-digit : Decimal (word number)

③ Data: Contact data is specified as :

0: OFF state

1: ON state

Program example

Command message

% 0 1 # W C S Y 0 0 0 A 1 ✻ ✻ CR

Response message

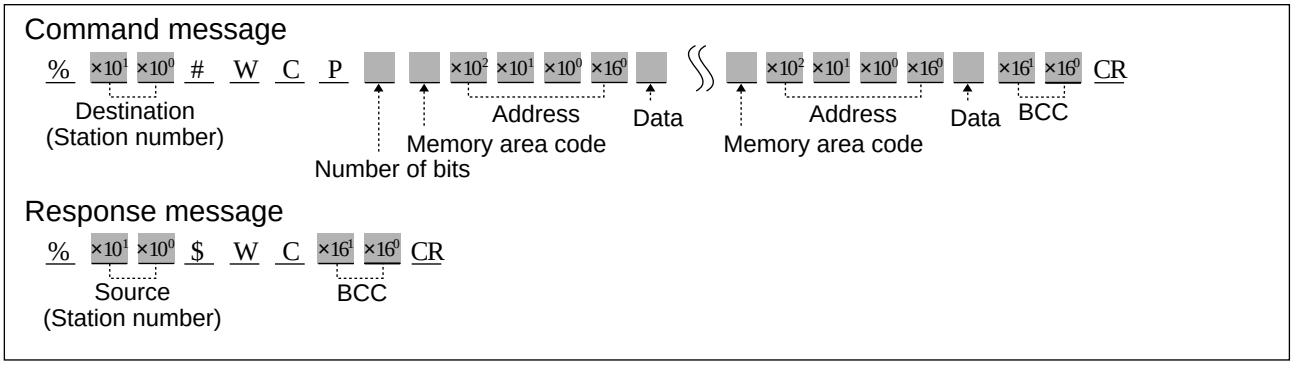
% 0 1 $ W C 1 4 CR

The data (1 = ON) is written to external output relay (YA) of the programmable controller whose station number is 01.

Command message
- Destination: 01 station
- Point: YA
- Data written: 1 (ON)

Response message
- Source: 01 station

■ When the unit code “P” is specified. [To write one or more bits of data (1 to 8 bits).]



Explanation

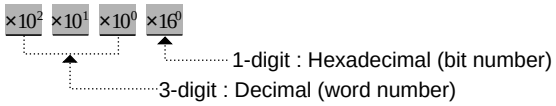
① Number of bits: When you specify “P” in the unit code, you must specify how many bits to write. Specify a number in the range of 1 to 8.

Notes:

- You must specify a separate memory area code, address and data for each bit of data you want to access. Thus, you will have to give from 1 to 8 memory area codes, addresses and data depending on the number of bits you specified.
- A single bit can also be accessed with the unit code “S”.

② Memory area code: Specify the memory area code for the programmable controller to be written into, referring to the codes given in page 146, “Memory area codes”.

③ Address: The address for Y (external output relay), R (internal relay) and L (link relay) is expressed using a relay bit numbering system as follows :



④ Data: Contact data is specified as :
0: OFF state
1: ON state

Program example

Command message

% 0 1 # W C P 3 Y 0 0 0 A 0 Y 0 0 1 F 1 R 0 0 0 5 0 ✻ ✻ CR

Response message

% 0 1 $ W C 1 4 CR

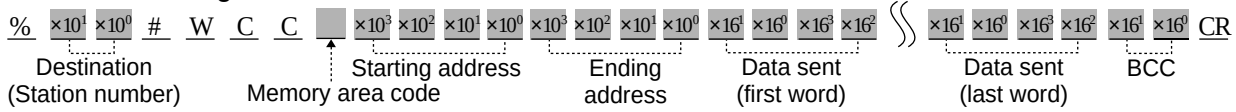
The data (0 = OFF, 1 = ON, 0 = OFF) are written to the external relays (YA and Y1F) and the internal relay (R5) of the programmable controller.

Command message
- Destination: 01 station
- Number of bits: 3 bits (YA, Y1F, R5)
- Data written: YA = 0 (OFF), Y1F = 1 (ON), R5 = 0 (OFF)

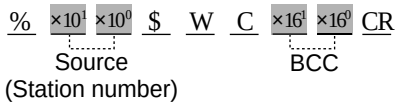
Response message
- Source: 01 station

■ When the unit code "C" is specified. [To write data in units of words (1 word = 16 bits).]

Command message



Response message



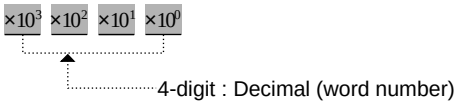
Explanation

① Memory area code: Specify the memory area code of the programmable controller to be written into, referring to the codes given in page 146, "Memory area codes".

Note:

- The memory area codes used in this command do not have same name as those that are used in programming the programmable controller.

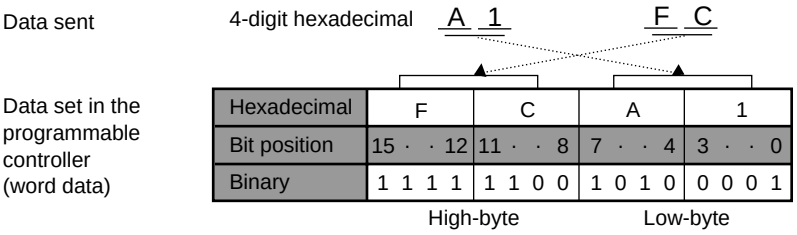
② Starting address
& Ending address: The starting and ending word addresses for Y (external output relay), R (internal relay) and L (link relay) are expressed using a word numbering system as follows :



Note:

- The ending address must be equal to or larger than the starting address.

③ Data sent: 4 characters are used to write one of word data in the form shown below.
Data will be sent to the programmable controller in order from the starting to the ending addresses.



Notes:

- The number of words of data that are sent is equal to the ending address minus the starting address plus one.
- The programmable controller stores words in low-byte, high-byte order. Thus, data sent to the programmable controller must be in that order.

Program example

Command message

% 0 1 # W C C R 0 0 0 0 0 0 0 2 6 3 0 0 4 4 3 3 0 A 0 0 ✻ CR

Response message

% 0 1 $ W C 1 4 CR

The data (H6300, H4433, H0A00) will be written into the address block [WR0 to WR2 (R0 to R2F)].

Command message
Destination: 01 station
Starting address: WR0
Ending address: WR2
Data write block: WR0 to WR2 (R0 to R2F)
Data sent: H6300, H4433, H0A00
Data set in programmable controller:
WR0=H0063, WR1=H3344, WR2=H000A

Data sent 4-digit hexadecimal 6 3 0 0

Data set in the programmable controller WR0

Hexadecimal	0	0	6	3
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 1 1 0	0 0 1 1

RF R0

Data sent 4-digit hexadecimal 4 4 3 3

Data set in the programmable controller WR1

Hexadecimal	3	3	4	4
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 1 1	0 0 1 1	0 1 0 0	0 1 0 0

R1F R10

Data sent 4-digit hexadecimal 0 A 0 0

Data set in the programmable controller WR2

Hexadecimal	0	0	0	A
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	1 0 1 0

R2F R20

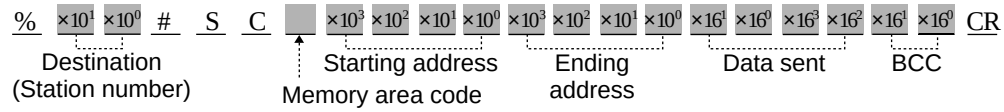
Response message
Source: 01 station

SC Set contact (word units)

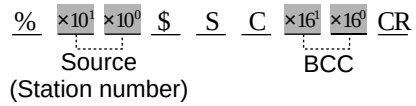
Outline Sets a data pattern (in word units) in external output relays, internal relays or link relays.

Basic message format

Command message



Response message



■ Memory area codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A : Available
N/A: Not Available

Notes:

- The codes “Y”, “R” and “L” are also used to write data patterns in units of words (1 word = 16 bits).
- Refer to page 133, “4) List of MEWTOCOL-COM Memory Area Codes” for details.

Description

- Sets the data pattern in external input relays (only for the FP3), external output relays, internal relays or link relays.
  The data pattern is written in units of words (one word = 16 bits).

■ Memory area code

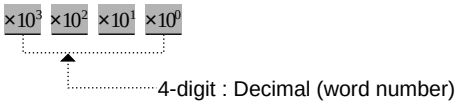
- Specify the memory area code for the programmable controller to be written into, referring to the codes given above in “Memory area codes”.

Note:

- The memory area codes used in this command do not have same name as those that are used in programming the programmable controller.

■ Starting address/Ending address

• The starting and ending word addresses for X [(external input relay) only for the FP3], Y (external output relay), R (internal relay) and L (link relay) are expressed using a word numbering system as follows :

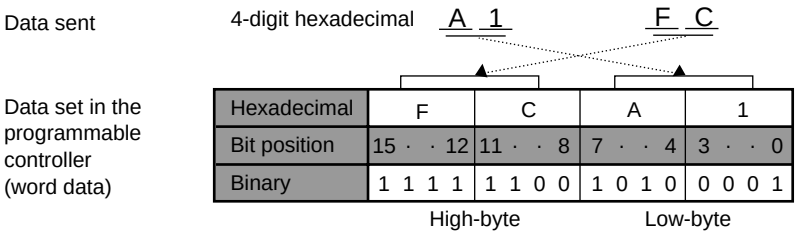


Note:

• The ending address must be equal to or larger than the starting address.

■ Data set

• 4 characters are used to set a data pattern in the form shown below.
Data will be sent to the programmable controller in order from the starting to the ending addresses.



Note:

• The programmable controller stores words in low-byte, high-byte order.
Thus, data sent to the programmable controller must be in that order.

Program example

Command message

% 0 1 # S C Y 0 0 0 0 0 0 3 0 A B C D ✻ ✻ CR

Response message

% 0 1 $ S C 1 0 CR

The data (HABCD) will be written to the address block (WY0000 to WY0030).
The command and response messages are recognized as :

Command message

Destination:	01 station
Starting address:	WY0
Ending address:	WY30
Data set block:	WY0 to WY30 (Y0 to Y30F)
Data sent:	HABCD
Data set in programmable controller:	HCDAB

Data sent

4-digit hexadecimal A B C D

Data pattern

Hexadecimal	C	D	A	B
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1

Data set in the programmable controller

Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Address				
WY0000	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0001	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0002	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0003	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0004	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
·	·	·	·	·
·	·	·	·	·
·	·	·	·	·
WY0026	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0027	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0028	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0029	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0030	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1

Response massage

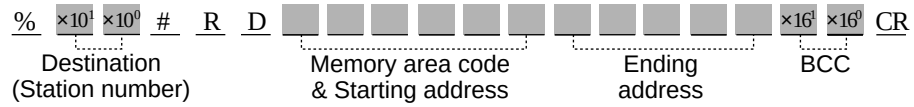
Source:	01 station

RD Read registers

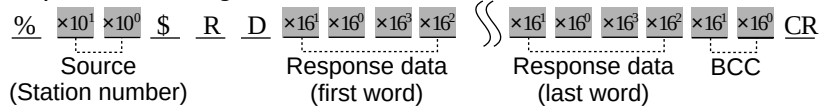
Outline Reads the contents stored in data registers, link data registers, file registers or index registers.

Basic message format

Command message



Response message



■ Memory area codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	N/A	N/A	N/A	N/A

A : Available
N/A: Not Available

Notes:

- The memory area code “ID” is used when both the “X” and the “Y” index registers.
- Refer to page 133, “4) List of MEWTOCOL-COM Memory Area Codes” for details.

Description

- Reads the contents stored in data registers, link data registers, file registers, or index registers (IX or/and IY).
  Since the memory area of each register is configured as 16 bits (one word), data from a register will be returned in the form of 4-digit hexadecimal.

■ Memory area code

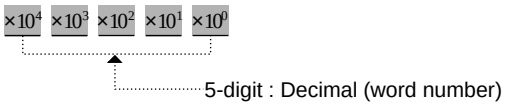
- Specify the memory area code for the programmable controller to be read from, referring to the codes given above in “Memory area codes”.

Note:

- The memory area codes used in this command do not have same name as those that are used in programming the programmable controller.

■ Starting address/Ending address

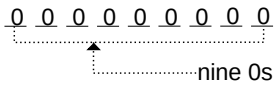
• The starting and ending addresses for “D” (data registers), “L” (link data registers) and “F” (file registers) are expressed using a word numbering system as follows :



Note:

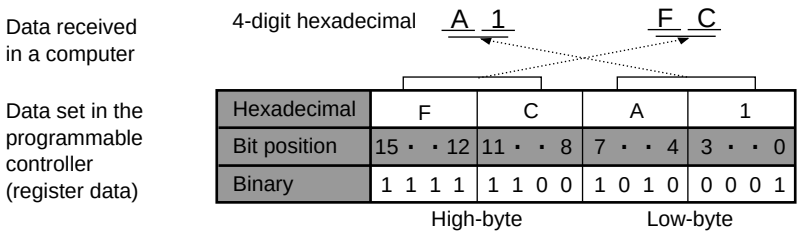
• The ending address must be equal to or larger than the starting address.

• The “IX” (index register IX), “IY” (index register IY) and “ID” (index registers IX and IY) are specified with nine 0s instead of specifying the starting and ending addresses, as the index registers do not have their own numbers with them.



■ Response data

• 4 characters are returned for each register address included in the command as shown below. Data will be returned from the programmable controller starting with the starting to the ending address.



Notes:

• The number of words of data that are returned is equal to the ending address minus the starting address plus one.
• The programmable controller stores words in low-byte, high-byte order. Thus, data returned by the programmable controller are in that order.

Program example

Command message

% 0 1 # R D D 0 1 1 0 5 0 1 1 0 7 ✻ ✻ CR

Response message

% 0 1 $ R D 6 3 0 0 4 4 3 3 0 A 0 0 6 2 CR

• The contents of data registers (DT1105 to DT1107) will be read by the programmable controller whose station number is 01.

Command message

Destination:	01 station
Starting address:	DT1105
Ending address:	DT1107
Read out block:	DT1105 to DT1107

Response message

Source:	01 station
Data received:	H6300, H4433, H0A00
Data set in programmable controller:	DT1105 = H0063, DT1106 = H3344, DT1107 = H000A

• DT1105

Data received in the computer: 4-digit hexadecimal 6 3 0 0

Actual data in the programmable controller DT1105:

Hexadecimal	0	0	6	3
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 1 1 0	0 0 1 1

• DT1106

Data received in the computer: 4-digit hexadecimal 4 4 3 3

Actual data in the programmable controller DT1106:

Hexadecimal	3	3	4	4
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 1 1	0 0 1 1	0 1 0 0	0 1 0 0

• DT1107

Data received in the computer: 4-digit hexadecimal 0 A 0 0

Actual data in the programmable controller DT1107:

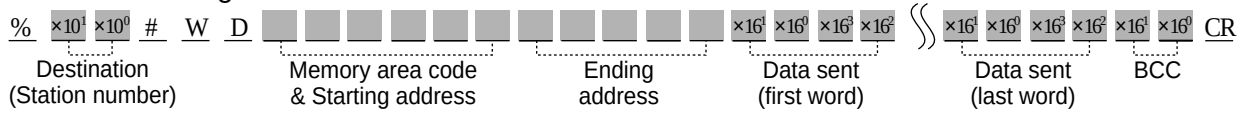
Hexadecimal	0	0	0	A
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	1 0 1 0

WD Write registers

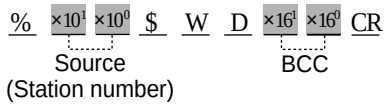
Outline Writes data into data registers, link data registers, file registers or index registers.

Basic message format

Command message



Response message



■ Memory area codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	N/A	N/A	N/A	N/A

A : Available
N/A: Not Available

Notes:

- The memory area code “ID” is used when both the “X” and the “Y” index registers.
- Refer to page 133, “4) List of MEWTOCOL-COM Memory Area Codes” for details.

Description

- Writes data into data registers, link data registers, file registers or index registers (IX or/and IY) of the programmable controller.
  Since the memory area of each register is configured as 16 bits (one word), data to a register will be written in the form of 4-digit hexadecimal.

■ Memory area code

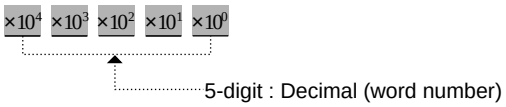
- Specify the memory area code for the programmable controller to be written into, referring to the codes given above in “Memory area codes”.

Note:

- The memory area codes used in this command do not have same name as those that are used in programming the programmable controller.

■ Starting address/Ending address

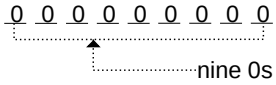
• The starting and ending addresses for “D” (data registers), “L” (link data registers) and “F” (file registers) are expressed using a word numbering system as follows :



Note:

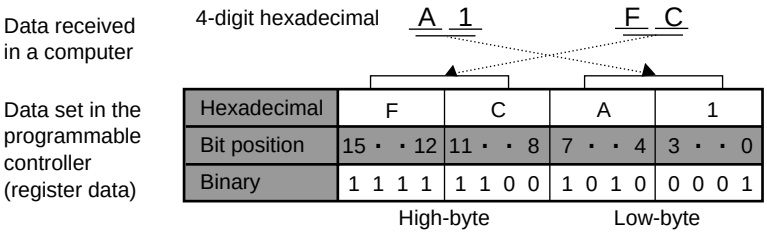
• The ending address must be equal to or larger than the starting address.

• The “IX” (index register IX), “IY” (index register IY) and “ID” (index registers IX and IY) are specified with nine 0s instead of specifying the starting and ending addresses, as the index registers do not have their own numbers with them.



■ Data sent

• 4 characters are needed for each word of data (one word per register address) as shown below. Data will be sent to the programmable controller in order from the starting to the ending address.



Notes:

- The number of words of data that are sent is equal to the ending address minus the starting address plus one.
- The programmable controller stores words in low-byte, high-byte order. Thus, data sent to the programmable controller must be in that order.
- When the memory area code is "ID", two words of data (8 characters) should be sent in the order IX register data, IY register data.

Program example

Command message

% 0 1 # W D D 0 0 0 0 1 0 0 0 0 3 0 5 0 0 0 7 1 5 0 0 0 9 ✻ ✻ CR

Response message

% 0 1 $ W D 1 3 CR

The data (H0500, H0715, H0009) will be sent to the specified registers (DT1, DT2, DT3) in the programmable controller.

Command message
- Destination: 01 station
- Starting address: DT1
- Ending address: DT3
- Data write block: DT1 to DT3
- Data sent: H0500, H0715, H0009
- Data set in programmable controller: DT1 = H0005, DT2 = H1507, DT3 = H0900

Response message
- Source: 01 station

Data sent — 4-digit hexadecimal: 0 5 | 0 0

Data set in the programmable controller DT1

Hexadecimal	0	0	0	5
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Data sent — 4-digit hexadecimal: 0 7 | 1 5

Data set in the programmable controller DT2

Hexadecimal	1	5	0	7
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 1	0 1 0 1	0 0 0 0	0 1 1 1

Data sent — 4-digit hexadecimal: 0 0 | 0 9

Data set in the programmable controller DT3

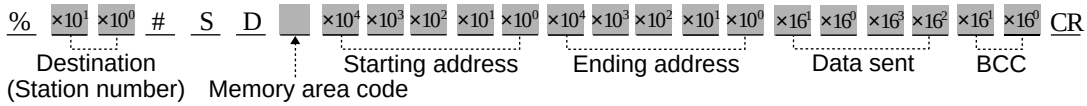
Hexadecimal	0	9	0	0
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	1 0 0 1	0 0 0 0	0 0 0 0

SD Set registers

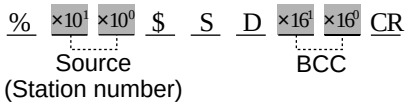
Outline Sets a data pattern in data registers, link data registers or file registers.

Basic message format

Command message



Response message



■ Memory area codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A : Available
N/A: Not Available

Note:

• Refer to page 133, “4) List of MEWTOCOL-COM Memory Area Codes” for details.

Description

• Sets a data pattern in data registers, link data registers or file registers in the programmable controller.
Since the memory area of each register is configured as 16 bits (one word), data to a register will be written in the form of 4-digit hexadecimal.

■ Memory area code

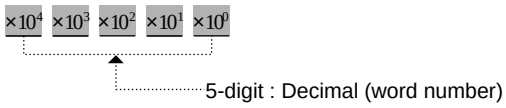
• Specify the memory area code for the programmable controller to be written into, referring to the codes given above in “Memory area codes”.

Note:

• The memory area codes used in this command do not have same name as those that are used in programming the programmable controller.

■ Starting address/Ending address

• The starting and ending addresses for “D” (data registers), “L” (link data registers) and “F” (file registers) are expressed using a word numbering system as follows :



Note:

• The ending address must be equal to or larger than the starting address.

■ Data sent

• 4 characters are needed for each word of data (one word per register address) as shown below. Data will be sent to the programmable controller in order from the starting to the ending addresses.

Data sent

4-digit hexadecimal A 1 F C

Set pattern set in the programmable controller (set pattern)

Hexadecimal	F	C	A	1
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	1 1 1 1	1 1 0 0	1 0 1 0	0 0 0 1
	High-byte		Low-byte	

Note:

• The programmable controller stores words in low-byte, high-byte order. Thus, data sent to the programmable controller must be in that order.

Program example

Command message

% 0 1 # S D L 0 0 0 0 0 0 0 0 3 0 A B C D ✻ ✻ CR

Response message

% 0 1 $ S D 1 6 CR

The data [ABCD (H)] will fill the address block (WY0000 to WY0030).

Command message

Destination:	01 station
Starting address:	LD0
Ending address:	LD30
Data set block:	LD0 to LD30
Data sent:	HABCD
Data set in programmable controller:	HCDAB

Data sent

4-digit hexadecimal A B C D

Data pattern

Hexadecimal	C	D	A	B
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1

Data set in the programmable controller

Bit position		15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Address	LD0	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD1	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD2	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD3	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD4	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	・	・	・	・	・
	・	・	・	・	・
	・	・	・	・	・
	LD26	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD27	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD28	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD29	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD30	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1

Response message

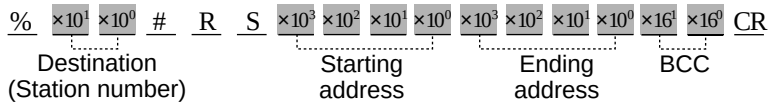
Source:	01 station

RS Read the set value from a timer/counter

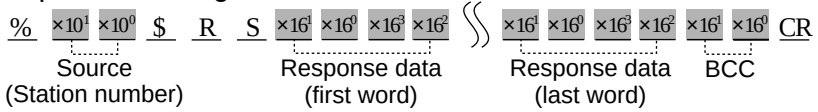
Outline Reads the timer/counter set value stored in the set value area.

Basic message format

Command message



Response message



Description

- Reads the timer/counter set value stored in the set value area.
- Since this command is dedicated to reading the timer/counter set value from the programmable controller, a memory area code is not required.

■ Starting address/Ending address

- The starting and ending addresses for timer/counter set value are expressed using a word numbering system as follows :

Note:

- The ending address must be equal to or larger than the starting address.

■ Response data

- 4 characters are needed for each word of data (one word per “SV” address) as shown below. Data will be read from the programmable controller in order from the starting to the ending addresses.

Data received 4-digit hexadecimal A 1 0 0

Data stored in the programmable controller

Hexadecimal	0	0	A	1
Decimal (K)	161			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	1 0 1 0	0 0 0 1
	High-byte		Low-byte	

Note:

- The programmable controller stores words in low-byte, high-byte order. Thus, data returned by the programmable controller are in that order.

Program example

Command message

% 0 1 # R S 0 0 0 0 0 0 0 2 ✻ ✻ CR

Response message

% 0 1 $ R S 0 5 0 0 1 4 0 0 2 8 0 0 0 B CR

The contents of timer/counter set value area (SV0, SV1, SV2) will be returned by the programmable controller whose station number is 01.

Command message
- Destination: 01 station
- Starting address: SV0
- Ending address: SV2
- Read out block: SV0 to SV2

Response message
- Source: 01 station
- Data received: H0500, H1400, H2800
- Data set in programmable controller: SV0 = H0005 (K5), SV1 = H0014 (K20), SV2 = H0028 (K40)

Data received in the computer — 4-digit hexadecimal: 0 5 | 0 0

Actual data in the programmable controller "SV0"

Hexadecimal	0	0	0	5
Decimal (K)	5			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Data received in the computer — 4-digit hexadecimal: 1 4 | 0 0

Actual data in the programmable controller "SV1"

Hexadecimal	0	0	1	4
Decimal (K)	20			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 1	0 1 0 0

Data received in the computer — 4-digit hexadecimal: 2 8 | 0 0

Actual data in the programmable controller "SV2"

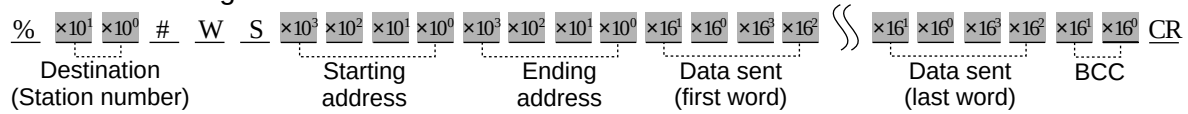
Hexadecimal	0	0	2	8
Decimal (K)	40			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 1 0	1 0 0 0

WS Write a data for a timer/counter set value area

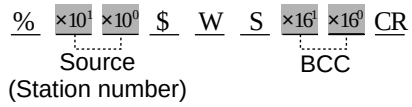
Outline Writes data into the timer/counter set value area in the programmable controller.

Basic message format

Command message



Response message



Description

- Writes the data into the specified timer/counter set value area.
- Since this command is dedicated to writing the timer/counter set value into a set value area of the programmable controller, a memory area code is not required.

■ Starting address/Ending address

- The starting and ending addresses for timer/counter set value are expressed using a word numbering system as follows :

Note:

- The ending address must be equal to or larger than the starting address.

■ Data sent

- 4 characters are needed for each word data (one word per “SV” address) as shown below. Data will be sent to the programmable controller in order from the starting to the ending addresses.

Data sent 4-digit hexadecimal A 1 0 0

Data set in the programmable controller

Hexadecimal	0	0	A	1
Decimal (K)	161			
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	1 0 1 0	0 0 0 1
	High-byte		Low-byte	

Note:

- The programmable controller stores words in low-byte, high-byte order. Thus, data sent to the programmable controller must be in that order.

Program example

Command message

% 0 1 # W S 0 0 0 0 0 0 0 2 0 5 0 0 1 4 0 0 2 8 0 0 ✻ ✻ CR

Response message

% 0 1 $ W S 0 4 CR

The data (H0500, H1400, H2800) will be sent to the timer/counter set value areas (SV0, SV1, SV2) of the programmable controller whose station number is 01.

Command message

Destination:	01 station
Starting address:	SV0
Ending address:	SV2
Read out block:	SV0 to SV2
Data sent:	H0500 H1400, H2800
Data set in programmable controller:	SV0 = H0005 (K5), SV1 = H0014 (K20), SV2 = H0028 (K40)

Response message

Source:	01 station

Data sent — 4-digit hexadecimal 0 5 0 0

Data set in the programmable controller "SV0"

Hexadecimal	0	0	0	5
Decimal (K)	5			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Data sent — 4-digit hexadecimal 1 4 0 0

Data set in the programmable controller "SV1"

Hexadecimal	0	0	1	4
Decimal (K)	20			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 1	0 1 0 0

Data sent — 4-digit hexadecimal 2 8 0 0

Data set in the programmable controller "SV2"

Hexadecimal	0	0	2	8
Decimal (K)	40			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 1 0	1 0 0 0

RK Read the elapsed value from a timer/counter

Outline Reads the timer/counter elapsed value stored in the elapsed value area.

Basic message format

Command message

%	×10¹	×10⁰	#	R	K	×10³	×10²	×10¹	×10⁰	×10³	×10²	×10¹	×10⁰	×16¹	×16⁰	CR
	Destination (Station number)					Starting address				Ending address				BCC		

Response message

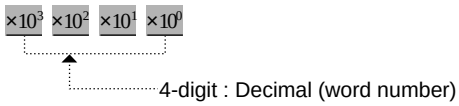
%	×10¹	×10⁰	$	R	K	×16¹	×16⁰	×16³	×16²	⟆	×16¹	×16⁰	×16³	×16²	×16¹	×16⁰	CR
	Source (Station number)					Response data (first word)					Response data (last word)				BCC		

Description

- Reads the timer/counter elapsed value stored in the elapsed value area.
- Since this command is dedicated to reading the timer/counter elapsed value from the programmable controller, a memory area code is not required.

