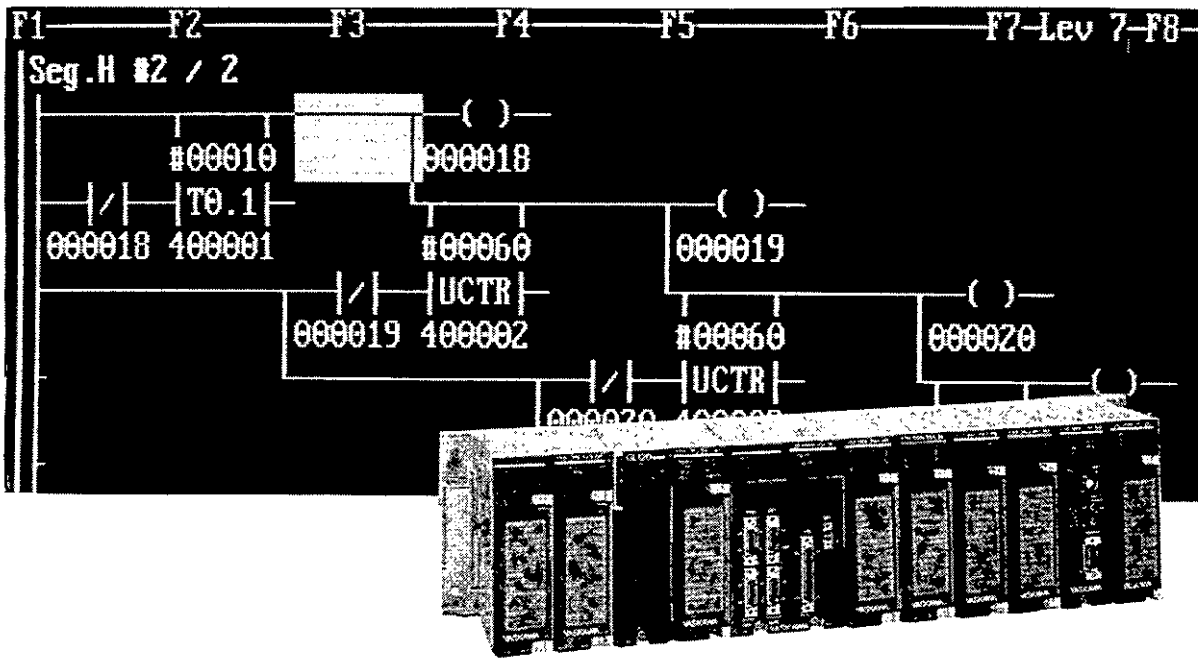
MEMOCON GL120, GL130

# MEMOBUS PLUS

# USER'S MANUAL




YASKAWA

MANUAL NO. SIEZ-C825-70.5

# Manual Contents

This manual describes specifications and applications of MEMOBUS PLUS as applicable to the GL120 and GL130 Programmable Controllers.

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

# 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.

# CONTENTS

# CONTENTS

# Introduction and Precautions



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

# I.1 Overview

- This manual describes in detail the functions, specifications, MSTR instructions and uses of the MEMOBUS PLUS local area network.

- Read this manual carefully to ensure the proper use of.the MEMOBUS PLUS. Also, keep this manual in a safe place so that it can be referred to whenever necessary.

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

| Manual | Manual number | Contents |
|---|---|---|
| MEMOCON GL120, GL130 MEMOBUS PLUS SA85 Network Adapter User's Manual | • SIEZ-C825-70.6 | Describes the SA85 Network Adapter for the MEMOBUS PLUS. |
| MEMOCON GL120, GL130 MEMOBUS PLUS BM85 Bridge/Multiplexer User's Manual | • SIEZ-C825-70.7 | Describes the BM85 Bridge/Multiplexer for the MEMOBUS PLUS. |

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

# I.2 Precautions

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



## I.2.1 Safety Precautions

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

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

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

- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual. A new version of the manual will be released under a revised manual 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 manual number listed on the front cover of this manual when ordering

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

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

## I.2.2 Installation Precautions

Abide by the following precautions when installing MEMOCON systems.

⚠**Caution** 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 malfunction. Do not use the MEMOCON in the following locations.

- Locations subject to direct sunlight, or ambient temperatures less than 0°C or more than 60°C.
- Locations subject to relative humidity greater than 95%, rapid changes in humidity, or condensation.
- Locations subject to corrosive or flammable gas.
- Locations that would subject the MEMOBUS PLUS to direct vibration or shock.
- Locations subject to contact with water, oil, chemicals, etc.

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

## I.2.3 Wiring Precautions

⚠**Caution** Always connect a power supply that meets the given specifications. Connecting an inappropriate power supply can cause fires.

⚠**Caution** Wiring must be performed by qualified personnel. Incorrect wiring can cause fires, product failure, or malfunctions.

**Note** Insert the interface cables properly.

Insert the connectors of the various interface cables that are to be connected to the MEMOBUS PLUS communications line and secure them well. Incorrect insertion of the connectors may result in a malfunction of the GL120 or GL130.

**Note** Execute noise control for the power supply.

If noise is transmitted from the external power supply, install an isolation transformer or noise filter to prevent noise interference. Insufficient noise control for the power supply may result in the GL120 or GL130, and the personal computer malfunctioning.

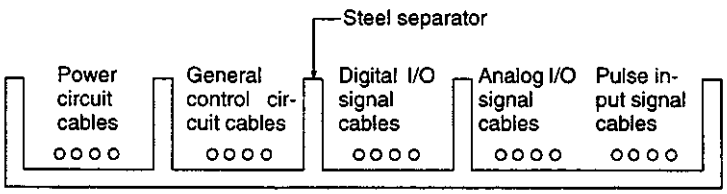
**Note** Select, separate, and lay external cables correctly.

Note the following items when selecting the I/O signal lines (external cables) to connect the GL120 or GL130 to external devices.

- Mechanical strength
- Noise interference
- Wiring distance
- Signal voltage, etc.

Always separate the I/O signal lines inside and outside the control panel from the power lines to reduce noise interference from the power lines. If the I/O signal lines and power lines are not separated properly, malfunctions may result.

Example of separating I/O signal lines from external cables




## I.2.4 Applications Precautions

### External Interlocks for the MEMOCON PLCs

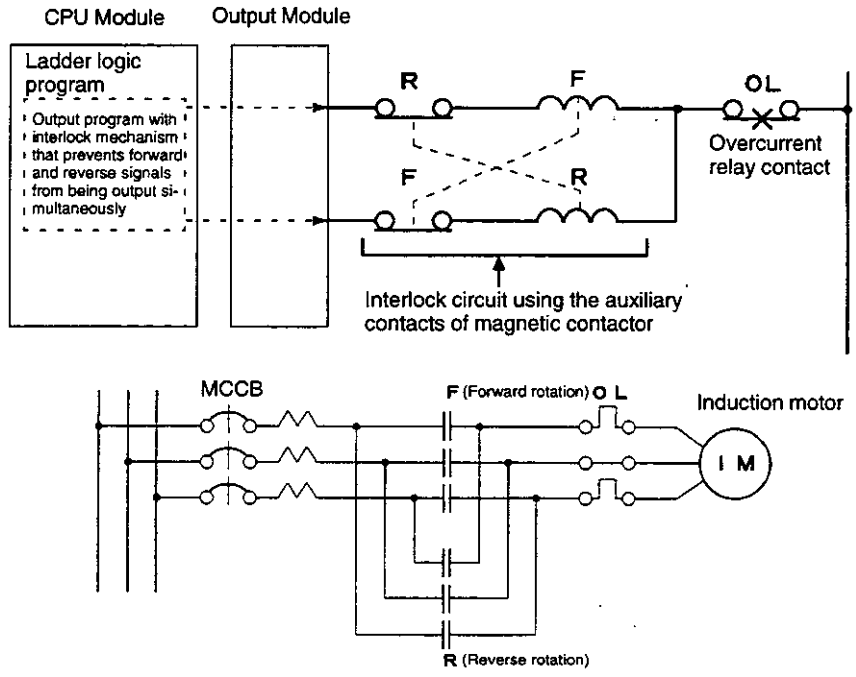
Externally connect an interlock to the MEMOCON if there is any chance that MEMOCON PLC failure could result in bodily harm, or equipment and accessory damage.

⚠ **WARNING** Do not touch any Module terminals when the system power is ON as there is a risk of electric shock.

⚠ **WARNING** Externally connect an emergency stop circuit, interlock circuits, and other safety switches to the MEMOCON. Otherwise, MEMOCON failure may damage the equipment or cause an accident.

An example for reciprocal operation for forward and reverse motor operation is shown below.

An interlock circuit is generally written into the MEMOCON ladder logic program to ensure that forward and reverse signals are not simultaneously output. At the same time, an external interlock circuit must be provided using the auxiliary contacts of magnetic contactors for the same purpose.




## I.2.5 Maintenance

⚠ **WARNING** Do not attempt to disassemble or modify the MEMOBUS PLUS in any way. Doing so can cause fires, product failure, or malfunctions.

# I.3 Using this Manual

- This manual is written for those who already have a basic knowledge of MEMOCON PLC systems. 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 are defined as follows:

  - **PLC = Programmable (Logic) Controller**
  - **GL120, GL130 = MEMOCON GL120 and/or MEMOCON GL130 Programmable Controller**
  - **SA85 = SA85 Network Adapter**
  - **BM85 = BM85 Bridge/Multiplexer**
  - **BP85 = BP85 Bridge**
  - **RR85 = RR85 Repeater**

- **Description of Technical Terms**

  The bold 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 PLUS Overview

# 1



This chapter introduces MEMOBUS PLUS, and describes network configurations and communications methods.

# 1.1 Overview

This section provides a general outline of the functions of MEMOBUS PLUS, network configurations, and transmission procedures.



## 1.1.1 What is MEMOBUS PLUS?

1) MEMOBUS PLUS is a local area network (LAN) designed for industrial controllers. It connects computers and Programmable Controllers (PLCs) to the network to provide the following functions:

   a) Data transmission between PLCs.

   b) Data transmission between computers and PLCs.

   c) PLC programming.

   d) Uploading and downloading of PLC programs.

2) MEMOBUS PLUS performs N:N communications based on token passing between devices connected to the network, such as PLCs (MEMOCON GL120, GL130) and computers with an SA85 Network Adapter. With MEMOBUS PLUS, any devices on the network can freely communicate with each other.

3) MEMOBUS PLUS is connected on a bus line, and shielded twisted-pair cables are used as the transmission medium. The baud rate is 1 Mbps.

4) Node addresses between 1 to 64 are allocated to devices on the network. Node addresses do not need to be arranged in numerical order, but each node address can be used only once.

5) A network consists of one or more cable sections. Each cable section can support up to 32 devices. The maximum cable length is 450 m. Cable sections are connected via an RR85 Repeater.

6) By using RR85 Repeaters, the number of devices which can be connected to a network can be increased to 64. Cable length can also be increased to 1,800 m.

7) The data transmission function of the network has the following capabilities:

a) Message Transmissions:
Up to 100 words of data (16 bits per word) can be transmitted to a designated device on the network.

b) Global Data Transmissions:
Up to 32 words of data can be broadcast to all devices on the network at the same time.

8) The following devices can be connected to the network:

a) Programmable Controllers: MEMOCON GL120, GL130

b) Computers: IBM PC/AT or compatible
(must have an SA85 Network Adapter)

c) Programming Panel: P120□N

d) Repeater: RR85

e) Bridge: BP85

f) Bridge/Multiplexer: BM85

9) The network has comprehensive diagnostic functions.

When an error occurs during transmission, the details of the error are displayed using a hexadecimal error code.

## 1.1.2 Network Configuration

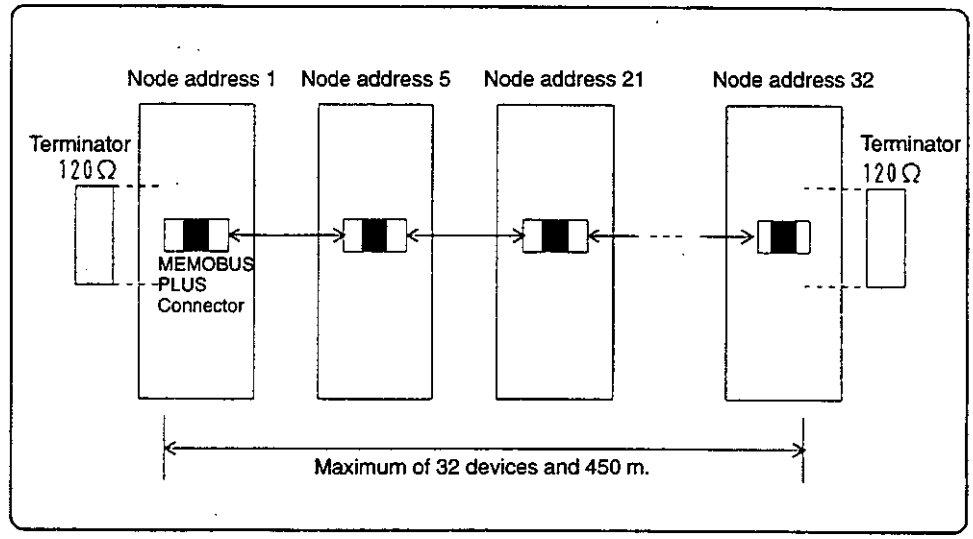
1) MEMOBUS PLUS comprises one or more cable sections. A maximum of 32 devices (such as PLCs and computers) can be connected to one cable section. The maximum transmission distance is 450 m.

2) Up to three Repeaters can be connected to one network. By connecting a Repeater to cable sections, up to 64 transmission devices can be connected. The transmission distance can also be extended to 1,800 m.

3) The following diagrams show examples of network configurations with and without the use of Repeaters.

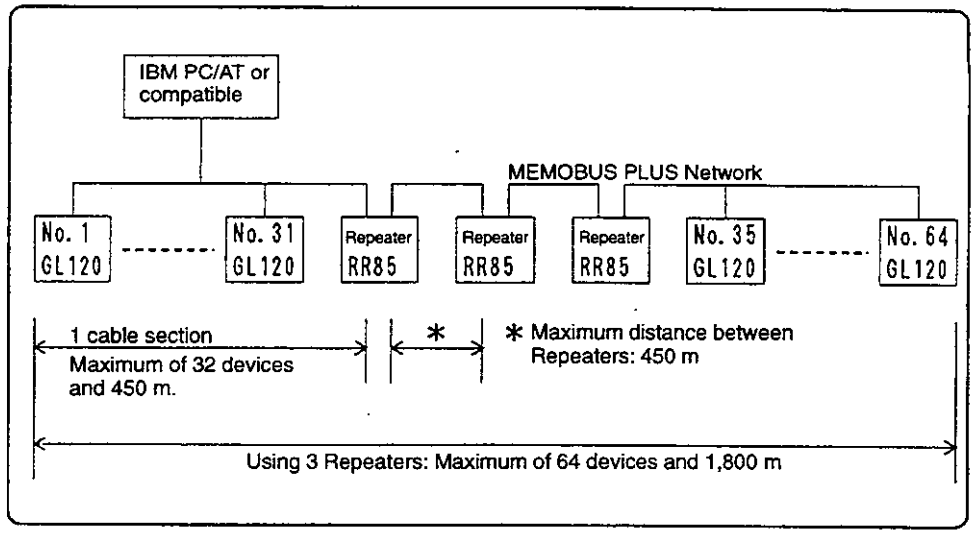
### a) Without Repeaters

◀EXAMPLE▶




### b) With Repeaters

◀EXAMPLE▶

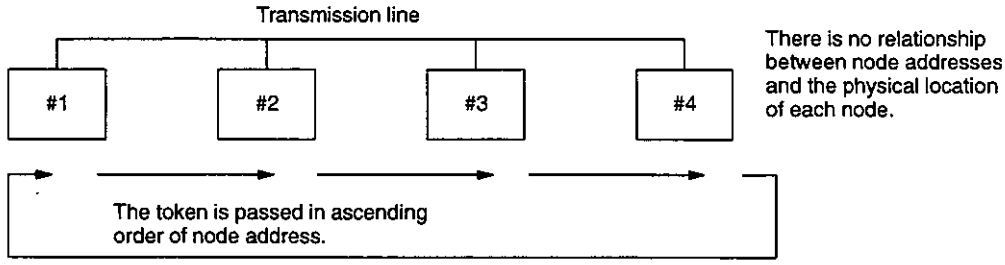



**Note** Computers connected to the MEMOBUS PLUS Network must be equipped with an SA85 Network Adapter.

## 1.1.3 Network Transmission Sequence

1) In the MEMOBUS PLUS Network, N:N data transmission between designated PLCs is performed using token passing. In a single network, a token is passed from one node to the next, and the node that receives the token frame obtains the right to access the network. While holding the token, the node transmits messages to other nodes. Each message has a route field in which the data source and destination are specified.

