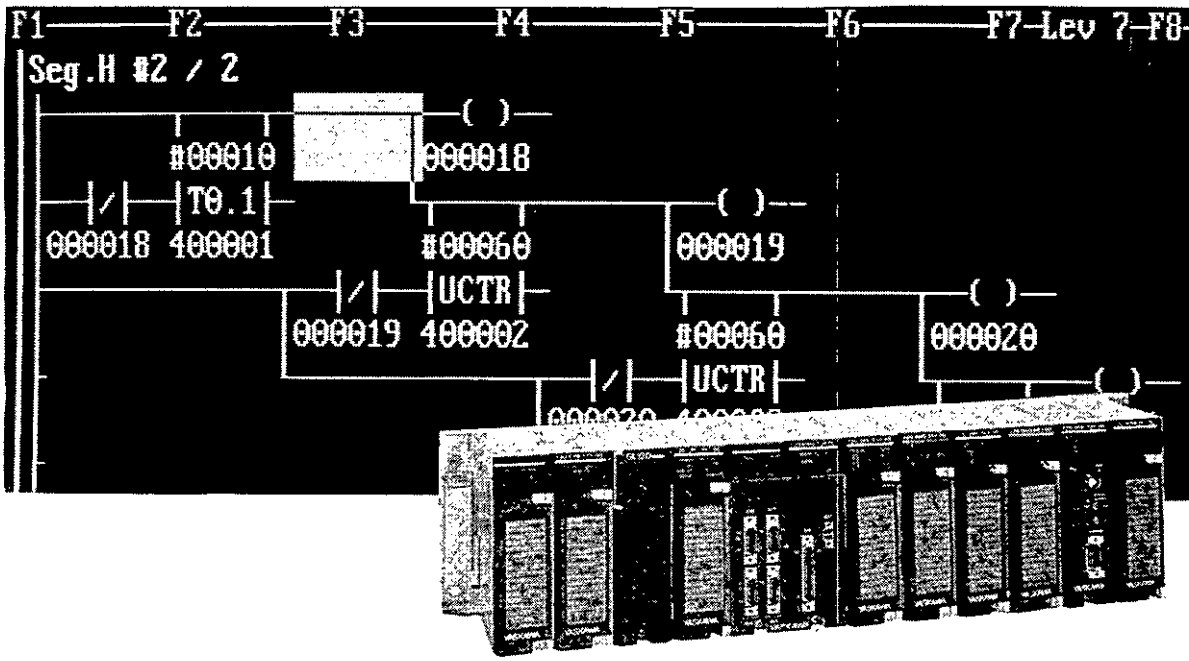
MEMOCON GL120, GL130

ETHERNET INTERFACE MODULE

USER'S MANUAL



YASKAWA

MANUAL NO. SIEZ-C825-70.21

Manual Contents

This manual describes specifications and applications of the MEMOCON GL120, GL130 Ethernet Interface Module.

Please read this manual carefully and be sure you understand the information provided before attempting to use an Ethernet Interface Module.

Visual Aids

The following aids are used to indicate certain types of information for easier reference.

Indicates references for additional information.

IMPORTANT — Indicates important information that should be memorized.

◀EXAMPLE▶ — Indicates application examples.

Indicates supplemental information.

SUMMARY — Indicates a summary of the important points of explanations.

Note — Indicates inputs, operations, and other information required for correct operation but that will not cause damage to the device.

Indicates definitions of terms used in the manual.

NOTICE

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in injury to people or damage to the products.

⚠ **WARNING** — Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.

⚠ **Caution** — Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

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CONTENTS

CONTENTS

Introduction and Precautions

This chapter introduces general information, including basic information and precautions for the use of this manual and the Ethernet Interface Module. **You must read this chapter before attempting to read the rest of the manual or using the product.**

I.1 Overview

- This manual provides the following information on the MEMOCON GL120, GL130 Ethernet Interface Module.
  - Functions and specifications
  - Setting communications parameters
  - Displaying communications status
  - Ladder logic instructions for Ethernet communications
  - Wiring
- Read this manual carefully in order to properly use the MEMOCON GL120, GL130 Ethernet Interface Module. Also, keep this manual in a safe place so that it can be used whenever necessary.
- This manual is written for Ethernet Interface Modules with the following model number: JAMSC-120NET12100.
- Setting communications parameter and displaying communications status are performed using the MEMOSOFT. MEMOSOFT version 1.41 or later support the Ethernet Interface Module. Be sure to use MEMOSOFT version 1.41 or later.

- Refer to the following related manuals as required.

Manual	Manual number	Contents
MEMOCON GL120, GL130 Hardware User's Manual	SIEZ–C825–20.1	Describes the system configuration, system components, functions, specifications, and installation of the GL120 and GL130.
MEMOCON GL130 CPU35 Module User's Manual	SIEZ–C825–20.1–3	Describes the functions, specifications, and usage of the CPU35 Module.
MEMOCON GL120, GL130 Software User's Manual, Volume 1	SIEZ–C825–20.11	Describes the following for the GL120 and GL130: 1) Operating principles 2) I/O allocation 3) Overview of instructions 4) Instruction processing times
MEMOCON GL120, GL130 Software User's Manual, Volume 2	SIEZ–C825–20.12	Describes the programming instructions used to create ladder logic programs for the GL120 and GL130. The following instructions and programming languages are described in other manuals. 1) Expansion Math Instructions 2) Process Control Instructions 3) Communications Instructions 4) Motion Control (Ladder Motion) Instructions 5) Motion Language
MEMOCON GL120, GL130 MEMOBUS User's Manual	SIEZ–C825–70.13	Describes the functions, specifications, and usage of the MEMOBUS.
MEMOCON GL120, GL130 P120 Programming Panel (MEMOSOFT) User's Manual	SIEZ–C825–60.7	Describes the functions, specifications, and usage of the P120 Programming Panel with MEMOSOFT.
MEMOCON GL120, GL130 MEMOSOFT for DOS User's Manual	SIEZ–C825–60.10	Describes the functions and operating procedures of the DOS version of MEMOSOFT.

- Thoroughly check the specifications and conditions or restrictions of the product before use.

- Registered Trademarks
  Ethernet is a registered trademark of the Xerox Corporation.
  MELSEC is a registered trademark of Mitsubishi Electric Co., Ltd.

I.2 Precautions

This section outlines general precautions that apply to using this manual and the product. **You must read this section first before reading the remainder of the manual.**

I.2.1 Safety Precautions

- The GL120, GL130 was not designed or manufactured for use in devices or systems directly related to human life. Users who intend to use the product described in this manual for special purposes such as devices or systems relating to transportation, medical, space aviation, atomic power control, or underwater use must contact Yaskawa Electric Corporation beforehand.

- This product has been manufactured under strict quality control guidelines. However, if this product is to be installed in any location in which a failure of the GL120, GL130 involves a life and death situation or in a facility where failure may cause a serious accident, safety devices MUST be installed to minimize the likelihood of any accident.

- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.

- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual. A new version of the manual will be released under a revised document number when any changes are made.

- Contact your Yaskawa representative or a Yaskawa office listed on the back of this manual to order a new manual whenever this manual is damaged or lost. Please provide the document number listed on the front cover of this manual when ordering.

- Contact your Yaskawa representative or a Yaskawa office listed on the back of this manual to order new nameplates whenever a nameplate becomes worn or damaged.

- Yaskawa cannot guarantee the quality of any products which have been modified. Yaskawa assumes no responsibility for any injury or damage caused by a modified product.

I.2.2 Installation Precautions

Abide by the following precautions when installing the Ethernet Interface Module.

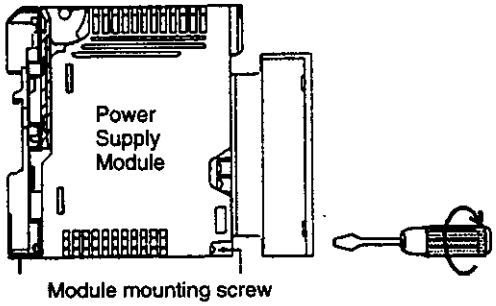
⚠ **Caution** The installation environment must meet the environmental conditions given in product catalogs and manuals. Using the Ethernet Interface Module in environments subject to high temperatures, high humidity, excessive dust, corrosive gases, vibration, or shock may lead to electrical shock, fire, or faulty operation. Do not use the Ethernet Interface Module in the following locations.

- Locations subject to direct sunlight or ambient temperatures not between 0 and 60 °C.
- Locations subject to relative humidity in excess of 95%, or condensation because of rapid changes in humidity.
- Locations subject to corrosive or flammable gas.
- Locations that would subject the GL120 and GL130 to direct vibration or shock.
- Locations subject to contact with water, oil, chemicals, etc.

⚠ **Caution** Install the GL120 and GL130 as described in this product manual. Improper installation may cause product failure, malfunctions, or Modules or other components to fall off.

⚠ **Caution** Make sure that all mounting screws are securely tightened.

Make sure that all installation screws for Modules or terminal blocks are securely tightened so that they do not become loose. Loose screws will cause failures in the GL120 and GL130.



I.2.3 Wiring Precautions

⚠ **Caution** Adequate safety precautions must be taken when connecting Ethernet. We recommend that Ethernet installation be performed by a qualified professional.

⚠ **Caution** Wiring must be performed by qualified personnel.

Wrong or inappropriate wiring may result in fire, failure, or electric shock.

⚠ **Caution** Care must be taken not to let foreign matter such as cable chips into the Mounting Bases or into the Modules.

Foreign matter in the Mounting Bases or Modules may cause fire, failures, and/or malfunctions.

⚠ **Caution** The Ethernet Interface Module is not protected from lightening surges, so do not wire overhead.

Lightening strikes may damage the product.

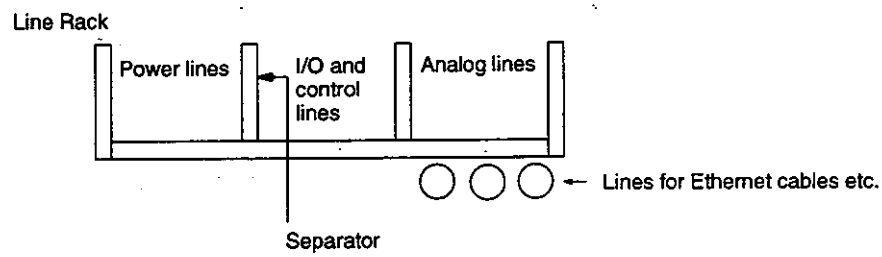
⚠ **Caution** Ground the protective ground terminal to a resistance of 100 Ω max.

Not grounding the protective ground terminal may result in electric shock or malfunction.

Select, Separate, and Lay External Wiring Correctly.

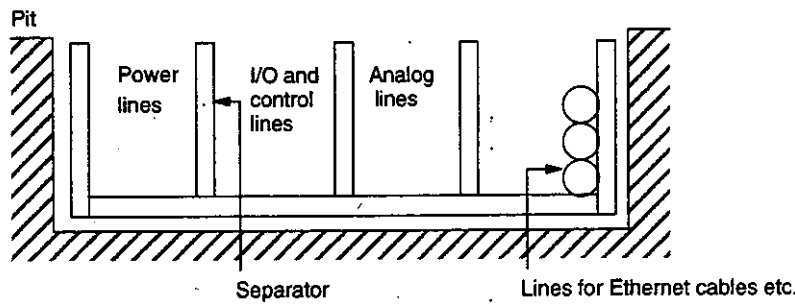
⚠ **Caution** I/O lines connecting the MEMOCON to external devices must be selected based on the following considerations: mechanical strength, resistance to noise, wiring distance, signal voltage, etc.

I/O lines must be separated from power lines both within and outside of the control panel to minimize the affects of noise. Faulty operation can result if I/O lines are not sufficiently separated from power lines.



⚠ **Caution** When wiring Ethernet cables outside of the control panel, place them in a duct or conduit by themselves to minimize the affects of noise.

Faulty operation can result if Ethernet lines are not sufficiently isolated.



Precautions for Connecting Interface Cables

⚠ **Caution** Do not use both 10Base5 or 10Base-T cables at the same time.

Using these cables together may damage the Ethernet Interface Module or cause malfunctions.

⚠ **Caution** MEMOBUS ports are used for future use, so do not connect interface cables to these ports.

Connecting Ethernet to MEMOBUS ports may cause faulty operation of the Ethernet Interface Module.

⚠ **Caution** Make sure that all interface cable connectors connected to the GL120 or GL130 are inserted properly and firmly secured.

If the connectors are not fully inserted, it may cause the GL120 or GL130 to malfunction.

I.2.4 Applications Precautions

⚠ **WARNING** Do not touch Module terminals while the power is turned ON.

Touching Module terminals may cause electric shock.

⚠ **WARNING** Construct an emergency stop circuit and an interlock circuit outside of the GL120, GL130.

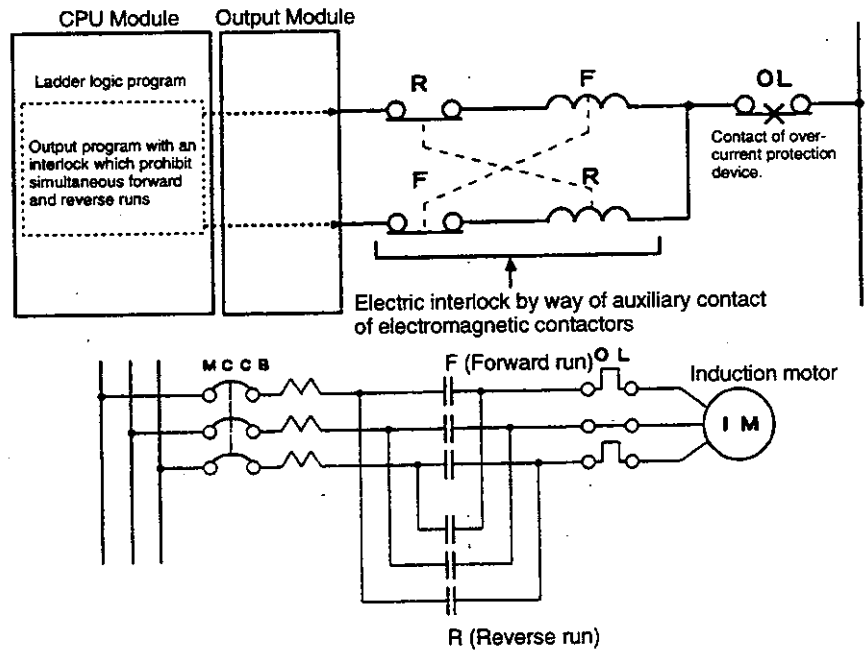
The absence of emergency stop and interlock circuits may result in machine damage or accidents should the GL120, GL130 fail.

External Interlocks for the GL120, GL130

Externally connect an interlock to the GL120, GL130 if there is any chance that GL120, GL130 failure could result in bodily harm or equipment damage.

Always use an external interlock system as shown in the following example when reciprocal operations (e.g., forward and reverse directions) are being performed with a motor.

An interlock is generally programmed in the GL120, GL130 to ensure that forward and reverse signals are not simultaneously output. An external interlock circuit must also be provided using the auxiliary contacts of electromagnetic contactors.



⚠Caution Operations such as RUN, STOP, forced outputs, and program changes during operation must be carried out with care.

Operational errors may damage the machine or cause accidents.

⚠Caution The Ethernet Interface Module can be used only if the CPU Module and the MEMOSOFT used for the MEMOCON GL120, GL130 are of the versions shown in the following table.

Using the wrong versions may result in failure or malfunction.

Name	Description	Model	Applicable Version	Location of Version Indication
CPU Module (16 kW)	CPU20	DDSCR-120CPU34100	□□B09 or later	Nameplate of the Module*
CPU Module (32 kW)	CPU30	DDSCR-130CPU54100	□□C03 or later	Nameplate of the Module*
CPU Module (40 kW)	CPU35	DDSCR-130CPU54110	□□A04 or later	Nameplate of the Module*
MEMOSOFT		FMSGL-AT3 (for DOS)	1.41□ or later	Bottom center of MEMOSOFT startup screen
		FMSGL-PP3E (for P120)		

Note The nameplate is attached to the right side of the Module.

Follow the Network Administrator's Instructions when Setting Communications Parameters

It is important when setting communications parameters, such as IP addresses and port numbers, that inconsistencies do not arise with settings on other nodes. For this reason, it is important to consult the network administrator when deciding parameter settings.

I.2.5 Maintenance

⚠Caution Do not attempt to disassemble or modify the Modules or Mounting Bases in any way.

Doing so can cause fires, product failure, or malfunctions.

I.3 Using this Manual

This Manual is compiled for readers who already have a basic knowledge of the Yaskawa MEMOCON products. We strongly recommend you read the *MEMOCON GL120, GL130 Hardware User's Manual* (SIEZ-C825–20.1) before you start reading this manual.

- **Meaning of Basic Terms**

  In this manual, the following terms are defined as follows, unless otherwise specified:

  - **EIF = Ethernet Interface Module**
  - **PLC = Programmable (Logic) Controller**
  - **PP = Programming Panel**
  - **GL120, GL130 = MEMOCON GL120 and/or MEMOCON GL130 Programmable Controller**

Overview

1

This chapter provides an overview of the Ethernet Interface Module.

1.1 Overview of the Ethernet Interface Module

This section provides an overview of the Ethernet Interface Module.

1.1.1 What is the Ethernet Interface Module?

The Ethernet Interface Module (Model: JAMSC-120NET12100) is an interface module used to connect a GL120, GL130-series PLC to an Ethernet network. By using this module, communications with other nodes on the network are possible using TCP/IP or UDP/IP protocol.

1.1.2 Ethernet Interface Module Features

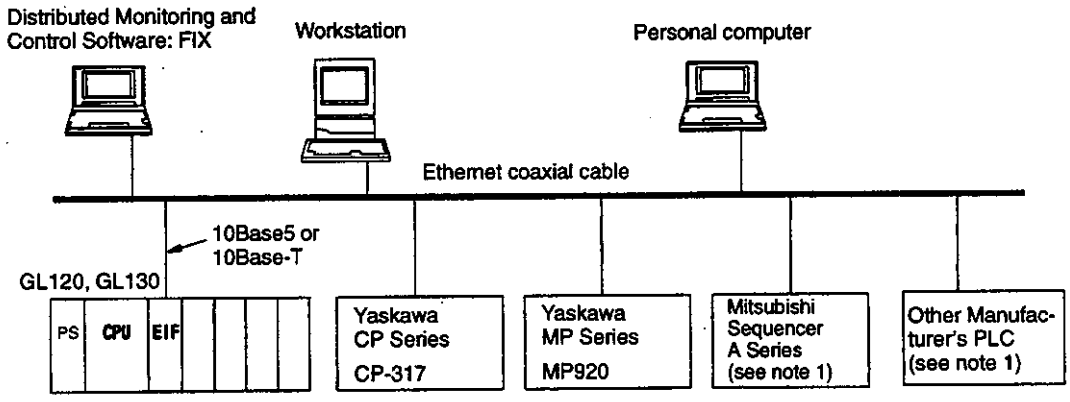
The features of the Ethernet Interface Module are as follows:

- An Ethernet network is an open system that allows the use of other manufacturer's PLCs together with Yaskawa system controllers on the same network, creating a flexible network configuration (see note).
- Communications with up to a maximum of 19 connections are possible with each Ethernet Interface Module.
- Communications are possible across Ethernet segments.
- Either 10Base5 or 10Base-T can be selected for Communications port.
- An external power supply is not needed.
- Special ladder logic instructions are provided for Ethernet communications.
- No communications program is necessary when the Module is used as a MEMOBUS Slave.
- Either binary or ASCII can be selected as the communications data type.
- Data transfers, data monitoring, and setting communications parameters are made easy with the use of MEMOSOFT Programming Software.

Note Communications functions for the Mitsubishi Sequencer or for other manufacturer's PLCs are currently under development.

1.1.3 Ethernet System Configurations

1) The following diagram shows an outline of an Ethernet system configuration. As shown in this diagram, communications between different controllers are possible via the open Ethernet transmission path.



PS: Power Supply Module
EIF: GL120, GL130 Ethernet Interface Module
Yaskawa CP Series: Large PLC series for factory control
Yaskawa MP Series: Machine Controller Series

Note (1) Communications functions for the Mitsubishi Sequencer or for other manufacturer's PLCs are currently under development.

(2) Ethernet is not recommended for transferring control signals of applications that require real-time capability. For these applications, we recommend either the PC Link or MEMOBUS PLUS network systems manufactured by Yaskawa.

⚠ Caution The Ethernet Interface Module can be used only if the CPU Module and the MEMOSOFT used for the MEMOCON GL120, GL130 are of the versions shown in the following table.

Using the wrong versions may result in failure or malfunction.

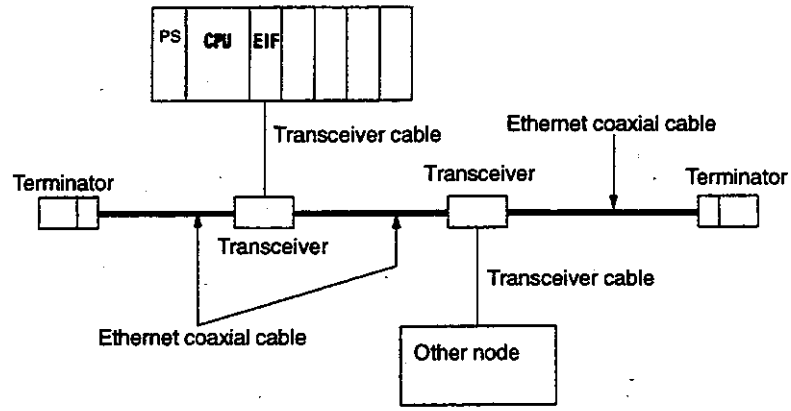
Name	Description	Model	Applicable Version	Location of Version Indication
CPU Module (16 kW)	CPU20	DDSCR-120CPU34100	□□B09 or later	Nameplate of the Module*
CPU Module (32 kW)	CPU30	DDSCR-130CPU54100	□□C03 or later	Nameplate of the Module*
CPU Module (40 kW)	CPU35	DDSCR-130CPU54110	□□A04 or later	Nameplate of the Module*
MEMOSOFT		FMSGL-AT3 (for DOS)	1.41□ or later	Bottom center of MEMOSOFT startup screen
		FMSGL-PP3E (for P120)		

Note The nameplate is attached to the right side of the Module.

2) The following examples show networks connected using 10Base5 and 10Base-T.

a) 10Base5 Connections

The following diagram shows Ethernet connections using the 10Base5 interface.

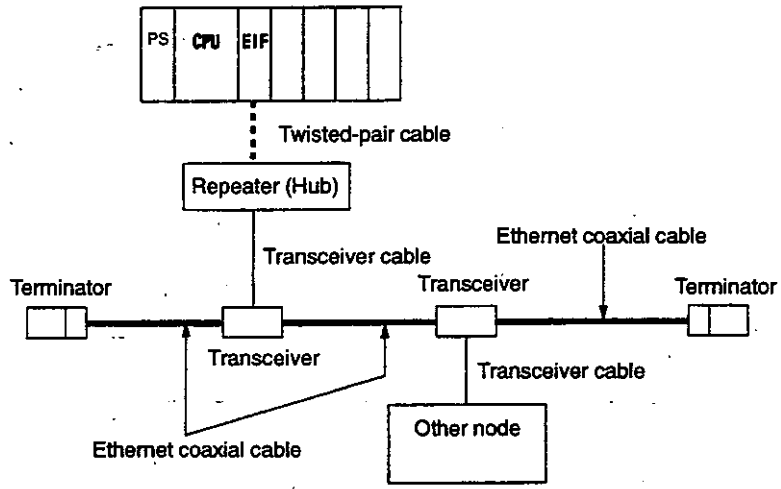


PS: Power Supply Module
EIF: Ethernet Interface Module
CPU: CPU20, CPU30, or CPU35 Module

(Three models of CPU Module are compatible with the Ethernet Interface Module: CPU20, CPU30, and CPU35.)

b) 10Base-T Connections

The following diagram shows Ethernet connections using the 10Base-T interface.



PS: Power Supply Module
EIF: Ethernet Interface Module
CPU: CPU20, CPU30, CPU35 Modules

(Three models of CPU Module are compatible with the Ethernet Interface Module: CPU20, CPU30, and CPU35.)

Components and Specifications

2

This chapter provides information on the components and specifications of the Ethernet Interface Module.

2.1 Components

This section describes the components of the Ethernet Interface Module.

2.1.1 Nomenclature

1) The following diagram shows the names of the Module's components.

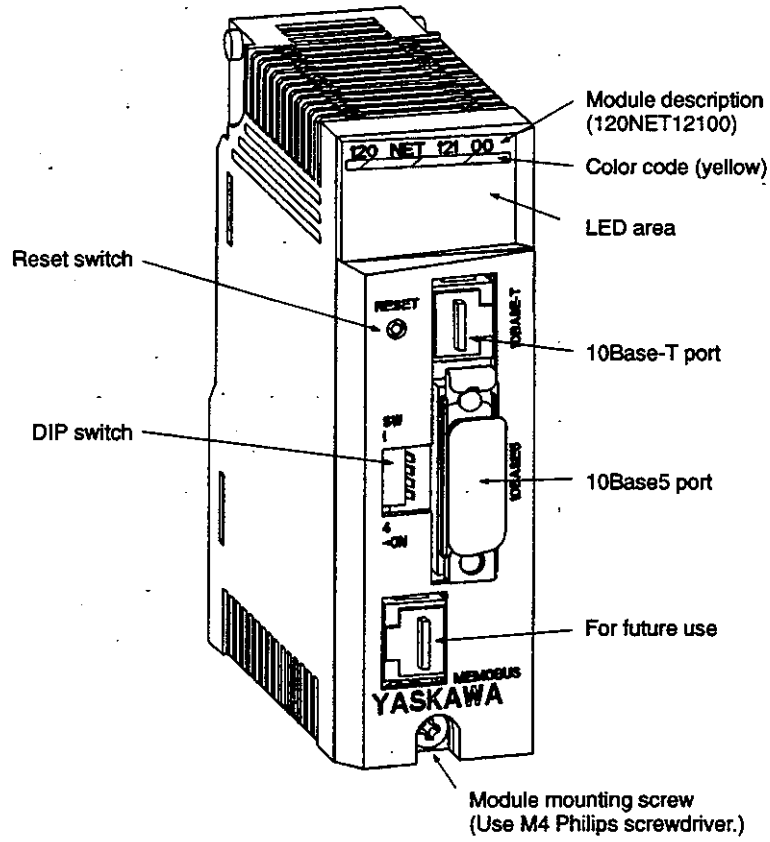
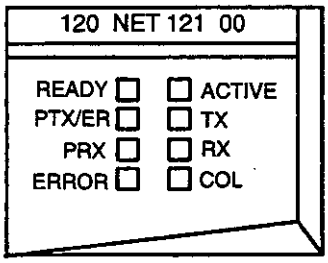


Figure 2.1 External Appearance of the Ethernet Interface Module

LED Area



LED	Color	Indication when ON
READY	Green	Ethernet Interface Module is normal.
ACTIVE	Green	Ethernet Interface Module is communicating with the CPU Module.
TX	Green	Ethernet Interface Module is sending data to the Ethernet network.
RX	Green	Ethernet Interface Module is receiving data from the Ethernet network.
COL	Red	A data collision occurred during Ethernet transmissions.
PTX/ER	Green	For future use.
	Red	For future use.
PRX	Green	For future use.
ERROR	Red	A transmission error occurred in the Module.