■ Starting address/Ending address

- The starting and ending addresses for timer/counter elapsed value are expressed using a word numbering system as follows :

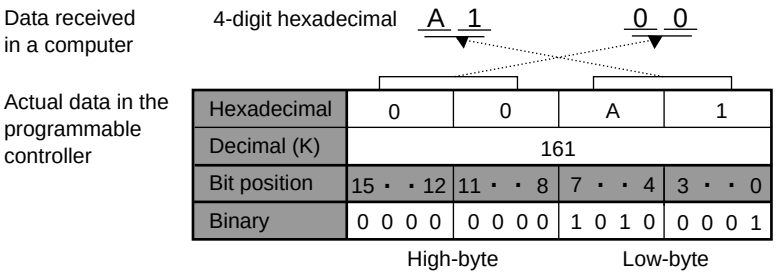


Note:

- The ending address must be equal to or larger than the starting address.

■ Response data

- 4 characters are needed for each word data (one word per “EV” address) as shown below. Data will be read from the programmable controller in order from the starting to the ending addresses.



Note :

- The programmable controller stores words in low-byte, high-byte order. Thus, data returned by the programmable controller are in that order.

Program example

Command message

% 0 1 # R K 0 0 0 0 0 0 0 2 ✻ ✻ CR

Response message

% 0 1 $ R K 0 5 0 0 1 4 0 0 2 8 0 0 1 F CR

The contents of timer/counter elapsed value area (EV0, EV1, EV2) will be returned by the programmable controller whose station number is 01.

Command message

Destination:	01 station
Starting address:	EV0
Ending address:	EV2
Read out block:	EV0 to EV2

Response message

Source:	01 station
Response data:	H0500, H1400, H2800
Actual data in programmable controller:	EV0 = H0005 (K5), EV1 = H0014 (K20), EV2 = H0028 (K40)

Data received in the computer — 4-digit hexadecimal: 0 5 | 0 0

Actual data in the programmable controller "EV0"

Hexadecimal	0	0	0	5
Decimal (K)	5			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Data received in the computer — 4-digit hexadecimal: 1 4 | 0 0

Actual data in the programmable controller "EV1"

Hexadecimal	0	0	1	4
Decimal (K)	20			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 1	0 1 0 0

Data received in the computer — 4-digit hexadecimal: 2 8 | 0 0

Actual data in the programmable controller "EV2"

Hexadecimal	0	0	2	8
Decimal (K)	40			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 1 0	1 0 0 0

WK Write a data for a timer/counter elapsed value area

Outline Writes data into the timer/counter elapsed value area in the programmable controller.

Basic message format

Command message

%	×10¹	×10⁰	#	W	K	×10³	×10²	×10¹	×10⁰	×10³	×10²	×10¹	×10⁰	×16¹	×16⁰	×16³	×16²	⟆⟅	×16¹	×16⁰	×16³	×16²	×16¹	×16⁰	CR
	Destination (Station number)					Starting address				Ending address				Datasent (first word)					Datasent (last word)				BCC		

Response message

%	×10¹	×10⁰	$	W	K	×16¹	×16⁰	CR
	Source (Station number)					BCC		

Description

- Writes data into the specified timer/counter elapsed value area.
- Since this command is dedicated to writing the timer/counter elapsed value into an elapsed value area of the programmable controller, a memory area code is not required.

■ Starting address/Ending address

- The starting and ending addresses for timer/counter elapsed value are expressed using a word numbering system as follows :

Note:

- The ending address must be equal to or larger than the starting address.

■ Data sent

- 4 characters are needed for each word data (one word per "EV" address) as shown below. Data will be sent to the programmable controller in order from the starting to the ending addresses.

Data sent — 4-digit hexadecimal: A 1 0 0

Data set in the programmable controller

Hexadecimal	0	0	A	1
Decimal (K)	161			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	1 0 1 0	0 0 0 1
	High-byte		Low-byte	

Note:

- The programmable controller stores words in low-byte, high-byte order. Thus, data sent to the programmable controller must be in that order.

Program example

Command message

% 0 1 # W K 0 0 0 0 0 0 0 2 0 5 0 0 1 4 0 0 2 8 0 0 ✻ ✻ CR

Response message

% 0 1 $ W K 1 A CR

The data (H0500, H1400, H2800) will be sent to the timer/counter set value areas (EV0, EV1, EV2) of the programmable controller whose station number is 01.

Command message

Destination:	01 station
Starting address:	EV0
Ending address:	EV2
Read out block:	EV0 to EV2
Data sent:	H0500, H1400, H2800

Response message

Source:	01 station
Actual data in programmable controller:	EV0 = H0005 (K5), EV1 = H0014 (K20), EV2 = H0028 (K40)

Data sent — 4-digit hexadecimal 0 5 0 0

Data set in the programmable controller "EV0"

Hexadecimal	0	0	0	5
Decimal (K)	5			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Data sent — 4-digit hexadecimal 1 4 0 0

Data set in the programmable controller "EV1"

Hexadecimal	0	0	1	4
Decimal (K)	20			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 1	0 1 0 0

Data sent — 4-digit hexadecimal 2 8 0 0

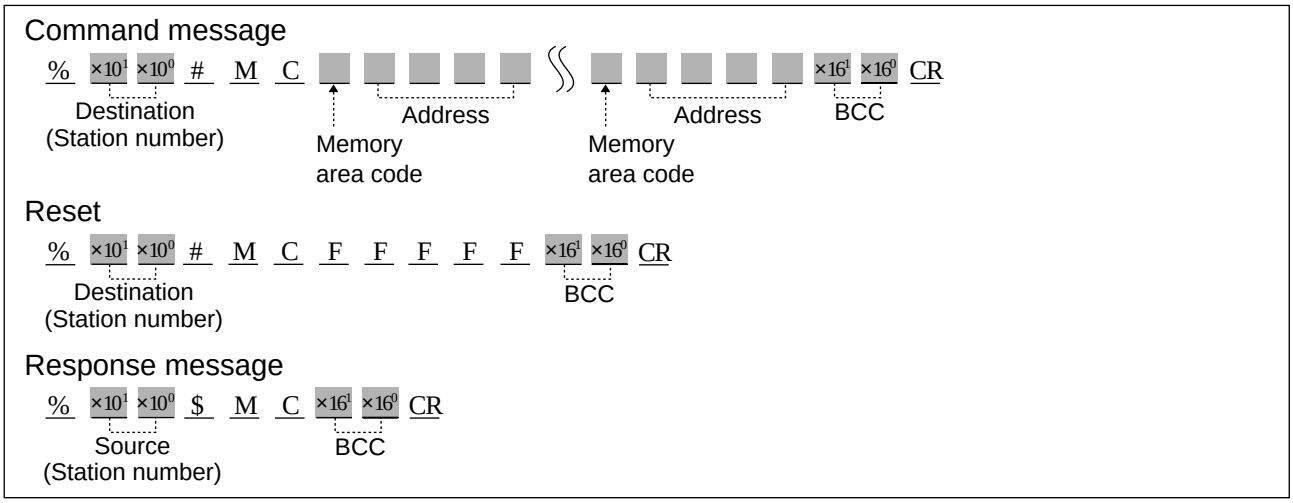
Data set in the programmable controller "EV2"

Hexadecimal	0	0	2	8
Decimal (K)	40			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 1 0	1 0 0 0

MC Specify contact addresses for monitoring Reset contact addresses that have been specified for monitoring

Outline Specifies the addresses of external input relays, external output relays, internal relays, link relays and timer or counter contacts.
Resets the points specified by previous "MC" commands.

Basic message format



■ Memory area codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
A	N/A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A

A : Available
N/A : Not Available

Note:

• Refer to page 133, "4) List of MEWTOCOL-COM Memory Area Codes" for details.

Description

• Specifies addresses of external input relays, external output relays, internal relays, link relays and timer or counter contacts to be monitored, or it resets the points previously specified by an "MC" command.

Notes:

• A maximum of 20 contacts can be specified in one command message.
• A maximum of 80 points can be specified for one station.

• The points specified in an "MC" command are monitored by executing an "MG" command.

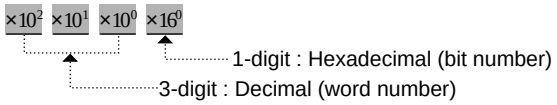
■ When specifying the contacts to be monitored

① Memory area code: Specify the memory area code for the programmable controller contacts to be monitored, referring to the codes given in the previous page.

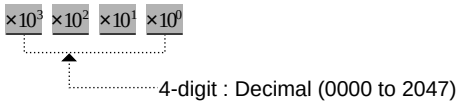
Notes:

- You can specify several different memory areas in one command message.
- When you want to specify plural points, you should specify each point with a combination of memory area codes and addresses.
- When you reset the points specified by “MC” commands, memory area codes are not required.

② Address setting: The addresses for “X” (external input relay), “Y” (external output relay), “R” (internal relay) and “L” (link relay) are expressed using relay bit numbering system as follows :



The contact address for “T” (timer contact) and “C” (counter contact) are expressed using a decimal numbering system as follows :



When you specify a timer contact, specify the contact with “T” and when you specify a counter contact, specify the contact with “C”. However, even if you specify “C” but then use a timer contact address or if you specify “T” and then a counter contact address, the computer will read the contents of the address specified in the command message.

Program example

Command message

% 0 1 # M C X 0 0 0 0 Y 0 0 1 A T 0 0 0 2 ✻ ✻ CR

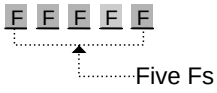
Response message

% 0 1 $ M C 0 E CR

The points to be monitored (X0, Y1A, T2) will be specified.

■ To reset the points specified by a previous “MC” command

• To reset the points specified by a previous “MC” command, five “F”s are used in place of a memory area code and address as follows:



Program example

Command message

% 0 1 # M C F F F F F ✻ ✻ CR

Response message

% 0 1 $ M C 0 E CR

All points specified using the “MC” command will be cancelled.

MD

Specify registers, word relays or set or elapsed value area of timer/counter for monitoring

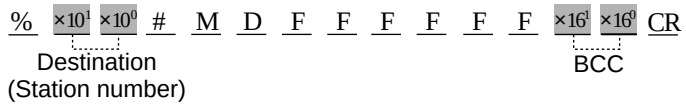
Reset the registers, word relays or timer/counter that have been specified for monitoring

Outline Specifies the addresses of external input relays (word units), external output relays (word units), internal relays (word units), link relays (word units), data registers, link data registers, file registers, index registers (IX or IY) or timer/counter set/elapsed value which will be monitored.
Resets the points specified by previous “MD” commands.

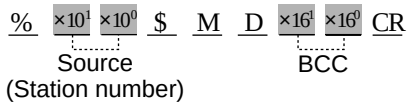
Basic message format

Command message

Reset



Response message



■ Memory area codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	A	N/A	A	N/A	A	N/A	A	A	A	A	A	A	N/A	N/A	N/A	A	A

A : Available
N/A : Not Available

Note:

• Refer to page 133, “4) List of MEWTOCOL-COM Memory Area Codes” for details.

Description

• Specifies the addresses of external input relays (word units), external output relays (word units), internal relays (word units), link relays (word units), data registers, link data registers, file registers or timer/counter set/elapsed value to be monitored, or it resets the points specified by a previous “MD” command.

Notes:

• A maximum of 16 registers can be specified in one command message.
• A maximum of 16 points can be specified for one station.

• The points specified in an “MD” command are monitored by executing an “MG” command.

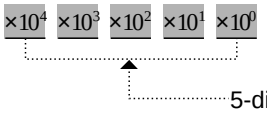
■ When specifying the points to be monitored

① Memory area code: Specify the memory area code of the programmable controller to be monitored, referring to the codes given in the previous page.

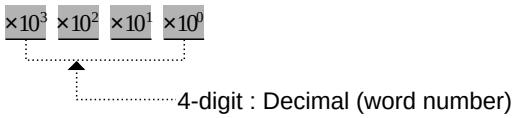
Notes:

- You can specify several different memory area codes in one command message.
- When you want to specify plural points, you should specify each point with a combination of memory area codes and addresses.
- When you reset the points specified by “MD” commands, memory area codes are not required.

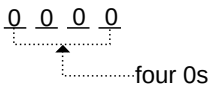
② Address setting: The addresses for “D” (data registers), “L” (link data registers), “F” (file registers), “S” (timer/counter Set value) and “E” (timer/counter Elapsed value) are expressed using a 5-digit word numbering system as follows:



The addresses for “WX” (word external input relays) and “WY” (word external output relays), “WR” (word internal relays) and “WL” (word link relays) are expressed using a 4-digit word numbering system as follows:



The “IX” (X type index registers) and the “IY” (Y type index registers) are specified using four 0s instead of specifying an address since the index registers do not have their multiple addresses.



Program example

Command message

% 0 1 # M D W X 0 0 0 0 D 0 0 0 1 0 S 0 0 0 0 2 ✻ ✻ CR

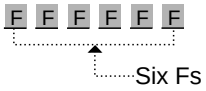
Response message

% 0 1 $ M D 0 9 CR

The points to be monitored [WX0 (X0 to XF), DT10, SV2] will be specified.

■ To reset the points specified by a previous “MD” command

• To reset the points specified by a previous “MD” command, six “F”s are used in place of a memory area code and address as follows :



Program example

Command message

% 0 1 # M D F F F F F F ✻ ✻ CR

Response message

% 0 1 $ M D 0 9 CR

All points specified using the “MD” command will be cancelled.

MG Monitor the points specified in “MC” and “MD” commands

Outline Monitor the points specified in “MC” and “MD” commands.

Basic message format

Command message

% $\times10^1$ $\times10^0$ # M G $\times16^1$ $\times16^0$ CR

Destination (Station number) — BCC

Response message

% $\times10^1$ $\times10^0$ $ M G _ $\times16^1$ $\times16^0$ $\times16^1$ $\times16^0$ ⟆ $\times16^1$ $\times16^0$ $\times16^1$ $\times16^0$ $\times16^1$ $\times16^0$ $\times16^3$ $\times16^2$ ⟆ $\times16^1$ $\times16^0$ $\times16^3$ $\times16^2$ $\times16^1$ $\times16^0$ CR

Source (Station number) — Pace counter — Number of “MC” characters — “MC” data — “MC” data — Number of “MD” characters — “MD” data — “MD” data — BCC

Description

• The contacts and registers preset with the “MC” and “MD” commands are monitored.

■ Pace counter

• The number of scans executed since last “MG” response message is returned.
If 1 to 9 scans, a one digit number (1 to 9) is returned.
If 10 scans or more, the character “A” is returned.

■ Number of characters for “MC” data

• The total number of characters of data required to return information about each of the points specified in the “MC” command will be expressed as 2-digit hexadecimal number (H00 to H14).

Note:

• Since a maximum of 80 points can be specified and 8 points are expressed using a 2-digit hexadecimal number, a maximum of 20 (H14) characters will be used to return this information.

■ “MC” data

• 8 bits of data will be returned as a 2-digit hexadecimal number using 2 characters as shown below.

Response data (Hex)	Binary	Specification
Lower digit	0th LSB	Status of the 1st set bit
	1st	Status of the 2nd set bit
	2nd	Status of the 3rd set bit
	3rd	Status of the 4th set bit
Upper digit	4th	Status of the 5th set bit
	5th	Status of the 6th set bit
	6th	Status of the 7th set bit
	7th MSB	Status of the 8th set bit

0 = OFF
1 = ON

Example : Response data : “56”

Data received — 2-digit hexadecimal 5 6

Actual data in the programmable controller

Hexadecimal	5	6
Bit position	7 ・・ 4	3 ・・ 0
Binary	0 1 0 1	0 1 1 0

MSB LSB

■ Number of characters for “MD” data

• The total number of characters of data required to return information about each of the points specified in the “MD” command will be expressed as a 2-digit hexadecimal number (H00 to H40).

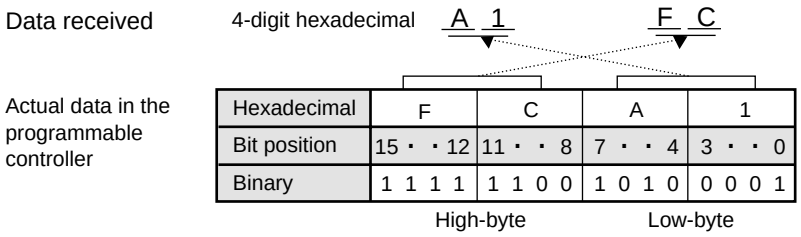
Note:

• Since a maximum of 16 points can be specified and each point is expressed using a 4-digit hexadecimal number, a maximum of 64 (H40) characters will be used to return this information.

■ “MD” data

• Each data will be returned as hexadecimal number using 4 characters as shown below.

Example : Data received : “HA1FC”



RR Read the contents of the system registers

Outline Reads the contents stored in the system registers of the programmable controller.

Basic message format

Command message

% $\times10^1$ $\times10^0$ # R R 0 $\times10^2$ $\times10^1$ $\times10^0$ $\times10^2$ $\times10^1$ $\times10^0$ $\times16^1$ $\times16^0$ CR

- $\times10^1$ $\times10^0$: Destination (Station number)
- $\times10^2$ $\times10^1$ $\times10^0$: Starting system register address
- $\times10^2$ $\times10^1$ $\times10^0$: Ending system register address
- $\times16^1$ $\times16^0$: BCC

Response message

% $\times10^1$ $\times10^0$ $ R R $\times16^1$ $\times16^0$ $\times16^3$ $\times16^2$ ⟆ $\times16^1$ $\times16^0$ $\times16^3$ $\times16^2$ $\times16^1$ $\times16^0$ CR

- $\times10^1$ $\times10^0$: Source (Station number)
- $\times16^1$ $\times16^0$ $\times16^3$ $\times16^2$: Response data (first word)
- $\times16^1$ $\times16^0$ $\times16^3$ $\times16^2$: Response data (last word)
- $\times16^1$ $\times16^0$: BCC

Description

- The contents of the system registers in the programmable controller are returned.
- "0" must be always placed between the command code and the starting system register number.

■ Starting/Ending system register addresses

- The starting and ending system register addresses are expressed using a form as shown below :

$\times10^2$ $\times10^1$ $\times10^0$

3-digit : Decimal

Note:

- The ending system register address must be equal to or larger than the starting system register address.

■ Response data

- 4 characters are needed for each system register data (one word per system register address) as shown below.
  Data will be returned from the programmable controller in order from the starting to the ending system register addresses.

Data received

4-digit hexadecimal 0 8 0 0

Actual data in the programmable controller

Hexadecimal	0	0	0	8
Decimal (K)	8			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	1 0 0 0

High-byte Low-byte

Program example

Command message

% 0 1 # R R 0 0 0 5 0 0 7 ✻ ✻ CR

Response message

% 0 1 $ R R C 8 0 0 C 8 0 0 3 C 0 0 7 0 CR

The contents of system registers (numbers 5 to 7) will be returned by the programmable controller whose station number is 01.

Command message
- Destination: 01 station
- Starting number: System register 5
- Ending number: System register 7

Response message
- Source: 01 station
- Response data: HC800, HC800, H3C00
- Actual data in programmable controller: System register 5 = H00C8, System register 6 = H00C8, System register 7 = H003C

Data received — 4-digit hexadecimal: C 8 | 0 0

Actual data in the programmable controller system register 5

Hexadecimal	0	0	C	8
Decimal (K)	200			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	1 1 0 0	1 0 0 0

Data received — 4-digit hexadecimal: C 8 | 0 0

Actual data in the programmable controller system register 6

Hexadecimal	0	0	C	8
Decimal (K)	200			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	1 1 0 0	1 0 0 0

Data received — 4-digit hexadecimal: 3 C | 0 0

Actual data in the programmable controller system register 7

Hexadecimal	0	0	3	C
Decimal (K)	60			
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 1 1	1 1 0 0

WR Write data into the system registers

Outline Writes data into the system registers of the programmable controller.

Basic message format

Command message

% ×10¹ ×10⁰ # W R 0 ×10² ×10¹ ×10⁰ ×10² ×10¹ ×10⁰ ×16¹ ×16⁰ ×16³ ×16² ⟆ ×16¹ ×16⁰ ×16³ ×16² ×16¹ ×16⁰ CR

- ×10¹ ×10⁰: Destination (Station number)
- ×10² ×10¹ ×10⁰: Starting system register address
- ×10² ×10¹ ×10⁰: Ending system register address
- ×16¹ ×16⁰ ×16³ ×16²: Data sent (first word)
- ×16¹ ×16⁰ ×16³ ×16²: Data sent (last word)
- ×16¹ ×16⁰: BCC

Response message

% ×10¹ ×10⁰ $ W R ×16¹ ×16⁰ CR

- ×10¹ ×10⁰: Source (Station number)
- ×16¹ ×16⁰: BCC

Description

- Data is written into the system registers of the programmable controller.
- "0" must be always placed between the command code and the starting system register address.

■ Starting/Ending system register addresses

- The starting and ending system register addresses are expressed using a form as shown below :

×10² ×10¹ ×10⁰

3-digit : Decimal

Note:

- The ending system register address must be equal to or larger than the starting system register address.

■ Data sent

- 4 characters are needed for each system register data (one word per system register address) as shown below.
  Data will be sent to the programmable controller in order from the starting to the ending system register addresses.

Data sent 4-digit hexadecimal 0 8 0 0

Data set in the programmable controller

Hexadecimal	0	0	0	8
Decimal (K)	8			
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	1 0 0 0
	High-byte		Low-byte	

Program example

Command message

% 0 1 # W R 0 0 0 5 0 0 7 C 8 0 0 C 8 0 0 3 C 0 0 ✻ ✻ CR

Response message

% 0 1 $ W R 0 5 CR

The data are written into the system registers (numbers 5 to 7) of the programmable controller whose station number is 01.

Command message

Destination:	01 station
Starting number:	System register 5
Ending number:	System register 7
Data sent:	HC800, HC800, H3C00
Data set in programmable controller:	System register 5 = H00C8, System register 6 = H00C8, System register 7 = H003C

Data sent — 4-digit hexadecimal: C 8 | 0 0

Data set in the programmable controller system register 5

Hexadecimal	0	0	C	8
Decimal (K)	200			
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	1 1 0 0	1 0 0 0

Data sent — 4-digit hexadecimal: C 8 | 0 0

Data set in the programmable controller system register 6

Hexadecimal	0	0	C	8
Decimal (K)	200			
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	1 1 0 0	1 0 0 0

Data sent — 4-digit hexadecimal: 3 C | 0 0

Data set in the programmable controller system register 7

Hexadecimal	0	0	3	C
Decimal (K)	60			
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 1 1	1 1 0 0

Response message

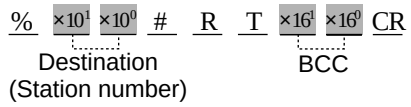
Source:	01 station

RT Read the status of the programmable controller

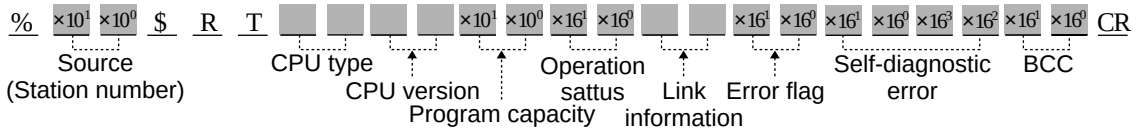
Outline Reads the status of the programmable controller.

Basic message format

Command message



Response message



Description

- The type of programmable controller, program capacity, operation mode and error flag status can be read with “RT” command.

■ CPU Type

- Type of CPU which exists in the station specified in the command message, will be returned using 2 characters as shown below :

Code	CPU type	Code	CPU type
04	FP1 C14/C16 series	13	FP-C and FP3 16 k type
05	FP-M 2.7 k type and FP1 C24/C40 series	02	FP5 16 k type
06	FP-M 5 k type and FP1 C56/C72 series	12	FP5 24 k type
03	FP3 10 k type	20	FP10S and FP10

■ CPU version

- The version of the CPU which exists in the station specified in the command message, will be returned using 2 characters.

Code	CPU version
10	Version 1.0
11	Version 1.1
12	Version 1.2
•	•
•	•
35	Version 3.5
•	•
•	•
45	Version 4.5

■ Program capacity (for FP-C/FP3/FP5)

- The program capacity will be returned using 2 characters when the destination station specified is FP-C, FP3 or FP5.

Code	Program capacity	Code	Program capacity
02	2 k (1,534) steps	14	14 k (13,822) steps
04	4 k (3,582) steps	16	16 k (15,870) steps
06	6 k (5,630) steps	18	18 k (17,918) steps
08	8 k (7,678) steps	20	20 k (19,966) steps
10	10 k (9,726) steps	22	22 k (22,014) steps
12	12 k (11,774) steps	24	24 k (24,062) steps

Note:

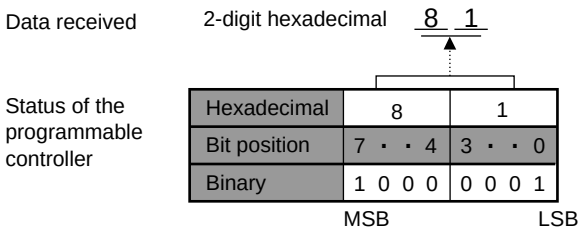
- If the destination station is other than FP-C, FP3 or FP5, a code other than the one above is stored here.

■ Operation status

• The operation status is expressed as a 2-digit hexadecimal number. The contents of the operation status are the same as the data in the special relays (R9020 to R9027).

Response data (Hex)	Bit position	Specification	Content
Lower digit	0th LSB	Operation mode setting flag (R9020)	0 : In PROG. mode 1 : In RUN mode
	1st	Test run mode condition flag (R9021)	0 : Not in TEST RUN mode 1 : In TEST RUN mode
	2nd	Break execution flag (R9022)	0 : Break not executing 1 : Break executing
	3rd	Break condition flag (R9023)	0 : Break is in invalid condition 1 : Break is valid in TEST RUN mode
Upper digit	4th	Output enable/disable condition flag in the TEST RUN mode (R9024)	0 : Output disabled 1 : Output enabled in TEST RUN mode
	5th	Step run condition flag (R9025)	0 : Not in step run mode 1 : In step run mode
	6th	Message instruction [F149 (MSG) /P149 (PMSG)] flag (R9026)	0 : Message instruction not executing 1 : Message instruction executing
	7th MSB	Remote mode set flag (R9027)	0 : Not in REMOTE mode 1 : In REMOTE mode

Example: Response data: “81”



■ Link information

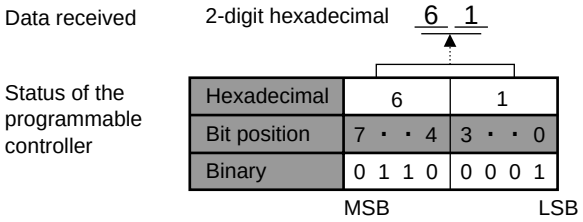
• Link information is returned using 2 characters. However, as this information is meaningless for reading the status of the programmable controller, ignore this information.

■ Error flags (R9000 to R9007)

• The status of 8 error flags will be returned using 2 characters.

Response data (Hex)	Bit position	Specification	Content
Lower digit	0th LSB	Self-diagnostic error flag (R9000)	0 : Self-diagnostic error has not occurred 1 : Self-diagnostic error occurred
	1st	Voltage dip detection flag (R9001)	0 : Voltage dip not detected 1 : Voltage dip detected
	2nd	Fuse blow detection flag (R9002)	0 : Fuse blow not detected 1 : Fuse blow detected
	3rd	Intelligent unit error flag (R9003)	0 : Intelligent unit error not detected 1 : Intelligent unit error detected
Upper digit	4th	I/O verify error flag (R9004)	0 : I/O verify error not detected 1 : I/O verify error detected
	5th	Battery voltage drop detection flag (Momentary flag) (R9005)	0 : No battery voltage drop detected 1 : Battery voltage drop detected
	6th	Battery voltage drop detection flag (Hold type flag) (R9006)	0 : No battery voltage drop detected 1 : Battery voltage drop detected
	7th MSB	Operation error flag (Momentary flag) (R9007)	0 : Operation error not detected 1 : Operation error detected

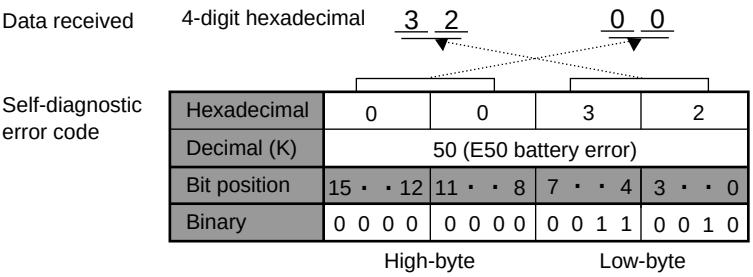
Example: Response data: "61"



■ Self-diagnostic errors (DT9000 for FP-M/FP1/FP-C/FP3/FP5, DT90000 for FP10S/FP10)

• Self-diagnostic error codes are read out from the programmable controller.
The contents of the codes are the same as those stored in special data register DT9000 (for FP-M/FP1/FP-C/FP3/FP5) or DT90000 (for FP10S/FP10) and are expressed in hexadecimal numbers. Since they are usually expressed in decimal numbers from E1 through E299, you need to convert the hexadecimal code into decimal. If no self-diagnostic error is detected H0000 is received.