### Token Passing




2) MEMOBUS PLUS devices have communications processors to control various network transmissions. These processors perform functions such as rotating tokens, sending/receiving messages, acknowledging reception, etc.

3) Data is written and read by nodes using MSTR instructions specified in the ladder logic of the node's application programs.

4) The MSTR instruction can be used to execute the following functions:

- Data Write
- Data Read
- Local Status Read
- Local Status Clear
- Global Data Write
- Global Data Read
- Remote Status Read
- Remote Status Clear

# MEMOBUS PLUS Specifications

# 2

This chapter provides the specifications of MEMOBUS PLUS.

# 2.1 Transmission Specifications

This section provides MEMOBUS PLUS transmission specifications.

MEMOBUS PLUS transmission specifications are as follows:

| Item | Specifications |
|---|---|
| **Baud Rate** | 1 Mbps (fixed) |
| **Transmission Cable** | Shielded twisted-pair cable |
| **Transmission Distance** | Without Repeater: 450 m max.<br>With 3 Repeaters: 1,800 m max. |
| **Topology** | Bus connection |
| **Communications Mode** | N:N |
| **Number of Nodes Connected** | Without Repeater: 32 nodes max.<br>With Repeater: 64 nodes max. |
| **Communications Method** | Token passing |
| **Transmission Format** | Conforms to HDLC. |
| **Error Check** | CRC-16 |
| **Insulation Method** | Pulse transformer: 1,000 VAC |
| **Terminator** | 120 Ω, 1/4 W |
| **Connections** | GL120, GL130: 3-pin terminal block<br>Repeater, Bridge: D-sub connector (9-pin, female) |
| **Communications Functions** | 1) N:N communications<br>2) 1:N global data communications (broadcasting)<br>3) Status monitoring |

# System Configuration

# 3

This chapter explains the MEMOBUS PLUS system configuration, connections between devices, and other hardware issues.

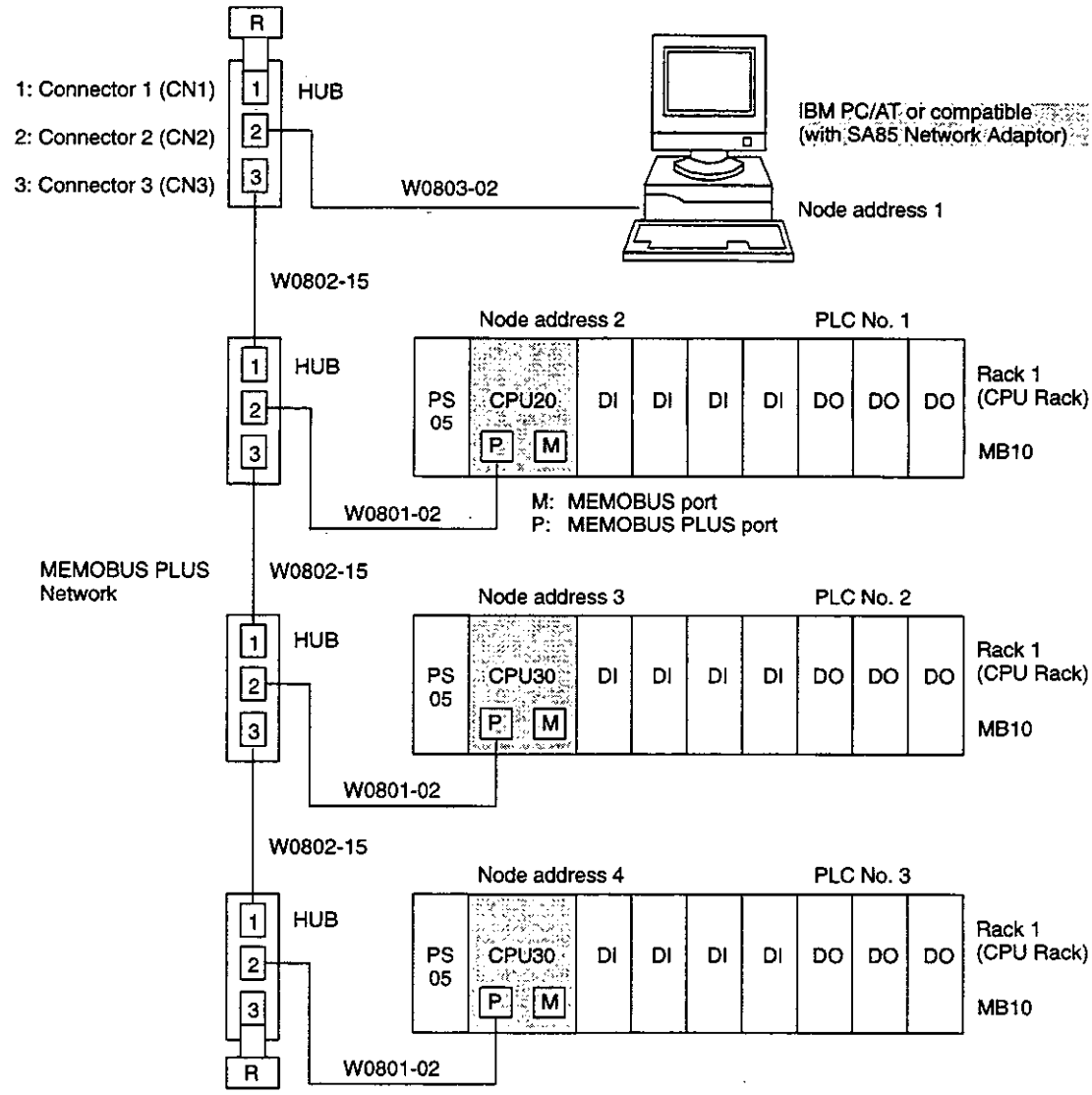
# 3.1 MEMOBUS PLUS System Configuration

This section describes the MEMOBUS PLUS system configuration and gives programming examples using MSTR instructions.



## 3.1.1 GL120/GL130 Communications

◀EXAMPLE▶




| | | | |
|---|---|---|---|
| PS05: | AC Input Power Supply Module (3 A) | HUB: | MEMOBUS PLUS Hub Module |
| CPU20: | CPU Module (16 kW) | R: | MEMOBUS PLUS Terminator |
| CPU30: | CPU Module (32 kW) | W0801-02: | MEMOBUS PLUS Branch Line Cable (2 m) |
| DI: | 12/24 VDC 16-point Input Module | W0802-15: | MEMOBUS PLUS Trunk Line Cable (15 m) |
| DO: | 12/24 VDC 16-point Output Module | W0803-02: | MEMOBUS PLUS Branch Line Cable (2 m) |
| MB10: | 10-slot Mounting Base | | |

Communications with GL120/GL130 will be described using the system configuration example on the preceding page. Here, the computer is used to write the communications program and load it from PLC No. 1 to PLC No. 2.

1) Connect each device via the MEMOBUS PLUS ports using shielded twisted-pair cables by a cascade connection method. Be sure to connect a Terminator (120 Ω) to both ends of the transmission line.

2) Each device on the network is called a node and is assigned a node address from 1 to 64. In this example, PLC No. 1 is at node address 2, PLC No. 2 is at node address 3, PLC No. 3 is at node address 4, and the computer is at node address 1. With the GL120 and GL130, there are two rotary switches on the CPU Module for setting node addresses. Use these switches to set a unique address for each node.

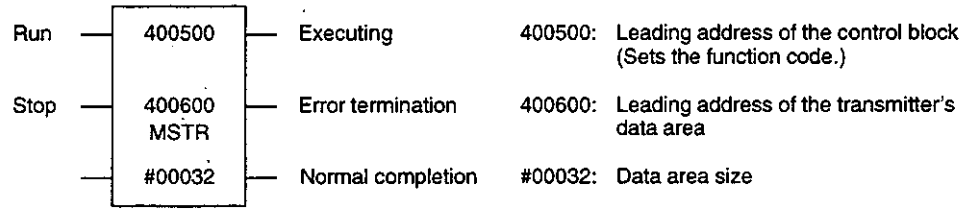
3) When transferring data from holding registers 400600 to 400631 (32 words) of No. 1 PLC to holding registers 400001 to 400032 of No. 2 PLC, write a ladder program using the MSTR instruction as described next.

**Note** (1) Set node addresses to between 1 and 64. Communications will not be possible with CPU Modules set outside this range.

(2) Do not use the same node address for more than one node within the same network. Communications will not be possible with devices with the same address within the same network.

4) To transfer data from holding registers 400600 to 400631 (32 words) of PLC No. 1 to holding registers 400001 to 400032 of No. 2 PLC, write a ladder program in PLC No. 1 using the MSTR instruction as follows:

Specify the MSTR instruction at the MEMOSOFT ladder program edit screen, and set the required operands and data.




**Data Settings**

Data for Controlling Transmission

| | | |
|---|---|---|
| 400500 | 0001 | Decimal |
| 400501 | 0000 | Decimal |
| 400502 | 0032 | Decimal |
| 400503 | 0001 | Decimal |
| 400504 | 0002 | Decimal |
| 400505 | 0000 | Decimal |
| 400506 | 0000 | Decimal |
| 400507 | 0000 | Decimal |
| 400508 | 0000 | Decimal |

Data To Be Sent

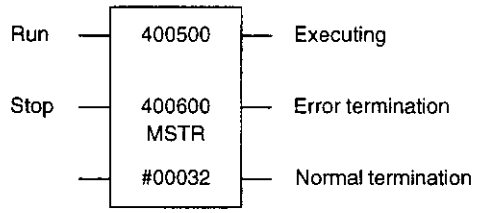
| | | |
|---|---|---|
| 400600 | 0001 | Decimal |
| 400601 | 0002 | Decimal |
| 400602 | 0003 | Decimal |
| 400603 | 0004 | Decimal |
| 400604 | 0005 | Decimal |
| 400605 | 0006 | Decimal |
| ⋮ | ⋮ | ⋮ |
| 400631 | 0032 | Decimal |

- **Control Block**

| | | | |
|---|---|---|---|
| 400500 | 0001 | Decimal | Gives the function code = 1 (data write). |
| 400501 | 0000 | Decimal | Error status (See *4.1.2 Error Status* for details.) |
| 400502 | 0032 | Decimal | Gives the data block size = 32. |
| 400503 | 0001 | Decimal | Set the offset as the leading address of the destination data area minus 400000. |
| 400504 | 0002 | Decimal | Gives the node address of the destination = 2. |
| 400505 | 0000 | Decimal | Set all of these to 0. (See *4 MSTR Instructions* for details.) |
| 400506 | 0000 | Decimal | |
| 400507 | 0000 | Decimal | |
| 400508 | 0000 | Decimal | |

5) To transfer data from holding registers 4000001 to 4000032 of PLC No.2 into holding registers 400600 to 400631 of PLC No. 1, write a ladder program in PLC No. 2 using the MSTR instruction as follows:

Specify the MSTR instruction at the MEMOSOFT ladder program edit screen, and set the required operands and data.




400500: Leading address of the control block (Sets the function code.)

400600: Leading address of the receiver's data area.

#00032: Data area size.

**Data Settings**

| Data for Controlling Reception | | | Data Received | |
|---|---|---|---|---|
| 400500 | 0002 | Decimal | 400600 | |
| 400501 | 0000 | Decimal | 400601 | |
| 400502 | 0032 | Decimal | 400602 | |
| 400503 | 0001 | Decimal | 400603 | |
| 400504 | 0002 | Decimal | 400604 | |
| 400505 | 0000 | Decimal | 400605 | |
| 400506 | 0000 | Decimal | 400606 | |
| 400507 | 0000 | Decimal | ... | |
| 400508 | 0000 | Decimal | 400631 | |

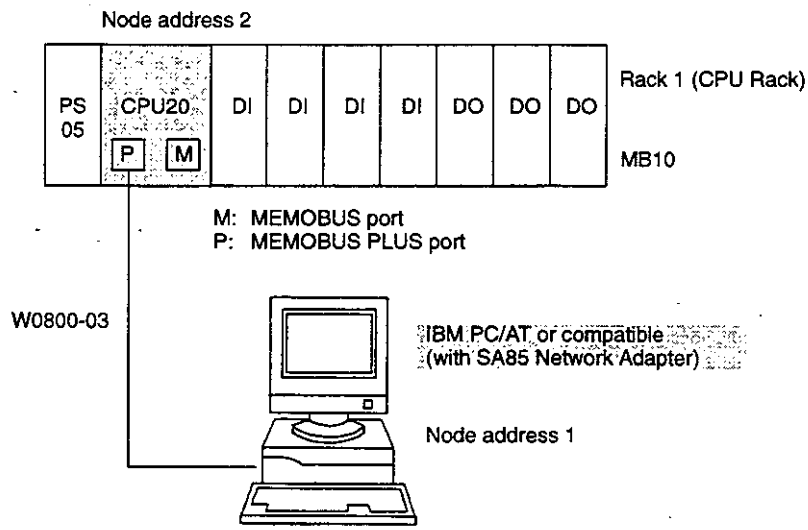
- **Control Block**

| | | | |
|---|---|---|---|
| 400500 | 0002 | Decimal | Gives the function code = 2 (data read). |
| 400501 | 0000 | Decimal | Error Status (See *4.1.2 Error Status* for details.) |
| 400502 | 0032 | Decimal | Gives the data block size = 32. |
| 400503 | 0001 | Decimal | Set the offset as the leading address of the destination data area minus 400000. |
| 400504 | 0002 | Decimal | Gives the node address of the destination = 2. |
| 400505 | 0000 | Decimal | Set all of these to 0. (See *4 MSTR Instructions* for details.) |
| 400506 | 0000 | Decimal | |
| 400507 | 0000 | Decimal | |
| 400508 | 0000 | Decimal | |

## 3.1.2 Communications between Computers and GL120/130 PLCs

1) The system configuration for communications between the computer and GL120/GL130 is shown below. An SA85 Network Adaptor must be installed in the computer.

◀EXAMPLE▶




| | | | |
|---|---|---|---|
| PS05: | AC Input Power Supply Module (3 A) | DI: | 12/24 VDC 16-point Input Module |
| CPU20: | CPU Module (16 kW) | DO: | 12/24 VDC 16-point Output Module |
| W0800-03: | MEMOBUS PLUS Cable (2.5 m) | MB10: | 10-slot Mounting Base |

2) The main applications of the SA85 Network Adaptor are as follows:

a) User interface.

b) Control, monitoring, and reporting.

c) Program loading, saving, and verification.

d) Online programming.