If an error occurs, the READY indicator will go OFF and the ERROR indicator will light or flash as described in the following table.

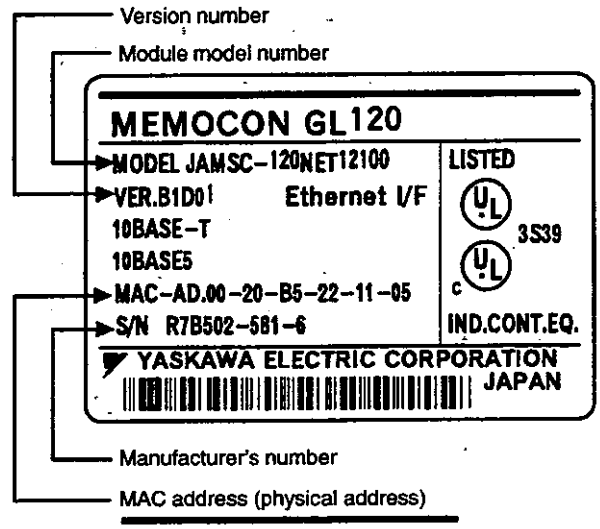
Error	ERROR Indicator Status
ROM error	The ERROR indicator will flash one time, go OFF for 1 s, and then repeat the cycle.
RAM error	The ERROR indicator will flash two times, go OFF for 1 s, and then repeat the cycle.
DPM error	The ERROR indicator will flash six times, go OFF for 1 s, and then repeat the cycle.
Watchdog timer error	The ERROR indicator will flash seven times, go OFF for 1 s, and then repeat the cycle.
Other error	The ERROR indicator will flash eight times, go OFF for 1 s, and then repeat the cycle.

2.1.2 Nameplate

1) The nameplate on the Ethernet Interface Module shows the model number, manufacturer's number, version number, and **MAC address (physical address)**.

2) The nameplate is attached to the right side of the Module.

3) An example of a nameplate is illustrated below.



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MAC address (physical address)

The MAC address is the hardware address of each device that becomes a node on a LAN. The MAC address is allocated to the Ethernet Interface Board inside the Module during manufacturing.

Although the IP address is used to designate the final destination, the MAC address is used to designate the network devices that must be passed through in order to reach the final destination.

2.2 Module Specifications

This section describes the specifications for the Ethernet Interface Module.

2.2.1 General Specifications

The general specifications of the Ethernet Interface Module are given in the following table.

Item		Specifications
Environment Conditions	Ambient Operating Temperature	0 to 60°C
	Ambient Storage Temperature	–25 to 85°C
	Ambient Operating Humidity	30% to 95% RH (with no condensation)
	Ambient Storage Humidity	5% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 according to JIS B 3501
	Corrosive Gas	No corrosive gas
	Operating Altitude	Less than 2,000 m above sea level
Mechanical Operating Conditions	Vibration Resistance	10 to 57 Hz with half-amplitude of 0.075 mm 57 to 150 Hz with fixed acceleration of 9.8 m/s^2 (1G) 10 sweep cycles in X, Y, and Z directions (sweep time: 1 octave/min) (according to JIS B 3502)
	Shock Resistance	Peak acceleration of 147 m/s^2 (15G) twice for 11 ms in ±X, ±Y, and ±Z directions (according to JIS B 3502)
Electrical Operating Conditions	Noise Resistance	1,500 V_{p-p} in either normal or common mode with pulse widths of 100 ns/1 µs and rise time of 1 ns (with impulse noise simulator) (according to JIS B 3502)
Dielectric Strength		Between primary side and internal circuits, or between primary and secondary sides: 1,500 VAC (for 1 min) or 1,800 VAC (for 1 s)
Insulation Resistance		Between primary side and ground: 100 MΩ min. via 500-VDC insulation resistance meter
Installation Requirements	Ground	Ground to 100 Ω or less (at room temperature and humidity)
	Configuration	Building-block structure Wall-mounted or DIN track-mounted
	Cooling Method	Natural cooling

2.2.2 Performance Specifications

The performance specifications for the Ethernet Interface Module are given in the following table.

Item		Specifications	
Name		Ethernet Interface Module	
Abbreviation		EIF	
Model Number		JAMSC–120NET12100	
Applicable CPU Modules		CPU20 (16 kW) (DDSCR–120CPU34100) CPU30 (32 kW) (DDSCR–130CPU54100) CPU35 (40 kW) (DDSCR–130CPU54110)	
Internal Current Consumption		10Base5: 1.5 A 10Base-T: 1.0 A	
Heating Value		7.5 W max.	
Hot Swapping (Removal/Insertion Under Power)		Permitted.	
Approximate Mass		300 g	
Dimensions (see note 1)		40.3 x 130 x 103.9 mm (W x H x D)	
Communications Specifications	Interface	10Base5	10Base-T
	Media Access Control Method	CSMA/CD	
	Baud Rate	10 Mbps	
	Modulation Method	Baseband	
	Max. Segment Length	500 m	100 m (Between hub (repeater) and node)
	Max. No. of Nodes	100 per segment (Within a coaxial segment)	2 per segment (Within a 10Base-T segment)
Protocol		TCP/IP or UDP/IP	
Data Type		ASCII or binary	
No. of Modules Mounted		1 per CPU Rack (a CPU Module mounted to a Mounting Base)	
External Power Supply		Not needed.	
Internal Power Supply (see note 2)		12 V, 500 mA for AUI	
External Connections		10Base5 port: AUI connector (with sliding lock) 10Base-T port: RJ-45 connector MEMOBUS port (not used): RJ-45 connector	

Note (1) The depth will be 112.0 mm if the terminal connected to the 10Base5 port on the Module is included.

(2) The power for the AUI (Attachment Unit Interface) is supplied from the GL120, GL130 Power Supply Module via the Ethernet Interface Module. No external power supply is required for the AUI.

⚠ Caution 10Base5 and 10Base-T cannot be used together. Doing so may damage the Ethernet Interface Module or cause malfunctions.

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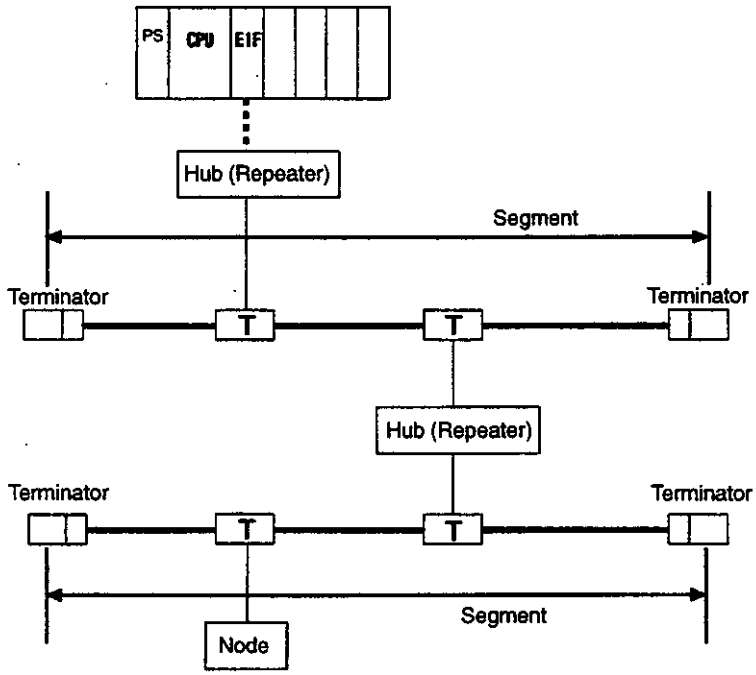
Segment

Segments are illustrated in the following diagram.



PS: Power Supply Module
EIF: Ethernet Interface Module
: Coaxial cable
: Transceiver cable
: Twisted-pair cable
T : Transceiver

2.3 Using Ethernet Interface Modules

This section provides instructions on how to use the Ethernet Interface Module, including communications port specifications and switch settings.

2.3.1 Mounting Location

1. Number of Units

One Ethernet Interface Module can be used for each CPU Module.

2. Location

The Ethernet Interface Module can be mounted to any slot on the Mounting Base of Rack 1 (the CPU Rack). It will occupy 1 slot of the Rack.

2.3.2 Communications Ports

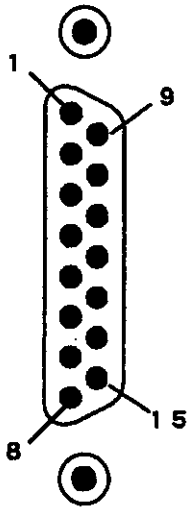
1) The Ethernet Interface Module has three communications ports: 10Base5 port, 10Base-T port, and the MEMOBUS port. The MEMOBUS port, however, is for future use. Do not use the MEMOBUS port.

2) The specifications for each port are described next.

a) 10Base5 Port

A transceiver cable (AUI) is used to connect the transceiver (MAU) to the 10Base5 communications port. A D-sub connector (15-pin, female) is used to connect the 10Base5 port. The connector pin arrangements and the signal names are shown in the following table.

Table 2.1 Pin Arrangement and Names of Signals for 10Base5 Ports

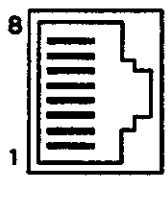


Pin	Symbol	Signal Name
1	CI–S	Control input circuit shield
2	CI–A	Control input circuit A
3	DO–A	Data output circuit A
4	DI–S	Data input circuit shield
5	DI–A	Data input circuit A
6	VC	Power supply common
7	Blank	Control output circuit A
8	CO–S	Control output circuit shield
9	CI–B	Control input circuit B
10	DO–B	Data output circuit B
11	DO–S	Data output circuit shield
12	DI–B	Data input circuit B
13	VP	Power supply positive
14	VS	Power supply shield
15	Blank	Control output circuit B
Shell	PG	Protective ground

b) 10Base-T Port

The 10Base-T port is used to connect the Module to the Ethernet via a Hub using a twisted-pair cable. An RJ-45 connector is used to connect to this port. The connector pin arrangements and the signal names are shown in the following table.

Table 2.2 Pin Arrangement and Names of Signals for 10Base-T Ports



Pin	Symbol	Signal Name
1	TXD+	Transmission data+
2	TXD–	Transmission data–
3	RXD+	Reception data+
4	–	Not used.
5	–	Not used.
6	RXD–	Reception data–
7	–	Not used.
8	–	Not used.

2.3.3 DIP Switch

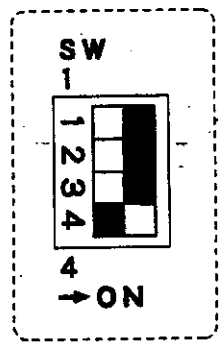
1) The DIP switch is used to select between the RUN and Self-diagnosis modes, or to select a communications port.

2) The DIP switch is used as described below.

a) The DIP switch has 4 pins. The pins are numbered from 1 to 4 as shown in the diagram.

b) Each pin is turned ON when pressed it to the right.

c) Each pin becomes effective (i.e., the setting is read) when the power is turned ON to the Power Supply Module of Rack 1 (CPU Rack) or the Reset Key is pressed. The power must be turned OFF and ON again before a new setting will be used.



3) Each pin's function is shown in the following table.

Table 2.3 Functions of the DIP Switch

Pin	Settings	Function
1	ON	Sets Module to Self-diagnosis mode. (Not normally used.)
	OFF	Sets Module to RUN mode.
2	ON	Selects the 10Base5 port.
	OFF	Selects the 10Base-T port.
3	ON	For future use. (Leave set to OFF.)
	OFF	
4	ON	For future use. (Leave set to OFF.)
	OFF	

⚠ **Caution** The 10Base5 port and 10Base-T port cannot be used at the same time. Use the port selected using DIP switch pin 2. Using the ports at the same time may damage the Ethernet Interface Module or cause malfunctions.

2.3.4 Reset Switch

1) Press the reset switch in the following cases:

- When the DIP switch settings have been changed.
- When errors have occurred.
- When communications parameters are changed for the local node.

2) When the reset switch is pressed, communications between the Ethernet Interface Module and connected devices will be interrupted. Communications will restart when the switch is released.

Communications Parameters and Status

3

This chapter provides details on Ethernet communications parameters and communications status indicators.

3.1 Overview

This section provides an overview of the parameter settings necessary to operate the Ethernet Interface Module and the communications status used to monitor communications.

3.1.1 Communications Parameter Settings and Communications Status Displays

Both communications parameter settings and communications status monitoring are performed using the MEMOSOFT. For details on operations, see *Chapter 4 Setting Communications Parameters and Displaying Status*.

- Communications parameters are set using two screens: the Local Communications Parameters Screen and the Host Communications Parameters Screen.
- The communications status with other nodes can be monitored from the Ethernet Communications Status Screens.

3.1.2 Communications Parameters

In order to use the Ethernet Interface Module to communicate with other nodes, it is necessary to set the communications parameters. The setting items for parameters are described below.

1) Local Communications Parameters

Sets parameters for the local node, such as the local IP address, subnet mask, etc.

2) Host Communications Parameters

Sets parameters for Hosts, such as host IP addresses, host port numbers, etc. Up to 19 nodes (connections) can be set. Connections 1 to 15 are for user program ladder logic instructions, such as ETMS, ETUS, and ETUR, and for slave communications that do not use functions. To use functions, use the corresponding host connection number. Connections 16 to 19 are used exclusively for MEMOBUS protocol slave communications. Ladder logic instructions cannot be used for connections 16 to 19.

If the local node port number is set to 0 for a connection, that connection will be defined as "not used" and nothing will be displayed in the connection parameter column on the MEMOSOFT for that connection.

3.1.3 Communications Status

The Ethernet Communications Status Screens display the status of connections 1 to 19 and other information, such as the local node's MAC address, the IP address, etc. Information is not displayed on connections for which the Host Communications Parameters have not been set (i.e., for those with a local port number of 0).

3.2 Communications Parameters

This section provides details on the parameters necessary for operating the Ethernet Interface Module.

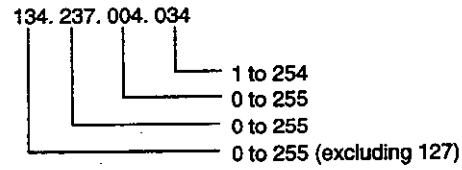
3.2.1 Local Communications Parameters

The local communications parameters are described below.

1) Local Setup, IP Address

Sets the IP address for the local node. Set the IP addresses so that no two nodes on the Ethernet network have the same address. An IP address consists of a 32-bit string divided into 8-bit sections by dots and displayed as four decimal numbers.

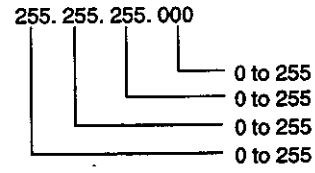
Setting Example



2) Local Setup, Subnet Mask

Sets the subnet mask for the local node's IP address. It consists of a 32-bit string divided into 8-bit sections by dots and displayed as four decimal numbers.

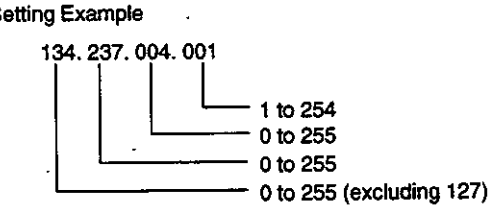
Setting Example



3) Local Setup, Gateway Address

Sets the gateway IP address for use when communicating with another network via a gateway. It consists of a 32-bit string divided into 8-bit sections by dots and displayed as four decimal numbers.

Setting Example



4) Local Setup, Diagnosis Port

The diagnostic port is not used. When using port number 10000 on the user's side, change the system diagnostic port to a number not used by another port.

5) MEMOBUS Setup, Response Wait Time

Sets the response wait time for the ETMS (ETHERNET MASTER instruction) ladder logic instruction. If a timeout occurs before a response has been returned from the Host, the data will be resent. (The number of retries can be set using *6) MEMOBUS Setup, Retry Count.*)

6) MEMOBUS Setup, Retry Count

Sets the number of retries when a timeout occurs during communications using the ETMS (ETHERNET MASTER instruction) ladder logic instruction. If there is still no response after the data has been sent by the set number of retries, an error response will be returned for the ETMS ladder logic instruction.

When the response wait time is set to 0, the number of retries will also be set to 0 and the response monitoring time will be infinite.

3.2.2 Host Communications Parameters

1) CNO: Connection Number

When the Ethernet Interface Module is used for communications, Hosts are distinguished by their connection number. The range of numbers is 1 to 19.
Connections 1 to 15 are used for user program ladder logic instructions, such as ETMS, ETUS, and ETUR, and for slave communications that do not use functions. Connections 16 to 19 are used exclusively for slave communications using MEMOBUS commands, so function instructions cannot be used.

Connection

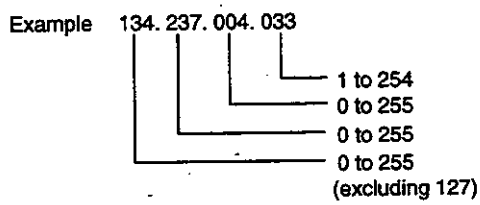
In order to perform 1-to-1 communications between the local program and a Host program, both nodes perform a series of checks to ensure that data is transferred. With connection-oriented protocols, a range of checks are performed, such as checking data has been sent, detection and troubleshooting of errors, checking sequence numbers, and controlling the volume of transmission data. These checks make very reliable communications possible. With connectionless protocols, there are no procedures for ensuring the quality of communications; they only send data. These protocols can perform high-speed communications, as they only perform very simple data processing, but they are less reliable.
TCP is a connection-oriented protocol and UDP is a connectionless protocol. In general, TCP should be selected to ensure reliable communications and UDP should be selected when high-speed communications are required.

2) Local Port

Sets the local port number for the connection. Set local port numbers so that each port is used for only one connection. Do not set the same port number as that of the diagnostic port. When the local port number is set to 0, that connection will be defined as "not used."

3) Host IP Address

Sets the IP address of the host. An IP address consists of a 32-bit string divided into 8-bit sections by dots and displayed as four decimal numbers. As with *4) Host Port*, if host IP address is set to 0, the connection will be set to the Unpassive Open Mode.



4) Host Port

Sets the host port number. Set the host port number so that the same combination of host IP address and host port number is not used for another connection. As with *3) Host IP Address*, if the host number is set to 0, the connection will be set to the Unpassive Open Mode.

INFO

Unpassive Open Mode

If both the host IP address and the host port number are set to 0, the resulting settings will be as follows:

- Host IP Address: 000.000.000.000
- Host Port Number: 0

The connection will be set to the Unpassive Open Mode and will be made to any node that requests connection for that connection number. If several nodes attempt to connect to the same Unpassive Open Mode connection, the first node to request connection will be connected, but the connection will then be switched to the next node requesting connection. In short, the connection will be switched between nodes as they request connection.

Unpassive Open Mode is used for a slave node and thus cannot be used for the master instructions ETMS and ETUS.

TERMS

Port number

A port number identifies which program is to be used for the local/host Communications. The port number and the communications program correspond 1-to-1.

5) Connection Type

Each connection has a specified transport layer protocol. Either TCP or UDP can be specified.

6) Application Protocol

Each connection has a specified application protocol. Set according to the host protocol used as follows:

MEMOBUS:	MEMOBUS protocol
MEMO-EX:	MEMOBUS expansion protocol
MELSEC:	MELSEC protocol (see note)
THROUGH:	No protocol is used.

Note The MELSEC protocol is currently under development and cannot be selected.

IMPORTANT **Ladder Logic Instructions and Protocols**

Ladder logic instructions all use specific protocols.

(1) The ETHERNET MASTER Instruction (ETMS): MEMOBUS protocol, MEMOBUS expansion protocol, MELSEC protocol.

(2) Ethernet User-set Protocol Communications

- ETHERNET USER SEND instruction (ETUS): THROUGH (no protocol used.)
- ETHERNET USER RECEIVE instruction (ETUR): THROUGH (no protocol used.)

(3) Ethernet Slave Communications (Ladder logic instructions not used.)

- Connections 1 to 15: MEMOBUS protocol, MEMOBUS expansion protocol, MELSEC protocol
- Connections 16 to 19: MEMOBUS protocol

7) Code

The communications data type is set for each connection. Either ASCII or RTU can be specified.

8) Host MAC Address

When the host does not support the **ARP (Address Resolution Protocol)**, the host's Ethernet address is specified. When the host does support ARP, 00:00:00:00:00:00 is set.

Note If any of the values set for the Host Communications Parameters are not compatible, the setting cannot be saved. Refer to *3.2.3 Checking Compatibility of Connection Parameters* when inputting the parameters.

ARP: address resolution protocol

ARP is a protocol used to determine the MAC address (physical address), using the specified IP address of a node. Using ARP, the user can perform communications simply by specifying the host IP address.
The ARP first broadcasts a message requesting the MAC address of the node with a specified IP address. The node with the specified IP address then responds with the MAC address information, making data communications possible between the two nodes.

3.2.3 Checking Compatibility of Connection Parameters

Connection parameters have the following limitations. Refer to these items when setting parameters.

1) Local Port Duplication

The same combination of local port number and connection type must not set for more than one connection.

2) Diagnosis Port

The local port number must not be the same as the diagnostic port number for any TCP connection.

3) Open Modes

If all parts of the host IP address are 0, the host port number will be 0 and the MAC address will also be 0.

4) Host Port Duplication

The same combination of host IP address, host port, and connection type must not be used for more than one connection. If both the host IP address and the host port are 0 however, this restriction does not apply.

5) MAC Address

The host IP address must also be the same for all connections that have the same MAC address. If the MAC address is 0 (when ARP is used), however, this restriction does not apply.

6) Network

When a gateway is not used, the local IP address masked with the subnet mask must have the same network address as each host IP address.

3.3 Communications Status

This section describes the Communications Status Screens used to monitor communications status.

Communications status is described below.

1) CNO: Connection Number

The connection number is used to distinguish hosts when the Ethernet Interface Module is used for communications. The range is 1 to 19.

2) Local IP Address

Displays the local node's IP address.

3) Subnet Mask

Displays the subnet mask for the local IP address.

4) Gateway IP Address

Displays the gateway IP address.

5) Diagnostic Port Number

Displays the diagnostic port number set in the Local Communications Parameters.

6) Local MAC Address

Displays the MAC address of the local node. A MAC address consists of 48 bits (6 bytes). This address is divided into 8-bit sections by colons and is displayed in hexadecimal.
Example: 00:20:B5:00:01:00

7) Communications Status

The communications status displays the status of each port.

a) For connections 1 to 15, the status is displayed as follows:

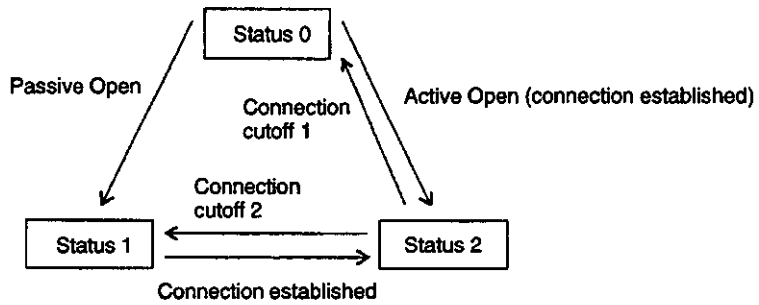
Displayed Value	TCP	UDP
0	The parameters have been set but data is not ready for transmission.	
1	Waiting for connection to be established.	Not used.
2	Data transfer is possible. (Connection has been established.)	Data transfer is possible.
---	Not used. (When the local port number is set to 0.)	

b) For connections 16 to 19, the status is displayed as follows:

Displayed Value	TCP	UDP
0	Not used.	
1	Waiting for connection to be established.	Not used.
2	Data transfer is possible. (Connection has been established.)	Data transfer is possible.
—	Not used. (When the local port number is set to 0.)	

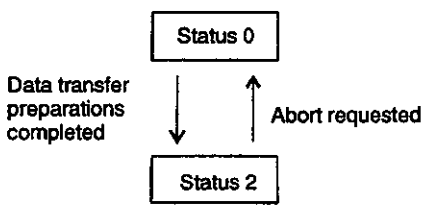
c) The status transitions are shown in the following diagrams.

(1) TCP Protocol



Connection cutoff 1: Passive Open Mode
Connection cutoff 2: Unpassive Open Mode

(2) UDP Protocol



TERMS

Passive Open Mode

The Passive Open Mode is a passive open status achieved when the host IP address and host port number are specified, thereby specifying the communications partner.

Unpassive Open Mode

The Unpassive Open Mode is a passive open status achieved when the host IP address and the host port number are set to 0, thus not specifying the communications partner.

