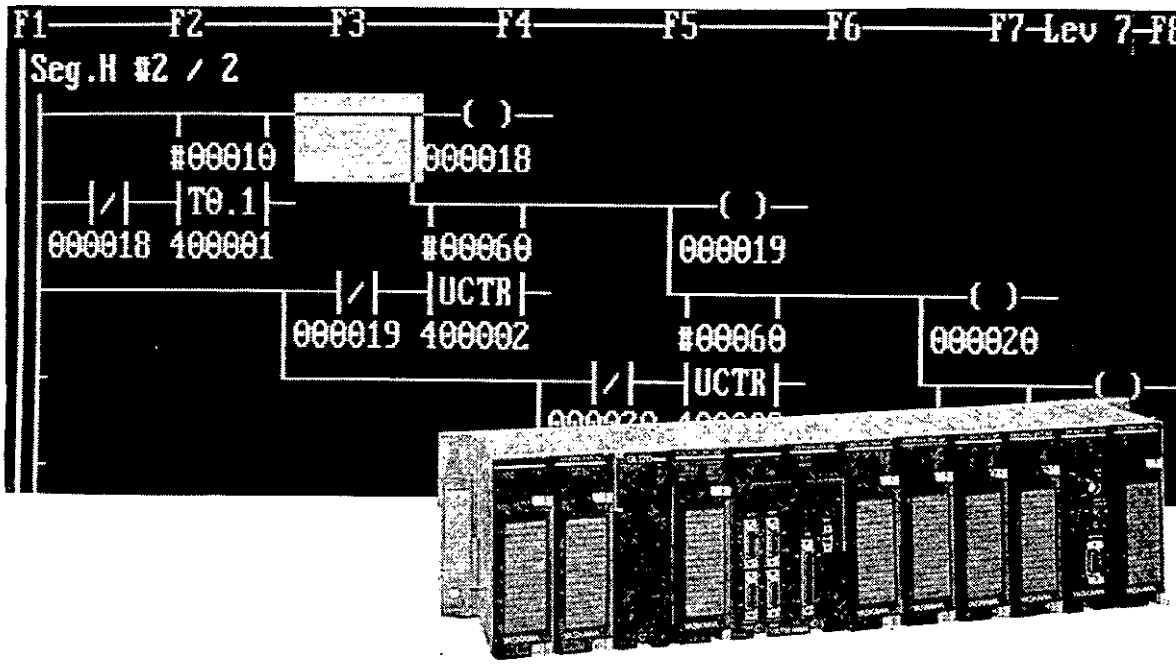
MEMOCON GL120, GL130

COM INSTRUCTIONS

USER'S MANUAL



YASKAWA

MANUAL NO. SIEZ-C825-70.14B

Manual Contents

This manual describes specifications and applications of the COMM and COMR communication instructions for the MEMOCON GL120 and GL130 Programmable Controllers (PLCs).

Please read this manual carefully and be sure you understand the information provided before attempting to use MEMOCON communications.

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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Introduction and Precautions

1

This chapter introduces the features of COM instructions and provides precautions for the use of this manual and the product. **You must read this chapter before attempting to read the rest of the manual or using the product.**

1.1 Features of COM Instructions

This section introduces the COM instructions.

The COM instructions are used to perform communications from the MEMOCON GL120 and GL130 Programmable Controllers (PLCs). Two different COM instructions are available: the COMM instruction and the COMR instruction. A different system configuration is required to use each of these instructions. The features of each instruction are given below.

1.1.1 COMM Instruction

The COMM instruction performs communications as a MEMOBUS master through a MEMOBUS port on a MEMOBUS Module.

With the COMM instructions, communications as a MEMOBUS master can be performed simultaneously through the four communication ports of the MEMOBUS Module. Communications are possible among GL120, GL130, and/or Micro PLCs, or with previous PLC models, such as the MEMOCON-SC GL60, GL70, GL20, U84, etc.

Application programs can written to enable communications between the MEMOBUS and devices supporting different protocols.

The following MEMOBUS Modules are available:

- MEMOBUS Module (RS232): Model JAMSC-120NOM26100
- MEMOBUS Module (RS422): Model JAMSC-120NOM27100

1.1.2 COMR Instruction

The COMR instruction performs communications as a MEMOBUS master from a Remote I/O Driver through a MEMOBUS port on a Remote I/O Receiver.
The remote I/O system enables communications between the MEMOBUS master station and the remote MEMOBUS slave devices.

With the COMR instruction, however, communications are possible on only one port at a time for each remote channel. If multiple Remote I/O Receivers are connected to the same Remote I/O Driver, the COMR is executed for only one port at a time. All other COMR instructions must wait for completion of the first COMR instruction before being executed on the specified port.

Application programs enable communications between the MEMOBUS and devices supporting different protocols.

The following Remote I/O Modules are available:

- Remote I/O Driver Module (JAMSC-120CRD13100)

- Remote I/O Receiver Module (JAMSC-120CRR13100)

1.2 Overview of Manual

- This manual describes how to use the COM instructions and the system configurations required to use them. Read this manual carefully in order to use COM instructions properly. Also, keep this manual in a safe place so that it can be used whenever necessary.

- The Modules that can use the additional functions of the MEMOBUS Module are shown in the table below. To use the "reception mode to receive the data transmitted before the start of the COMM instruction", the Module used in MEMOCON GL120 and GL130 must be of the following versions or later.

Module		Model	Version No.
CPU Module (8 kW)	CPU10	DDSCR-120CPU14200	□□A01 or later *
CPU Module (16 kW)	CPU20	DDSCR-120CPU34100	□□A07 or later *
CPU Module (16 kW)	CPU21	DDSCR-120CPU34110	□□A02 or later *
CPU Module (32 kW)	CPU30	DDSCR-130CPU54100	□□A06 or later *
CPU Module (40 kW)	CPU35	DDSCR-130CPU54110	□□A01 or later *
MEMOBUS-RS232 Module		JAMSC-120NOM26100	□□A03 or later *
MEMOBUS-RS422 Module		JAMSC-120NOM27100	□□A03 or later *

* The version No. is on the nameplate located on the right of the Module.

- Refer to the following manuals for related Peripheral Devices and Modules.

Product	Manual Name	Manual Number	Contents
CPU Module	MEMOCON GL120, GL130 Hardware User's Manual	SIEZ-C825-20.1	Describes the functions, specifications, and handling methods of GL120 and GL130 hardware.
Human-Machine Interface	MEMOCON GL120, GL130 Programming Panel P120 (MEMOSOFT) User's Manual	SIEZ-C825-60.7	Describes the functions, specifications, and usage of the Programming Panel P120 (with built-in MEMOSOFT).
	MEMOCON GL120, GL130 MEMOSOFT for DOS User's Manual	SIEZ-C825-60.10	Describes the functions and usage of the MEMOSOFT for DOS.
	MEMOCON GL120, GL130 Online Programmer for P120 Programming Panel User's Manual	SIEZ-C825-60.19	Describes the functions, specifications, and usage of the Online Programmer for the GL120 and GL130.
Communication Modules	MEMOCON GL120, GL130 Coaxial Remote I/O System User's Manual	SIEZ-C825-70.8	Describes the functions, specifications, and usage of the Coaxial Remote I/O System for the GL120 and GL130.
	MEMOCON GL120, GL130 MEMOBUS User's Manual	SIEZ-C825-70.13	Describes the functions, specifications, and usage of the MEMOBUS.

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

1.3 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.

1.3.1 Safety Precautions

- MEMOCON was not designed or manufactured for use in devices or systems that concern peoples' lives. 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 MEMOCON 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 product 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 re-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.

1.3.2 Installation Precautions

Abide by the following precautions when installing MEMOCON systems.

- The installation environment must meet the environmental conditions given in the product catalog and manuals. Using the MEMOCON in environments subject to high temperatures, high humidity, excessive dust, corrosive gases, vibration, or shock can lead to electrical shock, fire, or faulty operation. Do not use the MEMOCON 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%, rapid changes in humidity, or condensation.
  - Locations subject to corrosive or flammable gas.
  - Locations that would subject the MEMOCON to direct vibration or shock.
  - Locations subject to contact with water, oil, chemicals, etc.
- Install the MEMOCON as described in this product manual. Improper installation can cause product failure, malfunctions, or Modules or other components to fall off.
- Do not allow wire clippings or other foreign matter to enter the MEMOCON. Foreign matter can cause fires, product failure, or malfunctions.

1.3.3 Wiring Precautions

- Wiring must be performed by qualified personnel.

  Mistakes in wiring can cause fires, product failure, or malfunctions.

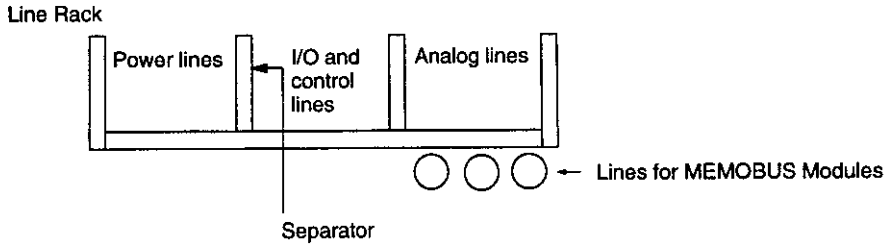
- Insert the interface cables properly.

  Insert the connectors of the various interface cables that are to be connected to MEMOCON into the communication ports and attach them properly. Improper insertion of interface cables may cause operational errors in the MEMOCON.

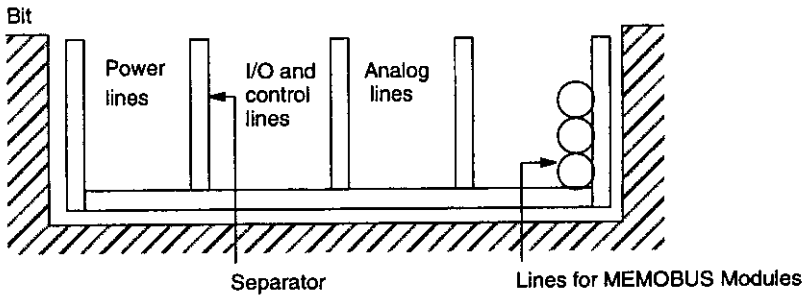
• Separate wiring properly.

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.



When wiring MEMOBUS Module 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 MEMOBUS lines are not sufficiently insolated.



1.3.4 Applications Precautions

Abide by the following precautions when applying the MEMOSOFT to control a PLC.

- Operations such as RUN, STOP, forced output, and program change during operation must be carried out with care. Operational errors may damage the machine or cause accidents.

- When using a modem, turn the power supply OFF or ON carefully.

  If the power supply of a slave machine is turned ON or OFF while the modem power supply is ON, the modem will output unnecessary signals to the two-core twisted cable (for several tens of milliseconds). If any messages are being transmitted at this time, a transmission error occurs. To avoid problems, turn ON the power supply of a slave machine before turning ON the power supply of the modem and turn OFF the power supply of the modem before turning OFF the power supply of the slave machine. Alternatively, turn ON and OFF the power supplies of a slave machine and a modem simultaneously.

1.3.5 Maintenance

Do not attempt to disassemble or modify the MEMOCON in any way. Doing so can cause fires, product failure, or malfunctions.

1.4 Using this Manual

This manual is written for those who already have a basic knowledge of MEMOCON PLCs. We recommend reading the MEMOCON GL120, GL130 Hardware User's Manual before attempting to read this manual.

- **Meaning of Basic Terms**

  In this manual, the following terms indicate the meanings as described below, unless otherwise specified.

  - **PLC = Programmable (Logic) Controller**

  - **PP = Programming Panel**

- **Description of Technical Terms**

  The shaded technical terms in this manual are briefly explained in the **Glossary** provided at the bottom of the page. An example is shown below.

Glossary

The following types of terms are described.

- Specific sequence control terms required for explanation of functions.

- Terms that are specific to programmable controllers and electronic devices.

MEMOBUS Modules

2

COMM instructions are used as MEMOBUS master communication instructions via the MEMOBUS Module. This chapter describes the specifications of the MEMOBUS Modules.

2.1 General Specifications

This section provides the general specifications of the MEMOBUS Modules.

The general specifications of the MEMOBUS Modules are shown in the following table.

Table 2.1 General Specifications

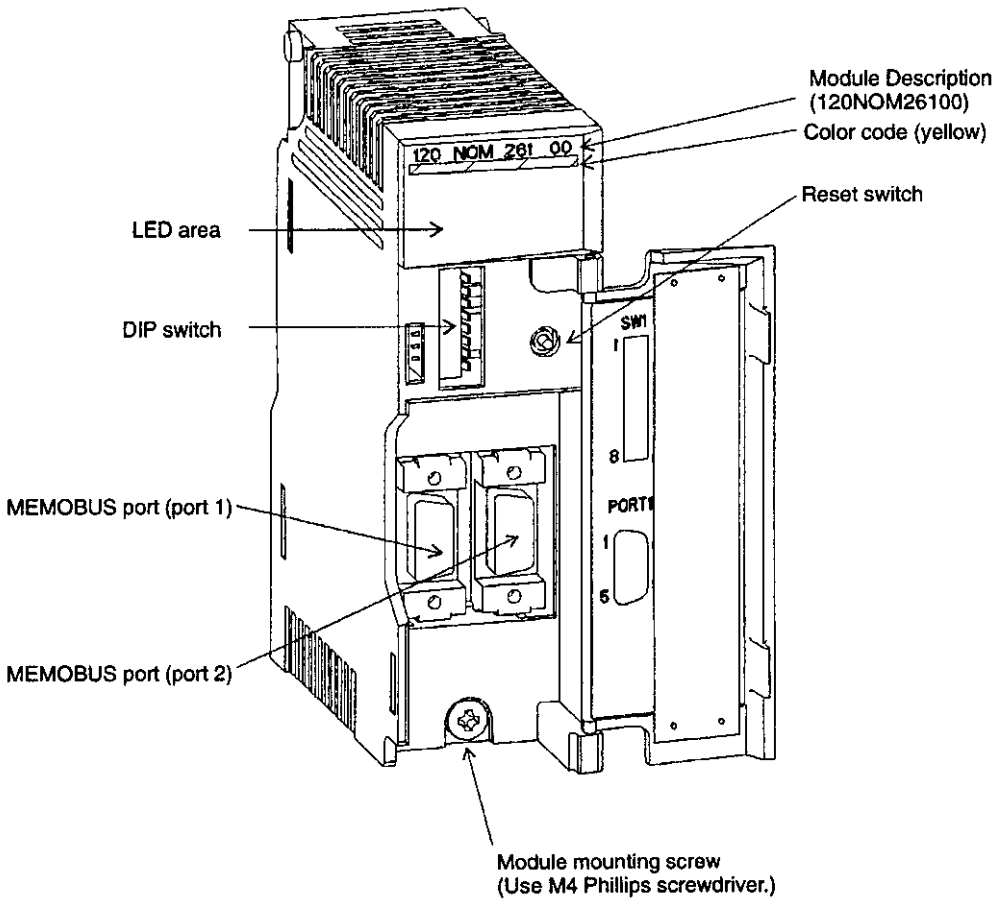
Item		Specifications
Dielectric Strength		• Between the primary side and the grounding or between the primary side and the secondary side: Detected current 10 mA or less with 1,500 VAC supplied for 1 minute or 1,800 VAC for 1 s. • Between the secondary side and the grounding: Detected current 30 mA or less with 500 VAC supplied for 1 minute or 550 VAC for 1 s.
Insulation Resistance		1) 10 MΩ min. between the primary side and the grounding or between the primary side and the secondary side (via the 500-VDC insulation resistance meter) 2) 100 MΩ min. between the secondary side and the grounding (via the 500-VDC insulation resistance meter)
Environment Conditions	Ambient Operating Temperature	0 to 60 °C
	Ambient Storage Temperature	–25 to 85 °C (except batteries)
	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 times each in X, Y, and Z directions (according to JIS B 3502)/(sweep time: 1 octave/min)
	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 in either normal or common mode with pulse widths of 100 ns/1 μs and rise time of 1 ns (according to JIS B 3502)/(with impulse noise simulator)
Installation Require-ments	Ground	Ground to 100 Ω or less
	Configuration	Building-block, wall-mounted or DIN track-mounted
	Cooling Method	Natural cooling

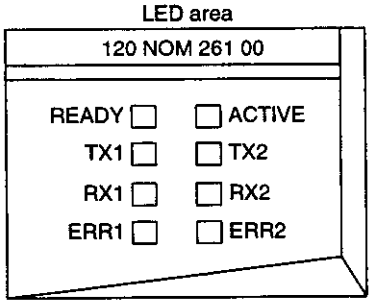
2.2 MEMOBUS Modules

This section provides the specifications of the MEMOBUS Modules.

2.2.1 MEMOBUS Modules (RS-232)

1. Appearance





LED	Color	Indication when ON
READY	Green	Module is operating normally.
ACTIVE	Green	Module is engaged in service with the CPU Module
TX1	Green	Module is transmitting data from port 1.
RX1	Green	Module is receiving data from port 1.
ERR1	Red	An error has occurred in the transmission of port 1.
TX2	Green	Module is transmitting data from port 2.
RX2	Green	Module is receiving data from port 2.
ERR2	Red	An error has occurred in the transmission of port 2.

When a status error has occurred, the READY, ERR1, and ERR2 indicators will operate as shown in the following table:

Type of Error	READY	ERR1	ERR2	Remarks
ROM error	Flashes	Not lit	Not lit	Checked all the time.
RAM error	Not lit	Flashes	Not lit	Checked when power is turned ON.
Common memory error	Flashes	Flashes	Not lit	Checked when power is turned ON.
Watchdog timer error	Not lit	Flashes	Flashes	Checked all the time.

Figure 2.1 Appearance of MEMOBUS Module (RS-232)

2. Function

1) The MEMOBUS Module (RS-232) is equipped with two MEMOBUS ports (master/slave) for RS-232C communications.

2) The MEMOBUS Module (RS-232) runs communications using RS-232C (master communications or slave communications) through MEMOBUS ports. MEMOBUS protocol or any other protocol can be used for the communications protocol.

3. Specifications

The specifications of MEMOBUS Module (RS-232) are shown in the following table.

Table 2.2 Specifications of MEMOBUS Module (RS-232)

Item	Specification	
Model Name	MEMOBUS-RS232	
Model No.	JAMSC-120NOM26100	
Internal Current Consumption	600 mA	
Maximum Heating Value	3.0 W	
Hot Swapping (Removal/Insertion Under Power)	Permitted	
Approximate Mass	300 g	
External Dimensions	Width: 40.34 mm Height: 130.00 mm Depth: 103.85 mm	
MEMOBUS Port Specifications	Communications Method	Half-duplex stop-start synchronization
	Transmission Levels	Conform to RS-232C.
	Protocol	MEMOBUS protocol or any other protocol
	Baud Rate	19,200/9,600/7,200/4,800/3,600/2,400/2,000/1,800/1,200/600/300/150 bps
	Communications Mode	RTU mode or ASCII mode
	Data Format	The following data format is used between the master and slaves, between the master and modems, and between modems and slaves: 1) Data bit length: 8 (RTU mode) or 7 (ASCII mode) bits 2) Parity check: Yes or No 3) Parity: Odd or even 4) Stop bits: 1 or 2
	Transmission Distance	15 m (Can be extended to 4.5 km maximum by using Yaskawa modem.)
	Transmission Error Detection	CRC-16 (RTU mode) or LRC (ASCII mode)
	Connector	D-sub connector (9-pin, female)

4. Using MEMOBUS Modules (RS-232)

1) Number of Modules

Together with MEMOBUS Modules (RS-422) explained in *2.2.2 MEMOBUS Modules (RS-422)*, two MEMOBUS Modules can be used.

2) Installation Location

MEMOBUS Modules (RS-232) can be mounted to any slot of the Mounting Base of any Rack of the local channel. It will occupy one slot.

3) MEMOBUS Ports

a) Devices connectable to MEMOBUS ports are shown in the following table. Each of these devices must be equipped with an RS-232C interface. In addition, depending on the type of device, the MEMOBUS port settings will need to be altered. This settings are altered using the DIP switch on the front of the Module. Refer to *4) DIP Switch* later in this section.

Table 2.3 Example of Devices Connectable to MEMOBUS Ports

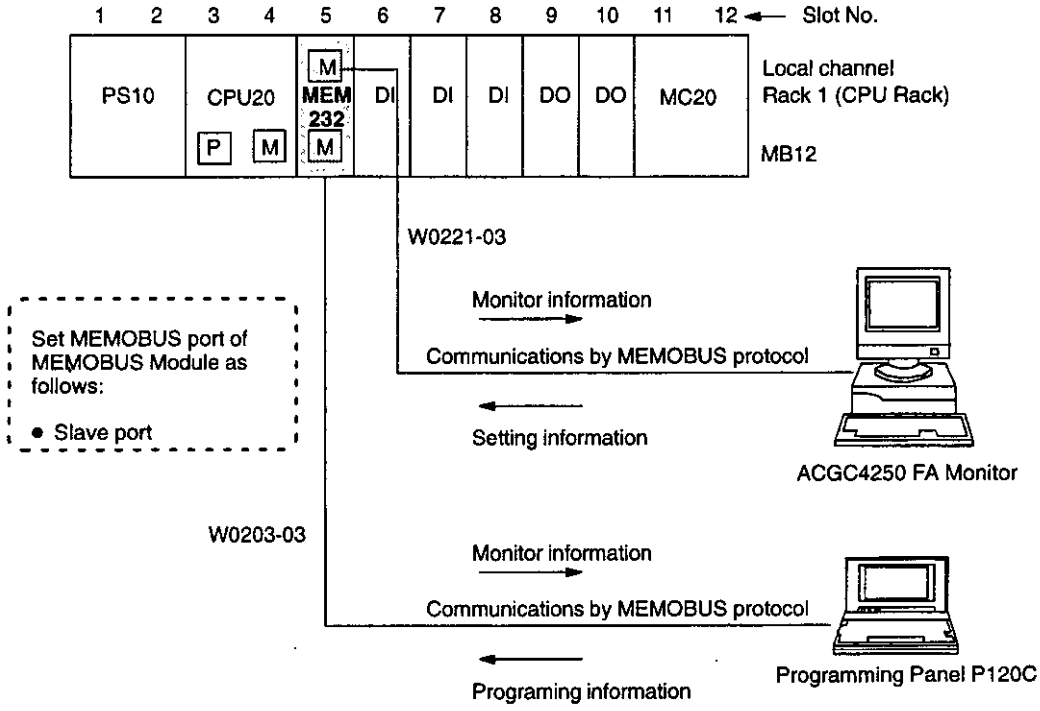
Type	Device	Remarks
MEMOBUS master	P120-series Programming Panel	• Set MEMOBUS port to slave port. • Communications performed using the MEMOBUS protocol • Creation of communications program not needed. • If your computer does not have MEMOSOFT, create a communications program based on the MEMOBUS protocol.
	Personal computer (with MEMOSOFT)	
	ACGC4000/400-series FA Monitor	
ASCII devices	Bar code reader	• Set the MEMOBUS port to combined master/slave port. • Set the MEMOBUS port to transparent mode. • Create a communications program using the COMM instructions in the GL120 and GL130.
	Serial printer	

b) For details on MEMOBUS port specifications, refer to *Table 2.2*.

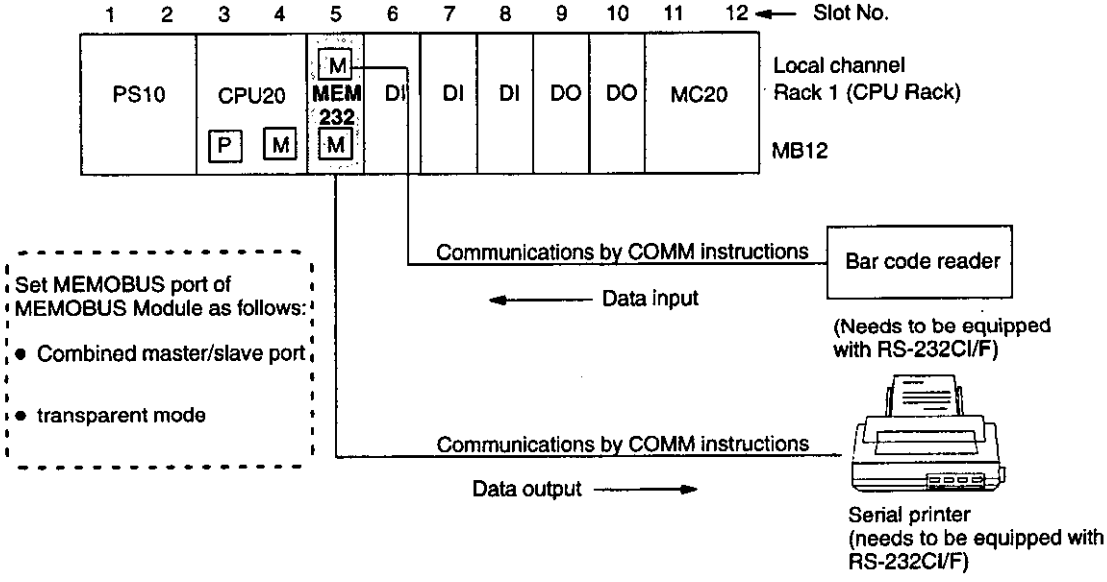
c) An example using a MEMOBUS Module (RS-232) is shown below:

◀EXAMPLE▶

Example 1
Connecting MEMOBUS Masters



Example 2
Connecting ASCII Devices

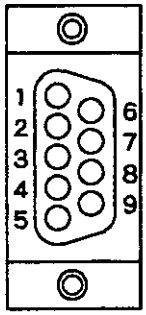


PS10:	Power Supply Module (7 A)	MB12:	12-slot Mounting Base
CPU20:	CPU Module (16 KW)	W0203-03:	MEMOBUS Cable (2.5 m)
MEM232:	**MEMOBUS Module (RS-232)**	W0221-03:	MEMOBUS Cable (3.0 m)
DI:	12/24-VDC 16-point Input Module	M:	MEMOBUS Port
DO:	12/24-VDC 16-point Output Module	P:	MEMOBUS PLUS Port
MC20:	4-axis Motion Module		

Figure 2.2 Using the MEMOBUS Module (RS-232)

d) The connector for the MEMOBUS port is a D-sub connector (9-pin, female). The connector pin arrangement and signal names are shown in the following table:

Table 2.4 Pin Arrangement and the Signal Names of MEMOBUS Port



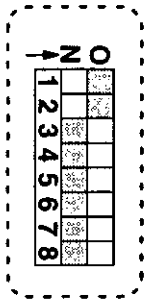
Pin No.	Symbol	Signal Name
1	FG	Protective ground
2	TXD	Transmission data
3	RXD	Reception data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	Signal ground
8		Not used.
9	DTR	Data terminal ready

e) COM Instructions(COMM, COMR)

Note (1) The communications instruction used for MEMOBUS ports of the MEMOBUS Module (RS-232) is the COMM instruction.