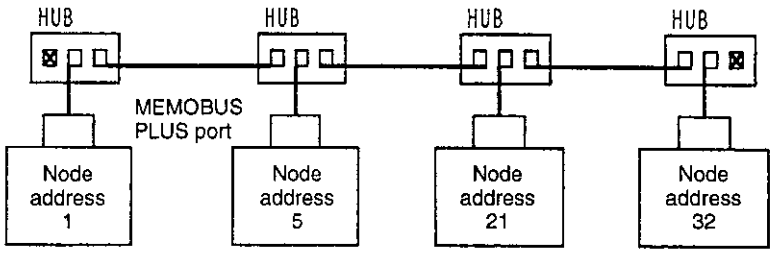
e) Testing and debugging of application programs.

f) Running the network diagnostic program.

# 3.2 Precautions on System Configuration

This section provides precautions on system configuration.

1) Make sure that all devices that form the MEMOBUS PLUS Network are connected using shielded twisted-pair cables by cascade connections. Make sure that a Terminator is connected to both ends of the network.




HUB: MEMOBUS PLUS Hub Module

⊠ : Terminator

2) A network consists of one or more cable sections. The following limitations apply to each cable section:

   a) Up to 32 nodes can be connected to the network cable.

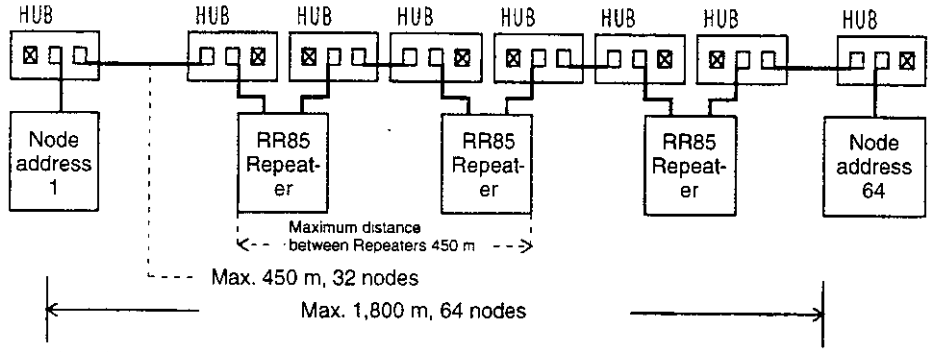
   b) The total length of the cable cannot exceed 450 m.

   c) The minimum cable length and the minimum distance between nodes is 3 m.

   d) Devices must be connected through the MEMOBUS PLUS communications ports on each device, so make sure that the dedicated connectors are used.

3) The devices which make up the network are called nodes and have individual node addresses. Node addresses can be set between 1 and 64, and the same address can be set only once. It is not necessary to have nodes arranged in ascending order of node address.

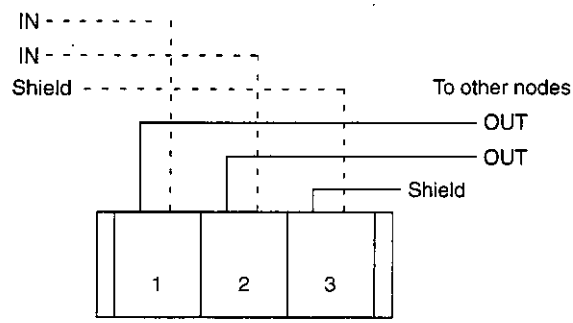
4) When the cable length of the network exceeds 450 m or when the number of nodes exceeds 32, extend the network by using an RR85 Repeater. Repeaters allow the network to be extended to 1,800 m and 64 nodes. A maximum of three Repeaters can be used in one network.




HUB: MEMOBUS PLUS Hub Module

⊠ : Terminator

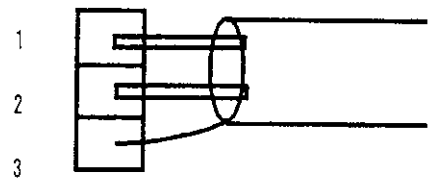
5) The MEMOBUS PLUS port connector for the GL120/GL130 is shown below. It is fitted with a 3-pin connector (female). Make the connection using the corresponding male connector. Insert a Terminator (120 Ω, 1/4 W) between DATAH and DATAL at the ends of the network.




**MEMOBUS PLUS Port Connector**

| Pin Number | Signal Name |
|---|---|
| 1 | DATAH |
| 2 | DATAL |
| 3 | SHIELD |

**Connector Terminal Block Diagram**




**Shielded Twisted-pair Cable Connection**

# 3.3 Overview of Operations

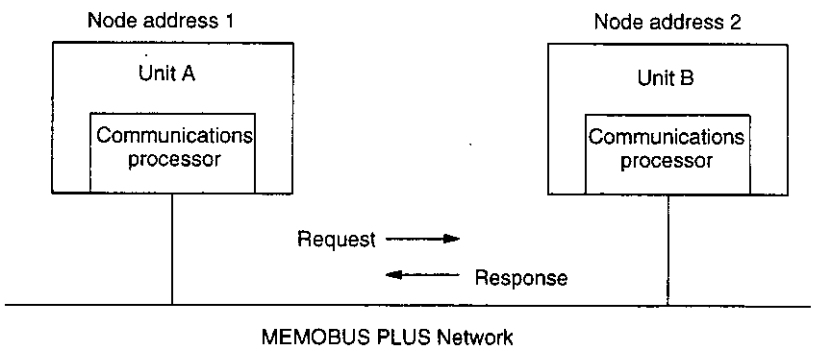
This section describes the transmission and reception of messages using the MEMOBUS PLUS communications processors.

### 1) Communications Processors

Devices connected to MEMOBUS PLUS are equipped with communications processors to control network communications. Communications processors perform token passing, message transmissions and receptions, acknowledgments, etc. In PLCs, the communications processor sends message data from or to the specified MSTR instruction.

### 2) Data Read Sequence

The order in which data is read by MSTR instructions is described using the following examples.




a) When the communications processor of Unit A acquires the token, it sends a data read request to the network. When the token with the data read request is received by the communications processor of Unit B, an acknowledgment is immediately sent through the network.

b) At the end of Unit B's scan, input information is fetched. The communications processor of Unit B prepares response data to the read request.

c) When Unit B's communications processor acquires the token, it sends the response data to Unit A. Unit A's communications processor immediately sends an acknowledgment through the network.

d) At the end of Unit A's scan, input information is fetched. This processing is completed the next time Unit A's MSTR instruction is solved. After input information is written to the data register, the MSTR instruction's Normal Termination output is turned ON.

# MSTR Instruction

# 4

This chapter describes the MEMOBUS PLUS software, including the MSTR instruction and message formats.

# 4.1 Outline of MSTR Instruction

This section describes the MSTR instruction and error status.

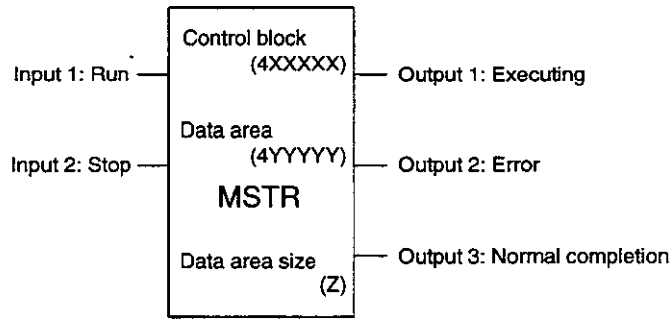


## 4.1.1 Basic MSTR Instruction

1) MEMOBUS PLUS transmissions are performed by MSTR instructions specified at nodes on the network. Four MSTR instructions can be executed at a time. When executing five or more MSTR instructions, wait until the MSTR instructions in progress have been completed before executing the next MSTR instruction.

**2) Structure**

MSTR instructions are written in the following format:




**3) Inputs**

Input 1: When input 1 turns ON, the instruction is executed. Either an N.O. or an N.C. contact is used for input 1.

Input 2: When input 2 turns ON, the instruction is canceled.

**4) Outputs**

Output 1: When output 1 is ON, it indicates that the instruction is being executed.

Output 2: When output 2 is ON, it indicates that the instruction has terminated with an error. An error code will be stored in the second register of the control block. The error termination output is output for only 1 scan.

Output 3: This indicates normal completion of the instruction. The normal completion output is output for only 1 scan.

### 5) Control Block

4XXXXX in the control block is the reference number of the leading register of a 9 consecutive holding registers. The following data is stored in the 9 holding registers:

a) 4XXXXX: Function code

b) 4XXXXX + 1: Error status

c) 4XXXXX + 2: Data block size

d) 4XXXXX + 3: Offset (leading address of the destination data area minus 400000)

e) 4XXXXX + 4: MEMOBUS PLUS routing path 1

f) 4XXXXX + 5: MEMOBUS PLUS routing path 2

g) 4XXXXX + 6: MEMOBUS PLUS routing path 3

h) 4XXXXX + 7: MEMOBUS PLUS routing path 4

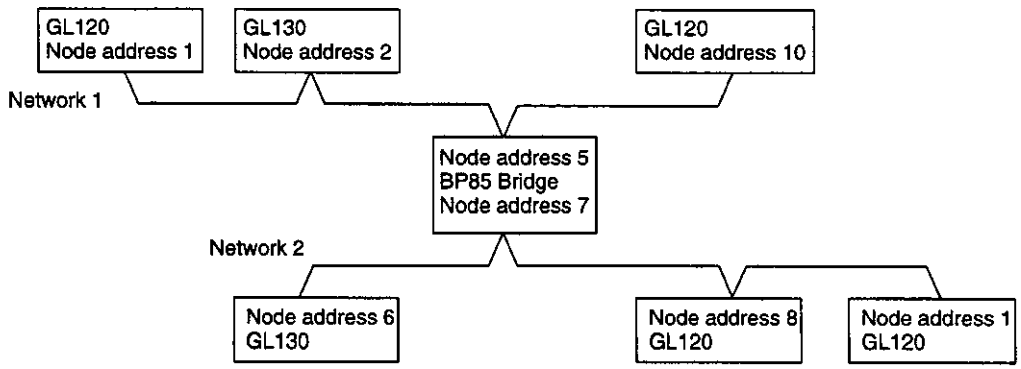
i) 4XXXXX + 8: MEMOBUS PLUS routing path 5

### 6) Path Setting

a) The communications path is indicated by routing paths 1 to 5, which are stored in registers 5 to 9 of the control block.

b) MEMOBUS PLUS communications can link up to five networks using BP85 Bridges. When five networks are connected by Bridges, five paths are used when a node on one network communicates with a node on the most distant network (via four Bridges). In this case, the final path 5 is the node address of the destination.

c) The path before the path with a contents of 0 is the node address of the destination. For a single network, path 1 is the node address of the destination, and paths 2 to 5 are set to 0. For example, consider the following system made up of two networks. When sending data from a GL120 at node address 1 on network 1 to the GL130 at node address 6 on network 2, the path settings are: Path 1 = 5, Path 2 = 6, Path 3 = 0, Path 4 = 0, Path 5 = 0.



**7) Data Area**

The data area indicates the leading reference number of the buffer used as the data storage area. It uses the number of holding registers required to store the specified size of data. When data is written, the data area is used as the source data area. When data is read, the data area is used as the destination data area.

**8) Data Area Size**

The size of the data area is given as the number of registers (words). Set the size of the data area equal to or larger than the length of the control block. The size can be set to a maximum value of 100.

**Note** (1) Do not use transitional contacts for inputs. If transitional contacts are used for inputs, the transmission will start, but will subsequently stop, outputs will all turn OFF, and no error code will be stored.

(2) Turn OFF the Run input during the next scan after both normal and error termination of the MSTR instruction. If the Run input is left ON, the instruction will be executed again. (For some functions, such as global data read/write and local status read/clear, the instruction will not be executed again unless the Run input is turned OFF once.)

## 4.1.2 Error Status

1) If an MSTR instruction has terminated with an error, error status will be stored in the second register of the control block.

2) Error status meanings are shown below.

a) Error Code: Mmss (hexadecimal)
M: major code m: minor code ss: subcode

| Error Code | Meaning | Error Code | Meaning |
|---|---|---|---|
| 1001 | Aborted | 2009 | Error: Transmission to local node |
| 2001 | Function code error | 200A | Global data length mismatch |
| 2002 | Parameter change error | 200B | High-speed scan execution not possible |
| 2003 | Data length error | 30ss | MEMOBUS Slave abnormal response received |
| 2004 | Offset value error | 4001 | MEMOBUS Slave response mismatch |
| 2005 | Data length + offset value error | 5001 | Network response mismatch |
| 2006 | Error in data area specification | 6mss | Routing error |
| 2007 | Error in network area specification | F001 | No MBP option |
| 2008 | Error in path specification | - | - |

b) Subcodes for Error Code "30ss"

| Subcode | Meaning |
|---|---|
| 01 | Function not supported |
| 02 | No register |
| 03 | Data value error |
| 05 | Time-consuming PP instruction enabled? |
| 06 | Unable to execute because of effect of time-consuming instruction. |
| 07 | Time-consuming PP instruction rejected? |

c) Minor Codes and Subcodes for Error Code "6mss"

| Minor Code | Meaning | Subcode | Meaning |
|---|---|---|---|
| m | 0: Local node | 01 | No response |
| | 1: Number 1 path | 02 | Access prohibited error |
| | 2: Number 2 path | 03 | Communications failure due to offline node |
| | 3: Number 3 path | 04 | Abnormal response reception |
| | : | 05 | Route node data path busy |
| | | 06 | Remote station down |
| | | 07 | Destination address error |
| | | 08 | Path node type error |
| | | 10 | Command rejected |
| | | 20 | Slave transaction lost |
| | | 40 | Unexpected path reception |
| | | 80 | Unexpected response reception |

## 4.1.3 MSTR Instruction Functions

1) The following table lists the functions of the MSTR instruction that can be used.

| Function | Function Code |
|---|---|
| Data write | 1 |
| Data read | 2 |
| Local status read | 3 |
| Local status clear | 4 |
| Global data write | 5 |
| Global data read | 6 |
| Remote status read | 7 |
| Remote status clear | 8 |

**2) Data Read/Write**

a) This function is used for 1:1 (peer-to-peer) communications.

b) When reading the contents of the holding registers (400001 to 409999) of the remote CPU Module, use function code 2 (Data Read). When writing to the holding registers of the remote CPU Module, use function code 1 (Data Write).

c) Up to 100 registers can be read or written at a time.

d) Four data read/write functions can be executed simultaneously. When this number is exceeded, a standby will occur.

**3) Global Data Read/Write**

a) In MEMOBUS PLUS communications, MEMOBUS PLUS devices (GL120/130 and computers with SA85) connected to a MEMOBUS PLUS Network share a common memory. Data written to this memory can be read by any devices connected to the Network (devices with MEMOBUS PLUS ports).

b) Data written to the common memory is called global data. To write global data, use function code 5 (Global Data Write). To read this data at other CPU Modules, use function code 6 (Global Data Read).

c) The location and maximum data size of the global data write memory is determined by the MEMOBUS PLUS node addresses. Each node has a memory with a maximum of 32 registers.

d) Any number of global read/write functions can be executed simultaneously.