Example: Response data: H3200

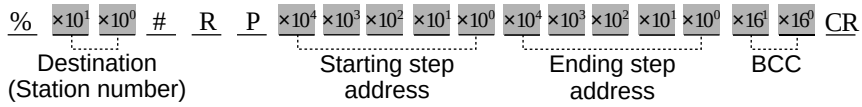


RP Read a program stored in the programmable controller

Outline Reads a program stored in the programmable controller.
This command is available only for program backup purposes. (Note that the read-out program cannot be read using NPST-GR.)

Basic message format

Command message



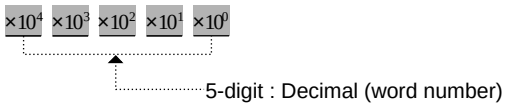
Response message

Description

- The program from the specified address is returned by the programmable controller.
- This command should be used to save the program block only for backup purposes.

■ Starting step address/Ending step address

- Starting and ending step addresses for the program are expressed as 5-digit decimal numbers as shown below :



Note:

- The ending step address must be equal to or larger than the starting step address.

■ Program

- Each program step will be returned as 4 characters.

Note:

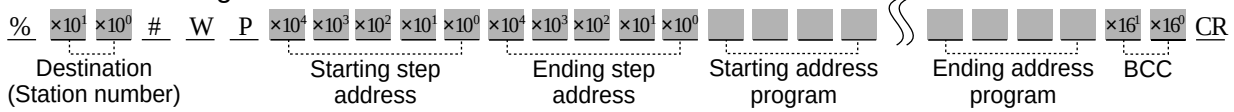
- To avoid malfunctions in the programmable controller, it is recommended that you do not modify or review the program that is read out.

WP Write a program which was saved by using the "RP" command back into the programmable controller

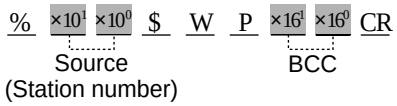
Outline Writes the program saved with the "RP" command back into the programmable controller.
This command is available only for program downloading purposes.

Basic message format

Command message



Response message

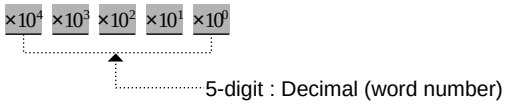


Description

- A program which was saved using the "RP" command is written back into the programmable controller.
- This command should be used only for downloading the program block saved by using the "RP" command.

■ Starting step address/Ending step address

- Starting and ending step addresses for the program are expressed using a 5-digit decimal as shown below:



Note:

- The ending step address must be equal to or larger than the starting step address.

■ Program

- Each program step will require 4 characters to be written back into the programmable controller.

Note:

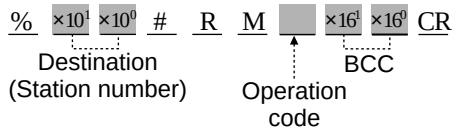
- The program which is downloaded must be a program which was saved using the "RP" command.
  If you modify or revise the program, malfunction may occur.

RM Remote control of programmable controller operation mode

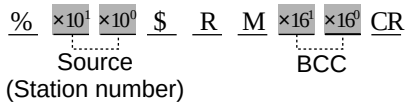
Outline Remotely controls the operation mode.
The operation mode is remotely set to the RUN or PROG. mode.

Basic message format

Command message



Response message



Description

• Controls the operation mode.
The operation mode is remotely set to the RUN or PROG. mode.

Note:

• The “RM” command is only valid when the programmable controller is set to REMOTE mode. For details, refer to the Hardware manuals for each programmable controller.

■ Operation code

Operation code	Specification
R	PROG. mode ⟶ RUN mode
P	RUN mode ⟶ PROG. mode

Program example

Command message

% 0 1 # R M R ✻ ✻ CR

Response message

% 0 1 $ R M 1 F CR

The operation mode of the programmable controller, whose station number is 01, is set to the RUN mode.

Command message
Destination: 01 station
Data sent: PROG. mode → RUN mode

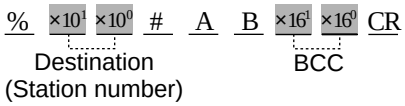
Response message
Source: 01 station

AB Abort a series of response messages

Outline Aborts a series of messages.
This command is used to abort the reception of a response message sent in multiple frames.

Basic message format

Command message



Response message

No response message

Description

- This command cancels a message being sent in multiple frames. The cancellation occurs in the middle of the communication, when you want to stop receiving the response message for any reason.

2. MEWTOCOL-DAT Protocol

The MEWTOCOL-DAT protocol is used for communication (data transfer) between a computer and an FP series programmable controller. A command is initiated from a programmable controller (using instructions) to a computer and the computer sends a response message back to the programmable controller in the MEWTOCOL-DAT format. All messages are transmitted in binary codes. Therefore, all data you receive from or send to an FP series programmable controller should be handled in binary code. For easier understanding, all descriptions in this section will be expressed in hexadecimal codes.

Note:

• Basic terminology of MEWTOCOL-DAT

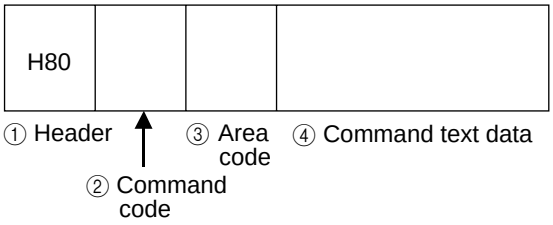
- Message: A series of binary data combining commands and text. A maximum of 1,020 words of data are available for text when communicating in a network with only high-level link units. A maximum of 16 words of data are available for text when communicating in a network with standard link units.
- Command message: A message which is sent to or from the programmable controller or computer. The programmable controller can issue command messages by executing the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions.

Item	Send/receive instruction	Command code of MEWTOCOL-DAT
Write data in word units	**F145 (SEND)**	H50
Write a bit data	**P145 (PSEND)**	H52
Read data in word units	**F146 (RECV)**	H51
Read a bit data	**P146 (PRECV)**	H53

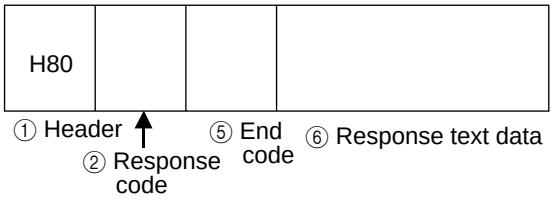
- Response message: A message which is issued by responding to a command message. When a computer issues a command message, the programmable controller sends it back to the computer. When a programmable controller issues a command message, the computer sends it back to the programmable controller.

1) Basic MEWTOCOL-DAT Message Format

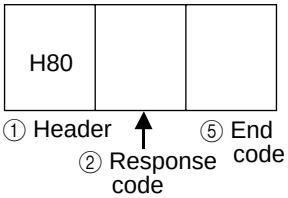
■ Command message format



■ Response message format



■ Error response message format



① **Header (H80)**
H80 is used as the header in both the command and response messages.

② **Command codes (H50 to H53) and response codes (HD0 to HD3)**
Command and response codes are specified using one byte as follows:

Command code	Corresponding response code	Description
H50	HD0	Command and response codes for writing data in word units.
H51	HD1	Command and response codes for reading data in word units.
H52	HD2	Command and response codes for writing a bit data.
H53	HD3	Command and response codes for reading a bit data.

③ **Area codes**
The operand is specified using one byte as follows:

Area code	Description
H00	Word link relays WL
H01	Word internal relays WR
H02	Word external output relays WY
H03	Word external input relays WX
H04	Timer/counter set value SV
H05	Timer/counter elapsed value EV
H06	Link data register LD
H07	Word special internal relays WR
H08	Special data register DT
H09	Data register DT
H0A	File register FL

④ **Command text data**
Depending on the command, the contents of text will vary.
Information such as memory addresses and data are specified here.

⑤ **End codes (HFF or error codes)**
The end code indicates the communication status using MEWTOCOL-DAT as follows:
- HFF: The operation has successfully completed.
- Other than HFF: An error was detected. For details about error codes, refer to page 197, “3. List of MEWTOCOL Error Codes”.

⑥ **Response text data**
When a command, which requests to have data sent back in a response message, is transmitted, it is followed by the end code of the response message.

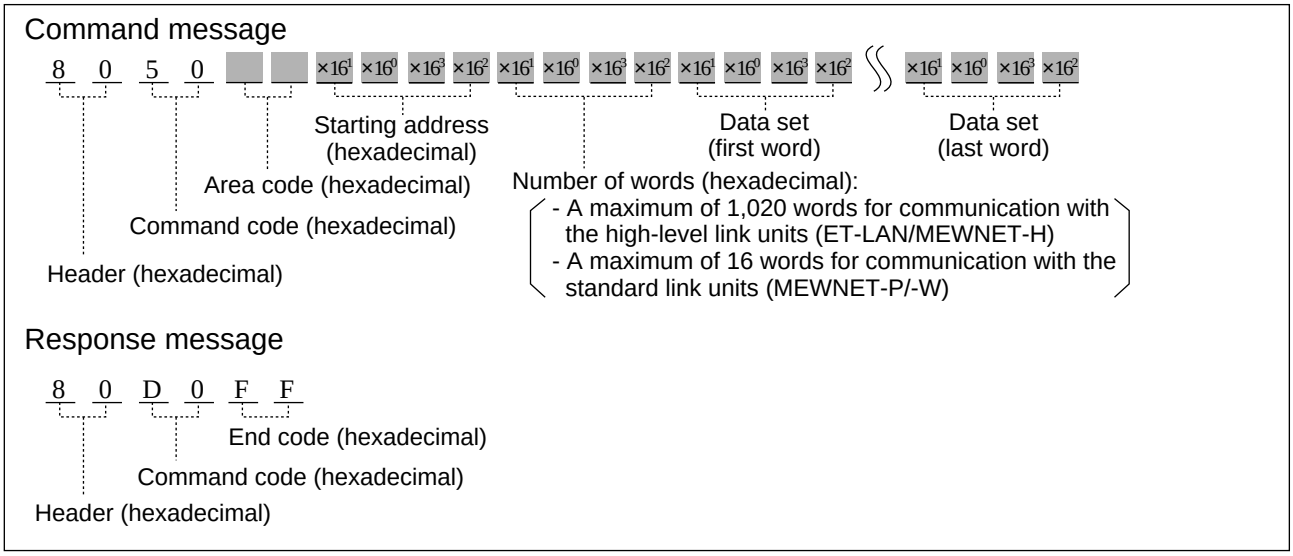
2) Description of MEWTOCOL-DAT Commands and Responses

Descriptions for each MEWTOCOL-DAT command and response message are explained in pairs in the pages shown below.

H50 Write data in word units

Outline Writes data into a specified area in word units.

Basic message format



■ List of memory area codes (hexadecimal)

Name of operands	Relay				Timer/ Counter		Register			Special internal relay	Special data register
	WX	WY	WR	WL	SV	EV	DT	LD	FL	WR	DT
Area code (HEX)	03	02	01	00	04	05	09	06	0A	07	08

Program example

Command message

8 0 5 0 0 9 0 1 0 0 0 3 0 0 5 0 0 1 0 3 0 0 0 0 0 2

Response message

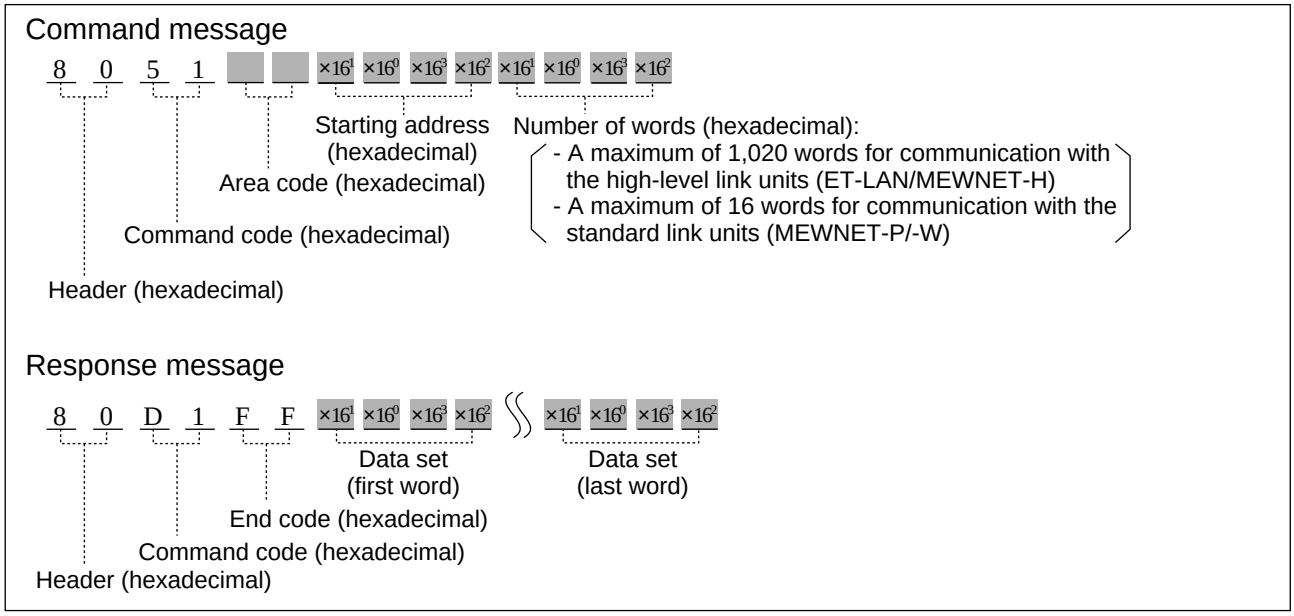
8 0 D 0 F F

• Data are transferred into data registers DT1, DT2, and DT3 as follows:
- Data set in DT1: H0150 (K336)
- Data set in DT2: H0003 (K3)
- Data set in DT3: H0200 (K512)

H51 Read data in word units

Outline Read data from a specified area in word units.

Basic message format



■ List of memory area codes (hexadecimal)

Name of operands	Relay				Timer/ Counter		Register			Special internal relay	Special data register
	WX	WY	WR	WL	SV	EV	DT	LD	FL	WR	DT
Area code (HEX)	03	02	01	00	04	05	09	06	0A	07	08

Program example

Command message

8 0 5 1 0 9 1 0 0 0 0 3 0 0

Response message

8 0 D 1 F F 5 0 0 1 0 3 0 0 0 0 0 2

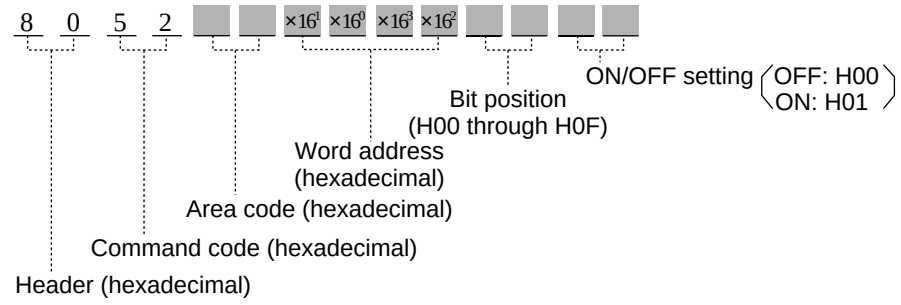
• Data stored in data registers DT16, DT17, and DT18 are read out as follows:
- Data read from DT16: H0150 (K336)
- Data read from DT17: H0003 (K3)
- Data read from DT18: H0200 (K512)

H52 Write a bit data

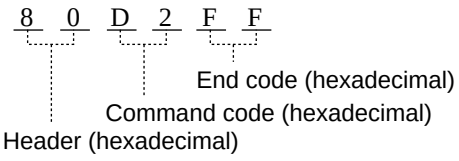
Outline Writes data into a bit of a specified word.

Basic message format

Command message



Response message



■ List of memory area codes (hexadecimal)

Name of operands	Relay				Timer/ Counter		Register			Special internal relay	Special data register
	WX	WY	WR	WL	SV	EV	DT	LD	FL	WR	DT
Area code (HEX)	03	02	01	00	04	05	09	06	0A	07	08

Program example

Command message

8 0 5 2 0 1 1 3 0 0 0 F 0 1

Response message

8 0 D 2 F F

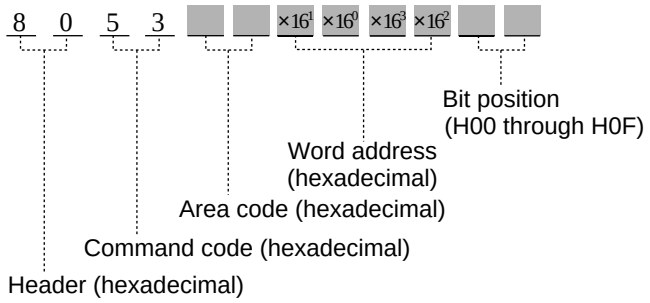
• Bit position 15 of word internal relay WR19 (R19F) is turned ON.

H53 Read a bit data

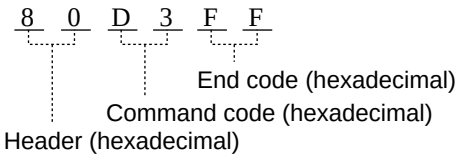
Outline Reads the bit of a specified word.

Basic message format

Command message



Response message



■ List of memory area codes (hexadecimal)

Name of operands	Relay				Timer/ Counter		Register			Special internal relay	Special data register
	WX	WY	WR	WL	SV	EV	DT	LD	FL	WR	DT
Area code (HEX)	03	02	01	00	04	05	09	06	0A	07	08

Program example

Command message

8 0 5 3 0 3 2 0 0 0 0 E

Response message

8 0 D 3 F F 0 1

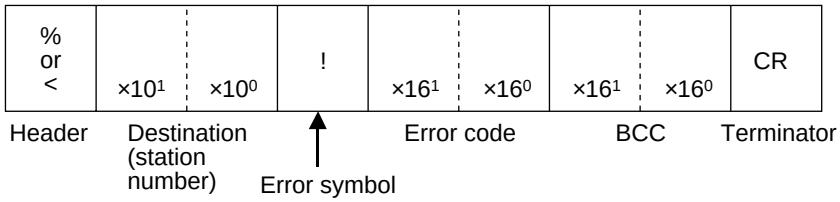
• The data in bit position 14 of word external input relay WX32 (X32E) is read out.

3. List of MEWTOCOL Error Codes

When an error occurs during a computer link and data transfer operation, the error code is sent back in the MEWTOCOL-COM or MEWTOCOL-DAT response message as follows:

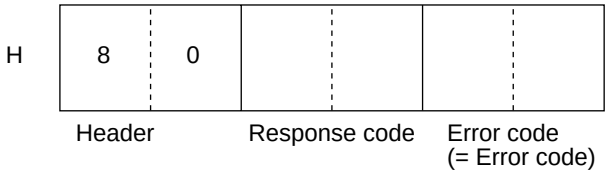
■ Computer link function (MEWTOCOL-COM)

• The error code is stored in the response message as follows:



■ Data transfer function (MEWTOCOL-DAT)

• The error code is stored in the response message as follows:



• The same error code is also stored in special data registers as follows:
- FP3 (without C) and FP3C: DT9039
- FP10S and FP10: DT90039

■ MEWTOCOL error code tables

MEWTOCOL error codes are usually expressed in hexadecimal in both MEWTOCOL-COM and MEWTOCOL-DAT response messages. The hexadecimal MEWTOCOL error codes are also expressed in ASCII HEX for convenience when reading MEWTOCOL-COM messages.

① Table of link error codes

Error code hexadecimal (ASCII HEX)	Name of error	Description	Steps to take
H21 (H32)(H31)	NACK error	Data error such as parity error and framing error, occurred.	Check the communication format, cable connection and ambient noise level.
H22 (H32)(H32)	WACK error	Overflow of the receive-buffer occurred in the local node.	Re-configure the receive-buffer size or send data size.
H23 (H32)(H33)	Source MEWTOCOL station number overlap	Source MEWTOCOL station number overlapped with that for another node, then the communication was shutdown.	Re-configure the MEWTOCOL station number in the network without overlap.
H24 (H32)(H34)	Transmission error	Data not conforming to the transmission protocol format was sent. Or a frame overflow or data error occurred.	Check the protocol format referring to the MEWTOCOL description.
H25 (H32)(H35)	Link unit hardware error	Communication parts of the link unit did not work properly.	Turn OFF the power for the system and then turn it ON again. - If communication goes well, probably an abnormality caused by noise. Check the cable connection and ambient noise level. - If communication cannot be performed well, probably a hardware abnormality. Replace the link unit with a new one.
H26 (H32)(H36)	MEWTOCOL station number setting error	The MEWTOCOL station number set for the source node was outside the specified range (ET-LAN system in the range of 1 to 64).	Set the MEWTOCOL station number within the specified range for the network.
H27 (H32)(H37)	Frame-over error	Data over the specified limit was transmitted. • Example for MEWTOCOL-COM: - 118 characters (using % header) or 2,048 characters (using < header in the high-level link unit).	Check the limitations of the frames for each link unit.
H28 (H32)(H38)	No response error	No response was sent back to the source station from the destination node.	Re-send the same data again.
H29 (H32)(H39)	Buffer close error	Data was transferred to or from the source node when its buffer was closed.	Open the buffer referring to the manual for each link unit.
H30 (H33)(H30)	Time-out error	Data cannot be transferred.	Re-send the same data again.
H32 (H33)(H32)	Transmission impossible error	Communication was shutdown because of buffer overflow of the source node.	Re-configure send data or buffer size so that the data size is within the limitation.
H33 (H33)(H33)	Communication stop	Network entry switch is OFF.	Turn the network entry switch ON.
H36 (H33)(H36)	No local station error	The source station does not exist in the network.	Check that the specified local station exists and re-send data again.
H38 (H33)(H38)	Other communication errors	Probably a transmission abnormality other than described above.	Redo the communication.

Notes:

- If an error occurs during communication in the 2nd or 3rd depth of the layers, an error response will not return.
- If a link error occurs, any other error (e. g., basic procedure error, processing error, or application error) will not be reported.

② **Table of basic procedure error codes**

Error code hexadecimal (ASCII HEX)	Name of error	Description	Steps to take
H40 (H34)(H30)	BCC error	BCC error occurred in the command data.	Check the connection of the cables and ambient noise level.
H41 (H34)(H31)	Format error	The command message does not match the protocol format.	Correct command message and re-send the correct one.
H42 (H34)(H32)	Not-support error	The command not supported by the source or destination node was transmitted.	Check that the command message sent is supported by the source and destination nodes.
H43 (H34)(H33)	Procedure error	Another series of messages was sent to one node when a series of messages in multiple frames was being sent.	Change the program so that another message series is not sent while one series is still in progress.

③ **Table of processing error codes (errors for the computer link function)**

Error code hexadecimal (ASCII HEX)	Name of error	Description	Steps to take
H50 (H35)(H30)	Link setting error	[Computer link function error] The route number, where no link unit existed, was specified in the computer link function.	Check the route number and set the correct one.
H51 (H35)(H31)	Simultaneous operation error	[Computer link function error] The send-buffer overflowed while sending data to the local node in the computer link function.	Re-send data.
H52 (H35)(H32)	Sending disable error	[Computer link function error] The sending operation to another node cannot be performed in the computer link function.	Turn OFF the power for the system and then turn it ON again. - If communication goes well, probably an abnormality caused by noise. Check the cable connection and ambient noise level. - If communication cannot be performed well, probably a hardware abnormality. Replace the link unit with a new one.
H53 (H35)(H33)	Busy error	[Computer link function error] A new command was received from a local node while processing multiple frames.	Re-send the command again.

④ **Table of application error codes**

Error code hexadecimal (ASCII HEX)	Name of error	Description	Steps to take
H60 (H36)(H30)	Parameter error	[Computer link function error] The area code specified is not available for the CPU or the command in the computer link function.	Re-set the correct area code.
H61 (H36)(H31)	Data error	[Computer link function error] The specified data format, such as number system, data range, etc., was not correct.	Correct the data format referring to the description for MEWTOCOL-COM format.
H62 (H36)(H32)	Registration error	[Computer link function error] The specified operands used for monitoring were not correct.	Set parameters for correct monitoring referring to the descriptions of MC and MD commands.
H63 (H36)(H33)	Mode error	[Computer link function error] In the current operation mode of the programmable controller, operation of the command cannot be performed.	Change the operation mode.
H65 (H36)(H35)	Protect error	[Computer link function error] The program was written to the programmable controller when writing to memory was prohibited.	It is impossible to write program into the programmable controller when the memory is protected.
H66 (H36)(H36)	Address error	[Computer link function error] The address setting format, such as number system, address limitations, etc., was not correct.	Correct the address format referring to the description of the MEWTOCOL-COM format.
H67 (H36)(H37)	No data error	[Computer link function error] The area without data was specified for reading.	Specify the correct area for reading.
H72 (H37)(H32)	Time-out error	[Data transfer function error] The CPU could not receive the answer within the specified time.	Re-send data.
H73 (H37)(H33)	Time-out error	[Data transfer function error] The receive-buffer did not become available within the specified time.	Re-send data.
H74 (H37)(H34)	Time-out error	[Data transfer function error] The response could not be received within the specified time.	Re-send data.

12-3. Instructions for Communication

The instructions used to control communication are classified into two types as follows:
- instructions for data transfer function:
  F145 (SEND), **P145 (PSEND)**, **F146 (RECV)** and **P146 (PRECV)** instructions.
- instructions for communication between the CPU and the shared memory in the link unit:
  F150 (READ), **P150 (PREAD)**, **F151 (WRT)** and **P151 (PWRT)** instructions.

Details about each instruction are explained in the following pages.

Data transfer instructions

Instructions for communication between a CPU and intelligent unit shared memory

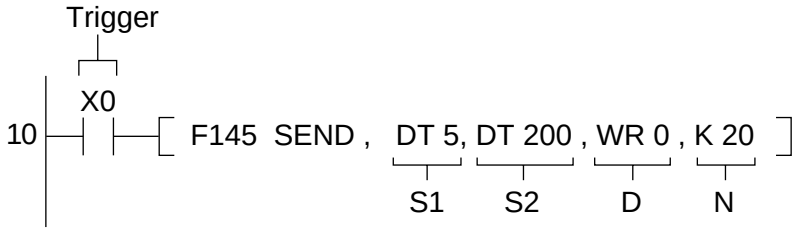
F145 (SEND) / P145 (PSEND) Link data send (data transfer function)

Step	Availability
9	All FP-C, FP3, FP5, FP10S and FP10

Outline Send data to another station through link units in the network.
(P145: executed only when the leading edge of the trigger in detected.)

Program example

Ladder Diagram



Boolean Non-ladder

Address	Instruction
10	ST X 0
11	F 145(SEND)
	DT 5
	DT 200
	WR 0
	K 20

S1	Starting 16-bit area for storing control data
S2	Starting 16-bit area for storing source data (data area in the source station)
D	Type of destination operands for storing data in the destination station. Be sure to select the area by setting address 0 (destination data area in another station).
N	Starting 16-bit area address for the destination operand specified in D above (destination data area in another station).

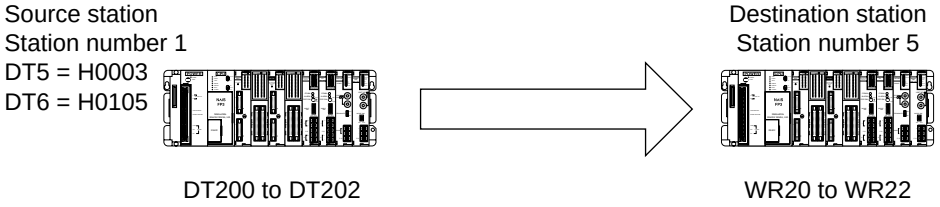
■ Operands

Operand	Relay				Timer/Counter		Register			Index register		Constant		Index modifier
	WX	WY	WR	WL	SV	EV	DT	LD	FL	IX	IY	K	H	
S1	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A
S2	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A
D	N/A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A
N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A

A: Available
N/A: Not Available

■ Explanation of example

• Sends the value stored in the area of the source station starting from DT200 to the area in another station starting from WR20 when trigger X0 turns ON.