(2) The COMR instruction cannot be used for MEMOBUS ports of MEMOBUS Modules (RS-232). This communications instruction can used only for MEMOBUS ports of Remote I/O Receiver Modules.

4) DIP Switch



a) The DIP switch consists of 8 pins. The pins are numbered from 1 to 8 as shown in the diagram at the right.

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

c) The settings of the pins are effective (read) at the following times:

(1) Pins 1 to 6: When the pin is turned ON or OFF.

(2) Pins 7 and 8: When the reset switch is pressed or when power is turned ON to the Power Supply Module of the Rack where the MEMOBUS Module (RS-232) is mounted.

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

Table 2.5 Function of DIP Switch

Pin No.	Settings	Function
1	ON	Sets communications mode and parameters of Port 2 to the defaults.
	OFF	Sets communications mode and parameters of Port 2 to user settings.
2	ON	Sets communications mode and parameters of Port 1 to the defaults.
	OFF	Sets communications mode and parameters of Port 1 to user settings.
3	ON	When using Port 2 as master port, sets communications mode to transparent mode.
	OFF	When using Port 2 as master port, sets communications mode to MEMOBUS mode.
4	ON	When using Port 1 as master port, sets communications mode to transparent mode.
	OFF	When using Port 1 as master port, sets communications mode to MEMOBUS mode.
5	ON	Sets Port 2 as slave port. Master communications become ineffective.
	OFF	Sets Port 2 as combined master/slave port. Master communications become effective. When using COMM instruction for Port 2, turn this pin OFF.
6	ON	Sets Port 1 as slave port. Master communications become ineffective.
	OFF	Sets Port 1 as combined master/slave port. Master communications become effective. When using COMM instruction for Port 1, turn this pin OFF.
7	ON	Sets Module number to 2.
	OFF	Sets Module number to 1.
8	ON	Sets Module to self diagnosis mode.
	OFF	Sets Module to normal operation mode.

Note When using two MEMOBUS Modules, do not use the same Module number. If you use the same Module number, the following will result:

- If the two MEMOBUS Modules are mounted to the same Rack, the MEMOBUS Module mounted to the slot with the larger slot number will not operate normally.

- If the two MEMOBUS Module are mounted to different Racks, the MEMOBUS Module mounted to the Rack with the larger Rack number will not operate normally.

e) The default communications mode and parameters are as follows:

(1) Communications mode: RTU mode

(2) Communications parameters:

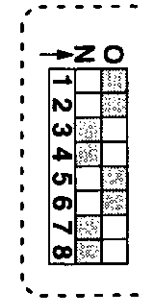
Baud rate:	9,600 bps
Parity check:	Yes
Parity:	Even
Stop bits:	1
Data bit length:	8
Delay time:	0 ms

f) When the communications mode and parameters of MEMOBUS port is set to the user settings, you can set and use any settings from the communications modes and parameters shown in *Table 2.2*. Selection is done from the MEMOSOFT.

g) Examples of setting DIP switch are shown below:

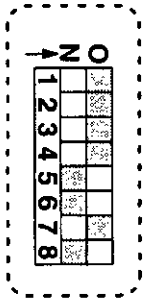
◀EXAMPLE▶ **Example 1**

When the DIP switch is set as shown in the diagram at the right, the MEMOBUS Module (RS-232) is set as follows:



- Communications parameters of port 2 are set to the defaults.
- Communications parameters of port 1 are set to the defaults.
- Port 2 is in MEMOBUS Mode.
- Port 1 is in MEMOBUS Mode.
- Port 2 is slave port.
- Port 1 is slave port.
- Module number: 1
- Normal operation mode

Example 2
When the DIP switch is set as shown in the diagram at the right, the MEMOBUS Module (RS-232) is set as follows:



- Communications parameters of port 2 are set to the defaults.
- Communications parameters of port 1 are set to the defaults.
- Port 2 is in transparent mode.
- Port 1 is in transparent mode.
- Port 2 is combined master/slave port.
- Port 1 is combined master/slave port.
- Module number: 2
- Normal operation mode

5) Reset Switch

a) Press the reset switch at the following times:

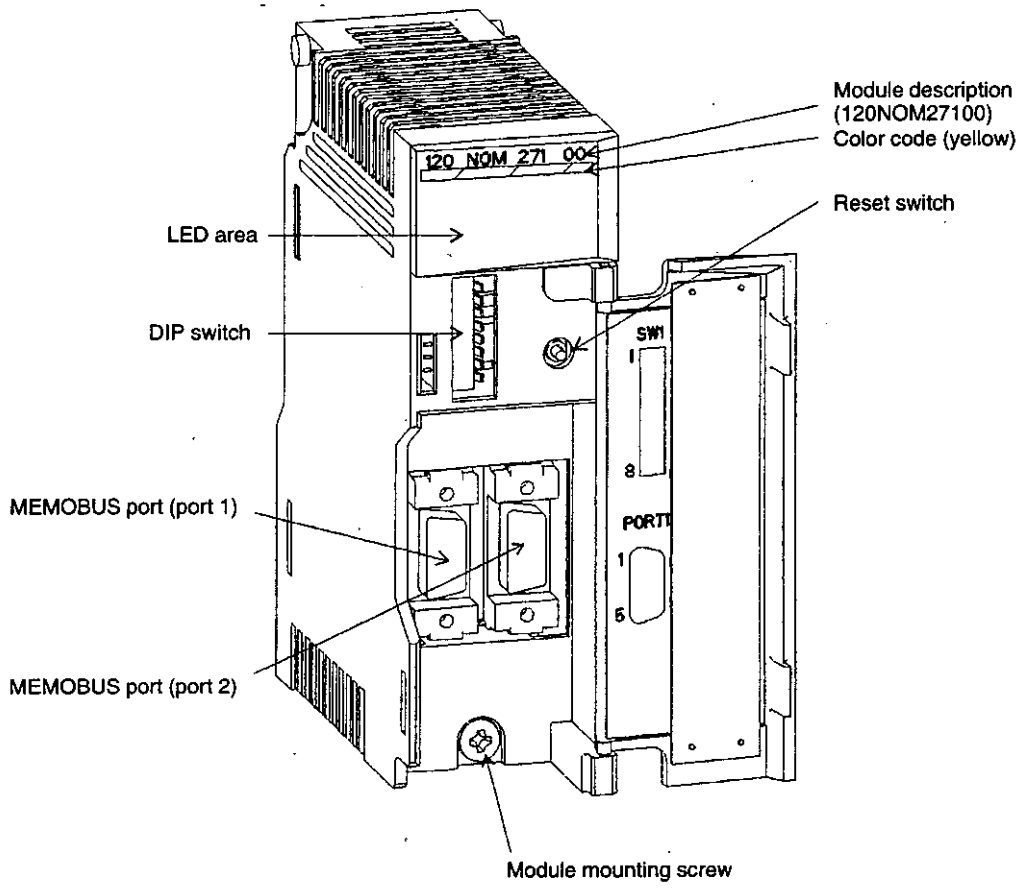
(1) When you have changed the setting of DIP switch pin 7 or 8.

(2) When errors have occurred.

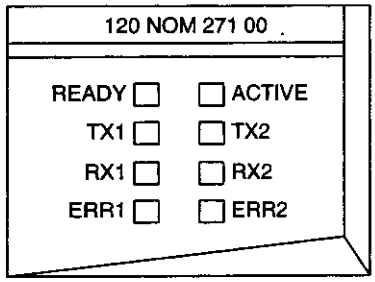
b) When the reset switch is pressed, communications between the MEMOBUS Module (RS-232) and connected devices will be interrupted. Communications will restart when the switch is released.

2.2.2 MEMOBUS Modules (RS-422)

1. Appearance



LED area



LED	Color	Indication when ON
READY	Green	Module is operating normally.
ACTIVE	Green	Module is engaged in service with the CPU Module
TX1	Green	Module is transmitting data from port 1.
RX1	Green	Module is receiving data from port 1.
ERR1	Red	An error has occurred in the transmission of port 1.
TX2	Green	Module is transmitting data from port 2.
RX2	Green	Module is receiving data from port 2.
ERR2	Red	An error has occurred in the transmission of port 2.

When a status error has occurred, the READY, ERR1, and ERR2 indicators will operate as shown in the following table:

Type of Error	READY	ERR1	ERR2	Remarks
ROM error	Flashes	Not lit	Not lit	Checked all the time.
RAM error	Not lit	Flashes	Not lit	Checked when power is turned ON.
Common memory error	Flashes	Flashes	Not lit	Checked when power is turned ON.
Watchdog timer error	Not lit	Flashes	Flashes	Checked all the time.

Figure 2.3 Appearance of MEMOBUS Module (RS-422)

2. Function

1) The MEMOBUS Module (RS-422) is equipped with two MEMOBUS ports for RS-422 communications.

2) The MEMOBUS Module (RS-422) performs communications using RS-422 (master communications or slave communications) through the MEMOBUS ports. The MEMOBUS protocol or any other protocol can be used for the communications protocol.

3) The features of the MEMOBUS Module (RS-422) are as follows:

   a) The transmission distance can be extended up to 500 m without a modem.

   b) Communications in 1:n format are possible without a modem: 1 master and up to 31 slaves.

4) The MEMOBUS Module (RS-422) can use either 2-line or 4-line communications.

Note The maximum transmission distance and the number of slaves for 1:n communications vary according to the specifications of connected communications devices.

3. Specifications

The specifications of the MEMOBUS Module (RS-422) are shown in the following table.

Table 2.6 Specifications of MEMOBUS Module (RS-422)

Item	Specifications	
Model Name	MEMOBUS-RS422	
Model No.	JAMSC-120NOM27100	
Internal Current Consumption	600 mA	
Maximum Heating Value	3.0 W max.	
Hot Swapping (Removal/Insertion Under Power)	Permitted	
Approximate Mass	Approx. 300 g	
External Dimensions	Width: 40.34 mm Height: 130.00 mm Depth: 103.85 mm	
MEMOBUS Port Specifications	Communications Method	Half-duplex stop-start synchronization
	Transmission Levels	Conform to RS-422.
	Protocol	MEMOBUS protocol or any other protocol
	Baud Rate	19,200/9,600/7,200/4,800/3,600/2,400/2,000/ 1,800/1,200/600/300/150 bps
	Communications Mode	RTU mode or ASCII mode
	Data Format	Transmission between the master and slaves uses the following data format: 1) Data bit length: 8 (RTU mode) or 7 (ASCII mode) 2) Parity check: Yes or No 3) Parity: Odd or even 4) Stop bits: 1 or 2
	Transmission Distance	500 m max.
	Transmission Error Detection	CRC-16 (RTU mode) or LRC (ASCII mode)
	Connector	D-sub connector (9 pin, female)

4. Using MEMOBUS Modules (RS-422)

1) Number of Modules

Together with MEMOBUS Modules (RS-232) explained in *2.2.1 MEMOBUS Modules (RS-232)*, two MEMOBUS Modules (RS-422) can be used.

2) Installation Location

The MEMOBUS Module (RS-422) can be mounted to any slot of the Mounting Base of any Rack of the local channel. It will occupy one slot.

3) MEMOBUS Port

a) Devices connectable to the MEMOBUS ports are shown in the following table. Each of these devices must be equipped with an RS-422 interface. In addition, depending on the type of device, the MEMOBUS port settings will need to be altered. This settings are altered using the DIP switch on the front of the Module. Refer to *4) DIP Switch* later in this section.

b) Refer to *Table 2.6* for details on MEMOBUS port specifications.

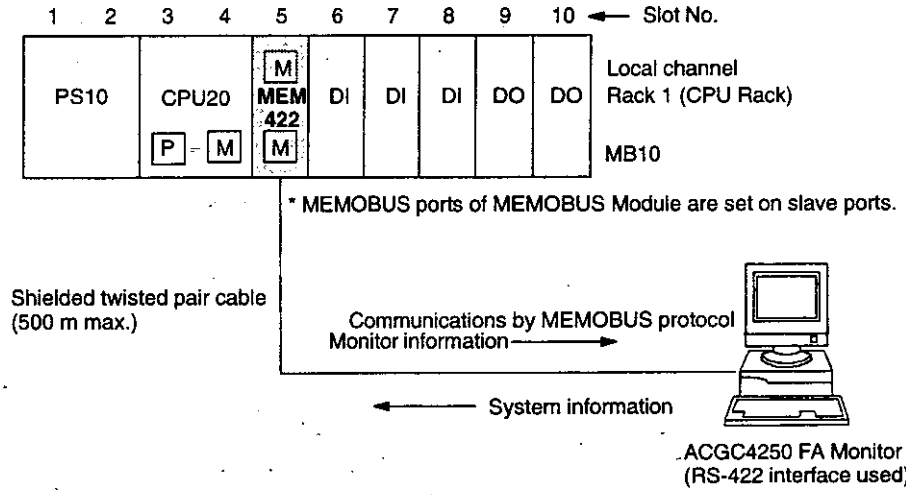
c) Examples of how to use the MEMOBUS Module are shown in *Figure 2.5* to *Figure 2.8.*

◀EXAMPLE▶

Table 2.7 Example of Devices connectable to MEMOBUS Port

Type	Devices	Remarks
Master	Yaskawa ACGC4000-series FA Monitors	• Set MEMOBUS port to slave port. • Creation of communications program not needed. • Communications performed using MEMOBUS protocol
Slaves	Yaskawa Inverters 1) VS-616G3 plus 2) VS-606PC3 3) VS-mini C **Note** Use Inverters which support MEMOBUS protocol.	• Set MEMOBUS port to combined master/slave port. • Create communications program using COMM instructions in the GL120/GL130. • Use MEMOBUS protocol for communications protocol.
	Yaskawa Servo Amplifiers 1) SGD-□□H 2) CACR-HR□□BAB 3) CACR-HR□□BB	• Set MEMOBUS port to combined master/slave port. • Set MEMOBUS port to transparent mode. • Create communications program using COMM instructions in the GL120/GL130.
	ASCII devices 1) Bar code readers 2) Electronic scales	• Use slave protocol for communications protocol.

◀EXAMPLE▶ **Example 1**
Connecting ACGC4250 FA Monitor (1:1 Communications)

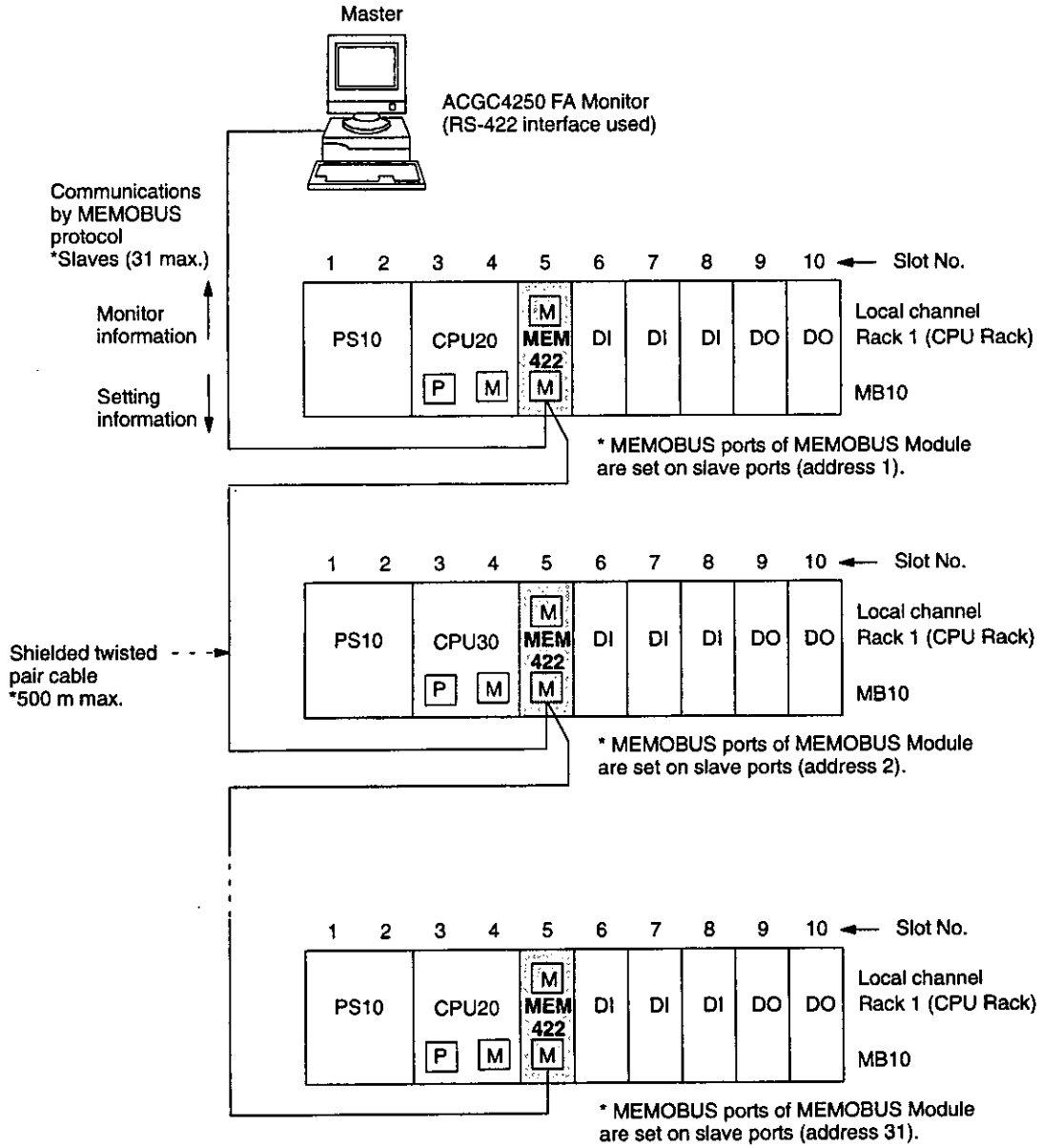


PS10:	Power Supply Module (7A)	DI:	12/24-VDC 16-point Input Module
CPU20:	CPU Module (16 KW)	DO:	12/24-VDC 16-point Output Module
MEM422:	**MEMOBUS Module (RS-422)**	MB10:	10-slot Mounting Base

Figure 2.4 Connecting ACGC4250 FA Monitor (1:1 Communications)

◀EXAMPLE▶ **Example 2**

Connecting ACGC4250 FA Monitor (1:31 Communications)



PS10: Power Supply Module (7A)
CPU20: CPU Module (16 KW)
CPU30: CPU Module (32 KW)
MEM422: MEMOBUS Module (RS-422)
DI: 12/24-VDC 16-point Input Module
DO: 12/24-VDC 16-point Output Module
MB10: 10-slot Mounting Base

Figure 2.5 Connecting ACGC4250 FA Monitor (1: 31 communications)

◀EXAMPLE▶ **Example 3**

Connecting VS-616G3 plus Inverters (1:31 Communications)

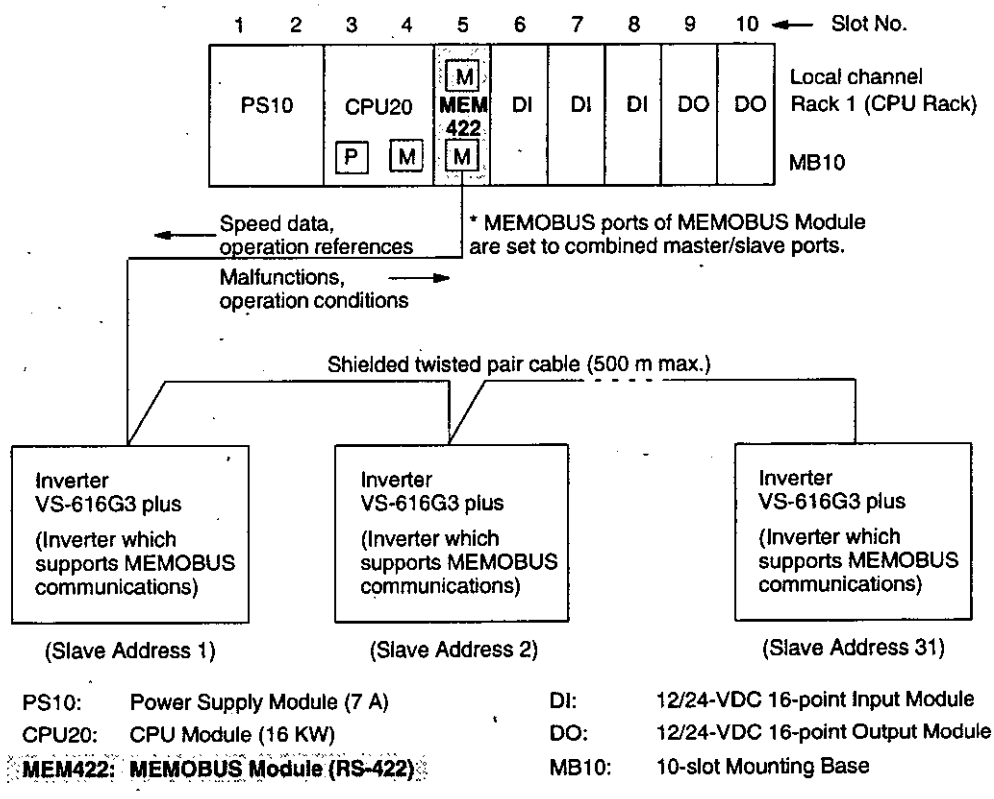


Figure 2.6 Connecting VS-616G3 Plus Inverters (1:31 Communications)

◀EXAMPLE▶ **Example 4**

Connecting ASCII Device (1:1 Communications)

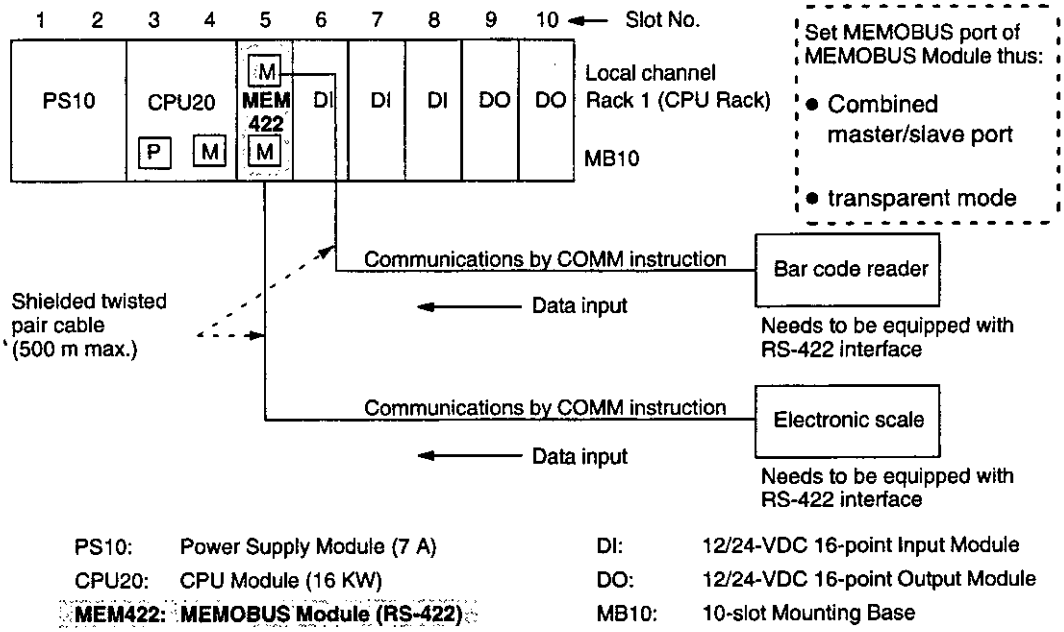
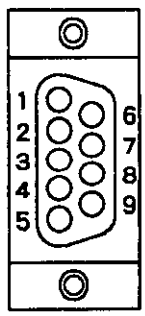


Figure 2.7 Connecting ASCII Devices (1: 1 Communications)

d) The connector for a MEMOBUS port is a D-sub connector (9-pin, female). The connector pin arrangement and signal names are shown in the following table:

Table 2.8 Pin Arrangement and the Signal Names



Pin No.	Symbol	Signal Name
1	PGND	Protective ground
2	TXD	Transmission data
3	RXD	Reception data
4	RXDRT	Receiver termination resistance:120 Ω
5		Not used
6	$\overline{\text{RXD}}$	Reception data inversion
7	SGND	Signal ground
8	TXRD	Sender termination resistance:120 Ω
9	$\overline{\text{TXD}}$	Transmission data inversion

e) Transmission Circuit

The communications circuits of the MEMOBUS Module (RS-422) are shown in the following figure.