**4) Local/Remote Status Read/Clear**

a) Network status includes connection status to the MEMOBUS PLUS Network, nodes connected to the network, error occurrences, the number of communications, etc.

b) To read the network status of the local node, use function code 3 (Local Status Read). To read the network status of another node, use function code 7 (Remote Status Read).

c) Use the Local/Remote Status Clear function to clear status information, such as the number of errors or messages.

d) Up to four Remote Status Read/Clear functions can be executed simultaneously. If this number is exceeded, a standby will occur.

# 4.2 Details of MSTR Instruction

This section describes the functions and control block details of the MSTR instruction.



## 4.2.1 Data Write

1) The Data Write function is used to transfer data from the network source node to the destination node. Several scans are required to complete writing the data.

**2) Control Block**

The details of the Data Write control block are as follows:

| Register | Function | Details |
|---|---|---|
| Leading reference | Function code | 1 |
| Leading reference + 1 | Error status | An error code is stored in hexadecimal when an error termination occurs. |
| Leading reference + 2 | Data length | Amount of data transmitted (words). |
| Leading reference + 3 | Destination data area | The leading reference of the destination node in which data is to be written. The value of the leading reference is the reference number of the holding register minus 400000. For example, 1 for holding register 400001, 49 for holding register 400049. |
| Leading reference + 4 to 8 | Paths 1 to 5 | Node addresses of the destination nodes. When communications are performed via a Bridge, the address of the Bridge is set. |

3) If the local node address is specified as the node to which data is to be written, an error termination will occur. If the reference of a holding register that does not exist in the destination node is specified, error information will be returned from the destination node and an error termination will occur.

## 4.2.2 Data Read

1) The Data Read function is used to transfer data from the destination node to the source node. Several scans are required to complete reading the data.

**2) Control Block**

The details of the Data Read control block are as follows:

| Register | Function | Details |
|---|---|---|
| Leading reference | Function code | 2 |
| Leading reference + 1 | Error status | An error code is stored in hexadecimal when an error termination occurs. |
| Leading reference + 2 | Data length | Amount of data received (words) |
| Leading reference + 3 | Destination data area | The leading reference of the destination node from which data is to be read. The value of the leading reference is the reference number of the holding register minus 400000. For example, 1 for holding resister 400001, 49 for holding register 400049 |
| Leading reference + 4 to 8 | Path 1 to 5 | Node address of the destination node. If communications is performed via a Bridge, the address of the Bridge is set. |

3) If the local node address is specified as the node from which data is to be read, an error termination will occur. If the reference of a node that does not exist in the destination node is specified, error information will be received from the destination node and an error termination will occur.

## 4.2.3 Local Status Read

1) The Local Status Read function is used to read network information about the local node. This function is completed in one scan.

**2) Control Block**

The details of the Local Status Read control block are as follows:

| Register | Function | Details |
|---|---|---|
| Leading reference | Function code | 3 |
| Leading reference + 1 | Error status | An error code is stored in hexadecimal when an error termination will occur. |
| Leading reference + 2 | Data length | Length of data read from the offset in the local node's status table.<br>(words) 0 < data length ≦ data area size (54 max.) |
| Leading reference + 3 | Offset | Number of the leading word of the status to be read. If this number is set to 1, status is read from the second entry in the status table. |
| Leading reference + 4 | Fixed value | 0 |
| Leading reference + 5 to 8 | Not valid | - |

3) For details on the status table, see *4.2.9 Network Status.*

## 4.2.4 Local Status Clear

1) The Local Status Clear function is used to clear network information about the local node. This function is completed in one scan.

**2) Control Block**

The details of the Local Status Clear control block are as follows:

| Register | Function | Details |
|---|---|---|
| Leading reference | Function code | 4 |
| Leading reference + 1 | Error status | An error code is stored in hexadecimal when an error termination occurs. |
| Leading reference + 2 | Not valid | - |
| Leading reference + 3 | Not valid | - |
| Leading reference + 4 | Fixed value | 0 |
| Leading reference + 5 to 8 | Not valid | - |

3) For details on the status table, see *4.2.9 Network Status.*

## 4.2.5 Global Data Write

1) The Global Data Write function is used to write data to the global data area of the local node. The written data can be read by any node on the same network. It is not possible to read global data from another network. This function is completed in one scan.

**2) Control Block**

The details of the Global Data Write control block are as follows:

| Register | Function | Details |
|---|---|---|
| Leading reference | Function code | 5 |
| Leading reference + 1 | Error status | An error code is stored in hexadecimal when an error termination occurs. |
| Leading reference + 2 | Data length | Length of data (words) written to the global data area.<br>Data length ≦ 32; data length ≦ data area size |
| Leading reference + 3 | Not valid | - |
| Leading reference + 4 | Fixed value | 0 |
| Leading reference + 5 to 8 | Not valid | - |

## 4.2.6 Global Data Read

1) The Global Data Read function is used to read data from the global data area of another node. This function is not completed until the global data area of the target node is valid (i.e., until the target node has written global data). Once the node from which data is being requested has written data, this function is completed in one scan.

**2) Control Block**

The details of the Global Data Read control block are as follows:

| Register | Function | Details |
|---|---|---|
| Leading reference | Function code | 6 |
| Leading reference + 1 | Error status | An error code is stored in hexadecimal when an error termination occurs. |
| Leading reference + 2 | Data length | Length of the data read from the global data area of the target node.<br>Data length ≦ 32; data length ≦ data area size.<br>Data length ≦ valid length of the global data area of the target node. |
| Leading reference + 3 | Valid length | Valid length of the global data area of the target node. This value is stored automatically. It is the data length of the global data written by the target node. |
| Leading reference + 4 | Target node | Node address (1 to 64) of the node from which global data is to be read |
| Leading reference + 5 to 8 | Not valid | - |

## 4.2.7 Remote Status Read

1) The Remote Status Read function reads network information about other nodes. Completion of this function requires multiple scans.

**2) Control Block**

Details of the Remote Status Read control block are as follows:

| Register | Function | Details |
|---|---|---|
| Leading reference | Function code | 7 |
| Leading reference + 1 | Error status | An error code is stored in hexadecimal when an error termination occurs. |
| Leading reference + 2 | Data length | Length of data read from the offset in the local node's status table offset.<br>0 < data length ≦ data area size (54 max.) |
| Leading reference + 3 | Offset | Number of the leading word of the status to be read. If this number is set to 1, status is read from the second entry in the status table. |
| Leading reference + 4 to 8 | Paths 1 to 5 | Addresses for the node for which status is to be read. If communications is performed via a Bridge, the address of the Bridge is set. |

3) For details on the status table, see *4.2.9 Network Status*.

## 4.2.8 Remote Status Clear

1) The Remote Status Clear function clears network information about other nodes. Completion of this function requires multiple scans.

**2) Control Block**

Details of the Remote Status Clear control block are as follows:

| Register | Function | Details |
|---|---|---|
| Leading reference | Function code | 8 |
| Leading reference + 1 | Error status | An error code is stored in hexadecimal when an error termination occurs. |
| Leading reference + 2 | Not valid | - |
| Leading reference + 3 | Not valid | - |
| Leading reference + 4 to 8 | Paths 1 to 5 | Addresses for the node for which status is to be cleared. If communications is performed via a Bridge, the address of the Bridge is set. |

3) For details on the status table, see *4.2.9 Network Status*.

## 4.2.9 Network Status

1) The following table shows the status data that can be read by the Local/Remote Status Read function. The numbers shown in the "Word" column of the table are used as offset values. The Local/Remote Status Clear function is used to clear the status data of words 13 to 22.

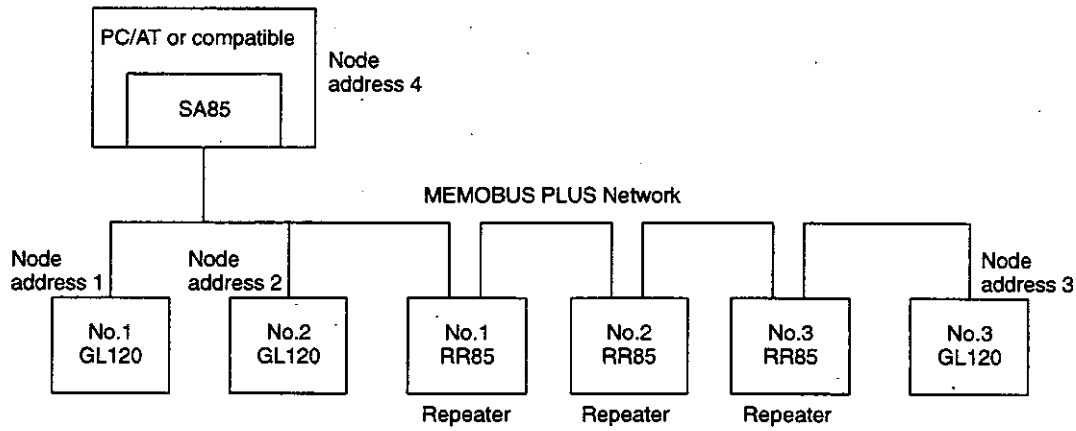
| Word | Bit | Meaning |
|---|---|---|
| 00 | | Node type ID |
| | 0 | Unconfirmed node |
| | 1 | PLC |
| | 2 | Bridge/Multiplexer (BM85) |
| | 3 | Host computer |
| | 4 | Bridge (BP85) |
| | 5 | Peer I/O |
| 01 | 0 to 11 | MEMOBUS PLUS Software version |
| | 12 to 14 | Reserved |
| | 15 | Error counter in word 15 |
| 02 | | Node address |
| 03 | | MAC state |
| | 0 | Power up |
| | 1 | Monitor offline |
| | 2 | Duplicate offline |
| | 3 | Idle |
| | 4 | Token used |
| | 5 | Work response |
| | 6 | Token passed |
| | 7 | Solicit response |
| | 8 | Check path |
| | 9 | Claim token |
| | 10 | Claim response |
| 04 | | Peer status (LED indicator code) |
| | 0 | Monitor link (receiving node only) |
| | 20 | Normal link |
| | 40 | No token |
| | 60 | Isolated node |
| | 80 | Duplicate node |
| 05 | | Token pass counter |
| 06 | | Token rotation time (ms) |
| 07 to 18 | | System reserved area |
| 19 | LO | Communications retry counter |
| | HI | Communications error counter |
| 20 | LO | Normal packet reception counter |
| | HI | No-response counter; Incremented while waiting for response (1 to 10 times/s). Incremented when nodes are added or removed. |
| 21 to 22 | | System reserved area |

| Word | Bit | Meaning | |
|---|---|---|---|
| 23 | LO | Active station bitmap nodes 1 to 8 | (Example)<br>b7 b6 b5 b4 b3 b2 b1 b0<br>8 7 6 5 4 3 2 1<br>Node<br>Local station bits are not set to 1. |
| | HI | Active station bitmap nodes 9 to 16 | |
| 24 | LO | Active station bitmap nodes 17 to 24 | |
| | HI | Active station bitmap nodes 25 to 32 | |
| 25 | LO | Active station bitmap nodes 33 to 40 | |
| | HI | Active station bitmap nodes 41 to 48 | |
| 26 | LO | Active station bitmap nodes 49 to 56 | |
| | HI | Active station bitmap nodes 57 to 64 | |
| 27 | LO | Token station table bitmap nodes 1 to 8 | |
| | HI | Token station table bitmap nodes 9 to 16 | |
| 28 | LO | Token station table bitmap nodes 17 to 24 | |
| | HI | Token station table bitmap nodes 25 to 32 | |
| 29 | LO | Token station table bitmap nodes 33 to 40 | |
| | HI | Token station table bitmap nodes 41 to 48 | |
| 30 | LO | Token station table bitmap nodes 49 to 56 | |
| | HI | Token station table bitmap nodes 57 to 64 | |
| 31 | LO | Global data presentable bitmap nodes 1 to 8 | Local station bits are also set to 1. |
| | HI | Global data presentable bitmap nodes 9 to 16 | |
| 32 | LO | Global data presentable bitmap nodes 17 to 24 | |
| | HI | Global data presentable bitmap nodes 25 to 32 | |
| 33 | LO | Global data presentable bitmap nodes 33 to 40 | |
| | HI | Global data presentable bitmap nodes 41 to 48 | |
| 34 | LO | Global data presentable bitmap nodes 49 to 56 | |
| | HI | Global data presentable bitmap nodes 57 to 64 | |
| 35 to 53 | | System reserved area | |

# 4.3 Communications Program Example

This section provides an example of programming used for writing/reading data to/from holding registers using the Global Data Read/Write functions.

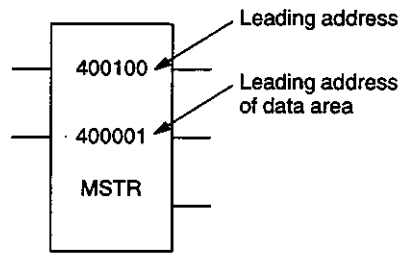
The following is an example of MEMOBUS PLUS system configuration.




*Up to 3 Repeaters can be used in a single network.

1) If, for example, the contents of the No. 1 GL120 holding registers 400001 to 400032 (32 registers) are transmitted as global data via the MEMOBUS PLUS Network, an MSTR instruction must be specified in the No. 1 GL120 ladder program as follows:

**1. MSTR Instruction**




**2. Control Block**

| | |
|---|---|
| 400100 | 5 |
| 400101 | Error code area |
| 400102 | 32 |
| 400103 | - |
| 400104 | 0 |
| 400105 | 0 |
| 400106 | 0 |
| 400107 | 0 |
| 400108 | 0 |

2) No. 2 GL120 reads the contents of No. 1 GL120's holding registers 400001 to 400032 (32 registers). An MSTR instruction must be specified in No. 2 GL120's ladder program as shown at *2. Control Block* in the figure above. The leading address of the data area must be specified as the leading address of the area in which read data is to be stored.

3) In the same way, No. 3 GL120 reads the contents of No. 1 GL120's holding registers 400001 to 400032 (32 registers). An MSTR instruction must be specified in No. 3 GL120's ladder program as shown at *2. Control Block* in the figure above. The leading address of the data area must be specified as the leading address of the area in which read data is to be stored.

# Wiring

# 5

This chapter provides information on wiring the MEMOBUS PLUS System.

# 5.1 Twisted-pair Cables

This section provides information on the terminal treatment and in-panel and external wiring of twisted-pair cables.



## 5.1.1 Terminals

1) Connect a Hub Module to each device on the network. Place the Hub Module close enough to the device and mount it so that the branch line cables can be connected. Prepare 2-m long branch line cables.

2) Connect a Terminator to the Hub Module at both ends of the trunk line cable.

3) Connect the Hub Modules with a little slack so that the cables do not pull free or twist.

4) Connect the correct length of branch line cable to each Hub Module.

5) For future maintenance, attach labels to the trunk line segments and the branch line cables to distinguish between them.

6) Before connecting the cables to the network devices, make sure that they are of the right type, and have no breaks.

7) Be sure to use the correct tools and testing devices necessary for checking and installing network components.

## 5.1.2 Wiring Paths

1) For in-panel wiring, do not place twisted-pair cables in the ducts used for other control lines and power lines. Use other ducts or wire independently. Twisted-pair cables can be placed in the ducts used for analog signal lines or transmission cables.

2) For external wiring, place twisted-pair cables into pits. Either use pits different from those for power lines and control lines, or enclose twisted-pair cables in conduits if using the same pit as power lines or control lines. If twisted-pair cables must be placed in the same pit as power lines, try to separate them as far from the power lines as possible. For example, place the twisted-pair cables in a separate tray.

3) Make sure that both ends of the conduit are grounded.

4) Twisted-pair cables can be placed in the same pit as analog signal lines or transmission cables.

