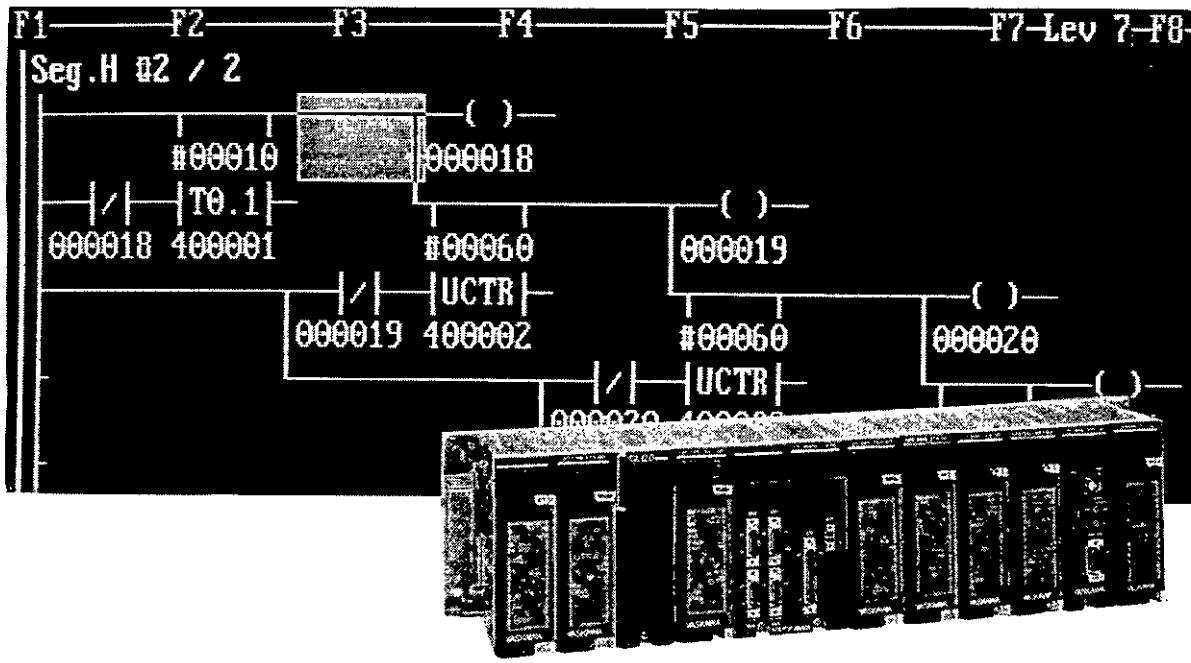
MEMOCON GL120, GL130

1000/2000-SERIES COAXIAL REMOTE I/O SYSTEM

USER'S MANUAL



YASKAWA

MANUAL NO. SIEZ-C825-70.9

Manual Contents

This manual describes specifications and applications of 1000/2000-series Coaxial Remote I/O System.

Please read this manual carefully and be sure you understand the information provided before attempting to use 1000/2000-series Coaxial Remote I/O System.

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

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

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I.1 Overview

- This manual describes how to use the 1000/2000-series Remote I/O Modules. Read this manual carefully to ensure the proper use of the Remote I/O Modules. Also, keep this manual in a safe place so that it can be used whenever necessary.

- The following Remote I/O Modules are discussed in this manual.

  JAMSC-120CRD13110 2000-series Remote I/O Driver Module

  JAMSC-IF70 2000-series Remote I/O Receiver Module

  JAMSC-IF70T 1000-series Remote I/O Receiver Module

  DISCT-J1060 1000-series Remote I/O Adapter

- Refer to the following related manuals as required.

Manual	Manual Number	Contents
MEMOCON GL120, GL130 Hardware User's Manual	SIEZ-C825-20.1	Describes the system configuration, system components, functions, specifications, installation, wiring, and external appearance of the GL120 and GL130.
MEMOCON GL120, GL130 Software User's Manual, Volume 1	SIEZ-C825-20.11	Describes the following for the GL120 and GL130: 1) Operating principles 2) I/O allocation 3) Overview of instructions 4) Instruction processing times
MEMOCON GL120, GL130 MEMOSOFT for P120 Programming Panel User's Manual	SIEZ-C825-60.7	Describes the functions, specifications, and usage of the P120 Programming Panel with MEMOSOFT.
MEMOCON GL120, GL130 MEMOSOFT for DOS User's Manual	SIEZ-C825-60.10	Describes the features and operating procedures of the DOS version of MEMOSOFT.
MEMOCON GL120, GL130 MEMOBUS User's Manual	SIEZ-C825-70.13	Describes the functions, specifications, and usage of the MEMOBUS.
MEMOCON GL120, GL130 COM Instructions User's Manual	SIEZ-C825-70.14	Describes the functions, specifications, and usage of the COM instructions. It also describes the specifications and usage of the MEMOBUS Module.
MEMOCON-SC GL60S Remote I/O System User's Manual	SIE-C815-14.7	Describes the functions, specifications, and usage of the GL60S Coaxial Remote I/O System.

- 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.**

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I.2.1 Safety Precautions

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

- This product has been manufactured under strict quality control guidelines. However, if this product is to be installed in any location in which a failure of 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 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 document number listed on the front cover of this manual when ordering.

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

- Yaskawa cannot make any quality guarantee for 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 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.

⚠**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.

⚠**Caution** Do not allow wire clippings or other foreign matter to enter the MEMOCON.

Foreign matter can cause fires, product failure, or malfunctions.

I.2.3 Wiring Precautions

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

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

Insert the Interface Cables Properly.

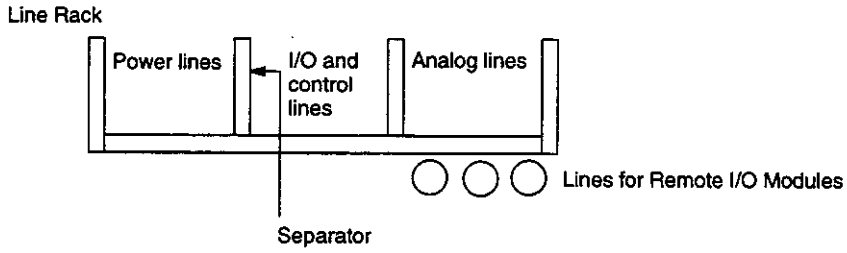
⚠**Caution** Insert the connectors of the various interface cables that are to be connected to MEMOCON into the communication ports and attach them properly.

Improper insertion of interface cables may cause operational errors in the MEMOCON.

Separate Wiring Properly.

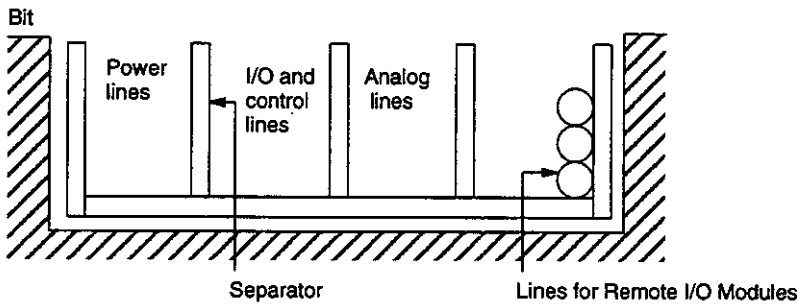
⚠ **Caution** I/O lines connecting the MEMOCON to external devices must be selected based on the following considerations: mechanical strength, resistance to noise, wiring distance, signal voltage, etc.

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



⚠ **Caution** When wiring Remote I/O 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.



I.2.4 Applications Precautions

⚠Caution The 2000-series Remote I/O Driver Module can be used only if the CPU Module and the MEMOSOFT used for the MEMOCON GL120, GL130 are of the versions shown in the following table.

Using the wrong versions may result in failure or malfunction.

Name	Description	Model	Applicable Version	Location of Version Indication
CPU Module (8 kW)	CPU10	DDSCR-120CPU14200	□□A01 or later	Nameplate of the Module (see note.)
CPU Module (16 kW)	CPU20	DDSCR-120CPU34100	□□B01 or later	
CPU Module (16 kW)	CPU21	DDSCR-120CPU34110	□□A01 or later	
CPU Module (32 kW)	CPU30	DDSCR-130CPU54100	□□B01 or later	
CPU Module (40 kW)	CPU35	DDSCR-130CPU54110	□□A01 or later	
MEMOSOFT		FMSGL-AT3 (for DOS)	1.31□ or later	Bottom center of MEMOSOFT startup screen
		FMSGL-PP3 (for P120)		
		FMSGL-PP3E (for P120)		

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

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

Operational errors may damage the machine or cause accidents.

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

Touching live terminals may cause electric shock.

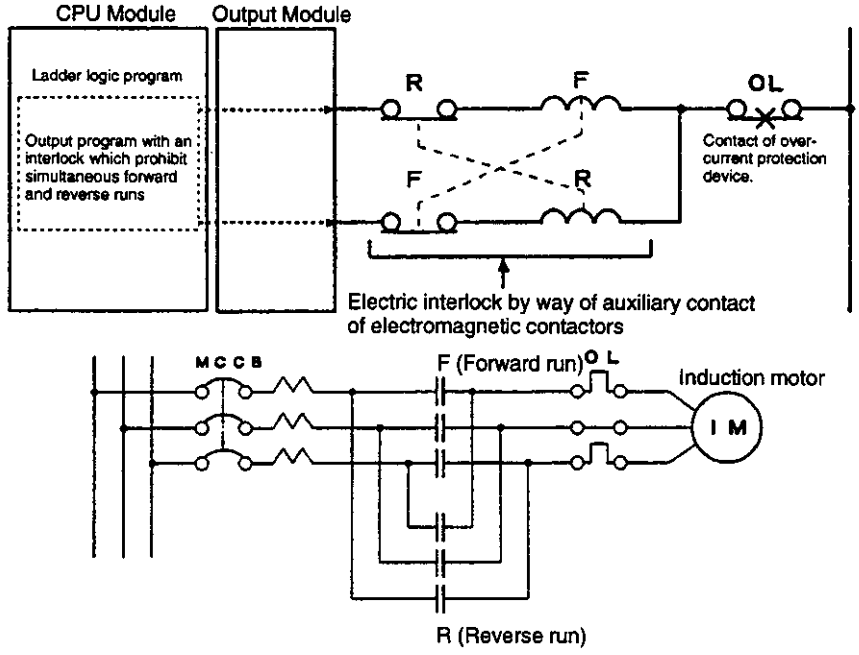
⚠ **WARNING** Externally connect emergency stop, interlock circuits, and other switches to the MEMOCON.

External Interlocks for the GL120 and GL130

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

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

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



I.2.5 Maintenance

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

Make sure that equipment power is turned OFF before mounting or removing the MEMOCON Modules.

⚠ **WARNING** Turn OFF the power supply before installing or removing a Remote I/O Driver Module.

Otherwise, an electric shock, an operation error, or a fault may occur.

I.3 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.

- **Basic Abbreviations**

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

  - **Remote I/O = Remote I/O System**
  - **Remote I/O Driver = Remote I/O Driver Module**
  - **Remote I/O Receiver = Remote I/O Receiver Module**
  - **PLC = Programmable (Logic) Controller**
  - **PP = Programming Panel**
  - **GL120, GL130 = MEMOCON GL120 and/or MEMOCON GL130 Programmable Controller**

Overview of Remote I/O System

1

This chapter outlines the Remote I/O System and the system configuration.

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1.2 System Configuration 1-3

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1.2.2 Definition of I/O Sections 1-4

1.2.3 Precautions on the System Configuration 1-4

1.1 Remote I/O System

This section gives an overview of the 2000-series Remote I/O System.

Overview

1) The 2000-series Remote I/O System is a communications system for installing 2000-series I/O sections and 1000-series I/O sections in remote locations.

2) Remote I/O consists of a Remote I/O Driver Module and a Remote I/O Receiver Module, which respectively function as a master station and a slave station on a remote communications line.

3) A Remote I/O Receiver Module has one MEMOBUS port. By connecting a P120 Programing Panel or a personal computer to this MEMOBUS port, programming and monitoring for the CPU Module are enabled.

4) All 2000-series and 1000-series I/O Modules can be used at remote stations.

5) Data can be transmitted over distances of up to 1 kilometer by selecting the baud rate and cable type.

In this manual, the term "2000-series Remote I/O Driver" is used for the Remote I/O Driver Module. This Module, however, can be used for both 1000-series and 2000-series I/O Modules.

1.2 System Configuration

This section describes the system configuration of Remote I/O and definition of the I/O sections.

1.2.1 Overview 1-3
1.2.2 Definition of I/O Sections 1-4
1.2.3 Precautions on the System Configuration 1-4

1.2.1 Overview

Figure 1.1 illustrates the system configuration of Remote I/O.

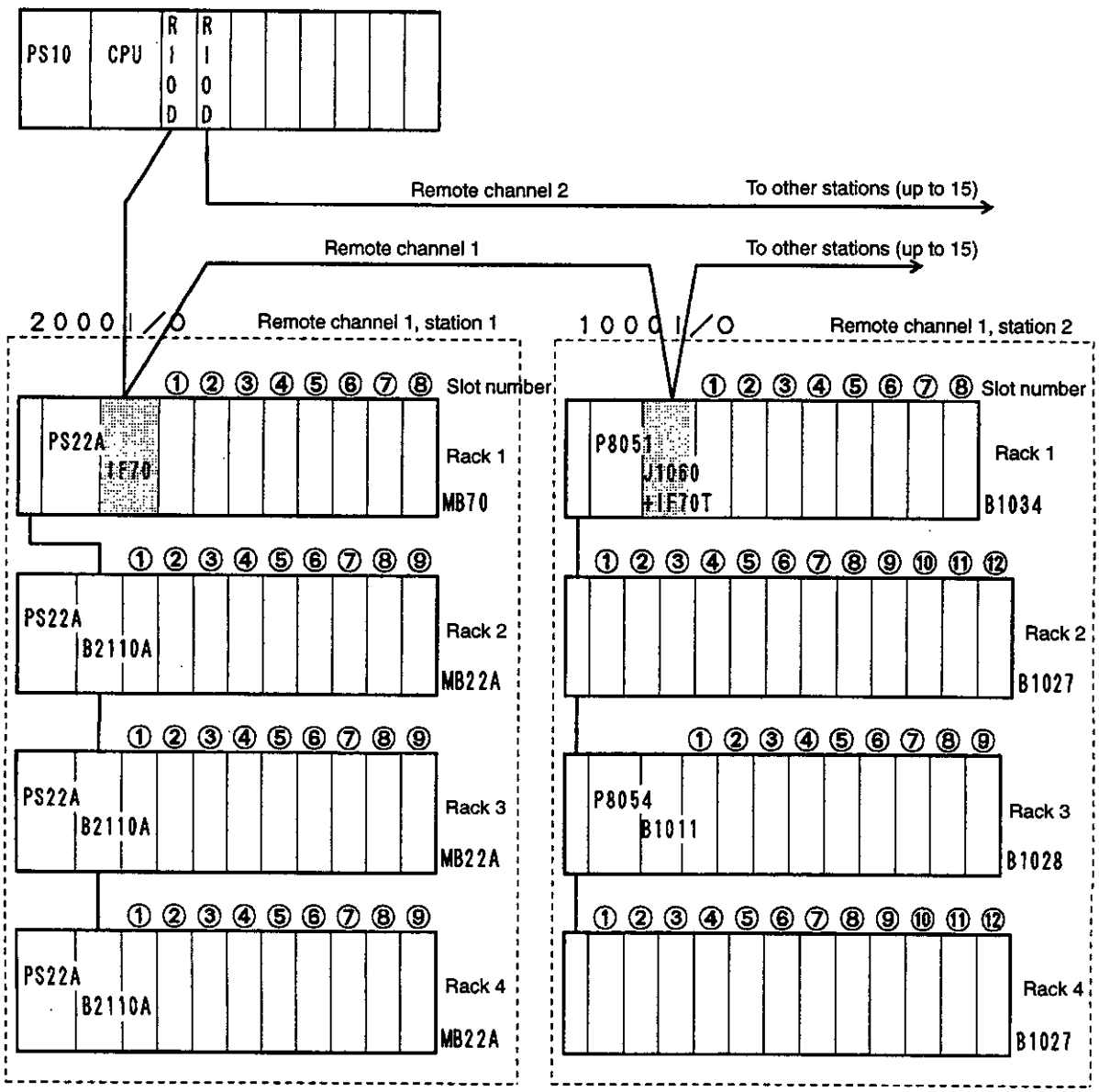

Figure 1.1 System Configuration Diagram

1.2.2 Definition of I/O Sections

1) Local Channel

The local channel includes all the I/O Modules mounted on the Mounting Base where the GL120 or GL130 CPU Module is installed, and all the I/O Modules mounted on Mounting Bases connected by Rack-to-rack Cables via I/O Expander Modules located on the right end of the Mounting Bases.

2) Remote Channels

A remote channel includes all of the I/O connected by a remote cable from a 2000-series Remote I/O Driver Module. Up to two Remote I/O Driver Modules can be installed on the GL120 and GL130 and these Modules are identified as remote channel 1 and remote channel 2. Remote channel numbers are set with a switch on the Remote I/O Driver Modules.

3) Remote Stations

A remote station includes all of the I/O Modules installed on the Mounting Base where a 2000-series Remote I/O Receiver Module and a 1000-series Remote I/O Receiver Module are installed, and all the I/O Modules installed on the Mounting Base connected with rack-to-rack cables via I/O Expander Modules. Up to 15 (from 1 to 15) station addresses can be assigned to remote stations for identification. The same station address cannot be assigned more than once within a remote channel. Station addresses are set using the rotary switches on the 2000-series and 1000-series Remote I/O Receiver Modules. The numbers set by the rotary switches must be the same as the station addresses.

4) Racks

A rack includes all of the I/O Modules installed on one Mounting Base. Rack numbers from 1 to 4 are assigned to the racks.

5) Slots

A slot is one of connectors for the various types of Modules that can be installed on a Mounting Base.

1.2.3 Precautions on the System Configuration

1) Station Combinations

Within the same channel, 120-series remote stations and 2000-series (or 1000-series) remote stations cannot be mixed. However, 2000-series remote stations and 1000-series remote stations can be mixed.

2) Numberd of Racks, Slots, and Modules

The numbers of racks, slots, and Modules that can be used is determined by the type and revisions of the Modules used in the remote station. The following table shows the numbers of racks, slots, and Modules that can be used according to the Module types and revisions.

Module Type	2000-series Remote I/O	1000-series Remote I/O		
	IF70	J1060□ + IF70T ↑ Revision A or Earlier	J1060 + IF70T	J1060A + IF70T ↑ Revision B or Later
Number of Racks	4	4	4	4
Number of Slots				
Rack 1	8	8	8	8
Rack 2	9	9	9	12
Rack 3	9	9	9	9
Rack 4	9	9	9	12
Maximum Number of Modules	35	35	35	38 Full slots cannot be allocated.

Note J1060□: Indicates a J1060 or J1060A Adapter.
Revision: The revision is given as a letter of the alphabet on the bottom of the IF70T Module.

Remote I/O Specifications

2

This chapter provides the Remote I/O specifications.

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2.1 Remote I/O Driver Module

This section provides the names and specifications of each component of the 2000-series Remote I/O Driver.

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2.1.1 Names of Components

The following diagram shows the name of each component.

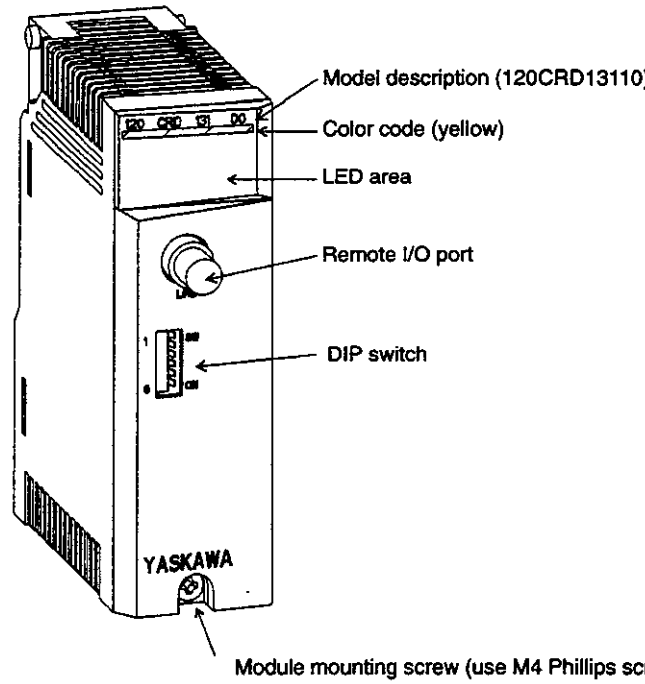
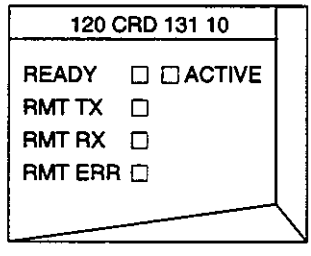


Figure 2.1 Appearance of 2000-series Remote I/O Driver Module

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 a communications on the remote I/O port.

If a status error occurs, the READY indicator will turn 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, turn OFF for 1 s, and then repeat this cycle.
Common Memory Error	RMT ERR will flash three times, turn OFF for 1 s, and then repeat this cycle.
Watchdog Timer Error	RMT ERR will flash four times, turn OFF for 1 s, and then repeat this cycle.