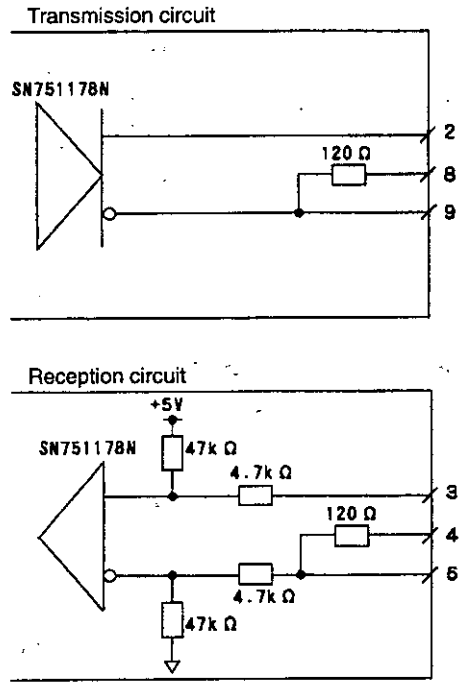


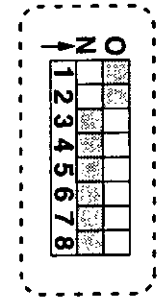
Figure 2.8 Transmission Circuit of MEMOBUS Port

f) COM Instructions (COMM, COMR)

Note (1) The communications instruction for the MEMOBUS ports of MEMOBUS Modules (RS-422) is the COMM instruction.

(2) The COMR instruction cannot be used for the MEMOBUS ports of MEMOBUS Modules (RS-422). This communications instruction can be used only for the MEMOBUS ports of the Remote I/O Receiver Module.

4) DIP Switch



a) DIP switch is composed of 8 pins. The pins are numbered from 1 to 8 as shown in the diagram at the right.

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

c) The setting of each pin is effective (read) at the following times:

(1) Pin 1 to 6: When the pin is turned ON.

(2) Pins 7 and 8: When the reset switch is pressed or when the power is turned ON to the Power Supply Module of the Rack where the MEMOBUS Module (RS-422) is mounted.

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

Table 2.9 Function of DIP Switch

Pin No.	Settings	Function
1	ON	Sets communications mode and parameters of Port 2 to the defaults.
	OFF	Sets communications mode and parameters of Port 2 to user settings.
2	ON	Sets communications mode and parameters of Port 1 to the defaults.
	OFF	Sets communications mode and parameters of Port 1 to user settings.
3	ON	When using Port 2 as master port, sets communications mode to transparent mode.
	OFF	When using Port 2 as master port, sets communications mode to MEMOBUS mode.
4	ON	When using Port 1 as master port, sets communications mode to transparent mode.
	OFF	When using Port 1 as master port, sets communications mode to MEMOBUS mode.
5	ON	Sets Port 2 as slave port. Master communications become ineffective.
	OFF	Sets Port 2 as combined master/slave port. Master communications become effective. When using COMM instruction for port 2, turn this pin OFF.
6	ON	Sets Port 1 as slave port. Master communications become ineffective.
	OFF	Sets Port 1 as combined master/slave port. Master communications become effective. When using COMM instruction for port 1, turn this pin OFF.
7	ON	Sets Module number to 2.
	OFF	Sets Module number to 1.
8	ON	Sets Module to self diagnosis mode.
	OFF	Sets Module to normal operation mode.

Note When using two MEMOBUS Modules, do not use the same Module number. If you use the same Module number, the following will result:

- If the two MEMOBUS Modules are mounted to the same Rack, the MEMOBUS Module mounted to the slot with the larger slot number will not operate normally.

- If the two MEMOBUS Modules are mounted to different Racks, the MEMOBUS Module mounted to the Rack with the larger Rack number will not operate normally.

e) The default communications mode and parameters are as follows:

(1) Communications mode: RTU mode

(2) Communications parameters:

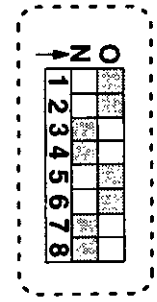
Baud rate:	9,600 bps
Parity check:	Yes
Parity:	Even
Stop bits:	1
Data bit length:	8
Delay time:	0 ms

f) When the communications mode and parameters of MEMOBUS port are set to the user settings, you can set and use any setting from the communications modes and parameters shown in *Table 2.6*. Selection is done using the MEMOSOFT.

g) Examples of setting the DIP switch are shown below:

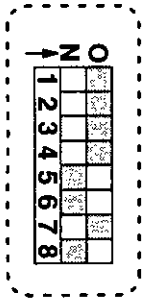
◀EXAMPLE▶ **Example 1**

When the DIP switch is set as shown in the diagram at the right, the MEMOBUS Module (RS-422) is set as follows:



- Communications parameters of port 2 are set to the defaults.
- Communications parameters of port 1 are set to the defaults.
- Port 2 is in MEMOBUS Mode.
- Port 1 is in MEMOBUS Mode.
- Port 2 is slave port.
- Port 1 is slave port.
- Module number: 1
- Normal operation mode

Example 2
When the DIP switch is set as shown in the diagram at the right, the MEMOBUS Module (RS-422) is set as follows:



- Communications parameters of port 2 are set to the defaults.
- Communications parameters of port 1 are set to the defaults.
- Port 2 is in transparent mode.
- Port 1 is in transparent mode.
- Port 2 is combined master/slave port.
- Port 1 is combined master/slave port.
- Module number: 2
- Normal operation mode

5) Reset Switch

a) Press the reset switch at the following times:

(1) When you have changed the setting of DIP switch pin 7 or 8.

(2) When errors have occurred.

b) When the reset switch is pressed, communications between the the MEMOBUS Module (RS-422) and connected devices will be interrupted. Communications will restart when the switch is released.

Using COMM Instructions

3

COMM instructions are used as MEMOBUS master communication instructions via the MEMOBUS Module. This Chapter describes how to use COMM instructions.

3.1 Mode Settings

This section describes how to set the mode for using the COMM instruction.

3.1.1 Setting Communications Modes

1) There are two communications modes: MEMOBUS Mode and Transparent Mode.

2) In Transparent Mode, transmission data prepared in a holding register is sent without processing and data received from a MEMOBUS port is stored in a holding register without processing.

3) MEMOBUS Mode is used when the GL120 serves as the MEMOBUS Master. This mode has two different settings, as described below.

a) Manual MEMOBUS Instruction Mode

In Manual MEMOBUS Instruction Mode, a BCC is added to the data in the holding register and then the combined data is sent as the MEMOBUS instruction.

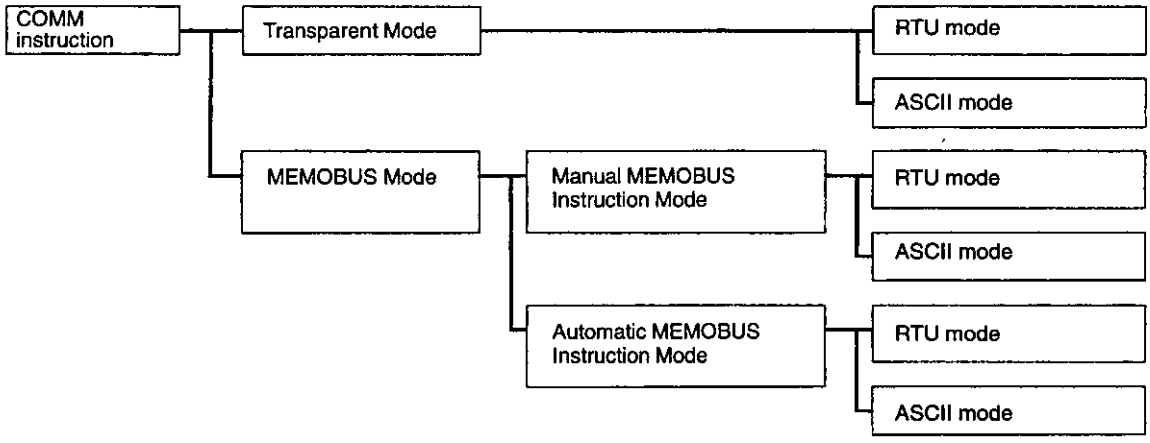
b) Automatic MEMOBUS Instruction Mode

In Automatic MEMOBUS Instruction Mode, the MEMOBUS instruction is automatically prepared according to the contents of a control block.

BCC

BCC stands for block check character. It is a character that is added to a block of data to check the block when data is processed or transmitted in blocks. This character is used to check whether or not the block of data is transmitted correctly. Both CRC (cycle redundancy check) and LRC (longitudinal redundancy check) are examples of BCC checking methods.

4) Both Transparent Mode and MEMOBUS Mode also contain two modes, RTU mode and ASCII mode. The relationship between these modes is shown in the following diagram.



5) Refer to *3.2 Transparent Mode* for details on Transparent Mode and to *3.3 MEMOBUS Mode* for details on MEMOBUS Mode.

3.2 Transparent Mode

This section describes using COMM instructions in Transparent Mode.

1) In Transparent Mode, transmission data prepared in a holding register is sent without processing and data received from a port is stored in a holding register without processing.

2) This provides maximum flexibility in communications through the use of the applications program. A BCC (block check character), such as those used in a CRC (cycle redundancy check) or a LRC (longitudinal redundancy check), is not automatically handled by the MEMOBUS Module, and must be added through the applications program.

3) RTU and ASCII modes are slightly different, as described next.

a) RTU Mode (8-bit Data)

(1) At transmission, the holding register data specified in the instruction is sent from the MEMOBUS port without processing.

(2) Upon reception, data received from the MEMOBUS port is input without processing to the holding register specified in the instruction.

(3) The end of a message is detected by a timer (24-bit timer).

b) ASCII Mode (7-bit Data)

(1) At transmission, the holding register data specified in the instruction is sent unprocessed from the port without code conversion. Since only 7 bits are used in ASCII mode, the MSB, however, is not sent.

(2) There are some restrictions in the format of messages received from remote devices. An end identifier (CR/LF) or an end detection timer (9,600/baud rate timer in seconds) is needed to end reception messages.

(3) If the first data received begins with a CR (carriage return), however, it is not regarded as the end identifier and is treated as ordinary data (0D). If a single LF (line feed) is received, then it is also treated as ordinary data (0A).

(4) All reception data, including the end identifier, is input into the holding registers specified in the instruction.

IMPORTANT When the MEMOBUS port is in Transparent Mode, it is used only for the Master transmissions when the CPU module is running.

3.3 MEMOBUS Mode

This section describes using COMM instructions in MEMOBUS Mode.

3.3.1 MEMOBUS Mode

1) This mode is used when the GL120 or GL130 serves as the MEMOBUS Master.

2) In this mode, there are two settings as described below.

a) Manual MEMOBUS Instruction Mode

In Manual MEMOBUS Instruction Mode, a BCC is added to the data in the holding register and then the combined data is sent as the MEMOBUS instruction.

b) Automatic MEMOBUS Instruction Mode

In Automatic MEMOBUS Instruction Mode, the MEMOBUS instruction is automatically prepared according to the contents of a control block.

IMPORTANT Use different device addresses for the master and slave when performing communications with COMM instructions in MEMOBUS Mode. A communications error will result if the same device address is used.

3.3.2 Manual MEMOBUS Instruction Mode

1) In Manual MEMOBUS Instruction Mode, the parameters in the top element in the COMM instructions are used to add the BCC to the data set as the middle element and the combined data is sent as a MEMOBUS instruction. Upon reception, the BCC is checked and deleted by the MEMOBUS Module and the data without the BCC is stored in the holding register range specified by the bottom element in the COMM instruction.

2) The form of the data sent from the MEMOBUS port of the MEMOBUS Module varies depending on the communications mode parameter settings of the RTU or ASCII modes.

a) RTU Mode

At transmission, a CRC is added to the holding register data specified in the instruction, and the data is sent from the MEMOBUS port. Upon reception, the CRC is removed, and the received data is input to the holding register specified in the instruction. The end of the reception message is detected by a timer (24-bit timer). The number of received data items does not include the BCC (in this case, the CRC).

b) ASCII Mode

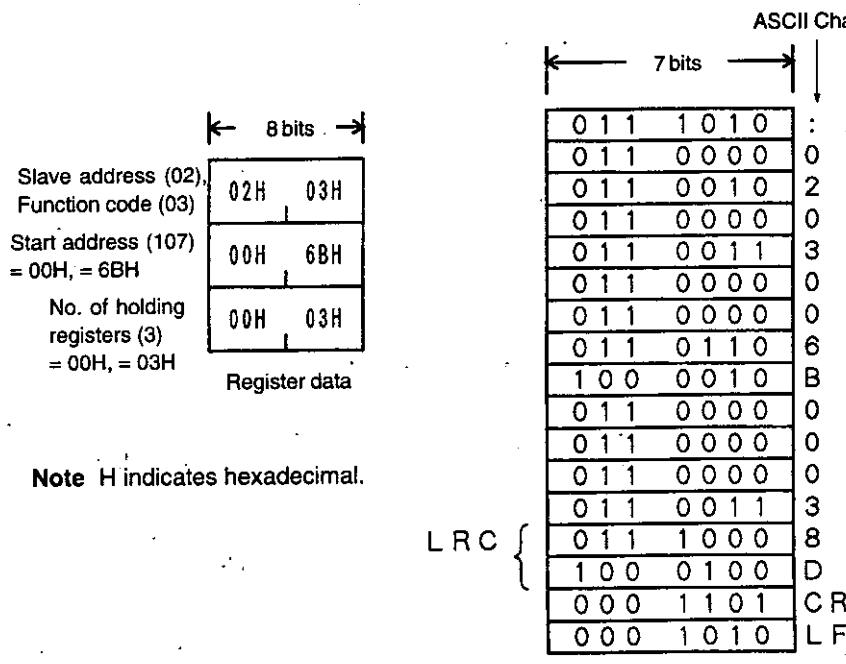
At transmission, the 8-bit holding register data specified in the instruction is converted to ASCII and sent from the MEMOBUS port. The transmission data is 7-bit data.

A start identifier ":", "LRC", and an end identifier "CR" or "LF" are automatically added by the MEMOBUS Module at transmission.

Upon reception, the start and end identifiers as well as the LRC are automatically removed, and the remaining data is stored as reception data in the holding register specified in the instruction. Here, the MEMOBUS Module converts data back from ASCII to 8-bit data.
The number of data items received does not include the BCC (in this case, the LRC) or identifiers.

The end of the received message is detected by a CR, an LF, or a 9,600/baud rate timer in seconds.

The following shows the relationship between register data and actual transmission/reception data in ASCII mode.



Note H indicates hexadecimal.

Register Data and Transmission Data

3.3.3 Automatic MEMOBUS Instruction Mode

1) In Automatic MEMOBUS Instruction Mode, the content of the holding register set as the middle element in the COMM instruction and content of the holding register set as the bottom element are used to automatically generate and send a MEMOBUS instruction.

2) If the Automatic Preparation Flag (FFFFh) is turned ON in the second register of the top element in the COMM instruction, a MEMOBUS instruction is automatically prepared and sent from the specified MEMOBUS port. Only instructions with the function codes shown in *Table 3.1* can be used.

Table 3.1 Instructions Applicable in Automatic Instruction Mode

Function Code (Decimal)	Function
1	Coil state read-out
2	Input relay state read-out
3	Holding register content read-out
4	Input register content read-out
15	Multiple coil state change
16	Write to holding register
18	Specific link coil state read-out
19	Constant register content read-out
20	Expansion register content read-out
21	Link register content read-out
29	Multiple link relay state change
30	Write to multiple constant registers
31	Write to multiple link registers
32	Write to multiple expansion registers

3) The form of the data sent from the MEMOBUS port of the MEMOBUS Module varies depending on the communications mode parameter settings of the RTU and ASCII modes.

a) RTU Mode

(1) For writing instructions, a CRC is added to the content of the middle and bottom elements, which are used to automatically generate a MEMOBUS instruction, and the combined data is sent from the MEMOBUS port.

(2) For reading instructions, a CRC is added to the content of the middle element, which is then used to generate a MEMOBUS instruction, and the combined data is sent from the MEMOBUS port. When the response data is received, register and coil data only are stored in the bottom element. An error code will be stored in the middle element if an error response is received. The end of the reception message is detected by a timer (24-bit timer).

b) ASCII Mode

A MEMOBUS instruction is prepared in the same manner as in RTU mode, but then the instruction is converted to ASCII, ":", "LRC" and "CR" or "LF" are added as appropriate, and the instruction is sent from the MEMOBUS port.

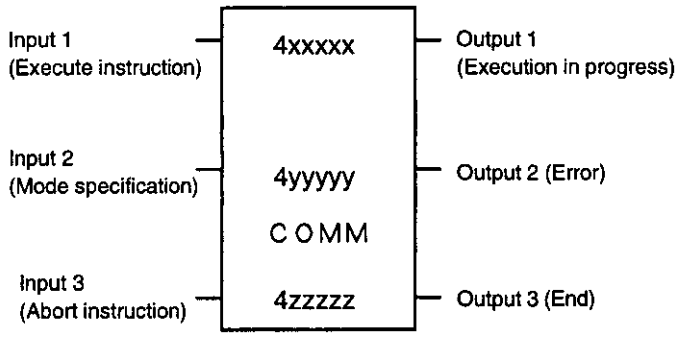
Reception data is converted back from ASCII to 8-bit data for reading instructions and the data is then stored in a holding register. An error code will be stored in the reception buffer if an error response is received. The end of the received message is detected by a CR, an LF or a 9,600/baud rate timer in seconds.

3.4 The COMM Instruction

This section describes the elements of the COMM instruction and how to use them.

3.4.1 Structure

1) The structure of the COMM instruction is shown in the following illustration.



2) The following conditions must be met to execute the instruction.

a) The specified MEMOBUS port must not be busy.

b) Input 1 must be ON.

c) Input 3 must be OFF.

3) The I/O of the COMM instruction are defined next.

a) Input 1: Execute Instruction

- The COMM instruction executes when input 1 is ON and input 3 is OFF. Output 1 goes ON when input 1 is received and execution begins.

- Usually, a differential contact must be used for input 1. The COMM instruction will carried out again if input 1 is still ON after the instruction has been carried out.

b) Input 2: Mode Specification

- Input 2 specifies either the Transmission/Reception Mode or the Transmission Mode when the execution of the COMM instruction begins.

ON . . . Transmission Mode
OFF . . Transmission/Reception Mode

- Transmission Mode only allows transmissions, and responses from the remote device are not required. Transmission Mode is used when the remote device is a printer, or other device that does not need to return a response.

- In Transmission/Reception Mode, the MEMOBUS Module waits for a response from the remote device after a transmission from the MEMOBUS port.

- For more details of the reception mode, refer to *4) Reception Mode* of this section.

- A timeout error is generated if no response is returned from the remote device after the allocated timeout period. The MEMOBUS Module will go on standby and the instruction will not end even if a response is not returned from the remote device when the unlimited timer is specified. In this case, timeout processing must be provided in the applications program.

c) Input 3: Abort Instruction

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

- Input 3 can be used to abort the instruction in Transmission/Reception Mode for timeouts or other abnormal conditions.

- Normally a differential contact must be used for this input. The COMM instruction will not be executed even if input 1 is ON as long as input 3 is ON.

d) Output 1: Execution in Progress

Output 1 goes ON when input 1 is received and the COMM instruction begins execution. It goes OFF when the operation ends or is aborted.

Output 1 goes OFF if an error occurs while the COMM instruction is being executed.

e) Output 2: Error

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

Error details are reflected in status error bits (see *Table 3.2*).

f) Output 3: End

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

All status error bits become 0 when output 3 goes ON.

4) Reception Mode

a) In the reception mode, data cannot be transmitted but can only be received from the remote device.

b) The reception mode is valid only in the transparent mode.

c) One of the following reception modes can be selected according to the setting of the COMM instruction

(1) Reception mode to receive the data transmitted after the COMM instruction starts

(a) COMM instruction setting

- Input 2: OFF (transmission/reception mode)
- Number of transmission data: 0 (the contents of the 2nd holding register of the top element)

(b) Operation

- The data received before the start of the COMM instruction is not stored in the reception buffer.
- The data being received at the start of the COMM instruction is not stored in the reception buffer.
- The data first received after the start of the COMM instruction is stored in the reception buffer of the bottom element, and the COMM instruction ends.
- The diagram below shows examples of a MEMOBUS port receiving data from a remote device. When the COMM instruction starts its execution while the MEMOBUS port is receiving Data (3) from the remote device, Data (4) is stored in the reception buffer. Thus, Data (1), (2), and (3) are not stored in the reception buffer.

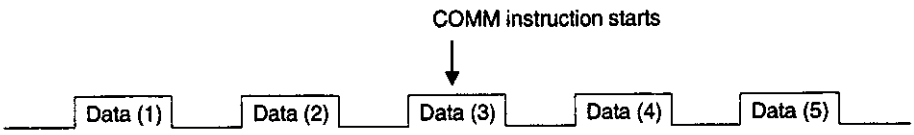


Figure 3.1 COMM Instruction Execution Start and Data Reception Timing

(2) Reception mode to receive the data transmitted before the COMM instruction starts

(a) COMM instruction setting

- Input 2: OFF (transmission/reception mode)
- Number of transmission data: 8000 (hexadecimal)
  (the contents of the 2nd holding register of the top element)

(b) Operation

- The data that has been received just before the start of the COMM instruction is stored in the reception buffer of the bottom element.
- If no data has been received before the start of the COMM instruction, the data being received at the start of the COMM instruction is stored in the reception buffer of the bottom element at the completion of reception, and the instruction ends.
- If no data has been received before the start of the COMM instruction and no data is being received, the data first received after the start of the COMM instruction is stored in the reception buffer of the bottom element, and the instruction ends.
- The diagram below shows an example of a MEMOBUS port receiving data from a remote device. When the COMM instruction starts while the MEMOBUS port is receiving data from the remote device, Data (2) is stored in the reception buffer.

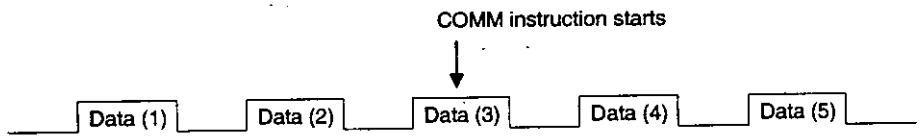


Figure 3.2 COMM Instruction Execution Start and Data Reception Timing

Note To use the mode to receive the data transmitted before the start of the COMM instruction, the Module used in MEMOCON GL120 and GL130 must be of the following versions or later.

Module		Type	Version No.
CPU Module (8 kW)	CPU10	DDSCR-120CPU14200	□□A01 or later *
CPU Module (16 kW)	CPU20	DDSCR-120CPU34100	□□A07 or later *
CPU Module (16 kW)	CPU21	DDSCR-120CPU34110	□□A02 or later *
CPU Module (32 kW)	CPU30	DDSCR-130CPU54100	□□A06 or later *
CPU Module (40 kW)	CPU35	DDSCR-130CPU54110	□□A01 or later *
MEMOBUS-RS232 Module		JAMSC-120NOM26100	□□A03 or later *
MEMOBUS-RS422 Module		JAMSC-120NOM27100	□□A03 or later *

* The version No. is on the nameplate located on the right of the Module.

3.4.2 Element Structure

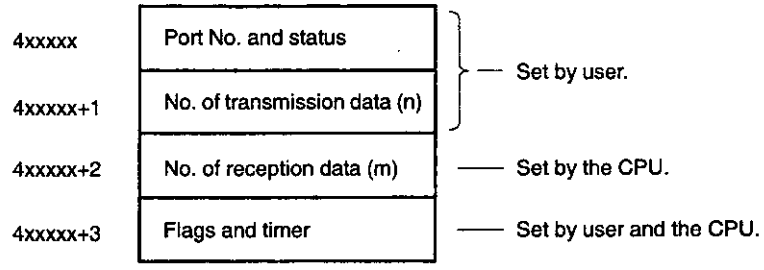
1) Transparent Mode and Manual MEMOBUS Instruction Mode

a) Top Element

(1) Structure

The top element uses 4 holding registers starting from 4xxxxx to store the data for controlling the COMM instruction. These holding registers cannot be used for any other purpose.

The number of the port used as well as the number of transmission data items are specified here. The top element is also used to indicate the number of reception data items as well as the operating conditions.



(2) Port Number and Status (4xxxxx)

The port for the MEMOBUS Module is specified in the rightmost 4 bits (0 to 3) of 4xxxxx. Communications with external remote devices are performed through the specified MEMOBUS port, and the status after communications is indicated in bits 5 to 15.

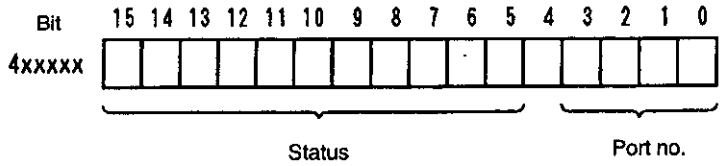


Table 3.2 Allocation of 4xxxxx Bits

<table>
<tr><th>Bit</th><th colspan="6">Meaning when Bit Is ON</th></tr>
<tr><td>15</td><td colspan="6">BCC (block check character for CRC and LRC) error
• Occurs only in MEMOBUS Mode.</td></tr>
<tr><td>14</td><td colspan="6">Cannot transmit from the specified port.
• Possible hardware malfunction.</td></tr>
<tr><td>13</td><td colspan="6">Timeout error
• Occurs if there is no response after the timer time specified in 4xxxxx + 3 has elapsed.</td></tr>
<tr><td>12</td><td colspan="6">Reception buffer overrun
• The number of reception data items exceeds 512 bytes.</td></tr>
<tr><td>11</td><td colspan="6">Incorrect transmission data
• The contents of 4xxxxx + 1 exceeds 512 bytes.</td></tr>
<tr><td>10</td><td colspan="6">Remote device is not connected to the specified port.
• DSR (data set ready) is OFF on the specified port.</td></tr>
<tr><td>9</td><td colspan="6">Incorrect port number
• A port number other than 1 to 5 has been specified.</td></tr>
<tr><td>8</td><td colspan="6">A specified MEMOBUS port error
• The MEMOBUS Module on the specified port is malfunctioning.</td></tr>
<tr><td>7</td><td colspan="6">The received response address and function code are not correct for the transmission message.
• Occurs only in MEMOBUS Mode.</td></tr>
<tr><td>6</td><td colspan="6">Error response received.
• An error response was received in MEMOBUS Mode.</td></tr>
<tr><td>5</td><td colspan="6">Master communications disabled.
• Master communications have been disabled on the DIP switch on the MEMOBUS Module on the specified MEMOBUS port.</td></tr>
<tr><td>4</td><td colspan="6">Not used.</td></tr>
<tr><td>3 to 0</td><td colspan="6">The port number is specified in bits 0 to 3.</td></tr>
<tr><td></td><td colspan="2" rowspan="2">Port No.</td><td colspan="4">Bit No.</td></tr>
<tr><td></td><td></td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td></td><td>1</td><td>Port 2 of the CPU10 Module</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td></td><td>2</td><td>Left port of MEMOBUS Module 1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td></td><td>3</td><td>Right port of MEMOBUS Module 1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td></td><td>4</td><td>Left port of MEMOBUS Module 2</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td></td><td>5</td><td>Right port of MEMOBUS Module 2</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
</table>

The status of bits 5 to 15 is updated each time the instruction is executed.