8) Error Status

Displays the most recent error to occur for each connection.

Displayed Value	Status
0	No error.
1	System error: Socket generation failed.
2	Local port number setting error
3	System error: Error during socket layer generation for TCP
4	System error: Error connecting for TCP
5	System error: Error connecting for TCP
6	System error: Socket polling error when receiving data
7	Send error for TCP
8	Send error for UDP
9	Reception error for TCP
10	Reception error for UDP
11	System error: Error when changing socket option
12	Protocol transfer error for MEMOBUS or MELSEC

9) Send Count

Displays the amount of data (number of packets) that has been sent to the host.

10) Receive Count

Displays the amount of data (number of packets) that has been received from the host.

11) Error Count

Displays the number of errors that have occurred at each connection.

12) Response Time (ms)

Displays the amount of time from when a command is sent using the ETMS instruction to when a response is received.

13) Transmission Protocol

Displays the connection protocol, either TCP or UDP, selected in the Host Communications Parameters.

14) Application Protocol

Displays the protocol type selected in the Host Communications Parameters, either MEMOBUS, MEMO-EX, MELSEC, or THROUGH.

15) Code

Displays the data type, either ASCII or RTU, selected in the Host Communications Parameters.

16) Collisions

Displays the total number of collisions (data collisions) occurring on the network. This gives an indication of the communications status of the network.

Setting Communications Parameters and Displaying Status

4

Setting, editing, and initializing communications parameters, and displaying communications status are performed using MEMOSOFT. This chapter describes these operations using MEMOSOFT.

4.1 Setting Ethernet Parameters

Ethernet communications parameters are set using the MEMOSOFT. This section describes the procedures for setting the Ethernet communications parameters.

4.1.1 Activating the Ethernet Settings Screen

⚠ Caution The Ethernet Interface Module can be used only if the CPU Module and the MEMOSOFT used for the MEMOCON GL120, GL130 are of the versions shown in the following table.

Using the wrong versions may result in failure or malfunction.

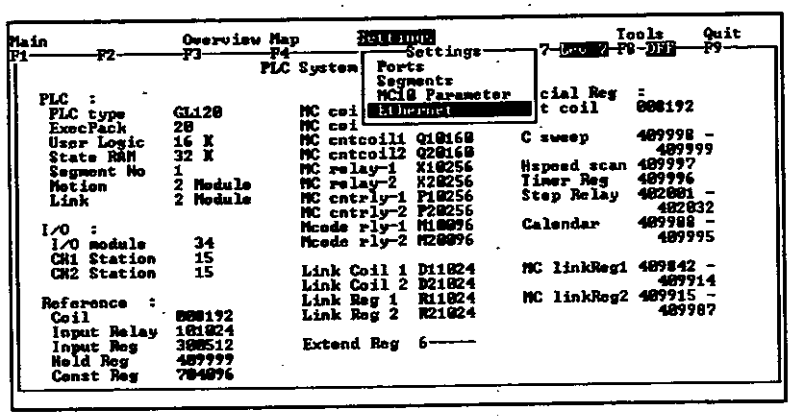
Name	Description	Model	Applicable Version	Location of Version Indication
CPU Module (16 kW)	CPU20	DDSCR-120CPU34100	□□B09 or later	Nameplate of the Module*
CPU Module (32 kW)	CPU30	DDSCR-130CPU54100	□□C03 or later	Nameplate of the Module*
CPU Module (40 kW)	CPU35	DDSCR-130CPU54110	□□A04 or later	Nameplate of the Module*
MEMOSOFT		FMSGL-AT3 (for DOS)	1.41□ or later	Bottom center of MEMOSOFT startup screen
		FMSGL-PP3E (for P120)		

Note The nameplate is attached to the right side of the Module.

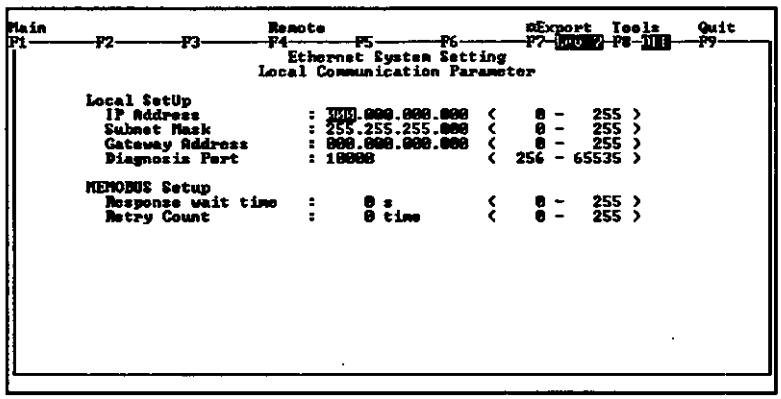
The Ethernet Settings Screen must be displayed to set Ethernet parameters. To display the Ethernet System Setting Screens, select ***Ethernet*** from the ***Settings*** Menu on the PLC System Configuration Screen as shown in the following procedure.

1) Press the **Tab** Key to switch to the menu cursor.

2) Select ***Ethernet*** from the ***Settings*** Menu using the **Cursor** Keys and press the **Enter** Key.



The Ethernet System Setting Local Communications Parameters Screen will be displayed.



Note (1) The Ethernet Interface Module is supported by MEMOSOFT version 1.41 or later. Be sure to use MEMOSOFT version 1.41 or later.

(2) To use files created on MEMOSOFT version 1.40 or before for Ethernet Interface Module settings, it is necessary to first update the settings by writing the new Ethernet system configuration settings to the files using MEMOSOFT version 1.41 or later.

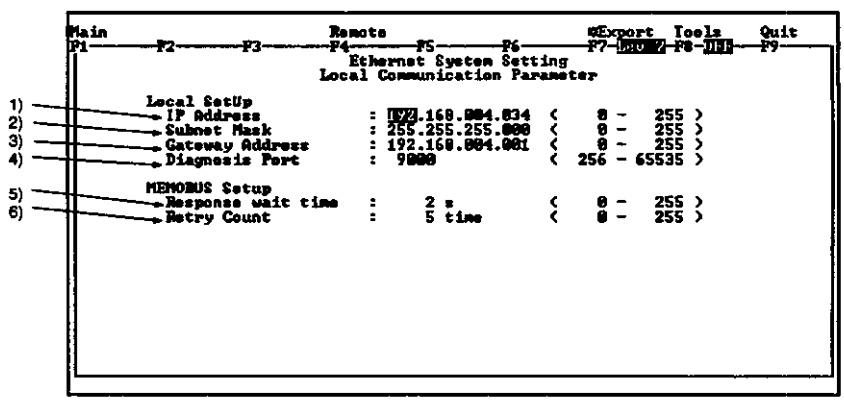
Refer to the following pages for setting methods for the Ethernet system.

4

4.1.2 Local Communications Parameters

1. Screen Configuration

The Local Communications Parameters Screen is shown below.



2. Local Communications Parameters

Details of the local communications parameters are described below.

1) Local Setup, IP Address

The local node's IP address (Internet protocol address).

- Setting Range: 000.000.000.000 to 255 (excluding 127).255.255.254
- Default Setting: 000.000.000.000

2) Local Setup, Subnet Mask

The subnet mask for the local node's IP address. When a subnet mask is not used, set the mask to 000.000.000.000.

- Setting Range: 000.000.000.000 to 255.255.255.255
- Default Setting: 255.255.255.000

3) Local Setup, Gateway Address

When communications are performed with another network via a gateway, the gateway IP address is set here. When a gateway is not used, set the address to 000.000.000.000.

- Setting Range: 000.000.000.000 to 255 (excluding 127).255.255.254
- Default Setting: 000.000.000.000

4) Local Setup, Diagnosis Port

The diagnostic port number is generally not used. The status of the Ethernet Interface Module's RAM can be monitored by connecting to this port number from another computer or workstation on the Ethernet. The Ethernet Interface Module can be accessed from test devices on the Ethernet and to perform diagnostic testing on the Module. This port number is used for communications with those test devices.

- Setting Range: 256 to 65535
- Default Setting: 10000

5) MEMOBUS Setup, Response Wait Time

Set the time from when an ETMS ladder logic instruction is sent until a response is returned. It is set in seconds. If a timeout occurs before a response has been returned from the host, the data will be resent by the number of retries set in *6) MEMOBUS Setup, Retry Count.*

- Setting Range: 0 to 255

• Default Setting: 0

6) MEMOBUS Setup, Retry Count

Set the number of times an instruction will be resent when a timeout is detected during communications using the ETMS ladder logic instruction (ETHERNET MASTER instruction). Data will be resent by the number of retries specified here. If there is still no response, an error response will be returned to the CPU Module's ETMS ladder logic instruction.

• Setting Range: 0 to 255

• Default Setting: 0

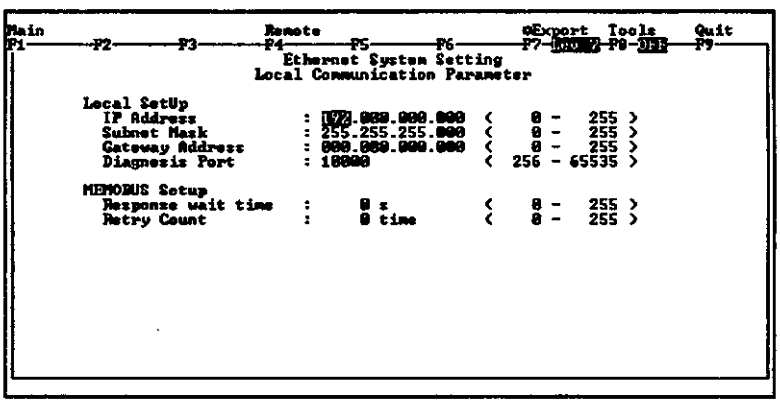
INFO When the response wait time is set to 0, the number of retries will also be set to 0 and the response monitoring time will be infinite.

3. Parameter Setting Procedure

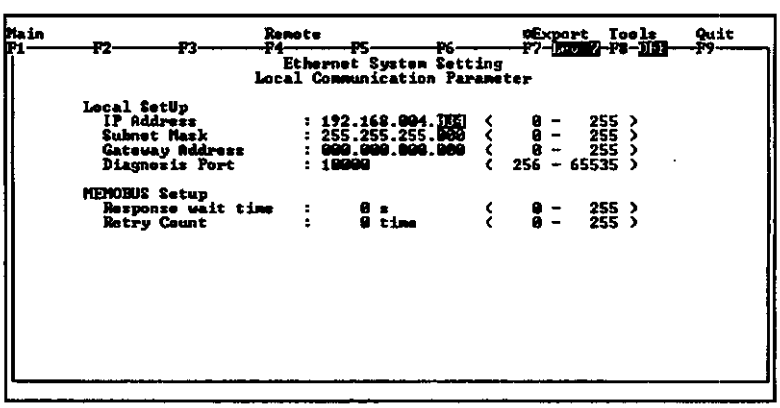
The procedure for setting parameters is outlined below.

In this example the IP address will be set to 192.168.004.034. The IP address setting area is divided into four fields.

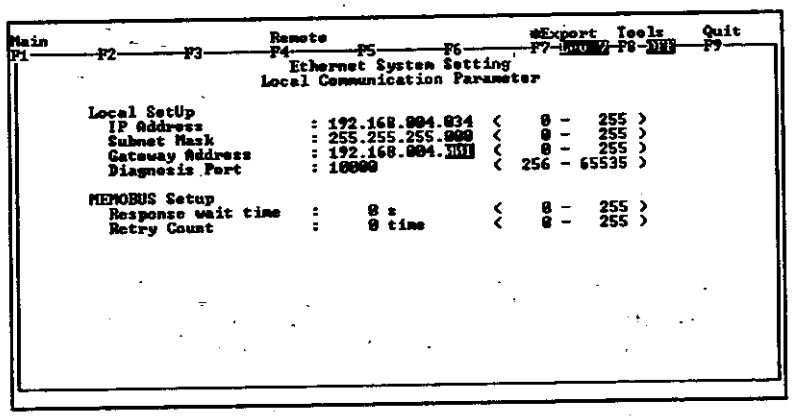
1) In the first field, enter **192** and press the **Enter** Key.



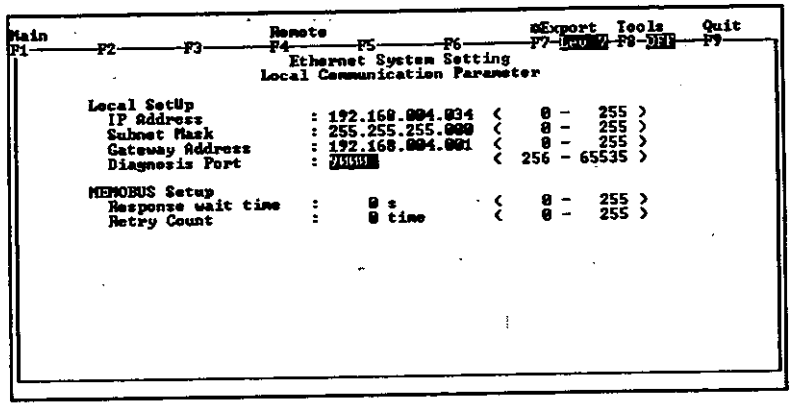
2) The cursor will move to the next field. In the same way, enter the numeric values in the other fields.



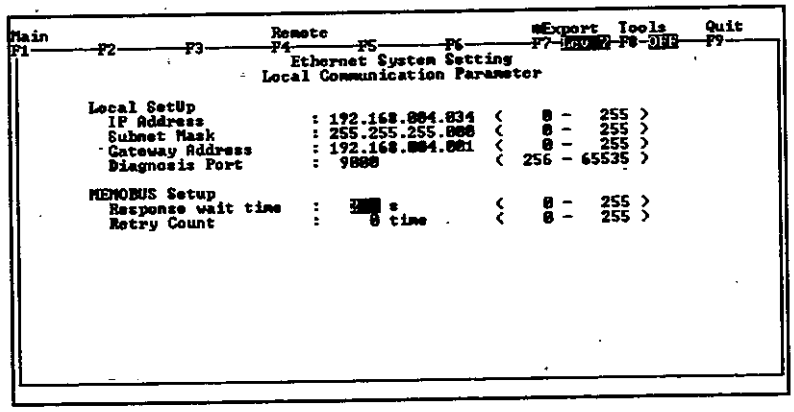
3) Enter the gateway address. In the same way as for the IP address, enter the numeric values in the each of the fields. Enter **198**, **168**, **4**, and **1** in that order.



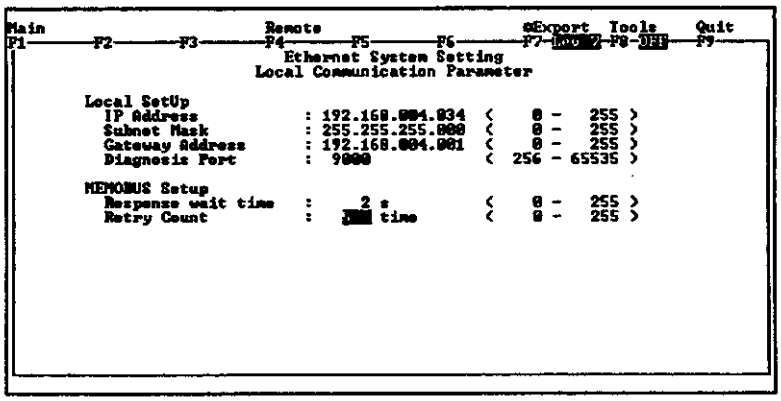
4) To enter the diagnostic port number, enter **9000** and press the **Enter** Key.



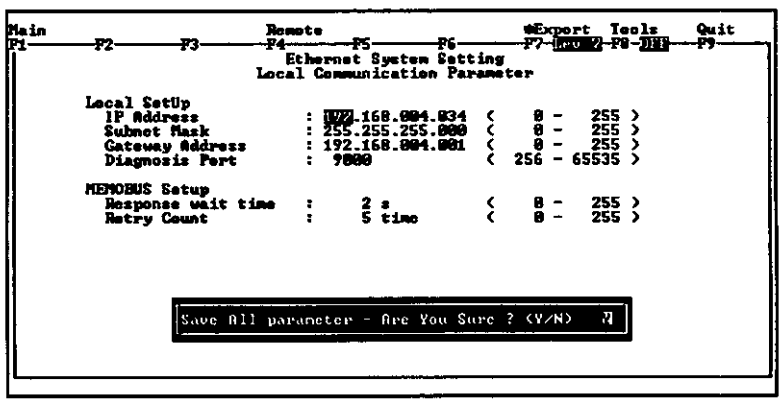
5) To enter the response wait time, enter **2** and press the **Enter** Key.



6) To enter the retry count (number of retries), enter **5** and press the **Enter** Key.



7) When all settings have been completed, select ***Quit*** from the Menu or press the **Esc** Key. A confirmation message will be displayed. Press the **Enter** Key.



The PLC System Configuration Screen will be displayed.

Note Changing Parameters

1) When setting communications parameters such as IP address and port number, it is important to ensure that there are no inconsistencies with the settings for other node. Be sure to follow the instructions of the network administrator when setting values.

2) When changes are made to parameters, the parameters are updated when you switch from the Communications Parameters Settings Screen to another screen. When working in Online mode, if the Settings Screen is left displayed even after making changes, communications will operate using the previous parameter settings. To have parameter changes reflected immediately, select ***Export,*** or switch out of the Settings Screen to another screen.

3) If the local parameters are changed in Online mode, all communications will be interrupted. When changing host parameters, only communications to the connection being changed will be interrupted and other connections will be unaffected.

INFO

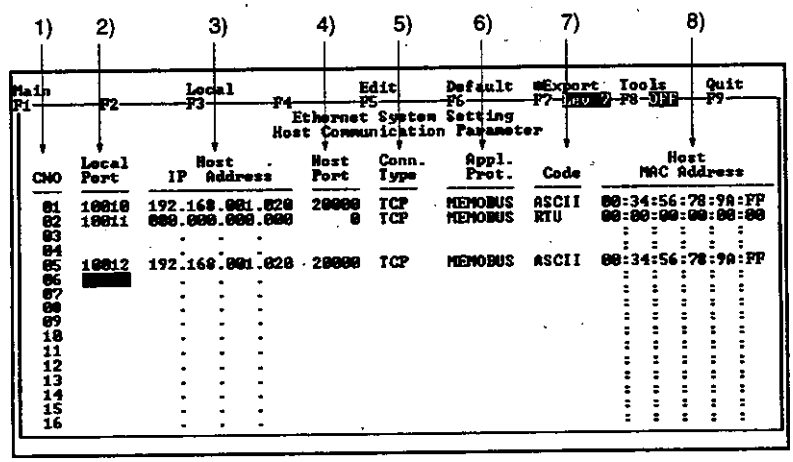
1) Parameters can be updated by selecting ***Export*** from the Menu. ***Export*** cannot be selected in Offline mode.

2) Parameter settings are checked for inconsistencies whenever they are updating or exported. If an inconsistency is discovered in any of the parameter settings, an error message will be displayed and parameters will need to be reset.

4.1.3 Host Communications Parameters Settings

1. Screen Configuration

The Host Communications Parameters Setting Screen configuration is displayed below.



2. Host Communications Parameters

Details of the host communications parameters are described below.

1) CNO: Connection Number

When the Ethernet Interface Module is used for communications, hosts are distinguished by their connection number. The range of numbers is 1 to 19. Connections 1 to 15 are used for user program ladder logic instructions, such as ETMS, ETUS, and ETUR and for slave communications that do not use functions. Connections 16 to 19 are used exclusively for slave communications using MEMOBUS commands.

2) Local Port

The local port number for each connection. When the connection is not used, set the port number to 0.

- Setting Range: 256 to 65535 or 0

- Default Setting: 0

3) Host IP Address

The host IP address for each connection.

- Setting Range: 000.000.000.000 to 255 (excluding 127).255.255.254
- Default Setting: 000.000.000.000

4) Host Port

The host port number for each connection.

- Setting Range: 256 to 65535 or 0
- Default Setting: 0

5) Connection Type

Set the protocol for the transport layer. Either TCP or UDP can be selected.

- Default Setting: TCP

6) Application Type

Set the host protocol (application protocols for each connection). Any one of the following can be selected.

MEMOBUS:	MEMOBUS protocol
MEMO-EX:	MEMOBUS expansion protocol
MELSEC:	MELSEC protocol (see note)
THROUGH:	No protocol is used.

- Default Setting: MEMOBUS

Note The MELSEC protocol is currently under development and cannot be selected.

7) Code

The communications data type. Set the data type according to the host protocol used for the connection. Either RTU or ASCII can be selected.

- Default Setting: RTU

8) Host MAC Address

Set the MAC address (Ethernet address) for the host when the host for communications does not support the ARP (Address Resolution Protocol). The host MAC address is set in hexadecimal format. When the host supports ARP, set the address to 00:00:00:00:00:00.

- Setting Range: 00:00:00:00:00:00 to FF:FF:FF:FF:FF:FF
- Default Setting: 00:00:00:00:00:00

Note If any of the values set for the host Communications parameters are not compatible, the settings cannot be saved. Refer to *3.2.3 Checking Compatibility of Connection Parameters* when inputting the parameters.

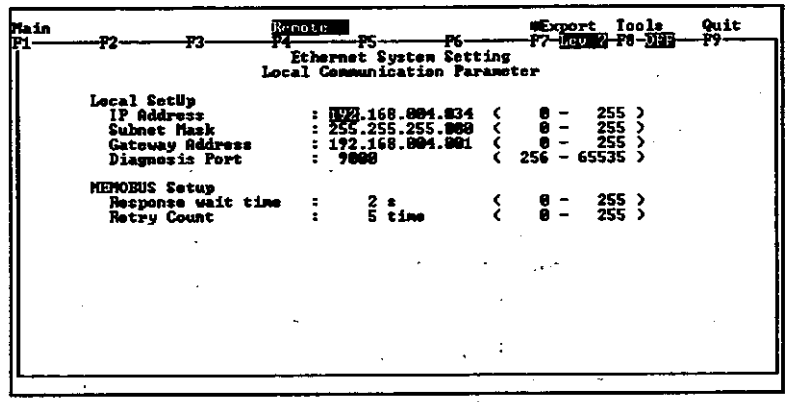
3. Parameter Setting Procedure

The procedure for setting parameters is outlined below.

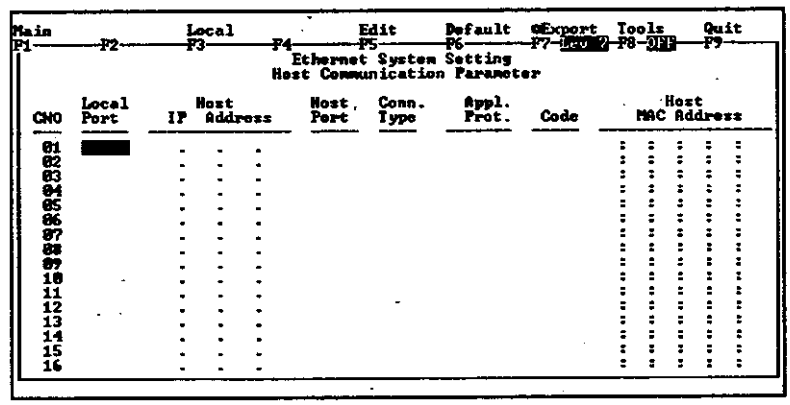
To display the Host Communications Parameters Screen, select from the Local Communications Parameters Setting Screen.

1) Press the **Tab** Key to switch to the menu cursor.

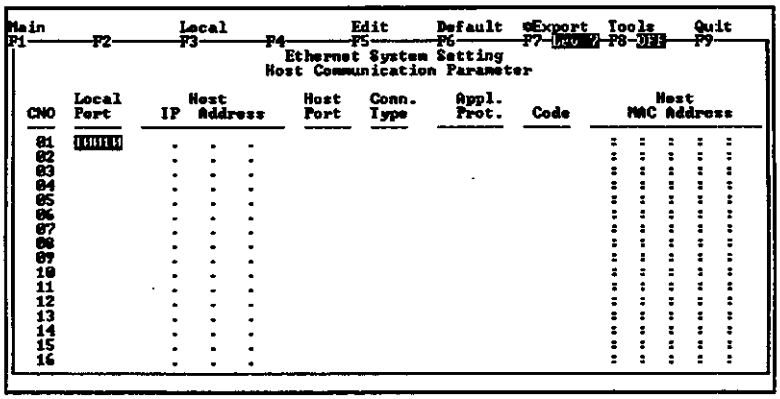
2) Select ***Remote*** from the Menu using the **Cursor** Keys and press the **Enter** Key.



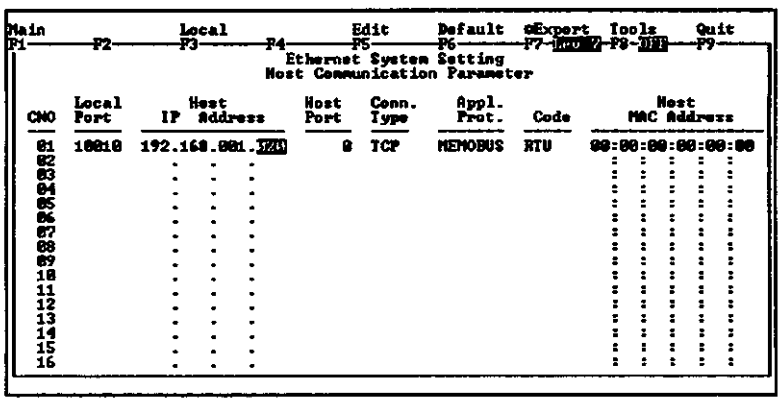
The Host Communications Parameters Screen will be displayed.