2.1.2 General Specifications

The general specifications of 2000-series Remote I/O Driver Modules is given in the following table.

Table 2.1 General Specifications of 2000-series Remote I/O Driver Module

Item		Specifications
Physical Environment	**Ambient Operating Temperature**	0 to 60 °C
	Ambient Storage Temperature	–25 to 85 °C
	Ambient Operating Humidity	30% to 95% RH (with no condensation)
	Ambient Storage Humidity	5% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 according to JIS B3501.
	Corrosive Gas	No corrosive gas
	Operating Altitude	Less than 2,000 m above sea level
Mechanical Operating Conditions	**Vibration Resistance**	Complies with JIS B3502: 10 to 57 Hz: Single amplitude 0.075 mm 57 to 150 Hz: Fixed acceleration 9.8 m/s^2 (1G) 10 sweep cycles in directions X, Y, and Z. (Sweep time: 1 octave/min)
	Shock Resistance	Complies with JIS B3502: Acceleration peak value: 147 m/s^2 (15G) Usage time: 11 ms Shock direction: Twice in directions ±X, ±Y, and ±Z.
Electrical Operating Conditions	**Noise Immunity**	Complies with JIS B3502: 1,500 $V_{(p-p)}$ in either normal or common mode with a pulse width of 100 ns/1 µs and a pulse rise time of 1 ns (tested with impulse noise simulator)
Dielectric Strength		Between all I/O terminals and internal circuit, and between I/O common terminals: 1,500 VAC (for 1 min) or 1,800 VAC (for 1 s)
Insulation Resistance		Between all I/O terminals and ground: At least 100 MΩ (at normal temperature and humidity) when measured with a 500-VDC insulation resistance tester.
Installation Requirements	**Ground**	Ground to 100 Ω or less
	Configuration	Building-block structure Wall-mounted or DIN track-mounted (either possible)
	Cooling Method	Natural cooling

2.1.3 Performance Specifications

The following table lists the performance specifications for the 2000-series Remote I/O Driver Module.

Table 2.2 2000-series Remote I/O Driver Module Specifications

Item		Specifications
Model Name		RIOD-2000
Model Number		JAMSC-120CRD13110
Dimensions		40.3 × 130 × 103.9 mm (W × H × D)
Mass		Approx. 300 g
Internal Current Consumption		800 mA
Heat Generation		4.0 W max.
Hot Swapping (Removal/Insertion under Power)		Not permitted.
Remote I/O Port Specifications	**Topology (Communications Network Configuration)**	Bus
	Media Access Control Method	Multi-drop (1:n communications)
	Media (Transmission Medium)	Coaxial cable (75 Ω)
	Modulation Method	Baseband
	Encoding Method	Manchester coding
	Baud Rate	Choose from 0.5, 1, 2, and 4 Mbps
	Transmission Distance	Transmission distance varies according to the band rate and the 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 max.
	Number of Stations	15 max. (Up to 15 Remote I/O Receiver Modules are connectable.)
	Error Control (RAS)	Automatic removal and recovery function for error stations
	Synchronization Method	Frame
	Communications Format	Conforms to HDLC.
	Insulation Method	Pulse transformer
	Connector	BNC connector

In this manual, the term "2000-series Remote I/O Driver" is used for the Remote I/O Driver Module. This Module, however, can be used for both 1000-series and 2000-series I/O Modules.

2.1.4 Functions

The 2000-series Remote I/O Driver Module functions as a master station for the Remote I/O System.

1) Remote I/O Port

The 2000-series Remote I/O Driver, 2000-series Remote I/O Receiver, and 1000-series Remote I/O Receiver each have one remote I/O port for data communications. The Remote I/O System is configured by connecting these ports with coaxial cable.

2) 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 AC power is turned On to the Power Supply Module of Rack 1 (CPU Rack).

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

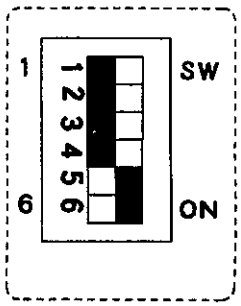


Table 2.3 Functions of DIP Switch

Pin No.	Settings	Function			
1	ON	Sets Module to self diagnosis mode.			
	OFF	Sets Module to remote mode.			
2	ON	Not used. Set to OFF.			
	OFF				
3	ON	Sets Module to master station of channel 2.			
	OFF	Sets Module to master station of channel 1.			
4	ON	Not used. Set to 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

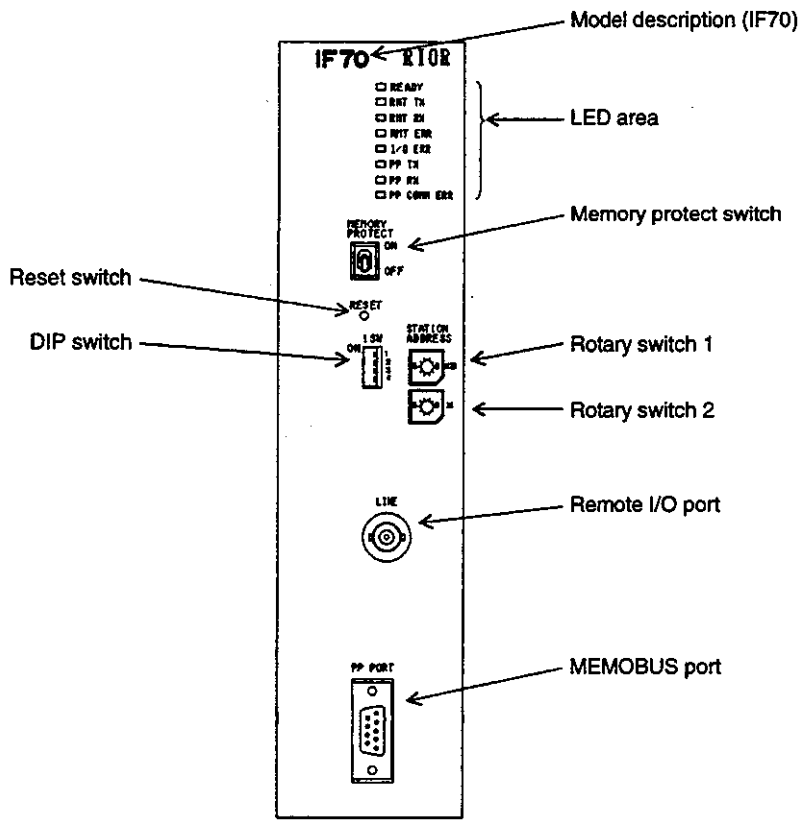
2.2 2000-series Remote I/O Receiver Module

This section gives the names and specifications of each component of the 2000-series Remote I/O Receiver Module.

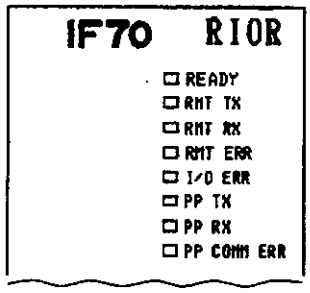
2.2.1 Names of Components 2-6
2.2.2 General Specifications 2-7
2.2.3 Performance Specifications 2-8
2.2.4 Functions 2-9

2.2.1 Names of Components

The following diagram shows the name of each component.



LED area



LED	Color	Indication when ON
READY	Green	Module is operating normally.
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.
I/O ERR	Red	An error has occurred during Module I/O processing.
RMT ERR	Red	An error has occurred in the communications for 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 COMM ERR	Red	An error has occurred in the transmission from the MEMOBUS port.

2.2.2 General Specifications

The following table shows the general specifications for the 2000-series Remote I/O Receiver Module.

Table 2.4 General Specifications of 2000-series Remote I/O Receiver Module

Item		Specifications
Physical Environment	**Ambient Operating Temperature**	0 to 55 °C
	Ambient Storage Temperature	–20 to 85 °C
	Ambient Operating Humidity	30% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 according to JIS B3501.
	Corrosive Gas	No corrosive gas.
Mechanical Operating Conditions	**Vibration Resistance**	Complies with JIS B3502 10 to 57 Hz: Single amplitude 0.075 mm 57 to 150 Hz: Fixed acceleration 9.8 m/s^2 (1G) 10 sweep cycles in directions X, Y, and Z. (Sweep time: 1 octave/min)
	Shock Resistance	Complies with JIS B3502 Acceleration peak value: 147 m/s^2 (15G) Usage time: 11 ms Shock direction: Twice in directions ±X, ±Y, and ±Z.
Electrical Operating Conditions	**Noise Immunity**	Complies with JIS B3502: 1,500 $V_{(p-p)}$ in either normal or common mode with a pulse width of 100 ns/1 µs and a pulse rise time of 1 ns (tested with impulse noise simulator)
Dielectric Strength		Between all I/O terminals and internal circuit, and between I/O common terminals: 1,500 VAC (for 1 min)
Insulation Resistance		Between all I/O terminals and ground: At least 100 MΩ (at normal temperature and humidity) when measured with a 500-VDC insulation resistance tester
Installation Requirements	**Ground**	Ground to 100 Ω or less
	Configuration	Building-block structure. Wall-mounted or DIN track-mounted (either possible)
	Cooling Method	Natural cooling

2.2.3 Performance Specifications

The following table lists the performance specifications for the 2000-series Remote I/O Driver Module.

Table 2.5 2000-series Remote I/O Receiver Module Specifications

Item		Specifications
Model Number		JAMSC-IF70
Dimensions		59.8 × 250 × 94 mm (W × H × D)
Mass		Approx. 600 g
Internal Current Consumption		2.4 A
Heat Generation		12 W max.
Hot Swapping (Removal/Insertion under Power)		Not permitted.
Remote I/O Port Specifications	**Topology (Communications Network Configuration)**	Bus
	Media Access Control Method	Multi-drop (1:n communications)
	Media (Transmission Medium)	Coaxial cable (75 Ω)
	Modulation Method	Baseband
	Encoding Method	Manchester coding
	Baud Rate	Choose from 0.5, 1, 2 and 4 Mbps
	Transmission Distance	Transmission distance varies according to the band rate and the 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 max.
	Number of Stations	15 max. (Up to 15 Remote I/O Receiver Modules are connectable.)
	Error Control (RAS)	Automatic removal and recovery function for error stations
	Synchronization Method	Frame
	Communications Format	Conforms to HDLC.
	Insulation Method	Pulse transformer
	Connector	BNC connector
MEMOBUS Port Specifications	**Communications Method**	Half-duplex asynchronous method
	Transmission Levels	Conform to RS-232C
	Protocol	MEMOBUS protocol
	Baud Rate	9,600 bps
	Communications Mode	RTU 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) 2) Parity check: Yes 3) Parity: 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)
	Connector	D-sub connector (9-pin, female)

2.2.4 Functions

The 2000-series Remote I/O Receiver Module functions as a slave station for the Remote I/O System.

1) Remote I/O Port

The 2000-series Remote I/O Driver, 2000-series Remote I/O Receiver, and 1000-series Remote I/O Receiver each have one remote I/O port for data communications. The Remote I/O System is configured by connecting these ports with coaxial cable.

2) MEMOBUS Port

a) The 2000-series Remote I/O Receiver Module can perform communications (slave communications) using an RS-232C interface via a MEMOBUS port. The MEMOBUS protocol is used as the communications protocol.

b) The following table shows an example of the devices that can be connected to the MEMOBUS port. An RS-232C interface must be provided by these devices.

Table 2.6 Example of Devices Connectable to the MEMOBUS Port

Type	Device	Remarks
MEMOBUS Master	P120-series Programming Panel	• Communications performed using the MEMOBUS protocol. • No communications program needs to be created. • 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	

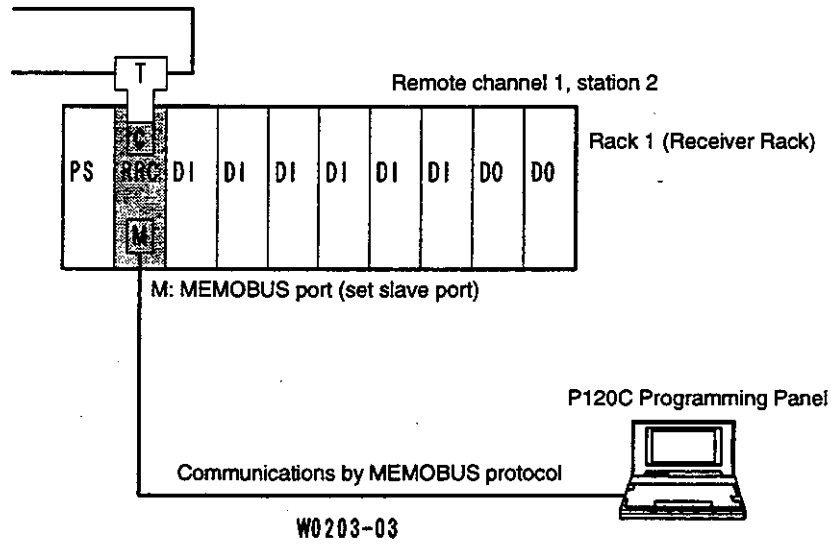
c) Number of Connectable MEMOBUS Masters

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) See *Table 2.5* for the transmission specifications of the MEMOBUS port.

e) An example using the MEMOBUS port is shown below.

◀EXAMPLE▶ **Connecting Programming Panel to MEMOBUS Port**

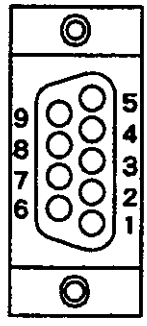


PS:	Power Supply Module	DO:	Output Module
RRC:	Remote I/O Receiver Module	MB:	Mounting Base
DI:	Input Module	W0203-03:	MEMOBUS Cable (2.5 m)

Figure 2.2 Using the MEMOBUS Port

f) 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 2.7 Pin Arrangement and the Signal Names of MEMOBUS Port

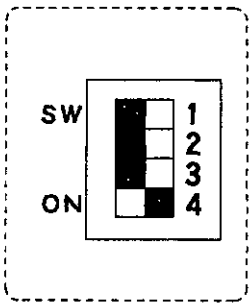


Pin No.	Symbol	Signal Name
1	FG	Protective ground
2	TXD	Transmission data
3	RXD	Reception data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	Signal ground
8	–	Not used
9	DTR	Data terminal ready

3) DIP Switch

The baud rate for the 2000-series Remote I/O Receiver Module is set using the DIP switch on the front panel of the Module. The DIP switch can be set either before or after the Module is installed. The switch settings are read and stored when the Module is turned ON or reset.

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



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

c) Each pin becomes effective at the following times.

Pin 3 and pin 4: When the reset switch is pressed, or when AC 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 2.8 Function of DIP Switch

Pin No.	Settings	Function			
1	ON	Not used. Set to OFF.			
	OFF				
2	ON	Not used. Set to OFF.			
	OFF				
3 4	Set the baud rate of Remote I/O System according to the table shown on the right.		Pin 3	Pin 4	Baud Rate
			ON	ON	4 Mbps
			ON	OFF	2 Mbps
			OFF	ON	1 Mbps
			OFF	OFF	0.5 Mbps

4) Rotary Switches

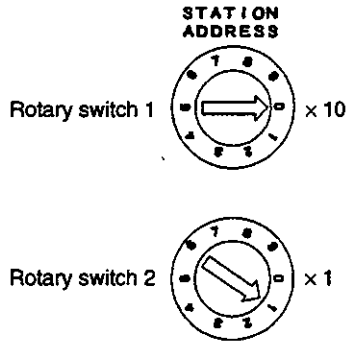
a) The rotary switches are used to set the station address of the Remote I/O Receiver Module.

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 form 0 to 9.

c) The settings of the rotary switches are effective (read) when the reset switch is pressed, or when AC 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 2.9 Setting the Station Address

Example Settings of Station Address 1	Station Address	Rotary Switch 1	Rotary Switch 2
	1 to 9	0	1 to 9
	10 to 15	1	0 to 5
	0 or 16 to 99	Not permitted.	

Note (1) Set 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.

5) Reset Switch

a) Press the reset switch in the following cases.

(1) When you have changed the setting of DIP switch pin 3 or 4.

(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.

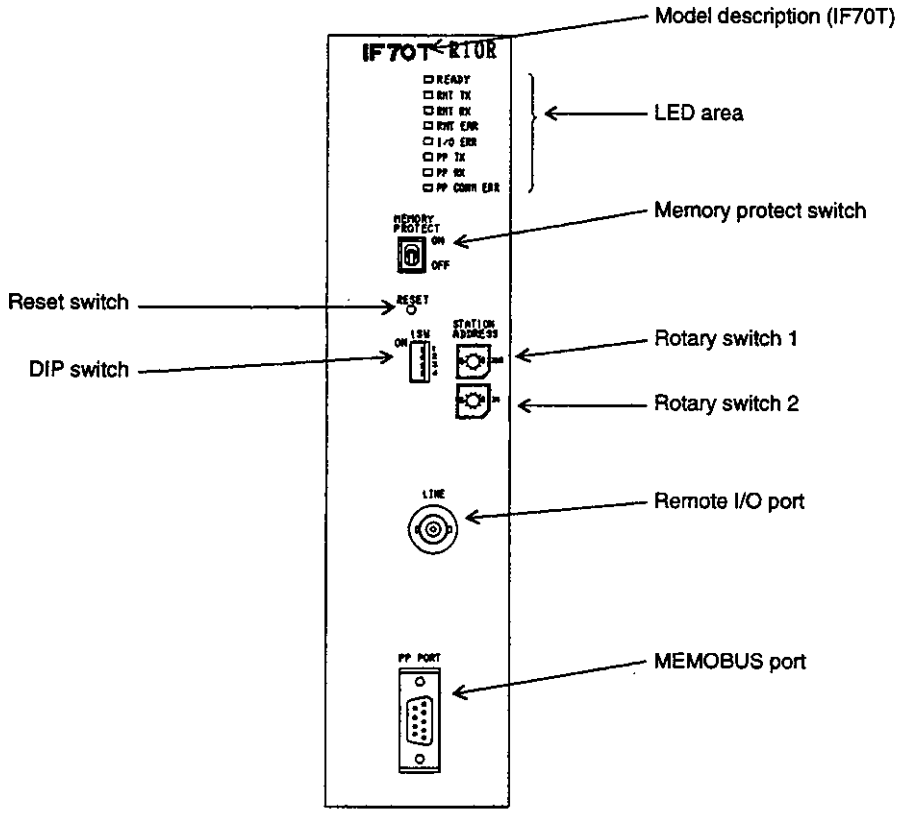
2.3 1000-series Remote I/O Receiver Module

This section provides the names and specifications of each component of the 1000-series Remote I/O Receiver.

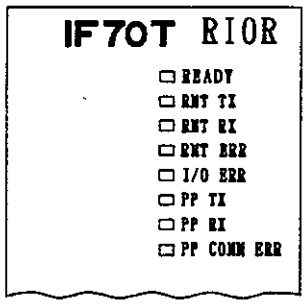
2.3.1 Names of Components 2-13
2.3.2 General Specifications 2-15
2.3.3 Performance Specifications 2-16
2.3.4 Functions 2-17

2.3.1 Names of Components

The following diagram shows the name of each component.



LED area



LED	Color	Indication when ON
READY	Green	Module is operating normally.
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.
I/O ERR	Red	An error has occurred during Module I/O processing.
RMT ERR	Red	An error has occurred in the communications for 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 COMM ERR	Red	An error has occurred in the transmission from the MEMOBUS port.

Note The 1000-series Remote I/O Receiver Module (IF70T) is used in conjunction with a 1000-series I/O Adapter (J1060).

2.3.2 General Specifications

The following table lists the general specifications for the 1000-series Remote I/O Receiver Module.

Table 2.10 General Specifications of 1000-series Remote I/O Receiver Module

Item		Specifications
Physical Environment	Ambient Operating Temperature	0 to 55 °C
	Ambient Storage Temperature	–20 to 85 °C
	Ambient Operating Humidity	30% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 according to JIS B3501.
	Corrosive Gas	No corrosive gas
Mechanical Operating Conditions	Vibration Resistance	Complies with JIS B3502: 10 to 57 Hz: Single amplitude 0.075 mm 57 to 150 Hz: Fixed acceleration 9.8 m/s^2 (1G) 10 sweep cycles in directions X, Y, and Z. (Sweep time: 1 octave/min)
	Shock Resistance	Complies with JIS B3502: Acceleration peak value: 147 m/s^2 (15G) Usage time: 11 ms Shock direction: Twice in directions ±X, ±Y, and ±Z.
Electrical Operating Conditions	Noise Immunity	Complies with JIS B3502: 1,500 $V_{(p-p)}$ in either normal or common mode with a pulse width of 100 ns/1 µs and a pulse rise time of 1 ns (tested with impulse noise simulator)
Dielectric Strength		Between all I/O terminals and internal circuit, and between I/O common terminals: 1,500 VAC (for 1 min)
Insulation Resistance		Between all I/O terminals and ground: At least 100 MΩ (at normal temperature and humidity) when measured with a 500-VDC insulation resistance tester
Installation Requirements	Ground	Ground to 100Ω or less
	Configuration	Building-block structure Wall-mounted or DIN track-mounted (either possible)
	Cooling Method	Natural cooling

2.3.3 Performance Specifications

The following table lists the performance specifications for the 1000-series Remote I/O Receiver Module.