# 5.2 MEMOBUS PLUS Cables

This section describes the devices needed to construct a MEMOBUS PLUS Network, and how to connect them. Using Hub Modules is recommended for network connection; however, because some users prefer to prepare everything by themselves, this section also describes network connection without the use of Hub Modules.



## 5.2.1 Outline

**1) Using Hub Modules**

For details see *5.2.2 Using Hub Modules*. When a cable of any length of 15 m or longer is required between Hub Modules, use a JZMSZ-120W0805-XXX (cable without connectors). See *W0805-XXX Cable* on page 5-7 for further details.

**2) Not Using Hub Modules**

See *5.2.3 Not Using Hub Modules* for details. For network connection without Hub Modules, the following notes must be observed.

**Note** (1) Cable Connection between a CPU Module, SA85, and Hub Module Terminal Blocks.

For "DATA HIGH" and "DATA LOW" signals, connect two cables to one pin (connectors on the CPU and SA85). If only one cable is used, reflections may occur which prevent normal operation. JZMSZ-120W006-02/JZMSZ-120W0807-02 are available as cables for this purpose, but they are only 2 m long. If longer cables are required, users must prepare them by themselves.

(2) Connectors on CPU Module and SA85

Secure the cables to prevent their weight from applying pressure on the connectors. If pressure is applied to the connectors, the cables may break.

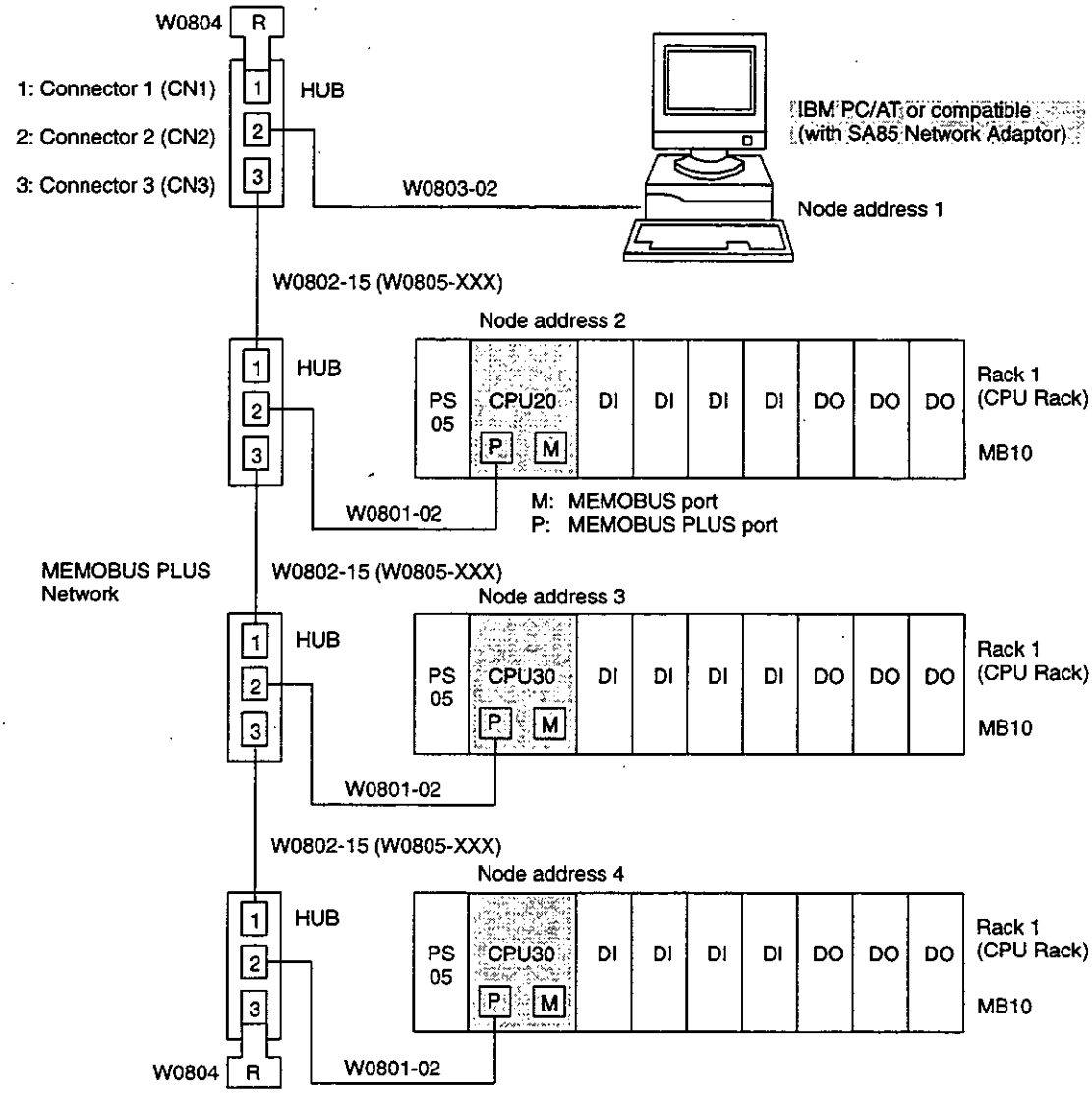
**3) Connections between P120□N and GL120/GL130**

When connecting a P120□N (a computer equipped with an SA85 Network Adapter) one-to-one to a CPU20/CPU30, use a JZMSZ-120W0800-XX cable. See *5.2.4 Connecting P120□N and GL120/GL130* for the specifications of this cable.

# 5.2.2 Using Hub Modules

### 1) System Configuration

The following system configuration is recommended in most cases.




| | | | |
|---|---|---|---|
| PS05: | AC Input Power Supply Module (3 A) | HUB: | MEMOBUS PLUS Hub Module |
| CPU20: | CPU Module (16 kW) | R: | MEMOBUS PLUS Terminator |
| CPU30: | CPU Module (32 kW) | W0801-02: | MEMOBUS PLUS Branch Line Cable (2 m) |
| DI: | 12/24 VDC 16-point Input Module | W0802-15: | MEMOBUS PLUS Trunk Line Cable (15 m) |
| DO: | 12/24 VDC 16-point Output Module | W0803-02: | MEMOBUS PLUS Branch Line Cable (2 m) |
| MB10: | 10-slot Mounting Base | W0805-XXX: | MEMOBUS PLUS Trunk Line Cable |

IMPORTANT

**2) Precautions**

The following precautions are for the system configuration shown on the previous page.

a) Connect each device via the MEMOBUS PLUS ports using shielded twisted-pair cables by a cascade connection method. Make sure that a Terminator (120 Ω) is connected to both ends of the transmission line.

b) Each device on the network is called a node, and is assigned a node address from 1 to 64. In this example, PLC No. 1 is at node address 2, PLC No. 2 is at node address 3, PLC No. 3 is at node address 4, and the computer is at node address 1. With the GL120 and GL130, there are two rotary switches on the front panel of the CPU Module for setting node addresses. Set a unique address for each device.

c) When connecting one Hub Module to another, connect Hub Module connector 1 to connector 3 with cable. If Hub Modules 1 and 1, or 3 and 3 are connected, the frame ground will be either grounded at both ends or not grounded at all. Therefore, make sure that connector 1 is connected to connector 3.

d) One Hub Module is required for each CPU Module or computer (with SA85 Network Adapter).

e) The following cables are used with MEMOBUS PLUS:

(1) JZMSZ-120W0801-02: Between CPU20/CPU30 and a Hub Module (2 m)

(2) JZMSZ-120W0802-XX: Between two Hub Modules (5 m, 10 m, and 15 m)

(3) JZMSZ-120W0803-02: Between SA85 and a Hub Module (2 m)

(4) JZMSZ-120W0804: Terminator

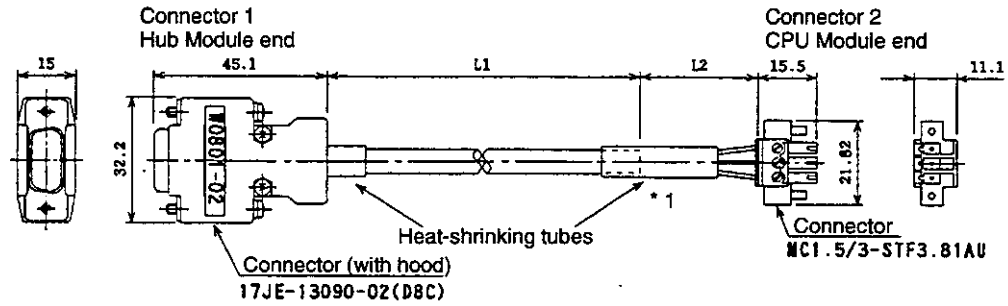
**3) Cable Specifications**

**a) JZMSZ-120W0801-02 Cable Specifications (Connects CPU20/CPU30 and a Hub Module)**

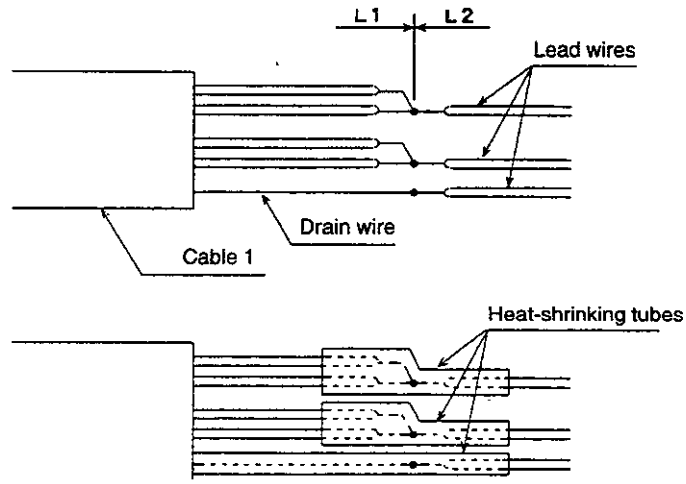
**(1) Main Components**

| Name | Model | Specifications | Manufacturer | Quantity |
|---|---|---|---|---|
| Connector 1 | 17JE-13090-02 (D8C) | 9-pin female, #4-40 UNC, soldered | DDK | 1 |
| Connector 2 | MC1.5/3-STF3.81AU | 3-pin female, gold plated | Phoenix | 1 |
| Cable 1 | - | KEV-SB 2 P x 0.2 SQ | Taiyo Densen | 1 |
| Lead wire | - | 0.5 $mm^2$, covered with insulating sheath | Not specified | 3 |

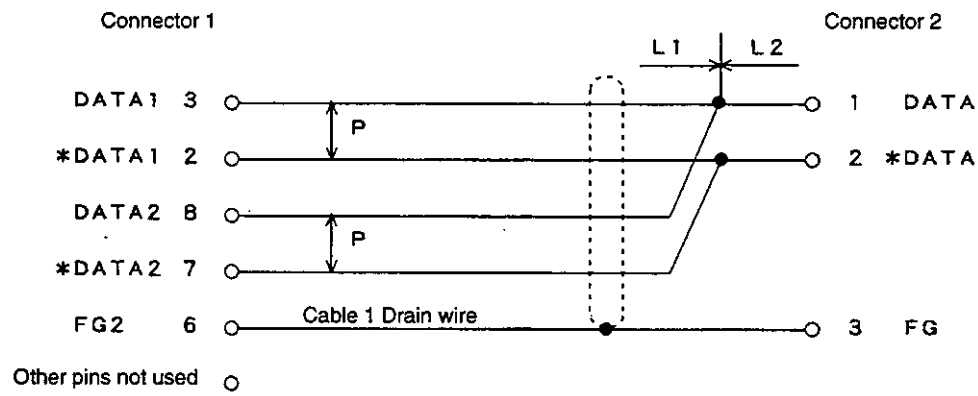
### (2) Appearance




### (3) Enlarged View of Section Indicated by * 1




### (4) Connections




### (5) Cable Lengths

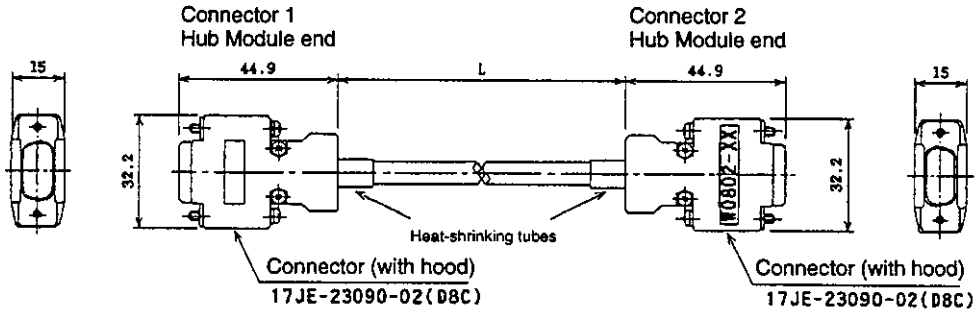
| L1 (mm) | L2 (mm) | Abbreviation | Model |
|---|---|---|---|
| $2000^{+120}_{0}$ | $30^{+10}_{0}$ | W0801-02 | JZMSZ-120W0801-02 |

### b) JZMSZ-120W0802-XX Cable Specifications (Connects Two Hub Modules)

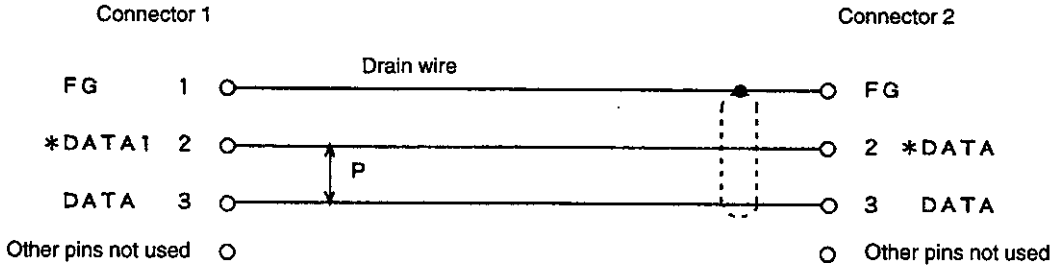
#### (1) Main Components

| Name | Model | Specifications | Maker | Number |
|---|---|---|---|---|
| Connector 1 | 17JE-23090-02 (D8C) | 9 pin male, #4-40 UNC, soldered | DDK | Total 1 |
| Connector 2 | 17JE-23090-02 (D8C) | 9 pin male, #4-40 UNC, soldered | DDK | |
| Cable 1 | | KEV-SB 2 (1 P) x 0.2 SQ (DE9405671) | Taiyo Densen | 1 |

#### (2) Appearance




#### (3) Connections




#### (4) Cable Lengths

| L (mm) | Abbreviation | Model |
|---|---|---|
| $5000^{+300}_{0}$ | W0802-05 | JZMSZ-120W0802-05 |
| $10000^{+600}_{0}$ | W0802-10 | JZMSZ-120W0802-10 |
| $15000^{+900}_{0}$ | W0802-15 | JZMSZ-120W0802-15 |

#### (5) W0805-XX Cables

W0802-XX Cables come in lengths of 5 m, 10 m and 15 m. If greater lengths are required, W0805-XXX cables without connectors can be used. Connection specifications are the same as for W0802-XX. Specifications for W0805-XXX cables are as follows:

- Model: JZMSZ-120W0805-XXX
  XXX (Length specification: 001 (1 m) to 500 (500 m))