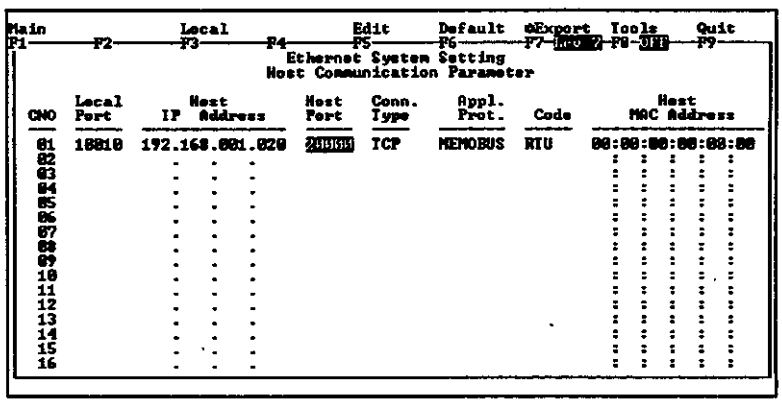
3) To set the local port, enter **10010** and press the **Enter** Key.



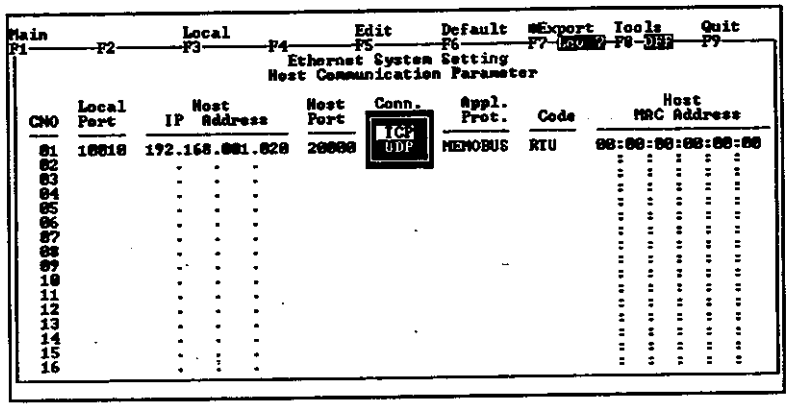
4) To set the host IP address, input values into each of the four fields. Enter **192**, **168**, **1**, and **20** and press the **Enter** Key.



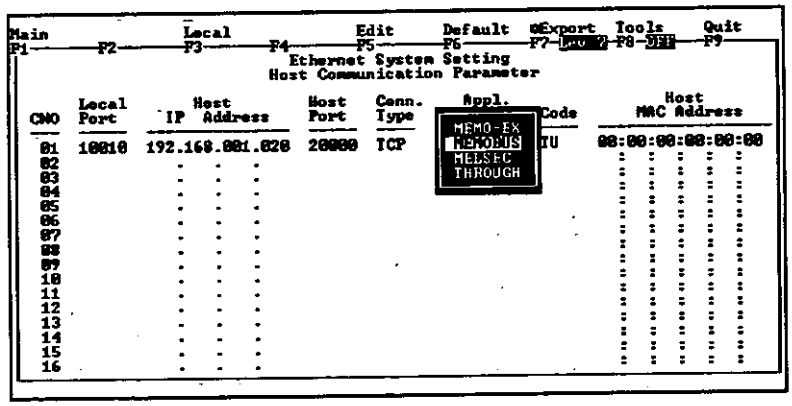
5) To set the host port, enter **20000** and press the **Enter** Key.



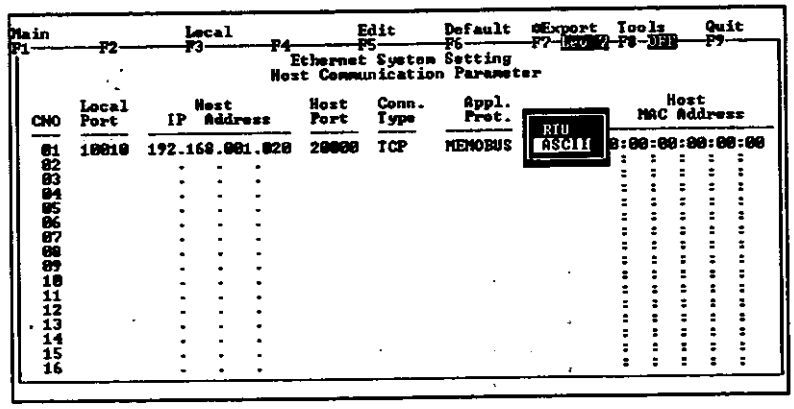
6) Set the connection type as follows: Move the cursor to ***Connection Type*** and press the **Enter** Key. A selection window will be displayed. Then select the connection type using the **Up** or **Down Cursor** Key and press the **Enter** Key.



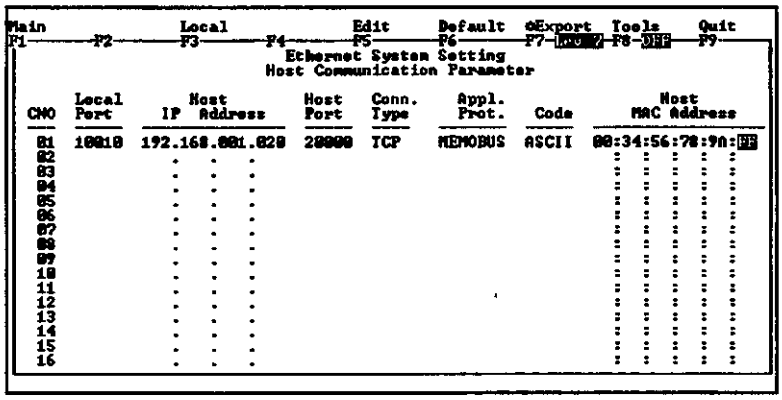
7) Set the application protocol as follows: Move the cursor to ***Application Protocol*** and press the **Enter** Key. A selection window will be displayed. Select the application protocol using the **Up** or **Down Cursor** Key and press the **Enter** Key.



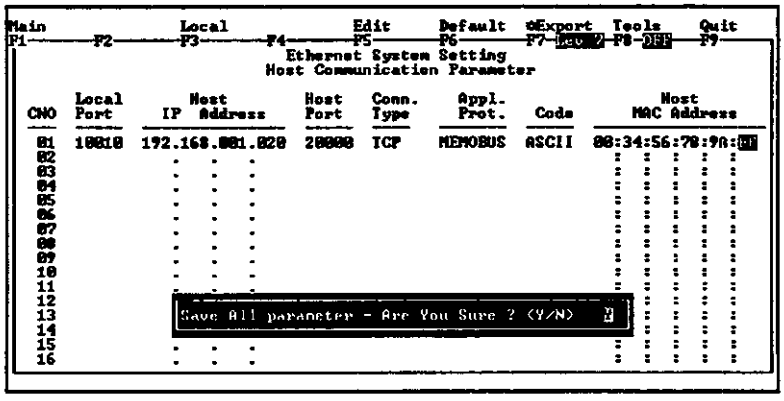
8) Set the data code as follows: Move the cursor to ***Code*** and press the **Enter** Key. A selection window will be displayed. Select the data code using the **Up** or **Down Cursor** Key and press the **Enter** Key.



9) Set the host MAC address. In this example, 00.34.56.78.9A.FF will be set. Enter values into each of the six fields. Enter **0**, **34**, **56**, **78** , **9A**, and **FF** and press the **Enter** Key.



10) When all settings have been completed, select ***Quit*** from the Menu or press the **Esc** Key. A confirmation message will be displayed. Press the **Enter** Key.



The PLC System Configuration Screen will be displayed.

Note When setting communications parameters such as IP address and port number, it is important to ensure that there are no inconsistencies with the settings for other nodes. Be sure to follow the instructions of the network administrator when setting values.

4.2 Editing Parameters

This section describes procedures using the Edit Menu, useful for editing Ethernet Communications Parameters. All editing is performed by connection number, i.e., by row.

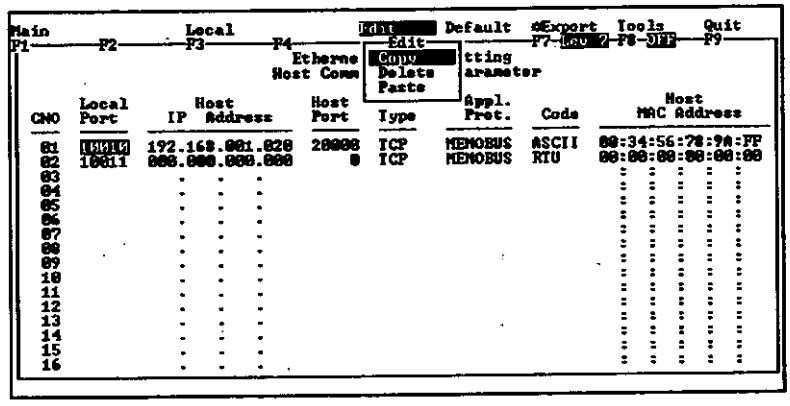
4.2.1 Copying Rows

Copy records the row data specified by the cursor. All set values, i.e., the local port, host IP address, host port, connection type, application protocol, code, and host MAC address, for the connection will be stored. Data stored using ***Copy*** can be inserted into other rows using ***Paste***.

1) Move the cursor to the start of the row to be copied using the **Cursor** Keys.

2) Press the **Tab** Key to switch to the menu cursor.

3) Select ***Copy*** from the ***Edit*** Menu using the **Cursor** Keys.



4) Press the **Enter** Key. The specified row data will be stored.

4.2.2 Deleting Rows

Delete deletes row data specified by the cursor and at the same time stores this data. All set values from the local port to the host MAC address for all the connection will be deleted.

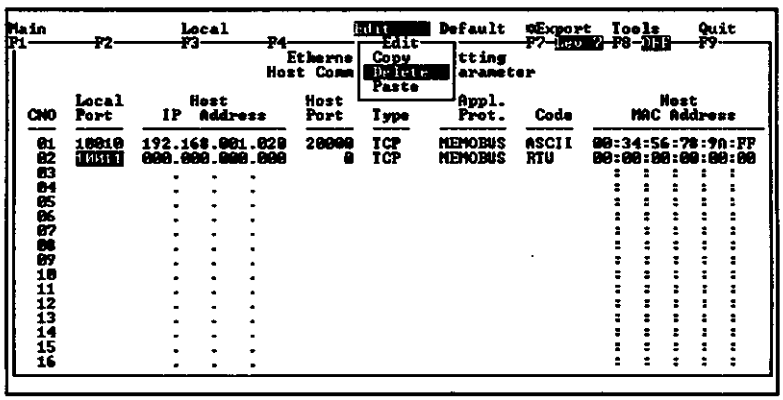
Data stored using ***Delete*** can be inserted into other positions using ***Paste***. This function is not only useful for deleting data, but can also be used to move data.

Note Row data can also be deleted using the **DEL** Key, but when this key is used, data is not stored.

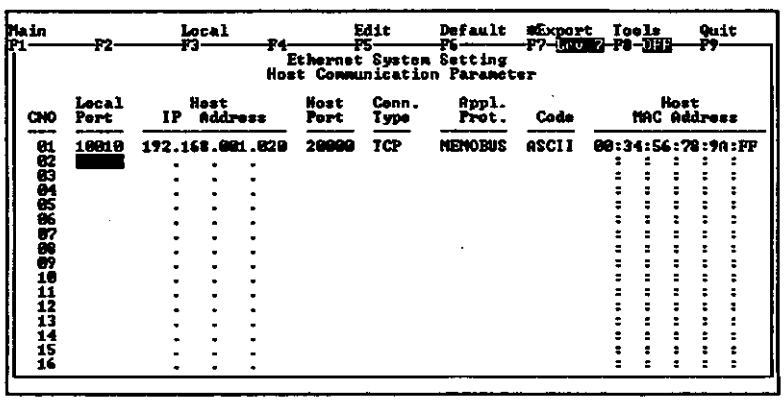
1) Move the cursor to the row to be deleted using the **Cursor** Keys.

2) Switch to the menu cursor using the **Tab** Key.

3) Select ***Delete*** from the ***Edit*** Menu using the **Cursor** Keys.



4) Press the **Enter** Key. The specified row data will be deleted.



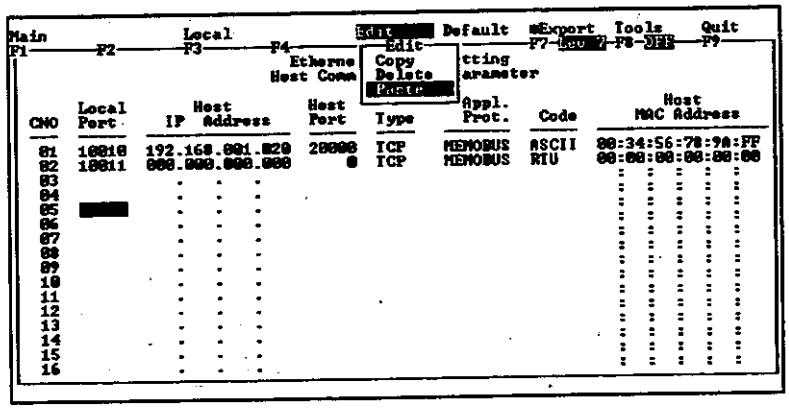
4.2.3 Pasting Rows

Paste inserts at the cursor position row data stored using ***Copy*** or ***Delete***. In the following example, data stored in *4.2.1 Copying Rows* will be inserted into another row.

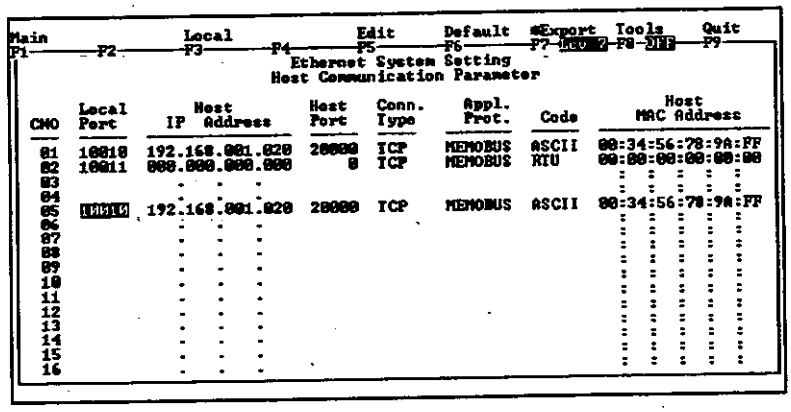
1) Move the cursor to the row where data is to be inserted using the **Cursor** Keys.

2) Switch to the menu cursor using the **Tab** Key.

3) Select ***Paste*** from the ***Edit*** Menu using the **Cursor** Keys.



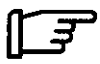
4) Press the **Enter** Key. The stored data will be inserted at the cursor position.



1) ***Copy***, ***Delete***, and ***Paste*** can be performed only on one row of data at a time. It is not possible to use these functions on several rows of data.

2) ***Paste*** can be performed on rows for which all parameters have already been set. The pasted data will overwrite existing data.

3) Data stored using ***Copy*** or ***Delete*** is stored either until the next ***Copy*** or ***Delete*** operation is performed, or until you quit the setting operation for Ethernet communications parameters.



The following key operations are useful when editing Ethernet communications parameters.

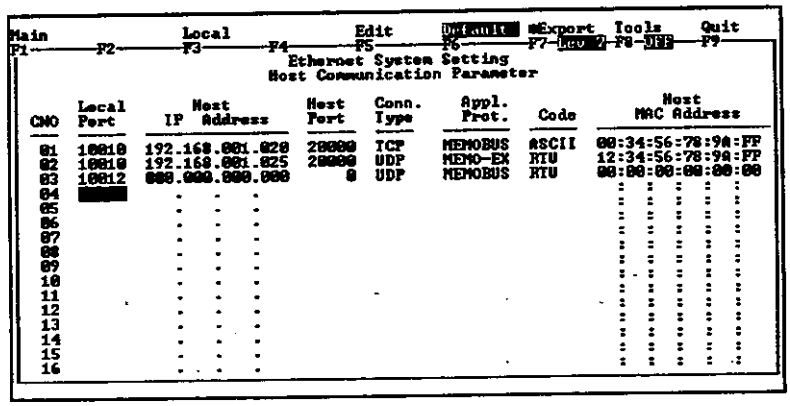
Alt+C Keys:	Row Copy
Alt+R Keys:	Row Paste
Alt+K Keys:	Row Delete
DEL Key:	Row Delete (Deleted data is not stored.)

4.3 Initializing Parameters

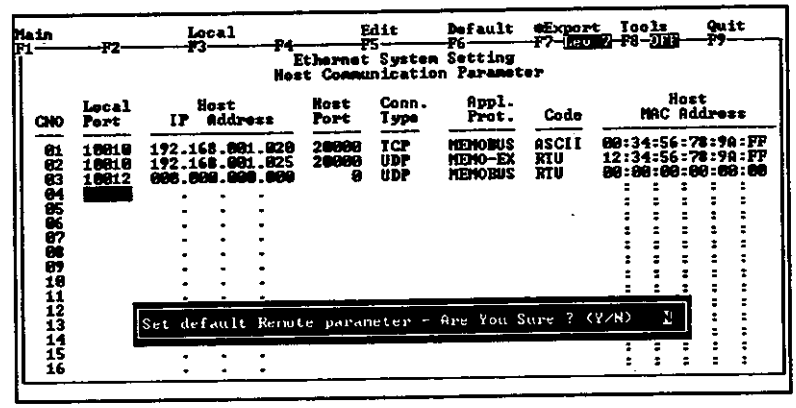
This section describes the procedure for initializing the host's Ethernet communications parameters.

This operation initializes (deletes) all host communications parameter settings. The initialization procedure is outlined below.

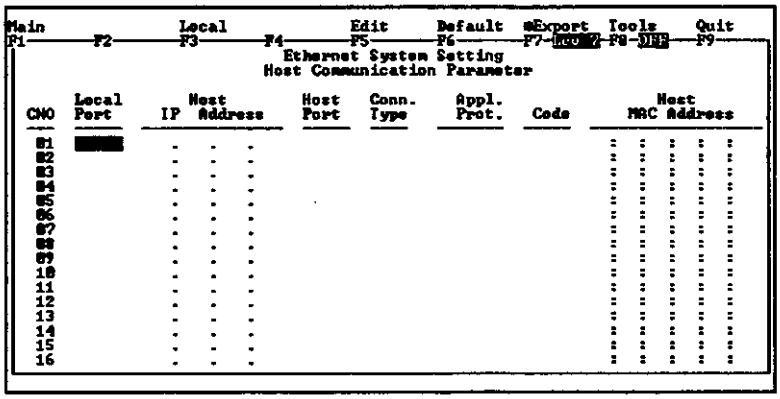
1) Select ***Default*** using the **Cursor** Keys.



2) A confirmation message will be displayed. Enter **Y** and press the **Enter** Key.



All host communications parameter settings will be deleted.



4.4 Communications Status

This section describes operations from the Communications Status Screens, which provide information on the communications status of the Ethernet network.

4.4.1 Overview

The Ethernet Status Screens displayed in MEMOSOFT provide the following information.

1) Ethernet Communications Status Screens

Display the status of the Ethernet Interface Module.

2) Option Install Information Screen

Displays information on installed Optional Modules, such as the Ethernet Interface Module or the PC Link Module.

3) Optional Module Status Screen

Displays the status of Optional Modules, such as the Ethernet Interface Module or the PC Link Module.

4) Optional Module Revision Screen

Displays ROM revision information on Optional Modules, such as the MEMOBUS Module or the PC Link Module.

Note (1) The Ethernet Interface Module is supported by MEMOSOFT version 1.41 or later. Be sure to use MEMOSOFT version 1.41 or later.

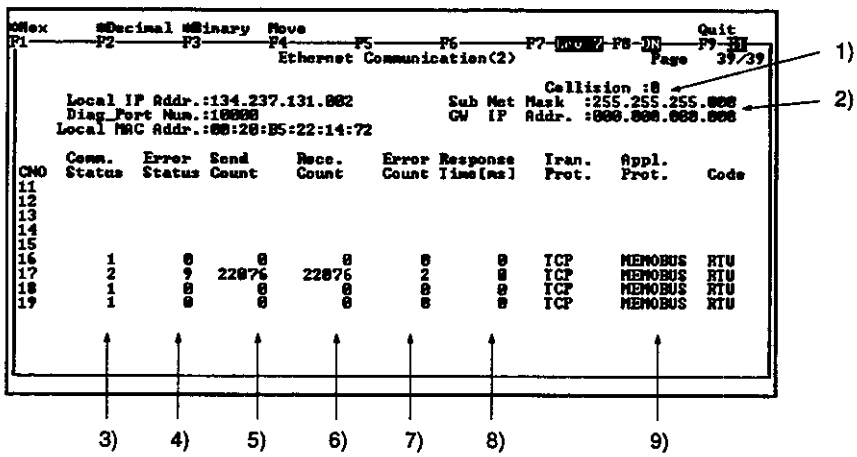
(2) To use files created on MEMOSOFT version 1.40 or before for Ethernet Interface Module settings, it is necessary to first update the settings by writing the new Ethernet system configuration settings to the files using MEMOSOFT version 1.41 or later. Even if a file does not contain Ethernet parameter settings, it will not be possible to display Ethernet communications status.

Refer to 4.1.2 and 4.1.3 for the setting methods for the Ethernet system.

4.4.2 Communications Status Screens

1. Screen Configuration

The Ethernet Status Screen configuration is displayed below.



2. Ethernet Communications Status

Details of the items displayed in Ethernet communications status are described below.

1) Collisions

Displays the total number of data collisions occurring on the Ethernet.

2) The settings made in *4.1.2 Local Communications Parameters Settings* are displayed here.

3) Communications Status

Displays the connection status of each connection. The status display is as follows:

a) For connections 1 to 15, the status is displayed as follows:

Displayed Value	TCP	UDP
0	The parameters have been set but data is not ready for transmission.	
1	Waiting for connection to be established.	Not used.
2	Data transfer is possible. (Connection has been established.)	Data transfer is possible.
---	Not used. (When the local port number is set to 0.)	

Note When a connection is not used, nothing is displayed in that row.

b) For connections 16 to 19, the status is displayed as follows:

Displayed Value	TCP	UDP
0	Not used.	
1	Waiting for connection to be established.	Not used.
2	Data transfer is possible. (Connection has been established.)	Data transfer is possible.
---	Not used. (When the local port number is set to 0.)	

Note When a connection is not used, nothing is displayed in that row.

4) Error Status

Displays the most recent error to occur for each connection.

Displayed Value	Status
0	No error.
1	System error: Socket generation failed.
2	Local port number setting error
3	System error: Error during socket layer generation for TCP
4	System error: Error connecting for TCP
5	System error: Error connecting for TCP
6	System error: Socket polling error when receiving data
7	Send error for TCP
8	Send error for UDP
9	Reception error for TCP
10	Reception error for UDP
11	System error: Error when changing socket option
12	Protocol transfer error for MEMOBUS or MELSEC

5) Send Count

Displays the number of packets of data that has been sent normally to the host.

6) Receive Count

Displays the number of packets of data that has been received normally from the host.

7) Error Count

Displays the number of errors that have occurred at the connection.

8) Response Time (ms)

Displays the amount of time from when a command is sent using the ETMS ladder logic instruction to when a response is received. The information displayed is only for the most recently sent command. The display is in ms.

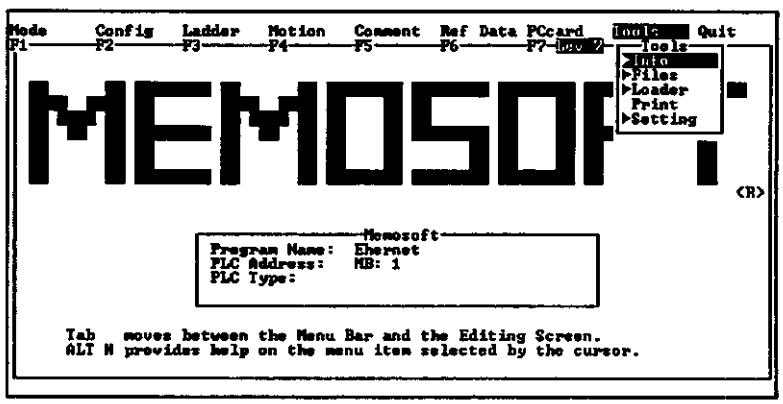
9) The settings made in *4.1.3 Host Communications Parameters Settings* are displayed here.

3. Status Screen Operations

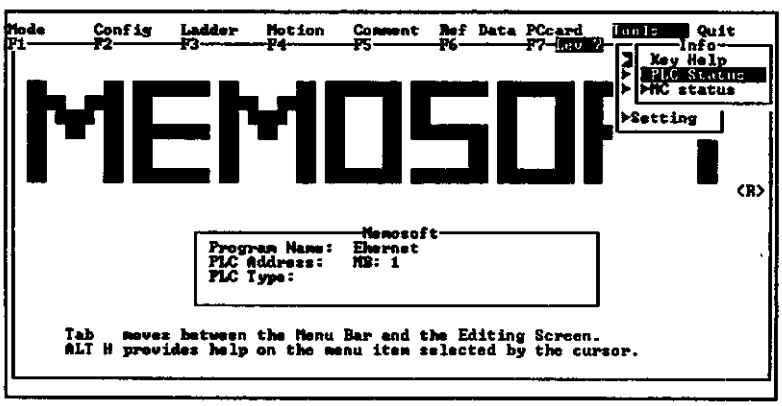
1) Accessing the Controller Status Information Screen

To monitor the communications status of the Ethernet, it is necessary to access the Status Screens. Use the following procedure to access the Controller Status Information Screen.

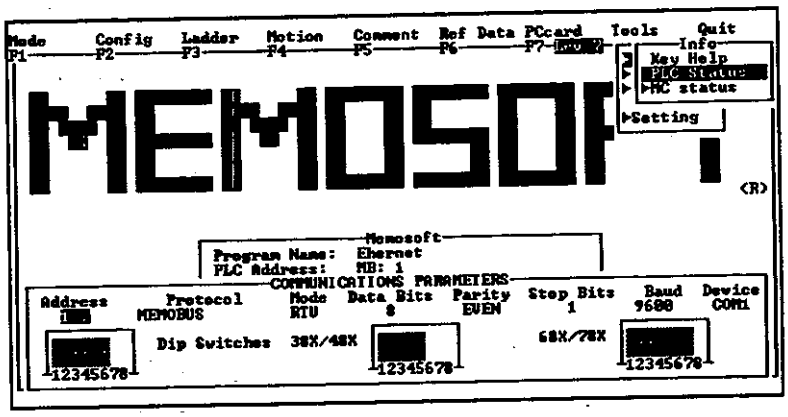
1) Select ***Info*** from the ***Tools*** Menu using the **Cursor** Keys and press the **Enter** Key.