Table 2.11 1000-series Remote I/O Receiver Module Specifications

Item		Specifications
Model Number		JAMSC-IF70T
Dimensions		59.8 × 250 × 94 mm (W × H × D)
Mass		Approx. 600 g
Internal Current Consumption		2.4 A
Heat Generation		12 W max.
Hot Swapping (Removal/Insertion under Power)		Not permitted
Remote I/O Port Specifications	**Topology (Communications Network Configuration)**	Bus
	Media Access Control Method	Multi-drop (1:n communications)
	Media (Transmission Medium)	Coaxial cable (75 Ω)
	Modulation Method	Baseband
	Encoding Method	Manchester coding
	Baud Rate	Choose from 0.5, 1, 2, and 4 Mbps
	Transmission Distance	Transmission distance varies according to the band rate and the 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 max.
	Number of Stations	15 max. (Up to 15 Remote I/O Receiver Modules are connectable.)
	Error Control (RAS)	Automatic removal and recovery function for error stations
	Synchronization Method	Frame
	Communications Format	Conforms to HDLC.
	Insulation Method	Pulse transformer
	Connector	BNC connector
MEMOBUS Port Specifications	**Communications Method**	Half-duplex asynchronous method
	Transmission Levels	Conform to RS-232C
	Protocol	MEMOBUS protocol
	Baud Rate	9,600 bps
	Communications Mode	RTU 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) 2) Parity check: Yes 3) Parity: 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)
	Connector	D-sub connector (9-pin, female)

2.3.4 Functions

The 1000-series Remote I/O Receiver Module functions as a slave station for the Remote I/O System.

1) Remote I/O Port

The 2000-series Remote I/O Driver, 2000-series Remote I/O Receiver, and 1000-series Remote I/O Receiver each have one remote I/O port for data communications. The Remote I/O System is configured by connecting these ports with coaxial cable.

2) MEMOBUS Port

a) The 1000-series Remote I/O Receiver Module can perform communications (slave communications) using an RS-232C interface via a MEMOBUS port. The MEMOBUS protocol is used as the communications protocol.

b) The following table shows an example of the devices that can be connected to the MEMOBUS port. An RS-232C interface must be provided by these devices.

Table 2.12 Example of Devices Connectable to the MEMOBUS Port

Type	Device	Remarks
MEMOBUS Master	P120-series Programming Panel	• Communications performed using the MEMOBUS protocol. • No communications program needs to be created. • 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	

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) See *Table 2.11* for the transmission specifications of the MEMOBUS port.

e) An example using the MEMOBUS port is shown below.

◀EXAMPLE▶ **Connecting Programming Panel to MEMOBUS Port**

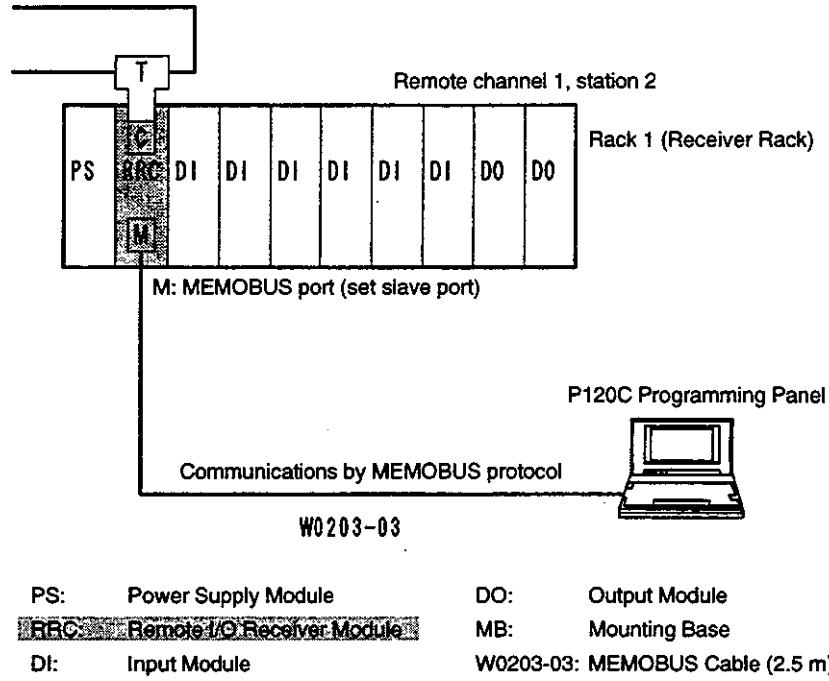
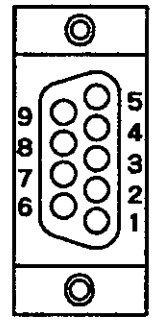


Figure 2.3 Using the MEMOBUS Port

f) 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 2.13 Pin Arrangement and the Signal Names of MEMOBUS Port

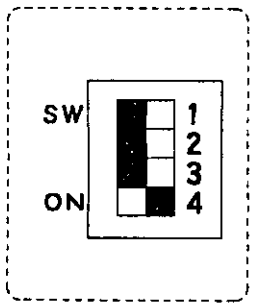


Pin No.	Symbol	Signal Name
1	FG	Protective ground
2	TXD	Transmission data
3	RXD	Reception data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	Signal ground
8	–	Not used
9	DTR	Data terminal ready

3) DIP Switch

The baud rate for the 1000-series Remote I/O Receiver Module is set using the DIP switch on the front panel of the Module. The DIP switch can be set either before or after the Module is installed. The switch settings are read and stored when the Module is turned ON or reset.

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



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

c) Each pin becomes effective at the following times.

Pin 3 and pin 4: When the reset switch is pressed, or when AC 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 2.14 Functions of DIP Switch

Pin No.	Settings	Function		
1	ON	Not used. Set to OFF.		
	OFF			
2	ON	Not used. Set to OFF.		
	OFF			
3 4	Set the baud rate of Remote I/O System according to the table shown on the right.	**Pin 3**	**Pin 4**	**Baud Rate**
		ON	ON	4 Mbps
		ON	OFF	2 Mbps
		OFF	ON	1 Mbps
		OFF	OFF	0.5 Mbps

4) Rotary Switches

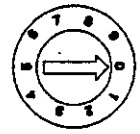
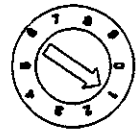
a) The rotary switches are used to set the station address of the Remote I/O Receiver Module.

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 form 0 to 9.

c) The settings of the rotary switches are effective (read) when the reset switch is pressed, or when AC 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 2.15 Setting the Station Address

Example Settings of Station Address 1	Station 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 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.

5) Reset Switch

a) Press the reset switch in the following cases.

(1) When you have changed the setting of DIP switch pin 3 or 4.

(2) When you have changed the settings 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.

I/O Servicing and Scan Time

3

This chapter describes the relationship between I/O servicing and the scan time.

3.1 I/O Servicing and Scan Time 3-2

3.1.1 Logic Solving and I/O Processing 3-2

3.1.2 I/O Processing Sequence 3-2

3.1.3 Delay of I/O Signals 3-3

3.1.4 I/O Processing Time 3-5

3.1 I/O Servicing and Scan Time

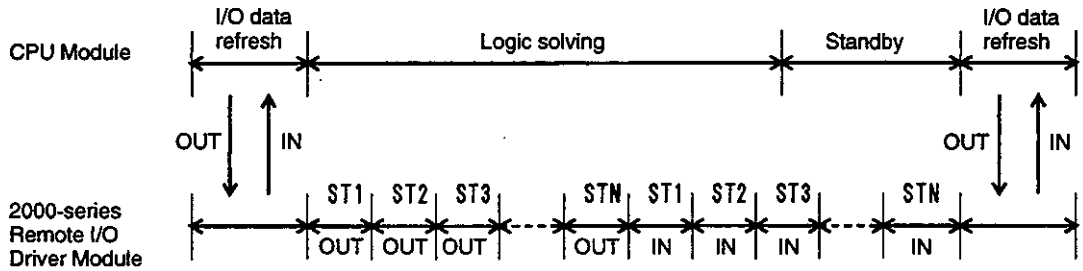
This section describes the relationship between I/O servicing and scanning.

3.1.1 Logic Solving and I/O Processing 3-2
3.1.2 I/O Processing Sequence 3-2
3.1.3 Delay of I/O Signals 3-3
3.1.4 I/O Processing Time 3-5

3.1.1 Logic Solving and I/O Processing

1) With the GL120 or GL130, logic solving by the CPU Module and parallel I/O processing by the 2000-series Remote I/O Driver Module are performed in parallel. Therefore, a scan delay occurs until the input signal connected to an Input Module is transmitted to the CPU Module, or until the result of logic solving (output signal) by the CPU Module is transmitted to an external device connected to an Output Module.

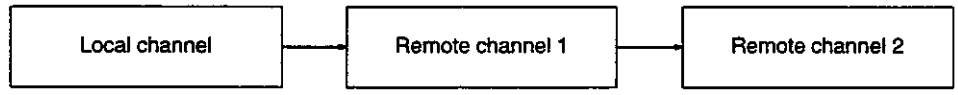
2) The relationship between logic solving by the CPU Module and I/O processing by the 2000-series Remote I/O Driver is shown below.



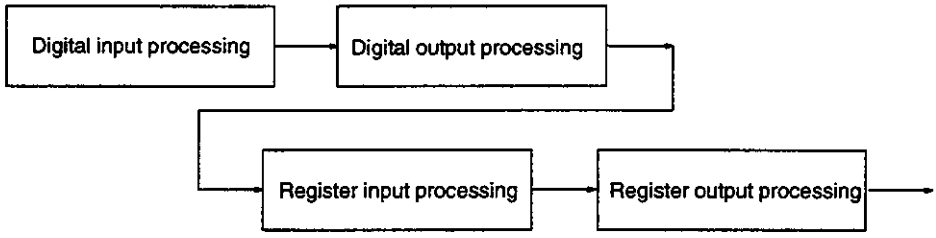
N≦15

3.1.2 I/O Processing Sequence

1) I/O processing services are performed in the following sequence: local channel, remote channel 1, and then remote channel 2.



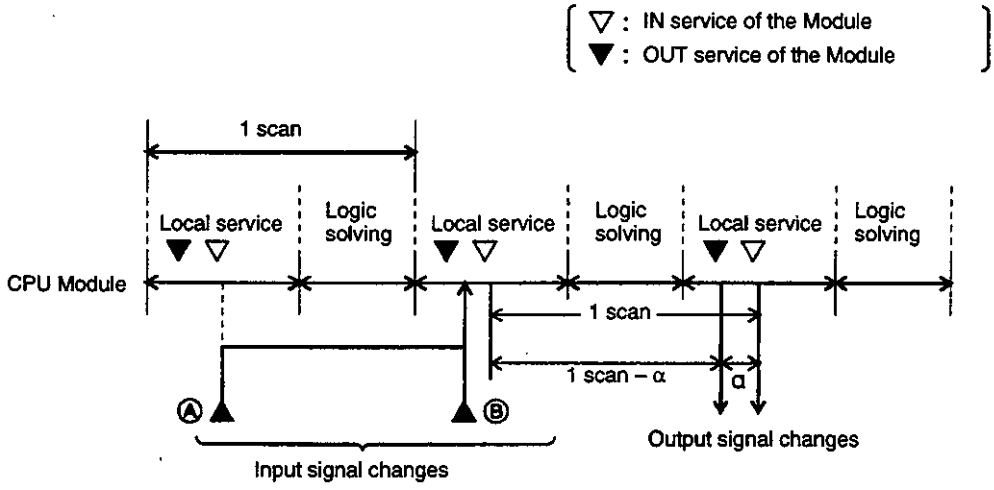
2) For each remote channel, I/O servicing is performed in ascending order of station addresses (1 to 15) in the following sequence.



3.1.3 Delay of I/O Signals

A delay occurs from the time a change occurs in an input signal until the CPU Module recognizes the change, solves the logic, and the result appears as an output signal.

1) Local Channel



a) Change of Input Signal –> CPU Module: 0 to 1 Scan

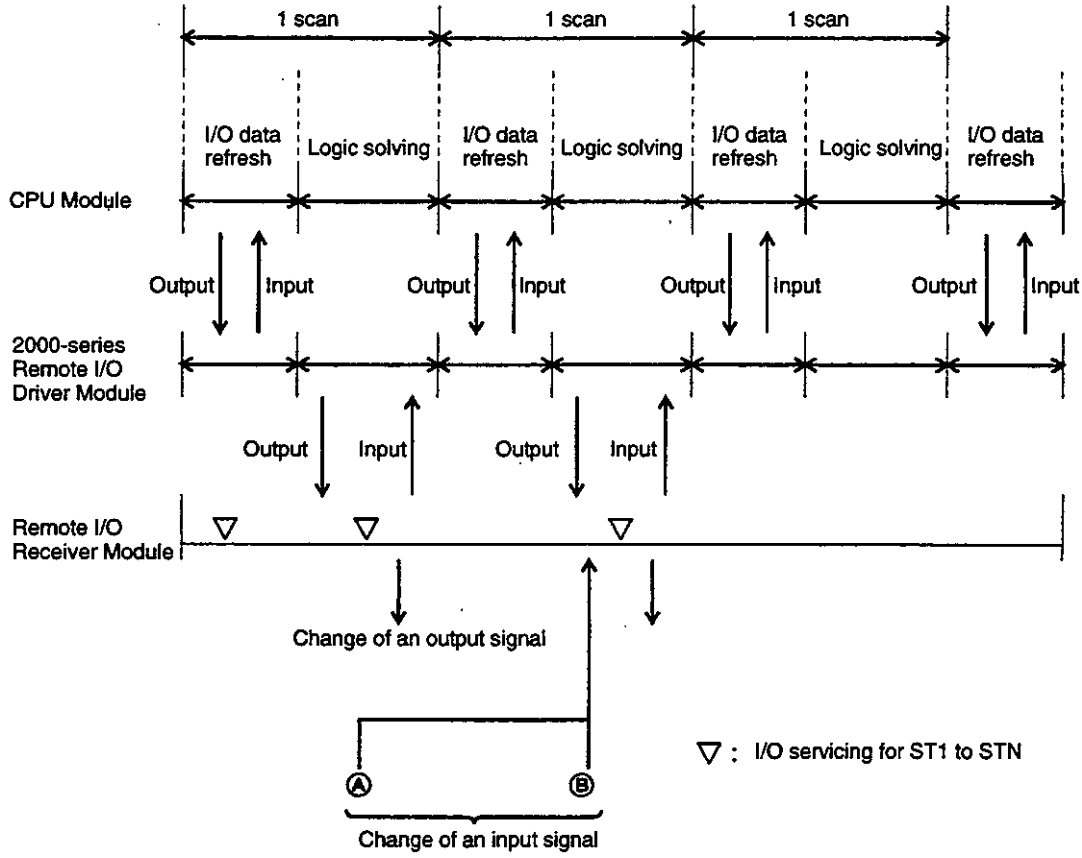
Time required for a change of an input signal to be input to the CPU Module through an Input Module is shown above. When a change of an input signal occurs near (A), the maximum delay is one scan, however, if a change occurs near (B), the delay will be minimal.

b) CPU Module–> Change of Output Signal: 1 Scan – α

The value of α depends on the I/O allocation. This is the time required from when a CPU Module starts to solve logic until the result appears as an output signal through an Output Module.

c) A time of (1 scan – α) to (2 scan – α) is thus required from a change in an input signal to the result appearing as an output signal. However, α varies according to the I/O allocation.

2) Remote I/O Channels



a) Change in Input Signal –> Remote I/O Receiver Module: 1 Scan or Less

This is the time required for a change in an input signal to be input to a Remote I/O Receiver Module through an Input Module. As shown above, when a change in an input signal occurs near (A) in the diagram, the maximum delay is one scan. When a change occurs near (B) in the diagram, the delay will be minimal.

b) Remote I/O Receiver Module –> Remote I/O Driver Module –> CPU Module: 1 Scan

c) CPU Module–> Remote I/O Driver Module: 1 Scan

d) Remote I/O Driver Module –> Remote I/O Receiver –> Change in Output: 1 Scan or Less

e) Therefore, 2 to 4 scan times are required for a change in an input signal to be output as an output signal.

3.1.4 I/O Processing Time

1) The I/O processing time in GL120 or GL130 can be calculated using the following equation.

I/O processing time = Local I/O processing time + Optional Module processing time + Remote I/O processing time

When no I/O Modules are allocated, the I/O processing time will be 0 if an Optional Module is not used.

2) Local I/O processing time = Input overhead + Output overhead + Total Input Module time + Total input byte time + Total Output Module time + Total output byte time

Item	GL120 (μs)	GL130 (μs)
Input overhead	67	100
Output overhead	56	91
Overhead per Input Module	83 (96)	72 (88)
Transmission time per input byte	20 (24)	15 (19)
Overhead per Output Module	91 (105)	75 (91)
Transmission time per output byte	10 (14)	8 (12)

Note Values in parentheses are for when Modules are installed in two to four racks.

◀EXAMPLE▶ The local I/O processing time will be as follows when two 24-VDC 32-point Input Modules and two 24-VDC 32-point Output Modules are used on rack 1 of the GL120:

Local I/O processing time = 67 + 56 + 83 × 2 + 20 × 8 + 91 × 2 +10 × 8 = 711 (μs)

3) The following table lists I/O processing times of Optional Modules.

I/O Processing Time of Optional Modules

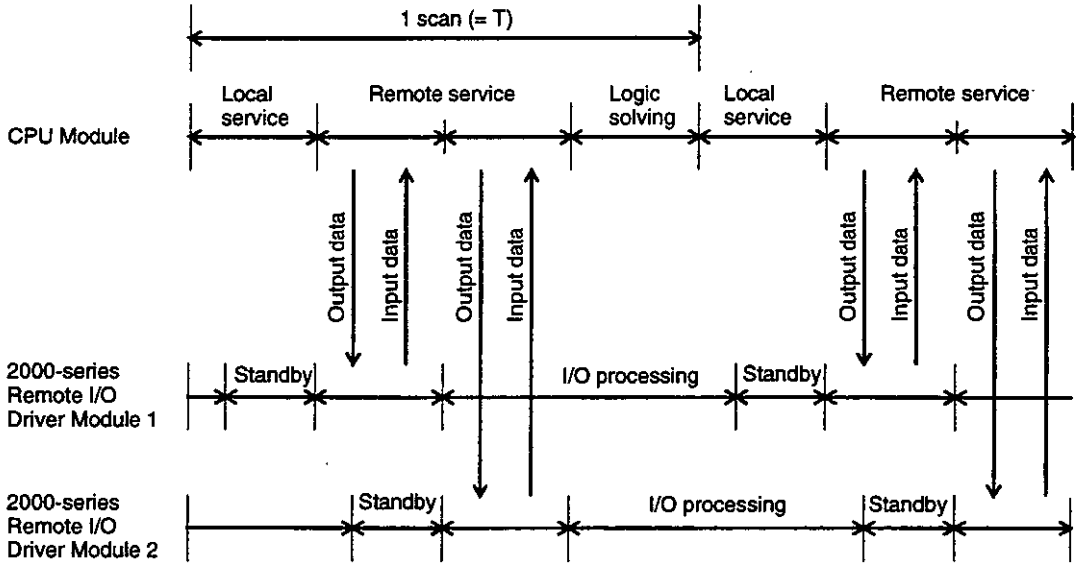
Name	Abbreviation	Model	GL120 I/O Processing Time (μs)	GL130 I/O Processing Time (μs)
MEMOBUS Module (RS-232)	MEMOBUS-232	JAMSC-120NOM26100	2900±300	3000±330
MEMOBUS Module (RS-422)	MEMOBUS-422	JAMSC-120NOM27100	2900±300	3000±330
PC Link Module (See note.)	PC LINK-COAX	JAMSC-120NFB23100	7400±1800+α	3000±1000+β
4-axis Motion Module	MC20	JAMSC-120MMB10400	1870	1497
1-axis Motion Module	MC10	JAMSC-120MMB10100		

Note The processing time for the following link data items is added to the PC Link Module.

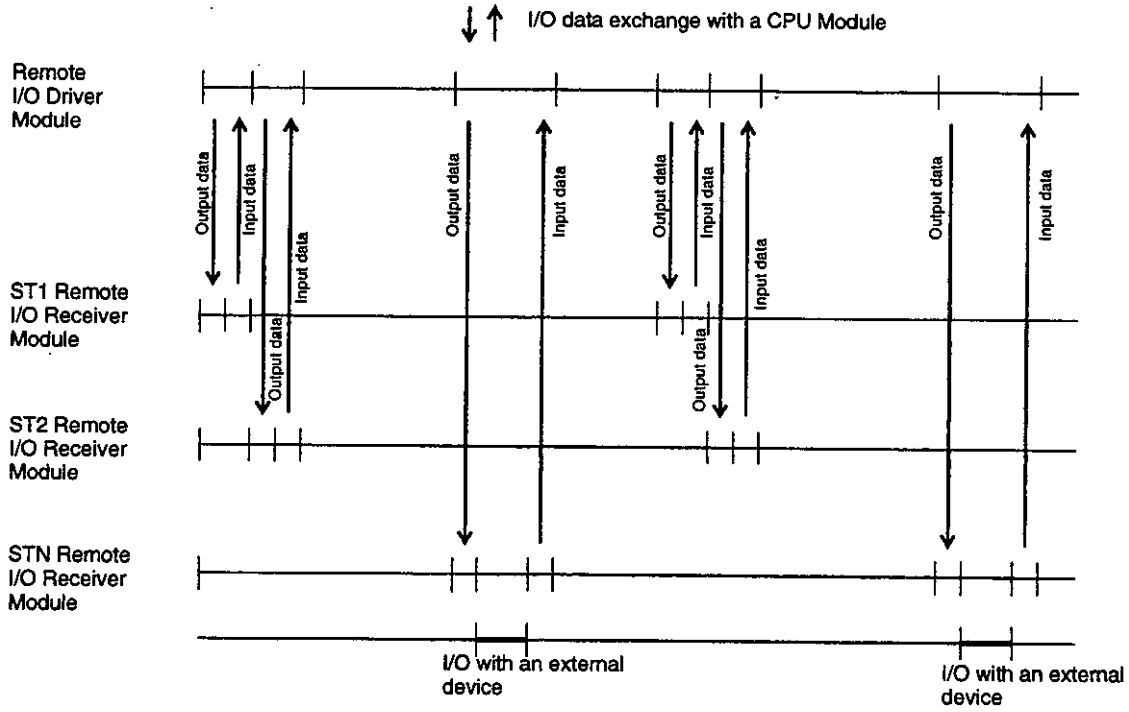
Item	Processing Time for Number of GL120 Data Items (μs)	Processing Time for Number of GL130 Data Items (μs)
Link input processing time	3650 + 0.4 × No. of input words	3500 + 0.23 × No. of input words
Link output processing time	4260 + 1.42 × No. of output words	140 + 1.95 × No. of output words
Processing time for the number of link data items	α = input + output	β = input + output

4) Processing Time of Remote I/O

a) When remote I/O is connected, the relationship of data exchange between a Remote I/O Driver Module and the CPU Module is as follows:



b) 2000-series Remote I/O Station I/O Timing



External Connections

4

This chapter describes the procedures for installing and connecting a Remote I/O System.