Description

- This instruction enables a programmable controller with a standard or high-level link unit to transfer data into another node. The link units compatible with the **F145 (SEND)/P145 (PSEND)** instructions are:
  - Standard link units: MEWNET-W link unit, MEWNET-P link unit and C. C. U.
  - High-level link units: ET-LAN unit and MEWNET-H link unit

  Since the limitations for each unit depend on the link unit, be sure to confirm the limitations for each link unit by referring to their manuals.
- The data in the source station specified by S2 is written to the area in the destination station specified by D and N.
- The type of area specified by D should always be a "0" address (e.g., DT0, LD0, WR0). To specify the actual address in D of another node, use N with a decimal or hexadecimal constant.
- The destination node MEWTOCOL station number, transfer data size and units for transfer are specified by control data S1 using two or more 16-bit areas. For details about the control data settings, refer to "■ Control data S1 settings for communication in the same layer" and "■ Control data S1 settings for inter-layer communication" in the following pages.

Notes:

- One CPU cannot execute two or more **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions in one scan. If the triggers for two or more **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions turn ON in a scan, the instruction programmed at the smallest address is executed.
- Actual operation of the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions occurs after the end instruction.

■ Flag condition

- Error flag (R9007): Turns ON and keeps the ON state,
  - when the area specified using the index modifier exceeds the limit.
  - when the area specified using S1, S2, D and N exceeds the limit in the source station or in another station data area range.

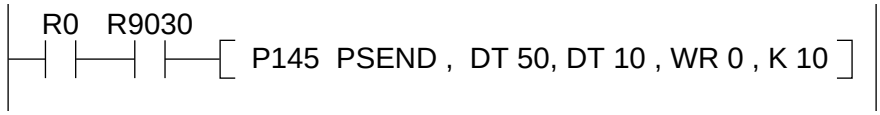
  The error address is transferred to:
  - FP-C/FP3/FP5: DT9017
  - FP10S/FP10: DT90017
- Error flag (R9008): Turns ON for an instant,
  - when the area specified using the index modifier exceeds the limit.
  - when the area specified using S1, S2, D and N exceeds the limit in the source station or in another station data area range.

  The error address is transferred to:
  - FP-C/FP3/FP5: DT9018
  - FP10S/FP10: DT90018
- **F145/P145** and **F146/P146** instructions execution flag (R9030): OFF while one of the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions is executed. No other **F145 (SEND)/P145 (PSEND)** or **F146 (RECV)/P146 (PRECV)** instruction can be executed. ON while none of the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions is executed. One of the **F145 (SEND)/P145 (PSEND)** or **F146 (RECV)/P146 (PRECV)** instructions can be executed.
- **F145/P145** and **F146/P146** instructions end flag (R9031): Turns ON for an instant when an abnormality is detected in the execution of the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions. The MEWTOCOL error code is stored as:
  - FP-C/FP3/FP5: DT9039
  - FP10S/FP10: DT90039

Notes:

- When using special internal relays R9008 and R9031 as the flags for this instruction, be sure to program the flags at the address immediately after the instruction.
- R9030 is used to prevent the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions from triggering while one of them is executing. Refer to the example below.

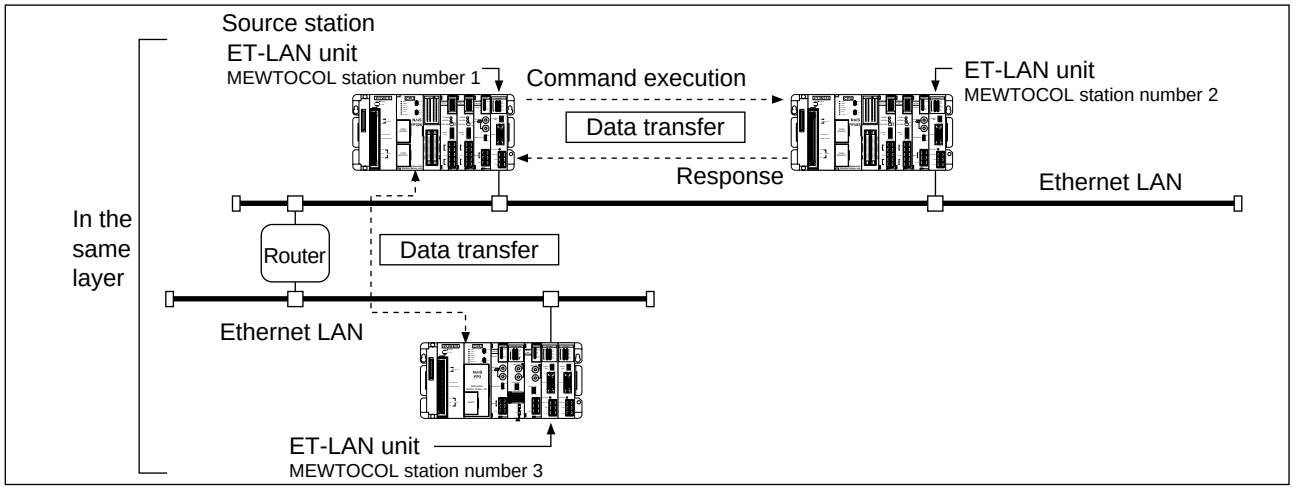
[EXAMPLE]



- If an H71, H72, or H73 error code is stored in DT9039 or DT90039, check the communication waiting time for these instructions with system register 32. If the set time is too short, a time out error may occur. The use of the default setting (2 s) is recommended.

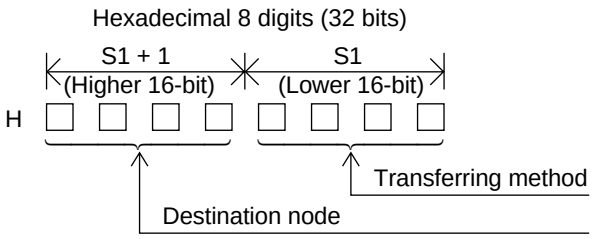
■ Control data S1 settings for communication in the same layer

Communication performed without using a relay unit, such as when using another ET-LAN, MEWNET-H, MEWNET-W or MEWNET-P link unit or C.C.U., is referred to as communication in the same layer.



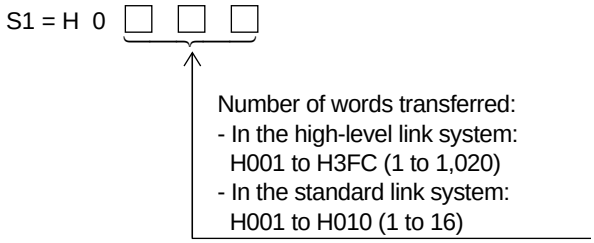
When the programmable controller communicates with another node in the same layer, control data S1 is specified as follows:

- Two words are used as control data, S1 + 1 and S1.
  If the lower 16-bit area, S1, is specified, the higher 16-bit area is automatically decided.

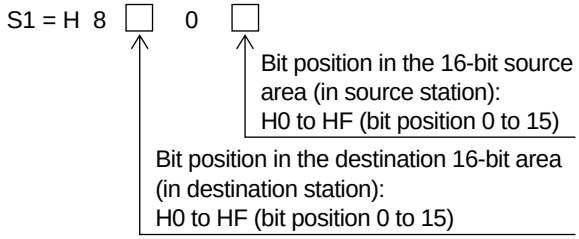


• Specifying the transfer method (lower 16-bit area: S1)

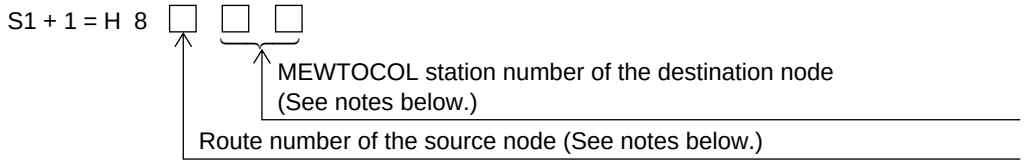
- When sending data in word units



- When sending a bit data



• Specifying destination node (higher 16-bit area: S1 + 1)



Notes:

- Route numbers are used to express the position of standard and high-level link units in a master backplane. The route numbers are assigned starting from the link unit in the slot nearest to the CPU.
  - FP-C: Routes 1 through 5 are available.
  - FP3/FP5: Routes 1 through 6 are available including 3 standard and 3 high-level link units.
  - FP10S/FP10: Routes 1 through 8 are available including 5 standard and 3 high-level link units.

  The units regarded as standard and high-level are:
  - Standard link units: MEWNET-W link unit, MEWNET-P link unit, C.C.U. and C-NET link unit
  - High-level link units: MEWNET-H link unit and ET-LAN unit
- Since the range of MEWTOCOL station numbers differs from network to network, be sure to check the manuals of each link system for details.

  [EXAMPLES]
  - MEWNET-P link system: 1 to 63
  - MEWNET-W link system: 1 to 32
  - MEWNET-H link system: 1 to 64
  - ET-LAN system: 1 to 64
- For details about link units, refer to page 122, “12-1. Standard and High-level Link Units”.

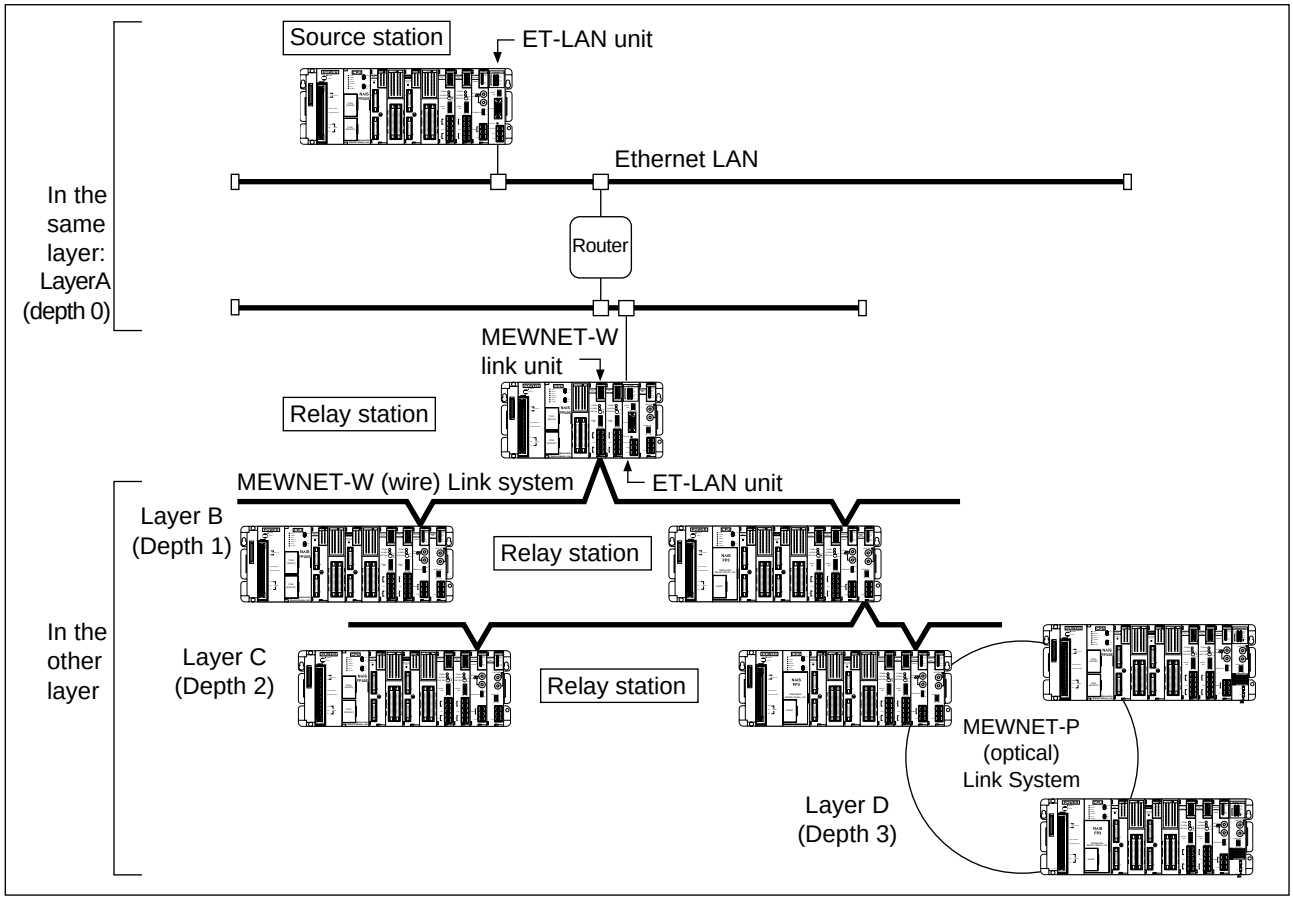
■ Control data S1 settings for inter-layer communication

Communication performed using relay units, such as ET-LAN, MEWNET-H, MEWNET-W and MEWNET-P link units and C.C.U., is referred to as inter-layer communication.

For inter-layer communication, there are limitations on link unit installation as follows.

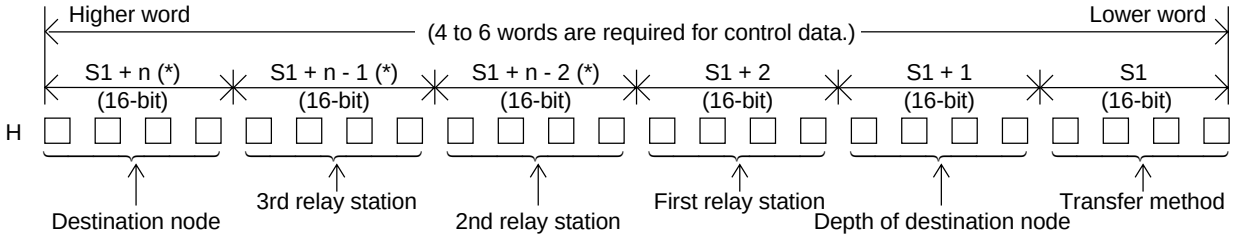
- When all inter-layer communication is performed only via high-level link units:
  You can install as many high-level and standard link units on relay stations as the CPU can handle.
- When inter-layer communication is performed via high-level and standard link units:
  No more than 3 link units can be installed in each relay station.

For details about the link units, refer to page 122. “12-1. Standard and High-level Link Units”.



When the programmable controller communicates with a node in another layer, S1 control data is specified as follows:

- Four to six words are used as control data (S1 + n, ..., S1 +1 and S1).
  If the lowest 16-bit S1 area is specified, the higher 16-bit areas are automatically decided.

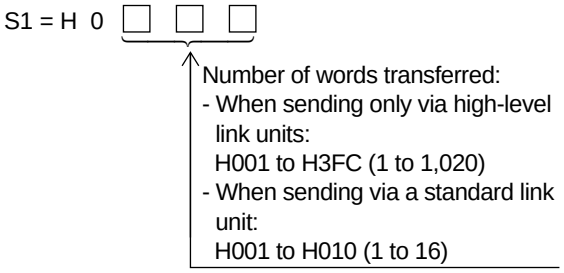


Note:

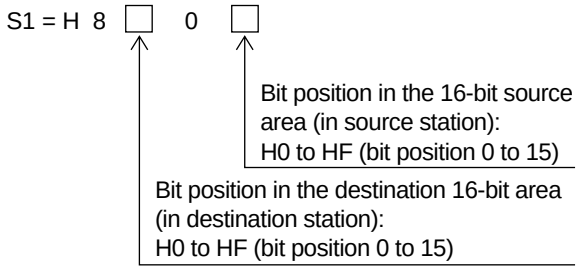
- (*) Depending on the depth of the destination node, the number of 16-bit areas used for the control data differs as follows:
  - When depth is 1: n = 3 (“S1 + n - 2” and “S1 + n - 1” are not used.)
  - When depth is 2: n = 4 (“S1 + n - 1” is not used.)
  - When depth is 3: n = 5 (All the areas described above are used.)

• Specifying the transfer method (lower 16-bit area: S1)

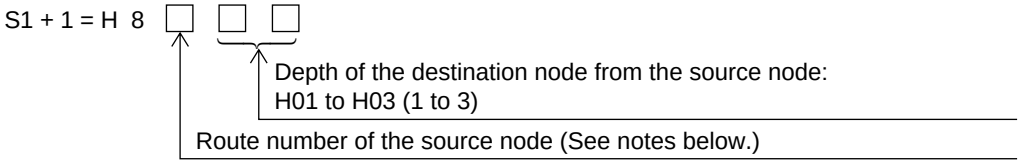
- When sending data in word units



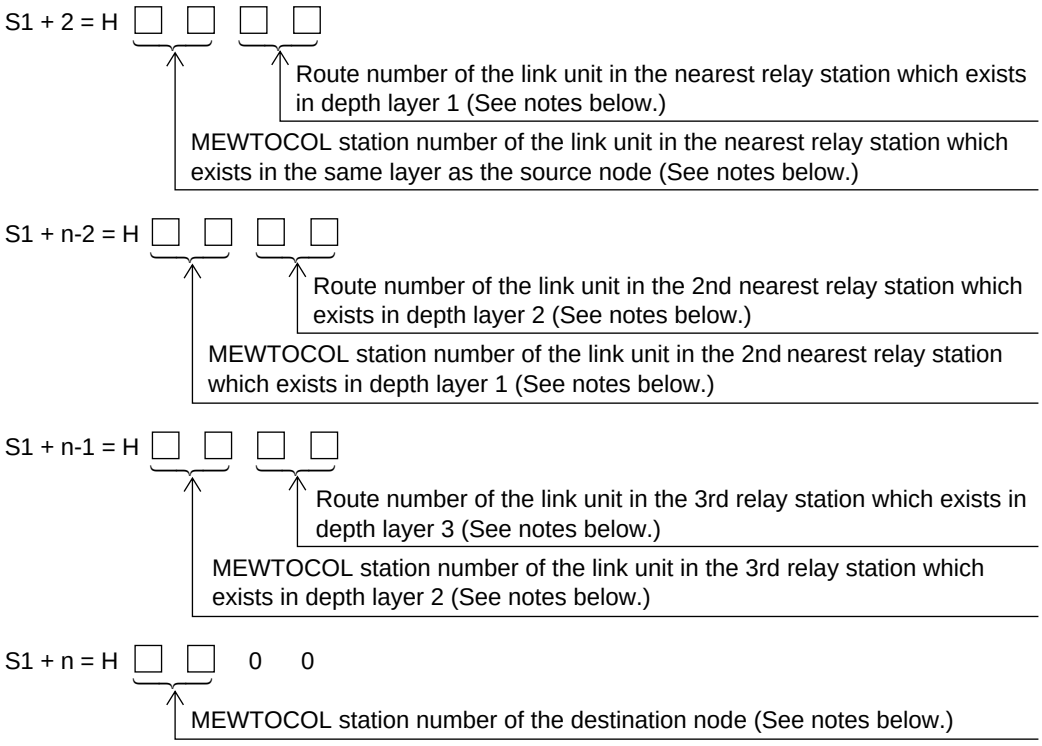
- When sending a bit data



• Specifying the destination node (16-bit area: S1 + 1)



• Specifying the relay stations and destination node (16-bit areas: S1 + 2 to S1 + n)



Notes:

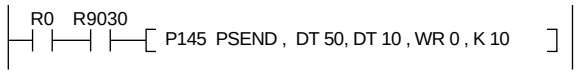
- Since the range of MEWTOCOL station numbers differs from network to network, be sure to check the manuals of each link system for details.
  [EXAMPLES]
  - MEWNET-P link system: 1 to 63
  - MEWNET-W link system: 1 to 32
  - MEWNET-H link system: 1 to 64
  - ET-LAN system: 1 to 64
- The range of route numbers available differs depending on the CPU type as follows:
  - FP3: 1 to 6 using 3 standard and 3 high-level link units.
  - FP10S: 1 to 8 using 5 standard and 3 high-level link units.

  However, if inter-layer communication is performed via a standard link unit, you cannot install more than 3 link units. In this case, route number 1 or 2 is specified.

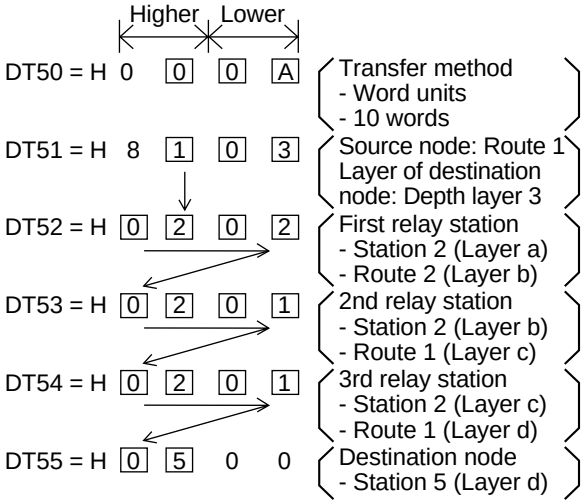
■ Application example

- Source node
  - MEWTOCOL station number: 1 (in depth 0, layer a)
  - Source data: Data stored in DT10 to DT19 (10 words)
  - Route number of link unit: 1
- Destination node
  - Depth from the source node: 3
  - MEWTOCOL station number: 5 (in depth 3, layer d)
  - Area for storing data received : WR10 to WR19
- First relay station
  - MEWTOCOL station number for the link unit in the same layer: 2 (in depth 0, layer a)
  - Route number for the link unit in depth layer 1: 2 (in depth 1, layer b)
- 2nd relay station
  - MEWTOCOL station number for the link unit in depth layer 1: 2 (in depth 1, layer b)
  - Route number for the link unit in depth layer 2: 1 (in depth 2, layer c)
- 3rd relay station
  - MEWTOCOL station number for the link unit in depth layer 2: 2 (in depth 2, layer c)
  - Route number for the link unit in depth layer 2: 1 (in depth 3, layer d)

[Program]

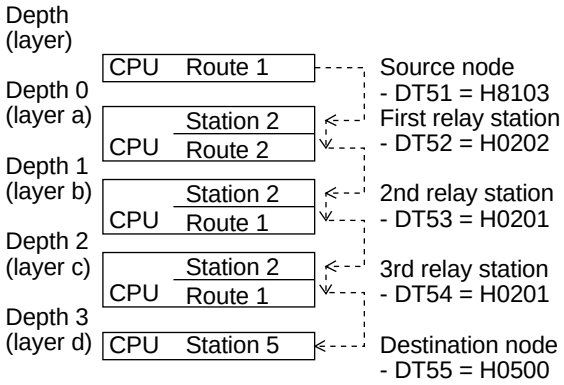


[Control data]

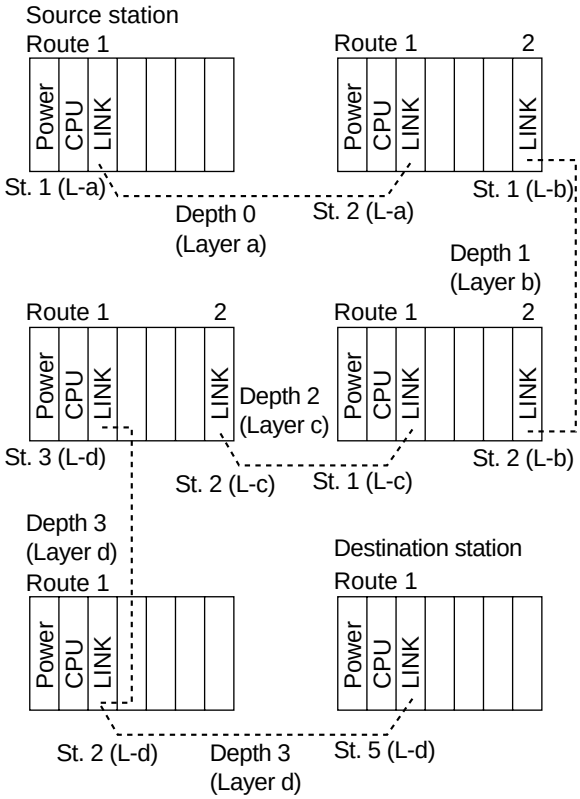


[Explanation]

- The link unit in the source station (layer a) transmits the data in data registers DT10 to DT19 into WR10 to WR19 in the destination station (layer d) via three relay stations as follows:



[Configurations]



St.: station, (L-a): Layer a, (L-b): layer b
(L-c): layer c, (L-d): layer d

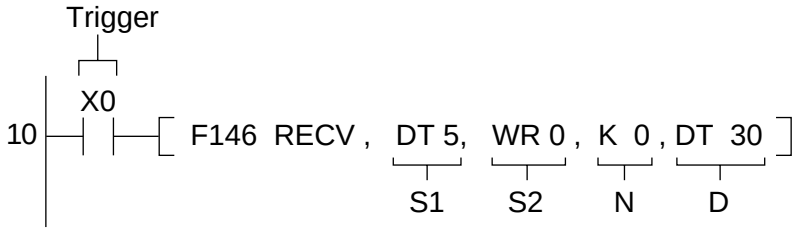
F146 (RECV) / P146 (PRECV) Link data receive (data transfer function)

Step	Availability
9	All FP-C, FP3, FP5, FP10S and FP10

Outline Receives data from another station through link units in the network. (P146: executed only when the leading edge of the trigger in detected.)

Program example

Ladder Diagram



Boolean Non-ladder

Address	Instruction
10	ST X 0
11	F 146(RECV)
	DT 5
	WR 0
	K 0
	DT 30

S1	Starting 16-bit area for storing control data
S2	Type of source operands for storing data in the destination station. Be sure to select the area by setting address 0 (source data area in another station).
N	Starting 16-bit area address for the source operand specified in S2 above (source data area in another station).
D	Starting 16-bit area address for storing data received (destination data area in source station).

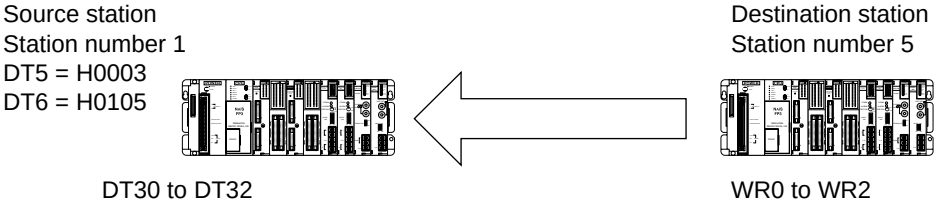
■ Operands

Operand	Relay				Timer/Counter		Register			Index register		Constant		Index modifier
	WX	WY	WR	WL	SV	EV	DT	LD	FL	IX	IY	K	H	
S1	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A
S2	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A
N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
D	N/A	N/A	N/A	N/A	A	A	A	A	A	N/A	N/A	N/A	N/A	A

A: Available
N/A: Not Available

■ Explanation of example

• Receives the value stored in the area in another station starting from WR0 to the area in the source station starting from DT30 when trigger X0 turns ON.



Description

- This instruction enables a programmable controller with a standard or high-level link unit to transfer data from another node. The link units compatible with the **F145 (SEND)/P145 (PSEND)** instructions are:
  - Standard link units: MEWNET-W link unit, MEWNET-P link unit and C. C. U.
  - High-level link units: ET-LAN unit and MEWNET-H link unit

  Since the limitations for each unit depend on the link units, be sure to confirm the limitations for each link unit by referring to their manuals.
- The data in the source station specified by S2 and N is written to the area in the source station specified by D.
- Type of area specified by S2 should always be a "0" address (e.g., DT0, LD0, and WR0). To specify the actual address in S2 of another node, use N with a decimal or hexadecimal constant.
- The destination node MEWTOCOL station number, transfer data size and units for transfer are specified by control data S1 using two or more 16-bit areas. For details about the control data settings, refer to "■ Control data S1 settings for communication in the same layer" and "■ Control data S1 settings for inter-layer communication" in the following pages.

Notes:

- One CPU cannot execute two or more **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions in one scan. If the triggers for two or more **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions turn ON in a scan, the instruction programmed at the smallest address is executed.
- Actual operation of the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions occurs after the end instruction.

■ Flag condition

- Error flag (R9007): Turns ON and keeps the ON state,
  - when the area specified using the index modifier exceeds the limit.
  - when the area specified using S1, S2, N and D exceeds the limit in the source station or in another station's data area range.

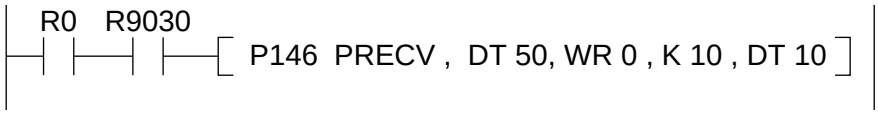
  The error address is transferred to:
  - FP-C/FP3/FP5: DT9017
  - FP10S/FP10: DT90017
- Error flag (R9008): Turns ON for an instant,
  - when the area specified using the index modifier exceeds the limit.
  - when the area specified using S1, S2, N and D exceeds the limit in the source station or in another station's data area range.