(3) Number of Transmission Data Items (4xxxxx + 1)

The number of data bytes (number of characters: n) transmitted is specified in 4xxxxx + 1.

The setting range for n is 1 to 512 (decimal) in the Manual MEMOBUS Instruction Mode, and 0 to 512 (decimal) or 8000 (hexadecimal) in the Transparent Mode.

Executing the COMM instruction with the number of transmission data items set to 0 or 8000 (hexadecimal) in Transparent Mode activates the reception mode. Data will, then, be received from the specified MEMOBUS port.

Table 3.3 No. of Transmission Data Items

n	No. of Transmission Buffer Registers
Even	n/2 registers
Odd	(n + 1)/2 registers

An error will occur immediately and the instruction will not be executed if a value outside the specified range is set.

(4) Number of Reception Data Items (4xxxxx + 2)

The number of data bytes (number of characters: m) received is set in 4xxxxx + 2.

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 (decimal), and the number of reception data items is cleared to 0 when the instruction is executed.

Table 3.4 No. of Reception Data Items

m	No. of Reception Buffer Registers
Even	m/2 registers
Odd	(m + 1)/2 registers

(5) Flags and Timer (4xxxxx + 3)

The leftmost 2 bits (14 and 15) in the register indicate the status of instruction execution. Bits 0 to 11 are used to set the timeout value for the COMM instruction.

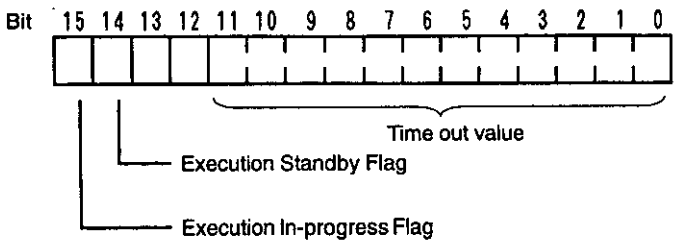


Table 3.5 Allocation of 4xxxxx + 3 Bits

Bit	Contents
15	• Execution In-progress Flag Bit 15 becomes 1 during execution. Even if input 1 is received, bit 15 will not become 1 until instruction execution is actually started. This bit is interlocked with output 1.
14	• Execution Standby Flag Bit 14 is set to 1 if the instruction has been executed, but the execution has not yet started. It thus indicates standby status when more than one COMM instruction is executed.
13, 12	No allocation. Always set to 0.
11 to 0	• Time out value Bits 0 through 11 are used to set the timeout period starting with instruction transmission from the communications port when the COMM instruction is executed, and ending with a response returned to the port. The setting range is 1 to 4,095 (in 100-ms increments). A setting of 0 specifies an unlimited time. If a response is not returned within the set timeout period, instruction execution will time out, and the COMM instruction will be ended.

Note Bit 14 and bit 15 will never be set to 1 at the same time.

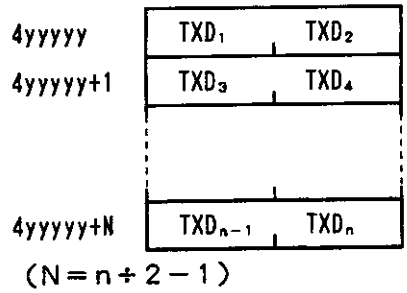
b) Middle Element

The middle element uses the specified number (N; see figures below) of holding registers starting from 4yyyyy as the transmission buffer.

4yyyyy indicates the first reference of the register block used to store the transmission data. The size of the transmission buffer depends on the number, n, of transmission data items. Transmission data must be set prior to executing the instruction.

Data is sent in ascending order (lowest number first) as indicated by the TXD (transmission data) subscripts shown in the following figures.

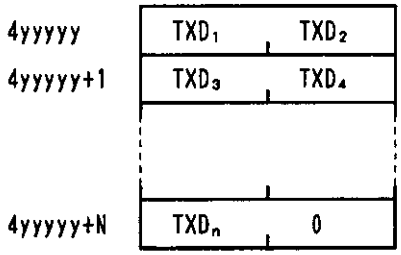
(1) n = Even Number



(N = n ÷ 2 − 1)

(2) n = Odd Number

Zero is entered for the leftover character.



(N = (n − 1) ÷ 2)

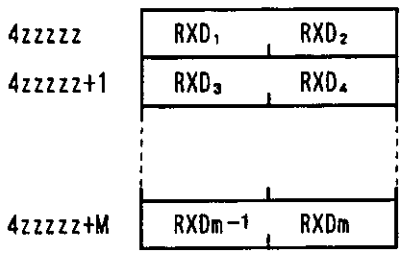
c) Bottom Element

The bottom element uses the specified number (M; see figures below) of holding registers starting from 4zzzzz as the reception buffer.

4zzzzz indicates the first 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. Do not use the register area for any other application. This area is not cleared when the instruction is executed.

Data is received in ascending order (lowest number first) as indicated by the RXD (reception data) subscripts shown in the following figures.

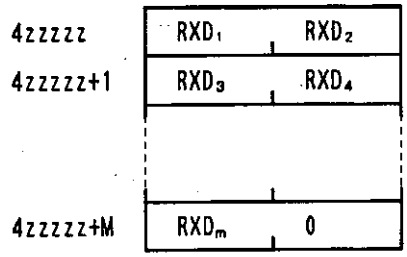
(1) m = Even Number



(M = m ÷ 2 − 1)

(2) m = Odd Number

Zero will be entered for the leftover character.



(M = (m − 1) ÷ 2)

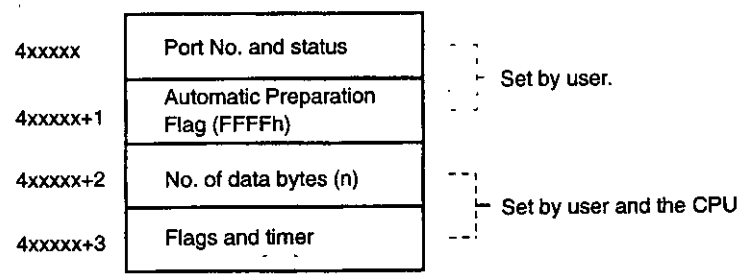
2) Automatic MEMOBUS Instruction Mode

a) Top Element

(1) Structure

The top element uses four holding registers starting from 4xxxxx to store the data for controlling the COMM instruction. These holding registers cannot be used for any other purpose.

The Automatic Preparation Flag (FFFFh) at 4xxxxx + 1 is turned ON to set the COMM instruction to Automatic MEMOBUS Instruction Mode. The MEMOBUS instruction is automatically prepared according to the contents of the middle and bottom elements, and is then sent from the MEMOBUS port specified by 4xxxxx.



(2) Port Number and Status (4xxxxx)

The port for the MEMOBUS Module is specified in the rightmost 4 bits (0 to 3) of 4xxxxx. Communications with external remote devices are performed through the specified MEMOBUS port, and the status after communications is indicated in bits 5 to 15.

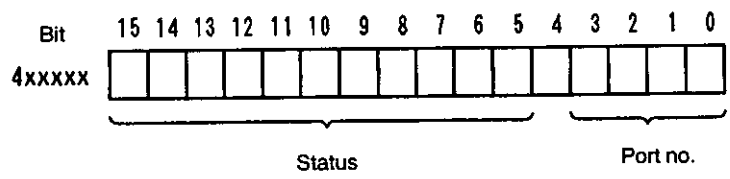


Table 3.6 Allocation of 4xxxxx Bits

<table>
<tr><th>Bit</th><th colspan="6">Meaning when Bit Is ON</th></tr>
<tr><td>15</td><td colspan="6">BCC (block check character for CRC and LRC) error
• Occurs only in MEMOBUS Mode.</td></tr>
<tr><td>14</td><td colspan="6">Cannot transmit from the specified port.
• Possible hardware malfunction.</td></tr>
<tr><td>13</td><td colspan="6">Timeout error
• Occurs if there is no response after the timer time specified in 4xxxxx + 3 has elapsed.</td></tr>
<tr><td>12</td><td colspan="6">Reception buffer overrun
• The number of reception data items exceeds 512 bytes.</td></tr>
<tr><td>11</td><td colspan="6">Incorrect transmission data
• The contents of 4xxxxx + 1 exceeds 512 bytes.</td></tr>
<tr><td>10</td><td colspan="6">Remote device is not connected to the specified port.
• DSR (data set ready) is OFF on the specified port.</td></tr>
<tr><td>9</td><td colspan="6">Incorrect port number
• A port number other than 1 to 5 has been specified.</td></tr>
<tr><td>8</td><td colspan="6">A specified MEMOBUS port error
• The MEMOBUS Module on the specified port is malfunctioning.</td></tr>
<tr><td>7</td><td colspan="6">The received response address and function code are not correct for the transmission message.
• Occurs only in MEMOBUS Mode.</td></tr>
<tr><td>6</td><td colspan="6">Error response received.
• An error response was received in MEMOBUS Mode.</td></tr>
<tr><td>5</td><td colspan="6">Master communications disabled.
• Master communications have been disabled on the DIP switch on the MEMOBUS Module on the specified MEMOBUS port.</td></tr>
<tr><td>4</td><td colspan="6">Not used.</td></tr>
<tr><td>3 to 0</td><td colspan="6">The port number is specified in bits 0 to 3.</td></tr>
<tr><td></td><td colspan="2">Port</td><td colspan="4">Bit No.</td></tr>
<tr><td></td><td colspan="2"></td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td></td><td>1</td><td>Port 2 of the CPU10 Module</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td></td><td>2</td><td>Left port of MEMOBUS Module 1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td></td><td>3</td><td>Right port of MEMOBUS Module 1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td></td><td>4</td><td>Left port of MEMOBUS Module 2</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td></td><td>5</td><td>Right port of MEMOBUS Module 2</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
</table>

The status of bits 5 to 15 is updated each time the instruction is executed.

(3) Automatic Preparation Flag (4xxxxx + 1)

Automatic MEMOBUS Instruction Mode is set when FFFFh is specified in 4xxxxx + 1.

(4) Number of Data Bytes (4xxxxx + 2)

In Automatic MEMOBUS Instruction Mode, this indicates the number of bytes for transmission or reception data in the data buffer (bottom element).

In a write instruction for the MEMOBUS instruction, the number of bytes for transmission data set in the data buffer is specified. The Setting range is 0 to 200 (decimal). The number of bytes is set to 0 when a normal end occurs after the instruction executes.

In a read instruction for the MEMOBUS instruction, the number of bytes is set to 0 because the number of transmission data items set in the data buffer is 0. When a normal end occurs after the instruction executes, data received in the data buffer is set, and the number of bytes of reception data is set in this register.

(5) Flags and Timer (4xxxxx + 3)

Bits 14 and 15 in this register indicate the execution status of the instruction. The COMM instruction timeout value is input into bits 0 to 11.

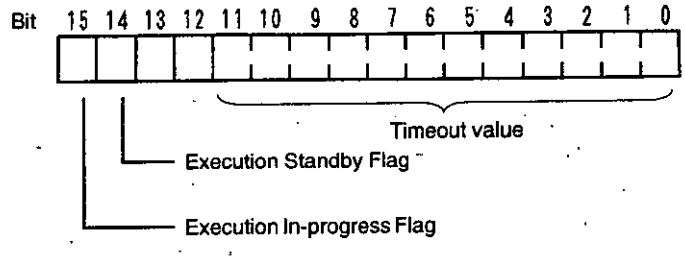


Table 3.7 Allocation of 4xxxxx + 3 Bits

Bit	Contents
15	• Execution In-progress Flag Bit 15 becomes 1 during execution. Even if input 1 is received, bit 15 will not become 1 until instruction execution is actually started. This bit is interlocked with output 1.
14	• Execution Standby Flag Bit 14 is set to 1 if the instruction has been executed, but the execution has not yet started. It thus indicates standby status when more than one COMM instruction is executed.
13, 12	No allocation. Always set to 0.
11 to 0	• Time out value Bits 0 through 11 are used to set the timeout period starting with instruction transmission from the communications port when the COMM instruction is executed, and ending with a response returned to the port. The setting range is 1 to 4,095 (in 100-ms increments). A setting of 0 specifies an unlimited time. If a response is not returned within the set timeout period, instruction execution will time out, and the COMM instruction will be ended.

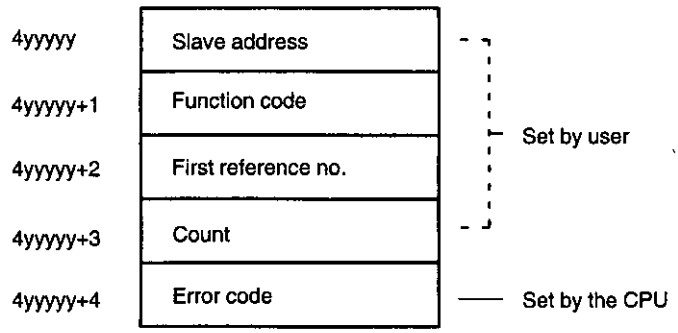
Note Bit 14 and bit 15 will never be set to 1 at the same time.

b) Middle Element

(1) Structure

When Automatic MEMOBUS Instruction Mode is set by the top element, the middle element serves as the header buffer used to prepare the MEMOBUS instruction as shown in the figure below.

The header buffer uses 5 holding registers starting from 4yyyyy. Transmission data must be set prior to executing the instruction.



(2) Slave Address (4yyyyy)

Set the device address of the slave device between 0 and 247.

(3) Function Code (4yyyyy + 1)

Set the function code of the MEMOBUS instruction. Refer to *Table 3.1* for details.

(4) First Reference Number (4yyyyy + 2)

Set the address of the first reference to be read or written. For example, to read reference 400001 using function code 3 (HOLDING REGISTER READ), set 0.

First reference number = 4yyyyy – 400001

(5) Count (4yyyyy + 3)

Set the number of registers, output coils, or input relays to be read or written.

(6) Error Code (4yyyyy + 4)

The CPU Module will set the MEMOBUS error code if an error response is returned. Error codes are shown in *Table 3.8.*

Table 3.8 Error Codes

Error Code	Meaning
01H	Illegal function code (does not exist)
02H	Illegal output coil, input relay, or register (not within range)
03H	Illegal number of output coils, input relays, or registers (not within range)

c) Bottom Element

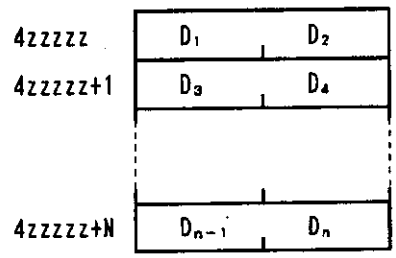
The bottom element uses the specified number (N) of holding registers starting from 4zzzzz as the data buffer.
4zzzzz indicates the first reference of the register block used to store transmission and reception data. The size of the buffer depends on the number, n, of data bytes.

Consider the maximum number of reception data items ahead of time, and be sure to maintain the buffer. Do not use the register area for any other application.

Write data (transmission data) is set in the data buffer for a write instruction, and read data (reception data) is set in the buffer for a read instruction.

Data is sent and received in ascending order (lowest number first) as indicated by the D subscripts shown in the following figures.

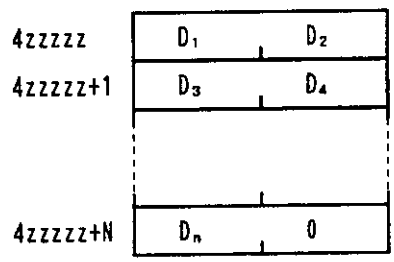
(1) n = Even Number



$(N = n \div 2 - 1)$

(2) n = Odd Number

Zero is entered for the last character. Zero will also be set in this character when receiving.



$(N = (n - 1) \div 2)$

3.5 Application Examples

This section describes example applications of the COMM instruction.

3.5.1 GL120 Master Operation

1) The example shows the use of a message to read the contents of a holding register with the GL120 used as the MEMOBUS Master. Here, MEMOBUS Mode is set for the MEMOBUS Module transmissions.

2) System Configuration

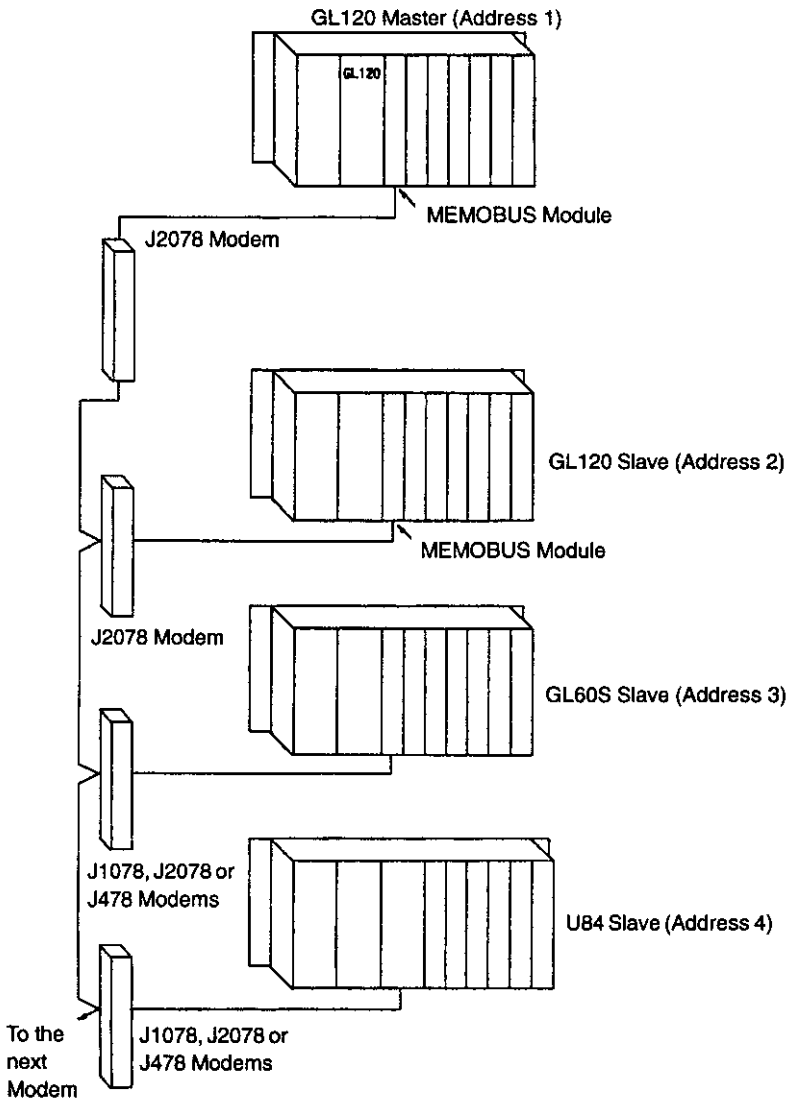
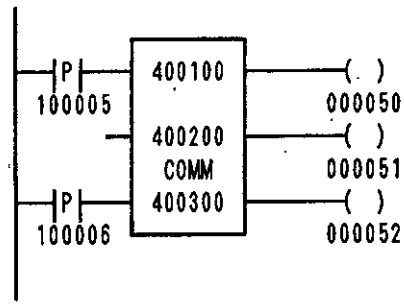


Figure 3.3 GL120 Master Configuration

3) Ladder Logic Instructions



The data stored in each register in this example described next.

a) Control Block (Top Element)

The COMM instruction is executed in Manual MEMOBUS Instruction Mode.

400100	2 (port No. and status)	
400101	6 (No. of transmission data)	
400102	0 (No. of reception data)	} Nothing needs to be set.
400103	0 (flags and timer)	

No value is set in register 400102 for the number of reception data items and flag/timer register 400103.

Because the port number here is 2, the MEMOBUS port 1 of the MEMOBUS Module 1 is used as the communications port.

The number of transmission data items is 6. This value is determined by the instruction message stored in the transmission buffer.

b) Transmission Buffer (Middle Element)

In this example, the contents of holding registers 400108 to 400110 are read from the GL120 with a slave address of 2.

Three registers are required for the transmission buffer because the number of transmission data items is 6. Registers 400200 to 400202 are used as the transmission buffer. The MEMOBUS Module automatically adds a CRC.

400200	02_H (Slave address)	03_H (Function code)	
400201	00_H	$6B_H$	• • • Start no. (107)
400202	00_H	03_H	• • • No. of holding registers (3)

c) Reception Buffer (Bottom Element)

The response message from the Slave is stored in registers 400300 to 400304. Because the number of reception data items is 9, the contents of register 400102 for the number of reception data items will be 9.

The rightmost 8 bits of register 400304 are 0 because no data is received for these bits.

400300	02_H	03_H
400301	06_H	02_H
400302	$2B_H$	00_H
400303	00_H	00_H
400304	63_H	00_H ← No data is received

Numeric values are in hexadecimal.

d) Operation

- 100005 is turned ON.
  Coil 50 will turn ON and communications with the specified Slave will take place as long as a COMM instruction to the same port is not already in progress.

- Coil 52 will turn ON for 1 scan after the response message is received.

e) If the Slave is a GL120 or GL130, then registers 400108 to 400110 are read; if the Slave is a GL60S, U84, or U84S, then registers 40108 to 40110 are read. If the Slave is a R84H-M or GL20, then registers 4108 to 4110 are read.

3.5.2 Transmission to ASCII Devices

1) The following example describes transmission to an ASCII device (here, a printer) from a GL120 MEMOBUS Master.

The MEMOBUS Module Transmission Mode is set to Transparent Mode.

2) System Configuration

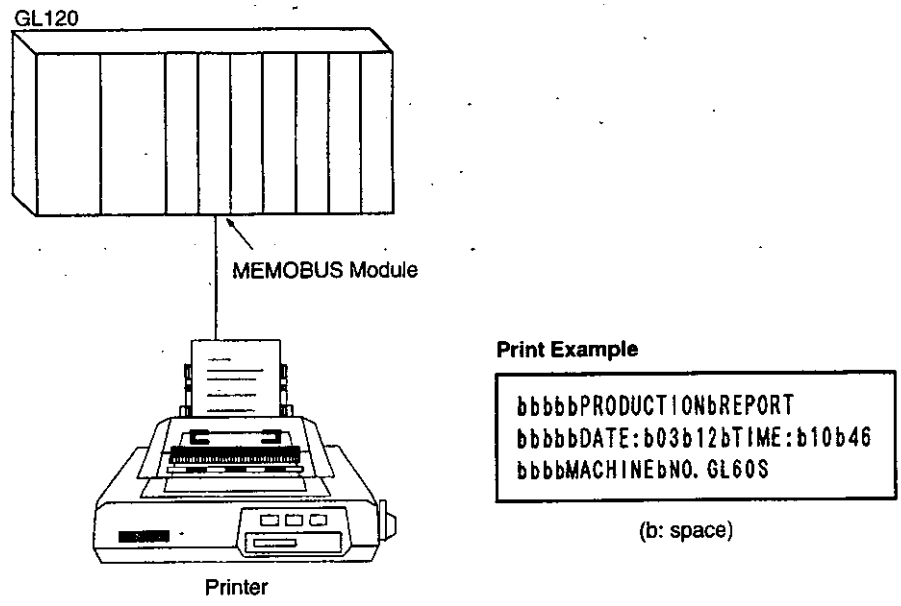
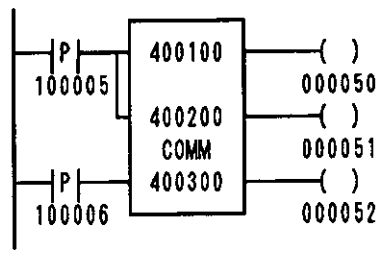


Figure 3.4 Example of Transmission to ASCII Device

3) Ladder Logic Instructions



The data stored in each register in this example is described next.

a) Control Block (Top Element)

400100	3 (port No. and status)
400101	77 (No. of transmission data)
400102	0 (No. of reception data)
400103	0 (flags and timer)

} Nothing needs to be set.

No value is set in flag/timer register 400103, and nothing needs to be set in register 400102.

The number of transmission data items includes a "CR" and "LF" for each line.

b) Transmission Buffer (Middle Element)

A total of 39 registers are required for the transmission buffer because the number of transmission data items is 77. Registers 400200 to 400238 are used as the transmission buffer.