4.1 Remote I/O Ports 4-2

4.2 Transmission Distance 4-5
4.2.1 Calculation Method 4-5
4.2.2 Maximum Transmission Distance 4-6

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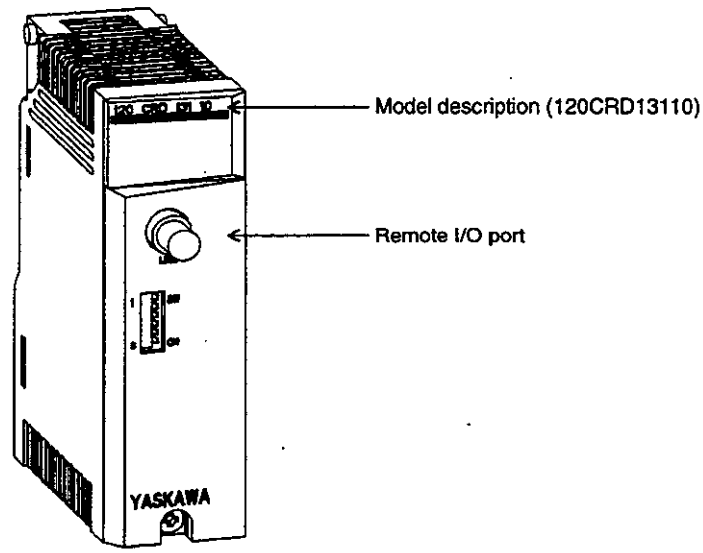
4.1 Remote I/O Ports

This section provides the specifications of the remote I/O ports.

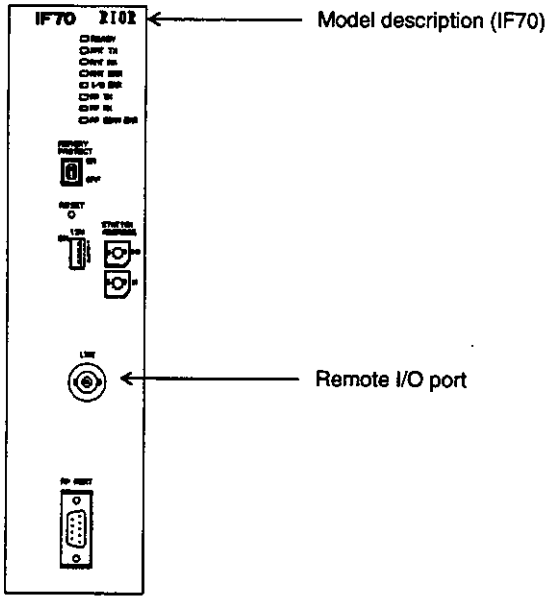
Overview

The 2000-series Remote I/O Driver, 2000-series Remote I/O Receiver, and 1000-series Remote I/O Receiver each have one remote I/O port for data communications. The Remote I/O System is configured by connecting these ports with coaxial cable.

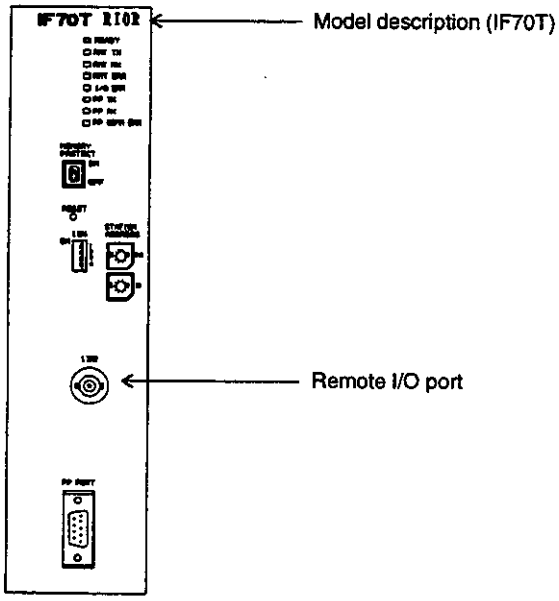
1) 2000-series Remote I/O Driver



2) 2000-series Remote I/O Receiver (Model: JAMSC-IF70)



3) 1000-series Remote I/O Receiver (Model: JAMSC-IF70T)



4) Remote I/O Port Specifications

Table 4.1 Remote I/O Port Specifications

Item	Specifications
Topology (Communications Network Configuration)	Bus
Media Access Control Method	Multi-drop (1:n communications)
Media (Transmission Medium)	Coaxial cable (75 Ω)
Modulation Method	Baseband
Encoding Method	Manchester coding
Baud Rate	Choose from 0.5, 1, 2, and 4 Mbps
Transmission Distance	Transmission distance varies according to the band rate and the 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 max.
Number of Stations	15 max. (Up to 15 Remote I/O Receiver Modules are connectable.)
Error Control (RAS)	Automatic removal and recovery function for error stations
Synchronization Method	Frame
Communications Format	Conforms to HDLC.
Insulation Method	Pulse transformer
Connector	BNC Connector

4.2 Transmission Distance

This section describes how to calculate the transmission distance of a Remote I/O transmission line.

4.2.1 Calculation Method 4-5
4.2.2 Maximum Transmission Distance 4-6

4.2.1 Calculation Method

The distance of a Remote I/O transmission line varies according to the baud rate, the number of Remote I/O Receiver Modules that are connected, and the type of coaxial cables used. The calculation method is shown below.

L = PL/Pa (km)

Where, PL = Pdr – Pm – Pt – Psn
= Pdr – 4.0 – 1.0 – Psn (dB)

Pdr = Pd – Pr + Px
= 19.4 (dB) + Px

L: Transmission distance (km)
PL: Coaxial cable allowable loss (dB)
Pa: Coaxial cable signal attenuation (dB/km)
Pdr: Transmission/reception level difference (dB)
Pm: Noise margin (dB)
Pt: Power supply temperature fluctuation (dB)
Psn: Module insertion loss (dB)
Pd: Transmission level = 68.9 (dB)
Pr: Reception level = 49.5 (dB)
Px: Compensation (depends on the baud rate) =
–3.4 dB/4 MHz, –2.4 dB/2 MHz, –1.9 dB/1 MHz, –1.4 dB/0.5 MHz

1) Coaxial Cable Allowable Loss: PL

Baud Rate (Mbps)	Transmission/ Reception Level Difference: Pdr (dB)	Coaxial Cable Allowable Loss: PL (dB)		
		PL	n = 1 (Receivers)	n = 15 (Receivers)
4	16.0	PL (4) = 11.0 – Psn (4)	10.78 dB	9.24 dB
2	17.0	PL (2) = 12.0 – Psn (2)	11.76 dB	10.08 dB
1	17.5	PL (1) = 12.5 – Psn (1)	12.22 dB	10.26 dB
0.5	18.0	PL (0.5) = 13.0 – Psn (0.5)	12.66 dB	10.28 dB

2) Module Insertion Loss: Psn

Baud Rate (Mbps)	Module Insertion Loss: Psn (dB)		
	Ps	n = 9	n = 15
4	0.11 (dB/unit)	1.1 dB	1.76 dB
2	0.12 (dB/unit)	1.2 dB	1.92 dB
1	0.14 (dB/unit)	1.4 dB	2.24 dB
0.5	0.17 (dB/unit)	1.7 dB	2.72 dB

Psn = Ps × (n + 1)
Where n = Number of Remote I/O Receiver Modules and 1 = Remote I/O Driver Module

3) Coaxial Cable Signal Attenuation: Pa

Cable (Manufactured by Fujikura, Ltd.)	Signal Attenuation: Pa (dB/km)			
	0.5 MHz	1 MHz	2 MHz	4 MHz
3C-2V, 3C-2V (Cu, Fe) ZV	9.0	13.8	20.0	28.8
5C-2V, 5C-2V (Cu, Fe) ZV	5.1	8.8	12.7	18.4
5C-FB, 5C-FB (Cu, Fe) ZV	4.8	7.4	10.5	14.0
7C-FB, 7C-FB (Cu, Fe) ZV	4.2	5.8	7.6	10.0
7C-FL, 7C-FL (Cu, Fe) ZV	2.9	4.4	6.4	9.3
12C-5AF, 12C-5AF (Cu, Fe) ZV	1.46	2.2	3.2	4.5

Signal attenuation: Pa is the value determined by multiplying the standard value by 1.15.

4.2.2 Maximum Transmission Distance

The maximum transmission distance (Lmax) is given in the following table when the number (n) of Remote I/O Receiver Modules is15 and the in-panel cable length (3C-2V) is 50 m or less.

Maximum transmission distance:

Lmax = In-panel cable length + Panel-to-panel cable length

Example of Lmax (n = 15 Modules)

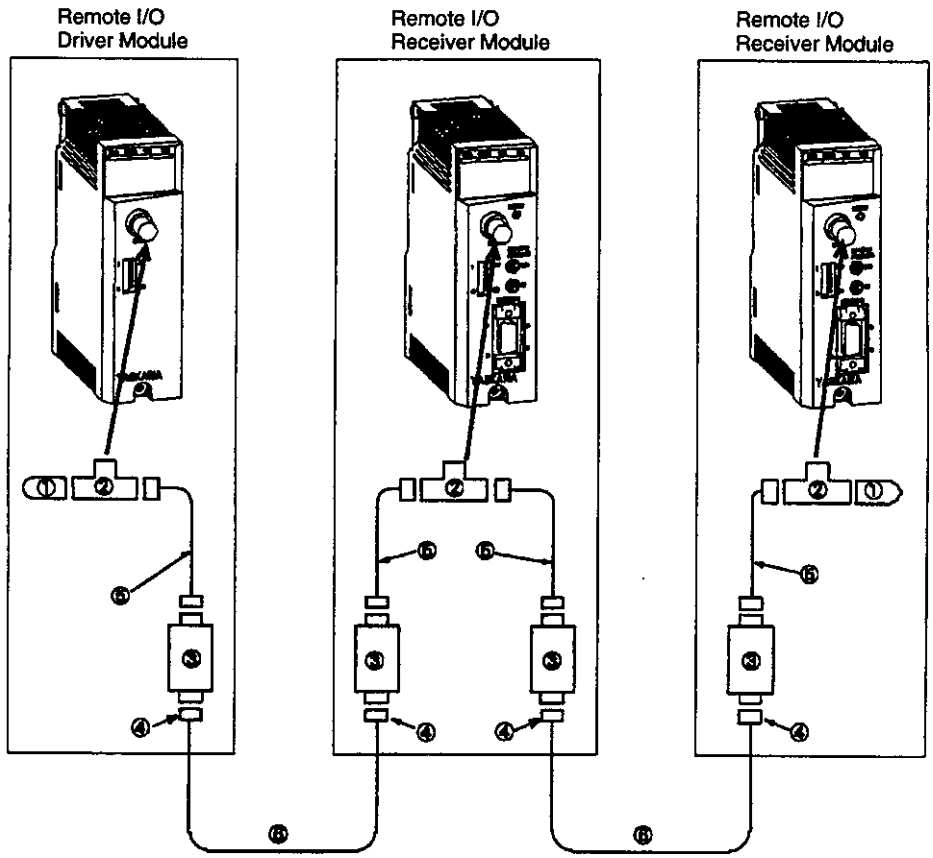
Baud Rate (Mbps)	Length of Coaxial Cable (km)				Maximum Transmission Distance: Lmax (km)
	3C-2V	5C-2V	7C-FL	12C-5AF	
4	0.05	0.42	0	0	0.47
	0.05	0.05	0	1.29	1.39
	0.05	0	0.83	0	0.88
2	0.05	0.71	0	0	0.76
	0.05	0.05	0	2.27	2.37
	0.05	0	1.41	0	1.46
1	0.05	1.03	0	0	1.08
	0.05	0.05	0	3.35	3.45
	0.05	0	2.16	0	2.21

4.3 Configuration of Remote I/O Transmission Lines

This section describes the configuration of remote I/O transmission lines.

The configuration of Remote I/O transmission lines is illustrated below. A Remote I/O transmission line consists of coaxial cables and coaxial connectors. As illustrated, the Remote I/O Driver Module does not necessarily have to be installed as an end station of the transmission line. Coaxial cables can be in-panel cables or panel-to-panel cables.

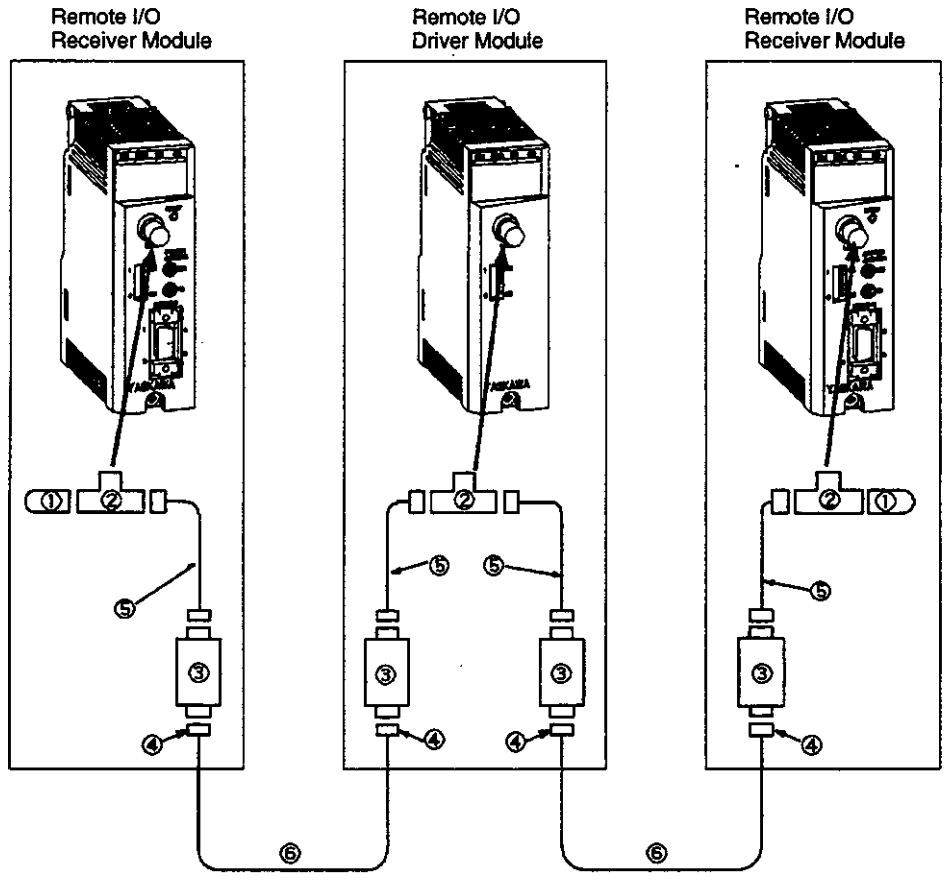
a) Remote I/O Driver Module Installed at End of Transmission Line



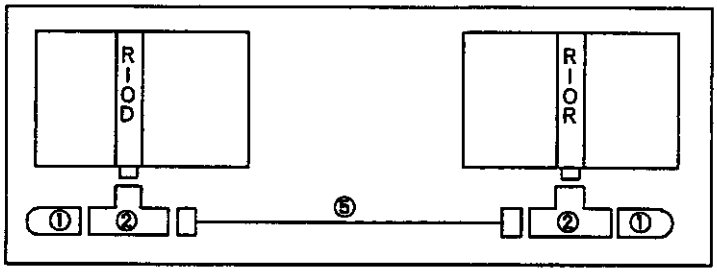
No.	Name	Model	Remarks
1	Terminator (75 Ω)	221629-5	Used at the end station of a transmission line.
2	T-adapter	413592-2	Used to connect a coaxial cable used as the terminal at a BNC Connector to a Module intended as a station.
3	Conversion Adapter	T-0298	Used to connect a coaxial cable used as the terminal at a BNC Connector to an F-connector coaxial cable.
4	F-connector	F-5FB	Used as the terminal for a trunk-line coaxial cable.
5	W60 Cable	JZMSZ-W60-□ W60-1: 2.0 m W60-2: 3.0 m W60-3: 5.0 m	Used as a branch cable (for in- panel wiring). A BNC Connector is used at each end of the cable.
6	Panel-to-panel coaxial cable (See note)	5C, 7C, 11C, 12C etc.	Select the appropriate cable according to the connection distance.

Note The W61 Cable, which can be used as a trunk line (panel-to-panel wiring), with an F-connector at both ends, is also available from Yaskawa.

b) Remote I/O Receiver Module Panels Installed at Ends of Transmission Line



c) Remote I/O Driver and Receiver Modules Installed in Same Panel



No.	Name	Model	Remarks
1	Terminator (75 Ω)	221629-5	Used at the end station of a transmission line.
2	T-adapter	413592-2	Used to connect a coaxial cable used as the terminal at a BNC Connector to a Module intended as a station.
3	Conversion Adapter	T-0298	Used to connect a coaxial cable used as the terminal at a BNC Connector to an F-connector coaxial cable.
4	F-connector	F-5FB	Used as the terminal for a trunk-line coaxial cable.
5	W60 Cable	JZMSZ-W60-□ W60-1: 2.0 m W60-2: 3.0 m W60-3: 5.0 m	Used as a branch cable (for in-panel wiring). A BNC Connector is used at each end of the cable.
6	Panel-to-panel coaxial cable (See note)	5C, 7C, 11C, 12C etc.	Select the appropriate cable according to the connection distance.

Note The W61 Cable, which can be used as a trunk line (panel-to-panel wiring), with an F-connector at both ends, is also available from Yaskawa.

4.4 In-panel Wiring

This section describes in-panel wiring.

4.4.1 Cables 4-10
4.4.2 Connections between Devices 4-13
4.4.3 Shield Treatment 4-13
4.4.4 Separating Coaxial Cables from Other Cables 4-13

4.4.1 Cables

1) Yaskawa Standard Coaxial Cables

Use the same coaxial cables as for GL120 PC Link Systems. The following table shows the models and specifications of Yaskawa standard coaxial cables.

a) W1000 Cable

Model	Cable Length	Cable Used	Remarks
JZMSZ-W1000-02	2 m	3C-2V (in-panel)	BNC Connectors at both ends
JZMSZ-W1000-03	3 m		
JZMSZ-W1000-05	5 m		

b) W60 Cable

Model	Cable Length	Cable Used	Remarks
JZMSZ-W60-1	2 m	3C-2V (in-panel)	BNC Connectors at both ends
JZMSZ-W60-2	3 m		
JZMSZ-W60-3	5 m		

c) W61 Cable

Model	Cable Length	Cable Used	Remarks
JZMSZ-W61-1	2 m	5C-FB (panel to panel)	F-connectors (F-5FB) at both ends Gold-plated contacts
JZMSZ-W61-2	5 m		
JZMSZ-W61-3	10 m		

2) Other Coaxial Cables

The table below shows the models and specifications of coaxial cables manufactured by Fujikura, Ltd.

Model (Fujikura, Ltd.)	Electrostatic and Magnetic Shield	Application	Conditions	Signal Attenuation: Pas (dB/km)			
				0.5 MHz	1 MHz	2 MHz	4 MHz
3C-2V	Not provided	In-panel	Special duct	9.0	12.0	17.0	25.0
3C-2V (Cu, Fe) ZV	Provided		Low-voltage duct				
5C-2V	Not provided	Panel-to-panel	Special duct	5.1	7.6	11.0	16.0
5C-2V (Cu, Fe) ZV	Provided		Low-voltage duct				
5C-FB	Not provided	Panel-to-panel	Special duct	4.8	7.4	10.5	14.0
5C-FB (Cu, Fe) ZV	Provided		Low-voltage duct				
7C-FB	Not provided	Panel-to-panel	Special duct	4.2	5.8	7.6	10.0
7C-FB (Cu, Fe) ZV	Provided		Low-voltage duct				
7C-FL	Not provided	Panel-to-panel	Special duct	2.9	3.8	5.6	8.1
7C-FL (Cu, Fe) ZV	Provided		Low-voltage duct				
12C-5AF	Not provided	Panel-to-panel	Special duct	1.46	2.2	3.2	4.5
12C-5AF (Cu, Fe) ZV	Provided		Low-voltage duct				

Note (a) Coaxial cables equivalent to the above can be applicable.