  The error address is transferred to:
  - FP-C/FP3/FP5: DT9018
  - FP10S/FP10: DT90018
- **F145/P145** and **F146/P146** instructions execution flag (R9030): OFF while one of the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions is executed. No other **F145 (SEND)/P145 (PSEND)** or **F146 (RECV)/P146 (PRECV)** instruction can be executed. ON while none of the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions is executed. One of the **F145 (SEND)/P145 (PSEND)** or **F146 (RECV)/P146 (PRECV)** instructions can be executed.
- **F145/P145** and **F146/P146** instructions end flag (R9031): Turns ON for an instant when an abnormality is detected during execution of the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions. The MEWTOCOL error code is stored as follows:
  - FP-C/FP3/FP5: DT9039
  - FP10S/FP10: DT90039

Notes:

- When using special internal relays R9008 and R9031 as the flags for this instruction, be sure to program the flags at the address immediately after the instruction.
- R9030 is used to prevent the **F145 (SEND)/P145 (PSEND)** and **F146 (RECV)/P146 (PRECV)** instructions from triggering while one of them is executing. Refer to the example below.

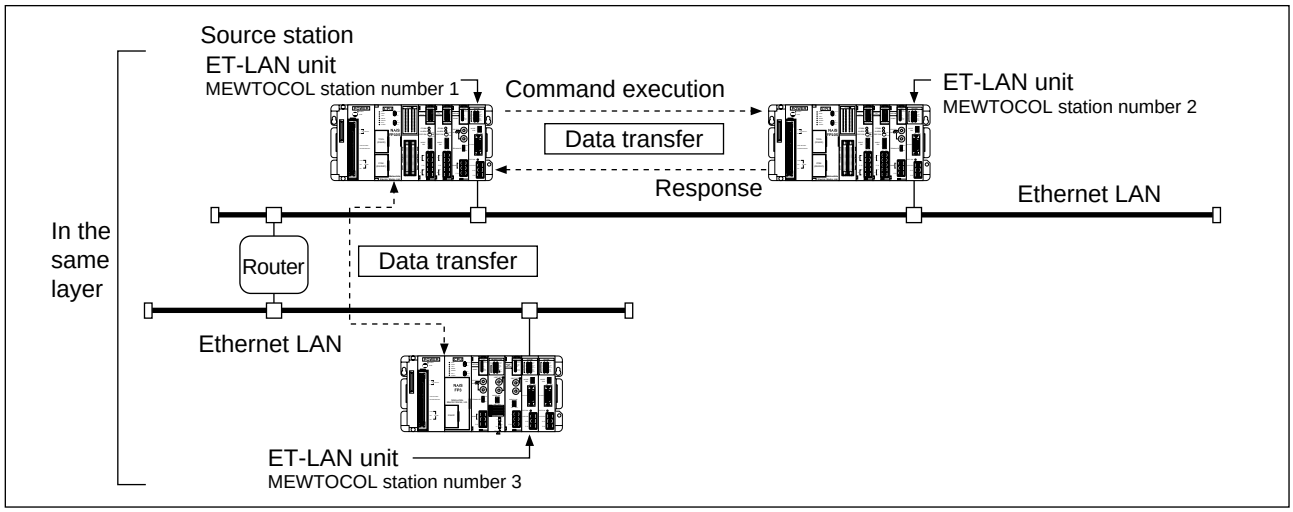
[EXAMPLE]



- If an H71, H72, or H73 error code is stored in DT9039 or DT90039, check the communication waiting time for these instructions with system register 32. If the set time is too short, a time out error may occur. The use of the default setting (2 s) is recommended.

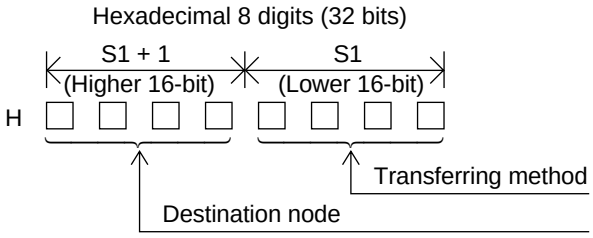
■ Control data S1 settings for communication in the same layer

Communication performed without using a relay unit, such as another ET-LAN, MEWNET-W or MEWNET-P link unit or C.C.U., is referred to as communication in the same layer.



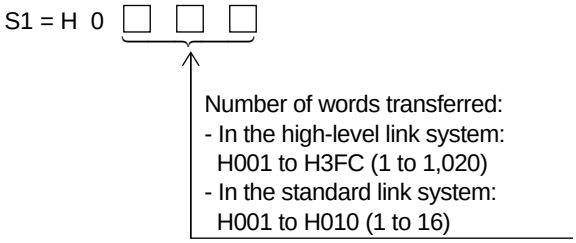
When the programmable controller communicates with another node in the same layer, the S1 control data is specified as follows:

- Two words are used as control data (S1 + 1 and S1).
  If the lower 16-bit area S1 is specified, the higher 16-bit area is automatically decided.

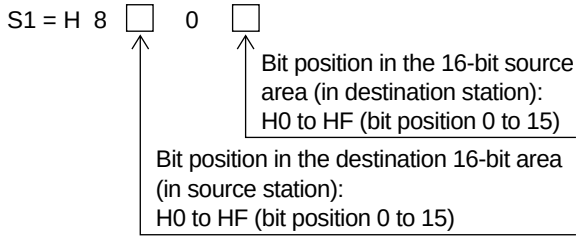


• Specifying the transfer method (lower 16-bit area: S1)

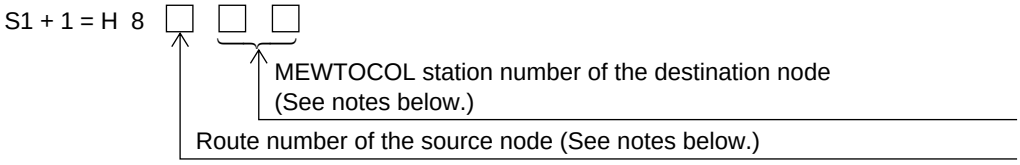
- When receiving data in word units



- When receiving a bit data



• Specifying the destination node (higher 16-bit area: S1 + 1)



Notes:

- Route numbers are used to express the position of standard and high-level link units in a master backplane. The route numbers are assigned starting from the link unit in the slot nearest to the CPU.
  - FP-C: Routes 1 through 5 are available.
  - FP3/FP5: Routes 1 through 6 are available including 3 standard and 3 high-level link units.
  - FP10S/FP10: Routes 1 through 8 are available including 5 standard and 3 high-level link units.

  The units regarded as standard and high-level are:
  - Standard link units: MEWNET-W link unit, MEWNET-P link unit, C.C.U. and C-NET link unit
  - High-level link units: MEWNET-H link unit and ET-LAN unit
- Since the range of MEWTOCOL station numbers differs from network to network, be sure to check the manuals of each link system for details.

  [EXAMPLES]
  - MEWNET-P link system: 1 to 63
  - MEWNET-W link system: 1 to 32
  - MEWNET-H link system: 1 to 64
  - ET-LAN system: 1 to 64
- For details about link units, refer to page 122, “12-1. Standard and High-level Link Units”.

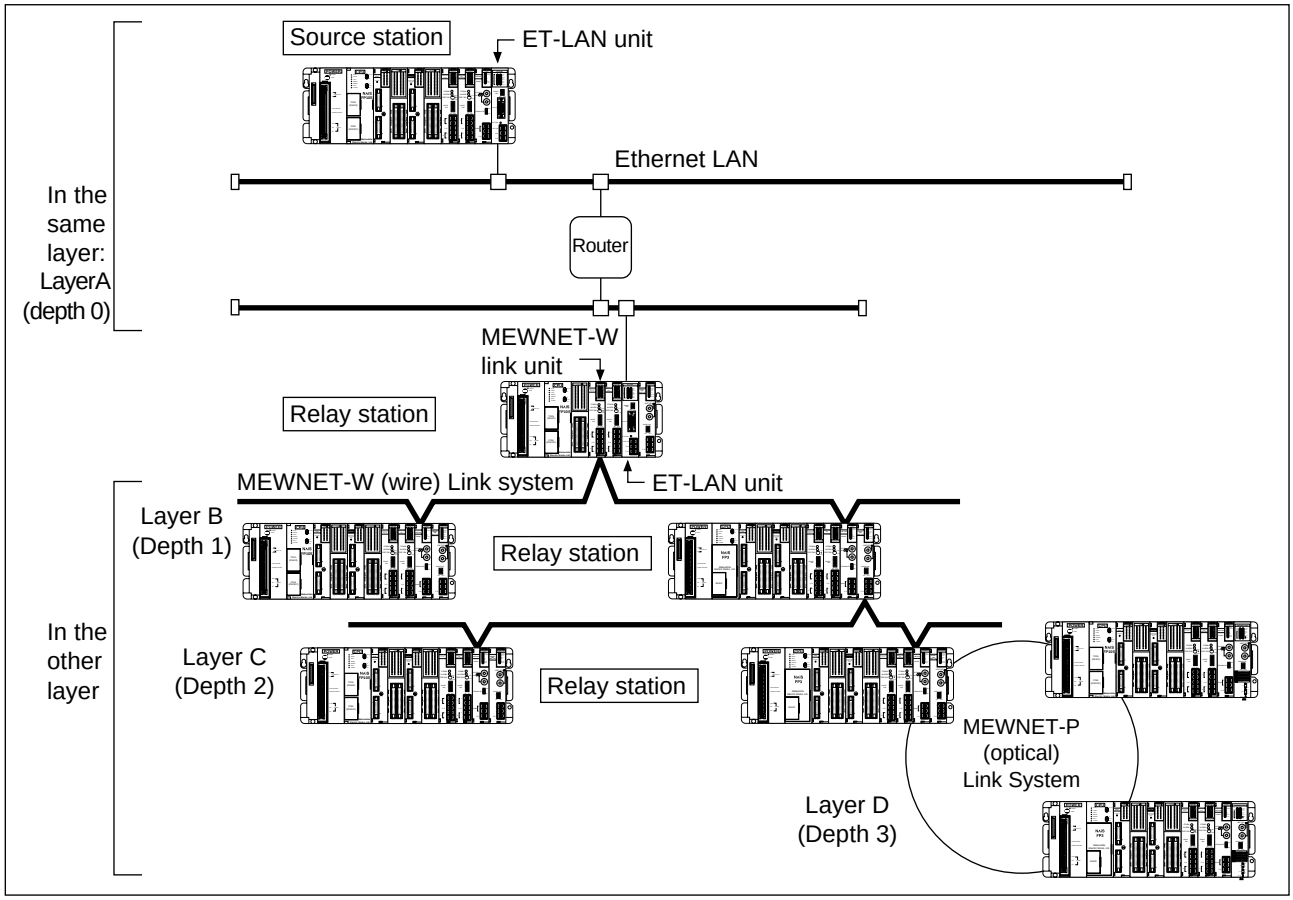
■ Control data S1 settings for inter-layer communication

Communication performed using relay units, such as ET-LAN, MEWNET-H, MEWNET-W and MEWNET-P link units and C.C.U., is referred to as inter-layer communication.

For inter-layer communication, there are limitations on link unit installation as follows.

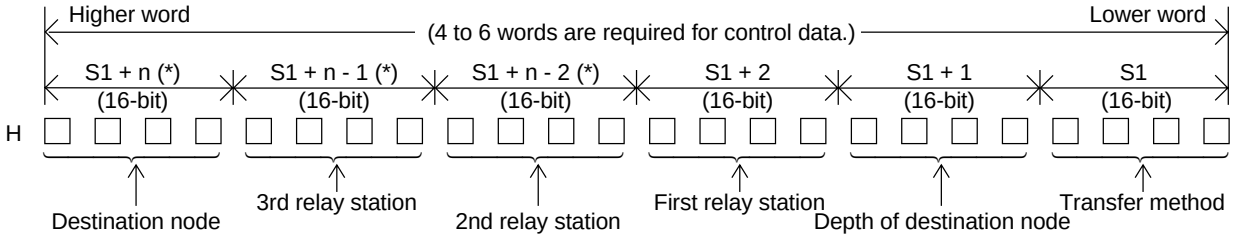
- When all inter-layer communication is performed only via high-level link units:
  You can install as many high-level and standard link units on relay stations as the CPU can handle.
- When inter-layer communication is performed via high-level and standard link units:
  No more than 3 link units can be installed in each relay station.

For details about the link units, refer to page 122. “12-1. Standard and High-level Link Units”.



When the programmable controller communicates with a node in another layer, the S1 control data is specified as follows:

- Four to six words are used as control data (S1 + n, ..., S1 +1 and S1).
  If the lowest 16-bit area S1 is specified, the higher 16-bit areas are automatically decided.

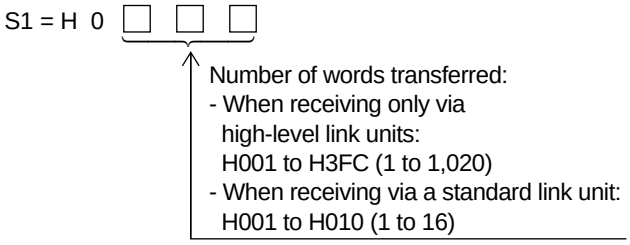


Note:

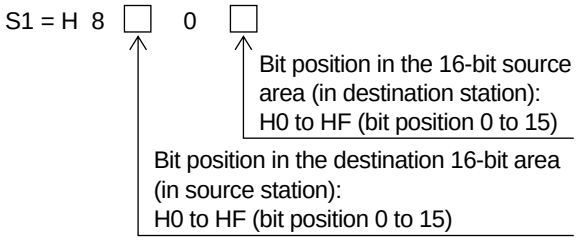
- (*) Depending on the depth of the destination node, the number of 16-bit areas used for the control data differs as follows:
  - When depth is 1: n = 3 (“S1 + n - 2” and “S1 + n - 1” are not used.)
  - When depth is 2: n = 4 (“S1 + n - 1” is not used.)
  - When depth is 3: n = 5 (All the areas described above are used.)

• Specifying the transfer method (lower 16-bit area: S1)

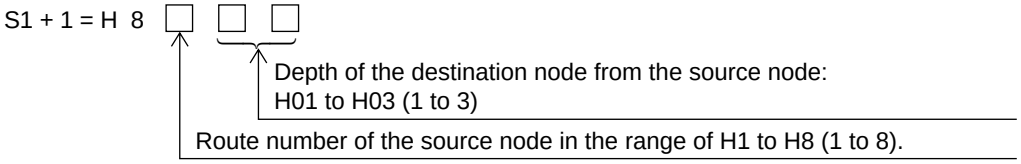
- When receiving data in word units



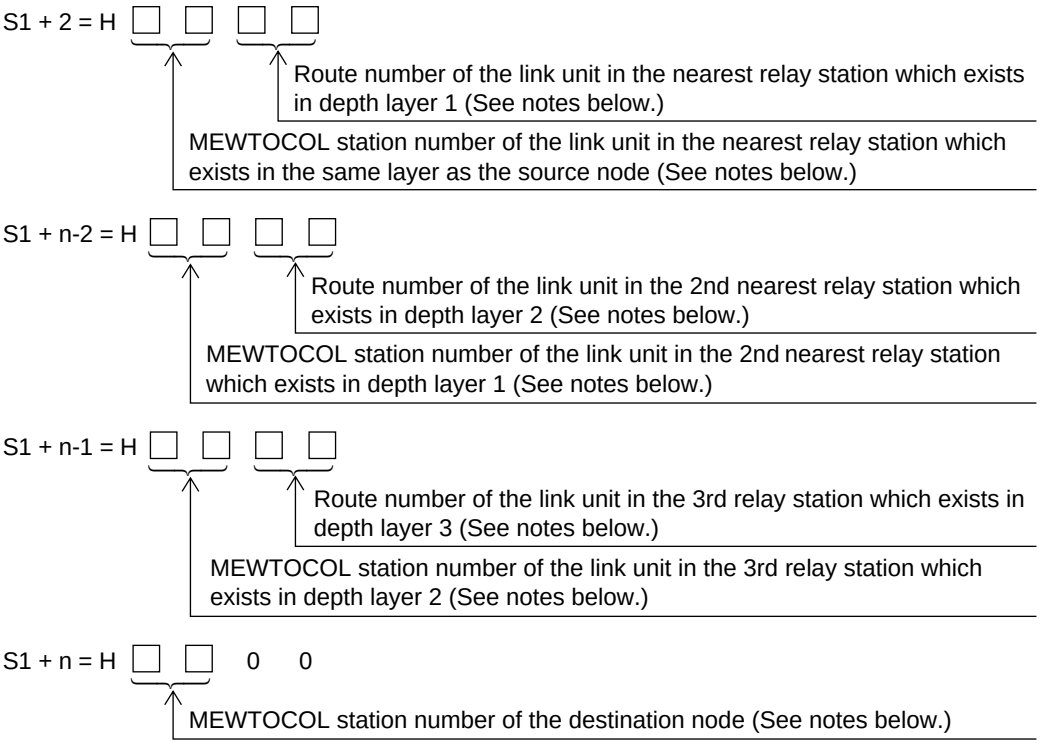
- When receiving a bit data



• Specifying the destination node (16-bit area: S1 + 1)



• Specifying the relay stations and destination node (16-bit areas: S1 + 2 to S1 + n)



Notes:

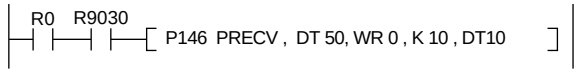
- Since the range of MEWTOCOL station numbers differs from network system to network system, be sure to check the manuals of each link system for details.
  [EXAMPLES]
  - MEWNET-P link system: 1 to 63
  - MEWNET-W link system: 1 to 32
  - MEWNET-H link system: 1 to 64
  - ET-LAN system: 1 to 64
- The range of route numbers available differs depending on the CPU type as follows:
  - FP3: 1 to 6 using 3 standard and 3 high-level link units.
  - FP10S: 1 to 8 using 5 standard and 3 high-level link units.

  However, if inter-layer communication is performed via a standard link unit, you cannot install more than 3 link units. In this case, route number 1 or 2 is specified.

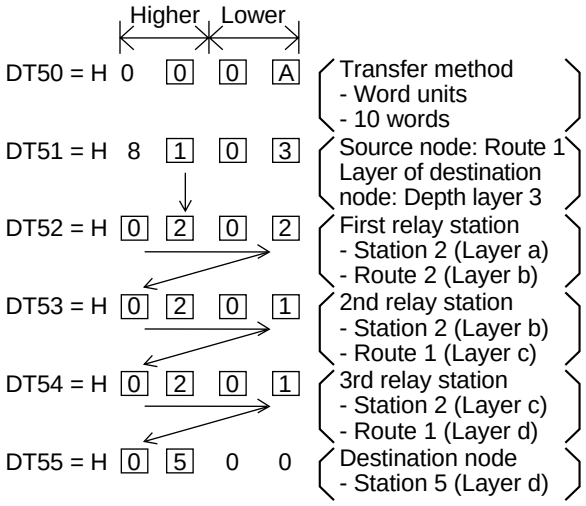
■ Application example

- Source node
  - MEWTOCOL station number: 1 (in depth 0, layer a)
  - Area for storing data received: DT10 to DT19
  - Route number of link unit: 1
- Destination node
  - Depth from the source node: 3
  - MEWTOCOL station number: 5 (in depth 3, layer d)
  - Source data: Data stored in WR10 to WR19 (10 words)
- First relay station
  - MEWTOCOL station number for the link unit in the same layer: 2 (in depth 0, layer a)
  - Route number for the link unit in depth layer 1: 2 (in depth 1, layer b)
- 2nd relay station
  - MEWTOCOL station number for the link unit in depth layer 1: 2 (in depth 1, layer b)
  - Route number for the link unit in depth layer 2: 1 (in depth 2, layer c)
- 3rd relay station
  - MEWTOCOL station number for the link unit in depth layer 2: 2 (in depth 2, layer c)
  - Route number for the link unit in depth layer 2: 1 (in depth 3, layer d)

[Program]

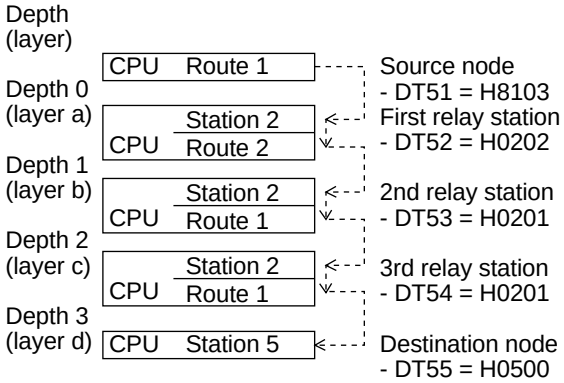


[Control data]

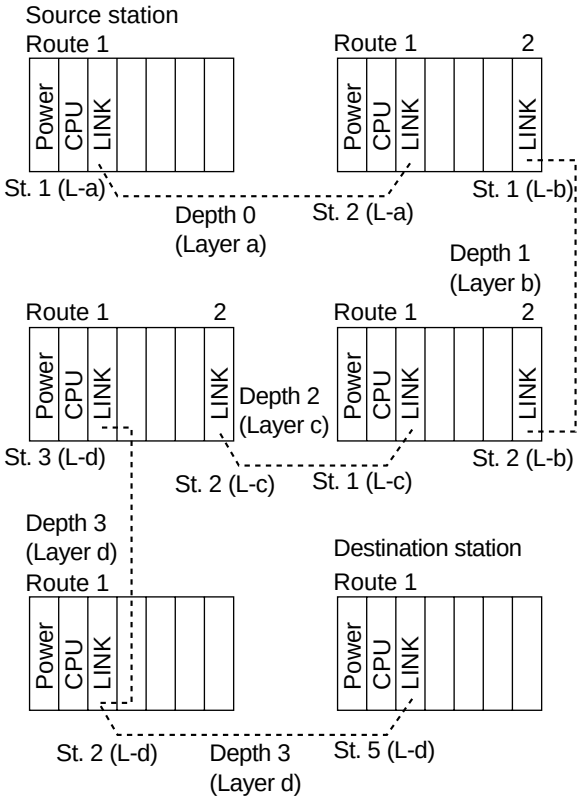


[Explanation]

- The link unit in the source station (layer a) reads data from word internal relays WR10 to WR19 in the destination station (layer d) and stores them in data registers DT10 to DT19 in the source station via three relay stations as follows:



[Configurations]



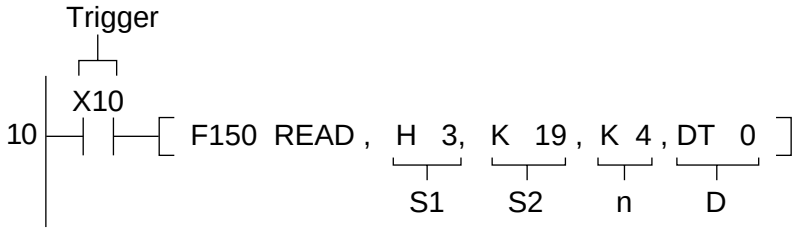
St.: station, (L-a): Layer a, (L-b): layer b
(L-c): layer c, (L-d): layer d

F150 (READ) P150 (PREAD) Shared memory read

Step	Availability
9	All FP-C, FP3, FP5, FP10S and FP10

Outline Reads data from the shared memory in an intelligent unit.
(P150: executed only when the leading edge of the trigger is detected.)

Program example

Ladder Diagram	Boolean Non-ladder	
	Address	Instruction
	10	ST X 10
	11	F 150(READ)
		H 3
		K 19
		K 4
		DT 0

S1	16-bit equivalent constant for specifying the bank number in the shared memory of the intelligent unit.
S2	16-bit equivalent constant for specifying the starting address in the shared memory of the intelligent unit (source data address).
n	16-bit equivalent constant for specifying the number of words to be read.
D	Starting 16-bit area address for storing read data (destination data address).

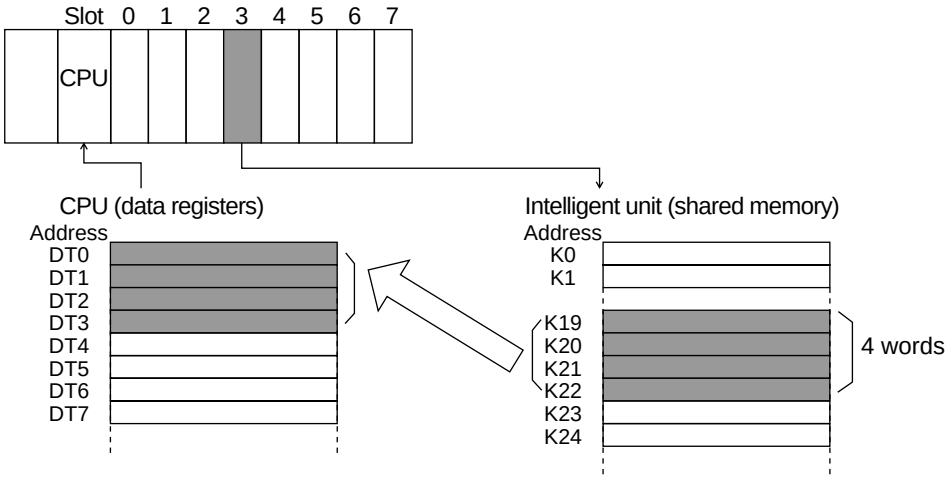
■ Operands

Operand	Relay				Timer/Counter		Register			Index register		Constant		Index modifier
	WX	WY	WR	WL	SV	EV	DT	LD	FL	IX	IY	K	H	
S1	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	N/A	N/A	A	A	A
S2	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	N/A	N/A	A	A	A
n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
D	N/A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A

A: Available
N/A: Not Available

■ Explanation of example

• Reads four words of data stored in the addresses starting from K19 of the intelligent unit shared memory (located in slot 3) and stores them in data registers DT0 to DT3 when trigger X10 turns ON.



Description

• This instruction enables a CPU to read data stored in the shared memory of the intelligent unit and store them in the specified operand when the trigger turns ON.
• The location and bank number of the intelligent unit is specified by S1. The address in the shared memory of the intelligent unit is specified by S2 if it does not have banks, and is specified by the combination of S1 and S2 if it does have banks in the shared memory. For details about the shared memory configuration of each intelligent unit, refer to the intelligent unit manual, and for details about the S1 settings refer to "■ Specifying the unit location and bank number S1" in the following section.
• The number of data read is specified by n, a decimal or hexadecimal constant.

■ Flag condition

• Error flag (R9007): Turn ON and keeps the ON state,
- when the area specified using index modifier exceeds the limit.
- when the area specified using n and D exceeds the limit of the area range.

The error address is transferred to:
- FP-C/FP3/FP5: DT9017
- FP10S/FP10: DT90017

• Error flag (R9008): Turns ON for an instant,
- when the area specified using index modifier exceeds the limit.
- when the area specified using n and D exceeds the limit of the area range.

The error address is transferred to:
- FP-C/FP3/FP5: DT9018
- FP10S/FP10: DT90018

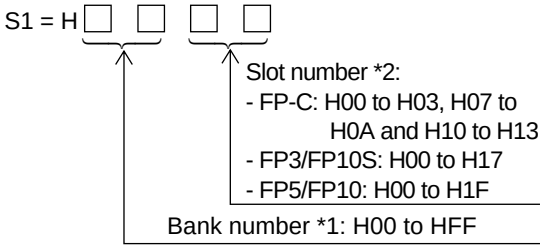
Note:

• When using special internal relay R9008 as the flag for this instruction, be sure to program it at the address immediately after the instruction.