400200	20_H	20_H
400201	20_H	20_H
400202	20_H	50_H (P)
400203	52_H (R)	$4F_H$ (O)
400204	44_H (D)	55_H (U)
400205	43_H (C)	54_H (T)
400206	49_H (I)	$4F_H$ (O)
400207	$4E_H$ (N)	20_H
400208	52_H (R)	45_H (E)
400209	50_H (P)	$4F_H$ (O)
400210	52_H (R)	52_H (T)
400211	$0D_H$ (CR)	$0A_H$ (LF)
400212	20_H	20_H
400213	20_H	20_H
400214	20_H	44_H (D)
400215	41_H (A)	54_H (T)
400216	45_H (E)	$3A_H$ (:)
400217	20_H	30_H (0)
400218	33_H (3)	20_H
400219	31_H (1)	32_H (2)
400220	20_H	54_H (T)
400221	49_H (I)	$4D_H$ (M)
400222	45_H (E)	$3A_H$ (:)
400223	20_H	31_H (1)
400224	30_H (0)	20_H
400225	34_H (4)	36_H (6)
400226	$0D_H$ (CR)	$0A_H$ (LF)
400227	20_H	20_H
400228	20_H	36_H (6)
400229	20_H	$0A_H$ (LF)
400230	41_H (A)	43_H (C)
400231	48_H (H)	49_H (I)
400232	$4E_H$ (N)	45_H (E)
400233	20_H	$4E_H$ (N)
400234	$4F_H$ (O)	$2E_H$ (.)
400235	47_H (G)	$4C_H$ (L)
400236	36_H (6)	30_H (0)
400237	53_H (S)	$0D_H$ (CR)
400238	$0A_H$ (LF)	00_H

Note Numeric values are in hexadecimal.

c) Reception Buffer (Bottom Element)

There is no reception data since only transmission has been specified. A reception buffer is therefore not necessary.

A dummy designation, however, must be given for the bottom element of the COMM instruction. Register 400300 in this example is not used in the actual COMM instruction.

d) Operation

- 100005 is turned ON.
  Coil 50 will turn ON, and the character string shown in the following will be printed as long as a COMM instruction to the same port is not already in progress.

```
bbbbbPRODUCTIONbREPORT
bbbbbDATE:b03b12bTIME:b10b46
bbbbMACHINEbNO. GL60S
```

(b: space)

- Coil 52 will turn ON for 1 scan at the end of the printing process.

3.6 Application Precautions

Observe the following precautions when performing communications through COMM instructions

1) The MEMOBUS Module will remain on standby waiting for a response if no response is returned from the remote device when an unlimited timer is specified in Transmission/ Reception Mode. If this happens, input 3 can be turned ON to cancel the COMM instructions and release the standby status.

2) Execution of the COMM instruction will be aborted if one of the following occurs after the instruction execution has been started and before execution has been completed.

   • Transmission data is changed.

   • The contents of the control block registers is changed.

   • SKIP is executed for a network with active COMM instructions.

   • Active COMM instructions are changed from MEMOSOFT software.

3) Instruction execution normally starts when input 1 goes from OFF to ON. If a COMM instruction is already being executed for the same port, subsequent COMM instructions will be placed on standby, and they will be executed after execution of the previous COMM instruction has been finished.

4) Use differential signals to control inputs, such as those used to execute instructions.

5) Data required in a COMM instruction must be set in registers as follows:

   a) The data must be set in the registers before the COMM instruction is executed.

   b) If arithmetic or other instructions are used to set the data, differential signals must be used to control execution of these instructions.

   Problems such as those described in precaution 2), above, may occur if non-differentiated signals are used.

6) When data is broadcast to Slaves by MEMOBUS broadcasting, communications will take place in Transmission Mode. Do not simultaneously execute more than one COMM instruction for the same slave port when broadcasting. If more than one COMM is executed for the same Slave, the Slave will not be able to receive data properly because the interval between MEMOBUS instructions will be too short.

7) The problem described in precaution 6), above, can also occur if a COMM instruction is aborted during execution and another COMM instruction has already been executed and is awaiting execution.

8) Do not connect Master Devices such as Programming Panels to a port used as the Master port; doing so, may hang up the port. Should this happen, stop all COMM instructions active for the port.

9) Use different device addresses for the master and the slave when performing communications with COMM instructions in MEMOBUS Mode. A communications error will occur if the same address is used.

Remote I/O Modules

4

The COMR instruction is used as the MEMOBUS master communication instruction for communications through a Remote I/O port on a Remote I/O Module. This chapter introduces the Remote I/O Modules.

4.1 General Specifications

This section provides the general specifications of the Remote I/O Modules.

The general specifications of the Remote I/O Modules are shown in the following table.

Table 4.1 General Specifications

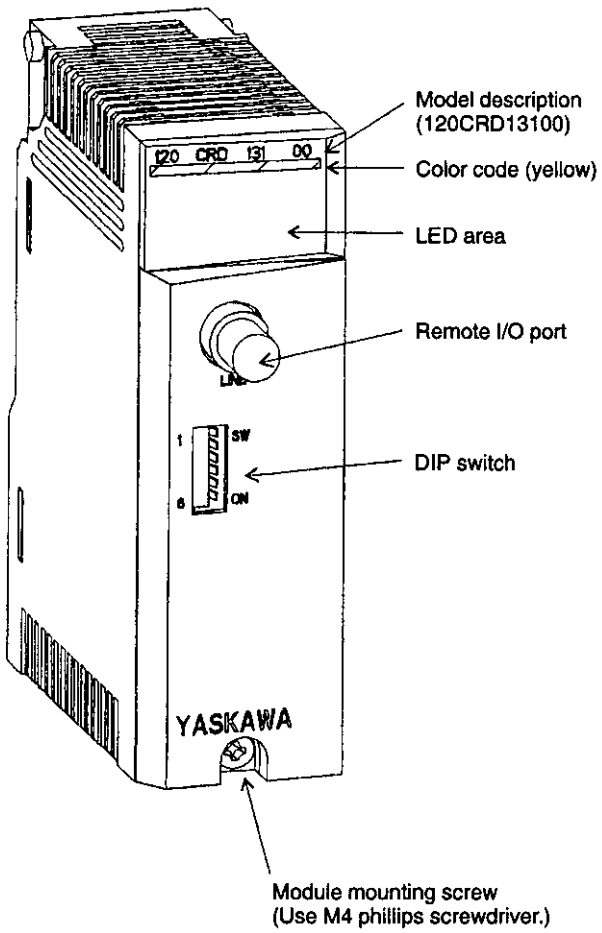
Item		Specifications
Dielectric Strength		1) Between the primary side and the grounding or between the primary side and the secondary side: Detected current 10 mA max. with 1,500 VAC for 1 minute or 1,800 VAC for 1 s. 2) Between the secondary side and the grounding: Detected current 30 mA max. with 500 VAC for 1 minute or 550 VAC for 1 s.
Insulation Resistance		1) 10 MΩ min. between the primary side and the grounding or between the primary side and the secondary side (via the 500-VDC insulation resistance meter) 2) 100 MΩ min. between the secondary side and the grounding (via the 500-VDC insulation resistance meter)
Environment Conditions	Ambient Operating Temperature	0 to 60 °C
	Ambient Storage Temperature	–25 to 85 °C (except batteries)
	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 times each in X, Y, and Z directions (according to JIS B 3502)/(sweep time: 1 octave/min)
	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 in either normal or common mode with pulse widths of 100 ns/1 µs and rise time of 1 ns (according to JIS B 3502) (with impulse noise simulator)
Installation Require-ments	Ground	Ground to 100 Ω or less
	Configuration	Building-block, wall-mounted or DIN track-mounted
	Cooling Method	Natural cooling

4.2 Remote I/O Modules

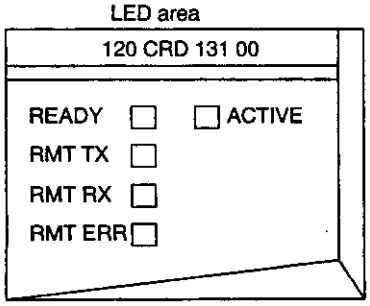
This section provides the secifications for two types of Remote I/O Modules.

4.2.1 Remote I/O Driver Module

1. Appearance



LED area



LED	Color	Indication when ON
READY	Green	Module is operating normally.
ACTIVE	Green	Module is processing I/O.
RMT TX	Green	Module is transmitting data from the remote I/O port.
RMT RX	Green	Module is receiving data from the remote I/O port.
RMT ERR	Red	An error has occurred in the transmission from the remote I/O port. Lit for 10 ms.

If a status error occurs, the READY indicator will go off and the RMT ERR indicator will flash as described in the following table.

ROM error	RMT ERR will flash continuously.
RAM error	RMT ERR will flash twice, go off for 1 s, and then repeat the cycle.
Common memory error	RMT ERR will flash three times, go off for 1 s, and then repeat the cycle.
Watchdog timer error	RMT ERR will flash four times, go off for 1 s, and then repeat the cycle.

Figure 4.1 Appearance of Remote I/O Driver Module

2. Function

Remote I/O Driver Modules function as the master station for a Remote I/O System using coaxial cable as the transmission cable.

3. Specifications

The specifications of the Remote I/O Driver Module are shown in the following table.

Table 4.2 Specifications of Remote I/O Driver Module

Item	Specifications	
Model Name	RIOD-COAX	
Model No.	JAMSC-120CRD13100	
Internal Current Consumption	800 mA	
Maximum Heating Value	4.0 W	
Hot Swapping (Removal/Insertion under Power)	Not permitted	
Approximate Mass	300 g	
External Dimensions	40.34 ×130.00 ×103.85 mm (W×H×D)	
Remote I/O Port Specifications	Topology (Communications Network)	Bus
	Media Access Control Method	Multi-drop (1:n communications)
	Media (Transmission Medium)	Coaxial cable (75Ω)
	Modulation Method	Base band
	Encoding Method	Manchester code
	Baud Rate	Choose from 0.5/1/2/4 Mbps
	Transmission Distance	Transmission distance varies according to the baud rate and specifications of coaxial cable. If, for example, the baud rate is 4 Mbps and 12C-5AF Coaxial Cable is used, it is possible to transmit up to 1 km.
	Number of Stations	15 max. (Up to 15 Remote I/O Receiver Modules can be connected.)
	Error Measures (RAS)	Automatic parallel off and malfunctioning station recovery
	Synchronization Method	Frame
	Communications Format	Conforms to HDLC.
	Insulation Method	Pulse transformer
	Connector	BNC connector

4. Using Remote I/O Driver Modules

1) Number of Units

Two Remote I/O Driver Modules can be used.

2) Installation Location

a) A Remote I/O Driver Module can be mounted to any slot on the Mounting Base of Rack 1 (CPU Rack) of the local channel.

b) An example of how to mount a Remote I/O Driver Module is shown on the next page.

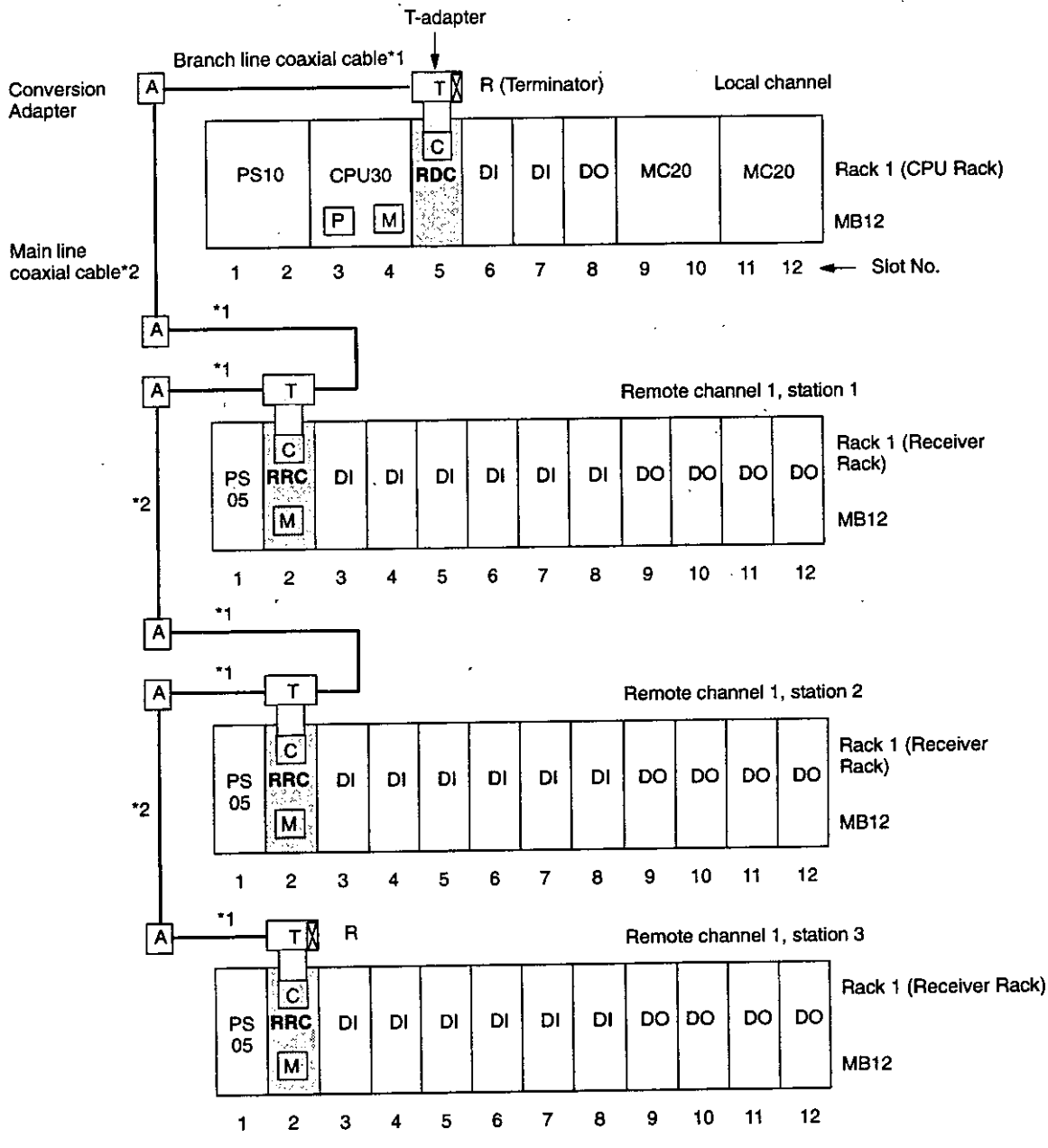
3) Remote I/O Port

a) Through the remote I/O port, the Remote I/O Driver Module runs communications (4 Mbps) with up to 15 Remote I/O Receiver Modules. The transmission distance varies according to the baud rate and specifications of the coaxial cable. If, for example, the baud rate is 4 Mbps and 12C-5AF coaxial cable is used, it is possible to transmit up to 1 km.

b) An example of how to connect a Remote I/O Driver Module and Remote I/O Receiver Modules is shown on the next page.

◀EXAMPLE▶ **Example**

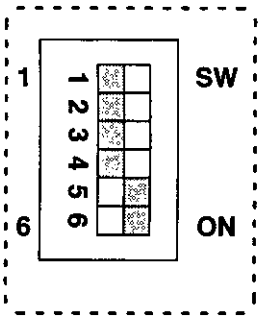
Connecting a Remote I/O Driver Module and Remote I/O Receiver Modules



PS10:	Power Supply Module (7 A)	DI:	12/24-VDC 16-point Input Module
PS05:	Power Supply Module (3 A)	DO:	12/24-VDC 16-point Output Module
CPU30:	CPU Module (32 KW)	MC20:	4-axis Motion Module
RDC:	**Remote I/O Driver Module**	MB12:	12-slot Mounting Base
RRC:	**Remote I/O Receiver Module**		

Figure 4.2 Connecting Remote I/O Driver/Receiver Modules

4) DIP Switch



a) The DIP switch consists of 6 pins. The pins are numbered from 1 to 6 as shown in the diagram.

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

c) The setting of each pin is effective when power is turned ON to the Power Supply Module in Rack 1 (CPU Rack).

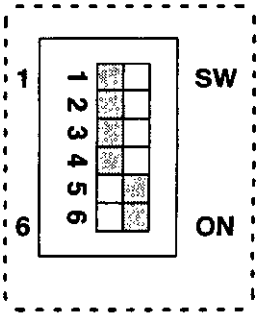
d) Each pin's function is shown in the following table.

Table 4.3 Function of DIP Switch

Pin No.	Settings	Function		
1	ON	Sets Module to self diagnosis mode.		
	OFF	Sets Module to remote mode.		
2	ON	For future use		
	OFF	Sets Module to 120 I/O mode.		
3	ON	Sets Module to master station of channel 2.		
	OFF	Sets Module to master station of channel 1.		
4	ON	For future use. It does not matter whether the pin is turned ON or OFF.		
	OFF			
5 6	Set the baud rate of Remote I/O System according to the table shown on the right.	Pin 5	Pin 6	Baud rate
		ON	ON	4 Mbps
		ON	OFF	2 Mbps
		OFF	ON	1 Mbps
		OFF	OFF	0.5 Mbps

e) Examples of setting the DIP switch are shown below:

◀EXAMPLE▶ **Example 1**

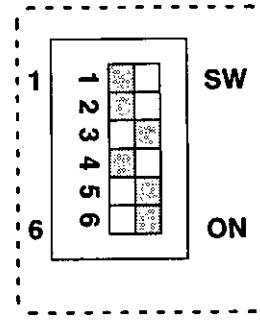


When the DIP switch is set as shown in the diagram on the right, the Remote I/O Driver Module is set as follows:

- Remote mode
- 120 I/O mode
- Master station of channel 1
- Baud rate: 4 Mbps

Example 2

When the DIP switch is set as shown in the diagram on the right, the Remote I/O Driver Module is set as follows:



- Remote mode
- 120 I/O mode
- Master station of channel 2
- Baud rate: 4 Mbps

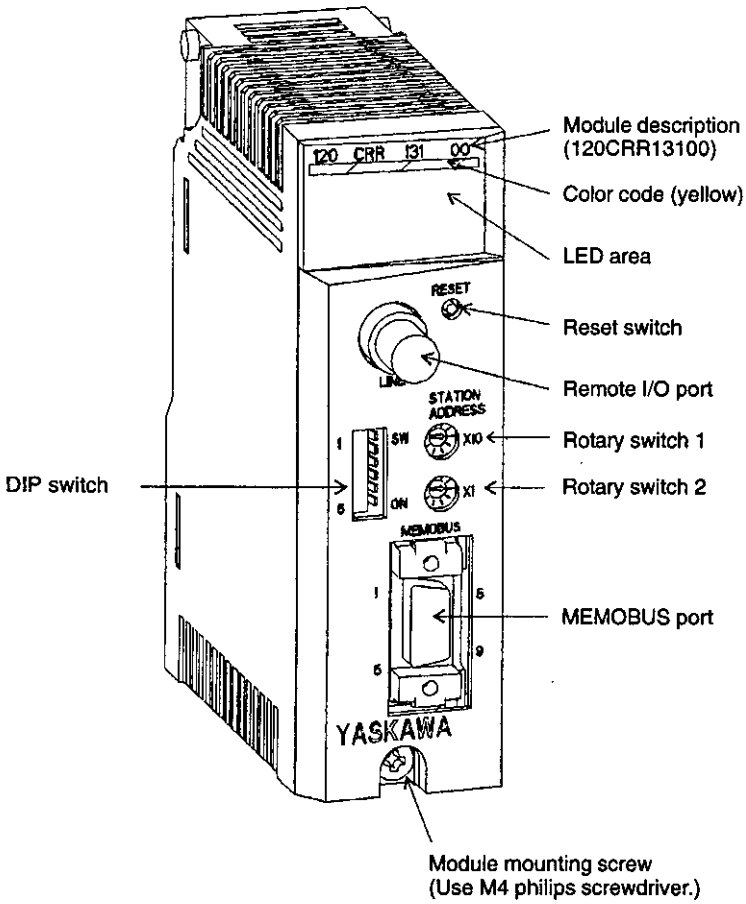
5. Related Manuals

Before operating a Remote I/O Driver Module, read the following manual carefully and be sure that you fully understand the information on specifications, application methods, safety precautions, etc.

MEMOCON GL120, GL130 Coaxial Remote I/O System User's Manual
(SIEZ-C825-70.8)

4.2.2 Remote I/O Receiver Module

1. Appearance



LED	Color	Indication when ON
READY	Green	Module is operating normally.
ACTIVE	Green	Module is processing I/O.
RMT TX	Green	Module is transmitting data from the remote I/O port.
RMT RX	Green	Module is receiving data from the remote I/O port.
RMT ERR	Red	An error has occurred in the transmission from the remote I/O port. Lit for 10 ms.
PP TX	Green	Module is transmitting data from the MEMOBUS port.
PP RX	Green	Module is receiving data from the MEMOBUS port.
PP ERR	Red	An error has occurred in the transmission from the MEMOBUS port.

If a status error occurs, the READY indicator will go off and the RMT ERR indicator will flash as described in the following table.

ROM error	RMT ERR will flash continuously.
RAM error	RMT ERR will flash twice, go off for 1 s, and then repeat the cycle.
ASIC error	RMT ERR will flash three times, go off for 1 s, and then repeat the cycle.
Watchdog timer error	RMT ERR will flash four times, go off for 1 s, and then repeat the cycle.

Figure 4.3 Appearance of Remote I/O Receiver Module

2. Function

The Remote I/O Receiver Module functions as a slave station in a Remote I/O System using coaxial cable as the transmission cable.

3. Specifications

The specifications of the Remote I/O Receiver Module are shown in the following table.

Table 4.4 Specifications of Remote I/O Receiver Module

Item	Specifications	
Model Name	RIOR-COAX	
Model No.	JAMSC-120CRR13100	
Internal Current Consumption	800 mA	
Maximum Heating Value	4.0 W	
Hot Swapping (Removal/Insertion under Power)	Permitted	
Approximate Mass	300 g	
External Dimensions	40.34×130.00 ×103.85 mm (W×H×D)	
Remote I/O Port Specifications	Topology (Communications Network)	Bus
	Media Access Control Method	Multi-drop (1: n communications)
	Media (Transmission Medium)	Coaxial cable (75Ω)
	Modulation Method	Base band
	Encoding Method	Manchester code
	Baud Rate	Choose from 0.5/1/2/4 Mbps
	Transmission Distance	Transmission distance varies according to the baud rate and specifications of coaxial cable. If, for example, the baud rate is 4 Mbps and 12C-5AF Coaxial Cable is used, it is possible to transmit up to 1 km.
	Number of Stations	15 max. (Up to 15 Remote I/O Receiver Modules can be connected)
	Error Measures (RAS)	Automatic parallel off and malfunctioning station recovery
	Synchronization Method	Frame
	Communications Format	Conforms to HDLC.
	Insulation Method	Pulse transformer
	Connector	BNC connector

Item	Specifications	
MEMOBUS Port Specifications	Communications Method	Half-duplex stop-start synchronization
	Transmission Levels	Conform to RS-232C
	Protocol	MEMOBUS protocol or any other protocol
	Baud Rate	19,200/9,600/7,200/4,800/3,600/2,400/2,000/ 1,800/1,200 bps
	Communications Mode	RTU mode or ASCII mode
	Data Format	The following data format is used between master and slaves, between master and modems, and between modems and slaves: 1) Data bit length: 8 (RTU mode) or 7 (ASCII mode) 2) Parity check: Yes or No 3) Parity: Odd or even 4) Stop bits: 1 or 2
	Transmission Distance	15 m (Can be extended to 4.5 km maximum by using Yaskawa modem.)
	Transmission Error Detection	CRC-16 (RTU mode) or LRC (ASCII mode)
	Connector	D-sub connector (9-pin, female)

4. Using Remote I/O Receiver Modules

1) Number of Modules

Fifteen Remote I/O Receiver Modules can be connected to each Remote I/O Driver Module.

2) Installation Location

a) A Remote I/O Receiver Module can be mounted to any slot on the Mounting Base of Rack 1 of a remote station.

b) Normally, a Remote I/O Receiver Module is mounted to the slot next to the Power Supply Module on the left hand side of Rack 1.

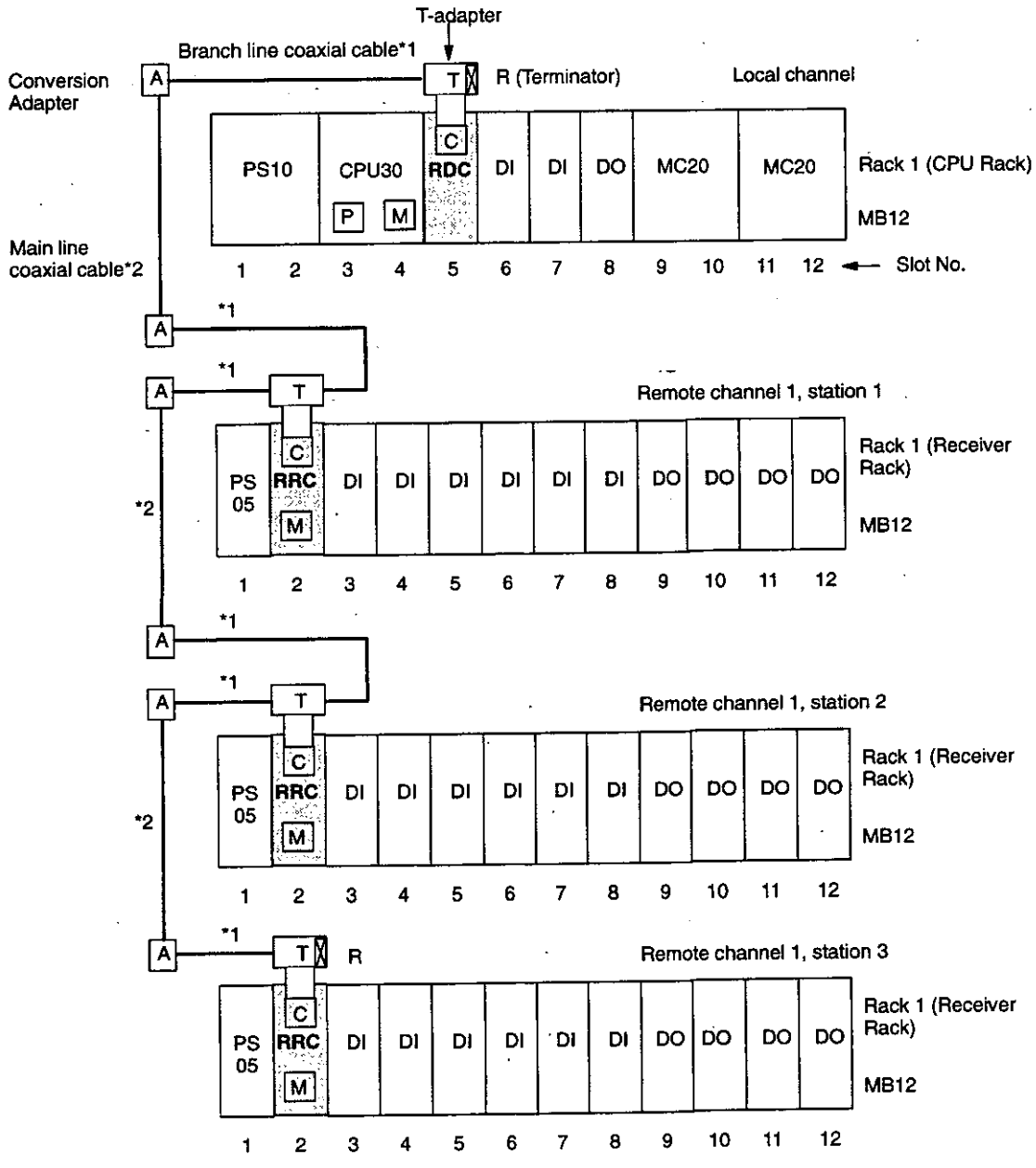
3) Remote I/O Port

a) The Remote I/O Driver Module runs high-speed communications of 4Mbps through the remote I/O port with Remote I/O Receiver Modules. The transmission distance varies according to the baud rate and specifications of coaxial cable. If, for example, the baud rate is 4 Mbps and 12C-5AF Coaxial Cable is used, it is possible to transmit up to 1 km.

b) An example of connecting a Remote I/O Driver Module and Remote I/O Receiver Modules is shown on the next page.