(b) Signal attenuation: Pas (dB/km) shows standard values.

3) Coaxial Connectors

The following table shows the models and specifications of coaxial connectors.

Connector	Name	Model	Abbreviation	Remarks	Manufacturer
Connection	BNC Connector	BNC-P-3-Ni-CAu	BNC-P-3	For 3C-2V, Gold-plated contacts	Daiichi Electronic Industries, Ltd.
	F-connector	FSPW-5-Ni-CAu		For 5C-2V, Gold-plated contacts	Fujikura, Ltd.
		F-5FB		For 5C-FB, Gold-plated contacts	Fujikura, Ltd.
		FSPW-7-Ni-CAu		For 7C-FL, Gold-plated contacts	Fujikura, Ltd.
		F-7FB		For 7C-FB, Gold-plated contacts	Fujikura, Ltd.
	Fitting Connector	FT-12C-2.9-TC31		For 12C-5AF, Gold-plated contacts	Fujikura, Ltd.
		FT-7C-FL		For 7C-FB, Gold-plated contacts	Fujikura, Ltd.
Branching	T-adapter	413592-2		For connection and branching	AMP
Conversion	Conversion Adapter	T-0298		For conversion of BNC and F-connectors	Yaskawa Electric Corp.
	Conversion Connector	FTR-FJ		For conversion of Fitting and F-connectors	Fujikura, Ltd.
Junction	Junction Connector	F-A		For joining F-connectors to each other	Fujikura, Ltd.
		FI-A		For connecting Fitting Connectors to each other	Fujikura, Ltd.
Termination	Terminator	221629-5		For termination of ends of transmission line	AMP

Note (a) All of the above connectors have a connection loss of 0 dB.

(b) Waterproof and insulate the junctions of the coaxial cable (e.g., wrap with self sealing tape).

(c) See *4.7 Grounding* for information on grounding.

4.4.2 Connections between Devices

Figure 4.1 shows the connections between the Remote I/O Driver Module and a Remote I/O Receiver Module and the use of the Conversion Adapter between these Modules.

1) Connect a T-adapter to the BNC Connector (LINE) on the front panel of the Module.

2) Connect the BNC Connector at one end of the coaxial cable to the T-adapter and the BNC Connector at the other end of the cable to the BNC receptacle on the Conversion Adapter.

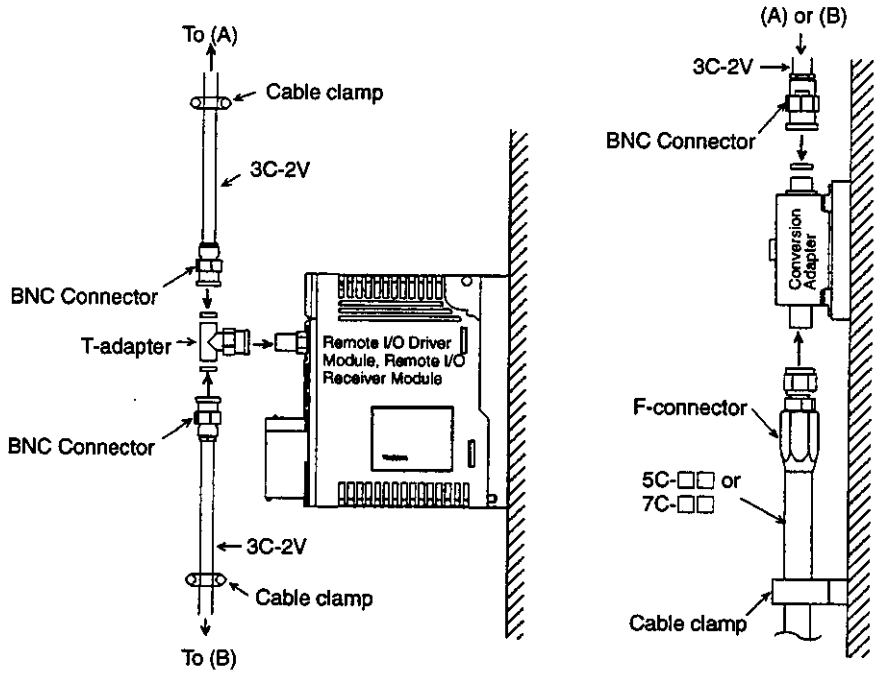


Figure 4.1 Device Connections

4.4.3 Shield Treatment

For shielded coaxial cables, ground the shield at one point (ground resistance: 100 Ω max). See *4.7 Grounding* for details.

4.4.4 Separating Coaxial Cables from Other Cables

1) Separation from Low-voltage Cables

Keep coaxial cables at least 100 mm away from low-voltage cables. Alternatively, use coaxial cables shielded with copper or iron (hereafter referred to as shielded coaxial cables). The coaxial cable should be housed in metal conduit or a metal duct.

2) Separation from Operation Circuit Cables

Keep shielded coaxial cables at least 100 mm away from operation circuit cables. Alternatively, shield the operation circuit cables.

3) Separation from Main Circuit Cables

Keep shielded coaxial cables away from main circuit cables as shown in *Table 4.2*. Alternatively, shield the main circuit cables.

Table 4.2 Recommended Distances between Shielded Coaxial Cable and Main Circuit Cable

Main Circuit	Recommended Distance
125 V, 10 A	300 mm or more
250 V, 50 A	450 mm or more
440 V, 200 A	600 mm or more
3 kV to 6 kV, 800 A	1,200 mm or more

4.5 Indoor Panel-to-Panel Wiring

This section describes indoor panel-to-panel wiring.

4.5.1 Connection between Devices 4-15
4.5.2 Shield Treatment 4-16
4.5.3 Separating Coaxial Cables from Other Cables 4-16

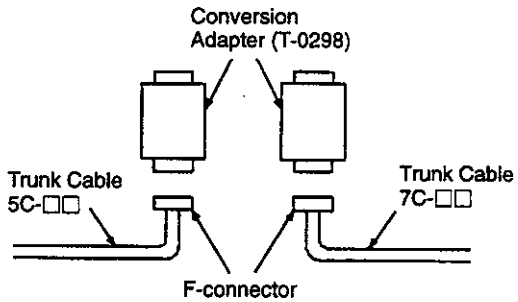
4.5.1 Connection between Devices

1) For Coaxial Cables 5C-□□ and 7C-□□, use F-connectors to connect to Conversion Adapters (see figure at *a)* below).

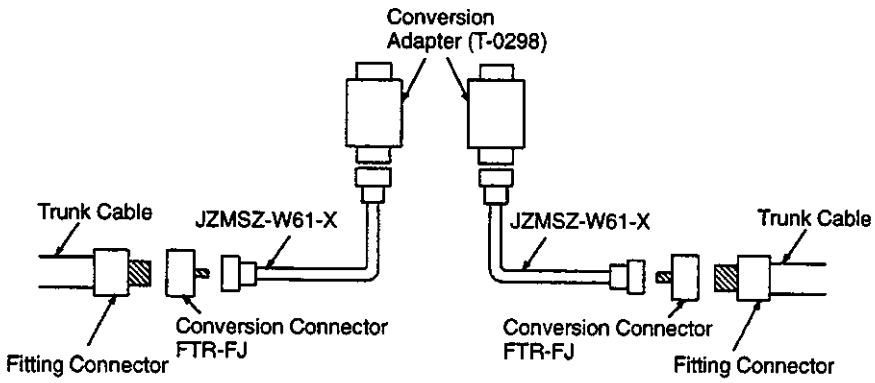
2) For trunk Coaxial Cables 11C-4AF and 12C-5AF, first connect to smaller Coaxial Cables 5C-□□ and 7C-□□ with Conversion Connectors, then connect these cables to Conversion Adapters with F-connectors (see figure at *b)* below).

3) Use Junction Connectors to connect trunk Coaxial Cables of the same size (see figure at *c)* below).

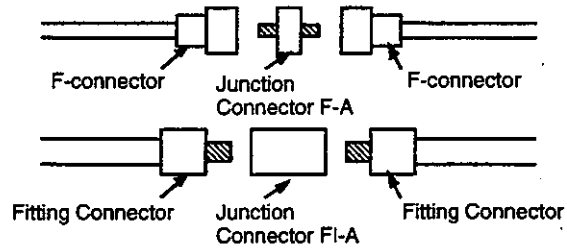
a) Connection of 5C - □□ and 7C - □□



b) Connection using Large Size Connectors



c) Connecting between Coaxial Cables



4.5.2 Shield Treatment

For shielded coaxial cables, ground the shield at one point (ground resistance: 100 Ω max). See *4.7 Grounding* for details.

4.5.3 Separating Coaxial Cables from Other Cables

1) Shielded Coaxial Cables

House the shielded coaxial cable in a low-voltage circuit duct separated from general operation circuit duct as shown in *Figure 4.2 (a)*. If the low-voltage circuit and general operation circuits are in the same duct, separate them by at least 100 mm, then place the shielded coaxial cable on the low-voltage circuit side as shown in *Figure 4.2 (b)*.

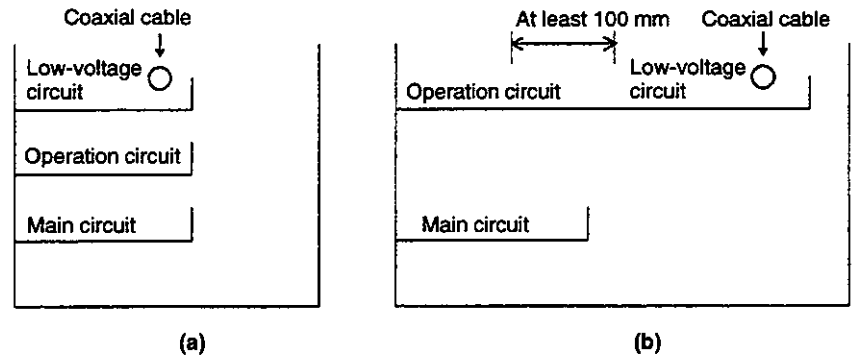


Figure 4.2 Separating Wire Ducts

2) Use a fitted duct cover that does not leave a gap between the duct and the cover.

Main Circuit	Recommended Distance
125 V, 10 A	300 mm or more
250 V, 50 A	450 mm or more
440 V, 200 A	600 mm or more
3 kV to 6 kV, 800 A	1,200 mm or more

3) Unshielded Coaxial Cables

Coaxial Cables must be run individually in metal conduit or metal duct as shown in *Figure 4.3*. Ground both ends of the metal conduit or duct and at as many points as necessary. Coaxial Cables 11C-4AF and 12C-5AF are difficult to run in conduit because they are inflexible. Run them individually in metal ducts. See *Figure 4.3 (b) and (d)*.

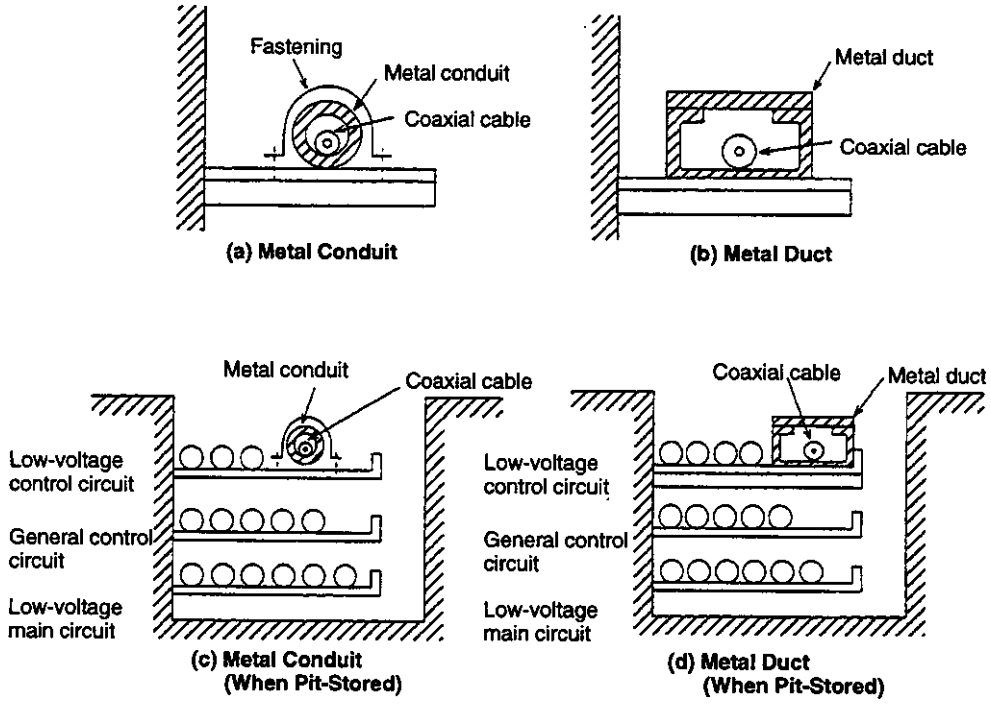


Figure 4.3 Coaxial Cable Installation

4) Bending Coaxial Cables

Use the following guidelines when bending coaxial cables: For 5C-□□ and 7C-□□, the bending radius must be 10 times or more of the finished bend diameter; For 11C-4AF and 12C-5AF, 20 times or more. (See *Figures 4.4 and 4.5.*) Use flexible metal conduit for bending so that the metal conduits can contact each other. In this case, the bending radius must be 20 times or more of the finished bend diameter for 5C-□□ and 7C-□□. (See *Figure 4.5.*)

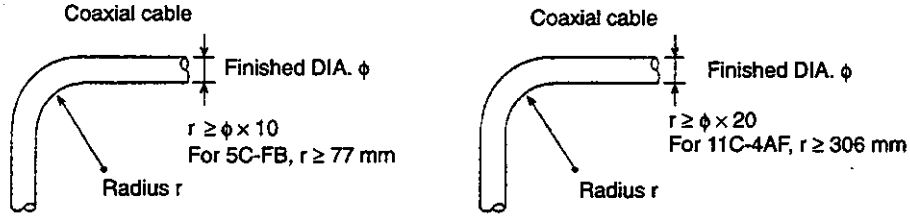


Figure 4.4 Cable Bending

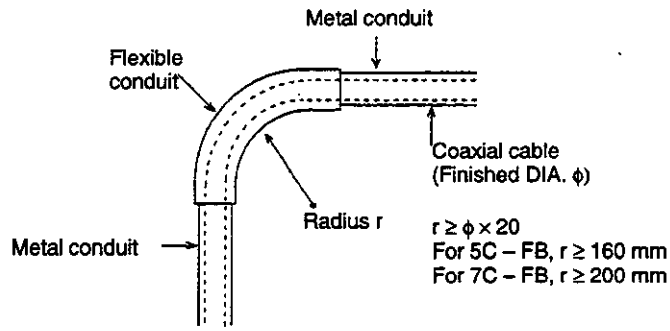


Figure 4.5 Metal Conduit Bending

a) Minimum Cable Bending Radius

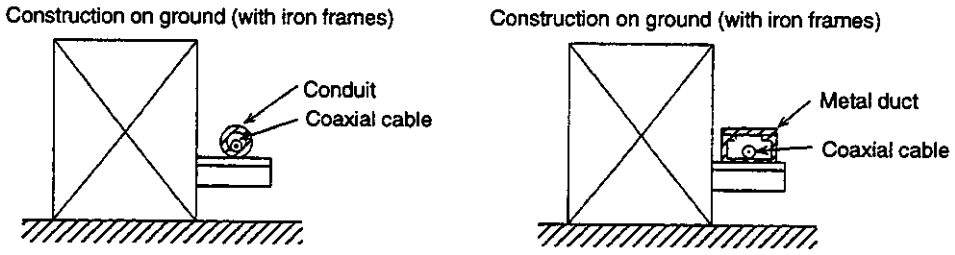
Model (Made by Fujikura, Ltd.)	Finished Diameter in mm	Minimum Bending Radius in mm (formula)
3C-2V	5.6	56 (r = ϕ × 10)
3C-2V (Cu, Fe) ZV	8.6	86 (r = ϕ × 10)
5C-2V	7.5	75 (r = ϕ × 10)
5C-2V (Cu, Fe) ZV	12.0	120 (r = ϕ × 10)
5C-FB	7.7	77 (r = ϕ × 10)
5C-FB (Cu, Fe) ZV	12.0	120 (r = ϕ × 10)
7C-FB	10.0	100 (r = ϕ × 10)
7C-FB (Cu, Fe) ZV	13.0	130 (r = ϕ × 10)
7C-FL	10.0	100 (r = ϕ × 10)
7C-FL (Cu, Fe) ZV	14.5	145 (r = ϕ × 10)
11C-4AF	15.3	306 (r = ϕ × 20)
11C-4AF (Cu, Fe) ZV	18.3	366 (r = ϕ × 20)
12C-5AF	15.3	306 (r = ϕ × 20)
12C-5AF (Cu, Fe) ZV	20.0	400 (r = ϕ × 20)

4.6 Outdoor Panel-to-Panel Wiring

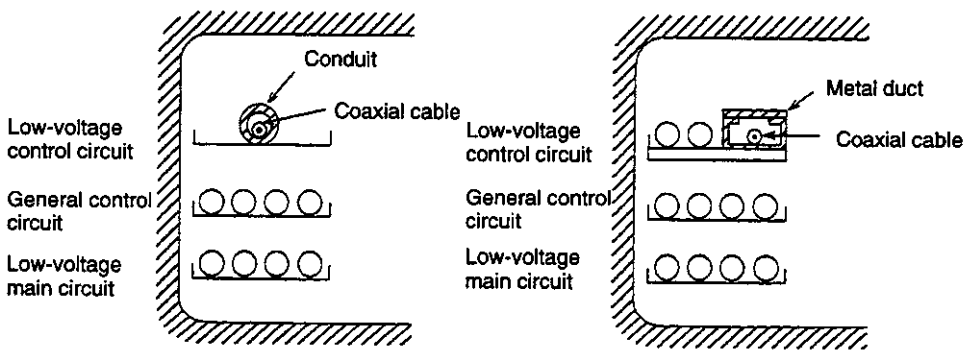
This section describes outdoor panel-to-panel wiring.

The procedures for laying coaxial cables are basically the same as those described in *4.5 Indoor Panel-to-Panel Wiring*, but note the following differences.

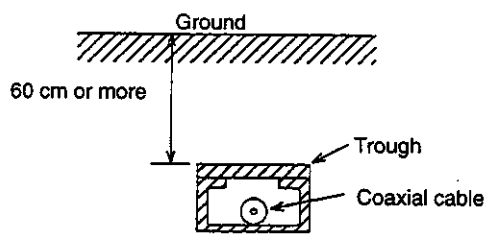
1) For outdoor wiring, always lay coaxial cables along above ground structures (steel frames). If no such structures are available, house the cables in an underground pit or tunnel or bury the cables in the ground.



(a) Construction on Ground



(b) Underground Pit or Tunnel



(c) Burying in the Ground

2) Do not route bare coaxial cables overhead. The cables may receive noise induced from airborne radio waves and cause transmission errors. Because the GL120, GL130 Remote I/O System is not protected from lightning, the equipment may also be damaged by lightning strikes.

3) Coaxial cable expands and contracts with temperatures. The thermal expansion coefficient of coaxial cables is about 0.005% per degree (°C). For example, a coaxial cable of 500 m expands 25 cm when the temperature increases 10°C. Normally, this extent of expansion can be compensated through the entire cable route. When coaxial cables are routed through an above ground structure, however, changes in the cable length may not be compensated because of large temperature fluctuations. Therefore, let the coaxial cable have some play at the inlet and outlet of each metal conduit so that changes in the cable length can be compensated.

4) If water is trapped in a metal conduit or duct and freezes in winter, it applies mechanical stress to the coaxial cable. To prevent this, drill drain holes in the metal conduit or duct.

4.7 Grounding

This section describes grounding methods.

4.7.1 Grounding Methods 4-21
4.7.2 Shielded Coaxial Cables 4-22
4.7.3 Metal Conduits and Metal Ducts 4-22

4.7.1 Grounding Methods

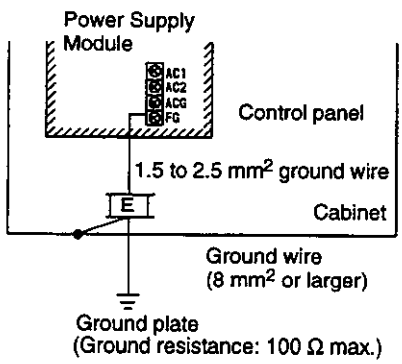
1) Procedure

a) Installing Equipment

The Mounting Base on which each Module of the GL120 or GL130 is installed must be mounted on an integrated steel base (frame). Always leave coaxial connectors above the electrical ground.

b) Ground Wire

Mount a ground terminal (E) in the control panel and connect the terminal to the cabinet of the control panel. Also, connect the ground terminal to the FG terminal on the Power Supply Module. For the ground wire between the ground terminal and the ground plate, use a ground wire of at least 8 mm^2 (AWG8) and also make the wire as short as possible. If the distance between the ground terminal and the ground plate is long, use a thicker ground wire so that the sum of the ground resistance and the ground wire resistance is less than100 Ω.



c) Ground Plate

The ground plate should be as close to the GL120 or GL130 control panel as possible and kept at least 15 meters away from the ground plates of other high-voltage control panels (Group B in *Table 4.3* below). The ground resistance must be 100 Ω or less.

d) Sharing Ground

Basically, a GL120 or GL130 should have its own ground. If a GL120 or GL130 must share the ground wire and ground plate with other control panels, use the following information as guidelines.