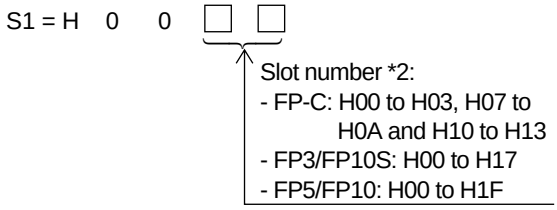
■ Specifying the unit location and bank number S1

The location of the intelligent unit and its bank number in the shared memory are specified by the constant S1. Among intelligent units for FP series programmable controllers, there are ones with and without bank sections in the shared memory. The setting of S1 varies depending on whether you access the unit with or without bank sections as follows:

- Accessing the intelligent unit with bank section



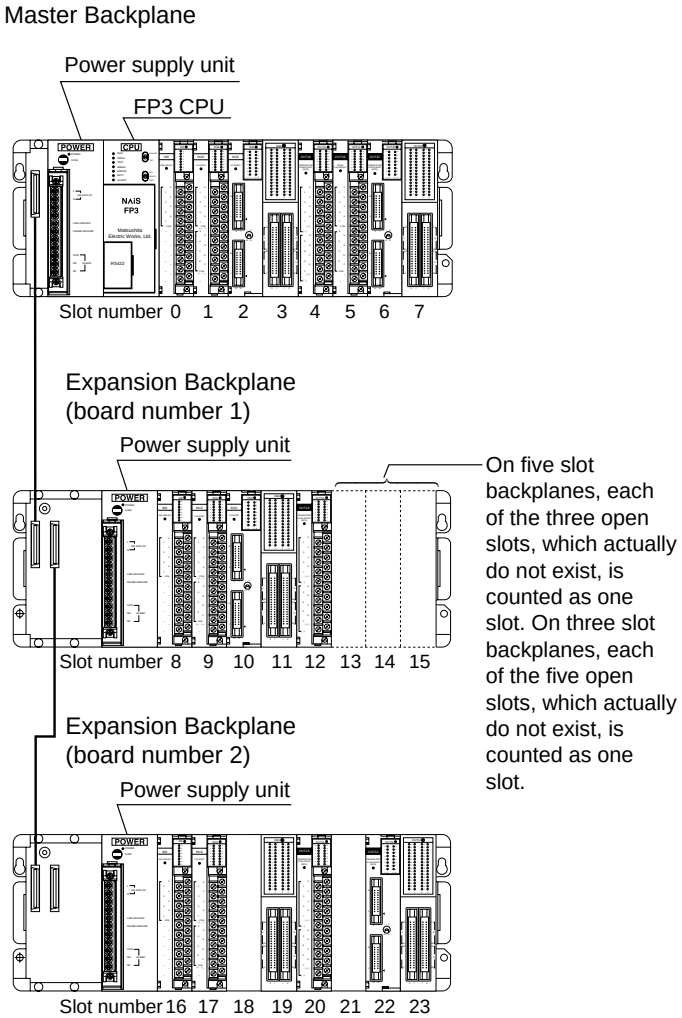
- Accessing the intelligent unit without bank section



*1 The intelligent units with bank sections in the shared memory are:
- Data memory units: AFP32091 and AFP32092 for FP3/FP10S
- ET-LAN unit: AFP3790 for FP3/FP10S

*2 Slot numbers are used to express the position of FP-C/FP3/FP5/FP10S/FP10 units except for the CPU and power supply unit. The slot numbers are assigned for each unit starting from the unit nearest the CPU and power supply unit. If you are using an FP-C with the intelligent board function built in, the intelligent board is regarded as the unit in slot 7.

- FP3 slot numbering example



F151 (WRT) P151 (PWRT)

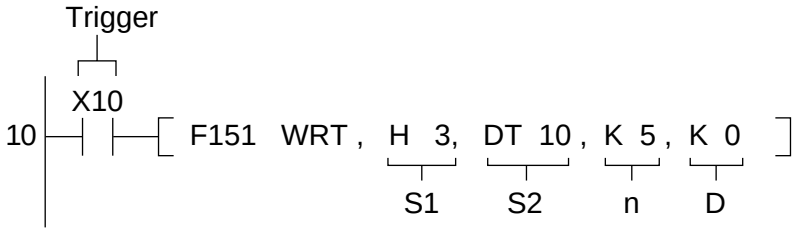
Shared memory write

Step	Availability
9	All FP-C, FP3, FP5, FP10S and FP10

Outline Writes data from the shared memory in an intelligent unit.
(P151: executed only when the leading edge of the trigger is detected.)

Program example

Ladder Diagram



Boolean Non-ladder

Address	Instruction
10	ST X 10
11	F 151(WRT)
	H 3
	K 10
	K 5
	DT 0

S1	16-bit equivalent constant for specifying the bank number in the shared memory of the intelligent unit
S2	Starting 16-bit area address for storing data written in the shared memory.
n	16-bit equivalent constant for specifying the number of words written in the shared memory.
D	Starting 16-bit area address for storing data written (destination data address).

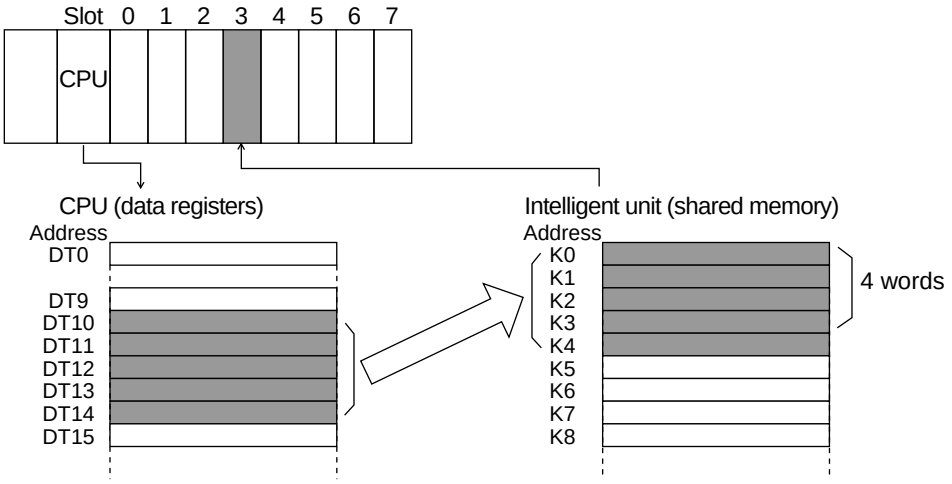
■ Operands

Operand	Relay				Timer/Counter		Register			Index register		Constant		Index modifier
	WX	WY	WR	WL	SV	EV	DT	LD	FL	IX	IY	K	H	
S1	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	N/A	N/A	A	A	A
S2	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A
n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A

A: Available
N/A: Not Available

■ Explanation of example

• Reads four words of data stored in the addresses starting from K19 of the intelligent unit shared memory (located in slot 3) and stores them in data registers DT0 to DT3 when trigger X10 turns ON.



Description

• This instruction enables a CPU to write data stored in the shared memory of the intelligent unit specified by the combintaion of S1 and D.
• The location and bank number of the intelligent unit is specified by S1. The address in the shared memory of the intelligent unit is specified by D if it does not have banks and is specified by the combination of S1 and D if it does have banks in the shared memory. For details about the shared memory configuration of each intelligent unit, refer the applicable intelligent unit manual, and for details about the S1 settings refer to "■ Specifying unit location and bank number S1" in the following section.
• The number of data written is specified by n, a decimal or hexadecimal constant.

■ Flag condition

• Error flag (R9007): Turn ON and keeps the ON state,
- when the area specified using index modifier exceeds the limit.
- when the area specified using S2 and n exceeds the limit of the area range.

The error address is transferred to:
- FP-C/FP3/FP5: DT9017
- FP10S/FP10: DT90017

• Error flag (R9008): Turns ON for an instant,
- when the area specified using index modifier exceeds the limit.
- when the area specified using S2 and n exceeds the limit of the area range.

The error address is transferred to:
- FP-C/FP3/FP5: DT9018
- FP10S/FP10: DT90018

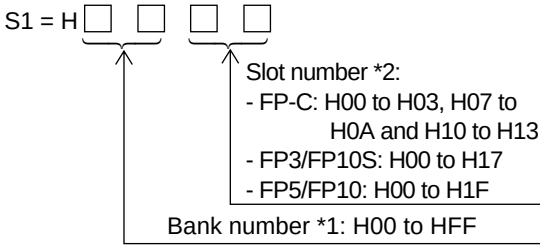
Note:

• When using special internal relay R9008 as the flag for this instruction, be sure to program it at the address immediately after the instruction.

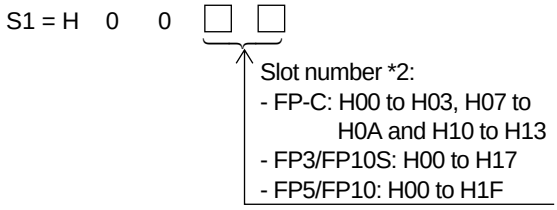
■ Specifying the unit location and bank number S1

The location of the intelligent unit and its bank number in the shared memory are specified by the constant S1. Among intelligent units for FP series programmable controllers, there are ones with and without bank sections in the shared memory. The setting of S1 varies depending on whether you access the unit with or without bank sections as follows:

- Accessing the intelligent unit with bank section



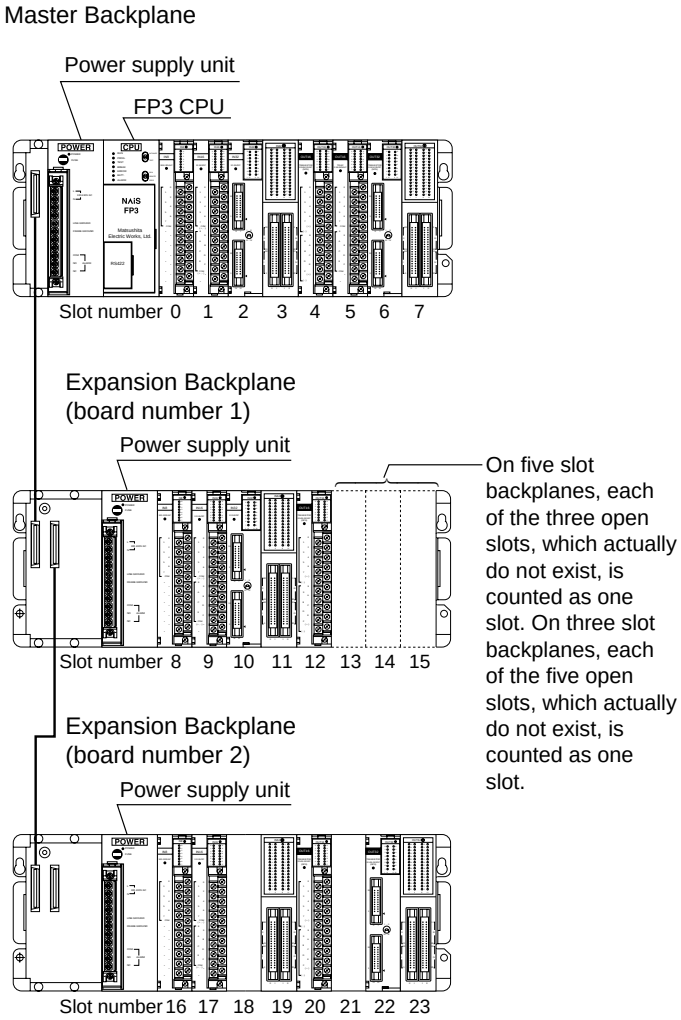
- Accessing the intelligent unit without bank section



*1 The intelligent units with bank sections in the shared memory are:
- Data memory units: AFP32091 and AFP32092 for FP3/FP10S
- ET-LAN unit: AFP3790 for FP3/FP10S

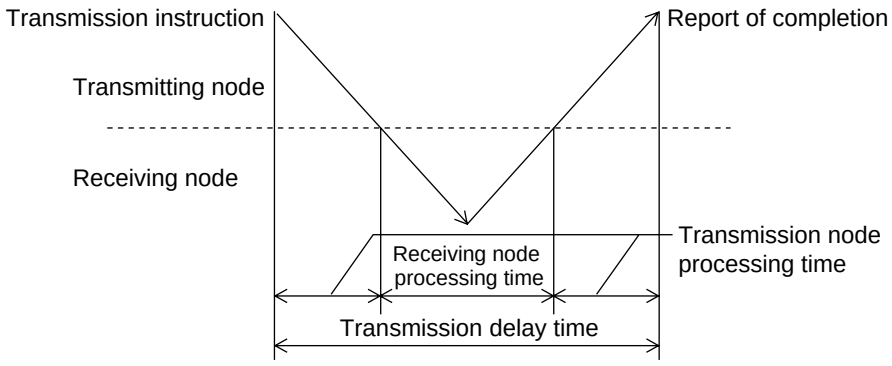
*2 Slot numbers are used to express the position of FP-C/FP3/FP5/FP10S/FP10 units except for the CPU and power supply unit. The slot numbers are assigned for each unit starting from the unit nearist the CPU and power supply unit. If you are using an FP-C with the intelligent board function built in, the intelligent board is regarded as the unit in slot 7.

- FP3 slot numbering example



12-4. Transmission Time of the Ethernet LAN

The minimum transfer delay time for transparent and MEWTOCOL communication can be obtained from the formulae below. These formulae provide a guide to knowing the transfer time when, using one connection, one station is sending and the other station is receiving. The actual transfer time may be longer depending on the load on the network, line conditions (environment), number of connections, system configuration, and window sizes.



Transfer delay time = transmitting node processing time + receiving node processing time

The following shows the processing time for an ET-LAN Unit. Please read the applicable manual when the device used is not an ET-LAN unit.

1. Transparent Communication

TCP/IP transmission node processing time = 9 + 0.010 × No. of transmitted bytes + scan time on transmission side (ms)
TCP/IP reception node processing time = 9 + 0.009 × No. of received bytes (ms)
UDP/IP transmission node processing time = 5 + 0.010 × No. of transmitted bytes + scan time on transmission side (ms)
UDP/IP reception node processing time = 4 + 0.009 × No. of received bytes

Note that the transfer delay time when using UDP/IP equals the transmission node processing time.

Example:

Using TCP/IP, when 1000 bytes of data is transmitted between ET-LAN units, and where the scan time on the transmission side is 100 ms,

Minimum transfer delay time = 9 + 0.010 × 1000 + 100 + 9 + 0.009 × 1000 = 137 ms

2. MEWTOCOL Transmission

Transmission node processing time = 10 + 0.010 × No. of command data bytes + 0.009 × No. of response data bytes + scan time on transmission side (ms)
Reception node processing time = 10 + 0.009 × No. of command data bytes + 0.010 × No. of response data bytes + scan time on reception side (ms)

The formulae above apply to both TCP/IP and UDP/IP.
The total number of command data and response data bytes comprises the total number of bytes of the MEWTOCOL format expansion header and the data.

Example:

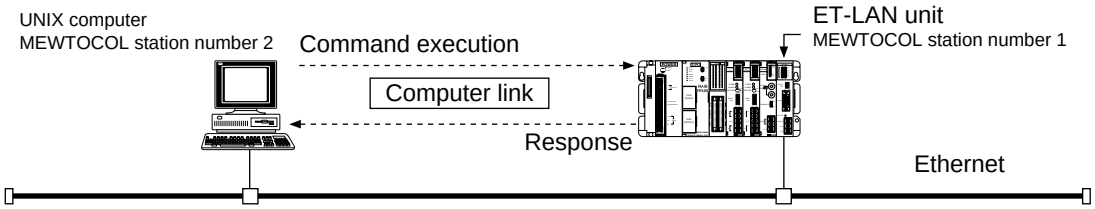
Using TCP/IP and the **F145 (SEND)/P145 (PSEND)** instruction, when 100 words of data is written between ET-LAN units, and where the scan time is 100 ms on the transmission side and 50 ms on the receiving side,

No. of command data bytes = 12 + 207 = 219
No. of response data bytes = 12 + 3 = 15
Minimum transfer delay time = 10 + 0.010 × 219 + 0.009 × 15 + 100 + 10 + 0.009 × 219 + 0.010 × 15 + 50 = 174.446 (ms)

12-5. Test Program for the ET-LAN Unit and a Computer

The programs explained hereafter are sample programs for communication between the ET-LAN unit and a UNIX computer. Communication is performed using the computer link function (MEWTOCOL-COM) in the same network.

■ System configurations



Items	ET-LAN unit	UNIX computer
IP address	192.9.201.130	No need to specify if network (subnet) address is the same as that for the unit.
Port number	4097	4098
Communication	MEWTOCOL communication	
MEWTOCOL station number	Station 1	Station 2
Protocol	TCP/IP	
Open method	Unpassive	Active (bind to connect)

UNIX is a trademark of X/Open Company Limited.

■ Operation outline

• After establishing the connection, the UNIX computer sends the MEWTOCOL-COM formatted command to the ET-LAN unit and changes the data in data register DT0 of the FP3/FP10S CPU.

■ How to use program

① Make sample communication programs for the FP3/FP10S CPU and UNIX computer.
- For details about the program for the FP3/FP10S, refer to "■ Ladder program for the FP3/FP10S programmable controller".
- For details about the program for a UNIX computer, refer to "■ Program for a UNIX computer".

② Compile the program for the UNIX computer using the compile program. For details about the compile program, refer to "■ Compile program for the UNIX computer".

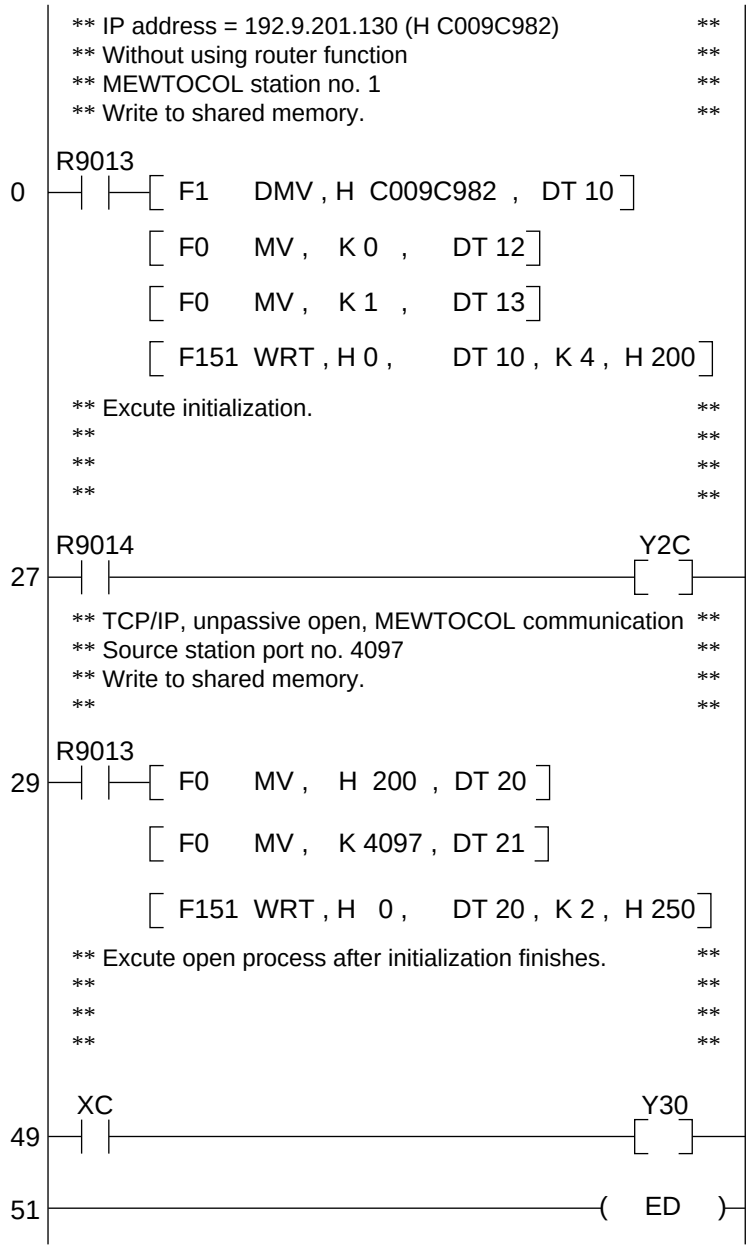
③ Change the mode of the FP3/FP10S to RUN.
④ Execute the sample program for the UNIX computer.
⑤ After establishing the connection, the UNIX computer displays the following menu and waits until 0, 1 or E is entered.

```
————————Sample Menu————————
        0.....Clear Data
        1.....Set Data
        E .....End Test
              Please press key (0 or 1 or E)
```

- When 0 is selected, H0000 is set in DT0 of the FP3/FP10S.
- When 1 is selected, HFFFF is set in DT0 of the FP3/FP10S.
- When E is selected, the connection is closed and the program finishes.

Please confirm that the data register DT0 is monitoring, as explained above, the FP3/FP10S.

■ Ladder program for the FP3/FP10S programmable controller



■ Program for the UNIX computer

```
#include <stdio.h>
#include <errno.h>
#include <ctype.h>
#include <string.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <netdb.h>
#include <netinet/in.h>




#define D_SRC_PORT          4098                        /* SOURCE PORT NUMBER */
#define D_DST_IP      "192.9.201.130" /* DESTINATION IP ADDRESS */
#define D_DST_PORT    4097          /* DESTINATION PORT NUMBER */

#define MEW_DST_NO          1               /* DESTINATION MEWTOCOL STATION NUMBER */
#define MEW_SRC_NO          2                           /* SOURCE MEWTOCOL STATION NUMBER */




#define OK                  0
#define ERROR         1


struct MEWTOCOL_stc {                                                   /* MEWTOCOL FORMAT */
      char      FTI ;
      char      padding ;                                                       /* 0 FIXED */
      unsigned char     datasize_L ;                                    /* DATA SIZE Low  */
      unsigned char     datasize_H ;                                    /* DATA SIZE High */
      unsigned char     COMorDAT;                                               /* MEWTOCOL-COM or
MEWTOCOL-DAT */
      unsigned char     reserved[5] ;                                   /* RESERVED 0 FIXED */
      unsigned char     dst_rout ;                                      /* DESTINATION MEWTOCOL
STATION NUMBER */
      unsigned char     src_rout ;                                      /* SOURCE MEWTOCOL STATION
NUMBER */
      char    data[2048] ;                                              /* SIZE OF MEWTOCOL FORMAT
TEXT DATA */ } ;
struct MEWTOCOL_stc  senddata, recvdata;          /* SEND- AND RECEIVE-BUFFERS */

int sno ;                                         /* SOCKET */


            /* DECLARATION OF FUNCTION PROTOTYPE */


extern int main() ;
extern int MewtocolClientOpen() ;
extern int MewtocolSample() ;
extern int MewtocolSendAndReceive() ;
extern unsigned char BCC() ;

int main(argc,argv)
int argc ;
int argv[] ;
{

            /* OPEN CONNECTION */

if( MewtocolClientOpen() != OK ) {
      puts("Can't open connection !") ;
      return( ERROR) ;
}

/* EXCHANGING DATA */
MewtocolSample() ;

/* CLOSE CONNECTION AND STOP PROCESSING */
close( sno ) ;
```

```
    return( OK ) ;

    }



    /* ================================================
      = OPEN CONNECTION WITH DESTINATION STATION
      =----------------------------------------------
      =
      =   Return    OK:CONNECTION ESTABLISHED
      =         ERROR:CONNECTION NOT ESTABLISHED
      =
      ================================================ */
    int     MewtocolClientOpen()
    {
            struct sockaddr_in SrcAddr ;                    /* SOURCE ADDRESS */
            struct sockaddr_in DstAddr ;                    /* DESTINATION ADDRESS */
            int err ;

            /* MAKE A SOCKET */
            if( (sno = socket( AF_INET , SOCK_STREAM , 0 )) < 0 ){
                    return( ERROR );                                        /* SOCKET CANNOT BE MADE */
            }

            /* ALLOCATE SOURCE ADDRESS FOR THE SOCKET */
            SrcAddr.sin_family      = AF_INET ;
            SrcAddr.sin_addr.s_addr = INADDR_ANY ;
            SrcAddr.sin_port        = htons(D_SRC_PORT) ;
            if(( err = bind( sno , (struct sockaddr *)&SrcAddr , sizeof( SrcAddr ))) < 0 ){
                    /* CANNOT ALLOCATE SOURCE ADDRESS FOR THE SOCKET */
                    close( sno );
                    return( ERROR ) ;
            }

            /* REQUEST-TO-OPEN THE DESTINATION */
            DstAddr.sin_family      = AF_INET ;
            DstAddr.sin_addr.s_addr = inet_addr( D_DST_IP );
       DstAddr.sin_port        = htons(D_DST_PORT ) ;
            if( (err = connect( sno , (struct sockaddr *)&DstAddr , sizeof( DstAddr ))) < 0 ){
                    /* CANNOT CONNECT TO DESTINATION */
                    close( sno ) ;
                    return( ERROR ) ;
            }
            return( OK );
    }

    /* ================================================
      = SELECTING AND PERFORMING OPERATION FROM SAMPLE MENU
      =----------------------------------------------
      =
      =   Return    OK:SUCCESSFULLY COMPLETED
      =         ERROR:NOT COMPLETED SUCCESSFULLY
      =
      ================================================ */
    int MewtocolSample()
    {
    LMenu:
            puts("------------ Sample Menu --------------") ;
            puts("0 .... Clear Data") ;
            puts("1 .... Set Data") ;
            puts("E .... End Test") ;
            printf("     Please,Push Key (0 or 1 or E) ");

            for(;;){
                    switch(getchar()){
                            case '0':
                                    printf(" Clear Data ");
                                    if( MewtocolSendAndRecieve("<01#WDD00000000000000")){
                                            return( ERROR );
                                    }
                                    break ;

                            case '1':
                                    printf(" Set Data ");
                                    if( MewtocolSendAndRecieve("<01#WDD0000000000FFFF")){
                                            return( ERROR );
```

```
                                }
                                break ;

                        case 'E':
                        case 'e':
                                puts("Bye Bye.") ;
                                return( OK );

                        case '\n':
                                break ;

                        default:
                                puts("Bad Command") ;
                                goto LMenu ;
                }
        }
}
/* ================================================
  = SEND MEWTOCOL DATA AND WAIT FOR RESPONSE
  =------------------------------------------------
  =
  =  Input  unsigned char *cmd :MEWTOCOL COMMAND MESSAGE FOR SENDING
  =
  =  Return    OK:SUCCESSFULLY COMPLETED
  =         ERROR:NOT COMPLETED SUCCESSFULLY
  =
  ================================================ */
int MewtocolSendAndRecieve( cmd )
unsigned char *cmd ;
{
        int len ;
        int sendsize,recvsize ;
        int senddatasize ;
        int err ;

        len = strlen(cmd) ;                                             /* SIZE OF SIGNIFICANT COMMAND
DATA */
        senddatasize = len
                                +2              /* BCC SIZE */
                +1 ;            /* CR SIZE */

        /* MAKIGN MEWTOCOL HEADER */
        senddata.FTI = 0x10 ;
        senddata.padding  = 0 ;                                         /* 0 FIXED */
        senddata.datasize_L = (unsigned char )senddatasize ;/* DATA SIZE Low */
        senddata.datasize_H = senddatasize/256 ;                        /* DATA SIZE High */

senddata.COMorDAT    = 0x00 ;                   /* 0x00:MEWTOCOL-COM 0x02:MEWTOCOL-DAT */

senddata.reserved[0] = 0 ;                      /* RESERVED 0 FIXED */
senddata.reserved[1] = 0 ;                      /* RESERVED 0 FIXED */
senddata.reserved[2] = 0 ;                      /* RESERVED 0 FIXED */
senddata.reserved[3] = 0 ;                      /* RESERVED 0 FIXED */
senddata.reserved[4] = 0 ;                      /* RESERVED 0 FIXED */


senddata.dst_rout  = MEW_DST_NO ;               /* DESTINATION MEWTOCOL STATION NUMBER */
senddata.src_rout  = MEW_SRC_NO ;               /* SOURCE MEWTOCOL STATION NUMBER */

/* MAKING MEWTOCOL DATA */
/* ① COPY COMMAND TO DATA */
/* ② CALCULATE BCC AND ADD THE RESULT BEHINDE THE DATA (IN ASCII HEX FORMAT) */
/* ③ ADD THE CR(0x0D) TO ITS END */
        sprintf(senddata, "%s%02X%c",cmd,BCC(cmd,len),0x0D) ;

        /* CALCULATE DATA SIZE OF WHOLE DATA FOR SENDING */
        sendsize = 12                                   /* SIZE OF DATA FROM FTI TO src_rout */
+senddatasize ;                 /* SIZE OF MEWTOCOL FORMAT TEXT DATA */

        /* TRANSFER TO DESTINATION */
        if( (err = send(sno,(char *)&senddata,sendsize,0)) < 0 ){
                return( ERROR ) ; /* SEND ERROR */
        }

        /* RECEIVE RESPONSE FROM DESTINATION STATION */

                /* CALCULATE RECEIVED DATA SIZE */
```

```
        recvsize = 12                                   /* SIZE OF DATA FROM FTI TO src_rout */
            +6                      /* SIZE OF MEWTOCOL FORMAT RESPONSE */
                                   +2                                   /* SIZE OF BCC */
            +1 ;                            /* SIZE OF CR */

        if( (err = recv(sno,(char *)&recvdata,recvsize,0 )) < 0 ){
                return( ERROR ) ;                                                       /* RECEIVE ERROR */
        }

        /* SEARCH FOR DATA ADDRESS IN THE RESPONSE */
                switch( rp[3] ){
                case '$': /* NORMAL RESPONSE */
                        puts("OK") ;
                        break ;

                case '!':  /* ERROR RESPONSE IS RECEIVED */
                        puts("ERROR RESPONS RECEIVED") ;
                        printf("ERROR CODE %c%c\n",rp[4],rp[5] );
                        break ;

                default: /* SYSTEM ERROR (UNEXPECTED RESPONSE IS RETURNED) */
                        puts("SYSTEM ERROR ");
                        return( ERROR );
        }
        return( OK );
}


/* ======================================================
   = CALCULATE BCC
   =------------------------------------------------------
   =
   =   Input  unsigned char *data :TEXT OF DESTINATION MESSAGE
   =          int len DATA SIZE OF TEXT
   =
   =   Return   RESULT OF BCC CALCULATION
   =
   ====================================================== */
unsigned char BCC(data,len)
unsigned char *data ;
int len ;
{
        unsigned char ans ;
        for( ans = *data++ ; --len ;){
                ans ^= *data++ ;
        }
        return( ans );
}
```

■ Compile program for a UNIX computer

```
.c.o:
	cc -c -g $< -DBSD -DDEVICE=\"ie0\"

OBJS = fp3smp.o

fp3smp: $(OBJS)
	cc -O $(OBJS) -o $@
	chmod g+rwx $@

$(OBJS): $<
```

12-6. Table of FP3/FP10S Memory Areas

1. FP3

Item	Name and Function	Symbol	Numbering	
			10 k program capacity type	16 k program capacity type
External I/O relays	**External input relay** This relay feeds signals to the programmable controller from an external device such as a limit switch or photoelectric sensor.	X (bit)	2,048 points (X0 to X127F)	
		WX (word)	128 words (WX0 to WX127)	
	External output relay This relay outputs the program execution result of the programmable controller and activates an external device such as a solenoid or motor.	Y (bit)	2,048 points (Y0 to Y127F)	
		WY (word)	128 words (WY0 to WY127)	
Internal relays	**Internal relay** This relay does not provide an external output and can be used only within the programmable controller.	R (bit)	1,568 points (R0 to R97F)	
		WR (word)	98 words (WR0 to WR62)	
	Link relay This is a shared relay which is used within the link system.	L (bit)	1,024 points × 2 (L0 to L63F, L640 to L127F)	
		WL (word)	64 words × 2 (WL0 to WL63, WL64 to WL127)	
	Special internal relay This relay is a special internal relay which has specific applications. This relay cannot be used for output. Use it only as a contact.	R (bit)	176 points (R9000 to R910F)	
		WR (word)	11 words (WR900 to WR910)	
Timer/ Counter	**Timer contact** This contact is the output of a **TM** (Timer) instruction. If a **TM** instruction has timed out, the contact with the same number turns ON.	T (bit)	200 points (T0 to T199)	
	Counter contact This contact is the output of a **CT** (Counter) instruction. If a **CT** instruction has counted up, the contact with the same number turns ON.	C (bit)	56 points (C200 to C255)	
	Timer/Counter set value The timer/counter set value area is a memory area where the set value of the **TM/CT** (Timer/Counter) instructions is stored. Each timer/counter set value area consists of 1 word (1 word = 16 bits). The address of this memory area corresponds to the **TM/CT** instruction number.	SV (word)	256 words (SV0 to SV255)	

Notes:

- Timer/Counter contacts are represented in decimal.
- Word addresses are represented in decimal.
- The addresses for relay bits (X, Y, R and L) are represented by a combination of word addresses (decimal) and hexadecimals. The least significant digit is hexadecimal and the rest of the digits are decimal.