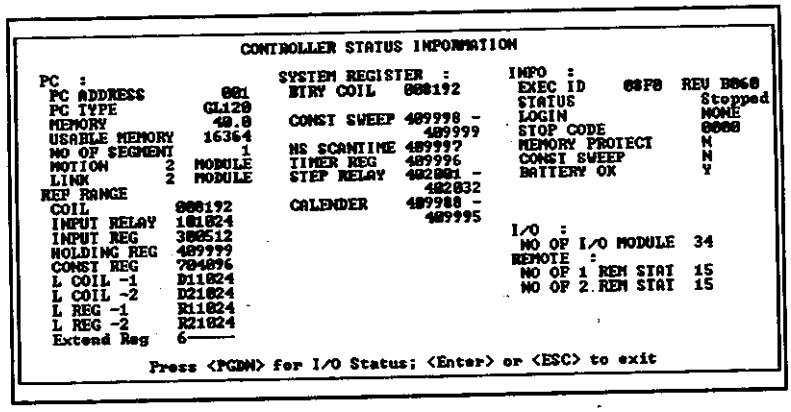
2) The submenu will be displayed. Select ***PLC Status*** and press the **Enter** Key.



3) In Offline mode, the Communications Parameters Screen will be displayed. Input the communications parameters and press the **Enter** Key.

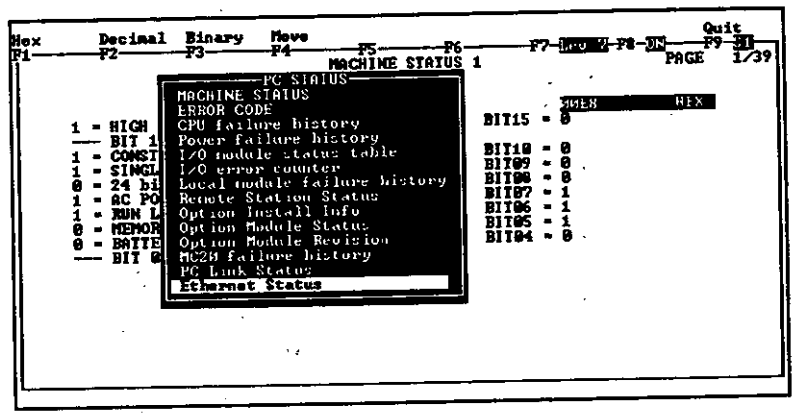


The Controller Status Information Screen will be displayed.

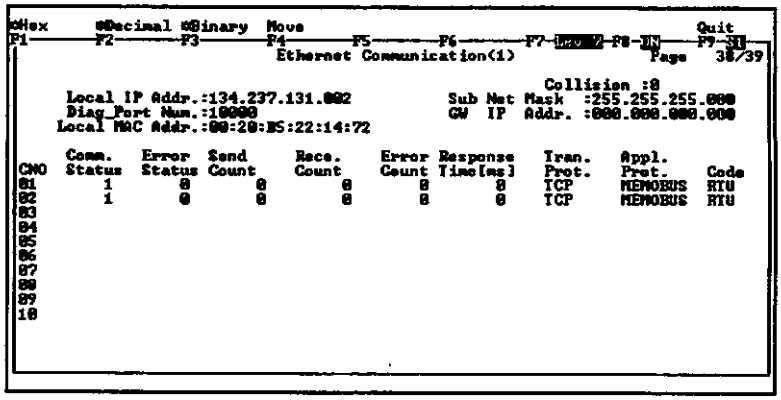


4) To switch to a detailed status display, press the **Pg Dn** Key. A list of PLC Status screens will be displayed.

5) Select ***Ethernet Status*** using the **Down Cursor** Key and press the **Enter** Key.



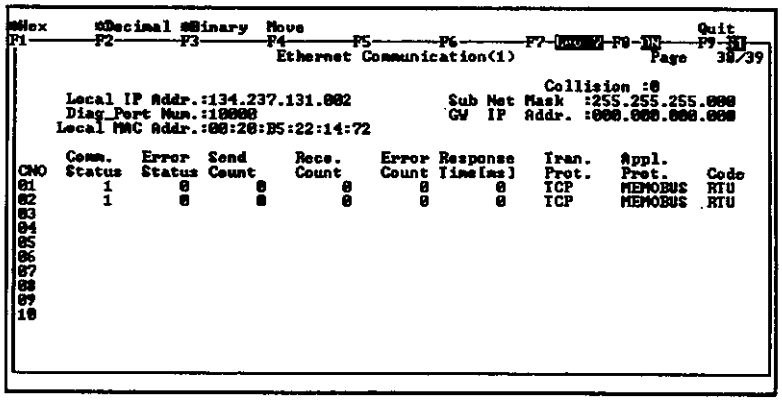
The Ethernet Communications Status (1) Screen will be displayed.



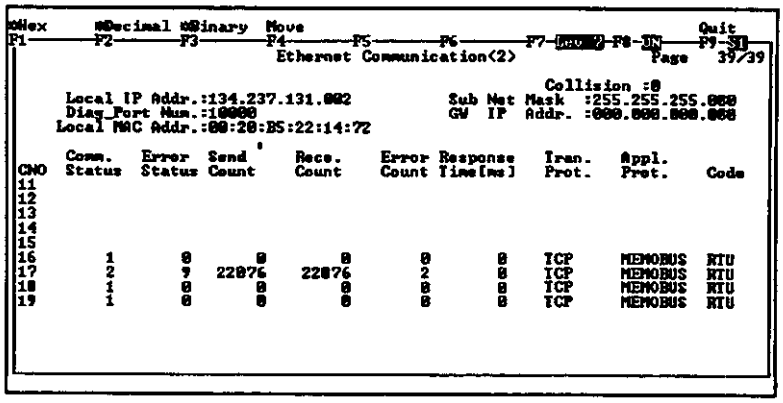
6) Switching Display Screens

Use the **Pg Up** or **Pg Dn** Key to move between Ethernet Communications Status (1) and (2) Screens. For example, to shift from Ethernet Communications Status (1) Screen to Ethernet Communications Status (2) Screen, press the **Pg Dn** Key, and the display will change. Select ***Quit*** or press the **Esc** Key to return to the PLC Status Menu.

Press the **Pg Dn** Key.



The screen will change.



CNO: Connection Number

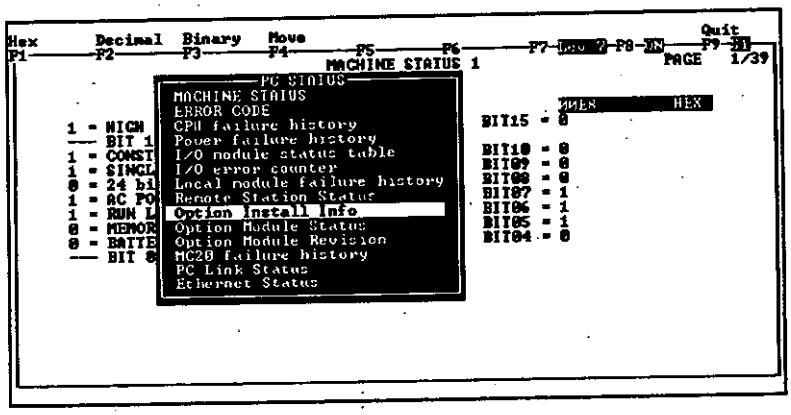
Connections 1 to 15 are used for program ladder logic instructions, such as ETMS, ETUS, and ETUR, and for slave communications that do not use functions.

4.4.3 Installed Options Information Screen

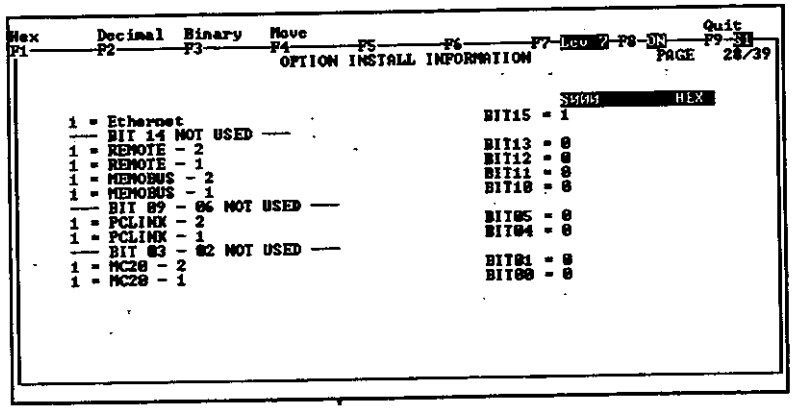
1) The Installed Options Information Screen displays information on the Optional Modules, such as Ethernet Interface Modules or the PC Link Modules, that are installed.

2) Use the following procedure to access the Option Install Information Screen.

Select ***Option Install Info*** from the PLC Status Menu.



The Option Install Information Screen will be displayed.

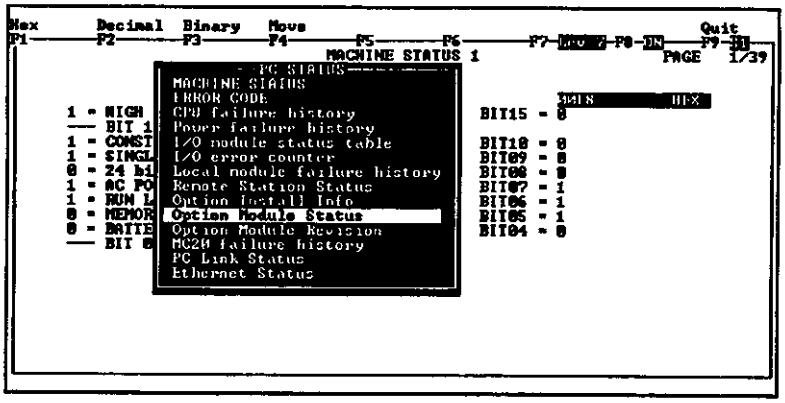


4.4.4 Optional Module Status Screen

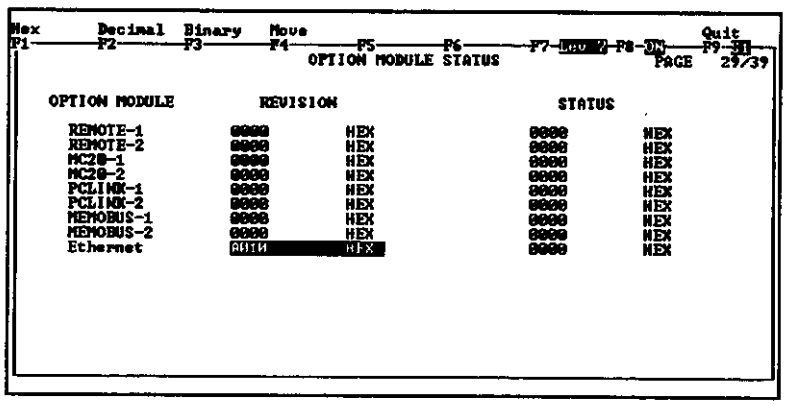
1) The Optional Module Status Screen displays the status of Optional Modules, such as Ethernet Interface Modules or the PC Link Modules.

2) Use the following procedure to access the Optional Module Status Screen.

Select ***Option Module Status*** from the PLC Status Menu.



The Optional Module Status Screen will be displayed.



Ladder Logic Instructions for Ethernet Communications

5

This chapter describes the functions and usage of the ladder logic instructions used for Ethernet communications.

5.1 Ethernet Ladder Logic Instructions

▌ This section describes the Ethernet ladder logic instructions.

There are 3 Ethernet ladder logic instructions, as shown in the following table.

Table 5.1 Ethernet Ladder Logic Instructions

Instruction Name	Mnemonic	Function
ETHERNET MASTER Instruction	ETMS	1) Used for master communications with any of the following communications protocols: • MEMOBUS • MEMOBUS expansion • MELSEC (see note 1) 2) The ETMS instruction receives a response from the slave node. 3) Only "MEMOBUS" or "MEMOBUS expansion" can be set as the application protocol in the parameter. Other protocols cannot be used.
ETHERNET USER SEND Instruction	ETUS	1) Used to send data to a remote node when a protocol other than those listed above is used. A response is not received from the remote node. 2) Only "THROUGH" can be set as the application protocol in the parameter. Other protocols cannot be used.
ETHERNET USER RECEIVE Instruction	ETUR	1) Used to receive data from a remote node when a protocol other than those listed above is used. A responses is not returned to the remote node. 2) Only "THROUGH" can be set as the application protocol in the parameter. Other protocols cannot be used.

Note (1) The MELSEC protocol is currently under development and cannot be selected.

(2) Observe the following precautions when using the Ethernet ladder logic instructions.

1) Connection numbers 1 to 15 can be used for the ladder logic instructions. A maximum of three of these numbers can be used for slave communications with the MEMOBUS protocol or MEMOBUS expansion protocol. Connection numbers 16 to 19 are used for slave communications with the MEMOBUS protocol and cannot be used for ladder logic instructions.

2) A maximum of 10 ladder logic instructions can be executed simultaneously.

3) Ladder logic instructions are not necessary to execute slave communications with the MEMOBUS protocol.

4) Unpassive Open Mode is used for a slave node and thus the master instructions ETMS and ETUS cannot be used.

5) When using the TCP protocol, disconnect the connection and allow at least one minute before connecting again.

5.2 The ETMS Instruction

This section provides details on the functions, structure, and usage of the ETMS instruction.

5.2.1 The ETMS Instruction

1. Functions

1) ETMS is the mnemonic for the ETHERNET MASTER instruction.

2) The ETMS instruction performs master communications using either MEMOBUS, MEMOBUS Expansion, or Mitsubishi's MELSEC protocols (see note).

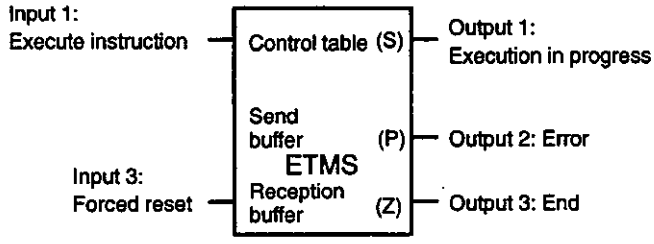
3) ETMS receives a response from the slave node.

4) It is not necessary to create a communications program in the slave. The slave node analyzes the command from the master.

Note The MELSEC protocol is currently under development and cannot be selected.

2. Structure

1) The structure of the ETMS instruction is shown in the following diagram.



2) ETMS required 3 elements (top, middle, and bottom) located vertically on the network. Use the following table to set the register reference numbers.

Table 5.2 ETMS Structural Elements

Element	Meaning	Setting range
Top (S)	The leading reference number in the control table.	Holding register: 400001 to 409993 (W00001 to W09993) Link register: R10001 to R11018 R20001 to R21018
Middle (P)	The leading reference number of the send buffer.	Holding register: 400001 to 409999 (W00001 to W09999) Link register: R10001 to R11024 R20001 to R21024
Bottom (Z)	The leading reference number of the reception buffer.	Holding register: 400001 to 409999 (W00001 to W09999) Link register: R10001 to R11024 R20001 to R21024

3. Execute Conditions

The following conditions must be met to execute the instruction.

1) The specified node for communications must not be engaged in communications with another ladder logic program.

2) Input 1 must be changed from OFF to ON.

3) Input 3 must be OFF.

4. I/O Definitions

The I/O definitions for the ETMS instruction are as follows:

1) Input 1: Execute Instruction

The ETMS instruction is executed when input 1 is ON and input 3 is OFF. Output 1 goes ON when input 1 turns ON and execution begins.

2) Input 3: Forced Reset

Input 3 can be used to abort the ETMS instruction during execution. When this input is ON, the three outputs go OFF. Input 3 takes priority over the other inputs.

Input 3 can be used to abort the instruction for timeouts and other abnormal conditions.

Note Normally a positive transitional contact must be used for inputs 1 and 3. If input 1 is ON when ETMS finishes executing, it will begin executing again. The ETMS instruction will not be executed even if input 1 is ON as long as input 3 is ON.

When either input 1 or 3 turns ON, all error codes in the control table will be cleared. (See *Table 5.6*).

3) Output 1: Execution in Progress

Output 1 will go ON when input 1 (Execute Instruction) turns ON and the ETMS instruction begins execution. It goes OFF when the operation ends or is forced reset.

Output 1 will go OFF if an error occurs while the ETMS instruction is being executed.

4) Output 2: Error

Output 2 will go ON for 1 scan when ETMS instruction execution ends with an error.

Details of errors are available in the control table error codes. (See *Table 5.6*).

5) Output 3: End

Output 3 will go ON for 1 scan when ETMS instruction execution ends normally.

5.2.2 Automatic Instruction Mode

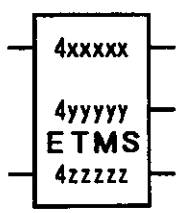
1. Mode

1) With the ETMS instruction, a command function code is set to specify a function for execution on a slave. For example, to make the slave read holding registers, function code 131 (decimal) is specified (Automatic Instruction Mode).

2) The mode is switched between Automatic Instruction Mode and Manual Instruction Mode depending on the function code.

3) ETMS requires 3 elements (top, middle, and bottom) located vertically on the network. The structure of each element in Automatic Instruction Mode is described following.

Example: ETMS Element Structure



2. Element Structure

A. Top Element

1) Control Table

The top element of the ETMS instruction is used to set the number of the register that is the leading reference in the control table.

The control table uses 7 registers starting from either 4XXXXX or RXXXXX. These registers are used by ETMS (ETHERNET MASTER instruction) as the master instruction to store data for controlling communications. These registers cannot be used for any other purpose.

The host connection number, function code, leading reference number, and reference data size are set by the user. All other register values are set by the system.

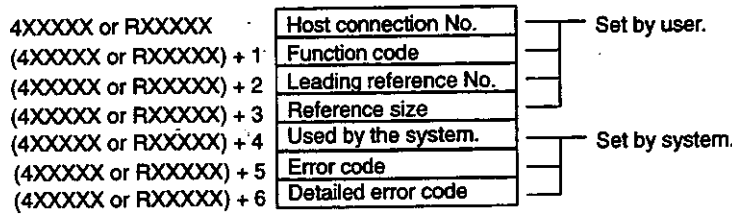


Figure 5.1 Control Table Structure: Automatic Instruction Mode

2) Host Connection Number (4XXXXX or RXXXXX)

The command is sent to the slave with the connection number specified using MEMOSOFT. The setting range is 1 to 15.

3) Function Code (4XXXXX + 1 or RXXXXX + 1)

Set the function code. Functions codes are used to specify functions for execution on the slave. The mode is switched between Automatic Instruction Mode and Manual Instruction Mode depending on the function code.

a) MEMOBUS Protocol

Function codes for MEMOBUS protocol are as shown in the following table.

Table 5.3 MEMOBUS Function Codes

Function Code		Function	Address Setting Range	Max. Data Size	
Decimal	Hex			RTU	ASCII
101	65	Read output coil states	0 to 8191	2000	2000
102	66	Read MC coil state 1	0 to 255	256	256
103	67	Read MC coil state 2	0 to 255	256	256
104	68	Read MC control coil state 1	0 to 159	160	160
105	69	Read MC control coil state 2	0 to 159	160	160
106	6A	Read link coil state 1	0 to 2047	2000	2000
107	6B	Read link coil state 2	0 to 2047	2000	2000
111	6F	Read input relay states	0 to 1023	2000	2000
112	70	Read MC relay state 1	0 to 255	256	256
113	71	Read MC relay state 2	0 to 255	256	256
114	72	Read MC control relay state 1	0 to 255	256	256
115	73	Read MC control relay state 2	0 to 255	256	256
116	74	Read M-code relay state 1	0 to 95	96	96
117	75	Read M-code relay state 2	0 to 95	96	96
121	79	Read input registers	0 to 511	125	125
131	83	Read holding registers	0 to 9998	125	125
132	84	Read link register state 1	0 to 2047	125	125
133	85	Read link register state 2	0 to 2047	125	125
134	86	Read constant register states	0 to 4095	125	125
141	8D	Write output coils	0 to 8191	800	800
142	8E	Write MC coils 1	0 to 255	256	256
143	8F	Write MC coils 2	0 to 255	256	256
144	90	Write MC control coils1	0 to 159	160	160
145	91	Write MC control coils 2	0 to 159	160	160
146	92	Write link coils 1	0 to 2047	800	800
147	93	Write link coils 2	0 to 2047	800	800
151	97	Write holding registers	0 to 9998	125	125
152	98	Write link registers 1	0 to 2047	100	100
153	99	Write link registers 2	0 to 2047	100	100
199	C7	Loopback test	Not applicable	Not applicable	

Note (1) Relays/coils: 1984, registers: 124

(2) Relays/coils: 800, registers: 100

Note The MEMOBUS function codes used in Automatic Instruction Mode are different from the MEMOBUS function codes used in Manual Instruction Mode. Be sure to use the right codes.

b) MEMOBUS Expansion Protocol

MEMOBUS expansion protocol function codes are the same as those for MEMOBUS, except those listed in the following table, for which the setting ranges are different.

Table 5.4 MEMOBUS Expansion Function Codes

Function code		Function	Address setting range	Max. Data Size	
Decimal	Hex			RTU	ASCII
121	79	Read input registers	0 to 511	508	508
131	83	Read holding registers	0 to 9998	508	508
151	97	Write holding registers	0 to 9998	507	507

c) Mitsubishi MELSEC Protocol

The MELSEC protocol is for future use. The MELSEC A-series Sequencer is the corresponding device.

4) Leading Reference Number (4XXXXX + 2 or RXXXXX + 2)

Specifies the leading reference number of the slave node for communications when reading or writing data. The setting range depends on the function code used. For details, refer to *Table 5.3* and *Table 5.4*.

The leading reference number is set in reference to the first reference in the reference area, i.e., the address of the first reference in each reference area is treated as "0."

For example: 400001 → 0 R10100 → 99

5) Reference Size (4XXXXX + 3 or RXXXXX + 3)

Specifies the number of relays, coils, or registers when reading or writing data. The setting range depends on the function code used. For details, refer to *Table 5.3* and *Table 5.4*.

6) Used by the System (4XXXXX + 4 or RXXXXX + 4)

Registers used by the ladder logic instruction. The contents of these registers are set by the system. Do not change the content of these registers from the user program. The structure of each bit in the register is shown in the following diagram.

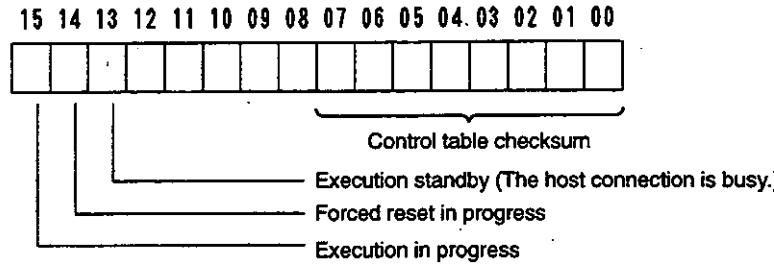


Table 5.5 Allocation of 4XXXXX + 4 Bits (RXXXXX + 4 Bits)

Bit	Contents
15	Execution In-progress Flag Bit 15 turns ON during execution. Even if input 1 turns ON, bit 15 will not turn ON until instruction execution is actually started. This bit is interlocked with output 1.
14	Forced Reset In-progress Flag Bit 14 turns ON when a forced reset is in progress using input 3 of the ETMS instruction. When forced reset has been completed, bit 14 turns OFF again.
13	Execution Standby Flag Bit 13 turns ON if the instruction has been executed, but execution has not yet started. It thus indicates standby status when the host connection is busy.
12 to 08	No allocation. Always 0.
07 to 00	Used as the control table checksum.

Note Bit 13, bit 14, and bit 15 will never be ON at the same time.

7) Error Code (4XXXXX + 5 or RXXXXX + 5)

If an error occurs in communications, an error code will be returned from the remote node. The following table provides a list of error codes. Error codes are displayed in hexadecimal.

Table 5.6 Error Codes

Error Code (Hex)	Name	Meaning
8XXX	Ethernet Interface Module stopped	Ethernet Interface Module operation has stopped due to an error.
4XXX	Ethernet Interface Module initializing	The Ethernet Interface Module is initializing.
2001	High-speed scan execution error	The ETMS instruction was executed in a high-speed scan.
2002	Host connection number error	The host connection number is not set between 1 and 15.
2003	Protocol error	A protocol not supported by the ETMS instruction has been set.
2004	No free buffers	All 10 buffers are already being used.
2005	Illegal function code	Function code does not exist.
2006	Error in number of send data	The number of send data is set to 0, or the number of send data exceeds the setting range or the table size.
2007	Number of reception data error	The number of reception data exceeds the setting range or the table size.
2008	Reference address outside range	The reference address exceeds the setting range.
2009	Reference size error	The reference size is set to 0 or exceeds the setting range.
200A	Control table damaged	The contents of the control table were changed while an instruction was being executed.
200B	Master instructions prohibited	Master instructions ETMS and ETUS were used in the Unpassive Open mode.
2011	Response error	An error was found in the response, such as corrupted communications data or the wrong data was sent. For details on the error, refer to the next register (4XXXXX + 6 or RXXXXX + 6).
2012	Error response received	An error response was returned. For details on the error, refer to the next register (4XXXXX + 6 or RXXXXX + 6).
2013	Ethernet Interface Module error response	An error was returned from the Ethernet Interface Module. For details on the error, refer to the next register (4XXXXX + 6 or RXXXXX + 6).