Table 4.3 Sharing Ground Wire and Ground Plate

Shared Use Permitted (Group A Panel)	Computer panels, instrumentation control panels, I/O relay panels, general control circuit panels, etc.
Shared Use NOT Permitted (Group B Panel)	High-voltage main circuit panels, large-capacity thyristor panels, etc.

4.7.2 Shielded Coaxial Cables

Ground the shield of the shielded coaxial cable at one point only. The figure below shows examples of grounding shielded coaxial cables (Sa, Sb, Sc, and Sd: relay terminals).

1) Sb and Sc Connected

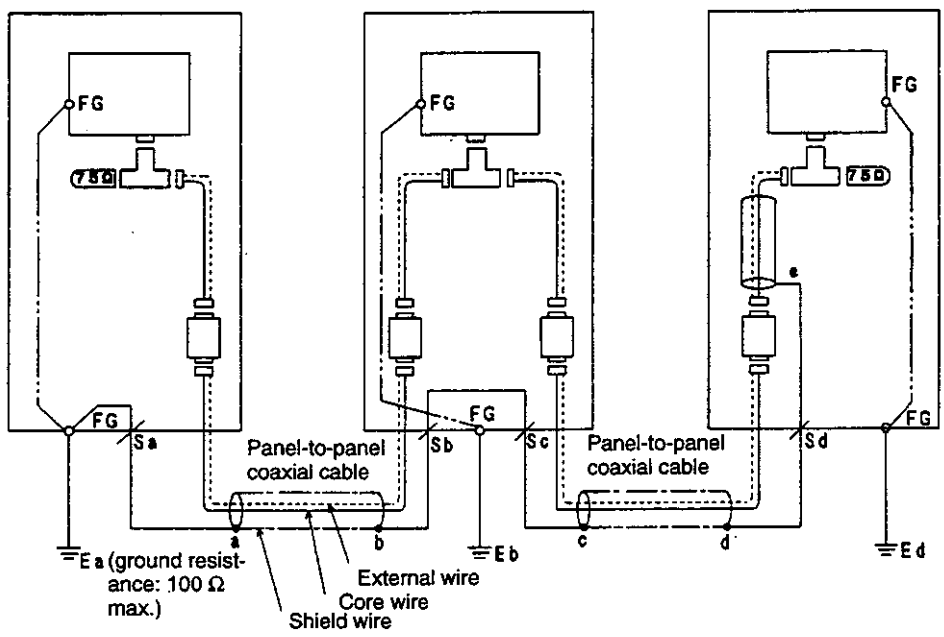
Ground the shield at point Ea or Ed in the figure.

2) Shield Not Groundable at Point Ea or Ed

Sa and Sc can be grounded at point Eb.

3) Shielded Coaxial Cable Inside a Panel

Connect point e on the shield to point d on the shield of the panel-to-panel shielded coaxial cable via relay terminal Sd.



4.7.3 Metal Conduits and Metal Ducts

Always ground both ends of a metal conduit or duct. Each metal conduit or duct should be grounded at as many points as possible.

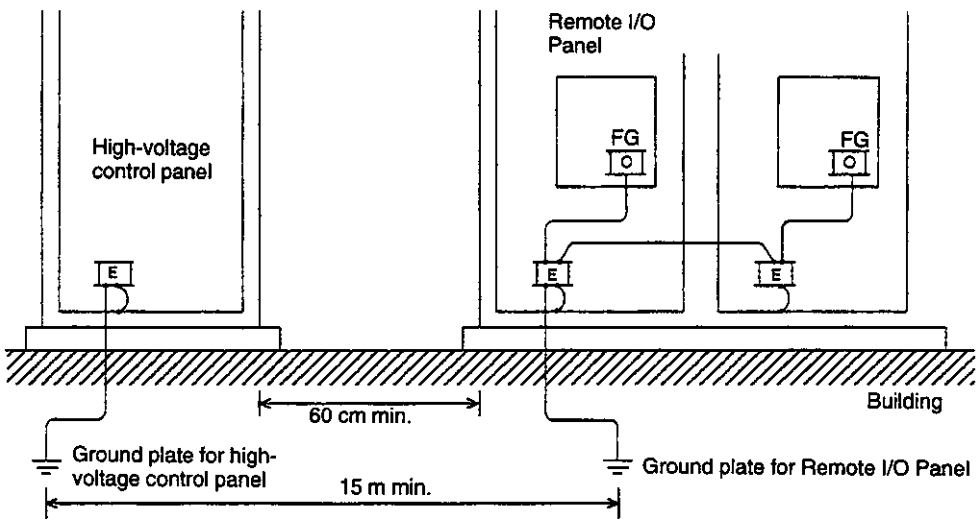
4.8 Installation of Control Panel

This section describes the method of installing a control panel.

Follow the procedure described below when installing a control panel (hereafter referred to as a Remote I/O Panel) for the GL120 or GL130, a Remove I/O Driver Module, or a Remove I/O Receiver Module.

1) Separating Remote I/O Panels from High-voltage Control Panels

Do not install a Remote I/O Panel and a high-voltage control panel (Group B in the *Table 4.3*) side by side. If a Remote I/O Panel must be installed near a high-voltage control panel, always keep the Remote I/O Panel at least 60 cm away from the high-voltage control panel. Likewise, keep the ground wire at least 60 cm away from that of the high-voltage control panel and keep the ground plate at least 15 m away from that of the high-voltage control panel.



2) Installing Remote I/O Panels and Other Control Panels Side by Side

Remote I/O Panels and Group A control panels can be installed side by side. In this case, these control panels are electrically connected to each other through the channel base. To further ensure safe grounding, connect the ground terminals (E) of these control panels with a ground wire of at least 8 mm^2 as shown in the figure below. Then, connect one of the ground terminals to the ground plate.

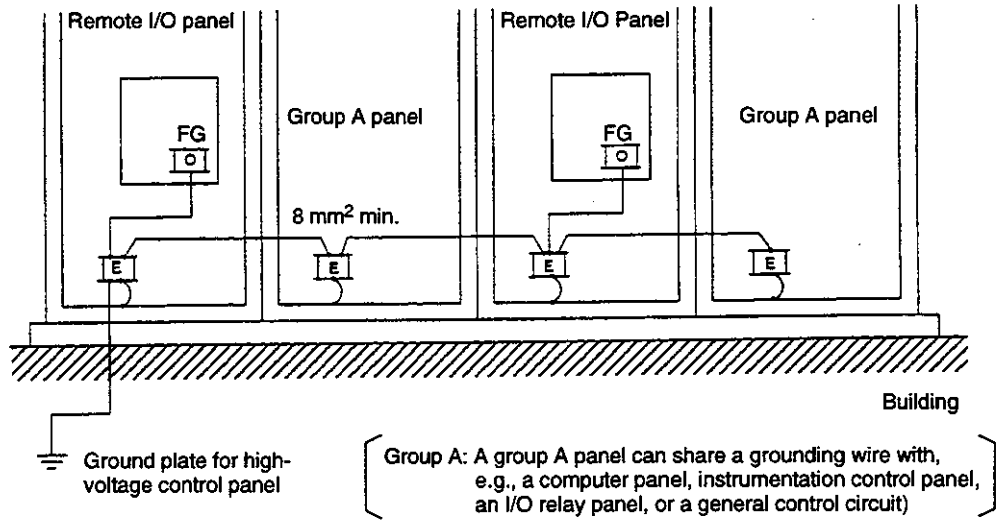


Figure 4.6 Separation from Group A Panels

3) Insulating Remote I/O Panels

When a Remote I/O Panel is installed in a steel-frame building, it is grounded through the building. This will not normally cause a problem. However, if a Remote I/O Panel is installed near a high-voltage control panel, a ground current from the high-voltage control panel will cause ground noise at the Remote I/O Panel. To prevent this, insulate the Remote I/O Panel from the building as shown in the figure below. Then, connect the ground terminal (E) of the Remote I/O Panel to its own ground plate.

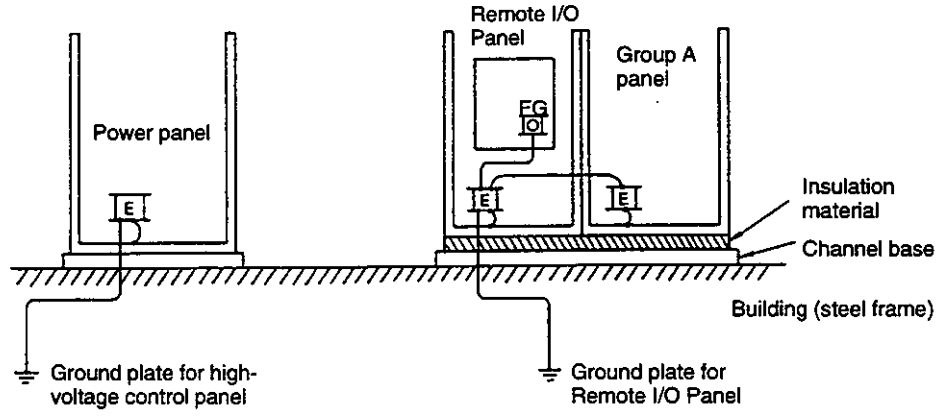


Figure 4.7 Remote I/O Panel Insulation

I/O Allocations

5

This chapter describes the I/O allocations.

5.1 I/O Allocations Using MEMOSOFT 5-2

5.1.1 Overview of I/O Allocations 5-2

5.1.2 MEMOSOFT I/O Allocation Screen 5-3

5.1.3 I/O Allocations 5-4

5.1.4 Switching I/O Allocation Screens 5-13

5.1 I/O Allocations Using MEMOSOFT

This section describes the I/O allocations (maps) for the 2000-series Remote I/O System.

5.1.1 Overview of I/O Allocations 5-2
5.1.2 MEMOSOFT I/O Allocation Screen 5-3
5.1.3 I/O Allocations 5-4
5.1.4 Switching I/O Allocation Screens 5-13

5.1.1 Overview of I/O Allocations

1) The interface between CPU Modules and 2000-series I/O Modules is established by allocating input relays, output coils, input registers, and output registers.

2) The method of allocating the reference numbers is the same as for 120-series I/O Modules. See *5.1.3* for the allocation method.

3) The 2000-series Remote I/O Driver Modules must be one of the Module versions supported by the MEMOCON GL120 or GL130. Make sure you fully understand the conditions of use and that you use the Module correctly.

⚠ **Caution** The 2000-series Remote I/O Driver Module can be used only if the CPU Module and the MEMOSOFT used for the MEMOCON GL120, GL130 are of the versions shown in the following table.

Using the wrong versions may result in failure or malfunction.

Name	Description	Model	Applicable Version	Location of Version Indication
CPU Module (8 kW)	CPU10	DDSCR-120CPU14200	□□A01 or later	Nameplate of the Module (see note.)
CPU Module (16 kW)	CPU20	DDSCR-120CPU34100	□□B01 or later	
CPU Module (16 kW)	CPU21	DDSCR-120CPU34110	□□A01 or later	
CPU Module (32 kW)	CPU30	DDSCR-130CPU54100	□□B01 or later	
CPU Module (40 kW)	CPU35	DDSCR-130CPU54110	□□A01 or later	
MEMOSOFT		FMSGL-AT3 (for DOS)	1.31□ or later	Bottom center of MEMOSOFT startup screen
		FMSGL-PP3 (for P120)		
		FMSGL-PP3E (for P120)		

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

5.1.2 MEMOSOFT I/O Allocation Screen

The MEMOSOFT I/O Allocation Screen is described below.

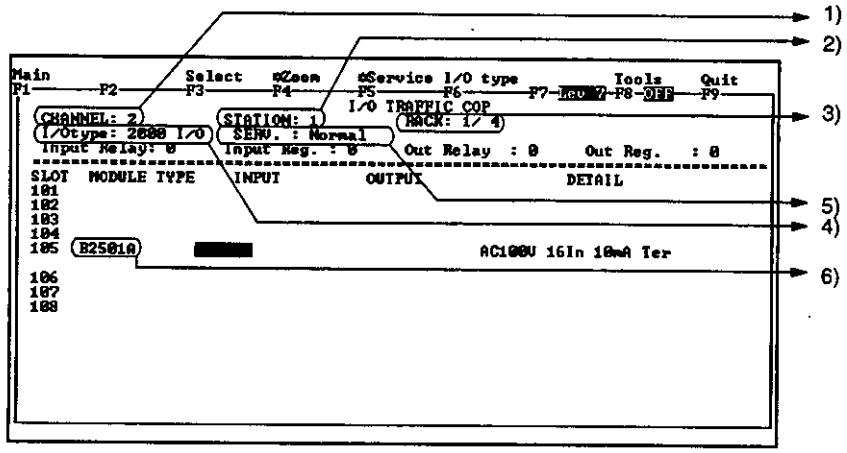


Figure 5.1 MEMOSOFT I/O Allocation Screen

1) Channel No.

Set **1** or **2** when a 2000-series I/O Module or a 1000-series I/O Module is used for a remote channel.

2) Station No.

From 1 to 15 Remote I/O Receiver Modules can be connected.

3) Rack No.

Rack numbers from 1 to 4 are assigned.

4) I/O Type

Set 2000-series I/O Modules or 1000-series I/O Modules.

5) Service Scan

Set I/O data refresh to be performed in a normal scan cycle or in a high-speed scan cycle. A normal scan will be used when a 2000-series I/O Module or a 1000-series I/O Module is selected as the I/O type.

6) Module Type

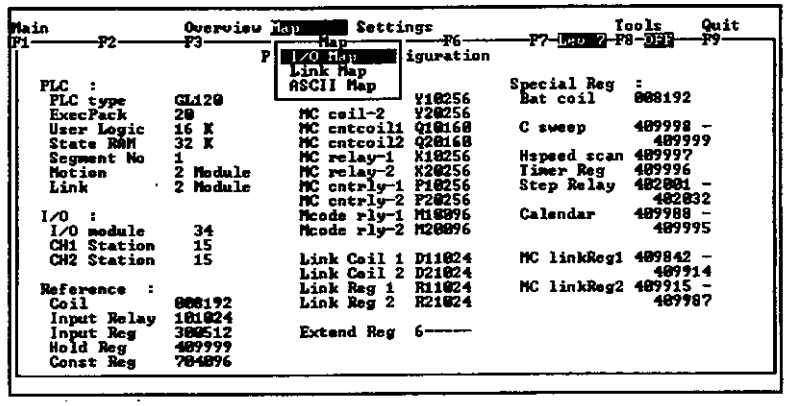
Enter the description (code) for the 2000-series I/O Module or the 1000-series I/O Module.

5.1.3 I/O Allocations

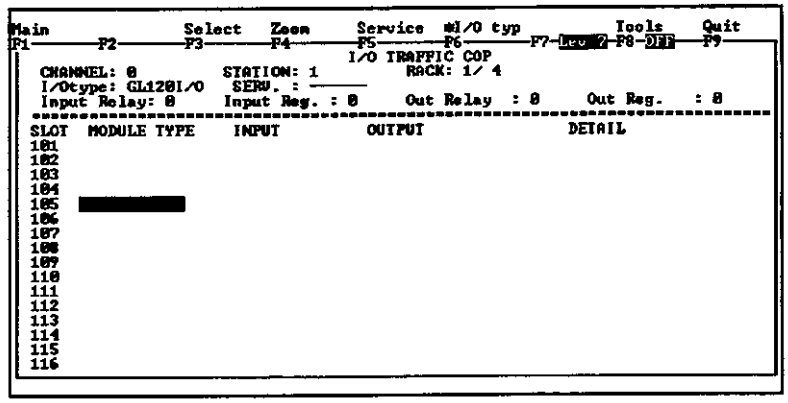
1. Basic Allocations

The I/O Allocation Screen can be displayed by selecting ***I/O Map*** from the Map Menu. Editing operations are not possible when the PLC is in RUN state.

1) Select ***I/O Map*** from the Map Menu using the Cursor Keys and press the Enter Key.

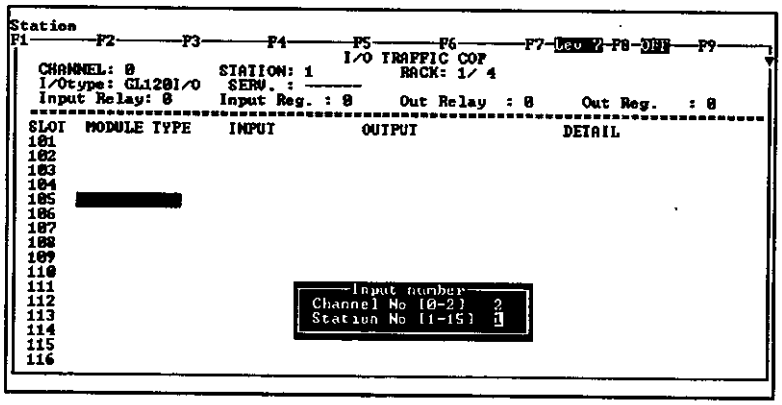


2) The I/O Allocation Screen will be displayed. Press the F3 Key to select the Select Menu. Then, press the F1 Key and select ***Station***.

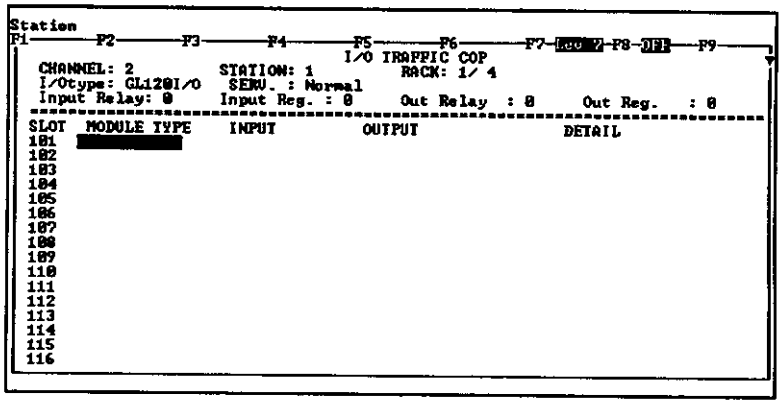


3) A window for entering a channel number and a station number will be displayed. Enter the channel number (***2*** in this example) and press the Enter Key. Enter the station number (***1***

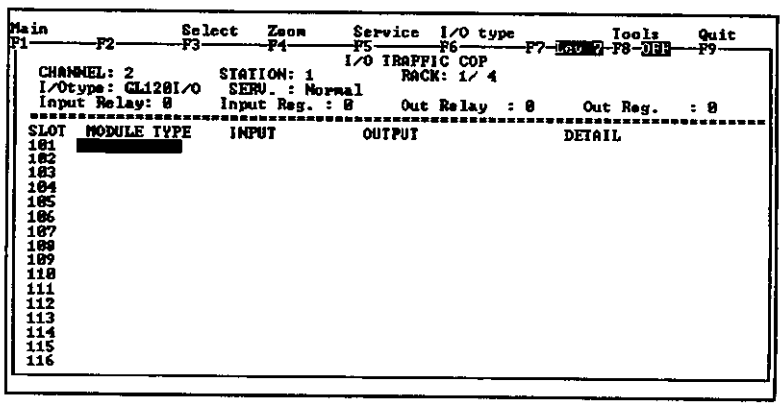
in this example) and press the Enter Key. For Remote I/O, enter 1 or 2 as the channel number.



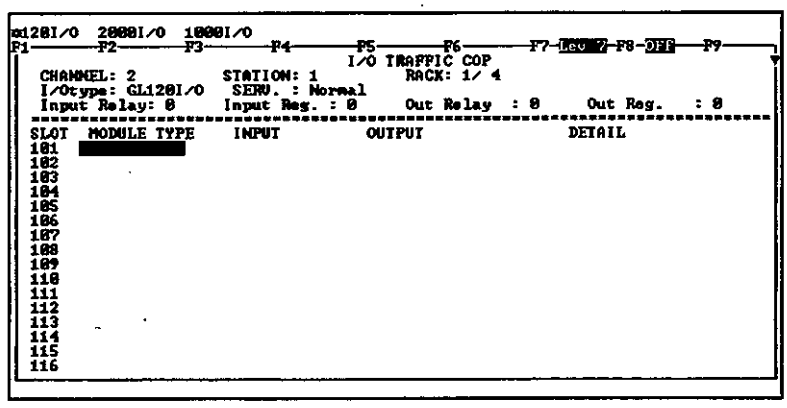
The I/O Allocation Screen for channel number 2 and station number 1 will be displayed.



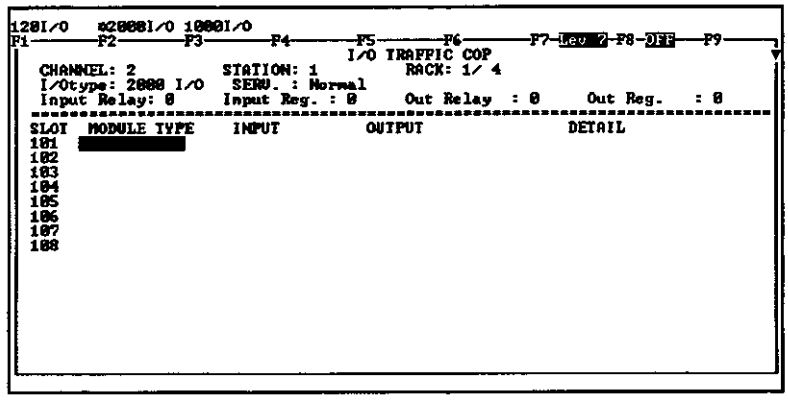
4) Press the Esc Key, then press the F6 Key to set the I/O type.