Item	Name and Function	Symbol	Numbering	
			10 k program capacity type	16 k program capacity type
Timer/ Counter	**Timer/Counter elapsed value** The timer/counter elapsed value area is a memory area where the elapsed value of the **TM/CT** (Timer/Counter) instruction is stored. Each timer/counter elapsed value area consists of 1 word (1 word = 16 bits). The address of this memory area corresponds to the **TM/CT** instruction number.	EV (word)	256 words (EV0 to EV255)	
Data area	**Data register** The data register is a memory area for data processed within the programmable controllers and each data register consists of 1 word (1 word = 16 bits).	DT (word)	2048 words (DT0 to DT2047)	
	Link data register This is a shared data memory which is used within the MEWNET link system. Data is handled in 16-bit (1-word) units.	LD (word)	128 words × 2 (LD0 to LD127 LD128 to LD255)	
	File register This is a data memory which is used from the program. Data is handled in 16-bit (1-word) units.	FL (word)	Max. 8,189 words (FL0 to FL8188)	Max. 22,525 words (FL0 to FL22524)
	Special data register The special data register is a memory area that has special applications.	DT (word)	256 words (DT9000 to DT9256)	
Index modifier	**Index register** The index register can be used as an address and constants modifier.	IX (word) IY (word)	One word each (No numbering system)	
Constant	**Decimal constants**	K	16-bit constant (word): K-32,768 to K32,767	
			32-bit constant (double word): K-2,147,483,648 to K2,147,483,647	
	Hexadecimal constants	H	16-bit constant (word): H0 to HFFFF	
			32-bit constant (double word): H0 to HFFFFFFFF	

Notes:

- Timer/Counter contacts are represented in decimal.
- Word addresses are represented in decimal.

2. FP10S

Item	Name and Function	Symbol	Numbering
External I/O relays	**External input relay** This relay feeds signals to the programmable controller from an external device such as a limit switch or photoelectric sensor.	X (bit)	4,096 points (X0 to X255F)
		WX (word)	256 words (WX0 to WX255)
	External output relay This relay outputs the program execution result of the programmable controller and activates an external device such as a solenoid or motor.	Y (bit)	4,096 points (Y0 to Y255F)
		WY (word)	256 words (WY0 to WY255)
Internal relays	**Internal relay** This relay does not provide an external output and can be used only within the programmable controller.	R (bit)	14,016 points (R0 to R875F)
		WR (word)	876 words (WR0 to WR875)
	Link relay This is a shared relay which is used within the MEWNET link system.	L (bit)	10,240 points (L0 to L639F)
		WL (word)	640 words (WL0 to WL639)
	Special internal relay This relay is a special internal relay which has specific applications. This relay cannot be used for output. Use it only as a contact.	R (bit)	176 points (R9000 to R910F)
		WR (word)	11 words (WR900 to WR910)
Timer/ Counter	**Timer contact** This contact is the output of a **TM** (Timer) instruction. If a **TM** instruction has timed out, the contact with the same number turns ON.	T (bit)	2,048 points (T0 to T1999)
	Counter contact This contact is the output of a **CT** (Counter) instruction. If a **CT** instruction has counted up, the contact with the same number turns ON.	C (bit)	2,048 points (C2000 to C2047)
	Timer/Counter set value The timer/counter set value area is a memory area where the set value of the **TM/CT** (Timer/Counter) instructions is stored. Each timer/counter set value area consists of 1 word (1 word = 16 bits). The address of this memory area corresponds to the **TM/CT** instruction number.	SV (word)	2,048 words (SV0 to SV2047)
	Timer/Counter elapsed value The timer/counter elapsed value area is a memory area where the elapsed value of the **TM/CT** (Timer/Counter) instruction is stored. Each timer/counter elapsed value area consists of 1 word (1 word = 16 bits). The address of this memory area corresponds to the **TM/CT** instruction number.	EV (word)	2,048 words (EV0 to EV2047)

Notes:

- Timer/Counter contacts are represented in decimal.
- Word addresses are represented in decimal.
- The addresses for relay bits (X, Y, R and L) are represented by a combination of word addresses (decimal) and hexadecimals. The least significant digit is hexadecimal and the rest of the digits are decimal.

Item	Name and Function	Symbol	Numbering
Data area	**Data register** The data register is a memory area for data processed within the programmable controllers and each data register consists of 1 word (1 word = 16 bits).	DT (word)	10,240 words (DT0 to DT10239)
	Link data register This is a shared data memory which is used within the MEWNET link system. Data is handled in 16-bit (1-word) units.	LD (word)	8,448 words (LD0 to LD8447)
	File register This is a data memory which is used from the program. Data is handled in 16-bit (1-word) units.	FL (word)	32,765 words (FL0 to FL32764)
	Special data register The special data register is a memory area that has special applications.	DT (word)	256 words (DT90000 to DT90255)
Index modifier	**Index register** The index register can be used as an address and constants modifier.	IX (word) IY (word)	One word each (No numbering system)
Constant	**Decimal constants**	K	16-bit constant (word): K-32,768 to K32,767
			32-bit constant (double word): K-2,147,483,648 to K2,147,483,647
	Hexadecimal constants	H	16-bit constant (word): H0 to HFFFF
			32-bit constant (double word): H0 to HFFFFFFFF

12-7. ASCII Code

b_7	b_6	b_5	b_4	b_3	b_2	b_1	ASCII HEX code		0	0	0	0	1	1	1	1
									0	0	1	1	0	0	1	1
									0	1	0	1	0	1	0	1
									Most significant digit							
									0	1	2	3	4	5	6	7
			0	0	0	0	Least significant digit	0	NUL	DLE	SPACE	0	@	P		p
			0	0	0	1		1	SOH	DC1	!	1	A	Q	a	q
			0	0	1	0		2	STX	DC2	”	2	B	R	b	r
			0	0	1	1		3	ETX	DC3	#	3	C	S	c	s
			0	1	0	0		4	EOT	DC4	$	4	D	T	d	t
			0	1	0	1		5	ENQ	NAK	%	5	E	U	e	u
			0	1	1	0		6	ACK	SYN	&	6	F	V	f	v
			0	1	1	1		7	BEL	ETB	’	7	G	W	g	w
			1	0	0	0		8	BS	CAN	(	8	H	X	h	x
			1	0	0	1		9	HT	EM	)	9	I	Y	i	y
			1	0	1	0		A	LF	SUB	*	:	J	Z	j	z
			1	0	1	1		B	VT	ESC	+	;	K	[	k	{
			1	1	0	0		C	FF	FS	,	<	L	\	l	|
			1	1	0	1		D	CR	GS	–	=	M	]	m	}
			1	1	1	0		E	SO	RS	.	>	N	^	n	~
			1	1	1	1		F	SI	US	/	?	O	_	o	DEL

12-8. Terminology

active open: One of connection opening methods for TCP/IP communication. To establish a virtual connection with another node, an active node must initiate an open call to a passive node.

address: An alphanumeric value that identifies where data is stored.

ambient temperature: The temperature of the air surrounding a system.

American Wire Gauge (AWG): A standard system used for designating the size of electrical conductors. Larger gauge numbers have smaller diameter.

AND: A Boolean operation that produces a logic “1” output if all inputs are “1”, and a logic “0” if any input is “0”.

ARP: Abbreviation for Address Resolution Protocol. This is used to transmit the Ethernet (physical) address, which is essential to Ethernet communication, by specifying the IP address. When communicating with a node address, whose Ethernet address is unknown, you only need to specify its IP address if the destination node has the ARP function.

ASCII: American Standard Code for Information Interchange. ASCII is normally used when alphanumeric (letters and decimal numbers) and control codes are sent as information to printers, etc. ASCII can be represented using 7 or 8 bits and is often expressed in a 2-digit hexadecimal form converted from specific binary expressions. ASCII expressed in 2-digit hexadecimals is called “ASCII HEX code”. For details about actual ASCII codes, refer to the table for ASCII.
[EXAMPLE] When a letter “M” is expressed in ASCII code:
7-bit ASCII : 1001101 (binary)
ASCII HEX code: 4D (hexadecimal)

asynchronous: Not synchronous. Repeated operations that take place in patterns unrelated over time.

AWG: See American Wire Gauge (AWG).

backplane: A printed circuit board located in the back of a chassis, that contains a data bus, power bus, and mating connectors for units. For FP3, FP5, FP10S and FP10 programmable controllers, two types of backplanes are available:
Master Backplane
Expansion Backplane

backup: A device that is kept available to replace something that may fail during operation.

baseband communication: A communication method which uses digital signals, without modulating them, in a complete bandwidth frequency.

battery backup: A battery or set of batteries that will provide power to the processor memory only when system power is lost. FP3 CPU, FP10S CPU, and S-RAM type IC cards have a battery backup system.

battery low:

A condition that exists when the backup battery voltage drops low enough to require battery replacement. For FP3 CPU, FP10S CPU, S-RAM and S-RAM/Flash-EEPROM type IC cards, the ERROR LED turns ON.

baud:

Formally defined as the shortest pulse width in data communication. However, usually used to refer to the number of binary bits transmitted per second (bps) during serial data communication.

BCC:

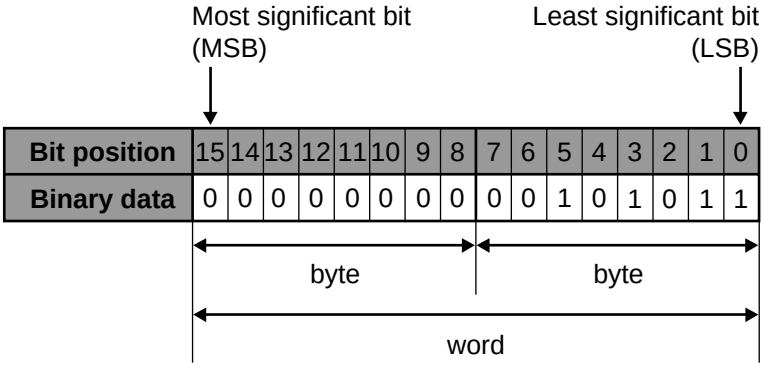
See Block Check Code

BCD:

See Binary Coded Decimal

binary:

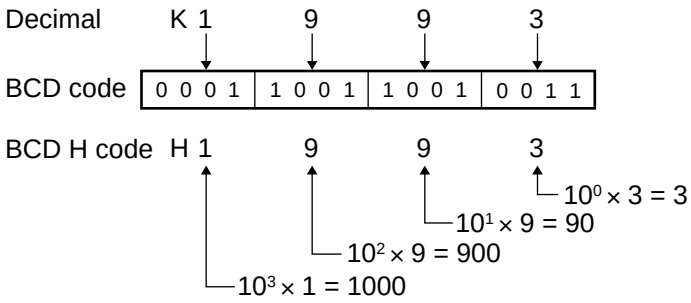
In general, programmable controllers work with binary numbers in one form or another to represent various codes or quantities. The binary number system uses the number 2 as the base and the only allowable symbols are “0” and “1”. There are no 2s, 3s, etc. Each digit of binary is called as “bit”. “Bit” means “binary digit”. A group of 8 bits is called a “byte” and a group of 16 bits (two bytes) is called a “word”.



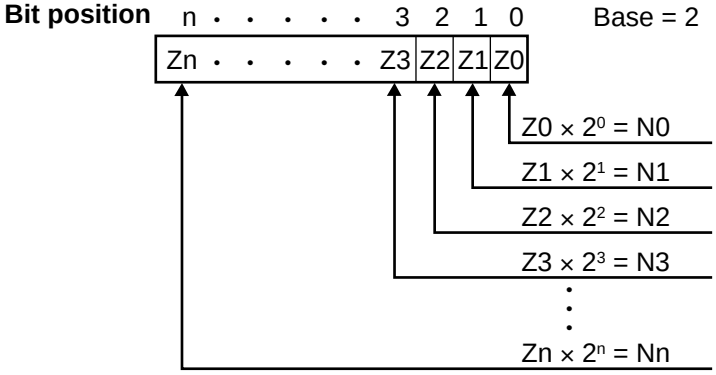
The binary number “0000000000101011” is expressed in decimal as follows:
$1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 0 \times 2^4 + 1 \times 2^5 + \cdots\cdots + 0 \times 2^{15}$
$= 1 + 2 + 0 + 8 + 0 + 32 + \cdots\cdots + 0$
$= 43$

Binary Coded Decimal (BCD): One of the codes expressed in binary. BCD is a binary code in which each decimal digit from 0 to 9 is represented by four binary digits (bits). The four positions have a weighted value of 1, 2, 4, and 8, respectively, starting with the least significant bit. A thumbwheel switch is specified as a BCD device, and when connected to a programmable controller, each decimal digit requires four inputs.
BCD is usually expressed grouping four bits as one digit in the same way as the hexadecimal constant H. **When BCD is grouped in four bit units, the BCD is expressed by adding the prefix H to the data. Since the weight of each BCD H code is same as that of decimals, be sure to pay attention not to be confused with hexadecimal numbers when BCD H code is handled.**

Example: When K1993 (decimal) is expressed in BCD.



binary number system: A number system that uses two symbols, “0” and “1”. Each digit position has a weighted value of 1, 2, 4, 8, 16, 32, 64, and so on begining with the least significant (right-most) digit.



The sum of N0 through Nn is the decimal equivalent of the number in base “2”.

Block Check Code (BCC): This code is used to detect errors in message transmissions. It is created by Exclusive ORing all of the codes from the header though the last text character, then translating the result (8-bit) data into two ASCII characters.

broadband communication: A communication method which modulates data, such as that for voice and video data transmission, into narrower bands for communication with different users.

buffer: A group of registers used for temporary data storage. This is used for data transmission and works effectively when there are transmission rate differences between sending and receiving devices.

bug: Software errors which will cause unexpected actions.

bus: Power distribution conductors.

Central Processing Unit: The Central Processing Unit is usually referred to as the CPU. The CPU controls system activities of the programmable controller.

character: A symbol such as a letter of the alphabet or decimal number. An ASCII character is most commonly used to express characters using binary.

complement: A logical operation that inverts a signal or bit. The complement of “1” is “0”, and the complement of “0” is “1”.

computer link: One of the communication methods between a computer and programmable controllers. In a computer link, the computer is the host, and it can control programmable controllers using a protocol. For FP series programmable controllers, communication between a computer and programmable controllers is performed using the MEWTOCOL-COM communication protocol. From the computer, you can read, write, or monitor data stored in the memory of a programmable controller.

connection: In data communication, a circuit between two data terminals.

CPU: See Central Processing Unit.

CRT: Abbreviation for cathode-ray tube.

data transfer: The data transfer function enables a programmable controller to send or get data to/from another programmable controller. This function is usually used between programmable controllers using the **F145 (SEND)/P145 (PSEND)** and **F146(RECV)/P146 (PRECV)** instructions through the link units. If you use this for communication with a computer, you need to prepare programs that conform to the MEWTOCOL-DAT format at the computer.

debug: Removing errors from a program.

decimal number system: The decimal number system uses the number 10 as the base and the allowable symbols are “0”, “1”, “2”, “3”, “4”, “5”, “6”, “7”, “8”, and “9”. Each digit position has a weighted value of 1, 10, 100, 1000, and so on, begining with the least significant (right-most) digit.

duplex: See full-duplex.

EEPROM: Electrically Erasable Programmable Read Only Memory. EEPROM can be programmed and erased by electrical pulses.

EPROM: Erasable Programmable Read Only Memory. EPROM can be reprogrammed after being entirely erased with the use of an ultra-violet light source.

FIFO: See First-In-First-Out.

First-In-First-Out: The order that data is written in, and read from registers.

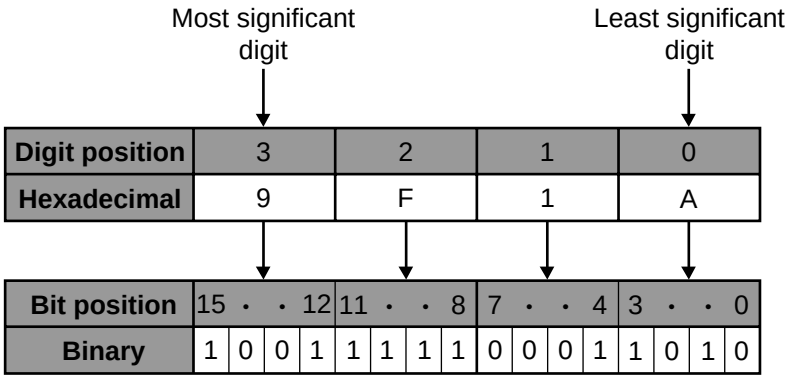
flag: A relay used to detect and remember certain events in the programmable controller. In FP series programmable controllers, some of the special internal relays are used as flags.

full-duplex: A communication link in which data can be transmitted and received at the same time.

half-duplex: A communication link in which transmission is limited to one direction at a time.

handshake communication: Data exchanges between two pieces of devices. For FP series programmable controllers, main signal exchanges between the CPU and the shared memory of intelligent units are referred to as handshake communication.

hexadecimal: The hexadecimal number system uses 16 as the base. The allowable symbols are numbers 0 through 9 and letters A through F. The letters are substituted for numbers 10 to 15, respectively, to represent all 16 numbers in one digit. The binary number system can easily be represented in hexadecimal with 4 bit groups. In this manner, a very large binary number can be represented by a hexadecimal number with significantly fewer digits.



hold: The memory area whose contents will not be lost or modified if operating power is lost or if the mode of the programmable controller is changed from RUN to PROG.

ICMP: Abbreviation for Internet Control Message Protocol. This is used to transmit an error message in a network. The FP3/FP10S ET-LAN unit supports the echo reply option to the ping command.

interrupt: The act of performing a more urgent task by putting off the presently executing task. FP series programmable controllers have three types of interrupts, as follows:
- input initiated interrupt
- high-speed counter initiated interrupt
- time initiated interrupt

I/O: Abbreviation of Input/Output.

I/O update: Taking the input data at the input interface into the memory for program execution and outputting the result of program execution to the output interface.

IP: Abbreviation for Internet Protocol. IP is used to transmit data in datagram units to a destination node specified by an IP address. It provides functions such as the dividing and reassembling of communication data, and communication services between networks via a router.

ladder diagram: A standard for representing relay-logic systems.

layer: The conceptual service groups in a network architecture hierarchy. (e.g., transport layer, network layer, data link layer, and physical layer, etc.)
In FP series programmable controller networks, the word layer is regarded as a subnetwork which should be accessed via relay stations.

LCD: Abbreviation for Liquid Crystal Display.

leading edge differential: A programming technique to operate a bit only for one scan at the moment its input condition turns ON from the OFF state.

Least Significant Bit (LSB): The bit which represents the smallest value in a byte, word, or double-word.

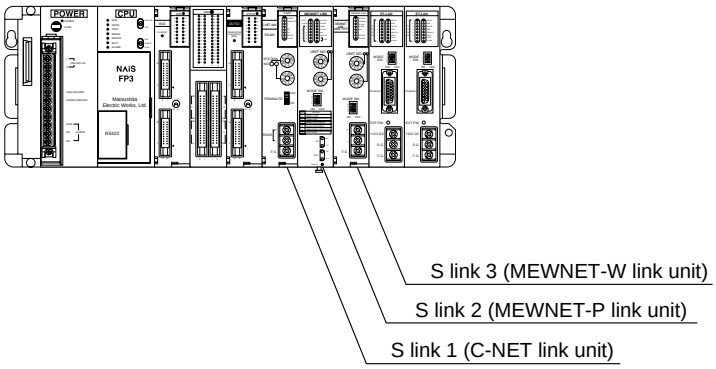
Least Significant Digit (LSD): The digit which represents the smallest value in a number.

LED: Abbreviation for Light-Emitting Diode.

link number: Link numbers are used for expressing the position of link units separately for the standard link system and high-level link system, starting from the link unit at the slot nearest to the CPU as follows:

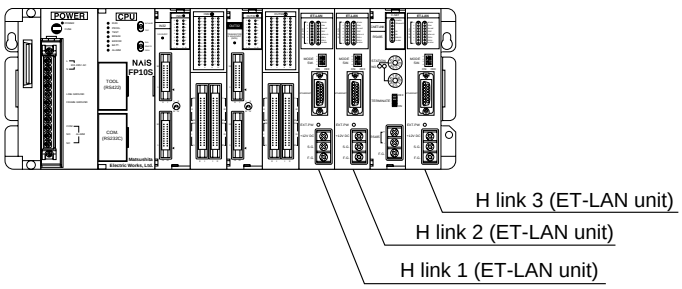
[Link number for standard link system]

- FP3: “S link 1”, “S link 2” and “S link 3”
- FP10S: “S link 1”, “S link 2”, “S link 3”, “S link 4” and “S link 5”



[Link number for high-level link system]

“H link 1”, “H link 2” and “H link 3”



link unit: Link units available for FP3 and FP10S are classified into two types: those for the “standard link system” and those for the “high-level link system”.
Units for the “standard link system” and “high-level link system” are listed as:
- Units for the standard link system:
  C.C.U. (Computer Communication Unit), C-NET Link Unit, MEWNET-P (Optical) Link Unit, MEWNET-W (Wire) Link Unit
- Units for the high-level link system:
  ET-LAN Unit, MEWNET-H Link Unit

malfunction: Incorrect function.

Master Control Relay: A relay which controls any series of programs with its operation. If the master control relay is de-energized, all of the contacts and devices controlled by the master control relay are de-energized.

MEWTOCOL-COM: A communication protocol for FP series programmable controllers that performs communication between a computer and programmable controllers.

modem: Abbreviation for MOdulator/DEModulator. The modem modulates digital signals and transmits them through a telephone line.

Most Significant Bit (MSB): The bit which represents the greatest value in a byte, word, or double-word.

Most Significant Digit (MSD): The digit which represents the greatest value in a number.

multidrop link: A communication link in which one host can communicate with two or more stations.

network: A group of nodes that use links to exchange information.

node: A communication station such as computer or programmable controller that is connected to a network.

noise: Random, unexpected electrical signals, that are caused by radio waves or by electrical or magnetic fields.

non-hold: The memory area whose contents will be lost or modified if operating power is lost or if the mode of the programmable controller is changed from RUN to PROG.

normally-closed contact: A contact which is closed when the coil of the relay is not activated.

normally-open contact: A contact which is open when the coil of the relay is not activated.

offline: Not being in continuous communication with another processor.

online: Being in continuous communication with another processor.

overflow: The act of exceeding the maximum limit in a registers capacity.

parity check: A check method for the number of 1s in a character when data communication is performed. The parity check is performed by calculating the number of ones in a character.

passive open:

One of connection opening methods for TCP/IP communication. To establish a virtual connection with another node, an active node must initiate an open call to a passive node. When using Ethernet, there are two passive open methods, unpassive and fullpassive.

PC link:

The term “PC link” means one of the link functions between programmable controllers that use specified relays and data registers. In the PC link, you do not have to make a complicated program for communications. The PC link function is available separately for the standard link system and the high-level link system as follows:

[PC link for standard link system]
In the standard link system, a maximum of two PC links are available per CPU using MEWNET-P (Optical) or MEWNET-W (Wire) link units. The two PC links for the standard link systems are called “PC link S0” and “PC link S1”. For each link communication, 1,024 points of link relays L and 128 words of link data registers LD are used for communications.
The PC link S0 and S1 allocations can be set using system register 46* as follows:

- when system register 46 = K0, between two MEWNET-P or MEWNET-W link units used for PC link, PC link S0 is assigned for the unit nearest to the CPU (unit with a smaller S link number).
- when system register 46 = K1, between two MEWNET-P or MEWNET-W link units used for PC link, PC link S0 is assigned for the unit farthest from the CPU (unit with a larger S link number).

* System register 46 is available for FP3C series with CPU version 4.4 or later and all FP10Ses.

[PC link for high-level link system]
In the high-level link system, a maximum of two PC links are available per CPU using MEWNET-H link units. The two PC links for the high-level link systems are called “PC link H0” and “PC link H1”. For each link communication, you can assign relays and registers used for link communications using setting tools.
The PC link H0 and H1 allocations are decided by the position of the MEWNET-H link units. Between the two MEWNET-H link units used for the PC link, PC link H0 is assigned for the unit nearest to the CPU (unit with a smaller H link number), and PC link H1 for the unit farthest from the CPU (unit with a larger H link number).

peripheral device:

Devices that are connected to the programmable controller.

PLC:

Abbreviation for Programmable Logic Controller. See programmable controller.

potentiometer:

A simple transducer which works based on resistance change.

programmable controller:

A control device which can be programmed to control process or machine operations. A programmable controller is often referred to as a PLC when abbreviated.

RAM:

Random Access Memory. RAM provides an excellent means for easily creating and altering a program. Many of the FP series programmable controllers use RAM with battery backup for the application memory.