◀EXAMPLE▶ **Example**

Connecting a Remote I/O Driver Module and Remote I/O Receiver Modules



PS10:	Power Supply Module (7 A)	DI:	12/24-VDC 16-point Input Module
PS05:	Power Supply Module (3 A)	DO:	12/24-VDC 16-point Output Module
CPU30:	CPU Module (32 KW)	MC20:	4-axis Motion Module
RDC:	**Remote I/O Driver Module**	MB12:	12-slot Mounting Base
RRC:	**Remote I/O Receiver Module**		

Figure 4.4 Connecting Remote I/O Driver/Receiver Modules

4) MEMOBUS Port

a) A Remote I/O Receiver Module run RS-232C communications (master communications or slave communications) through the MEMOBUS port. Either MEMOBUS protocol or any other protocol can be used for the communications protocol.

b) Devices that can be connected to the MEMOBUS port are shown in the following table. Each of these devices must be equipped with an RS-232C interface. In addition, depending on the type of device, the MEMOBUS port settings will need to be altered. This settings are altered using the DIP switch on the front of the Module. Refer to *5) DIP Switch* for details.

Table 4.5 Example of Devices Connectable to the MEMOBUS Port

Type	Device	Remarks
MEMOBUS master	P120-series Programming Panel	• Set MEMOBUS port to slave port. • Communications performed using the MEMOBUS protocol
	Personal computer (with MEMOSOFT)	• Creation of communications program not needed.
	ACGC4000/400-series FA Monitor	• If your computer does not have MEMOSOFT, create a communications program based on the MEMOBUS protocol.
ASCII devices	Bar code reader	• Set the MEMOBUS port to combined master/slave port. • Set the MEMOBUS port to transparent mode.
	Serial printer	• Create a communications program using the COMR instructions in the GL120 and GL130.

c) Number of Connectable MEMOBUS Masters

Note When connecting a MEMOBUS master such as a P120 Programming Panel to the MEMOBUS port of the Remote I/O Receiver Module, only one master can be connected per remote channel. More than one master cannot be connected to one remote channel.

d) Number of Connectable ASCII Devices

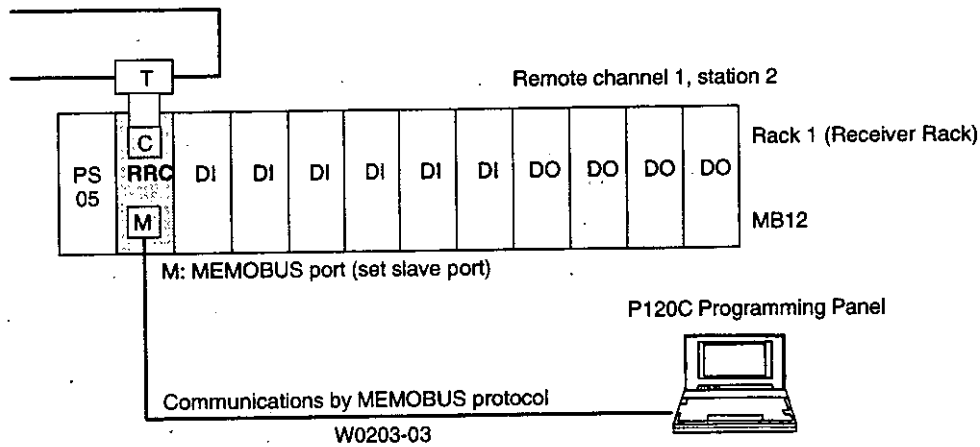
When connecting ASCII devices such as printers to the MEMOBUS port of the Remote I/O Receiver Module, between 1 and 15 devices can be connected per remote channel.

e) Refer to *Table 4.4* for the transmission specifications of the MEMOBUS port.

f) An example using the MEMOBUS port is shown below:

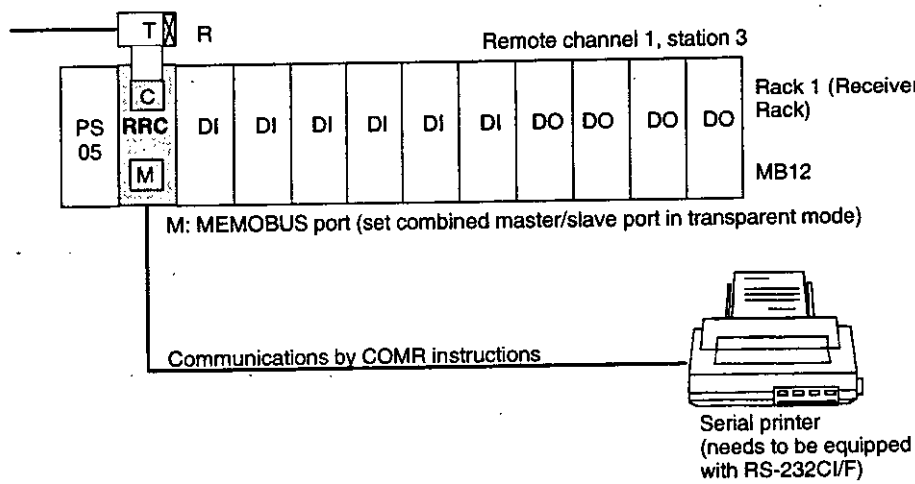
◀EXAMPLE▶ **Example 1**

Connecting Programming Panel to MEMOBUS port



Example 2

Connecting serial printer to MEMOBUS port

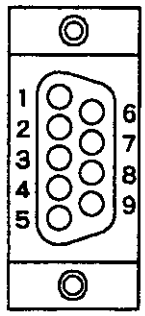


PS05:	Power Supply Module (3 A)	DO:	12/24-VDC 16-point Output Module
RRC:	**Remote I/O Receiver Module**	MB12:	12-slot Mounting Base
DI:	12/24-VDC 16-point Input Module	W0203-03:	MEMOBUS Cable (2.5 m)

Figure 4.5 Using the MEMOBUS Port

g) The connector for the MEMOBUS port is a D-sub connector (9-pin, female). The connector pin arrangement and signal names are shown in the following table:

Table 4.6 Pin Arrangement and the Signal Names of MEMOBUS Port



Pin No.	Symbol	Signal Name
1	FG	Protective ground
2	TXD	Transmission data
3	RXD	Reception data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	Signal ground
8		Not used
9	DTR	Data terminal ready

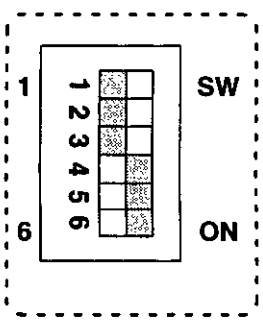
h) COM Instructions (COMM, COMR)

Note (1) The COMR instruction can be used only for the MEMOBUS port of the Remote I/O Receiver Module.

(2) The COMM instruction cannot be used for the MEMOBUS port of the Remote I/O Receiver Module. The COMM instruction can be used for the MEMOBUS port of the following two communications Modules:

MEMOBUS Module (RS-232): Model JAMSC-120NOM26100
MEMOBUS Module (RS-422): Model JAMSC-120NOM27100

5) DIP Switch



a) The DIP switch is composed of 6 pins. The pins are numbered from 1 to 6 as shown in the diagram.

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

c) Each pin becomes effective at the following times.

(1) Pins 2 to 4: When the pin setting is changed.

(2) Pin 1, pin 5, and pin 6: When the reset switch is pressed, or when power is turned ON to the Power Supply Module of Rack 1 (Receiver Rack).

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

Table 4.7 Function of DIP Switch

Pin No.	Settings	Function		
1	ON	Sets Module to self diagnosis mode.		
	OFF	Sets Module to remote mode.		
2	ON	Sets MEMOBUS port to slave port. Master communications becomes ineffective.		
	OFF	Sets MEMOBUS port to combined master/slave port. Master communications becomes effective. When using COMR instruction, turn OFF this pin.		
3	ON	When using MEMOBUS port as master port, sets communications mode to transparent mode.		
	OFF	When using MEMOBUS port as master port, sets communications mode to MEMOBUS mode.		
4	ON	When using MEMOBUS port as slave port, sets communications mode and parameters to the defaults.		
	OFF	When using MEMOBUS port as slave port, sets communications mode and parameters to user settings.		
5 6	Sets the baud rate of the Remote I/O System as shown at the right.	Pin 5	Pin 6	Baud rate
		ON	ON	4 Mbps
		ON	OFF	2 Mbps
		OFF	ON	1 Mbps
		OFF	OFF	0.5 Mbps

e) The default communications mode and parameters are as follows:

(1) Communications mode: RTU mode

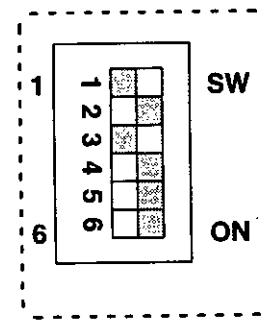
(2) Communications parameters:

Baud rate:	9,600 bps
Parity check:	Yes
Parity:	Even
Stop bits:	1
Data bit length:	8
Delay time:	0 ms

f) Examples of setting the DIP switch are shown below:

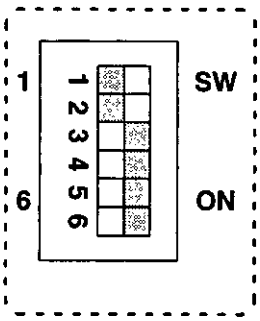
◀EXAMPLE▶ **Example 1**

When the DIP switch is set as shown in the diagram on the right, the Remote I/O Receiver Module is set as follows:



- Module in remote mode.
- MEMOBUS port is used as slave port.
- When MEMOBUS port is used as slave port, communications mode and parameters are set to the defaults.
- Baud rate of Remote I/O System is 4 Mbps.

Example 2



When the DIP switch is set as shown in the diagram on the right, the Remote I/O Receiver Module is set as follows:

- Module in remote mode.
- MEMOBUS port is used as combined master/slave port.
- When MEMOBUS port is used as master port, communications mode is in transparent mode.
- When MEMOBUS port is used as slave port, communications mode and parameters are set to the defaults.
- Baud rate of Remote I/O System is 4 Mbps.

6) Rotary Switches

a) The rotary switches are used to set the station address of the Remote I/O Receiver Module.

b) There are two rotary switches. The top rotary switch is rotary switch 1 and the bottom switch is rotary switch 2. Each switch has positions from 0 to 9.

c) The settings of the rotary switches are effective (read) when the reset switch is pressed, or when power is turned ON to the Power Supply Module of the Rack where the Remote I/O Receiver Module is mounted.

d) Station addresses are set between 1 and 15. The following table shows the settings.

Table 4.8 Setting the Station Address

Example Settings of Node Address 1	Node Address	Rotary Switch 1	Rotary Switch 2
STATION ADDRESS Rotary switch 1 ×10 Rotary switch 2 ×1	1 to 9	0	1 to 9
	10 to 15	1	0 to 5
	0 or 16 to 99	Not permitted.	

Note (1) Set the station address to between 1 and 15. If the address is set to 0 or, to 16 or above, normal communications will not be possible.

(2) Do not use the same address for more than one station within the same channel. If this occurs, remote stations with the same address will not be able to communicate normally.

7) Reset Switch

a) Press the reset switch in the following cases:

(1) When you have changed the setting of DIP switch pins 1, 5, or 6.

(2) When you have changed the setting of the rotary switches.

(3) When errors have occurred.

b) When the reset switch is pressed, communications between the Remote I/O Receiver Module and Remote I/O Driver Module are interrupted. Communications restart when the switch is released.

8) Related Manuals

Before operating your Remote I/O Receiver Module, read the following manual carefully and be sure that you fully understand the information on specifications, applications methods, safety precautions, etc.

MEMOCON GL120, GL130 Coaxial Remote I/O System User's Manual
(SIEZ-C825-70.8)

Using COMR Instructions

5

The COMR instructions are used as MEMOBUS master communication instructions via the Remote I/O Modules. This chapter describes how to use COMR instructions.

5.1 Mode Settings

This section describes how to set the mode for using the COMR instruction.

5.1.1 Setting Communications Modes

1) There are two communications modes: MEMOBUS Mode and Transparent Mode.

2) In Transparent Mode, transmission data prepared in a holding register is sent without processing and data received from a MEMOBUS port is stored in a holding register without processing.

3) MEMOBUS Mode is used when the GL120 serves as the MEMOBUS Master. This mode has two different settings, as described below.

a) Manual MEMOBUS Instruction Mode

In Manual MEMOBUS Instruction Mode, a BCC is added to the data in the holding register and then the combined data is sent as the MEMOBUS instruction.

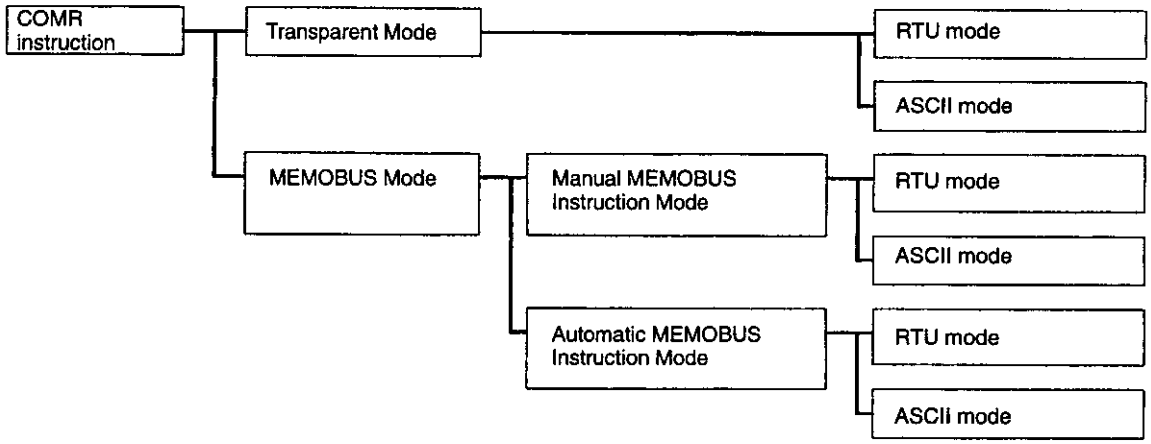
b) Automatic MEMOBUS Instruction Mode

In Automatic MEMOBUS Instruction Mode, the MEMOBUS instruction is automatically prepared according to the contents of a control block.

BCC

BCC stands for block check character. It is a character that is added to a block of data to check the block when data is processed or transmitted in blocks. This character is used to check whether or not the block of data is transmitted correctly. Both CRC (cycle redundancy check) and LRC (longitudinal redundancy check) are examples of BCC checking methods.

4) Both Transparent Mode and MEMOBUS Mode also contain two modes, RTU mode and ASCII mode. The relationship between these modes is shown in the following diagram.



5) Refer to *5.2 Transparent Mode* for details on Transparent Mode and to *5.3 MEMOBUS Mode* for details on MEMOBUS Mode.

5.2 Transparent Mode

This section describes using COMR instructions in Transparent Mode.

1) In Transparent Mode, transmission data prepared in a holding register is sent without processing and data received from a port is stored in a holding register without processing.

2) This provides maximum flexibility in communications through the use of the applications program. A BCC (block check character), such as those used in a CRC (cycle redundancy check) or a LRC (longitudinal redundancy check), is not automatically handled by the Remote I/O Receiver Module, and must be added through the applications program.

3) RTU and ASCII modes in the transparent mode are slightly different, as described next.

a) RTU Mode (8-bit Data)

(1) At transmission, the holding register data specified in the instruction is sent from the MEMOBUS port without processing.

(2) Upon reception, data received from the MEMOBUS port is input without processing to the holding register specified in the instruction.

(3) The end of a message is detected by a timer (24-bit timer).

b) ASCII Mode (7-bit Data)

(1) At transmission, the holding register data specified in the instruction is sent unprocessed from the port without code conversion. Since only 7 bits are used in ASCII mode, the MSB, however, is not sent.

(2) There are some restrictions in the format of messages received from remote devices. An end identifier (CR/LF) or an end detection timer (9,600/baud rate timer in seconds) is needed to end reception messages.

(3) If the first data received begins with a CR (carriage return), however, it is not regarded as the end identifier and is treated as ordinary data (0D). If a single LF (line feed) is received, then it is also treated as ordinary data (0A).

(4) All reception data, including the end identifier, is input into the holding registers specified in the instruction.

5.3 MEMOBUS Mode

This section describes using COMR instructions in MEMOBUS Mode.

5.3.1 MEMOBUS Mode

1) This mode is used when the GL120 or GL130 serves as the MEMOBUS Master.

2) In this mode, there are two settings as described below.

a) Manual MEMOBUS Instruction Mode

In Manual MEMOBUS Instruction Mode, a BCC is added to the data in the holding register and then the combined data is sent as the MEMOBUS instruction.

b) Automatic MEMOBUS Instruction Mode

In Automatic MEMOBUS Instruction Mode, the MEMOBUS instruction is automatically prepared according to the contents of a control block.

IMPORTANT Use different device addresses for the master and slave when performing communications with COMR instructions in MEMOBUS Mode. A communications error will result if the same device address is used.

5.3.2 Manual MEMOBUS Instruction Mode

1) In Manual MEMOBUS Instruction Mode, the parameters in the top element in the COMR instructions are used to add the BCC to the data set as the middle element, and then the combined data is sent as a MEMOBUS instruction. Upon reception, the BCC is checked and deleted by the Remote I/O Receiver Module, and the data without a BCC is stored in the holding register range specified by the bottom element in the COMR instruction.

2) The form of the data sent from the MEMOBUS port of the Remote I/O Receiver Module varies as described next depending on the communications mode parameter setting of RTU or ASCII mode.

a) RTU Mode

At transmission, a CRC is added to the holding register data specified in the instruction, and the data is sent from the MEMOBUS port. Upon reception, the CRC is removed, and the received data is input to the holding register specified in the instruction. The end of the reception message is detected by a timer (24-bit timer). The number of received data items does not include the BCC (in this case, the CRC).

b) ASCII Mode

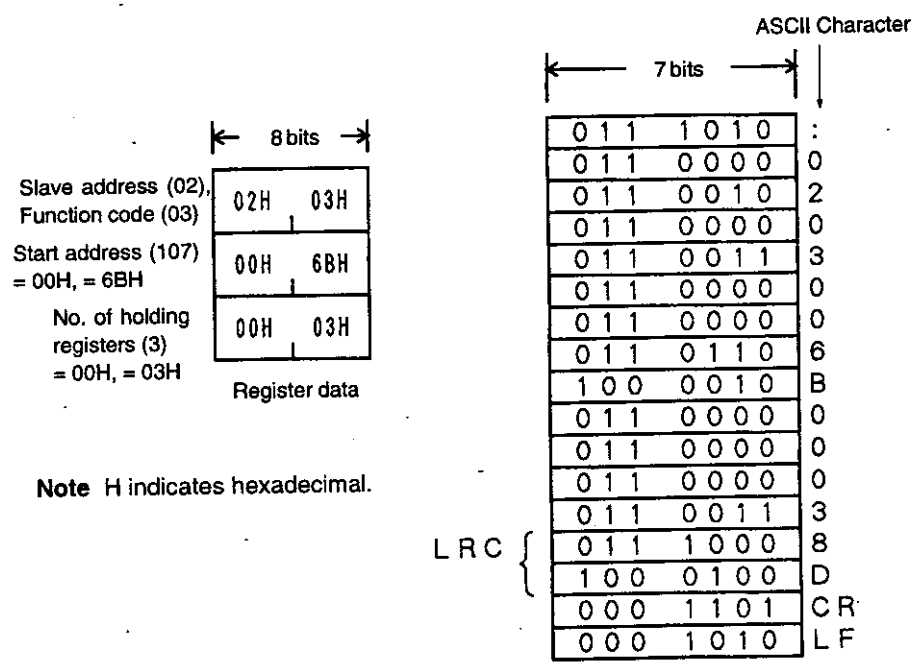
At transmission, the 8-bit holding register data specified in the instruction is converted to ASCII and sent from the MEMOBUS port. The transmission data is 7-bit data.

A start identifier ":", "LRC", and an end identifier "CR" or "LF" are automatically added by the Remote I/O Receiver Module at transmission.

Upon reception, the start and end identifiers as well as the LRC are automatically removed, and the remaining data is stored as reception data in the holding register specified in the instruction. Here, the Remote I/O Receiver Module converts data back from ASCII to 8-bit data.

The number of data items received does not include either the BCC (in this case, the LRC) or identifiers. The end of the received message is detected by a CR, an LF, or a 9,600/baud rate timer in seconds.

The following shows the relationship between register data and actual transmission/reception data in ASCII mode.



Note H indicates hexadecimal.

Register Data and Transmission Data Transmission data

5.3.3 Automatic MEMOBUS Instruction Mode

1) In Automatic MEMOBUS Instruction Mode, the content of the holding register set as the middle element in the COMR instruction and content of the holding register set as the bottom element are used to automatically generate and send a MEMOBUS instruction.

2) If the Automatic Preparation Flag (FFFFh) is turned ON in the second register of the top element in the COMR instruction, a MEMOBUS instruction is automatically prepared and sent from the specified MEMOBUS port. Only instructions with the function codes shown in *Table 3.1* can be used.

Table 5.1 Instructions Applicable in Automatic Instruction Mode

Function Code (Decimal)	Function
1	Coil state read-out
2	Input relay state read-out
3	Holding register content read-out
4	Input register content read-out
15	Multiple coil state change
16	Write to holding register
18	Specific link coil state read-out
19	Constant register content read-out
20	Expansion register content read-out
21	Link register content read-out
29	Multiple link relay state change
30	Write to multiple constant registers
31	Write to multiple link registers
32	Write to multiple expansion registers

3) The form of the data sent from the MEMOBUS port of Remote I/O Receiver Module varies depending on the communications mode parameter settings of the RTU and ASCII modes.

a) RTU Mode

(1) For writing instructions, a CRC is added to the content of the middle and bottom elements, which are used to automatically generate a MEMOBUS instruction, and the combined data is sent from the MEMOBUS port.

(2) For reading instructions, a CRC is added to the content of the middle element, which is then used to generate a MEMOBUS instruction, and the combined data is sent from the MEMOBUS port. When the response data is received, register and coil data only are stored in the bottom element. An error code will be stored in the middle element if an error response is received. The end of the reception message is detected by a timer (24-bit timer).

b) ASCII Mode

A MEMOBUS instruction is prepared in the same manner as in RTU mode, but then the instruction is converted to ASCII, ":", "LRC" and "CR" or "LF" are added as appropriate, and the instruction is sent from the MEMOBUS port.

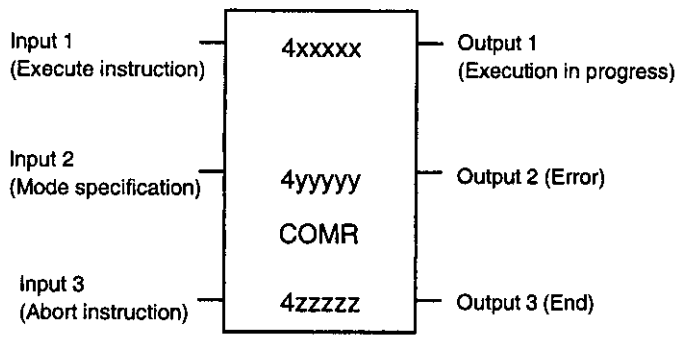
Reception data is converted back from ASCII to 8-bit data for reading instructions and the data is then stored in a holding register. An error code will be stored in the reception buffer if an error response is received. The end of the received message is detected by a CR, a LF or a 9,600/baud rate timer in seconds.

5.4 The COMR Instruction

This section describes the elements of the COMR instruction and how to use them.

5.4.1 Structure

1) The structure of the COMR instruction is shown in the following illustration.



2) The following conditions must be met to execute the instruction.

a) The specified MEMOBUS port must not be busy.

b) Input 1 must be ON.

c) Input 3 must be OFF.

3) The I/O of the COMR instruction are defined next.

a) Input 1: Execute Instruction

- The COMR instruction executes when input 1 is ON and input 3 is OFF. Output 1 goes ON when input 1 is received and execution begins.

- Normally, a differential contact must be used for input 1. The COMR instruction will execute again if input 1 is still ON at the end of execution.

b) Input 2: Mode Specification

- Input 2 specifies either the Transmission/Reception Mode or the Transmission Mode when the COMR instruction begins.