5) Select ***I/O type*** and press the F2 Key to set ***2000 I/O*** as the I/O type.



6) Move the cursor to the slot to be allocated.

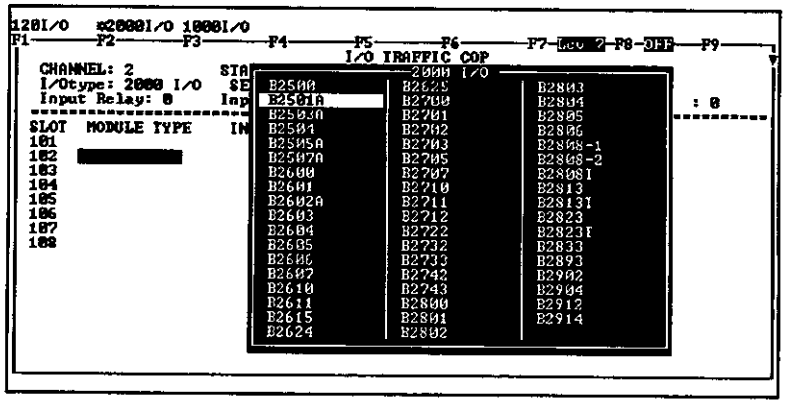


Control can be transferred between racks by the following key operations.

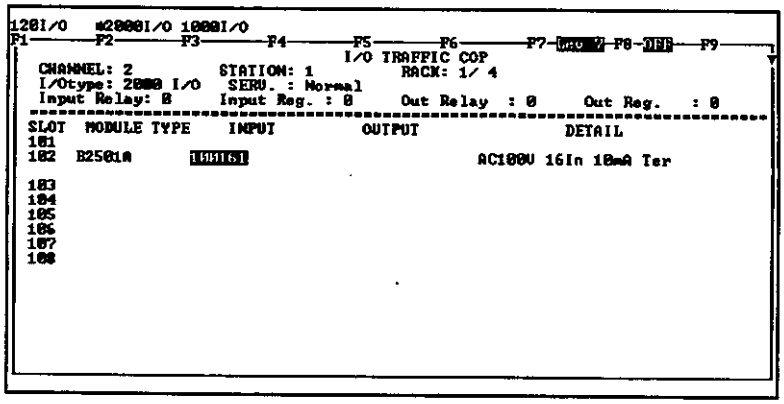
PgUp	The I/O Allocation Screen of the rack one number lower is displayed. When Rack 1 is displayed, the screen is switched to that of Rack 4.
PgDn	The I/O Allocation Screen of the rack one number higher is displayed. When Rack 4 is displayed, the screen is switched to that of Rack 1.

Channels and stations can be switched from the menu only.

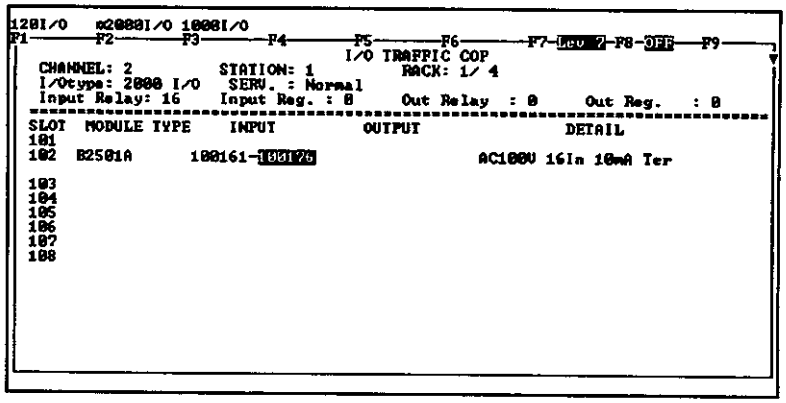
7) When the ? Key is pressed, a list of Module types that can be allocated will be displayed. To select the Module to be allocated, move the cursor to the position of the Module and press the Enter Key.



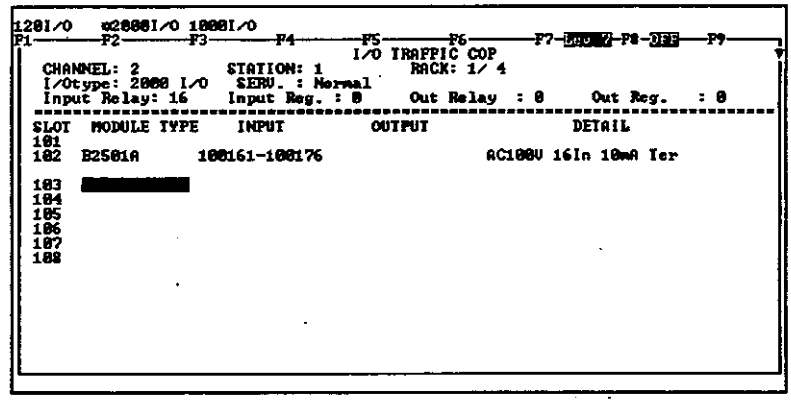
8) Enter the starting reference number. In this example,the reference number of the input relay is ***100161*** because a Digital Input Module was selected.



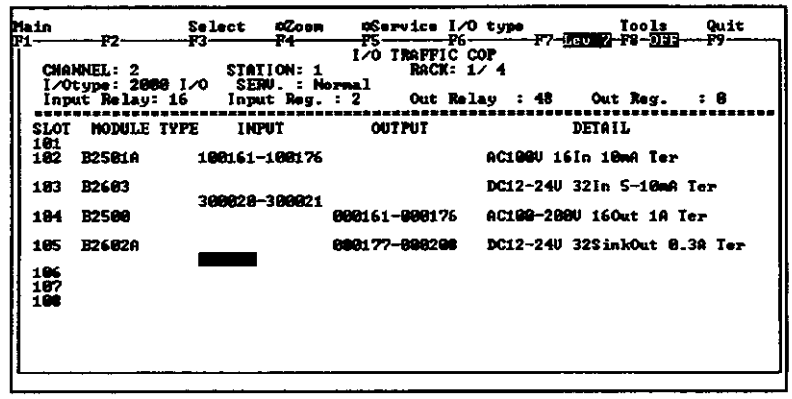
9) The cursor will move to the position of the last reference number. The number determined by adding the number of I/O points to the starting reference number will be set as the default. If the number is correct, simply press the Enter Key.



The setting will be stored and the cursor will move to the next slot.



10) Allocate other I/O Modules using the same procedure.



INFO

1) When specifying an I/O relay as the reference, specify a value of 16n + 1 (n = 0, 1, 2, ...) as the starting reference number.

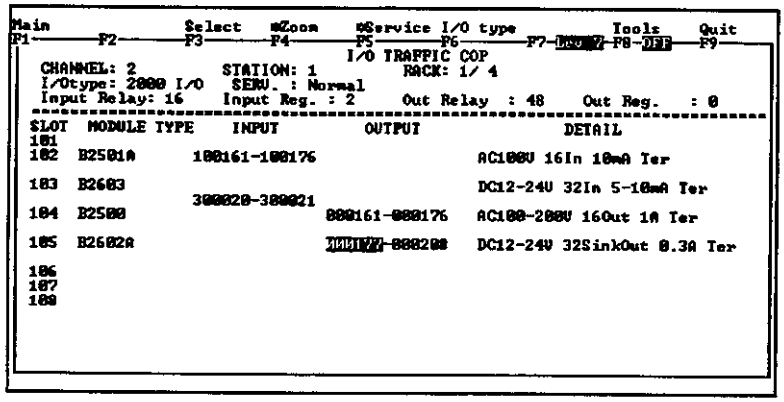
2) If the reference number that was entered has already been assigned, a warning message will be displayed. If the existing reference number can be used, simply press the Enter Key.

3) To change the last reference number set by default, enter a different reference number in the position of the last reference number. When specifying an I/O relay as the reference, specify 8n (n = 1, 2, 3, ...) as the number of I/O points.

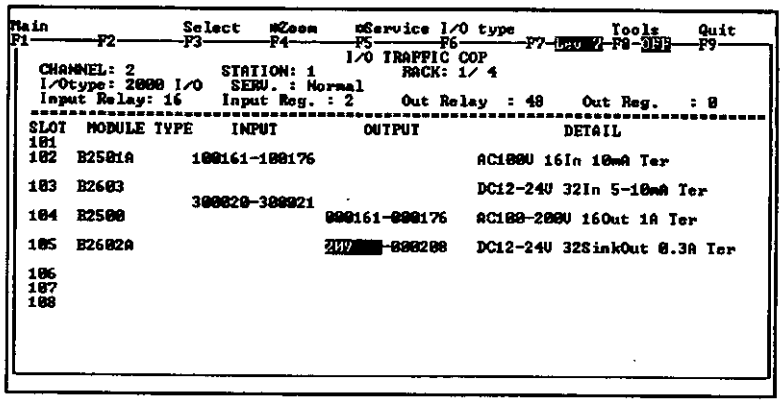
2. Changing a Reference Number

Use the following procedure to change a reference number that has been allocated.

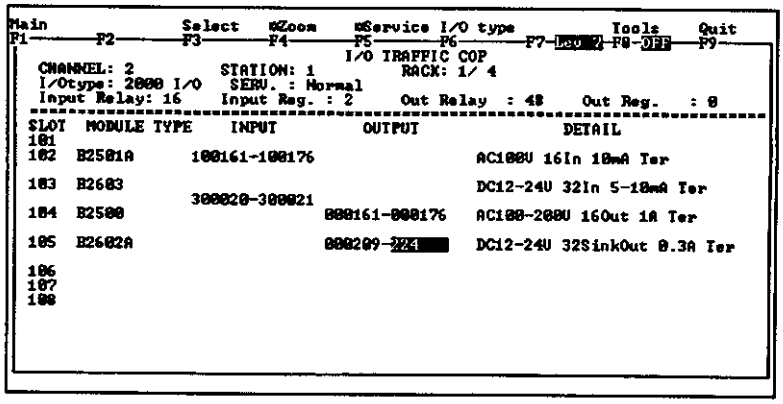
1) Move the cursor to the position of the reference number to be changed using the Cursor Keys.



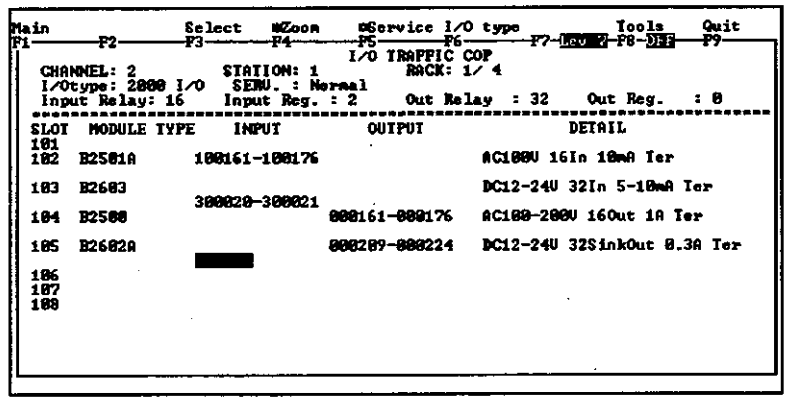
2) Enter the starting reference number (***209*** in this example) and press the Enter Key.



3) The cursor will move to the position of the last reference number. The number determined by adding the number of I/O points of the Module to the starting reference number will be set by default. In this example, assign 16 points. Enter the last reference number (***224*** in this example) and press the Enter Key.



The reference number will be changed.

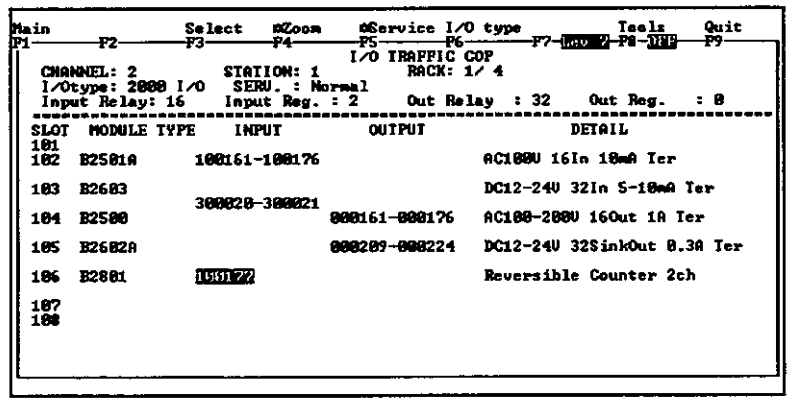


INFO It is also possible to change the last reference number only. Move the cursor to the position of the current last reference number and enter a new last reference number.

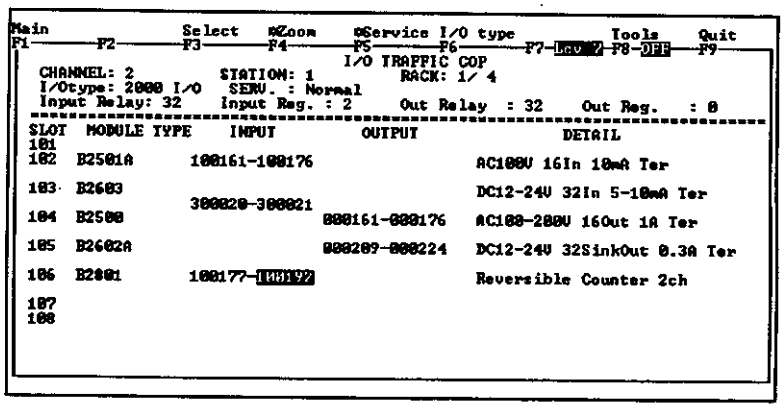
3. Allocating Composite Modules

For Composite Modules, allocate Digital I/O and Register I/O using a 2-line allocation area on the I/O Allocation Screen. The following example shows how to allocate Composite Modules.

1) A Counter Module is allocated as an example. Move the cursor to the slot where the Counter Module is to be allocated. Select a Counter Module, and a 2-line allocation area will be displayed and the cursor will move to the input relay position. Enter the starting reference number of the input relay (***100177*** in this example) and press the Enter Key.



2) The cursor will move to the position of the last reference number. Press the Enter Key if the last reference does not need to be changed.



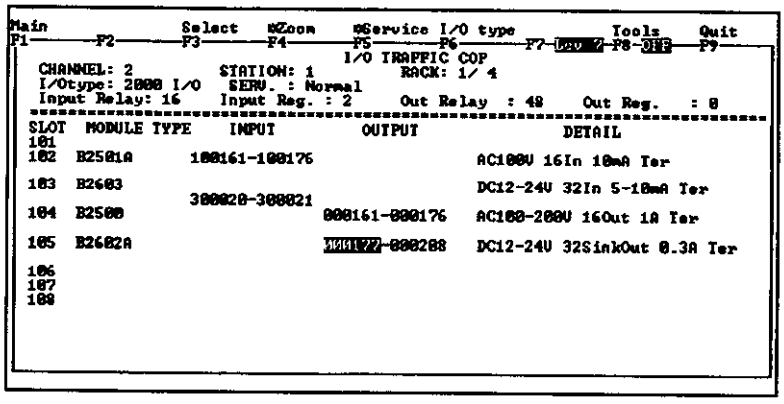
The settings will be stored, and the cursor will move to the position of the starting reference number of the output coil.

3) Allocate the output coil, input register, and output register using the same procedure given above.

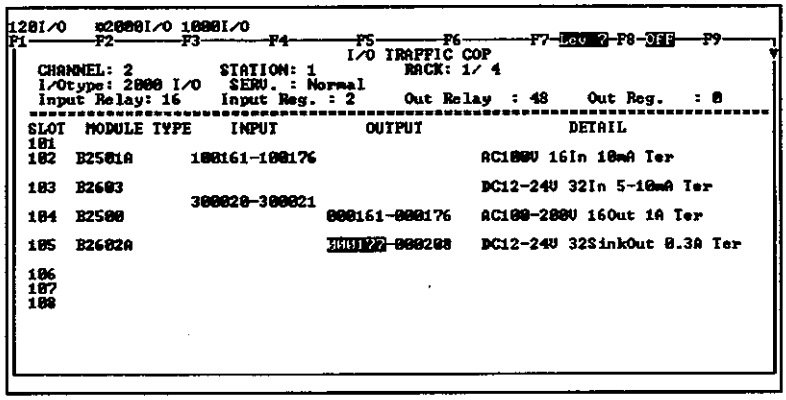
4. Changing the I/O Module Type

Use the following procedure to change the I/O Module type that has been allocated. The following example shows how to change the remote station allocated for a 2000-series I/O Module to a 1000-series I/O Module.

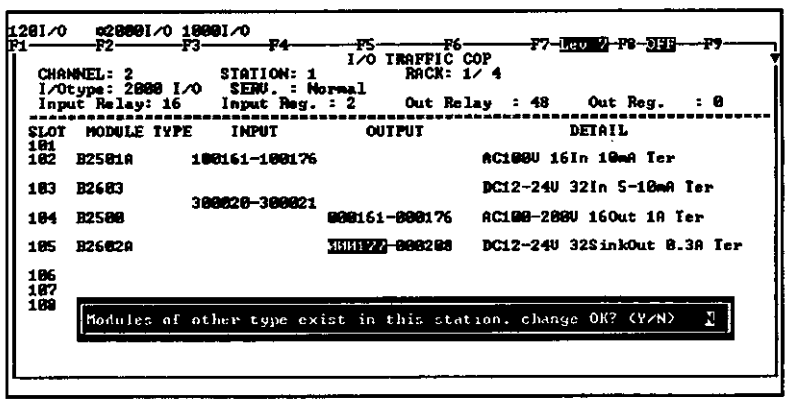
1) Display the I/O Allocation Screen for the channel and station numbers to be changed, then press the F6 Key to select ***I/O type***.



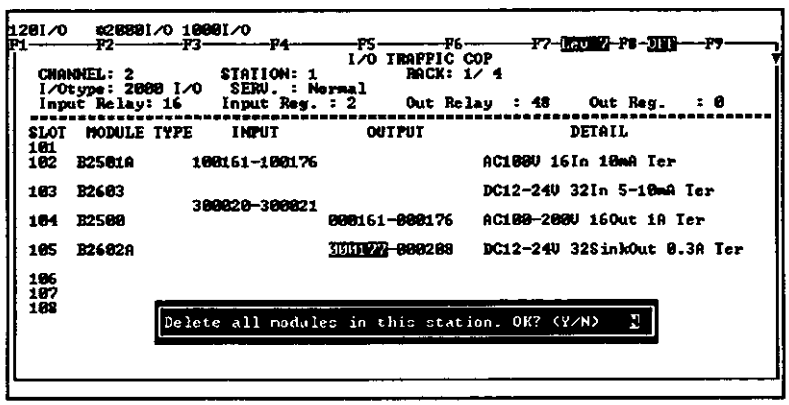
2) Press the F3 Key to select ***1000 I/O***.



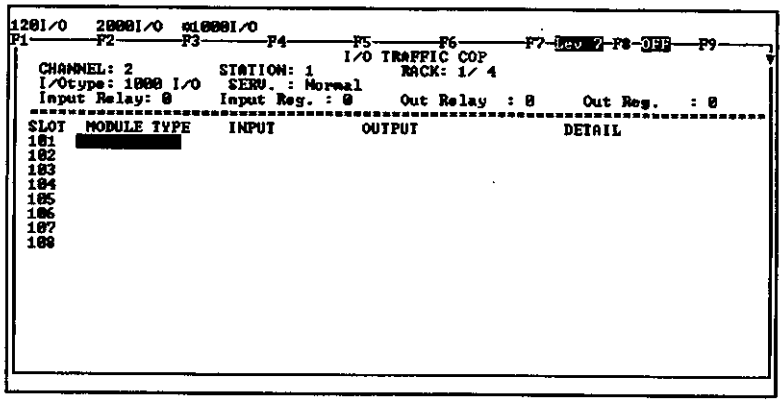
3) A confirmation message will be displayed on the bottom of the screen. Enter "Y" and press the Enter Key.



4) A confirmation message will be displayed asking you whether the I/O allocation for the selected remote station is to be deleted. If the remote station is to be changed to the 1000-series I/O Module, enter "Y" and press the Enter Key.



The I/O type of the selected remote station will be changed to the I000-series I/O Module.