8) Detailed Error Code (4XXXXX + 6 or RXXXXX + 6)

The detailed error code provides information on the cause of 3 of the error codes listed in the previous table: Response error, error response received, and Ethernet Interface Module error response. Detailed error codes are also displayed in hexadecimal format.

a) Detailed Codes for Response Errors

Table 5.7 Response Error Details

Error Code (Hex)	Details
0001	Major function mismatch
0002	Sub-function mismatch
0003	Special reference sub-command mismatch
0004	Loopback test code mismatch
0005	Loopback test data mismatch

b) Detailed Codes for Error Responses Received

Table 5.8 Error Response Received Details

Error Code (Hex)	Details
0001	Sub-function error
0002	Reference number error
0003	Data volume error
0004	Command format error

c) Detailed Codes for Ethernet Interface Module Error Responses

Table 5.9 Ethernet Interface Module Error Response Details

Error Code (Hex)	Details
4NXX	Sequence error
5NXX	Resetting
6NXX	Data reception error
7NXX	Connection error
8NXX	Data send error
9NXX	Response timeout

Note N: Command code (ETUS = 1, ETUR = 2, ETMS = 3)
xx: Connection number

B. Middle Element

The middle element is used as a send buffer when writing data to references.

1) When data is written to references, data of the reference data size specified in the control table will be stored in the registers.

2) When data is written to coils or relays, the following amount of data will be stored in the registers.

$$\left\lceil \frac{\text{Reference size} + 15}{16} \right\rceil$$ (One unit) (See note 1)

3) Reference data contents to be written is stored.

4) The middle element is not used to perform the following functions.

- Reading from reference data
- Loopback

C. Bottom Element

The bottom element is used as a reception buffer when reading data from references.

1) When data is read from references, data of the reference data size specified in the control table is stored in the register.

2) When data is read from coils or relays, only the following amount of data is stored in the register.

$$\left\lceil \frac{\text{Reference size} + 15}{16} \right\rceil$$ (One unit) (See note 1)

3) Reference data contents that are read is stored.

4) The bottom element is not used to perform the following functions.

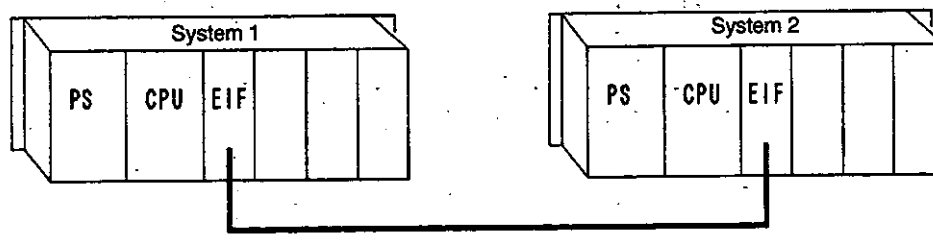
- Writing data to a reference
- Loopback

Note (1) The number of relays or coils will be the large integer that does not exceed the following value: (Reference size + 15)/16

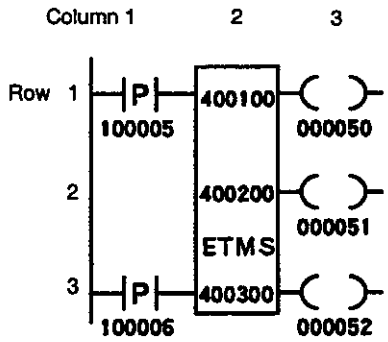
(2) Make sure that the register area used as the reception buffer is not used for any other purpose.

3. Usage Example

A. System Configuration



B. Communications Circuit Example



In this example, the contents of coils 000001 to 000018 in system 2 is read from system 1. The ladder logic program on the left is created in system 1. No ladder logic program is created in system 2.

C. Data Stored in Registers

(i) Control Table (Top Element)

The Automatic Instruction Mode is used.

400100	1 (Host connection No.)
400101	101 (Function: Read output coil states)
400102	0 (Leading reference No.)
400103	18 (Reference size)
400104	0 (Used by the system.)
400105	0 (Error code)
400106	0 (Detailed error code)

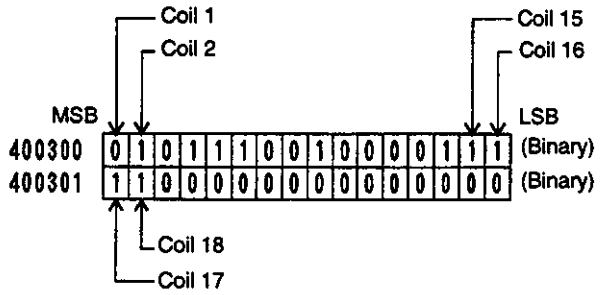
Nothing is set in registers after and including system use register 400104. The reason 1 is set as the host connection number is that it is assumed that the IP address for system 2 has been set for connection number 1 of system 1.

(ii) Send Buffer (Middle Element)

In this example, only the read function is used, so the register specified here is not used.

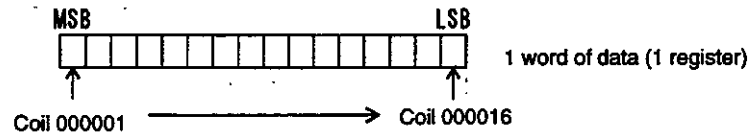
(iii) Reception Buffer (Bottom Element)

The 18 bits of reception data are received from the slave. One register and two bits of data are stored as reception data.



INFO

When reading or writing coil or relay reference data, the first digital reference will be the MSB of the word data and the 16th digital reference will be the LSB.
This format is the fixed format for the GL120, GL130 Series. If the reception data is copied directly to a coil reference, a ladder logic program can be constructed using the digital reference image on the slave. The layout of data in coil 000001 to 000016 is shown below.



(iv) Operation

- Input relay 100005 is turned ON. If the command can be sent, coil 000050 will turn ON.
- When a response has been received, coil 000052 will turn ON for one scan only.

5.2.3 Manual Instruction Mode

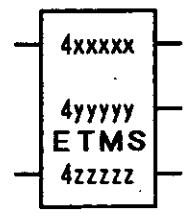
1. Mode

1) With the ETMS instruction, command function codes are set to specify functions for execution on a slave. For example, to make the slave read holding registers, function code 03 (decimal) is specified (Manual Instruction Mode).

2) The mode is switched between Automatic Instruction Mode and Manual Instruction Mode depending on the function code.

3) ETMS requires 3 elements (top, middle, and bottom) located vertically on the network. The structure of each element in Manual Instruction Mode is described following.

Example: ETMS Element Structure



2. Element Structure

A. Top Element

(i) Control Table

The top element of the ETMS instruction is used to set the register number of the register that is the leading reference in the control table.

The control table uses 7 registers starting from either 4XXXXX or RXXXXX. These registers are used by ETMS (ETHERNET MASTER instruction) to store data for controlling communications. These registers cannot be used for any other purpose.

The host connection number, function code, and send data size are set by the user. All other register values are set by the system.

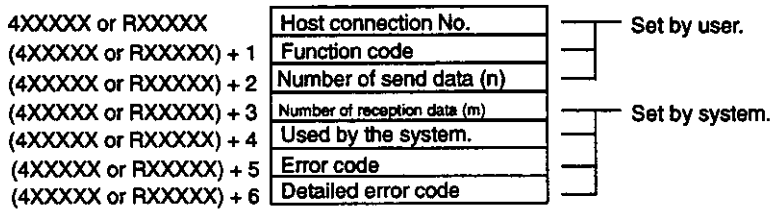


Figure 5.2 Control Table Structure: Manual Instruction Mode

4) Host Connection Number (4XXXXX or RXXXXX)

The command is sent to the slave with the connection number specified using MEMOSOFT. The setting range is 1 to 15.

5) Function Code (4XXXXX + 1 or RXXXXX + 1)

Set the function code. Functions codes are used to specify functions for execution on the slave. The mode is switched between Automatic Instruction Mode and Manual Instruction Mode depending on the function code.

a) MEMOBUS Protocol

Function codes for MEMOBUS protocol are as shown in the following table.

Table 5.10 MEMOBUS Function Codes

Function Code		Function	Address Setting range	Max. Data Size		Mod
Deci-mal	Hex			RTU	ASCII	
01	01	Read output coil states	0 to 8191	2000	2000	Yes
02	02	Read input relay states	0 to 1023	2000	2000	Yes
03	03	Read holding register contents	0 to 9998	125	125	Yes
04	04	Read input register contents	0 to 511	125	125	Yes
05	05	Change single output coil state	0 to 8191	1	1	
06	06	Write single holding register	0 to 9998	1	1	
07	07	Read special coil states	0 to 8191	8	8	
08	08	Loopback test	–	2	2	Yes
15	0F	Change multiple output coil states	0 to 8191	800	800	Yes
16	10	Write multiple holding registers	0 to 9998	100	100	Yes
17	11	Read machine status	–	9	9	
18	12	Read link coil states	0 to 2047	2000	2000	Yes
19	13	Read constant register contents	0 to 4095	125	125	Yes
21	15	Read link register content	0 to 2047	125	125	Yes
22	16	Write holding register mask	0 to 9998	1	1	
23	17	Read/Write multiple holding register contents	0 to 9998	125 100	125 100	
24	18	Read FIFO register content	0 to 9998	31	31	
25	19	Change single link coil state	0 to 2047	1	1	
26	1A	Write single constant register	0 to 4095	1	1	
27	1B	Write single link register	0 to 2047	1	1	
29	1D	Change multiple link coil states	0 to 2047	800	800	Yes
30	1E	Write multiple constant registers	0 to 4095	100	100	
31	1F	Write multiple link registers	0 to 2047	100	100	Yes
33	21	Read special reference states	See note 2	See note 3	See note 3	Yes
34	22	Change special reference states	See note 2	See note 4	See note 4	Yes

Note (1) Automatic Instruction Mode supports only those commands marked "Yes" in the far-right column. Manual Instruction Mode supports all commands listed in the table.

(2) MC Coils: 0 to 512
M-code Relays: 0 to 192
MC Control Relays: 0 to 512
MC Relays: 0 to 512
MC Control Coils: 0 to 320

(3) Input relays/Output coils: 1984, registers: 124

(4) Input relays/Output coils 800, registers: 100

Note The MEMOBUS function codes used in Automatic Instruction Mode are different from the MEMOBUS function codes used in Manual Instruction Mode. Be sure to use the right codes.

b) MEMOBUS Expansion Protocol

MEMOBUS Expansion protocol function codes are the same as those for MEMOBUS, except those listed in the following table, for which the setting range is different.

Table 5.11 MEMOBUS Expansion Function Codes

Function Code		Function	Address Setting Range	Max. Data Size		Mode
Decimal	Hex			RTU	ASCII	
03	03	Read holding register contents	0 to 9998	508	508	Yes
04	04	Read input register contents	0 to 511	508	508	Yes
16	10	Write holding registers	0 to 9998	507	507	Yes
13	0D	Write non-continuous holding registers	0 to 9998	508	508	
14	0E	Write multiple non-continuous holding registers	0 to 9998	254	254	

Note Automatic Instruction Mode supports only those commands marked "Yes" in the far-right column. Manual Instruction Mode supports all commands listed in the table.

IMPORTANT Observe the following precaution when setting MEMOBUS protocol for Manual Instruction Mode.
The instruction format is almost identical to the MEMOBUS instruction format, and has the following 3 patterns. Use these patterns to make settings. For more details on each instruction format, refer to the following manual.

- *MEMOCON GL120, GL130 MEMOBUS User's Manual* (SIEZ-C825-70.13)

1) Pattern 1

The structure of the query message and response message are illustrated below.

Set/read data within the bold lines.

Query Message: Set in the middle element of the ETMS instruction

Response Message: Read to the bottom element of the ETMS instruction

Query Message

Slave address	
Function code	
Starting No.	MSB
	LSB
Number of units	MSB
	LSB
CRC-16	MSB
	LSB

Response Message (Normal)

Slave address	
Function code	
Number of data	
Data	
CRC-16	MSB
	LSB

Table 5.12 Corresponding Command Function Codes

Function Code		Function
Decimal	Hex	
01	01	Read output coil states
02	02	Read input relay states
03	03	Read holding register contents
04	04	Read input register contents
05	05	Change single output coil state
06	06	Write single holding register
07	07	Read special coil states
08	08	Loopback test
17	11	Read machine status
18	12	Read link coil states
19	13	Read constant register contents
21	15	Read link register content
22	16	Write holding register mask
24	18	Read FIFO register contents
25	19	Change single link coil state
26	1A	Write single constant register
27	1B	Write single link register

Note Here, 24 (decimal), or 18 (hexadecimal), does not include the number of query messages.

◀EXAMPLE▶ **Reading Holding Register Contents**

- **Command Format**

Query Message

Slave address	
Function code	
Starting No.	MSB
	LSB
Number of units	MSB
	LSB
CRC-16	MSB
	LSB

Set in the middle element of the ETMS instruction

Response Message (Normal)

Slave address	
Function code	
Number of data	
Data	MSB
	LSB
Data	
CRC-16	MSB
	LSB

Read to the bottom element of the ETMS instruction

- The data that should be stored in each register for the above example is illustrated below.

a) Control Table (Top Element)

4xxxxx	1 (Host connection number)
4xxxxx+1	3 (Function: Read holding register contents)
4xxxxx+2	4 (Number of send data)
4xxxxx+3	4 (Number of reception data)
4xxxxx+4	0 (Used by the system.)
4xxxxx+5	0 (Error code)
4xxxxx+6	0 (Detailed error code)

Set by system

b) Send Buffer (Middle Element)

Set Contents: Read 2 registers from holding register 400010 onwards.

4yyyyy	00 (Hex)	09 (Hex)
4yyyyy+1	00 (Hex)	02 (Hex)

c) Reception Buffer (Bottom Element)

Read Contents: Content of 400010: 1234 (Hex)
Content of 400011: 5678 (Hex)

4zzzzz	12 (Hex)	34 (Hex)
4zzzzz+1	56 (Hex)	78 (Hex)

2) Pattern 2

The structure of the query message and response message are illustrated below.

Set/read data within the bold lines.

Query Message: Set in the middle element of the ETMS instruction

Response Message: Read in the bottom element of the ETMS instruction

Query Message

Slave address	
Function code	
Starting No.	MSB
	LSB
Number of units	MSB
	LSB
Number of data	
Data	
CRC-16	MSB
	LSB

Response Message (Normal)

Slave address	
Function code	
Number of data	
Data	
CRC-16	MSB
	LSB

Table 5.13 Corresponding Command Function Codes

Function Code		Function
Decimal	Hex	
15	0F	Change multiple output coil states
16	10	Write multiple holding registers
23	17	Read/write multiple holding registers
29	1D	Change multiple link coil states
30	1E	Write multiple constant registers
31	1F	Write multiple link registers
34	22	Change special reference states

◀EXAMPLE▶ **Writing to Multiple Holding Registers**

- **Command Format**

Query Message

Slave address		
Function code		
Starting No.	MSB	Set in the middle element of the ETMS instruction
	LSB	
Number of units	MSB	
	LSB	
Number of data		← Omitted
Data written to the first holding register	MSB	Set in the middle element of the ETMS instruction
	LSB	
Data written to the next holding register	MSB	
	LSB	
Data written to the next holding register	MSB	
	LSB	
CRC-16	MSB	
	LSB	

Response Message (Normal)

Slave address		
Function code		
Starting No.	MSB	Read to the bottom element of the ETMS instruction
	LSB	
Number of units	MSB	
	LSB	
CRC-16	MSB	
	LSB	

- The data that should be stored in each register for the above example is illustrated below.

a) Control Table (Top Element)

4xxxxx	1 (Host connection No.)	
4xxxxx+1	16 (Function: Write multiple holding registers)	
4xxxxx+2	10 (Number of send data)	
4xxxxx+3	4 (Number of reception data)	Set by system
4xxxxx+4	0 (Used by the system.)	
4xxxxx+5	0 (Error code)	
4xxxxx+6	0 (Detailed error code)	

b) Send Buffer (Middle Element)

Write Contents: Write the contents of holding registers 400010 to 400012.
400010: 1234 (Hex)
400011: 5678 (Hex)
400012: 9ABC (Hex)

4yyyyy	00 (Hex)	09 (Hex)
4yyyyy+1	00 (Hex)	03 (Hex)
4yyyyy+2	12 (Hex)	34 (Hex)
4yyyyy+3	56 (Hex)	78 (Hex)
4yyyyy+4	9A (Hex)	BC (Hex)

Starting No.: 400010-400001

c) Reception Buffer (Bottom Element)

Read Contents

4zzzzz	00 (Hex)	09 (Hex)
4zzzzz+1	00 (Hex)	03 (Hex)

3) Pattern 3

The structure of the query message and response message are illustrated below.

Set/read data within the bold lines.

Query Message: Set in the middle element of the ETMS instruction

Response Message: Read in the bottom element of the ETMS instruction

Query Message

Slave address	
Function code	
Sub-function code	
Starting No.	MSB
	LSB
Number of units	MSB
	LSB
CRC-16	MSB
	LSB

Response Message (Normal)

Slave address	
Function code	
Sub-function code	
Number of data	
Data	
CRC-16	MSB
	LSB

Table 5.14 Corresponding Command Function Code

Function Code		Function
Decimal	Hex	
33	21	Read special reference states

◀EXAMPLE▶ **Reading Special Reference Status (Reading MC Coil Status)**

- **Command Format**

Query Message

Slave address		
Function code		
Sub-function code		
Starting No.	MSB	
	LSB	
Number of units	MSB	
	LSB	
CRC-16	MSB	
	LSB	

Set in the middle element of the ETMS instruction

Response Message (Normal)

Slave address		
Function code		
Sub-function code		Read to the bottom element of the ETMS instruction
Number of data		
Data		Read to the bottom element of the ETMS instruction
CRC-16	MSB	
	LSB	

- Sub-function Code: 01 (Hex) = MC coil

- Starting No.: Leading MC coil number – Y00001

- The data that should be stored in each register for the above example is illustrated below.

a) Control Table (Top Element)

4xxxxx	1 (Host connection No.)	Set by system
4xxxxx+1	33 (Function: Read special reference states)	
4xxxxx+2	5 (Number of send data)	
4xxxxx+3	4 (Number of reception data)	
4xxxxx+4	0 (Used by the system.)	
4xxxxx+5	0 (Error code)	
4xxxxx+6	0 (Detailed error code)	

b) Send Buffer (Middle Element)

Set Contents: Read 20 coils starting from MC coil Y10010.

4yyyyy	01 (Hex)	27 (Hex)	Starting No.: Y10010-Y00001
4yyyyy+1	19 (Hex)	00 (Hex)	
4yyyyy+2	14 (Hex)		

c) Reception Buffer (Bottom Element)

Read Contents: Reads 20 coils starting from MC coil Y10010.

4zzzzz	01 (Hex)	FF (Hex)	When all coils from Y10010 to Y10029 are 1.
4zzzzz+1	FF (Hex)	0F (Hex)	

INFO Supplementary Information on the MEMOBUS Expansion Commands

1)The MEMOBUS expansion protocol includes the following two commands that are not available with the MEMOBUS protocol.

- Read multiple non-continuous holding registers
- Write multiple non-continuous holding registers

2)Functions and other details of the above two commands are described below.

a) Read Multiple Non-continuous Holding Registers

(1) Function

Reads data from multiple non-continuous holding registers.
Function code: 0D (Hex)
Maximum number of data units per message: 508

(2) Query Message and Response Message

The following illustration shows a configuration example of a query message and response message. The query message is set in the middle element (4yyyyy) of the ETMS instruction. The response message is set in the bottom element (4zzzzz) of the ETMS instruction.

Example for Reading Three Holding Registers

Query Message

Not used.		00 H
Number of units	LSB	03 H
	MSB	00 H
Reference No. 1	LSB	00 H
	MSB	00 H
Reference No. 2	LSB	09 H
	MSB	00 H
Reference No. 3	LSB	63 H
	MSB	00 H

Response Message (Normal)

Not used.		00 H
Number of units	LSB	03 H
	MSB	00 H
Data 1	LSB	11 H
	MSB	11 H
Data 2	LSB	22 H
	MSB	22 H
Data 3	LSB	33 H
	MSB	33 H

Contents to be read
Reads data 1111 Hex from 400001
Reads data 2222 Hex from 400010
Reads data 3333 Hex from 400100

b) Write Multiple Non-continuous Holding Registers

(1) Function

Writes data into multiple non-continuous holding registers.
Function code: 0E (Hex)
Maximum number of data units per message: 254

(2) Query Message and Response Message

The following illustration shows a configuration example of a query message and response message. The query message is set in the middle element (4yyyyy) of the ETMS instruction. The response message is set in the bottom element (4zzzzz) of the ETMS instruction.

Example for Writing Three Holding Registers

Query Message

Not used.		00 H
Number of units	LSB	03 H
	MSB	00 H
Reference No. 1	LSB	00 H
	MSB	00 H
Data 1	LSB	34 H
	MSB	12 H
Reference No. 2	LSB	09 H
	MSB	00 H
Data 2	LSB	78 H
	MSB	56 H
Reference No. 3	LSB	63 H
	MSB	00 H
Data 3	LSB	BC H
	MSB	9A H

Response Message (Normal)

Not used.		00 H
Number of units	LSB	03 H
	MSB	00 H

Contents to be written
Writes data 1234 Hex into 400001
Writes data 5678 Hex into 400010
Write data 9ABC Hex into 400100

---

d) Number of Send Data Items (n) (4XXXXX + 2 or RXXXXX + 2)

The number of message bytes (number of characters: n) transmitted is specified in 4XXXXX + 2 or RXXXXX + 2. The setting range for n is 1 to 512 in Manual Instruction Mode. An error will occur immediately and the instruction will not be executed if a value outside the specified range is set.

Table 5.15 Number of Send Data Items

n	Number of Send Buffer Registers
Even	n/2 registers
Odd	(n + 1)/2 registers

e) Number of Reception Data Items (m) (4XXXXX + 3 or RXXXXX + 3)

The number of bytes (number of characters: m) in the received message is set in 4XXXXX + 3 or RXXXXX + 3. The number is set by the CPU when a normal end occurs after the instruction is executed. The range of m values written in the register is 0 to 512, and the number of reception data items is cleared to 0 when an instruction is executed.

Table 5.16 Number of Reception Data Items

m	Number of Reception Buffer Registers
Even	m/2 registers
Odd	(m + 1)/2 registers

f) Used by the System (4XXXXX + 4 or RXXXXX + 4)

The registers are used by the ladder logic instructions. The contents of the registers are set by the system. Do not change the content of these registers from the user program. The structure of each bit is shown in the following diagram.

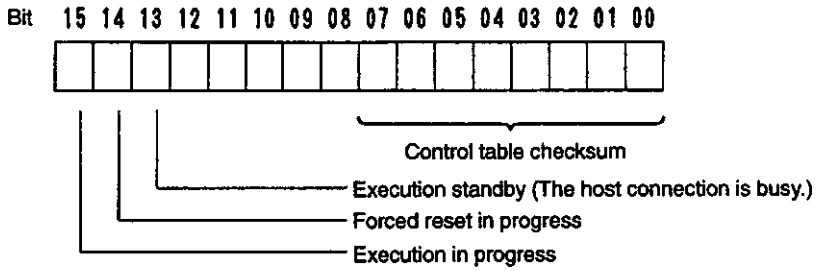


Table 5.17 Allocation of 4XXXXX + 4 Bits (RXXXXX + 4 Bits)

Bit	Contents
15	Execution In-progress Flag Bit 15 turns ON during execution. Even if input 1 is received, bit 15 will not turn ON until instruction execution is actually started. This bit is interlocked with output 1.
14	Forced Reset In-progress Flag Bit 14 turns ON when forced reset is in progress using input 3 of the ETMS instruction. When forced reset has been completed, bit 14 turns OFF again.
13	Execution Standby Flag Bit 13 is set to 1 if the instruction has been executed, but execution has not yet started. It thus indicates standby status when the host connection is busy.
12 to 08	No allocation. Always 0.
07 to 00	Used as the control table checksum.

Note Bit 13, bit 14, and bit 15 will never be ON at the same time.

g) Error Code (4XXXXX + 5 or RXXXXX + 5)

When an error occurs in communications, an error code will be returned from the host. The following table provides a list of error codes. Error codes are displayed in hexadecimal.

Table 5.18 Error Codes

Error Code (Hex)	Name	Meaning
8XXX	Ethernet Interface Module stopped	Ethernet Interface Module operation has stopped due to an error.
4XXX	Ethernet Interface Module initializing	The Ethernet Interface Module is initializing.
2001	High-speed scan execution error	The ETMS instruction was executed in a high-speed scan.
2002	Host connection number error	The host connection number is not set between 1 and 15.
2003	Protocol error	A protocol not supported by the ETMS instruction has been set.
2004	No free buffers	All 10 buffers are already being used.
2005	Illegal function code	Function code does not exist.
2006	Error in number of send data	The number of send data is set to 0, or the number of send data exceeds the setting range or the table size.
2007	Number of reception data error	The number of reception data exceeds the setting range or the table size.
2008	Reference address outside range	The reference address exceeds the setting range.
2009	Reference size error	The reference size is set to 0 or exceeds the setting range.
200A	Control table damaged	The contents of the control table were changed while an instruction was being executed.
200B	Master instructions prohibited	Master instructions ETMS and ETUS were used in the Unpassive Open mode.
2011	Response error	An error was found in the response, such as corrupted communications data or the wrong data was sent. For details on the error, refer to the next register (4XXXXX + 6 or RXXXXX + 6).
2012	Error response received	An error response was returned. For details on the error, refer to the next register (4XXXXX + 6 or RXXXXX + 6).
2013	Ethernet Interface Module error response	An error was returned from the Ethernet Interface Module. For details on the error, refer to the next register (4XXXXX + 6 or RXXXXX + 6).

h) Detailed Error Code (4XXXXX + 6 or RXXXXX + 6)

The detailed error code provides information on the cause of 3 of the error codes listed in the previous table: Response error, error response received, and Ethernet Interface Module error response. Detailed error codes are also displayed in hexadecimal.