ON . . . Transmission Mode
OFF . . Transmission/Reception Mode

- Transmission Mode allows only transmissions, and responses from the remote device are not required. Transmission Mode is used when the remote device is a printer, or other device that does not need to return a response.

- In Transmission/Reception Mode, the MEMOBUS port waits for a response from the remote device after a transmission from the port.

- For more details of the reception mode, refer to *4) Reception Mode* of this section.

- A timeout error is generated if no response is returned from the remote device after the allocated timeout period. The MEMOBUS port will go on standby and the instruction will not end even if a response is not returned from the remote device when the unlimited timer is specified. In this case, timeout processing must be provided in the applications program.

c) Input 3: Abort Instruction

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

- Input 3 can be used to abort the instruction in Transmission/Reception Mode for time-outs or other abnormal conditions.

- Normally a differential contact must be used for this input. The COMR instruction will not be executed even if input 1 is ON as long as input 3 is ON.

d) Output 1: Execution in Progress

Output 1 goes ON when input 1 is received and the COMR instruction begins execution. It goes OFF when the operation ends or is aborted.

Output 1 goes OFF if an error occurs while the COMR instruction is being executed.

e) Output 2: Error

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

Error details are reflected in status error bits (see *Table 5.2*).

f) Output 3: End

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

All status error bits become 0 when output 3 goes ON.

4) Reception Mode

a) In the reception mode, data cannot be transmitted but can only be received from the remote device.

b) The reception mode is valid only in the transparent mode.

c) One of the following reception modes can be selected according to the setting of the COMR instruction.

(1) Reception mode to receive the data transmitted after the COMR instruction starts

(a) COMR instruction setting

- Input 2: OFF (transmission/reception mode)
- Number of transmission data: 0 (the contents of the 2nd holding register of the top element)

(b) Operation

- The data received before the start of the COMR instruction is not stored in the reception buffer.
- The data being received at the start of the COMR instruction is not stored in the reception buffer.
- The data first received after the start of the COMR instruction is stored in the reception buffer of the bottom element, and the COMR instruction ends.
- The diagram below shows examples of a MEMOBUS port receiving data from a remote device. When the COMR instruction starts its execution while the MEMOBUS port is receiving Data (3) from the remote device, Data (4) is stored in the reception buffer. Thus, Data (1), (2), and (3) are not stored in the reception buffer.

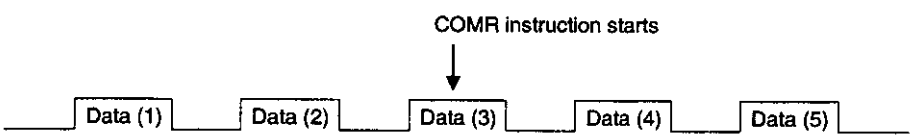


Figure 5.1 COMR Instruction Execution Start and Data Reception Timing

Note 1. In the reception mode of the COMR instruction, only the "reception mode to receive the data transmitted after the COMR instruction starts" can be used.
2. The "reception mode to receive the data transmitted before the COMR instruction starts" is not available for the COMR instruction.

5.4.2 Element Structure

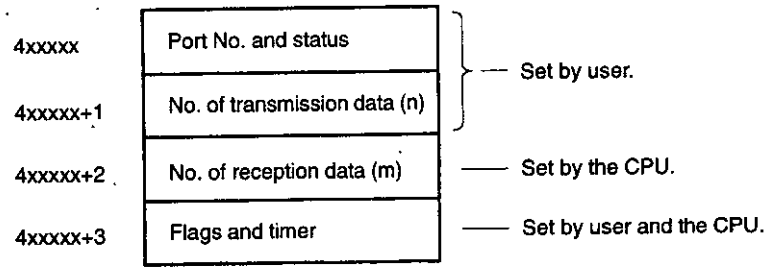
1) Transparent Mode and Manual MEMOBUS Instruction Mode

a) Top Element

(1) Structure

The top element uses four holding registers starting from 4xxxxx to store the data for controlling the COMR instruction. These holding registers cannot be used for any other purpose.

The number of the port used as well as the number of transmission data items are specified here. The top element is also used to indicate the number of reception data items as well as the operating conditions.



(2) Port Number and Status (4xxxxx)

The channel number of the Remote I/O Driver Module and the station address of the Remote I/O Receiver Module are specified in the rightmost 5 bits (0 to 4) of 4xxxxx. Communications with external remote devices are performed through the specified MEMOBUS port, and bits 5 to 15 indicate the status after communications.

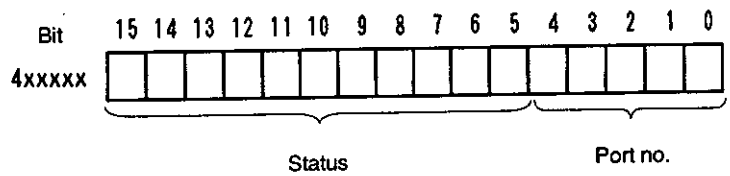


Table 5.2 Allocation of 4xxxxx Bits

<table>
<tr><th>Bit</th><th>Meaning when Bit Is ON</th></tr>
<tr><td>15</td><td>BCC (block check character for CRC and LRC) error
• Occurs only in MEMOBUS Mode.</td></tr>
<tr><td>14</td><td>Cannot transmit from the specified port.
• Possible hardware malfunction.</td></tr>
<tr><td>13</td><td>Timeout error
• Occurs if there is no response after the timer time specified in 4xxxxx + 3 has elapsed.</td></tr>
<tr><td>12</td><td>Reception buffer overrun
• The number of reception data items exceeds 512 bytes.</td></tr>
<tr><td>11</td><td>Incorrect transmission data
• The contents of 4xxxxx + 1 exceeds 512 bytes.</td></tr>
<tr><td>10</td><td>Remote device is not connected to the specified port.
• DSR (data set ready) is OFF on the specified port.</td></tr>
<tr><td>9</td><td>Incorrect port number
• A port number (station address) other than 1 to 15 has been specified.</td></tr>
<tr><td>8</td><td>A specified MEMOBUS port error
• The Remote I/O Receiver Module on the specified port is malfunctioning.</td></tr>
<tr><td>7</td><td>The received response address and function code are not correct for the transmission message.
• Occurs only in MEMOBUS Mode.</td></tr>
<tr><td>6</td><td>Error response received.
• An error response was received in MEMOBUS Mode.</td></tr>
<tr><td>5</td><td>Master communications disabled.
• Master communications have been disabled on the DIP switch on the Remote I/O Receiver Module on the specified MEMOBUS port.</td></tr>
<tr><td>4</td><td>Specifies the channel number of the Remote I/O Driver Module.
0: Channel No. 1
1: Channel No.2</td></tr>
<tr><td>3 to 0</td><td>The station address (Port No.) of the Remote I/O Receiver Module is specified in bits 0 to 3.
<table>
<tr><th rowspan="2">Station Address (Port No.)</th><th colspan="4">Bit No.</th></tr>
<tr><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>Not used</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td></td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>3
.
.
.
13</td><td>0
.
.
.
1</td><td>0
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.
.
1</td><td>1
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.
.
0</td><td>1
.
.
.
1</td></tr>
<tr><td>14</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>15</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table>
</td></tr>
</table>

Note Set the station address within the range 1 to 15. A remote station with a station address out of this range cannot perform normal communications.

INFO The status of bits 5 to 15 is updated each time the instruction is executed.

(3) Number of Transmission Data Items (4xxxxx + 1)

The number of data bytes (number of characters: n) transmitted is specified in 4xxxxx + 1.
The setting range for n is 1 to 512 (decimal) in Manual MEMOBUS Instruction Mode, and 0 to 512 (decimal) in Transparent Mode.

Executing the COMR instruction with the number of transmission data items set to 0 in Transparent Mode activates reception mode and data will be received from the specified MEMOBUS port.

Table 5.3 No. of Transmission Data Items

n	No. of Transmission Buffer Registers
Even	n/2 registers
Odd	(n + 1)/2 registers

An error will occur immediately and the instruction will not be executed if a value outside the specified range is set.

(4) Number of Reception Data Items (4xxxxx + 2)

The number of data bytes (number of characters: m) received is set in 4xxxxx + 2.

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 (decimal), and the number of reception data items is cleared to 0 when the instruction is executed.

Table 5.4 No. of Reception Data Items

m	No. of Reception Buffer Registers
Even	m/2 registers
Odd	(m + 1)/2 registers

(5) Flags and Timer (4xxxxx + 3)

The leftmost 2 bits (14 and 15) in the register indicate the status of instruction execution. Bits 0 to 11 are used to set the timeout value for the COMR instruction.

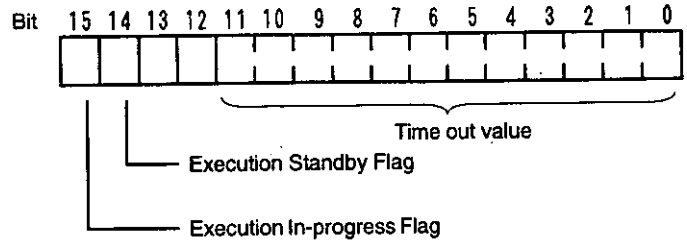


Table 5.5 Allocation of 4xxxxx + 3 Bits

Bit	Contents
15	• Execution In-progress Flag Bit 15 becomes 1 during execution. Even if input 1 is received, bit 15 will not become 1 until instruction execution is actually started. This bit is interlocked with output 1.
14	• Execution Standby Flag Bit 14 is set to 1 if the instruction has been executed, but the execution has not yet started. It thus indicates standby status when more than one COMR instruction is executed.
13, 12	No allocation. Always set to 0.
11 to 0	• Time out value Bits 0 through 11 are used to set the timeout period starting with instruction transmission from the communications port when the COMR instruction is executed, and ending with a response returned to the port. The setting range is 1 to 4,095 (in 100-ms increments). A setting of 0 specifies an unlimited time. If a response is not returned within the set timeout period, instruction execution will time out, and the COMR instruction will be ended.

Note Bit 14 and bit 15 will never be set to 1 at the same time.

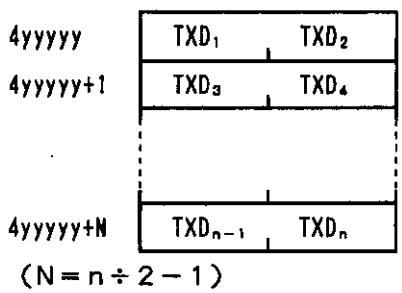
b) Middle Element

The middle element uses the specified number (N; see figures below) of holding registers starting from 4yyyyy as the transmission buffer.

4yyyyy indicates the first reference of the register block used to store the transmission data. The size of the transmission buffer depends on the number, n, of transmission data items. Transmission data must be set prior to executing the instruction.

Data is sent in ascending order (lowest number first) as indicated by the TXD (transmission data) subscripts shown in the following figures.

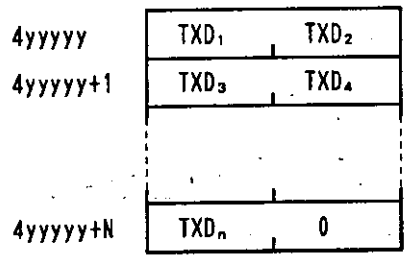
(1) n = Even Number



(N = n ÷ 2 − 1)

(2) n = Odd Number

Zero is entered for the leftover character.



(N = (n − 1) ÷ 2)

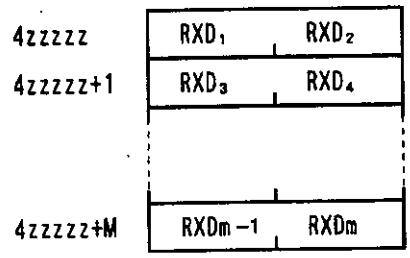
c) Bottom Element

The bottom element uses the specified number (M; see figures below) of holding registers starting from 4zzzzz as the reception buffer.

4zzzzz indicates the first 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. Do not use the register area for any other application. This area is not cleared when the instruction is executed.

Data is received in ascending order (lowest number first) as indicated by the RXD (reception data) subscripts shown in the following figures.

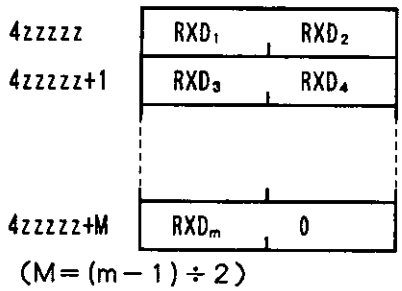
(1) m = Even Number



(M = m ÷ 2 − 1)

(2) m = Odd Number

Zero will be entered for the leftover character.



(M = (m − 1) ÷ 2)

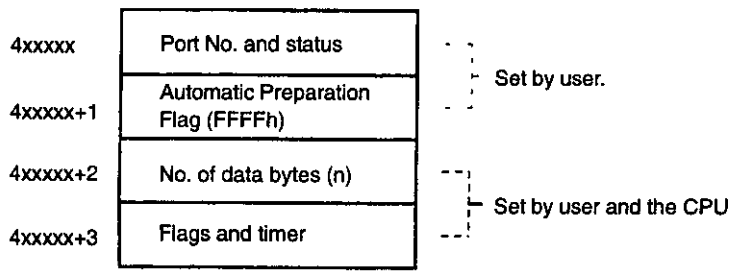
2) Automatic MEMOBUS Instruction Mode

a) Top Element

(1) Structure

The top element uses four holding registers starting from 4xxxxx to store the data for controlling the COMR instruction. These holding registers cannot be used for any other purpose.

The Automatic Preparation Flag (FFFFh) at 4xxxxx + 1 is turned ON to set the COMR instruction to Automatic MEMOBUS Instruction Mode. The MEMOBUS instruction is automatically prepared according to the contents of the middle and bottom elements, and is then sent from the MEMOBUS port specified by 4xxxxx.



(2) Port Number and Status (4xxxxx)

The channel number of the Remote I/O Driver Module and the station address (port No.) of the Remote I/O Receiver Module are specified in the rightmost 5 bits (0 to 4) of 4xxxxx. Communications with external remote devices are performed through the specified MEMOBUS port, and the status after communications is indicated in bits 5 to 15.

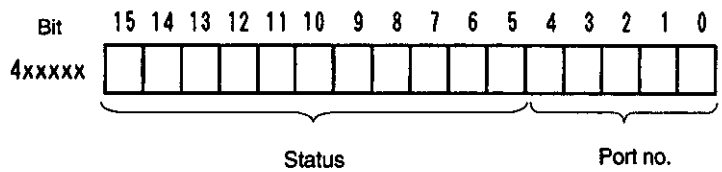


Table 5.6 Allocation of 4xxxxx Bits

<table>
<tr><th>Bit</th><th>Meaning when Bit Is ON</th></tr>
<tr><td>15</td><td>BCC (block check character for CRC and LRC) error
• Occurs only in MEMOBUS Mode.</td></tr>
<tr><td>14</td><td>Cannot transmit from the specified port.
• Possible hardware malfunction.</td></tr>
<tr><td>13</td><td>Timeout error
• Occurs if there is no response after the timer time specified in 4xxxxx + 3 has elapsed.</td></tr>
<tr><td>12</td><td>Reception buffer overrun
• The number of reception data items exceeds 512 bytes.</td></tr>
<tr><td>11</td><td>Incorrect transmission data
• The contents of 4xxxxx + 1 exceeds 512 bytes.</td></tr>
<tr><td>10</td><td>Remote device is not connected to the specified port.
• DSR (data set ready) is OFF on the specified port.</td></tr>
<tr><td>9</td><td>Incorrect port number
• A port number (station address) other than to 15 has been specified.</td></tr>
<tr><td>8</td><td>A specified MEMOBUS port error
• The Remote I/O Receiver Module on the specified port is malfunctioning.</td></tr>
<tr><td>7</td><td>The received response address and function code are not correct for the transmission message.
• Occurs only in MEMOBUS Mode.</td></tr>
<tr><td>6</td><td>Error response received.
• An error response was received in MEMOBUS Mode.</td></tr>
<tr><td>5</td><td>Master communication disabled.
• Master communication has been disabled on the DIP switch on the Remote I/O Receiver Module on the specified MEMOBUS port.</td></tr>
<tr><td>4</td><td>Specifies the channel number of the Remote I/O Driver Module.
0: Channel No. 1
1: Channel No.2</td></tr>
<tr><td>3 to 0</td><td>The station address (Port No.) of the Remote I/O Receiver Module is specified in bits 0 to 3.
<table>
<tr><th rowspan="2">Station Address
(Port No.)</th><th colspan="4">Bit No.</th></tr>
<tr><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>Not used</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td></td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>3
.
.
.
13</td><td>0
.
.
.
1</td><td>0
.
.
.
1</td><td>1
.
.
.
0</td><td>1
.
.
.
1</td></tr>
<tr><td>4</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>5</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table></td></tr>
</table>

Note Set the station address within the range between 1 to 15. The remote station with the station address out of the range can not perform normal communications.

INFO The status of bits 5 to 15 is updated each time the instruction is executed.

(3) Automatic Preparation Flag (4xxxxx + 1)

Automatic MEMOBUS Instruction Mode is set when FFFFh is specified in 4xxxxx + 1.

(4) Number of Data Bytes (4xxxxx + 2)

In Automatic MEMOBUS Instruction Mode, this indicates the number of bytes for transmission or reception data in the data buffer (bottom element).

In a write instruction for the MEMOBUS instruction, the number of bytes for transmission data set in the data buffer is specified. The number of bytes is set to 0 when a normal end occurs after the instruction executes.

In a read instruction for the MEMOBUS instruction, the number of bytes is set to 0 because the number of transmission data items set in the data buffer is 0. When a normal end occurs after the instruction executes, data received in the data buffer is set, and the number of bytes of reception data is set in this register.

(5) Flags and Timer (4xxxxx + 3)

Bits 14 and 15 in this register indicate the execution status of the instruction. The COMR instruction timeout value is input into bits 0 to 11.

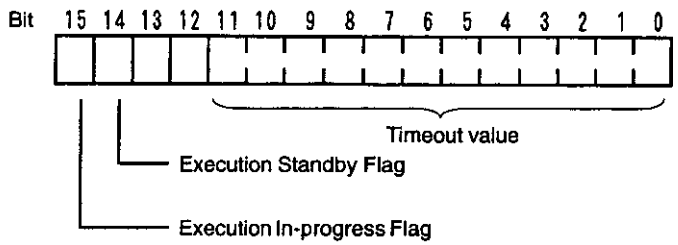


Table 5.7 Allocation of 4xxxxx + 3 Bits

Bit	Contents
15	• Execution In-progress Flag Bit 15 becomes 1 during execution. Even if input 1 is received, bit 15 will not become 1 until instruction execution is actually started. This bit is interlocked with output 1.
14	• Execution Standby Flag Bit 14 is set to 1 if the instruction has been executed, but the execution has not yet started. It thus indicates standby status when more than one COMR instruction is executed.
13, 12	No allocation. Always set to 0.
11 to 0	• Time out value Bits 0 through 11 are used to set the timeout period starting with instruction transmission from the communications port when the COMR instruction is executed, and ending with a response returned to the port. The setting range is 1 to 4,095 (in 100-ms increments). A setting of 0 specifies an unlimited time. If a response is not returned within the set timeout period, instruction execution will time out, and the COMR instruction will be ended.

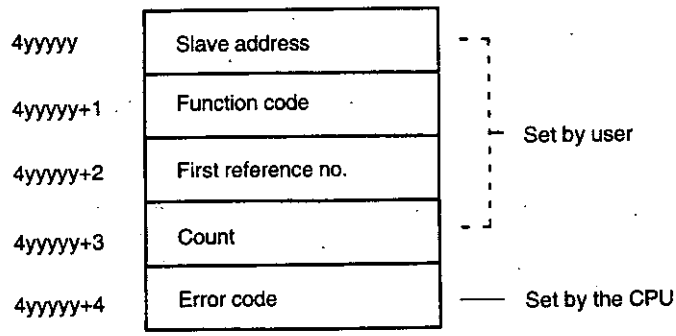
Note Bit 14 and 15 will never be set to 1 at the same time.

b) Middle Element

(1) Structure

When Automatic MEMOBUS Instruction Mode is set by the top element, the middle element serves as the header buffer used to prepare the MEMOBUS instruction as shown in the figure below.

The header buffer uses 5 holding registers starting from 4yyyyy. Transmission data must be set prior to executing the instruction.



(2) Slave Address (4yyyyy)

Set the device address of the slave device between 0 and 247.

(3) Function Code (4yyyyy + 1)

Set the function code of the MEMOBUS instruction. Refer to *Table 3.1* for details.

(4) First Reference Number (4yyyyy + 2)

Set the address of the first reference to be read or written. For example, to read reference 400001 using function code 3 (HOLDING REGISTER READ), set 0.

First reference number = 4yyyyy – 400001

(5) Count (4yyyyy + 3)

Set the number of registers, output coils, or input relays to be read or written.

(6) Error Code (4yyyyy + 4)

The CPU Module will set the MEMOBUS error code if an error response is returned. Error codes are shown in *Table 5.8.*

Table 5.8 Error Codes

Error Code	Meaning
01H	Illegal function code (does not exist)
02H	Illegal output coil, input relay, or register (not within range)
03H	Illegal number of output coils, input relays, or registers (not within range)

c) Bottom Element

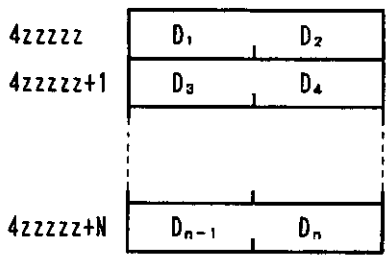
The bottom element uses the specified number (N) of holding registers starting from 4zzzzz as the data buffer.
4zzzzz indicates the first reference of the register block used to store transmission and reception data. The size of the buffer depends on the number, n, of data bytes.

Consider the maximum number of reception data items ahead of time, and be sure to maintain the buffer. Do not use the register area for any other application.

Write data (transmission data) is set in the data buffer for a write instruction, and read data (reception data) is set in the buffer for a read instruction.

Data is sent and received in ascending order (lowest number first) as indicated by the D subscripts shown in the following figures.

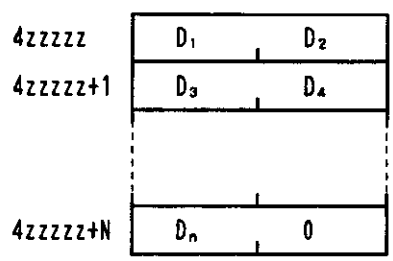
(1) n = Even Number



(N = n ÷ 2 − 1)

(2) n = Odd Number

Zero is entered for the last character. Zero will also be set in this character when receiving.



(N = (n − 1) ÷ 2)

5.5 Application Precautions

Observe the following precautions when performing communications through COMR instructions

1) The Remote I/O Receiver Module will remain on standby waiting for a response if no response is returned from the remote device when an unlimited timer is specified in Transmission/Reception Mode. If this happens, input 3 can be turned ON to cancel the COMR instructions and release the standby status.

2) Execution of the COMR instruction will be aborted if one of the following occurs after the instruction execution has been started and before execution has been completed.

   - Transmission data is changed.
   - The contents of the control block registers is changed.
   - SKIP is executed for a network with active COMR instructions.
   - Active COMR instructions are changed from MEMOSOFT software.

3) Instruction execution normally starts when input 1 goes from OFF to ON. If a COMR instruction is already being executed for the same port, subsequent COMR instructions will be placed on standby, and they will be executed after execution of the previous COMR instruction has been finished.

4) Use differential signals to control inputs, such as those used to execute instructions.

5) Data required in a COMR instruction must be set in registers as follows:

   a) The data must be set in the registers before the COMR instruction is executed.

   b) If arithmetic or other instructions are used to set the data, differential signals must be used to control execution of these instructions.

   Problems such as those described in precaution 2), above, may occur if non-differentiated signals are used.

6) When data is broadcast to Slaves by MEMOBUS broadcasting, communications will take place in Transmission Mode. Do not simultaneously execute more than one COMR instruction for the same slave port when broadcasting. If more than one COMR is executed for the same Slave, the Slave will not be able to receive data properly because the interval between MEMOBUS instructions will be too short.

Peripheral Devices of MEMOBUS System

6

This Chapter describes the peripheral devices of the MEMOBUS System.

6.1 J2078 Modem

1) Description

Figure 6.1 shows the external appearance of the J2078 Modem.

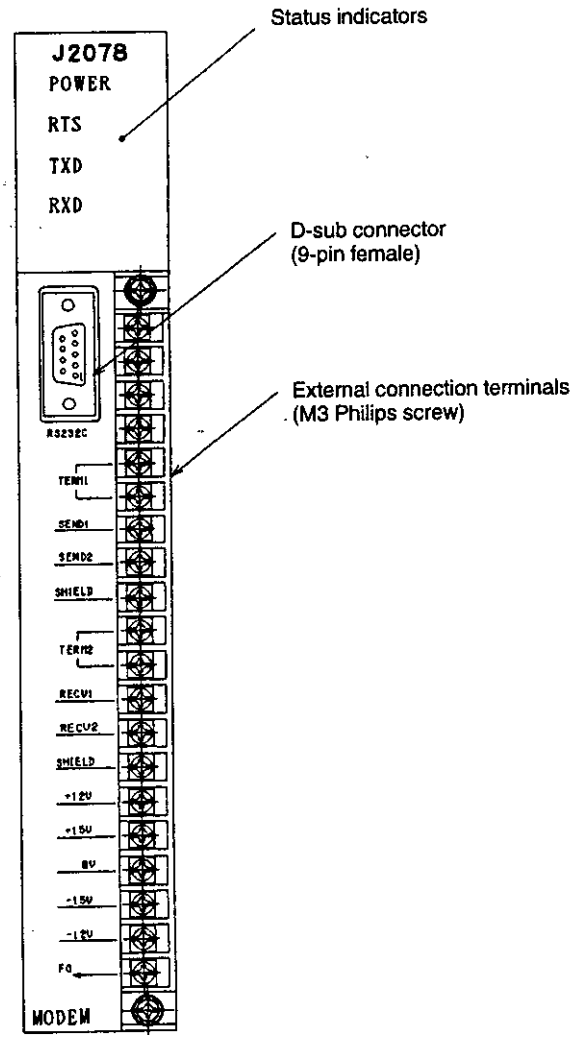


Figure 6.1 External Appearance of the J2078

2) Indicators

The front panel of the J2078 has four indicators, POWER, RTS, TXD and RXD. The meaning of each indicator is explained in *Table 6.1*.