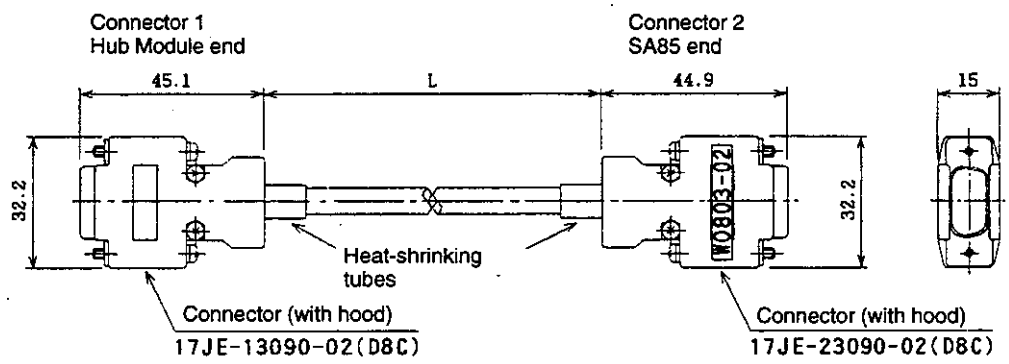
- Specifications: 1 P x 22 WG, drain wire

### c) JZMSZ-120W0803-02 Cable Specifications (Connects SA85 to a Hub Module)

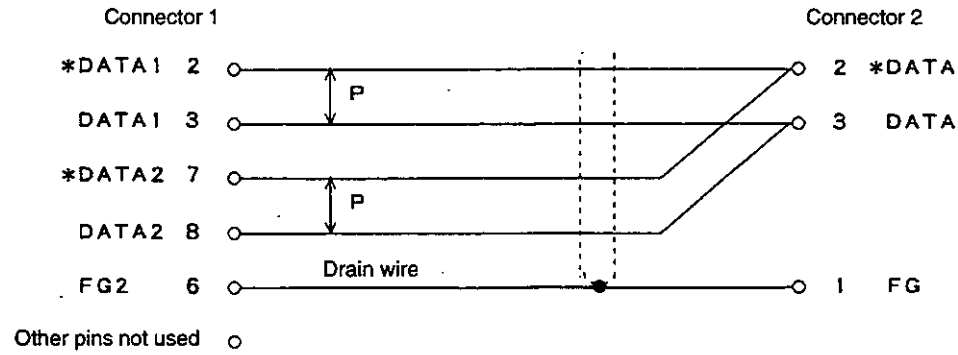
#### (1) Main Components

| Name | Model | Specifications | Maker | Number |
|---|---|---|---|---|
| Connector 1 | 17JE-13090-02 (D8C) | 9 pin female, #4-40 UNC, soldered | DDK | 1 |
| Connector 2 | 17JE-23090-02 (D8C) | 9 pin male, #4-40 UNC, soldered | DDK | 1 |
| Cable | | KEV-SB 2 P x 0.2 SQ | Taiyo Densen | 1 |

#### (2) Appearance




#### (3) Connections

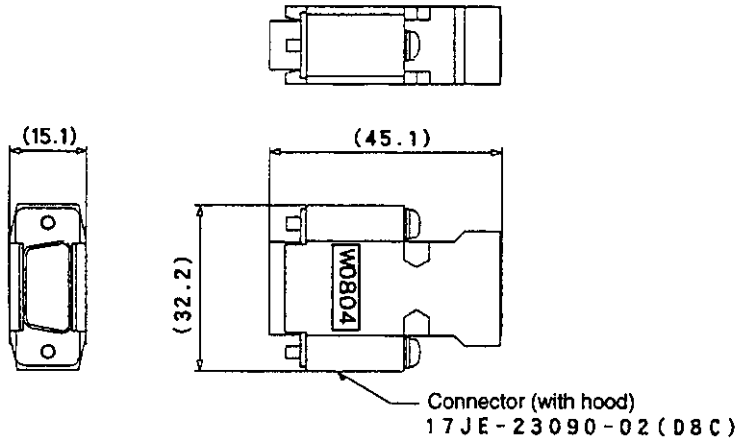



#### (4) Cable Length

| L (mm) | Abbreviation | Model |
|---|---|---|
| $2000^{+120}_{0}$ | W0803-02 | JZMSZ-120W0803-02 |

### d) Appearance of the JZMSZ-120W0804 (Hub Module Terminator)

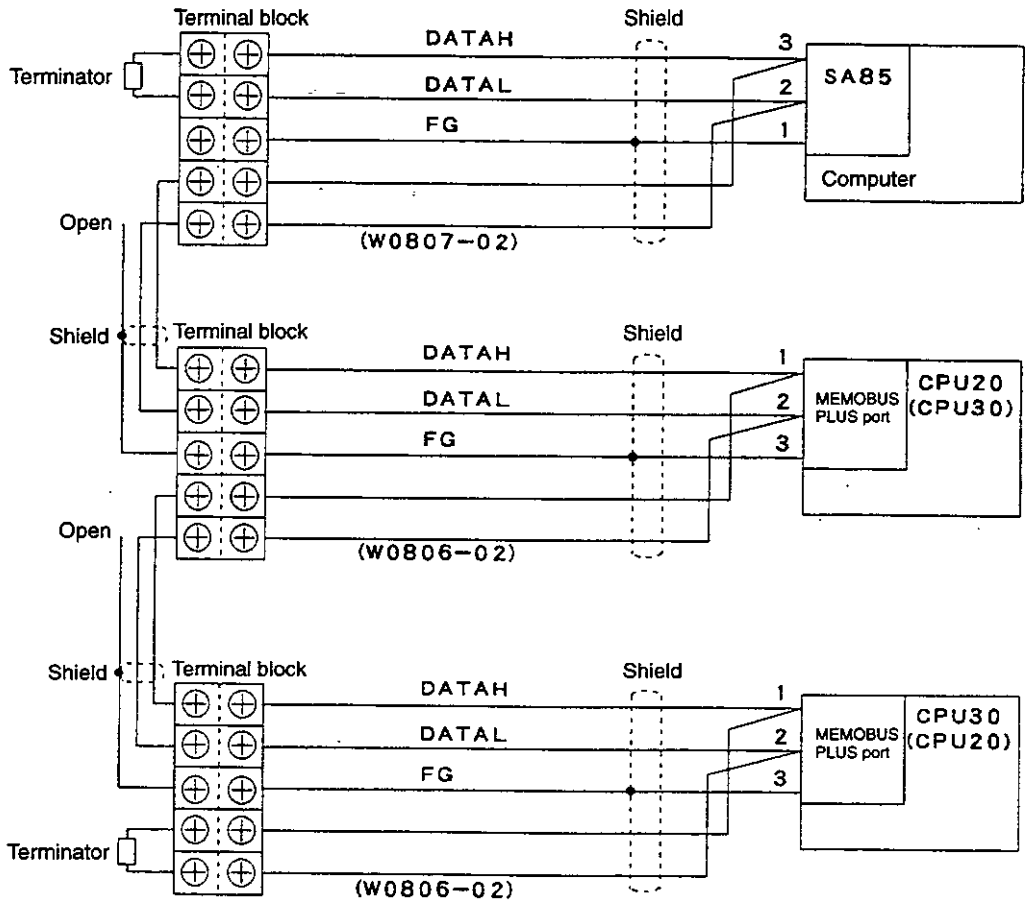
This Terminator is solely for use with Hub Modules. It is used at both ends of the transmission line on a MEMOBUS PLUS Network.



## 5.2.3 Not Using Hub Modules

The following diagram shows the system configuration without Hub Modules. This is applicable when users prepare all materials by themselves.

### 1) System Configuration

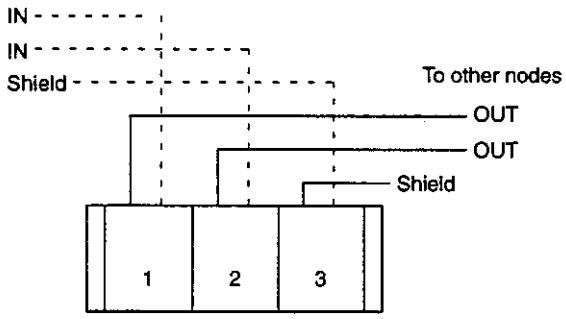



- Terminator: At least 120 Ω and 1/4 W

- The each terminal pair on the right and left sides of the terminal block must be electrically connected.

### 2) Connector Pin Arrangement on the GL120/GL130

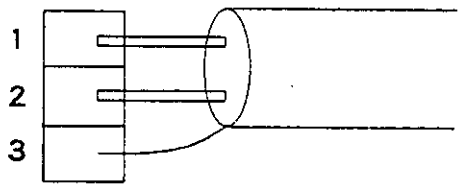
a) The following diagram shows the CPU Module's MEMOBUS PLUS port connector. It is a 3-pin (female) connector. The corresponding (male) connector must be used for the connection. At the end of a network, connect a terminator (120 Ω, 1/4 W) as shown in the diagram.



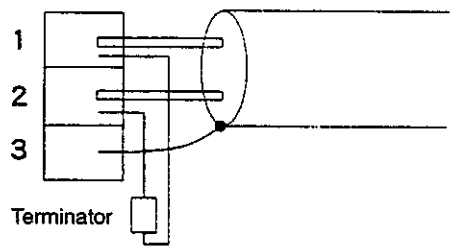

CPU Module's MEMOBUS PLUS Port Connector

| Pin Number | Signal Name |
|---|---|
| 1 | DATAH |
| 2 | DATAL |
| 3 | SHIELD |

#### b) Connector Terminal Block Diagram




Shielded Twisted-pair Cable Connection




Terminator Connection

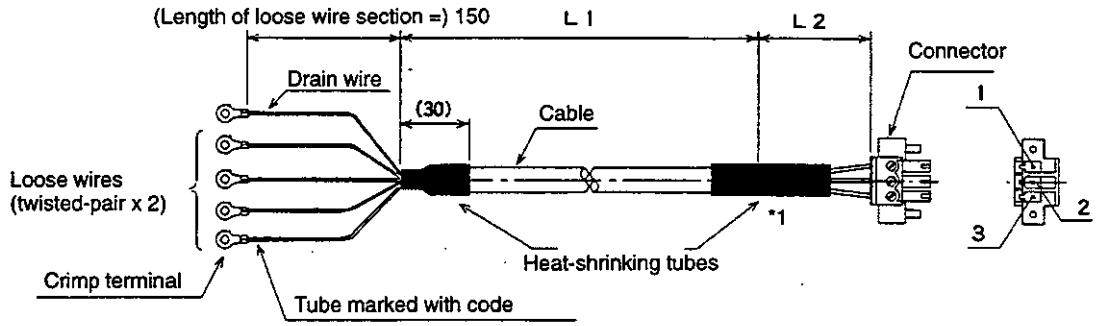
### 3) Cable Specifications

#### a) JZMSZ-120W0806-02 Cable Specifications

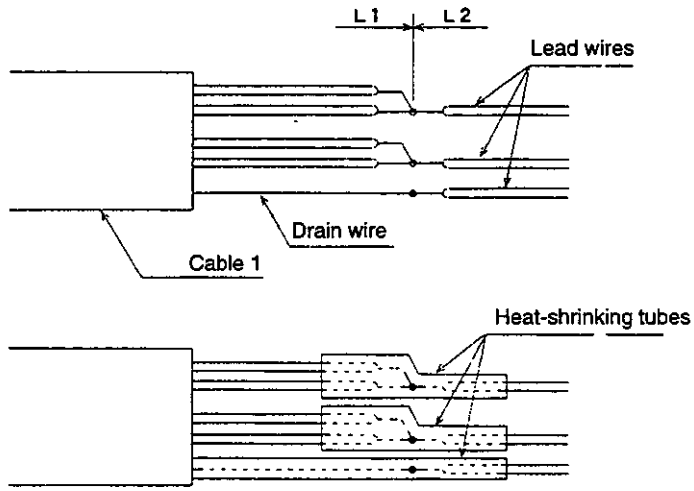
##### (1) Main Components

| Name | Model | Specifications | Maker | Number |
|---|---|---|---|---|
| Connector 1 | WC1.5/3-T3.81AU | 3-pin female, gold plated | DDK | 1 |
| Cable | | KEV-SB 2 P x 0.2 SQ | Taiyo Densen | 1 |
| Lead wire | | 0.5 $mm^2$, covered with insulating sheath | Not specified | 3 |

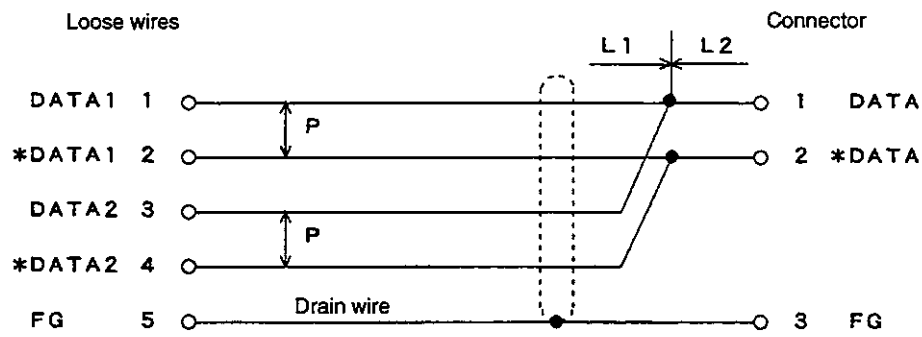
### (2) Appearance




### (3) Enlarged View of Section Indicated by *1




### (4) Connections




### (5) Cable Length

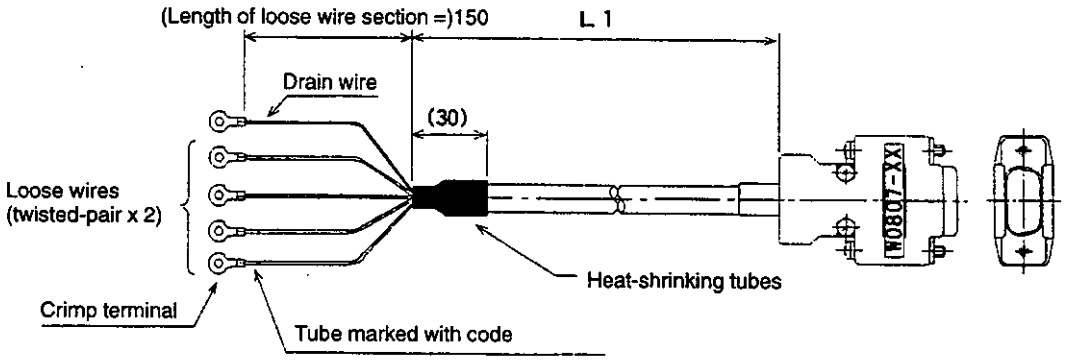
| L1 (mm) | L2 (mm) | Model |
|---|---|---|
| $2000^{+120}_{0}$ | $30^{+10}_{0}$ | JZMSZ-120W0806-02 |

### b) JZMSZ-120W0807-02 Cable Specifications (Connects Two Hub Modules)

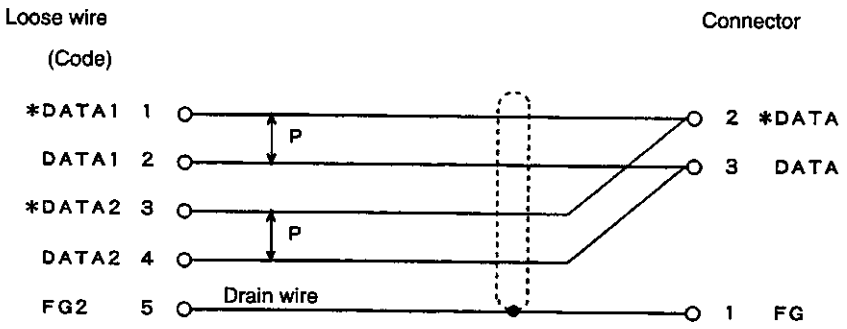
#### (1) Main Components

| Name | Model | Specifications | Maker | Number |
|---|---|---|---|---|
| Connector | 17JE-23090-02 (D8C) | 9-pin male, #4-40 UNC, soldered | DDK | 1 |
| Cable | | KEV-SB 2 P x 0.2 SQ | Taiyo Densen | 1 |

#### (2) Appearance




#### (3) Connections




#### (4) Cable Length

| L (mm) | Abbreviation | Model |
|---|---|---|
| $2000^{+120}_{0}$ | W0807-02 | JZMSZ-120W0807-02 |

## 5.2.4 Connecting P120□N and GL120/GL130

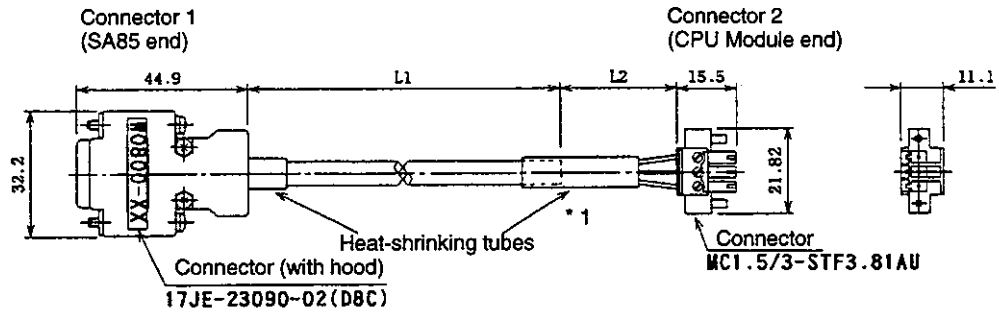
1) When connecting the P120□N (a computer with SA85 Network Adapter) one-to-one to GL120/GL130, use a JZMSZ-120W0800-XX cable.