(1) Detailed Codes for Response Errors

Table 5.19 Response Error Details

Error Code (Hex)	Details
0001	Major function mismatch
0002	Sub-function mismatch
0003	Special reference sub-command mismatch
0004	Loopback test code mismatch
0005	Loopback test data mismatch

(2) Detailed Codes for Error Responses Received

Table 5.20 Error Response Received Details

Error Code (Hex)	Details
0001	Sub-function error
0002	Reference number error
0003	Data volume error
0004	Command format error

(3) Detailed Codes for Ethernet Interface Module Error Responses

Table 5.21 Ethernet Interface Module Error Response Details

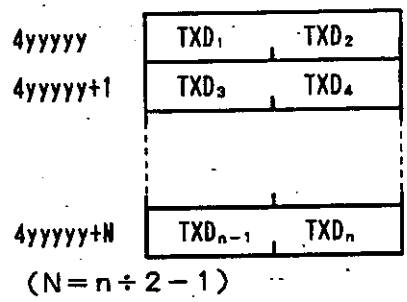
Error Code (Hex)	Details
4NXX	Sequence error
5NXX	Resetting
6NXX	Data reception error
7NXX	Connection error
8NXX	Data send error
9NXX	Response timeout

Note N: Command code (ETUS = 1, ETUR = 2, ETMS = 3)
xx: Connection number

B. Middle Element

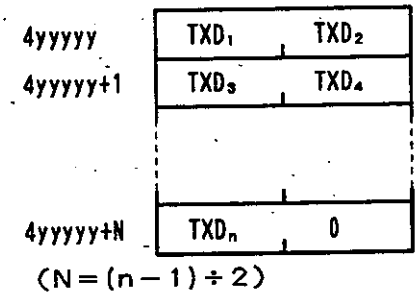
The send data is stored in the middle element. The middle element uses the specified number (N; see figures below) of holding registers starting from 4YYYYY as the send buffer. The middle element indicates the leading reference of the register block used to store the send data. The size of the send buffer depends on the number, n, of send data items. Send data must be set prior to executing the instruction. Data is sent in the order of the subscripts given for TXD (send data) in the following diagrams.

(i) n = Even Number



(N = n ÷ 2 − 1)

(ii) Odd Number



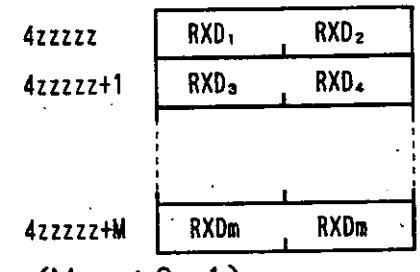
(N = (n − 1) ÷ 2)

TXD: Send data

C. Bottom Element

Reception data is stored in the bottom element. The bottom element uses the specified number (M; see figures below) of holding registers starting from 4ZZZZZ as the reception buffer. It indicates the leading reference of the register block used to store reception data. The size of the reception buffer depends on the number, m, of reception data items. Consider the maximum number of reception data items ahead of time, and be sure to maintain the buffer. This area is not cleared when the instruction is executed. Data is received in the order of the subscripts indicated for RXD (reception data) in the following diagrams.

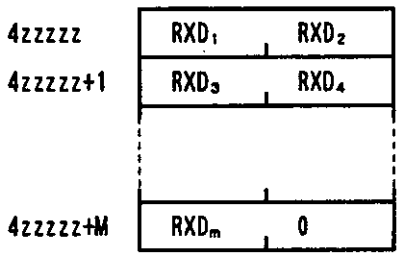
(i) m = Even Number



(M = m ÷ 2 − 1)

(ii) m = Odd Number

Characters remaining at the end are filled with zeros (0).



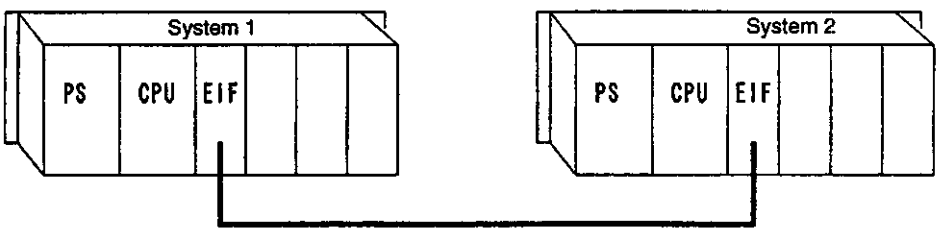
(M=(m−1)÷2)

RXD: Reception data

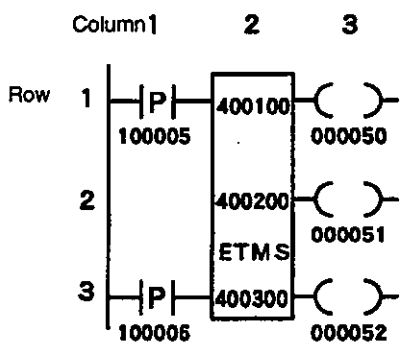
Note Do not use the register area for any other application.

3. Usage Example

A. System Configuration



B. Communications Circuit Example



In this example, the contents of coils 000001 to 000018 in system 2 is read from system 1. The ladder logic program on the left is created in system 1. No ladder logic program is created in system 2.

C. Data Stored in Registers

(i) Control Table (Top Element)

400100	1 (Host connection No.)
400101	1 (Function: Read output coil states)
400102	4 (Number of send data)
400103	0 (Number of reception data)
400104	0 (Used by the system.)
400105	0 (Error code)
400106	0 (Detailed error code)

Nothing is set in registers after and including register 400103 (number of reception data). The reason 1 is set as the host connection number is that it is assumed that the IP address for system 2 has been set for connection number 1 of system 1.

The number of send data items is 4. This value is dependent on the MEMOBUS command data stored in the send buffer.

(ii) Send Buffer (Middle Element)

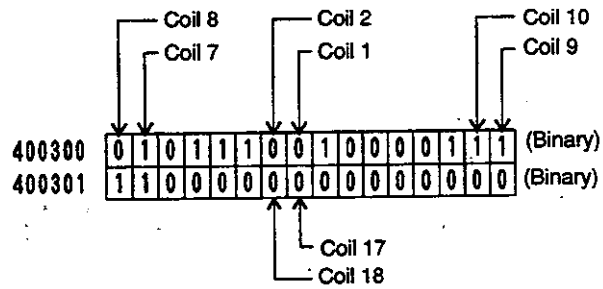
In this example, the contents of output coils 000001 to 000018 of the GL120 in system 2 are read. The MEMOBUS command data is 4 bytes, so it is necessary to have a send buffer of 2 registers. Holding registers 400200 to 400201 are thus used as the reception buffer. The CRC is not necessary.

400200	00 (Hex)	00 (Hex) Starting No.
400201	00 (Hex)	12 (Hex) Number of coils

Number of coils: 18 (decimal) = 12 (hexadecimal)

(iii) Reception Buffer (Bottom Element)

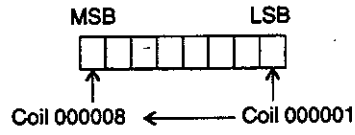
The response message from the slave is stored in holding registers 400300 to 400301. A total of 4 bytes of response data is received, so the contents of register 400103 (number of reception data) is 4. The rightmost 8 bits of the last reception data holding register 400301 do not received data and are set to 0.



Note A maximum of 1024 registers can be stored in a send buffer or reception buffer. Therefore, send/receive commands using more than 1024 holding registers cannot be used. If the designated number of registers exceeds 1024, a send/reception size error will occur.

When reading or writing coil or relay references, the position of the first digital reference will be the LSB and the 8th digital reference will be the MSB.

The data layout for coil 000001 to coil 000008 is as shown.



(iv) Operation

- Input relay 100005 is turned ON. If the command can be sent, coil 000050 will turn ON.
- When a response has been received, coil 000052 will turn ON for one scan only.

5.3 The ETUS Instruction

This section provides details on the functions, structure, and usage of the ETUS instruction.

1) Functions

a) ETUS is the mnemonic for the ETHERNET USER SEND instruction.

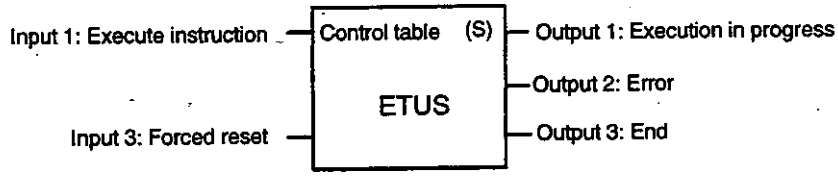
b) The ETUS instruction uses any protocol to send data to a remote node.

c) ETUS does not receive a responses from the remote node.

d) When using the ETUS instruction, it is necessary to ensure that the ladder logic program at the remote node contains the ETUR (ETHERNET USER RECEIVE) instruction and also that the ETUR instruction is being executed (i.e., that Input 1 is ON: Waiting to receive data).

2) Structure

a) The structure of the ETUS instruction is shown in the following diagram.



b) ETUS required 3 elements (top, middle, and bottom) located vertically on the network. Use the following table to set the register reference numbers.

Table 5.22 ETUS Structural Elements

Element	Meaning	Setting Range	
Top Element	The leading reference number of the control table.	Holding register	400001 to 409993 (W00001 to W09993)
		Link register	R10001 to R11018 R20001 to R21018
Middle Element	Not used.	–	000001
Bottom Element	Not used.	–	000001

Middle Element and Bottom Element

The middle and bottom elements are not used. The display is fixed at constant 000001.

3) Execute Conditions

The following conditions must be met to execute the instruction.

a) The specified node for communications must not be engaged in communications with another ladder logic program.

b) Input 1 must be changed from OFF to ON.

c) Input 3 must be OFF.

4) I/O Definitions

The I/O definitions for the ETUS instruction are as follows:

a) Input 1: Execute Instruction

The ETUS instruction is executed when input 1 is ON and input 3 is OFF. Output 1 goes ON when input 1 turns ON and execution begins.

b) Input 3: Forced Reset

Input 3 can be used to abort the ETUS instruction during execution. When this input is turned ON, the three outputs go OFF. Input 3 takes priority over the other inputs.

Input 3 can be used to abort the instruction for timeouts and other abnormal conditions.

Note Normally a positive transitional contact must be used for inputs 1 and 3. If input 1 is ON when ETUS finishes executing, it will begin executing again. The ETUS instruction will not be executed even if input 1 is ON as long as input 3 is ON.

When either input 1 or 3 turns ON, all error codes in the control table will be cleared. (See *Table 5.6*).

c) Output 1: Execution in Progress

Output 1 will go ON when input 1 (Execute Instruction) turns ON and the ETUS instruction begins execution. It goes OFF when the operation ends or is forced reset.

Output 1 will go OFF if an error occurs while the ETUS instruction is being executed.

d) Output 2: Error

Output 2 will go ON for 1 scan when ETUS instruction execution ends with an error.

Details of errors are available in the control table error codes. (See *Table 5.6*).

e) Output 3: End

Output 3 will go ON for 1 scan when ETUS instruction execution ends normally.

5) Element Structure

a) Top Element

(1) Control Table

The top element of the ETUS instruction is used to set the number of the register that is the leading reference in the control table.

The control table uses 7 registers starting from either 4XXXXX or RXXXXX. These registers are used by ETUS as the master instruction to store data for controlling communications. These registers cannot be used for any other purpose.

The host connection number, leading address of hold registers used as send buffer, and number of holding registers to use as send buffer items are set by the user. All other register values are set by the system.

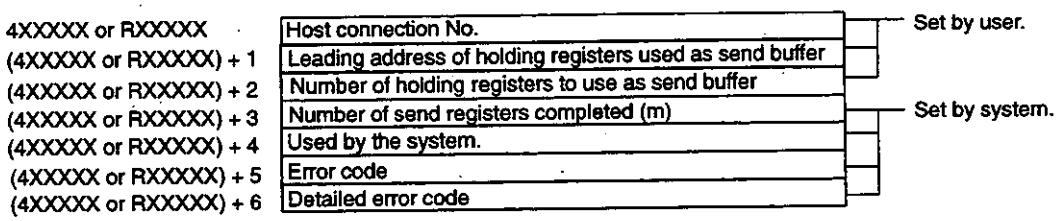


Figure 5.3 Control Table Structure

6) Top Element Contents

a) Host Connection Number

The command is sent to the slave with the connection number specified using MEMOSOFT. The setting range is 1 to 15.

b) Leading Address of Holding Registers Used as Send Buffer

Specify the address of the leading reference of the send registers. The value set is the leading reference address of the holding registers minus the fist address in the reference area (400001).

c) Number of Holding Registers to Use as Send Buffer

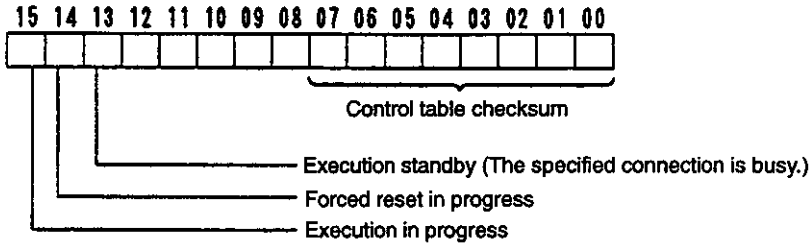
Specify the number of holding registers to send. The setting range is 1 to 1024.

d) Number of Registers Sent

After the instruction has been executed, the number of registers that was sent is set. After the instruction has been completed, the value will be the same as the number of holding registers to use as send buffer.

e) Used by the System

Registers used by the ladder logic instructions. Do not change the content of these registers from the user program.



f) Error Code

For details, see *Table 5.6*

g) Detailed Error Code

For details, see *Table 5.7*, and *Table 5.8*, and *Table 5.9*.

5.4 The ETUR Instruction

This section provides details on the functions, structure, and usage of the ETUR instruction.

1) Functions

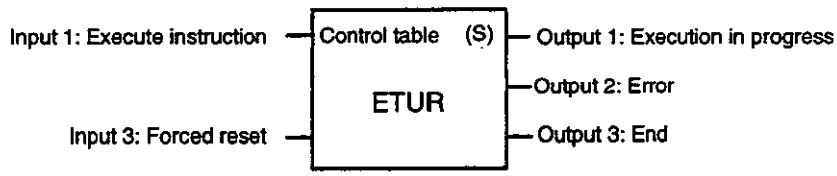
a) ETUR is the mnemonic for the ETHERNET USER RECEIVE instruction.

b) The ETUR instruction uses any protocol to receive data from a remote node.

c) The remote node does not return a response.

2) Structure

a) The structure of the ETUR instruction is shown in the following diagram.



b) ETUR requires 3 elements (top, middle, and bottom) located vertically on the network. Use the following table to set the register reference numbers.

Table 5.23 ETUR Structural Elements

Element	Meaning	Setting Range	
Top Element	The leading reference number of the control table.	Holding register	400001 to 409993 (W00001 to W09993)
		Link register	R10001 to R11018 R20001 to R21018
Middle Element	Not used.	–	000001
Bottom Element	Not used.	–	000001

INFO **Middle Element and Bottom Element**

The middle and bottom elements are not used. The display is fixed at constant 000001.

3) Execute Conditions

The following conditions must be met to execute the instruction.

a) The specified node for communications must not be engaged in communications with another ladder logic program.

b) Input 1 must be changed from OFF to ON.

c) Input 3 must be OFF.

4) I/O Definitions

The I/O definitions for the ETUR instruction are as follows:

a) Input 1: Execute Instruction

The ETUR instruction is executed when input 1 is ON and input 3 is OFF. Output 1 goes ON when input 1 turns ON and execution begins.

b) Input 3: Forced Reset

Input 3 can be used to abort the ETUR instruction during execution. When this input is turned ON, the three outputs go OFF. Input 3 takes priority over the other inputs.

Input 3 can be used to abort the instruction for timeouts and other abnormal conditions.

Note Normally a positive transitional contact must be used for inputs 1 and 3. If input 1 is ON when ETUR finishes executing, it will begin executing again. The ETUR instruction will not be executed even if input 1 is ON as long as input 3 is ON.

When either input 1 or 3 turns ON, all error codes in the control table will be cleared. (See *Table 5.6*).

c) Output 1: Execution in Progress

Output 1 will go ON when input 1 (Execute Instruction) is received and the ETUR instruction begins execution. It goes OFF when the operation ends or is forced reset.

Output 1 will go OFF if an error occurs while the ETUR instruction is being executed.

d) Output 2: Error

Output 2 will go ON for 1 scan if ETUR instruction execution ends with an error.

Details of errors are available in the control table error codes. (See *Table 5.6*).

e) Output 3: End

Output 3 will go ON for 1 scan when ETUR instruction execution ends normally.

5) Element Structure

a) Top Element

(1) Control Table

The top element of the ETUR instruction is used to set the number of the register that is the leading reference number of the control table.

The control table uses 7 registers starting from either 4XXXXX or RXXXXX. These registers are used by ETUR as the master instruction to store data for controlling communications. These registers cannot be used for any other purpose.

The host connection number, leading address at holding registers to use as reception buffer, and number of holding registers to use as reception buffer are set by the user. All other register values are set by the system.

4XXXXX or RXXXXX	Host connection No.	Set by user.
(4XXXXX or RXXXXX) + 1	Leading address at holding registers to use as reception buffer	
(4XXXXX or RXXXXX) + 2	Number of holding registers to use as reception buffer	
(4XXXXX or RXXXXX) + 3	Number of reception registers completed (m)	Set by system.
(4XXXXX or RXXXXX) + 4	Used by the system.	
(4XXXXX or RXXXXX) + 5	Error code	
(4XXXXX or RXXXXX) + 6	Detailed error code	

Figure 5.4 Control Table Structure

6) Top Element Contents

a) Host Connection Number

Data is received from the master with the connection number specified using MEMOSOFT. The setting range is 1 to 15.

b) Leading address at Holding Registers to Use as Reception Buffer

Specify the address of the leading reference of the reception registers. The value set is the leading reference address of the holding registers minus the fist address in the reference area (400001).

c) Number of Holding Registers to Use as Reception Buffer

Specify the number of holding registers to use as reception buffer.

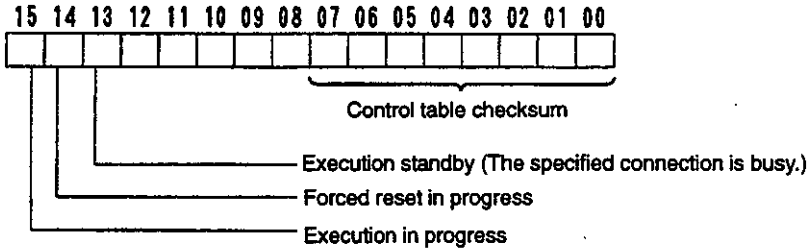
d) Number of Reception Registers Completed

After the instruction has been executed, the number of registers received is set. After the instruction has been completed, the value will be the same as the number of holding registers to use as reception buffer.

Range: 1 to 1024

e) Used by the System

Registers used by the ladder logic instructions. Do not change the content of these registers from the user program.



f) Error Code

For details, see *Table 5.6*

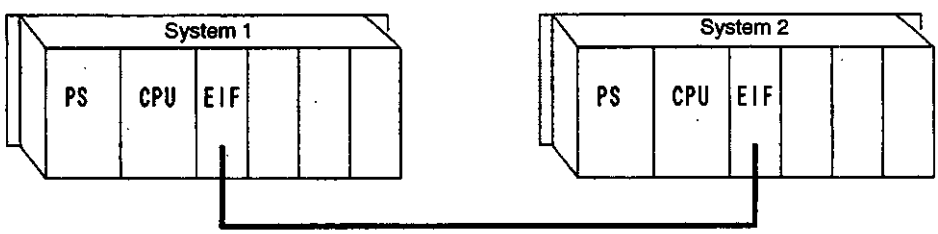
g) Detailed Error Code

For details, see *Table 5.7*, and *Table 5.8*, and *Table 5.9*.

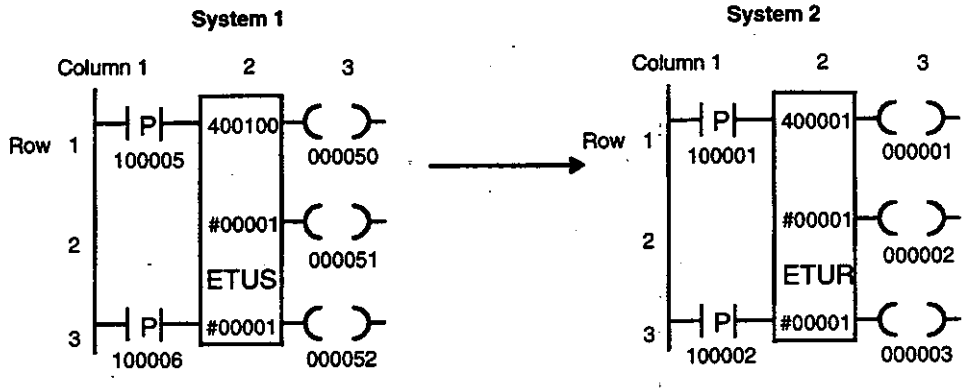
5.4.1 Application Example

This section describes an application example of communications between two systems using the ETUS and ETUR instructions.

1. System Configuration



2. Communications Circuits



Contents of 100 registers will be sent when the input relay 100005 changes from OFF to ON.

The system will be ready to receive data when the input relay 100001 changes from OFF to ON. When data is received from system 1, coil 000003 will turn ON for one scan, completing data reception.

Note **Instruction Execution Procedure**
Be careful of the instruction execution procedure when using the ETUS and ETUR instructions. First, make system 2 ready to receive data by executing the ETUR instruction and then execute the ETUS instruction on the sending side.

3. Data Stored in Registers

A. Control Table (Top Element)

System 1: Sends 100 registers of data from holding registers 400300 to 400399.

400100	1 (Host connection No.)
400101	299 (Leading address of holding registers used as send buffer)
400102	100 (Number of holding registers to use as send buffer)
400103	0 (Number of registers sent)
400104	0 (Used by the system.)
400105	0 (Error code)
400106	0 (Detailed error code)

System 2: Receives 100 registers of data from holding registers 400100 to 400199.

400100	1 (Host connection No.)
400101	099 (Leading address at holding registers to use as reception buffer)
400102	100 (Number of holding registers to use as reception buffer)
400103	0 (Number of registers received)
400104	0 (Used by the system.)
400105	0 (Error code)
400106	0 (Detailed error code)

Note (1) For system 1, do not set anything in the registers with a number of 400103 or larger. For system 2, do not set anything in the registers with a number of 400004 or larger. These registers are set by the system.

(2) In system 2, the number of registers received given in 40004 depends on the number of reception registers set in 40003 as shown below.

- Value in 400003 Is 99 or Smaller

  The number of register set in 400003 is received. If it is set to 50, the system receives 50 registers of data and ignores the rest.

- Value in 400003 Is 100 or Larger

  The number of registers being sent is 100, so the data for all 100 registers will be received.

B. Middle Element and Bottom Element

The middle element and the bottom element are both always 1.

Wiring

6

This chapter provides details on connecting and wiring the Ethernet Interface Module.

6.1 Wiring

This section describes connections, wiring, and grounding methods for the Ethernet Interface Module.

6.1.1 Connecting to Ethernet

1) The procedure for connecting the Ethernet Interface Module to Ethernet is described in this section.

a) There are two connection methods: 10Base5 and 10Base-T.

b) Only use one connection, either 10Base5 or 10Base-T, for communications. Do not leave a cable connected to the port that is not being used. For example, when 10Base5 is being used for communications, do not connect anything to the 10Base-T port. Doing so may damage the Module or cause malfunctions.

IMPORTANT **Installing Ethernet**

Adequate safety precautions must be taken when connecting Ethernet. We recommend that Ethernet installation be performed only by a qualified professional.

INFO **Ethernet Communications with other than 10Base5 or 10Base-T**

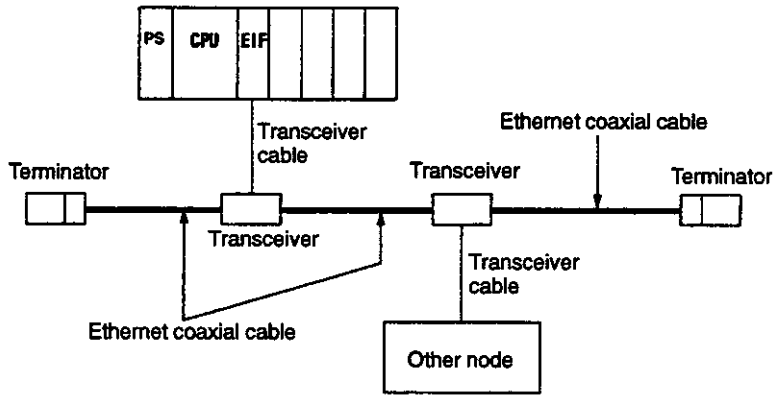
When using other communications media, such as 10Base2, that are not directly supported by this Module, it is necessary to connect a converter to the 10Base5 (or 10Base-T) port. The 10Base5 port conforms to the IEEE802.3 standard.

2) Peripheral Devices

The following devices are necessary to configure the network. These devices must be purchased separately. Use devices which conform to the IEEE802.3 standard for use with 10Base-T or 10Base5. Products recommended by Yaskawa are provided in the following examples.

a) 10Base5

(1) A 10Base5 connection configuration is shown in the following diagram.



PS: Power Supply Module
EIF: Ethernet Interface Module
CPU: CPU20, CPU30, or CPU35 CPU Module

(2) Use Ethernet coaxial cables (also known as yellow cables), connectors, terminators, transceivers, and transceiver cables that conform to the IEEE802.3 standard.