Table 6.1 J2078 Indicators

Indicator	Meaning
POWER	External power supply in normal status: Lit when the external power supply (±15 V or ±12 V) is supplied normally.
RTS	Request to Send: Lit when the RTS signal from a master or slave is a logic 1.
TXD	Sending: Indicates that data is being sent from the send output terminal. Lights with a logic 1.
RXD	Receiving: Indicates that data is being received from the receive input terminal. Lights with a logic 1.

The J2078 comprises a modulator that converts the RS-232C digital signal into 50 and 80 kHz analog signals and a demodulator that performs the reverse process. A block diagram of the J2078 is shown in *Figure 6.2*.

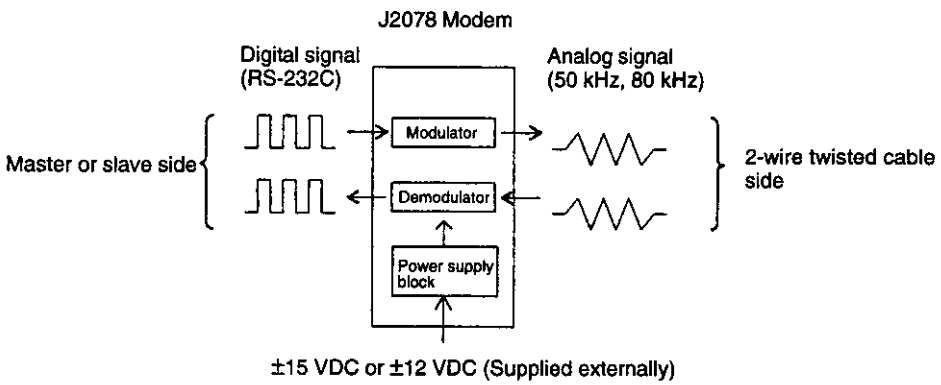


Figure 6.2 Block Diagram of the J2078

With the digital signal, logic 1 (–12 V) is a mark, and logic 0 (+12 V) is a space. With the analog signal, 1 corresponds to 50 kHz, while 0 corresponds to 80 kHz.

3) Mounting Method

a) On the 2000-series I/O Mounting Base

The J2078 can be mounted in the slot on the 2000-series I/O Mounting Base for Yaskawa PLCs. It occupies a single slot. *Figure 6.3* shows the basic points of mounting the J2078 to the Mounting Base.
Remove the connector cover attached to the J2078, align the guide posts on the J2078 to the guide holes on the Mounting Base, and then push the J2078 straight in. Secure the unit to the Mounting Base with the mounting screws (M4) on the J2078.

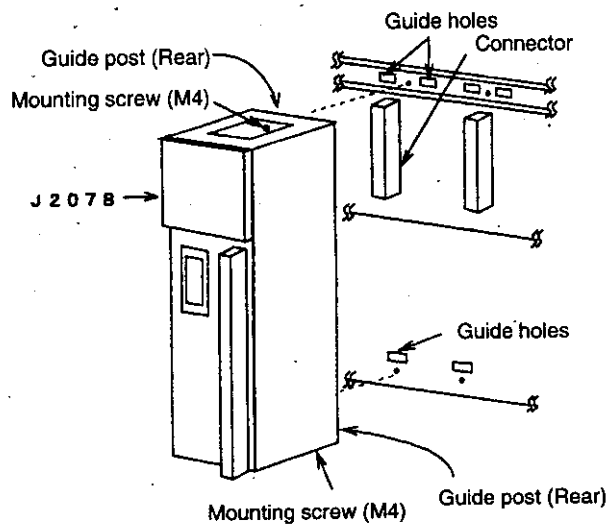


Figure 6.3 Mounting the J2078 to the Mounting Base

b) On a Mounting Bracket

With an optional Mounting Bracket, the J2078 can be mounted to a control panel. The J2078 must be mounted vertically in this configuration as shown in *Figure 6.4*.

Contact your nearest Yaskawa representative directly for more information about this Mounting Bracket (model: DF8305869).

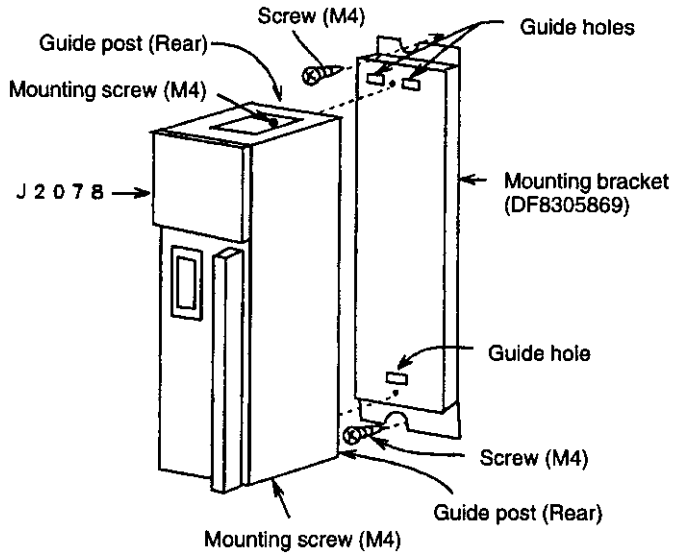


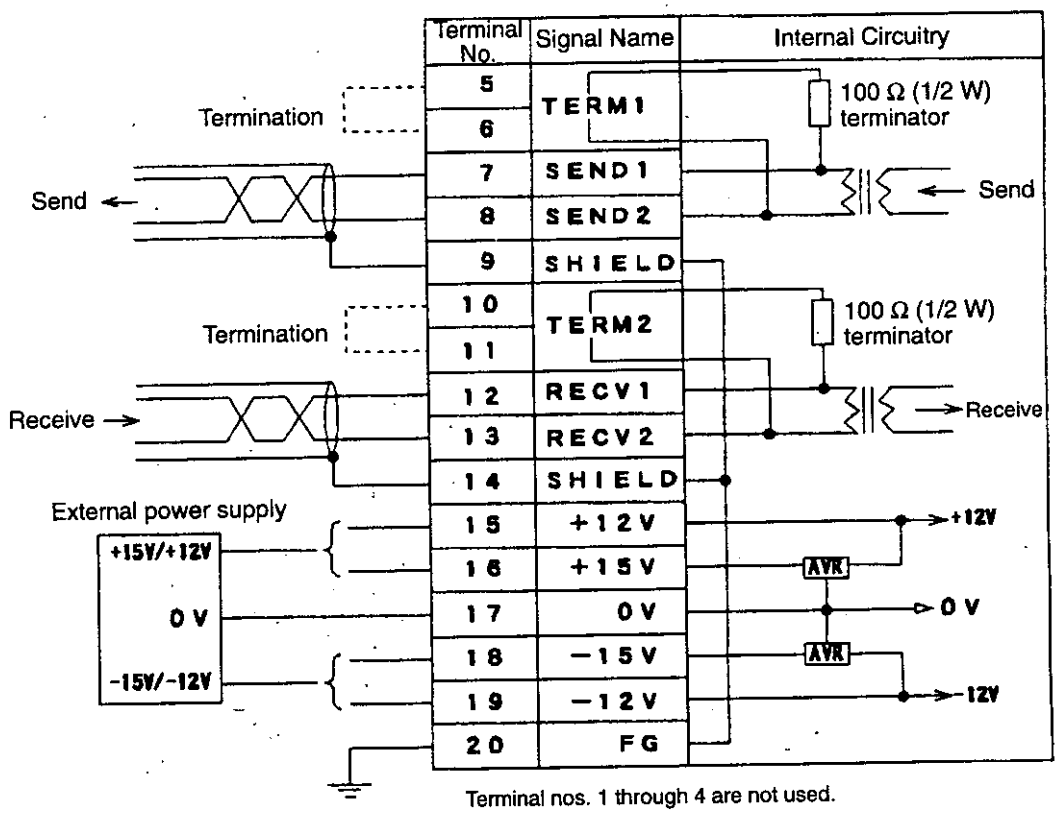
Figure 6.4 Mounting the J2078 with a Mounting Bracket

4) **Connecting Procedure**

a) A 9-pin female D-sub connector and a 20-pin connector board (terminal board) are located on the front of the J2078 for external signal connections.

b) The D-sub connector is used for the RS-232C cable connecting the master to slaves. When connecting the RS-232C cable, make sure that the cable is securely attached with the M3 screw on the cable side of the D-sub connector (9-pin, male).

c) Connect 2-core twisted cable and external power supplies to the terminal board. *Figure 6.5* shows the connecting diagram for the terminal board. The diagram also shows the J2078 internal connections on the terminal board.



Terminal nos. 1 through 4 are not used.

Figure 6.5 Terminal Board Connections

d) On the terminal board, terminals number 7 and 8 are transmission output terminals, while terminals number 12 and 13 are receive input terminals. Connect 2-core twisted cable to these terminals. Since the 2-core twisted cable is not polarized, there is no need to worry about polarity.

e) Terminals number 5 and 6 as well as 10 and 11 are used to connect the 2-core twisted cable terminators. Terminators are required for the J2078 Modems at each end of a single run of the MEMOBUS system in order to terminate the 2-core twisted cables. Here, use jumper wires to connect terminals number 5 and 6 as well as terminals number 10 and 11 on the J2078 terminal boards located at both ends. This will connect the terminator (100 Ω, 1/2 W) built into the J2078 to the 2-core twisted cable.

f) Do not connect anything between terminals number 5 and 6 or terminals number 10 and 11 on J2078 terminal boards anywhere between the two ends.

g) Terminals number 9 and 14 are for grounding the shielded covering of the 2-core twisted cable.
The shielded covering of the 2-core twisted cable must be grounded in order to block external noise interference.
Therefore, connect terminal No. 9 or 14 to the shielded covering on one end of the 2-core twisted cable. Also connect terminal No. 20 to a ground with a resistance no greater than 100 Ω. Terminals number 9, 14 and 20 are connected internally, so any one of these can be used to ground one end of the shielded covering.

h) Terminals number 15 to 19 are used to connect external power supplies. The J2078 requires a ±15 VDC or a ±12 VDC external power supply. With a ±15 VDC power supply, connect the plus side to terminal No. 16, and the minus side to terminal No. 18. With a ±12 VDC power supply, connect the plus side to terminal No. 15, and the minus side to terminal No. 19. In either case, connect 0 V to terminal No. 17.

i) Power supply requirements are given below:
+15 V, +12 V: 200 mA
−15 V, −12 V: 100 mA

j) Use an M3 screw to secure the crimp terminal to the terminal board for all wiring as shown in *Figure 6.6*. Where two, 2-core twisted cables are connected to J2078 Modems, (i.e., other than at the ones at the ends) overlap the crimp terminals for the two pairs and secure the overlapped terminals with the screw.

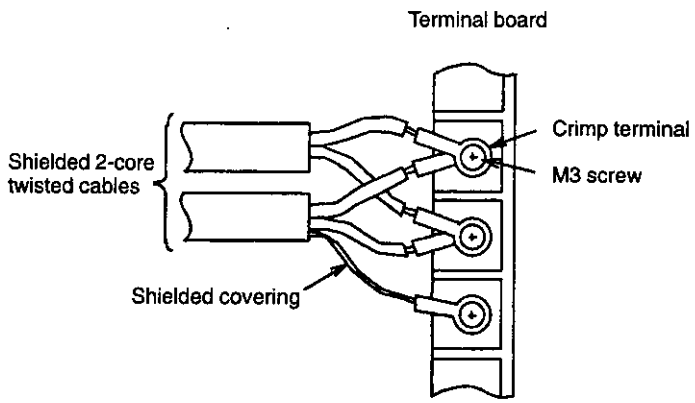


Figure 6.6 Wiring to the Terminal Board

6.2 MEMOBUS Cables

This section describes Yaskawa's MEMOBUS cables used for the MEMOBUS system.

The MEMOBUS cables are used for connecting a MEMOBUS Module or a Remote I/O Receiver Module to a MEMOBUS master device or MEMOBUS slave devices.
The following MEMOBUS cables are available as standard cables.

1) Application

The MEMOBUS cables are used for connecting the following Modules to a MEMOBUS master device or MEMOBUS slave devices:

- MEMOBUS Module (RS232) : JAMSC-120NOM26100
- MEMOBUS Module (RS422) : JAMSC-120NOM27100
- Remote I/O Receiver Module : JAMSC-120CRR13100

2) MEMOBUS cable specifications are shown in *Table 6.2*.

Table 6.2 MEMOBUS Cables

Name	Model Name	Model Number	Summary	Cable Length
W0200 Cable	W0200-03	JZMSZ-120W0200-03	1) Used to connect NEC PC-9801 personal computer to the MEMOBUS port on a CPU Module or MEMOBUS Module (RS-232). 2) Cables provide D-sub connector (25-pin, male) on personal computer end.	2.5 m
	W0200-15	JZMSZ-120W0200-15		15.0 m
W0201 Cable	W0201-03	JZMSZ-120W0201-03	1) Used to connect NEC PC-9801 personal computer to the MEMOBUS port on a CPU Module or MEMOBUS Module (RS-232). 2) Cables provide half-pitch connector (MDR 14-pin, plug-in, straight) on personal computer end.	2.5 m
	W0201-15	JZMSZ-120W0201-15		15.0 m
W0202 Cable	W0202-03	JZMSZ-120W0202-03	1) Used to connect DOS personal computer to the MEMOBUS port on a CPU Module or MEMOBUS Module (RS-232). 2) Cables provide D-sub connector (9-pin, female) on personal computer end.	2.5 m
	W0202-15	JZMSZ-120W0202-15		15.0 m
W0203 Cable	W0203-03	JZMSZ-120W0203-03	1) Used to connect Programming Panel (P120) to the MEMOBUS port on a CPU Module or MEMOBUS Module (RS-232).	2.5 m

Name	Model Name	Model Number	Summary	Cable Length
	W0203-15	JZMSZ-120W0203-15	2) Cables provide D-sub connector (9-pin, female) on P120 end.	15.0 m
W0204 Cable	W0204-05	JZMSZ-120W0204-05	1) Used to connect the RS-232C or RS-422 port on an FA Monitor (ACGC4200) to the MEMOBUS port on a CPU Module or MEMOBUS Module (RS-232).	5.0 m
	W0204-10	JZMSZ-120W0204-10		10.0 m
	W0204-15	JZMSZ-120W0204-15	2) Cables provide D-sub connector (25-pin, female) on ACGC4200 end.	15.0 m
W0205 Cable	W0205-01	JZMSZ-120W0205-01	1) Used to connect 2000 Series Modem (J2078) to the MEMOBUS port on a CPU Module or MEMOBUS Module (RS-232).	1.0 m
	W0205-03	JZMSZ-120W0205-03		3.0 m
	W0205-05	JZMSZ-120W0205-05	2) Cables provide D-sub connector (9-pin, male) on 2000 Series Modem (J2078) end.	5.0 m
W0206 Cable	W0206-01	JZMSZ-120W0206-01	1) Used to connect a standard modem* to the MEMOBUS port on a CPU Module or MEMOBUS Module (RS-232).	1.0 m
	W0206-03	JZMSZ-120W0206-03	* The PV-AF3361WW modem made by AIWA is recommended for MEMOMAIL.	3.0 m
	W0206-05	JZMSZ-120W0206-05	2) Cables provide D-sub connector (25-pin, male) on modem end.	5.0 m
W0207 Cable	W0207-03	JZMSZ-120W0207-03	1) Used to connect the RS-232C port (PP port) on an ACGC4200 FA Monitor or the MEMOBUS port on a MEMOCON-SC Series Module to the MEMOBUS port on a CPU Module or MEMOBUS Module (RS-232).	2.5 m
	W0207-15	JZMSZ-120W0207-15	2) Cables provide D-sub connector (9-pin, male) on ACGC4200 or MEMOCON-SC end.	15.0 m
W0208 Cable	W0208-03	JZMSZ-120W0208-03	1) Used to connect the MEMOBUS port on a CPU Module to the MEMOBUS port on a MEMOBUS Module (RS-232).	2.5 m
	W0208-15	JZMSZ-120W0208-15	2) Cables provide D-sub connectors (9-pin, male) at both ends.	15.0 m
W0220 Cable	W0220-05	JZMSZ-120W0220-05	1) Used to connect the RS-232C or RS-422 port on an FA Monitor (ACGC4200) to the MEMOBUS port on a MEMOCON-SC Series Module.	5.0 m
	W0220-10	JZMSZ-120W0220-10		10.0 m
	W0220-15	JZMSZ-120W0220-15	2) Cables provide D-sub connector (25-pin, female) on ACGC4200 end and D-sub connector (9-pin, male) on MEMOCON-SC end.	15.0 m
W0221 Cable	W0221-01	JZMSZ-120W0221-01	1) Used to connect 2000 Series Modem (J2078) to the RS-232C or RS-422 port on an FA Monitor (ACGC4200).	1.0 m
	W0221-03	JZMSZ-120W0221-03		3.0 m
	W0221-05	JZMSZ-120W0221-05	2) Cables provide D-sub connector (25-pin, female) on ACGC4200 end and D-sub connector (9-pin, male) on 2000 Series Modem (J2078) end.	5.0 m
W0222 Cable	W0222-05	JZMSZ-120W0222-05	1) Used to connect the RS-232C port (PP port) on an FA Monitor (ACGC4200) to the MEMOBUS port on a MEMOCON-SC Series Module.	5.0 m
	W0222-10	JZMSZ-120W0222-10		10.0 m
			2) Cables provide D-sub connector (9-pin, male) on	

Name	Model Name	Model Number	Summary	Cable Length
	W0222-15	JZMSZ-120W0222-15	2) Cables provide D-sub connector (9-pin, male) on ACGC4200 end and D-sub connector (9-pin, female) on MEMOCON-SC end.	15.0 m
W0240 Cable	W0240-01	JZMSZ-120W0240-01	1) Used to connect 2000 Series Modem (J2078) to the RS-232C port on NEC PC-9801 personal computer. 2) Cables provide D-sub connector (25-pin, male) on personal computer end.	1.0 m
	W0240-03	JZMSZ-120W0240-03		3.0 m
	W0240-05	JZMSZ-120W0240-05		5.0 m
W0241 Cable	W0241-01	JZMSZ-120W0241-01	1) Used to connect 2000 Series Modem (J2078) to the RS-232C port on a DOS personal computer. 2) Cables provide D-sub connector (9-pin, female) on personal computer end.	1.0 m
	W0241-03	JZMSZ-120W0241-03		3.0 m
	W0241-05	JZMSZ-120W0241-05		5.0 m
W0260 Cable	W0260-03	JZMSZ-120W0260-03	1) Used to connect the RS-232C port (PP port) on an FA Monitor (ACGC4200) or the MEMOBUS port on a MEMOCON-SC Series Module to the RS-232C port on a DOS personal computer. 2) Cables provide D-sub connector (9-pin, male) on ACGC4200 or MEMOCON-SC end and D-sub connector (9-pin, female) on personal computer end.	2.5 m
	W0260-15	JZMSZ-120W0260-15		15.0 m

Appendix A

ASCII Codes

ASCII Code

ASCII code	Decimal	Hexadecimal
Bell	07	07
Linefeed	10	0A
Formfeed	12	0C
Carriage return	13	0D
→	26	1A
←	27	1B
Space	32	20
!	33	21
//	34	22
#	35	23
$	36	24
%	37	25
£	38	26
'	39	27
(	40	28
)	41	29
*	42	2A
+	43	2B
,	44	2C
–	45	2D
.	46	2E
/	47	2F
0	48	30
1	49	31
2	50	32
3	51	33
4	52	34
5	53	35
6	54	36
7	55	37
8	56	38
9	57	39
:	58	3A
;	59	3B
<	60	3C
=	61	3D
>	62	3E
?	63	3F

ASCII code	Decimal	Hexadecimal
@	64	40
A	65	41
B	66	42
C	67	43
D	68	44
E	69	45
F	70	46
G	71	47
H	72	48
I	73	49
J	74	4A
K	75	4B
L	76	4C
M	77	4D
N	78	4E
O	79	4F
P	80	50
Q	81	51
R	82	52
S	83	53
T	84	54
U	85	55
V	86	56
W	87	57
X	88	58
Y	89	59
Z	90	5A
[	91	5B
]	93	5D
^	94	5E
_	95	5F
a	97	61
b	98	62
c	99	63
d	100	64
e	101	65
f	102	66
g	103	67

ASCII code	Decimal	Hexadecimal
h	104	68
i	105	69
j	106	6A
k	107	6B
l	108	6C
m	109	6D
n	110	6E
o	111	6F
p	112	70
q	113	71
r	114	72
s	115	73
t	116	74
u	117	75
v	118	76
w	119	77
x	120	78
y	121	79
z	122	7A
{	123	7B
|	124	7C
}	125	7D
ü	129	81
ä	132	84
ö	148	94
Ç	155	9B
£	156	9C
ñ	164	A4
■	219	DB
α	224	E0
β	225	E1
Σ	228	E4
σ	229	E5
μ	230	E6
Ω	234	EA
∞	236	EC
ε	238	EE
÷	246	F6

Appendix B

Dimensions

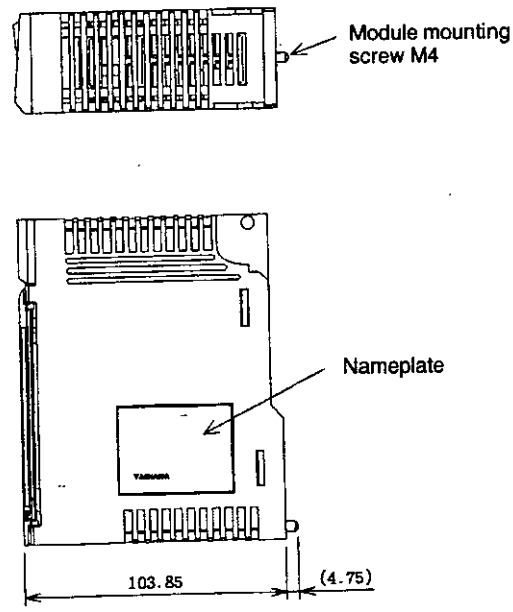
This appendix provides the external dimensions of the MEMOBUS Modules and Remote I/O Modules.

B.1 MEMOBUS Modules

1) MEMOBUS Module (RS-232) Model No. JAMSC-120NOM26100

2) MEMOBUS Module (RS-422) Model No. JAMSC-120NOM27100

Unit: mm
Approx. mass: 300 g

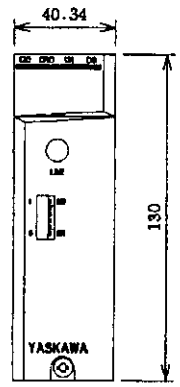


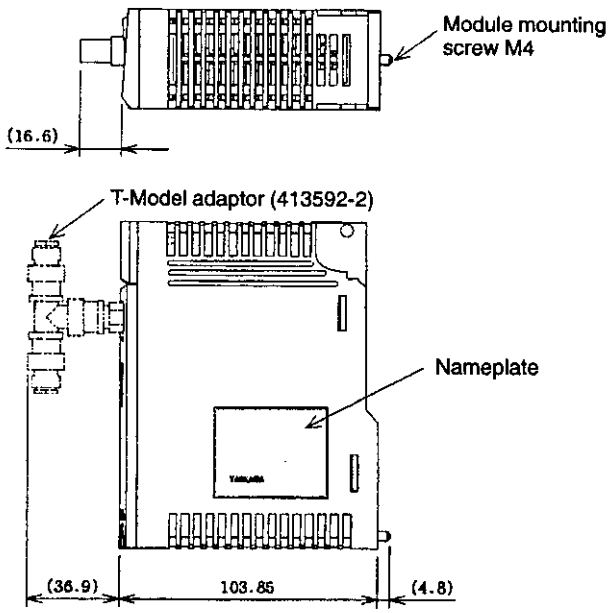
B.2 Remote I/O Modules

1) Remote I/O Driver Module

Model No. JAMSC-120CRD13100

Unit: mm
Approx. mass: 300 g

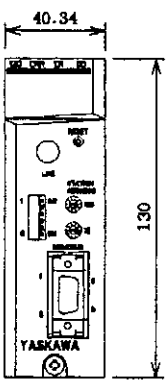


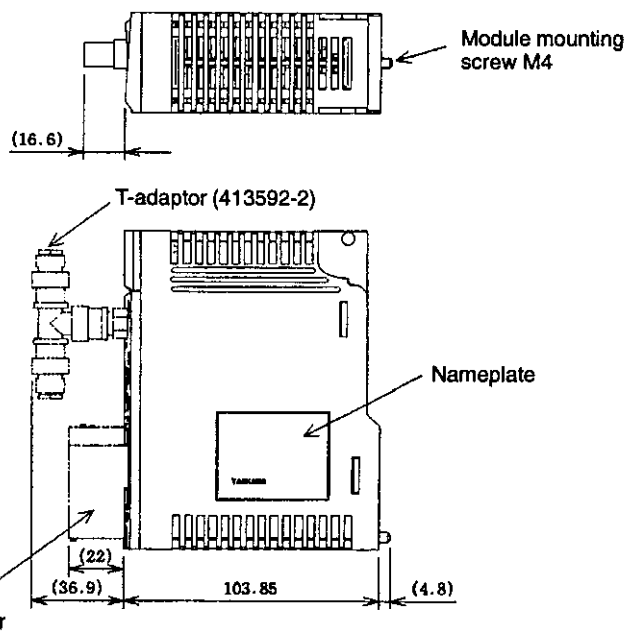


2) Remote I/O Receiver Module

Model No. JAMSC-120CRR13100

Unit: mm
Approx. mass: 300 g





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