## a) JZMSZ-120W0800-XX Cable Specifications (Connects CPU20/CPU30 and P120□N)

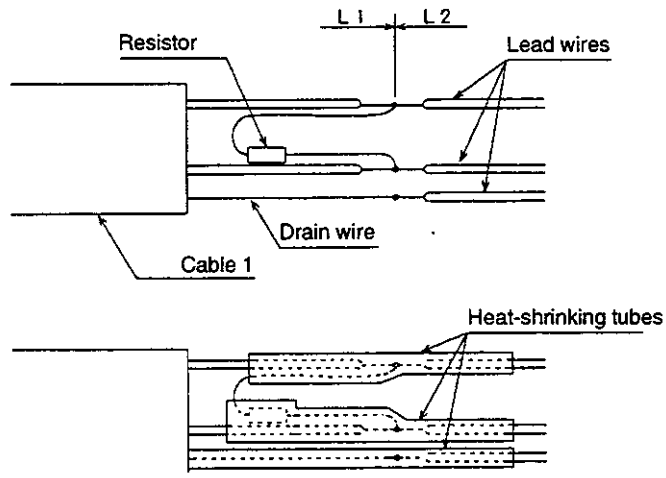
### (1) Main Components

| Name | Model | Specifications | Maker | Number |
|---|---|---|---|---|
| Connector 1 | 17JE-23090-02 (D8C) | 9-pin male, #4-40 UNC, soldered | DDK | 1 |
| Connector 2 | MC1.5/3-STF3.81AU | 3-pin female, gold plated | Phoenix | 1 |
| Cable 1 | | KEV-SB 2 (1 P) x 0.2 SQ (DE9405671) | Taiyo Densen | 1 |
| Lead wire | | 0.5 $mm^2$, covered with insulating sheath | Not specified | 3 |
| Resistor | | 120 Ω, 5%, 1/4 W, metal film resistor or carbon film resistor | Not specified | 2 |

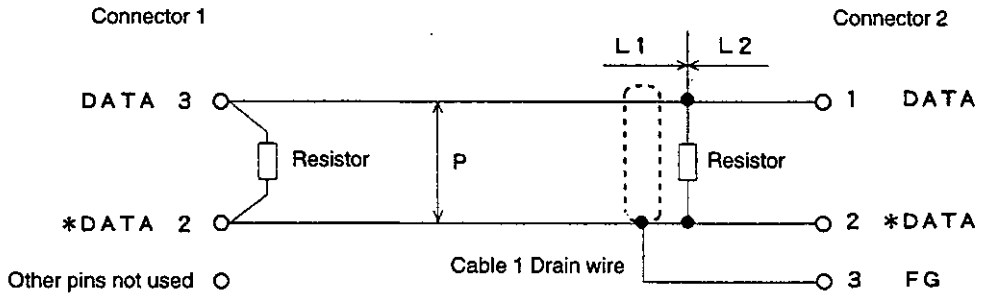
### (2) Appearance




### (3) Enlarged View of Section Indicated by *1



### (4) Connections




### (5) Cable Length

| L1 (mm) | L2 (mm) | Abbreviation | Model |
|---|---|---|---|
| $2500^{+150}_{0}$ | $30^{+10}_{0}$ | W0800-03 | JZMSZ-120W0800-03 |
| $15000^{+450}_{0}$ | $30^{+10}_{0}$ | W0800-15 | JZMSZ-120W0800-15 |

# Handling Devices

# 6

This chapter describes how to properly use the devices in the MEMOBUS PLUS Network.

# 6.1 Using Devices

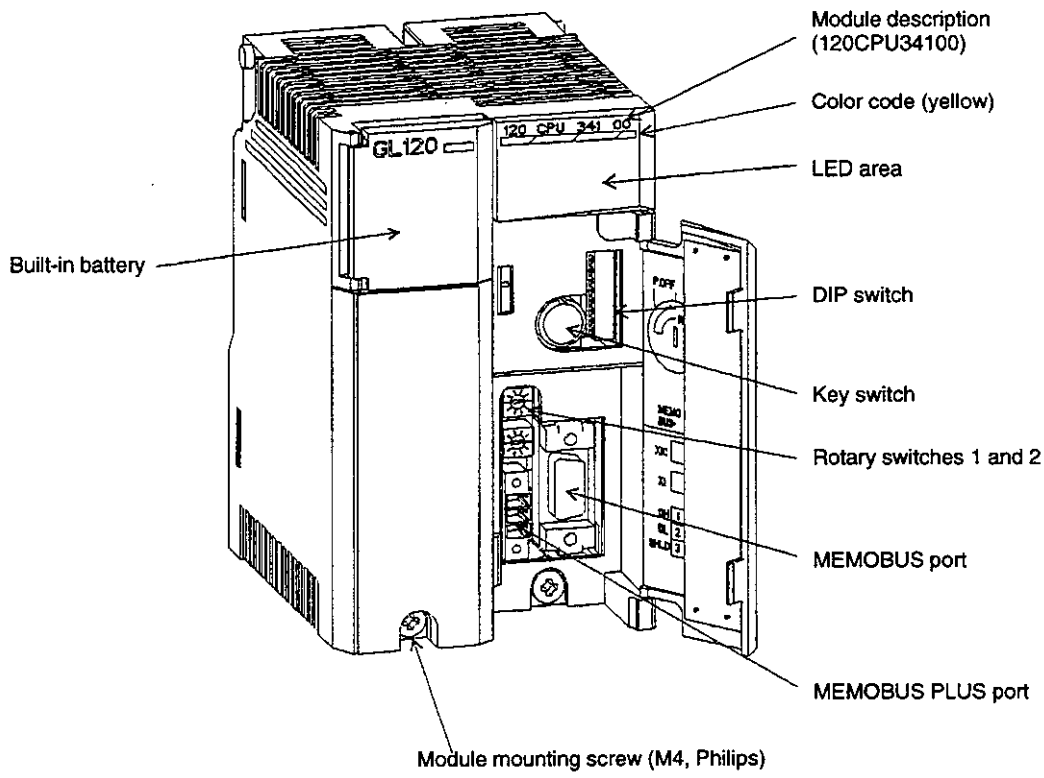
This section describes each device in a MEMOBUS PLUS Network.

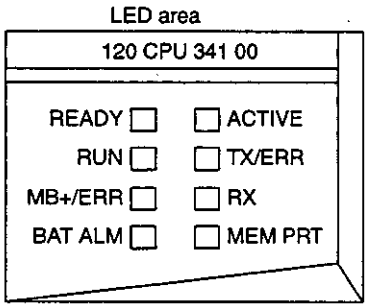


## 6.1.1 GL120, GL130

### 1) Appearance of CPU Module

The diagram below shows the appearance of the GL120/GL130 CPU Module. The model illustrated is the CPU20 (DDSCR-120CPU34100).



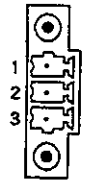



| LED | Color | Indication when ON |
|---|---|---|
| READY | Green | The CPU Module is normal. |
| RUN | Green | The CPU Module is running. |
| MB+/ERR | Green | The MEMOBUS PLUS port is transmitting/receiving data normally. |
| | Red | A transmission/reception error has occurred in the MEMOBUS PLUS port. |
| BAT ALM | Red | Voltage in the CPU Module's built-in battery is running down. |
| ACTIVE | Green | Access to the CPU Module from other Modules is possible. |
| TX/ERR | Green | The MEMOBUS port is transmitting data normally. |
| | Red | A transmission/reception error has occurred in the MEMOBUS port. |
| RX | Green | The MEMOBUS port is receiving data normally. |
| MEM PRT | Green | The key switch is set for memory protect ON. |

**Note** Replace the battery in the CPU Module within two weeks after the BAT ALM indicator lights (replacement battery: BR-2/3A-1). Programs or data stored in the CPU Module, 4-axis Motion Modules will be lost if replacement is delayed.

### 2) MEMOBUS PLUS Port

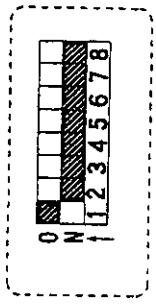
The MEMOBUS PLUS port connector is a terminal block connector (3-pin, female). The following diagram shows the pin arrangement and the signal names.




| Pin Number | Symbol | Signal Name |
|---|---|---|
| 1 | DH | DATA HIGH |
| 2 | DL | DATA LOW |
| 3 | SHLD | SHIELD |

### 3) DIP Switch

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




b) Each pin turns ON when it is moved to the left (toward the key switch).

c) Only pin 3 is used for the MEMOBUS PLUS system. Pin 3's function is shown below. The setting of pin 3 takes effect as soon as it is changed.

| Setting | Function |
|---|---|
| ON | Sets the CPU Module to Bridge Mode. |
| OFF | Releases the CPU Module from Bridge Mode. |

d) **Pin 3 Setting**

(1) When pin 3 is turned ON, the CPU Module will change to Bridge Mode. In this mode, the CPU Module's MEMOBUS Master connected to the MEMOBUS port can perform communications between transmission devices on the MEMOBUS PLUS Network.

(2) In Bridge Mode, the MEMOBUS Master must use the node address set for the MEMOBUS PLUS port to specify the communications partner on the network. For more information on node address setting, see *4) Rotary Switch.* In Bridge Mode, the slave address set for the MEMOBUS port is invalid.

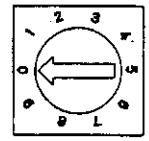
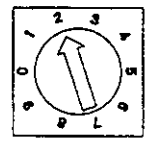
**4) Rotary Switch**

a) The rotary switches are used to set the node address at the MEMOBUS PLUS port.

b) There are two rotary switches; the upper switch is Rotary Switch 1 and the lower switch is Rotary Switch 2. Each switch has positions numbered from 0 to 9.

c) The node address is set between 1 and 64. The following table shows how to set the node address.

**Node Address Setting**

| Example Settings of Node Address 2 | Node Address | Rotary Switch 1 | Rotary Switch 2 |
|---|---|---|---|
| | 1 to 9 | 0 | 1 to 9 |
| Rotary switch 1  × 10 | 10 to 19 | 1 | 0 to 9 |
| | 20 to 29 | 2 | 0 to 9 |
| | 30 to 39 | 3 | 0 to 9 |
| | 40 to 49 | 4 | 0 to 9 |
| Rotary switch 2  × 1 | 50 to 59 | 5 | 0 to 9 |
| | 60 to 64 | 6 | 0 to 4 |

**Note** (1) The setting of the rotary switches is effective (read) when the AC power is turned ON to the Power Supply Module of the CPU Rack.

(2) Set the node address to between 1 and 64. If CPU Modules have settings outside this range, normal communications will not be possible.

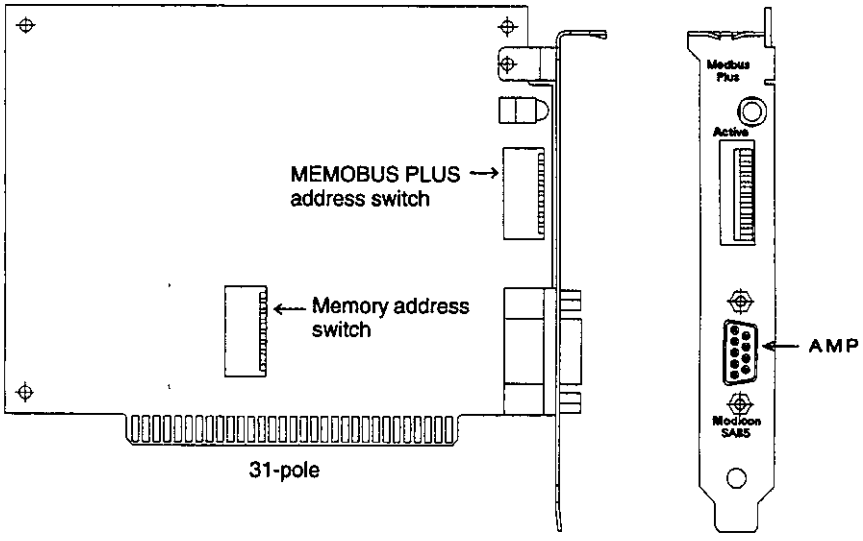
(3) The same node address must not be used more than once within a single Network. If transmission devices in the same Network have the same node address, correct communications will not be possible.

## 6.1.2 SA85 Network Adapter

### 1) Model

JAMSC-120NOM21120

### 2) Appearance of SA85




### 3) Hardware Components

a) Before installing the SA85 in the host computer (personal computer), set the node address and memory address switches. Refer to the following manual for further details.

- Manual Title: MEMOCON GL120, GL130
  MEMOBUS PLUS SA85 Network Adapter User's Manual
- Manual No.: SIEZ-C825-70.6

(1) Set the node address using the MEMOBUS PLUS address switch. When the node address is set, the SA85 will be recognized as a node on the MEMOBUS PLUS Network. The node address is assigned as a number used to transfer of tokens and messages.

(2) Set the memory address using the memory address switch. The SA85 uses the host computer's memory as its own status and communications buffer. To prevent conflicts with other optional boards on the host computer, a buffer address must be set for the SA85.

The range of possible addresses is C0000 to EF800 (hexadecimal). Two kilobytes (800 in hexadecimal) of memory area starting from the specified memory

address will be used for the SA85. To determine the usable memory areas, refer to the user's manual of the host computer. Be careful not to overlap with areas used by other applications.

b) After setting the node address and memory address, install the SA85 into an available expansion slot in the host computer and connect the cables.

**4) Software Components**

a) Before starting communications processing with the SA85, always perform the following procedure:

- Copy the device driver to the hard disk.
- Modify CONFIG.SYS.

Refer to the following manual for details.