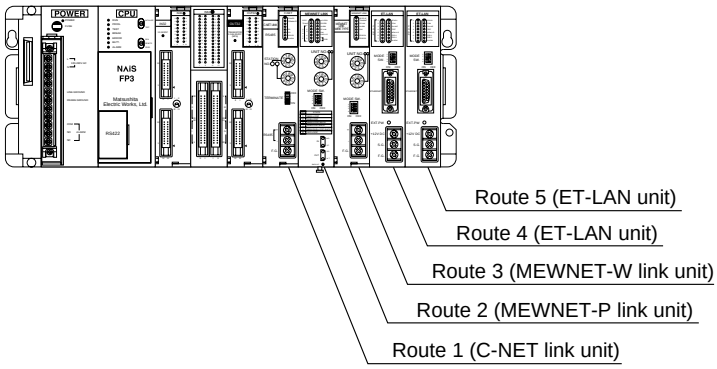
register: A unit of memory for various types of data. A register is usually 16 bits wide.

repeater: In an Ethernet LAN, a device that re-sends or relays a signal traveling along a LAN cable. It is used to overcome restrictions in segment length in the LAN.

ROM: Read Only Memory. See EEPROM and EPROM.

route number: Route numbers are used for expressing the position of standard and high-level link units together. This numbering system is used to perform communication over layers, such as when remote programming, etc. The route numberings are assigned starting from the link unit at the slot nearest to the CPU as follows:

- FP3: "route 1", "route 2", "route 3", "route 4", "route 5" and "route 6" including 3 standard link units and 3 high-level link units
- FP10S: "route1", "route 2", "route 3", "route 4", "route 5", "route 6", "route 7" and "route 8" including 5 standard link units and 3 high-level link units.



RS232C: An EIA communication standard for data transmission media that is less than 15 m. Most common serial communication standard.

RS422: An EIA communication standard for data transmission media.

rung: Term for a ladder program. A rung refers to the programmed instructions that drive one output.

scan: Time required to read all inputs, execute the program, and update local and remote information.

segment: In a network, this refers to a piece of coaxial cable that is closed on both ends by a terminator. The segment length is the distance between terminators and varies depending on the type of network.

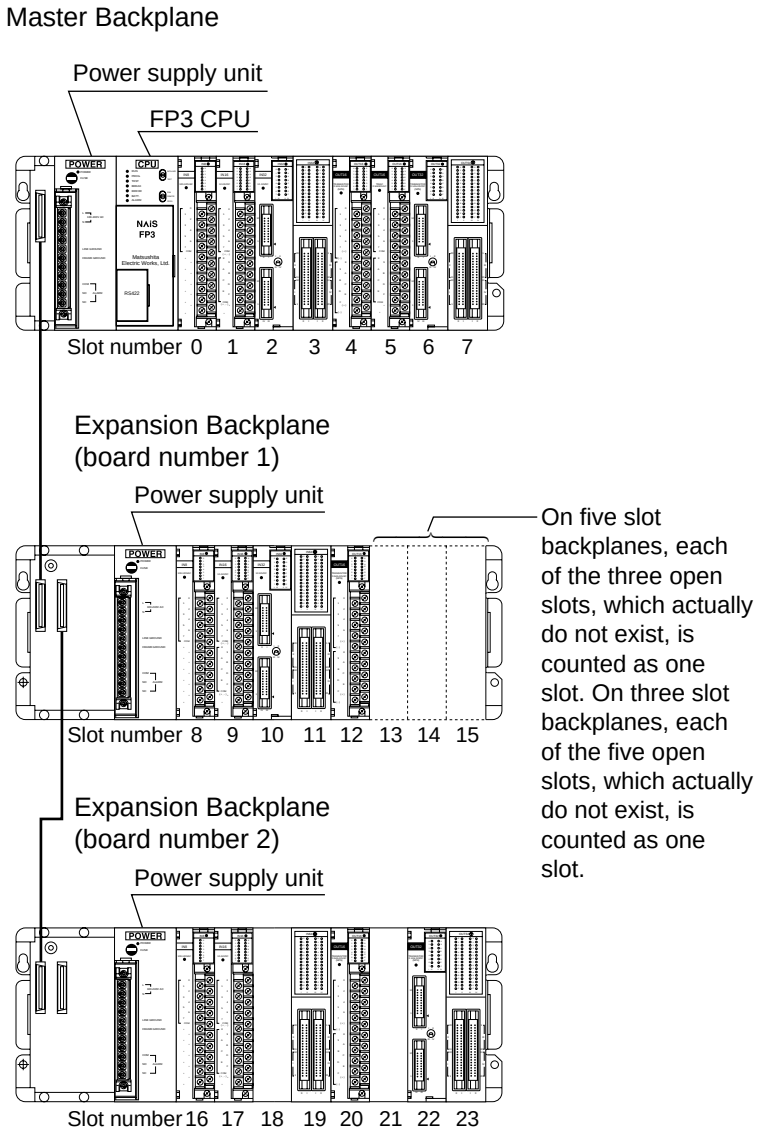
self-diagnostic function: A function within the programmable controller which monitors operation and indicates any fault that is detected.

serial communication: A communication style in which data is transmitted bit by bit serially.

shared memory: Memory that can be accessed by two or more pieces of devices. In FP series programmable controllers, some intelligent units have shared memory which can be accessed by both the CPU and the intelligent unit.

slot number:

Slot numbers are used for expressing the position of FP3/FP10S units except for the CPU and power supply unit. The slot numbers are assigned for each unit, starting from the unit in the slot nearest to the CPU. In the slot numbering system, all types of backplanes are regarded as the 8-slot type and the number is assigned in the order: CPU equipped master backplane, expansion backplane with board number 1, and then the expansion backplane with board number 2, starting from slot number 0.



stop bit:

The last bit when a character is transmitted.

subnet:

In TCP/IP communication, a part of a network specified by a part of the internet address.

system errors:

Errors resulting from the device or the environment.

system register:

The registers used only for system settings of the programmable controller.

TCP: Abbreviation for Transmission Control Protocol. This is a connection-based communication method. Since communication services including re-transmission, sequence and flow control for the communication data are provided, this protocol guarantees high communication reliability.

10 BASE 5 network: One of the CSMA/CD method networks which allows 10 Mbps baseband local area communication with a maximum segment length of 500 m. Usually referred to as Ethernet.

10 BASE T network: One of the CSMA/CD method networks which allows 10 Mbps baseband local area communication with twisted-pair cable.

10 BASE 2 network: One of the CSMA/CD method networks which allows 10 Mbps baseband local area communication with a maximum segment length of 200 m. Usually referred to as Cheapernet.

trailing edge differential: A programming technique to operate a bit only for one scan at the moment its input condition turns OFF from the ON state.

two's complement: A number system used to express positive and negative numbers in binary. In this system, the number becomes negative if the most significant bit of the data is "1". In FP series programmable controllers, numbers are expressed using the two's complement.

UDP: Abbreviation for User Diagram Protocol. This is a connectionless communication method. Since no re-transmission, sequence, or flow control for communication data is provided, support at the application level is required to guarantee communication reliability.

underflow: The act of going below the minimum limit in a register's capacity.

watchdog timer: A timer that monitors processing time of the programmable controller. If the program does not time out, the processor is assumed to be faulty.

word: A unit of bits which is usually executed at the same time. A word is composed of 16 bits.

12-9. Product Types

FP3 and FP10S programmable controllers are highly compatible in their hardware configurations. In this section, product types are introduced, classified into three parts:

- 1. Products for FP3
- 2. Products for FP10S
- 3. Products for FP3 and FP10S

1. Products for FP3

■ FP3 CPU

Type		Part number	Description
FP3 (without C) (ET-LAN unit not compatible.)	10 k-step type	AFP3210	RAM- or EPROM-based operation (EPROM optional)
		AFP3211	RAM- or EPROM-based operation (EPROM optional) with comment and trace memory
		AFP3212	RAM-based operation
FP3C	10 k-step type	AFP3210C	RAM-based operation with EPROM or EEPROM program storage option
		AFP3211C	RAM-based operation with EPROM or EEPROM program storage option and comment and trace memory
		AFP3212C	RAM-based operation
	16 k-step type	AFP3220C	RAM-based operation with EPROM or EEPROM program storage option

■ FP3 PID control software

Type	Part number	Description
FP3 PID Machine Language Package	AFP166548	A machine language module which makes PID control possible with an FP3 or FP-C programmable controllers.
FP3 PID Utility	AFP166558	This utility allows the setting of FP3 PID machine language package parameters and the monitoring of operation from a personal computer.

■ FP3 optional memory

Type	Part number	Description
Memory unit 16 k-step (EPROM 2pc in a set)	AFP5202	Memory used to store the program for driving the FP3. Write it with a commercially avialable ROM programmer.
Master memory 16 k-step (EEPROM 2pc in a set)	AFP5206	Memory used to store the master program for driving the FP3. Write it with a programming tool.

■ FP ROM writer

Type		Part number	Description
FP ROM Writer		AFP5651	ROM programmer used for programming the ROMs of FP series programmable controllers.
FP Peripheral Cable	0.5 m/1.6 ft.	AFP5520	Cable used for connection between the CPU programming tool port (RS422) and FP ROM writer.
	3 m/9.8 ft.	AFP5523	

2. Products for FP10S

■ FP10S CPU

Type		Part number	Description
FP10S CPU	30 k-step type	AFP6231	RAM-based operation with IC card program and data storage option.

■ Optional memory

Type		Part number	Description
S-RAM type IC Memory Card	256KB	AIC40200	Memory used to store the program for driving the FP10S or the data for FP10S. Battery backup random access memory.
	512KB	AIC40500	
	1MB	AIC41000	
Flash-EEPROM type IC Memory Card	256KB	AIC40002	Memory used to store the program for driving the FP10S or the data for FP10S. No battery backup required.
	512KB	AIC40005	
	1MB	AIC40010	
S-RAM/ Flash-EEPROM type IC Memory Card	RAM: 256KB ROM: 256KB	AIC40202	Memory used to store the program for driving the FP10S or the data for FP10S. - S-RAM: battery backup random access memory - Flash-EEPROM: no battery backup required
	RAM: 512KB ROM: 256KB	AIC40502	
	RAM: 1MB ROM: 256KB	AIC41002	

3. Products for FP3 and FP10S

■ Master backplane

Type	Part number	Description
3-slot type	AFP3505	In addition to slots for the CPU and the power supply unit, 3 slots are available for other units.
5-slot type	AFP3501	In addition to slots for the CPU and the power supply unit, 5 slots are available for other units.
8-slot type	AFP3502	In addition to slots for the CPU and the power supply unit, 8 slots are available for other units.

■ Expansion backplane

Type	Part number	Description
3-slot type	AFP3506	In addition to a slot for the power supply unit, 3 slots are available for other units.
5-slot type	AFP3503	In addition to a slot for the power supply unit, 5 slots are available for other units.
8-slot type	AFP3504	In addition to a slot for the power supply unit, 8 slots are available for other units.

■ Expansion cable

Type	Part number	Description
0.5 m/1.6 ft.	AFP3510	Cable used for connection between master and expansion backplanes or between expansion backplanes.
1 m/3.3 ft.	AFP3511	
3 m/9.8 ft.	AFP3513	
10 m/32.8 ft.	AFP35110	
15 m/49.2 ft.	AFP35115	
25 m/82.0 ft.	AFP35125	

Note:

• The limit on the length of the expansion cable between backplanes differs for the FP3 and the FP10S.
FP3: Max. 25 m/82 ft. between backplanes. Total 40 m/131 ft.
FP10S: Max. 15 m/49.2 ft. between backplanes. Total 30 m/98.4 ft.

■ Power supply unit

Type	Part number	Description
100 to 120 V AC/200 to 240 V AC operating type	AFP3631	Power supply to backplane: 2.4 A, 5 V DC External power supply: 0.8 A, 24 V DC
100 to 240 V AC operating type	AFP3636	Power supply to backplane: 6 A, 5 V DC External power supply: Not available
24 V DC operating type	AFP3634	Power supply to backplane: 2.4 A, 5 V DC External power supply: Not available
Power supply dummy unit	AFP3639	Used instead of power supply unit when an extra power supply is not needed for the expansion backplanes.

■ Input unit

Type		Part number	Description
DC input type	16-input screw terminal style	AFP33023	Input voltage: 12 to 24 V DC Sink/source input
	32-input connector style	AFP33024	Input voltage: 12 to 24 V DC Sink/source input
		AFP33014	Input voltage: 5 V DC Sink/source input
	64-input connector style	AFP33027	Input voltage: 12 to 24 V DC Sink/source input
		AFP33017	Input voltage: 5 V DC Sink/source input
AC input type	8-input screw terminal style	AFP33041	Input voltage: 100 to 120 V AC
		AFP33051	Input voltage: 200 to 240 V AC
	16-input screw terminal style	AFP33043	Input voltage: 100 to 120 V AC
		AFP33053	Input voltage: 200 to 240 V AC

■ Output unit

Type		Part number	Description
Relay type	16-output screw terminal style	AFP33103	2 A/point, 5 A/common, 250 V AC, 30 V DC without relay sockets
		AFP33203	2 A/point, 5 A/common, 250 V AC, 30 V DC with relay sockets
Transistor NPN open-collector type	16-output screw terminal style	AFP33483	0.1 A/point at 5 V DC, 0.5 A/point at 12 to 24 V DC
	32-output connector style	AFP33484	0.05 A/point at 5 V DC, 0.1 A/point at 12 to 24 V DC
	64-output connector style	AFP33487	0.05 A/point at 5 V DC, 0.1 A/point at 12 to 24 V DC
Transistor PNP open-collector type	16-output screw terminal style	AFP33583	0.1 A/point at 5 V DC, 0.3 A/point at 12 V DC, 0.5 A/point at 24 V DC
	32-output connector style	AFP33584	0.05 A/point at 5 V DC, 0.1 A /point at 12 to 24 V DC
	64-output connector style	AFP33587	0.5 A/point at 100 to 240 V AC
Triac type	16-output screw terminal style	AFP33703	Input voltage: 200 to 240 V AC

■ Maintenance parts

Type	Part number	Description
Lithium Battery	AFP8801	For FP3 CPU, FP10S CPU, Positioning Unit F type, and Data Memory Unit
	AFP8805	For data process unit
Fuse	AFP88021	2 A, for FP3 power supply units (AFP3631, AFP3634)
	AFP88032	5 A, for FP3 output unit (AFP33703)
	AFP88042	5 A, for FP3 output units (AFP33483, AFP33583)
Relay	PC1a-24V	For output unit (relay type)
Cover for FP3 I/O unit's I/O terminal block	AFP3801	2-step type
Dummy Unit	AFP3300	Cover for blank slot

■ Programming tools

FP Programmer Ⅱ

Type		Part number	Description
FP Programmer Ⅱ		AFP1114	Handheld programming device for FP series programmable controllers.
FP Peripheral Cable	0.5 m/1.6 ft.	AFP5520	Cable needed for connection between the CPU programming tool port (RS422) and the FP Programmer Ⅱ's communication port.
	3 m/9.8 ft.	AFP5523	

NPST-GR programming support tools

Type		Part number	Description
NPST-GR Software (Ver.3)		AFP266538	Program editing software used with commercially available computer (IBM PC-AT or 100% compatible)
FP Peripheral Cable	0.5 m/1.6 ft.	AFP5520	Cable needed for connection between the CPU port (RS422) and the RS422/232C adapter's RS422 port.
	3 m/9.8 ft.	AFP5523	
RS422/232C Adapter		AFP8850	RS422 ↔ RS232C signal converter Used for connection between the computer's RS232C port and the FP3/FP10S CPU programming tool port (RS422) when programming with the NPST-GR, etc.
RS232C cable		Needs to be made to match your computer	Cable needed for connection between the RS422/232C adapter's RS232C port and your computer. Refer to the wiring example on the next page.

RS232C cable example:

① RS422/232C adapter and IBM PC-AT (9 pin)

RS422/232C adapter (RS232C connector side, 25-pin male type)

Pin No.	Abbreviation
1	FG
2	SD (TXD)
3	RD (RXD)
4	RS (RTS)
5	CS (CTS)
6	DR (DSR)
7	SG
8	CD (DCD)
20	ER (DTR)

IBM PC-AT side (9-pin female type)

Pin No.	Abbreviation
1	CD (DCD)
2	RD (RXD)
3	SD (TXD)
4	ER (DTR)
5	SG
6	DR (DSR)
7	RS (RTS)
8	CS (CTS)
9	RI (CI)

② RS422/232C adapter and personal computer (25 pin)

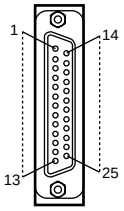
RS422/232C adapter (RS232C connector side, 25-pin male type)

Pin No.	Abbreviation
1	FG
2	SD (TXD)
3	RD (RXD)
4	RS (RTS)
5	CS (CTS)
6	DR (DSR)
7	SG
8	CD (DCD)
20	ER (DTR)

Personal computer side (25-pin female type)

Pin No.	Abbreviation
1	FG
2	SD (TXD)
3	RD (RXD)
4	RS (RTS)
5	CS (CTS)
6	DR (DSR)
7	SG
8	CD (DCD)
20	ER (DTR)

*RS232C interface connector pins of RS422/232C adapter (25-pin female type)



FP data access unit

Type		Part number	Description
FP data access unit		AFP1682	A unit for monitoring and changing data of FP series programmable controllers.
FP Peripheral Cable	0.5 m/1.6 ft.	AFP5520	Cable needed for connection between the CPU programming tool port (RS422) and the FP data access unit's communication port.
	3 m/9.8 ft.	AFP5523	

■ Standard link system

MEWNET-P (optical) link unit and peripherals

Type	Part number	Description
FP3 MEWNET-P (Optical) Link Unit	AFP3710	One of the standard link units Main functions: PC link S, data transfer, remote programming, computer link Fiber optics medium
Optical fiber cord	AFP4200***	***: 001 to 100 Length: 1 m/3.281 ft. to 100 m/328.084 ft. Example: AFP4200001: 1 m/3.281 ft. AFP4200100: 100 m/328.084 ft.
Optical fiber cable	AFP4402***	***: 001 to 800 Length: 1 m/3.281 ft. to 800 m/2624.672 ft. Example: AFP4402010: 10 m/32.808 ft AFP4402100: 100 m/328.084 ft.
RS232C Link Unit	AFP8760	Used as an interface for communication between an MEWNET-P (optical) link system and your computer when a computer link function is configured in the system.

MEWNET-W (wire) link unit

Type	Part number	Description
FP3 MEWNET-W (Wire) Link Unit	AFP3720	One of the standard link units Main functions: PC link S, data transfer, remote programming Communication medium: Twisted pair cable

C.C.U. (computer communication unit) and peripherals

Type	Part number	Description
FP3 C.C.U. (Computer Communication Unit)	AFP3462	One of the standard link units Main functions: computer link (1 computer: 1 programmable controller) Communication medium: RS232C cable
RS232C cable	AFB85833 AFB85853	Cable needed for connection between the C.C.U. RS232C port and your computer. Refer to wiring below.

C-NET link unit and peripherals

Type		Part number	Description
FP3 C-NET Link Unit		AFP3463	One of the standard link units Main functions: Computer link (1 computer: 1 programmable controller) Communication medium: 2-conductor cable or twisted pair cable
C-NET Adapter	100 V AC to 240 V AC	AFP8536	RS485 ↔ RS422/RS232C signal converter: Used for communication between the programmable controller and your computer. Communication medium: RS485 port: 2-conductor cable or twisted pair cable
	24 V DC	AFP8532	
RS232C cable		Needs to be made to match your computer	Cable needed for connection between the C-NET Adapter's RS232C port and your computer. Refer to wiring below.

RS232C cable example:

① C-NET adapter and IBM PC-AT (9-pin)

Connected to C-NET adapter (9 pins male)

Pin No.	Abbreviation
1	FG
2	SD (TXD)
3	RD (RXD)
4	RS (RTS)
5	CS (CTS)
6	RI (CI)
7	SG
8	CD (DCD)
9	ER (DTR)

Connected to computer (25 pins female)

Pin No.	Abbreviation
1	FG
2	SD (TXD)
3	RD (RXD)
4	RS (RTS)
5	CS (CTS)
6	DR (DSR)
7	SG
8	CD (DCD)
20	ER (DTR)

② C-NET adapter and personal computer (25-pin)

Connected to C-NET adapter (9 pins male)

Pin No.	Abbreviation
1	FG
2	SD (TXD)
3	RD (RXD)
4	RS (RTS)
5	CS (CTS)
6	RI (CI)
7	SG
8	CD (DCD)
9	ER (DTR)

Connected to IBM PC-AT (9 pins female)

Pin No.	Abbreviation
1	CD (DCD)
2	RD (RXD)
3	SD (TXD)
4	ER (DTR)
5	SG
6	DR (DSR)
7	RS (RTS)
8	CS (CTS)
9	RI (CI)

■ High-level link system

ET-LAN unit

Type	Part number	Description
FP3 ET-LAN Unit	AFP3790	High-level link unit for communications using TPC/IP or UDP/IP.

■ MEWNET-TR (remot I/O) system

Transmitter master unit

Type	Part number	Description
FP3 MEWNET-TR Transmitter Master Unit	AFP3750	Main function: Remote I/O control Communication medium: Twisted-pair cable

I/O transmitter unit and expansion FP I/O terminal unit

Type		Part number	Description
Input type FP I/O transmitter unit	4-input unit	AFP87525	Rated power supply voltage: 24 V DC Rated input voltage: 24 V DC Source input type
	8-input unit	AFP87521	
	16-input unit	AFP87522	
Output type FP I/O transmitter unit	4-output unit	AFP87527	Rated power supply voltage: 24 V DC Transistor NPN open collector output Max. 0.5 A/point, 1 A/ unit
	8-output unit	AFP87523	
	16-output unit	AFP87524	
FP I/O terminal unit input type (Expansion unit)	8-input unit	AFP87425	Rated power supply voltage: 24 V DC Rated input voltage: 24 V DC Source input type Used for both MEWNET-TR and MEWNET-F systems.
	16-input unit	AFP87426	
FP I/O terminal unit output type (Expansion unit)	8-output unit	AFP87427	Rated power supply voltage: 24 V DC Transistor NPN open collector output Max. 0.5 A/point, 1 A/unit Used for both MEWNET-TR and MEWNET-F systems.
	16-output unit	AFP87428	
FP I/O terminal unit expansion cable	0.08 m/0.26 ft.	APL2510	Used for connection between transmitter and expansion FP I/O terminal units. An APL2510 is attached to the expansion FP I/O terminal unit.
	0.28 m/0.91 ft.	APL2511	
	0.48 m/1.57 ft.	APL2512	

■ MEWNET-F (remote I/O) system

Master unit

Type	Part number	Description
FP3 Master Unit	AFP3742	Main functions: Remote I/O control, remote programming, memory access

Slave unit

Type	Part number	Description
FP3 Slave Unit	AFP3743	One of the slave stations

FP I/O terminal board and cables

Type		Part number	Description
FP I/O Terminal Board	MIL connector style	AFP87445	Power supply: 12 V DC Input: 16-point 12 V DC input power supply Output: 16-point transistor NPN open collector (0.2 A/12 V DC)
		AFP87446	Power supply: 24 V DC Input: 16-point 24 V DC input power supply Output: 16-point transistor NPN open collector (0.2 A/24 V DC)
	Screw terminal style	AFP87432	Power supply: 24 V DC Input: 16-point 24 V DC input power supply Output: 8-point relay (2 A/250 V AC, 2 A/30 V DC)
		AFP87444	Power supply: 24 V DC Input: 16-point 24 V DC input power supply Output: 16-point transistor NPN open collector (0.2 A/24 V DC)
I/O Cable	1 m/3.281 ft.	AFB8521	Cable for input connector (30 pins) For FP I/O terminal board (MIL connector style)
	2 m/6.562 ft.	AFB8522	
	3 m/9.843 ft.	AFB8523	
	4 m/13.123 ft.	AFB8524	
	1 m/ 3.281 ft.	AFB8531	Cable for Output connector (34 pins) For FP I/O terminal board (MIL connector style)
	2 m/6.562 ft.	AFB8532	
	3 m/9.843 ft.	AFB8533	
	4 m/13.123 ft.	AFB8534	
	1 m/3.281 ft.	APL9511	Cable for power supply connector Attached for FP I/O terminal bord (MIL connector style)
	1 m/3.281 ft.	AY15313	Cable for input terminals (30 pins) For PC terminal M type (screw terminal style)
	2 m/6.562 ft.	AY15315	
	3 m/9.843 ft.	AY15316	
	5 m/16.404 ft.	AY15317	
	1 m/3.281 ft.	AY15523	Cable for output terminals (34 pins) For PC terminal M type (screw terminal style)
	2 m/6.562 ft.	AY15525	
	3 m/9.843 ft.	AY15526	
	4 m/16.404 ft.	AY15527	

FP I/O terminal unit and cables

Type		Part number	Description
Primary FP I/O terminal unit input type	8-input unit	AFP87421	Rated power supply voltage: 24 V DC Rated input voltage: 24 V DC Source input type
	16-input unit	AFP87422	
Primary FP I/O terminal unit output type	8-output unit	AFP87423	Rated power supply voltage: 24 V DC Transistor NPN open collector output Max. 0.5 A/point, 1 A/unit
	16-output unit	AFP87424	
Expansion FP I/O terminal unit input type	8-input unit	AFP87425	Rated power supply voltage: 24 V DC Rated input voltage: 24 V DC Source input type Used for both MEWNET-TR and MEWNET-F systems.
	16-input unit	AFP87426	
Expansion FP I/O terminal unit output type	8-output unit	AFP87427	Rated power supply voltage: 24 V DC Transistor NPN open collector output Max. 0.5 A/point, 1 A/unit Used for both MEWNET-TR and MEWNET-F systems.
	16-output unit	AFP87428	
FP I/O terminal unit expansion cable	0.08 m/0.26 ft.	APL2510	Used for connection between primary and expansion FP I/O terminal units. An APL2510 is attached to the expansion FP I/O terminal unit.
	0.28 m/0.91 ft.	APL2511	
	0.48 m/1.57 ft.	APL2515	

FP1 I/O link unit and cables

Type		Part number	Description
FP1 I/O Link Unit	DC type	AFP1732	Power supply: 24 V DC
	AC type	AFP1736	Power supply: 100 V AC to 240 V AC
I/O Cable	0.07 m/0.230 ft.	AFP15101	Connection between FP1 I/O Link Unit and the FP1 Control Expansion Unit.
	0.30 m/0.984 ft.	AFP15103	
	0.50 m/1.640 ft.	AFP15105	

FP-M I/O link board

Type	Part number	Description
FP-M I/O Link Board	AFC1732	A board for exchanging I/O information between FP-C/FP3/FP5/ FP10S/FP10 and FP-M using the MEWNET-F network.

■ Intelligent units

Type		Part number	Description
A/D Converter Unit	4-channel type	AFP3400	Input range: ±10 V/+1 V to +5 V/±20 mA/+4 mA to +20 mA
	8-channel type	AFP3402	Input range: ±10 V
		AFP3403	Input range: +1 V to +5 V
		AFP3405	Input range: +4 mA to +20 mA
		AFP3406	Input range: +1 V to +5 V/+4 mA to +20 mA Isolated between channels
RTD Input Unit		AFP3421	4 channels, 3-wire Pt. 100/DIN compatible Temperature range: -100˚ to +200˚ C
Thermocouple Input Unit		AFP3420	4 channels, K- or J-type compatible Temperature range: K-type.....0˚ to +1,000˚ C J-type.....0˚ to +600˚ C
D/A Converter Unit	2-channel type	AFP3410	Output range: ±10 V/±20 mA
		AFP3411	Output range: +1 V to +5 V/+4 mA to +20 mA
		AFP3416	Output range: +1 V to +5 V Isolated between channels
		AFP3417	Output range: +4 mA to +20 mA Isolated between channels
	4-channel type	AFP3418	Output range: +1 V to +5 V Isolated between channels
		AFP3419	Output range: +4 mA to +20 mA Isolated between channels
High-speed Counter Unit	1-channel type	AFP3621	2-phase, 24 bits down counter 100 kcps/50 kcps/25 kcps/8 kcps selectable
	2-channel type	AFP3622	
Pulse Output Unit		AFP3480	200 Hz to 5 kHz/3 kHz to 40 kHz range selectable
Positioning Unit F Type	Single-axis type	AFP3431	400 points/axis, max. speed: 400 kpcs Quick start of less than 15 ms Linear and circular interpolation (dual-axis type)
	Dual-axis type	AFP3432	
	Teaching Unit Ⅱ	AFP5134	Programming tool of positioning unit
Interrupt Unit		AFP3452	8 interrupt triggers available
Serial Data Unit		AFP3460	Two RS232C ports available
Data Process Unit	Data Process Unit	AFP3461	Two RS232C ports available Written in BASIC language
	DP-Term Software	AFP866518	Terminal software for commercially available personal computer (IBM PC or 100% compatible)
Data Memory Unit		AFP32091	128 k word memory
		AFP32092	256 k word memory

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RECORD OF CHANGES

ACG No.	Date	Description of Changes
ACG-M0058-1	JUL. 1995	First edition

These materials are printed on ECF pulp.
These materials are printed with earth-friendly vegetable-based (soybean oil) ink.

Please contact .....

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