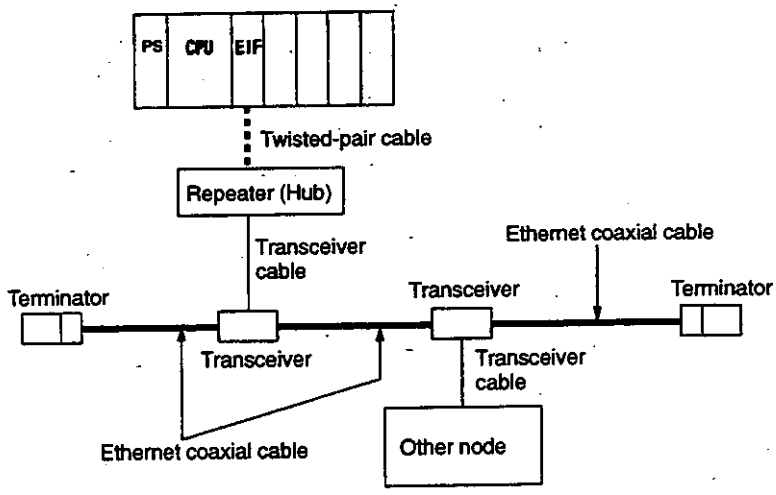
(3) The maximum length for transceiver cables is 50 m.

(4) Recommended Products:

Transceiver cables:	HBN-TC-100 (Hitachi Electric Cable)
Transceivers:	HBN-200TZ (Hitachi Electric Cable)
Ethernet coaxial cable:	HBN-CX-100 (Hitachi Electric Cable)
Coaxial cable connectors:	HBN-N-PC (Hitachi Electric Cable)
Terminator:	HBN-T-NJ (Hitachi Electric Cable)

b) 10Base-T

(1) A 10Base-T connection configuration is shown in the following diagram.



PS: Power Supply Module
EIF: Ethernet Interface Module
CPU: CPU20, CPU30, or CPU35 CPU Module

(2) Twisted-pair cables used for 10Base-T communications should be category-3 cables. Category-3 cables are used for baud rates of up to 10 Mbps. Recommended twisted-pair cables are listed in (4), below. When using twisted-pair cables other than those recommended by Yaskawa, ensure that the cables are category 3 or greater.

(3) The maximum length for twisted-pair cable between a hub (or repeater) and the Ethernet Interface Module (or node) is 100 m.

(4) Recommended Products:
Twisted-pair cables: HUTPTC-CAT3-4P (Hitachi Electric Cable)
Ethernet hub: HCN-7500 (Hitachi Electric Cable)

INFO **Ethernet and IEEE802.3**

The following table shows Ethernet components and the corresponding terms in the IEEE802.3 standard.

Ethernet	IEEE802.3
Coaxial cable	Medium
Transceiver	MAU (Medium Attachment Unit)
Transceiver cable	AUI (Attachment Unit Interface)
Node	DTE (Data Terminal Equipment)

6.1.2 Internal Panel Wiring

1. Separate Wiring

Separate transmission cables from other wiring systems by the distances listed below and wire them separately.

A. Separation from Low-voltage Power Cables

Separate transmission cables completely from low-voltage power cables (recommended distance: 100 mm min.).

B. Separation from Operation Circuit Cables

Either separate transmission cables completely from operation circuit power cables (recommended distance: 100 mm min.) or shield the operation circuit cables.

C. Separation from Main Circuit Cables

Either separate transmission cables completely from main circuit power cables (at the distances shown below) or shield the main circuit cables.

Recommended Separation Distances

Main Circuit	Separation Distance
125 V, 10 A	300 mm min.
250 V, 50 A	450 mm min.
440 V, 200 A	600 mm min.
3 to 6 kV, 800 A	1,200 mm min.

Note Refer to the above table and separate transmission cables correctly. Insufficient separation of cables may cause the Ethernet system to malfunction as a result of noise.

6.1.3 Indoor Panel-to-Panel Wiring

1. Separate Wiring

1) Lay transmission cables in a separate metal conduit or a metal duct. (See the following diagram.)

2) Be sure to ground both ends of the metal conduit or duct, and ground as many points in-between as possible.

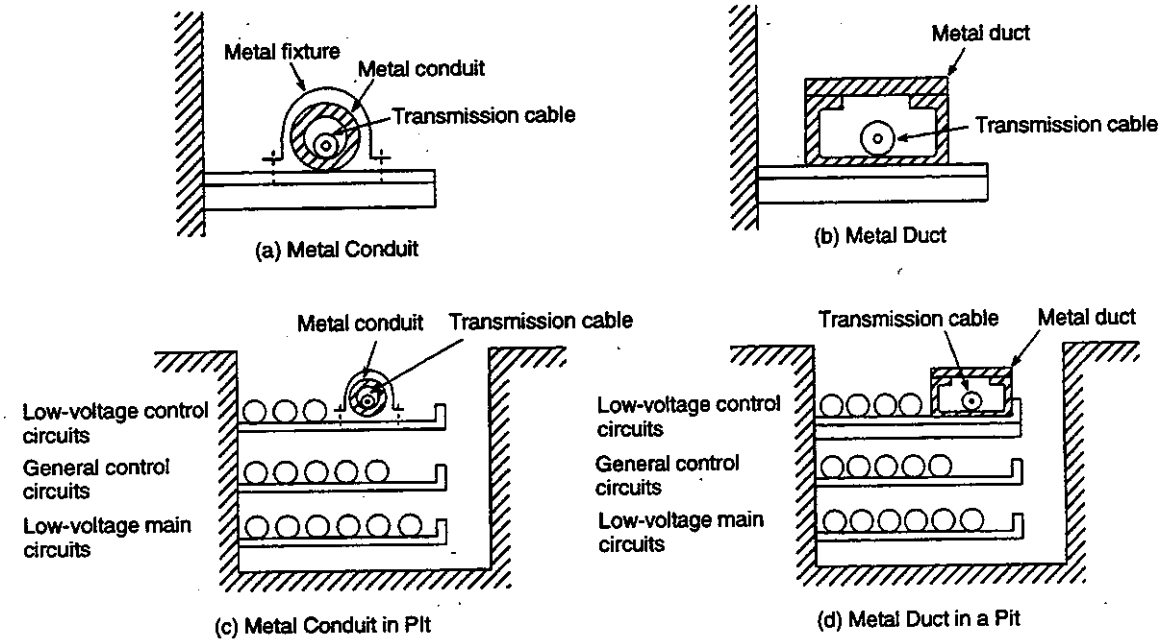


Figure 6.1 Laying Transmission Cables

6.1.4 Outdoor Panel-to-Panel Wiring

1) The procedure for laying transmission cables outdoors is basically the same as that for *6.1.3 Indoor Panel-to-Panel Wiring*, except for the following precautions.

⚠ **Caution** The Ethernet Interface Module is not protected from lightening surges, so do not wire overhead. Lightening strikes may damage the product.

a) When laying transmission cables outdoors, always run cables parallel to an above-ground structure (steel frame). When there are no above-ground structures, lay the cables in an underground pit or tunnel, or bury them underground.

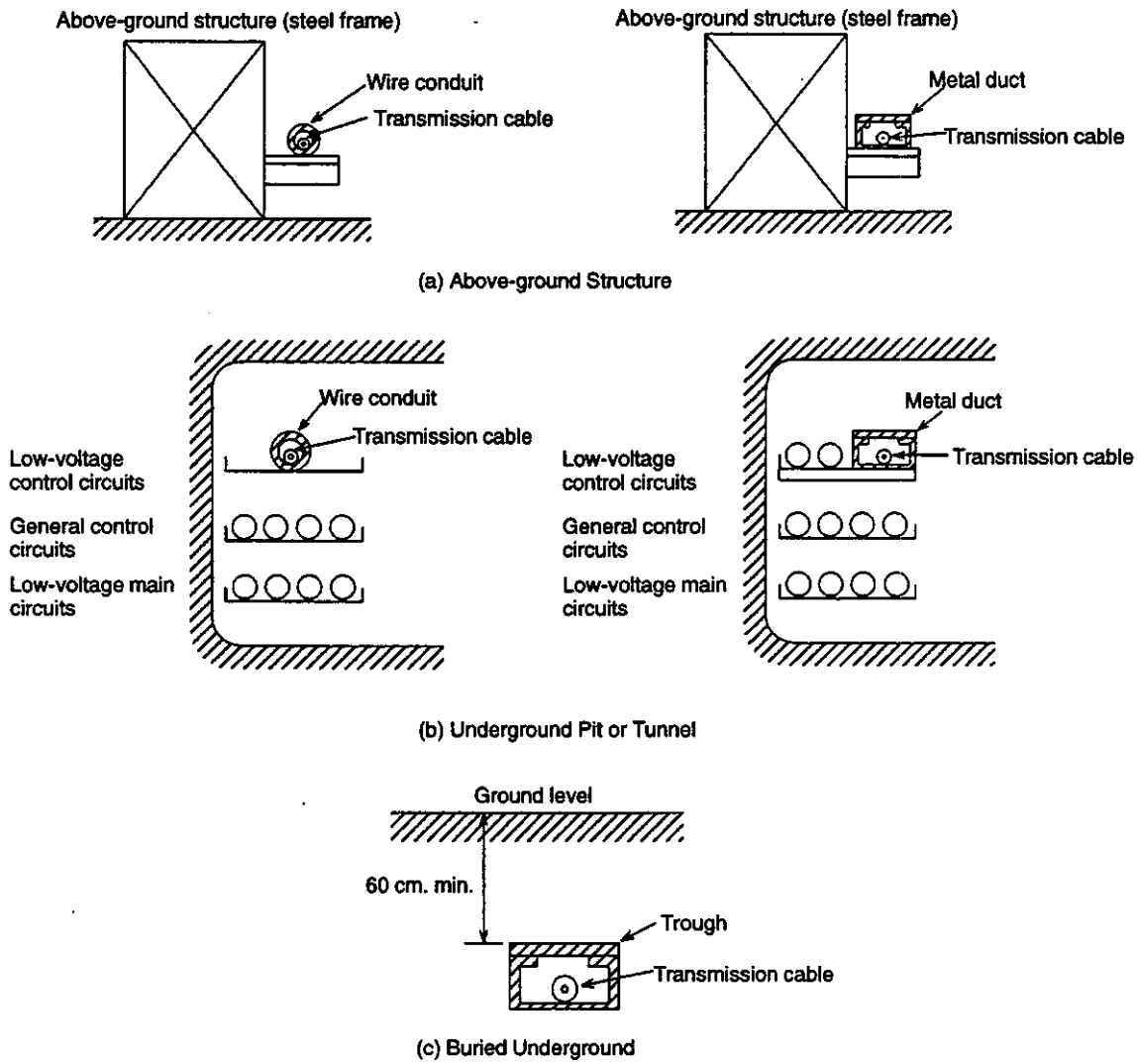


Figure 6.2 Examples of Laying Cables Between Buildings

b) Do not wire naked transmission cables overhead. Induction noise from electromagnetic waves in the air may cause transmission errors to occur.

6.1.5 Grounding

1. Grounding Method

A. Mounting Devices

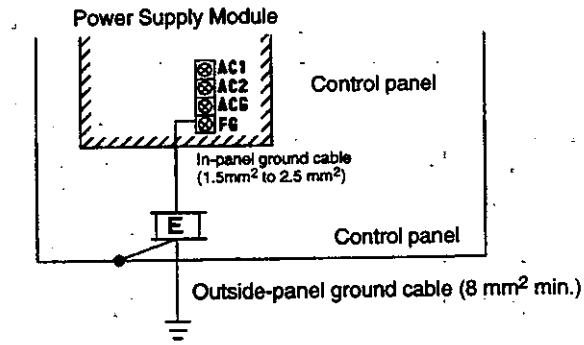
Mount the Mounting Base to which the PLC Modules are mounted to a one-piece iron base (frame).

B. Ground Wires

Prepare a ground terminal for grounding the control panel and connect the control panel box to the terminal. Alternatively, connect the FG terminal on the Power Supply Module to the ground terminal.

Connect the ground terminal of the control panel and the ground pole with a cable of 8 mm^2 (AWG 8) or larger. Make sure that the length of this ground cable is as short as possible.

If the distance to the ground pole is too long, increase the size of the ground wire until the difference between the ground resistance and the ground wire resistance is 100 Ω max.



C. Ground Pole

Prepare a position for the ground pole as close as possible to the control panel of the PLC and as far away as possible from the ground poles for other strong electric panels (group B, below) (15 m min.). Ground to a resistance of 100 Ω max.

D. Common Ground

As a rule, each PLC should have its own ground, but when its necessary to share a ground wire or ground pole with another control panel, note the following.

○	Group A (Sharing possible)	Computer panels, Instrumentation control panels, I/O relay panels, general control circuits, etc.
×	Group B (Sharing not possible)	High-voltage main circuit panel, large capacity thyristors, etc.

Figure 6.3 Sharing Ground Wires or Ground Poles

2. Transmission Cables

Ground the transmission cable shield tape at one point.

3. Metal Conduits and Metal Ducts

Be sure to ground both ends of the metal conduit or duct, and ground as many points in-between as possible.

6.1.6 Control Panel Grounding

1. Separate from Strong Power Panels

Do not place computer panels next to power panels (Group B in the previous table). When the computer panel must be installed close to a power panel, separate the computer panel as far as possible from the power panel (60 cm min.) and keep the respective ground wires or ground poles are far apart as possible.

Ground wires should be separated by 60 cm min. and ground poles by 15 m.

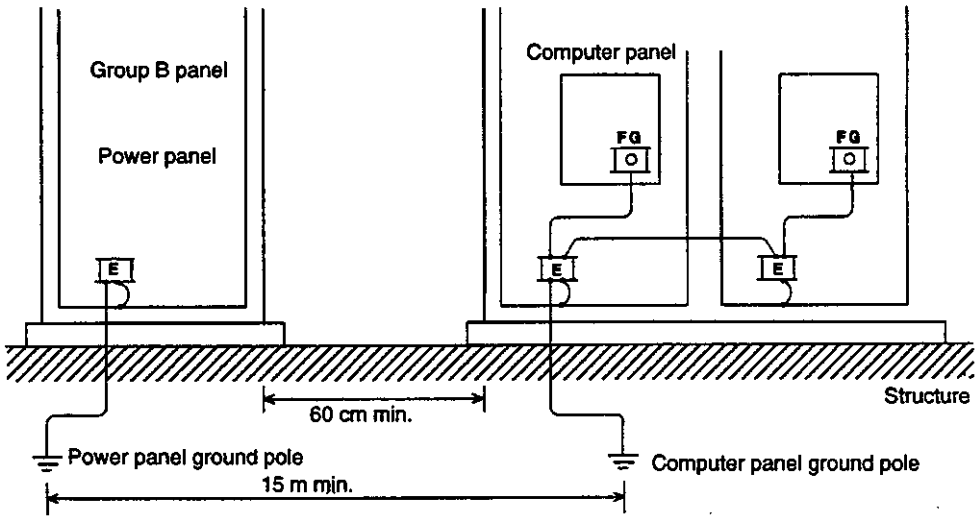


Figure 6.4 Separate from Power Panels

2. Installation with other Control Panels

Computer panels can be installed next to other panels, such as those is Group A in the previous table. In this case, however, a channel base should run under the control panels. To ensure that each panel is grounded, connect the ground terminals on each control

panel with wires of at least 8 mm^2. Then wire one of these ground terminals to the ground pole.

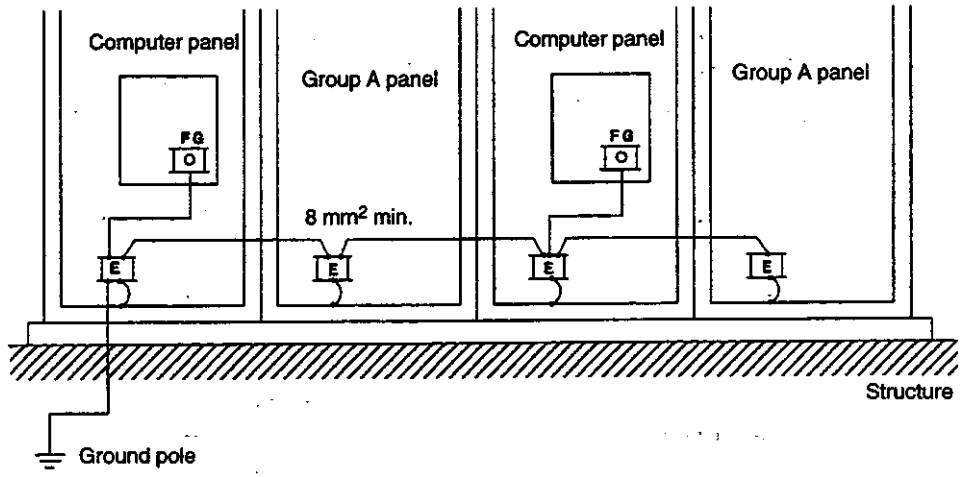


Figure 6.5 Connecting in Parallel with Group A Panels

3. Insulating the Computer Panel

When a computer panel is installed in a steel-framed structure, the computer panel is ground through the structure, and usually there are no difficulties.

When there is a power panel in close proximity to the computer panel, however, the control panel of each computer panel should be insulated to avoid the effects of noise from the power panel's ground current. The computer panel's ground terminal should also be grounded to the computer panel's ground pole.

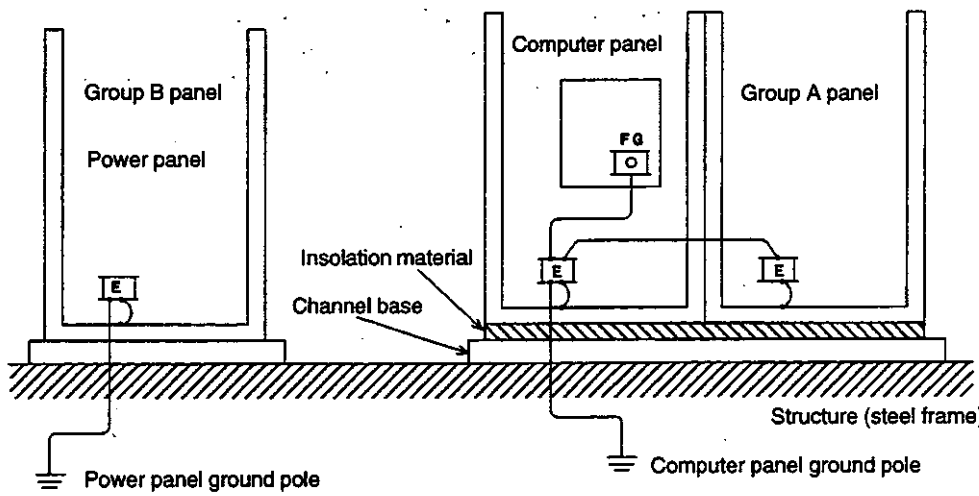


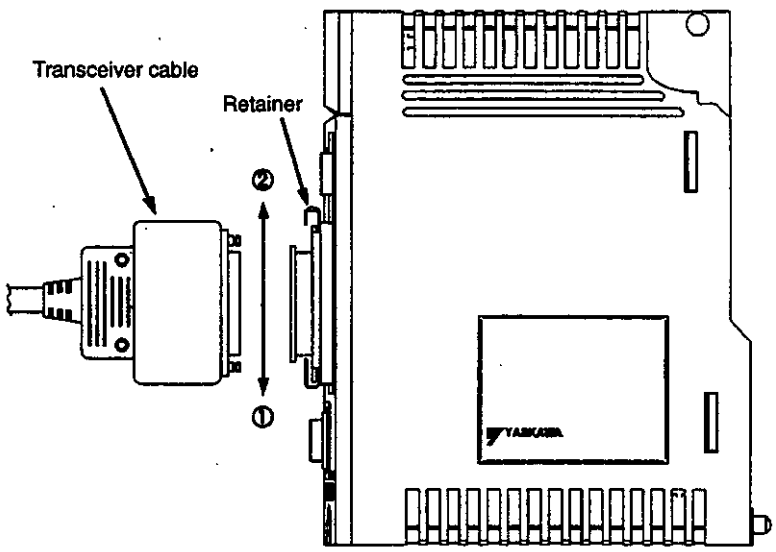
Figure 6.6 Insulating Computer Panels

6.2 Connecting Cables

This section describes procedures and precautions for connecting 10Base5 and 10Base-T to the Ethernet Interface Module.

6.2.1 10Base5 Connection

The procedure for connecting a transceiver cable to the 10Base5 port of the Ethernet Interface Module is shown below.



1) Slide the retainer towards (2).

2) Connect the transceiver cable to the Ethernet Interface Module. Make sure that the transceiver cable connector is fully inserted.

3) Slide the retainer towards (1) to lock the connector in place.

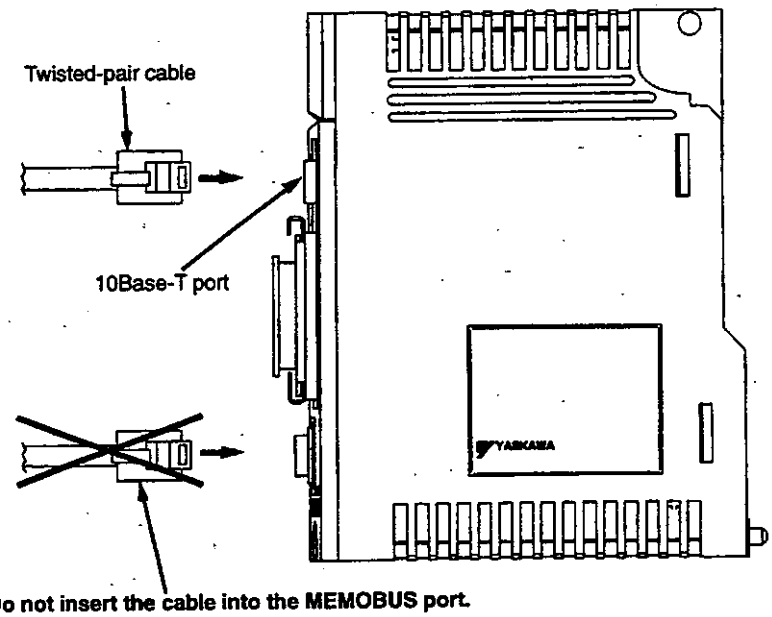
4) Turn ON the power supply to the Power Supply Module on the rack to which the Ethernet Interface Module is mounted.

Note (1) Only use one connection, either 10Base5 or 10Base-T, for communications. Do not leave a cable connected to the port that is not being used. For example, when 10Base5 is used for communications, do not connect anything to the 10Base-T port. Doing so may damage the Module or cause malfunctions.

(2) Make sure that all cable connectors connected to the 10Base5 port are inserted properly and firmly secured. If the connectors are not fully inserted, it may cause the Ethernet Interface Module to malfunction.

6.2.2 10Base-T Connection

1) The procedure for connecting a twisted-pair cable to the 10Base-T port of the Ethernet Interface Module is shown below.



Connect the twisted-pair cable to the Ethernet Interface Module. Insert the twisted-pair cable connector into the port until a click is heard.

Note (1) Do not connect the twisted-pair cable to the MEMOBUS port. The Ethernet Interface Module will not function normally.

(2) Only use one connection, either 10Base5 or 10Base-T, for communications. Do not leave a cable connected to the port that is not being used. For example, when 10Base-T is used for communications, do not connect anything to the 10Base5 port. Doing so may damage the Module or cause malfunctions.

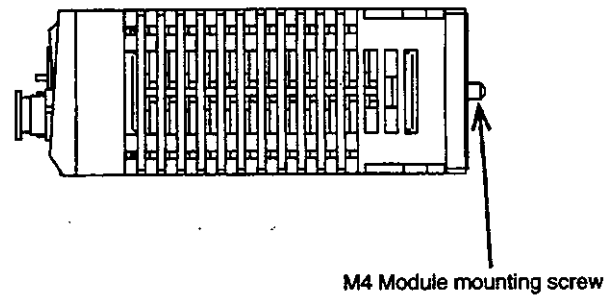
(3) Make sure that all cable connectors connected to the 10Base-T port are inserted properly and firmly secured. If the connectors are not fully inserted, it may cause the Ethernet Interface Module to malfunction.

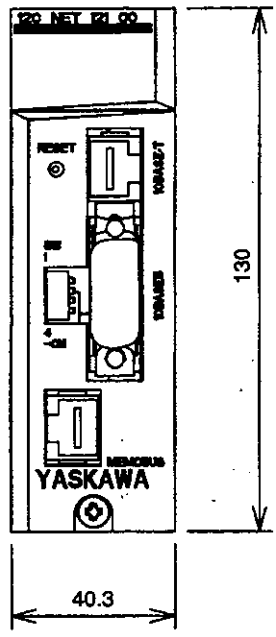
Appendix A

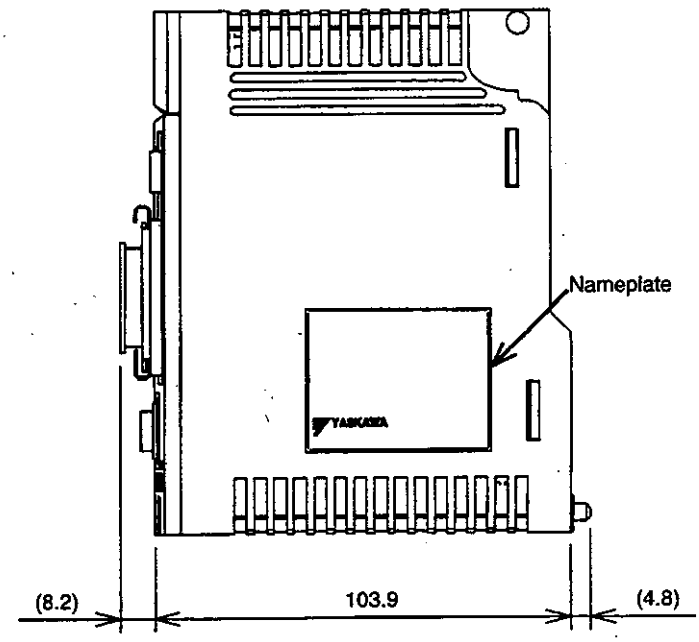
Dimensions

A.1 Ethernet Interface Module (Model: JAMSC-120NET12100)

Unit: mm
Approx. mass: 300 g







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ETHERNET INTERFACE MODULE
USER'S MANUAL

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