- Manual title: MEMOCON GL120, GL130
  MEMOBUS PLUS SA85 Network Adapter User's Manual
- Manual No.: SIEZ-C825-70.6

b) Device driver setup involves the following tasks:

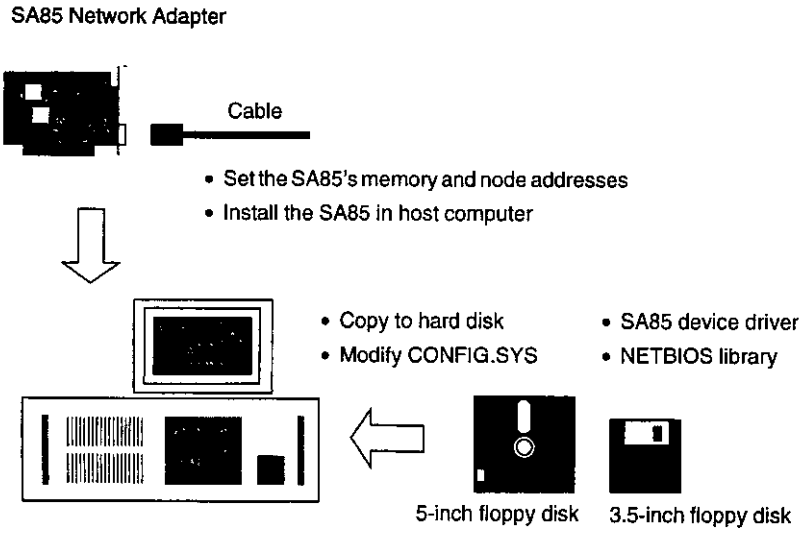
- Setting the adapter number (0 or 1)
- Setting the memory address
- Setting the software interrupt number

These parameters must be set according to the application to be used. These parameter settings are particularly important when the computer contains multiple optional functions.

c) The source codes, headers, and library contained in the floppy disk provided with the SA85 can be installed. Microsoft C can be used to include these programs in the application program, and compile or link them.

d) The SA85 is provided with the Network Diagnostic Utility and sample programs that show how to access PLC registers and global data.

e) The following diagram briefly illustrates how to install the SA85 in the host computer.




## 6.1.3 MEMOBUS PLUS Hub Modules

**1) Model**

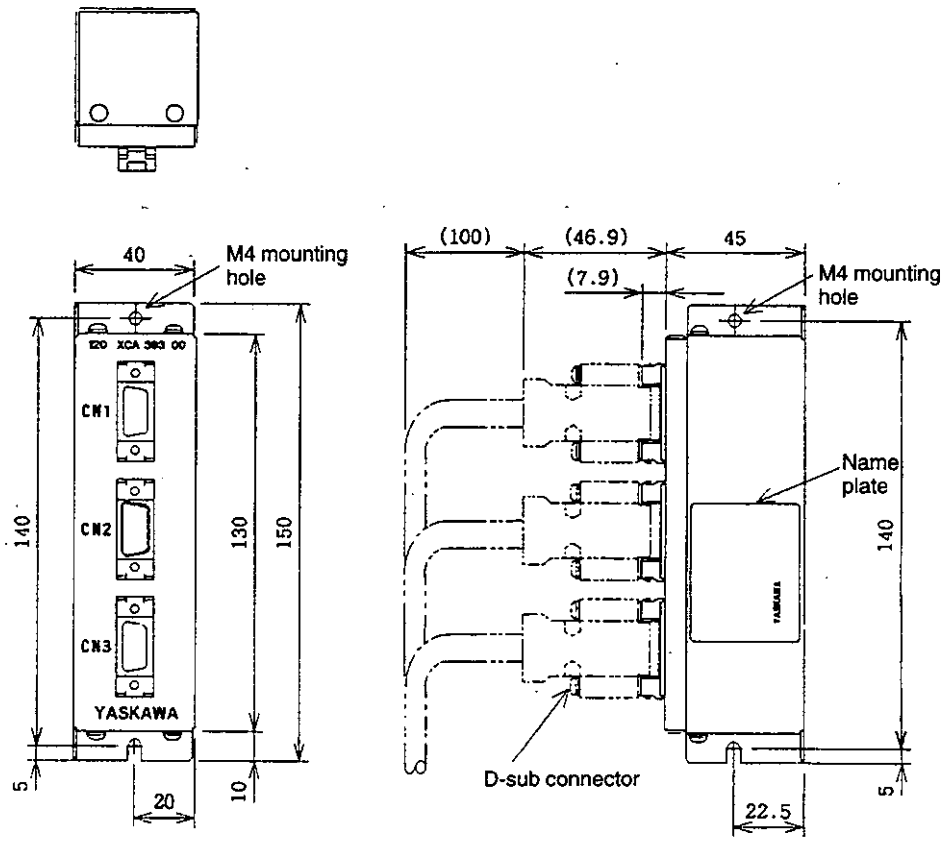
JAMSC-120XCA39300

**2) Application**

The Hub Module can be used in a MEMOBUS PLUS Network as follows:

- Connecting trunk line cables.
- Connecting a trunk line cable to a branch line cable.

### 3) Appearance of Hub Module




Unit: mm

Approx. mass: 250 g

# Appendix A

## Expansion Devices

# A.1 RR85 Repeater

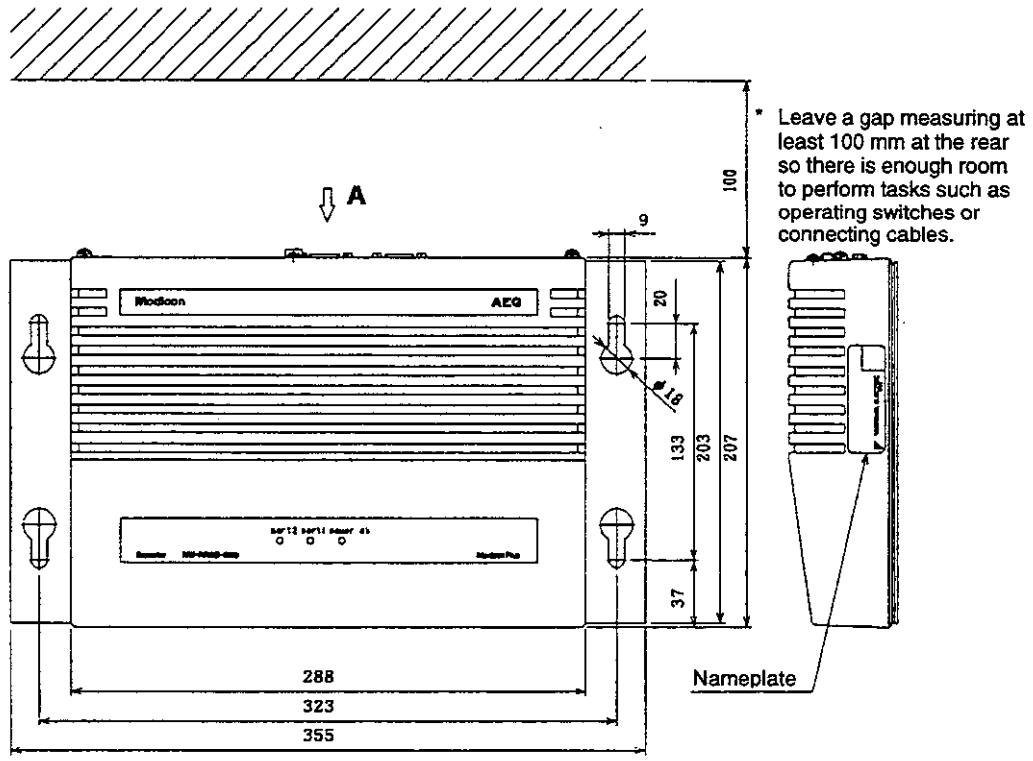
### 1) Model

JAMSC-120NRP21000

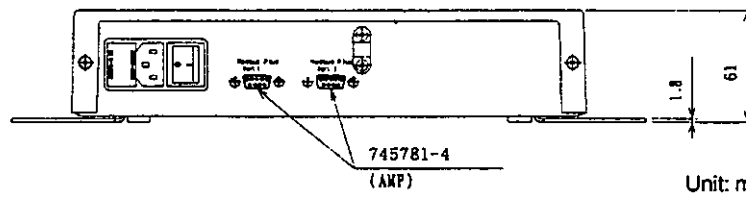
### 2) Application

The MEMOBUS PLUS Network can be expanded by using RR85 Repeaters. Up to three Repeaters can be connected to a single Network.

### 3) Appearance of RR85




**Viewed from Arrow A (Rear View)**




Unit: mm

Approx. mass: 2,200 g

# A.2 BP85 Bridge

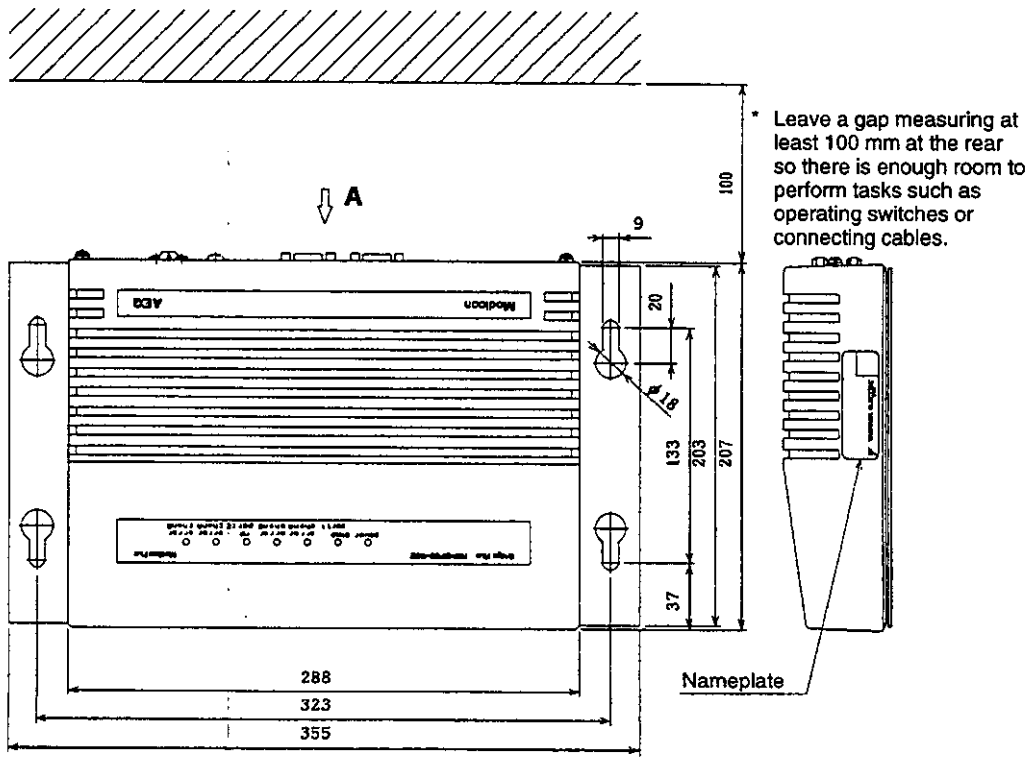
### 1) Model

JAMSC-120NBB21000

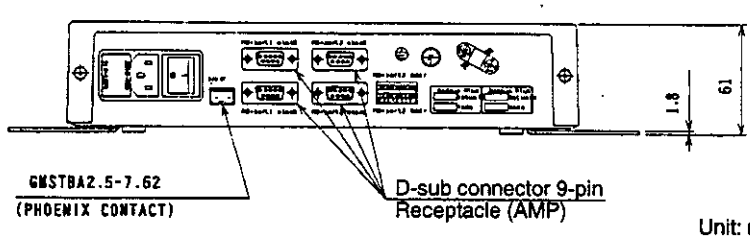
### 2) Application

Multiple MEMOBUS PLUS Networks can be connected together by using BP85 Bridges.

### 3) Appearance of BP85




**Viewed from Arrow A (Rear View)**




Unit: mm

Approx. mass: 2,300 g

# A.3 BM85 Bridge/Multiplexer

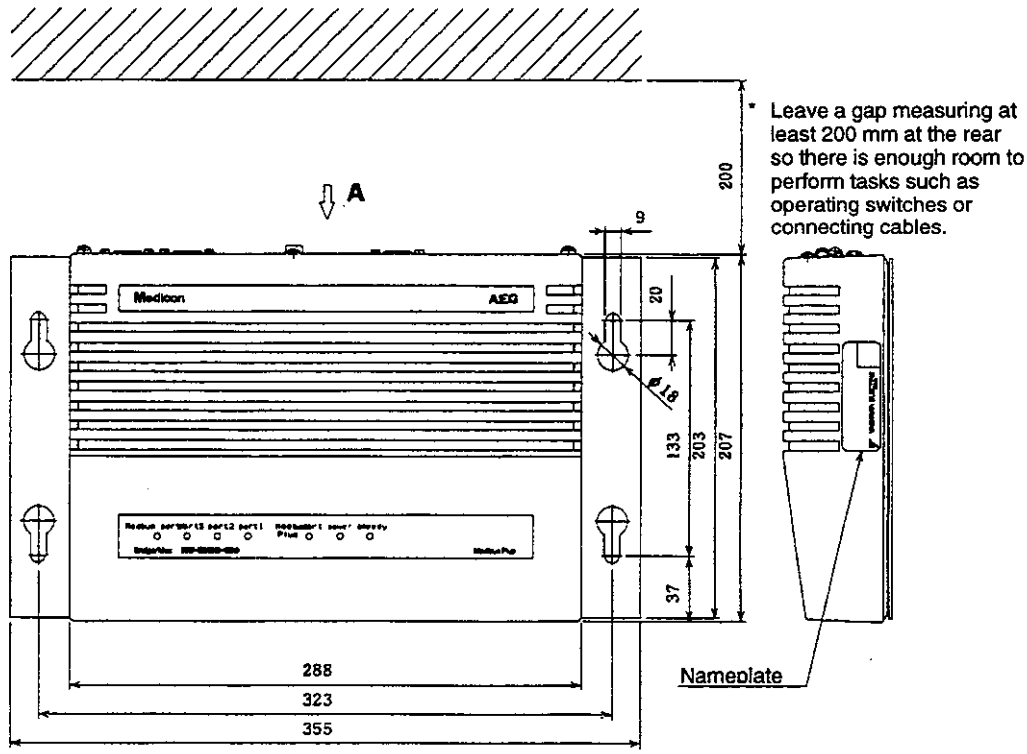
### 1) Model

JAMSC-120NBB26000

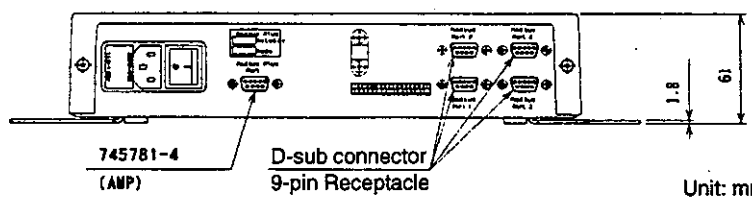
### 2) Application

MEMOBUS devices can be connected to a MEMOBUS PLUS Network by using a BM85 Bridge/Multiplexer.

### 3) Appearance of BM85




**Viewed from Arrow A (Rear View)**




Unit: mm

Approx. mass: 2,400 g

# INDEX

## B



## C



## D



## E



## G



## H

## I



## L



## M



## N



## O–P



## R



## S

# T



# W

# MEMOCON GL120, GL130
# MEMOBUS PLUS
# USER'S MANUAL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