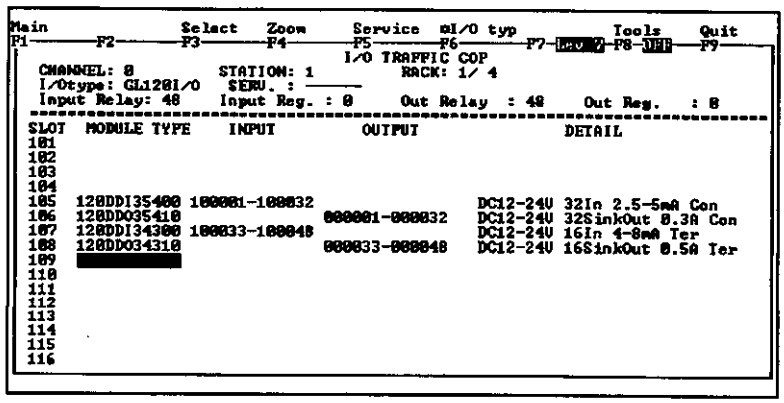


5.1.4 Switching I/O Allocation Screens

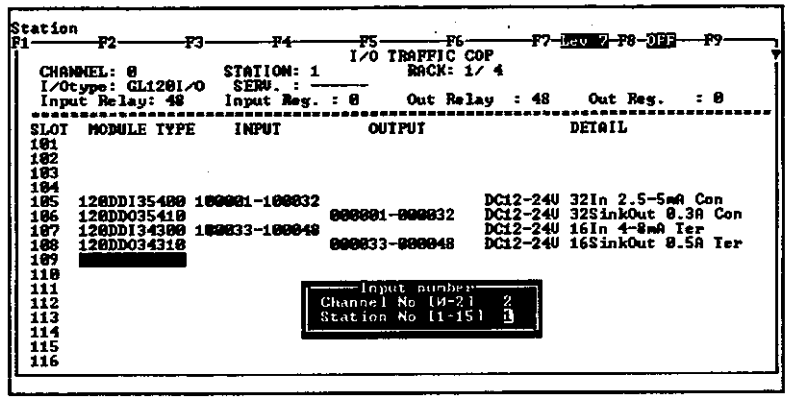
The I/O Allocation Screen is displayed for each rack. Therefore, to allocate I/O for a different rack, the I/O Allocation Screen must be switched. The channel number, station number, and rack number currently being edited are displayed on the 4th line from the top of the screen. An example of switching a channel or a station is shown below.

1) Switch to the menu cursor using the Tab Key.

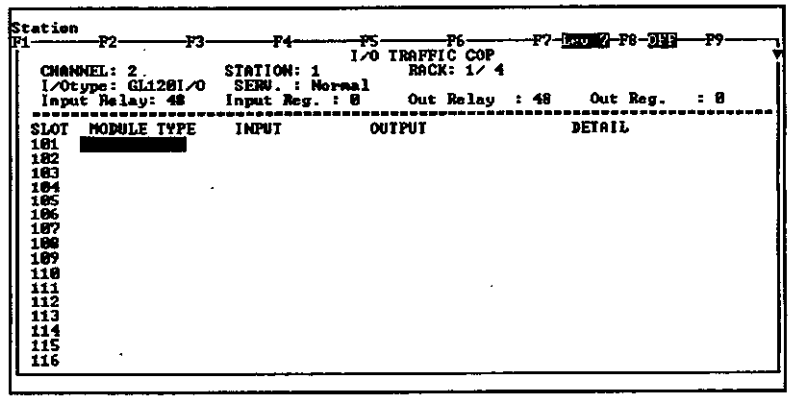
2) Select ***Station*** from the Select Menu using the Cursor Keys and press the Enter Key.



3) A window for entering a channel number and a station number will be displayed. Enter the channel number (***2*** in this example) and press the Enter Key. Enter the station number (***1*** in this example) and press the Enter Key.



The I/O Allocation Screen for channel number 2 and station number 1 will be displayed.



Control can be transferred between racks by the following key operations.

PgUp — The I/O Allocation Screen of the rack one number lower is displayed. When Rack 1 is displayed, the screen is switched to that of Rack 4.

PgDn — The I/O Allocation Screen of the rack one number higher is displayed. When Rack 4 is displayed, the screen is switched to that of Rack 1.

Channels and stations can be switched from the menu only.

Troubleshooting

6

This chapter describes remote I/O error processing.

6.1 Self Diagnosis 6-2

6.1.1 Self-diagnostic Functions 6-2

6.1.2 Fault Detection 6-3

6.1.3 Fault Checking Procedure 6-6

6.1 Self Diagnosis

This section describes the self-diagnostic functions of the 2000-series Remote I/O Driver.

6.1.1 Self-diagnostic Functions 6-2
6.1.2 Fault Detection 6-3
6.1.3 Fault Checking Procedure 6-6

6.1.1 Self-diagnostic Functions

1) Self-diagnostic Functions

The 2000-series Remote I/O Driver Module performs self diagnosis at startup and while the power is ON. If a fault is detected, the content is displayed on the LED indicators on the front panel of the Module.

a) Self-diagnostic Functions at Startup

CPU check

RAM check

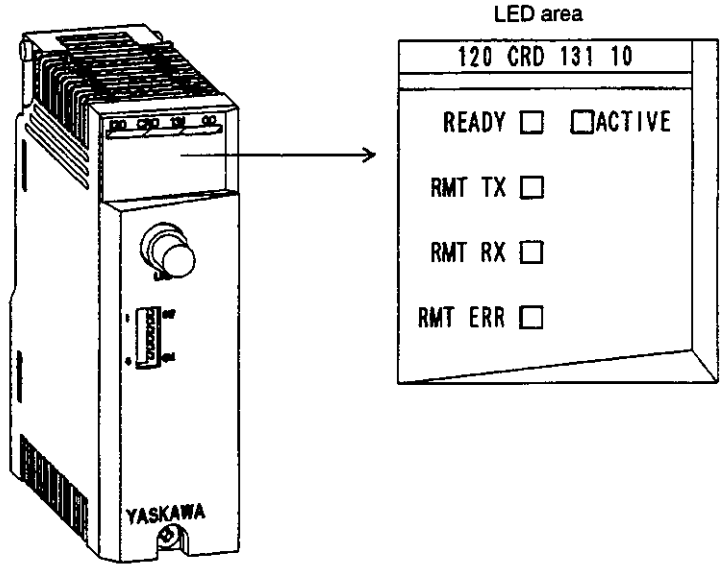
ROM check

b) Self-diagnostic Function with Power ON (Continuous Check)

Watchdog timer check

2) Error Display

When an error occurs, the content is shown on the indicators in the LED area.



If a status error occurs, the READY indicator will turn 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, turn OFF for 1 s, and then repeat this cycle.
Common Memory Error	RMT ERR will flash three times, turn OFF for 1 s, and then repeat this cycle.
Watchdog Timer Error	RMT ERR will flash four times, turn OFF for 1 s, and then repeat this cycle.

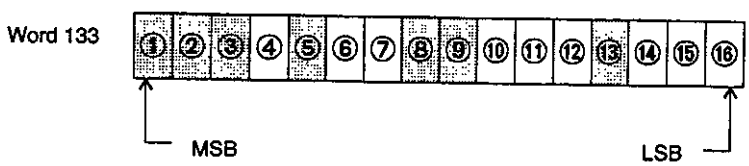
6.1.2 Fault Detection

1) Monitoring by a Remote Station Status Table

a) Status information for the Remote I/O Driver can be read using the STAT instruction.

b) Status information for the remote channel is stored in status words 133 to 162 (for 30 stations).

c) Status word 133 contains the status of station 1 of remote channel 1 as follows (same for 134 to 162);



Bit Number	Name	Meaning when Bit is Set to "1"
1	Communications error or no remote station response	A communications error occurred between a Remote I/O Driver Module and a Remote I/O Receiver Module. Alternatively, no response is sent from a remote station.
2	Allocated data error	The data that was allocated contains an abnormality.
3	Output data length error	The output data length sent from the Remote I/O Driver Module is abnormal.
8	Bus check error	The bus control signal is faulty.
9	Allocation request	No data is allocated to the remote station.
13	I/O service timeout error	No I/O service was performed within a certain period.
14	BUSY check error	The response from the I/O Module is faulty.
16	RIOR error	The Remote I/O Receiver Module is faulty.

INFO A momentary 2008H error will occur when the power for the Remote I/O Receiver Module is turned ON, but this does not indicate faulty operation.

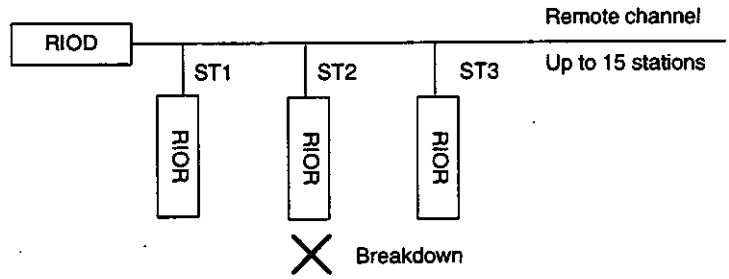
2) Detection of Faulty Stations

a) The Remote I/O Driver Module performs a scan service for Remote I/O Receiver Modules. If no response is sent or an abnormality is detected, the related bit of the remote station status table of the CPU is set to "1."

b) When an abnormality is detected over five scans consecutively, the input signal for the station is set to "0."

c) Other non-faulty Remote I/O Receiver Modules are serviced normally.

d) Station #2 is faulty in the following example. Status word 134 is set to 8000H.



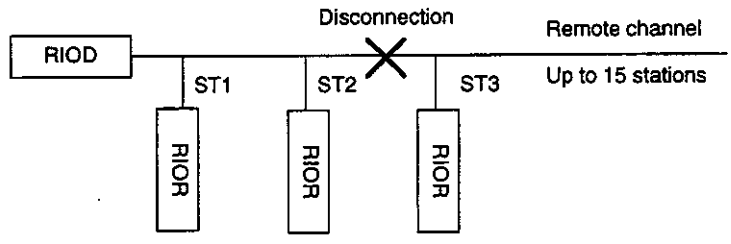
RIOD: Remote I/O Driver Module
RIOR: Remote I/O Receiver Module
ST1: Station number 1

3) Break on the Transmission Line

a) Since the terminator at one end of the transmission line will be lost by disconnection, normal transmission to all the Remote I/O Receiver Modules is not guaranteed.

b) Since the Remote I/O Driver Module performs scan services for all the Remote I/O Receiver Modules, I/O operation is performed for only those Remote I/O Receiver Modules that issue a normal response.

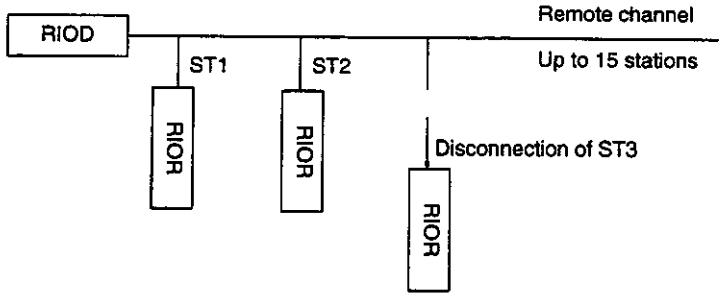
c) Example of a Break on the Transmission Line



4) Disconnection from the Transmission Line

a) Since no response is sent from a disconnected Remote I/O Receiver Module, the station is assumed to be faulty.

b) Example of Disconnection from the Transmission Line



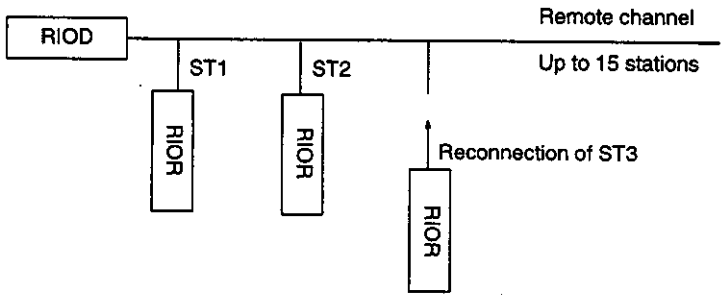
5) Reconnection to the Transmission Line

a) In the first service after reconnection, the I/O allocation is requested from the Remote I/O Receiver Module.

b) Normal operation starts after I/O allocation information is sent to Remote I/O Receiver Module from the Remote I/O Driver Module.

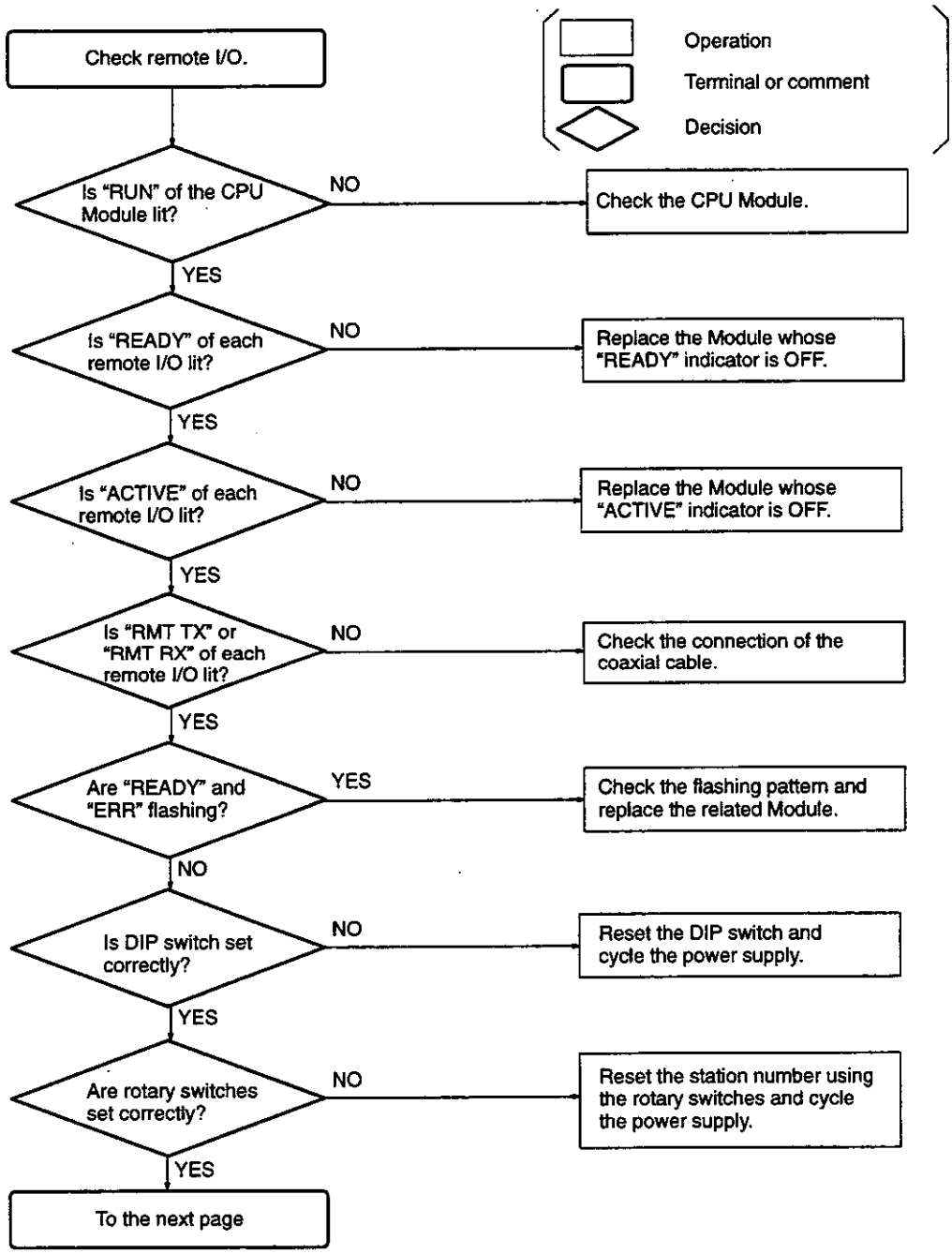
c) The same operation is also performed when the Remote I/O Receiver Module reset switch is pressed.

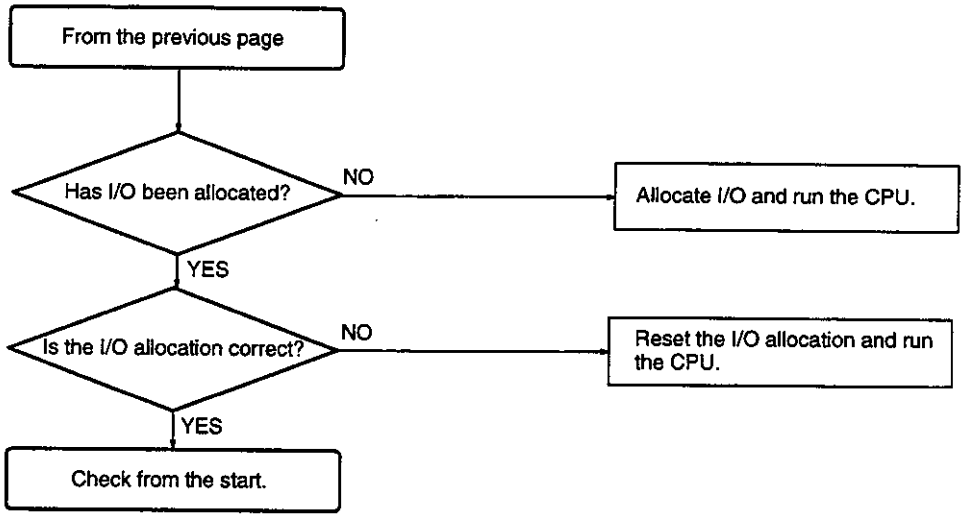
d) Example of Reconnection to the Transmission Line



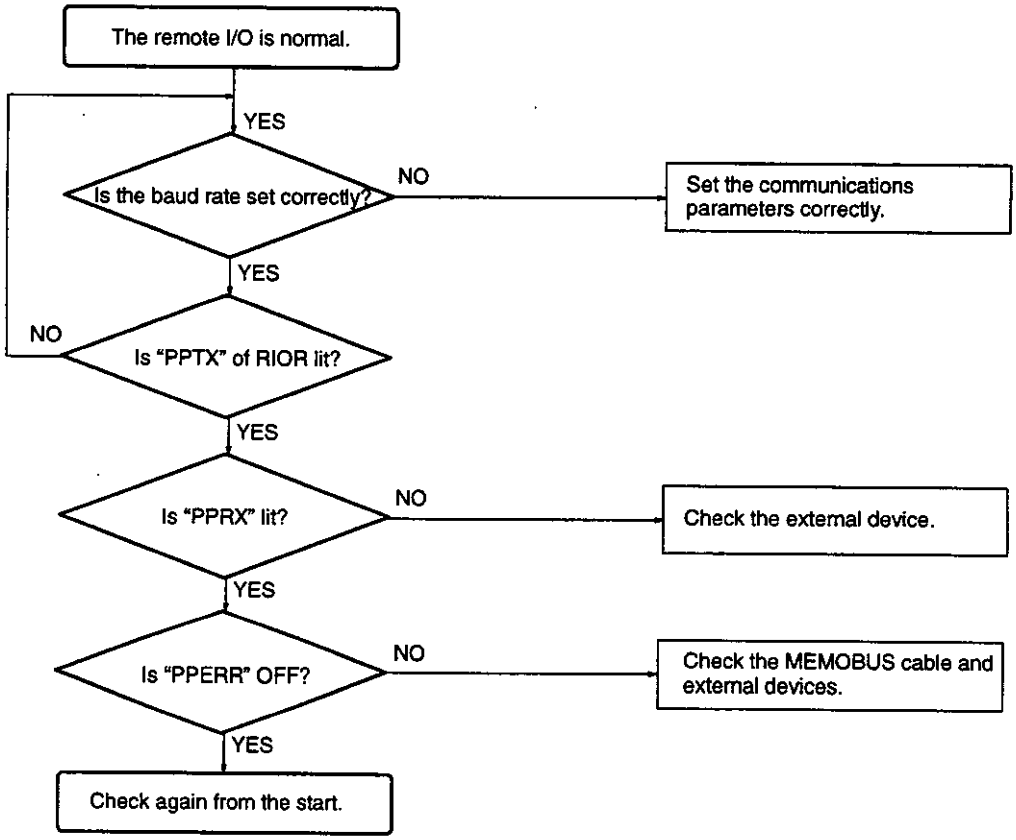
6.1.3 Fault Checking Procedure

1) Checking Remote I/O Faults





2) Checking Remote I/O Receiver Module MEMOBUS Port Failures



Appendix A

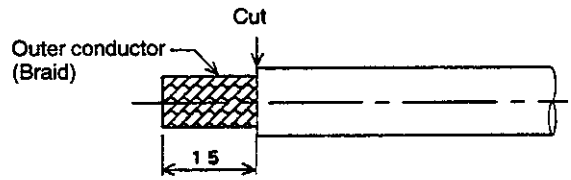
Coaxial Cable Connector Installation Procedures

This appendix describes the installation procedures for BNC Connectors, F-connectors, and Fitting Connectors.

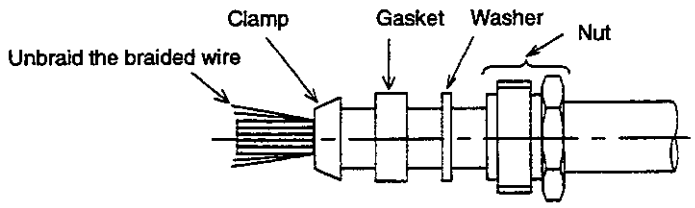
A.1 BNC Connector Installation A-2
A.2 F-connector Installation A-4
A.3 Fitting Connector Installation A-7

A.1 BNC Connector Installation

1) Remove the sheath to 15 mm from the cable end. Use a cutter knife or pipe cutter (IFV1638).



2) Slide a nut, washer, gasket, and clamp onto the coaxial cable in this order.

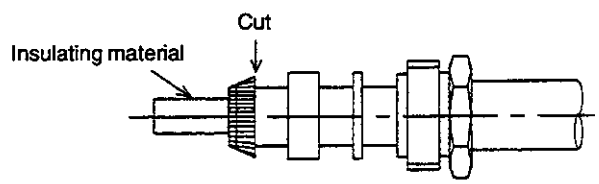


Note a) Place the nut, washer, and gasket over the sheath.

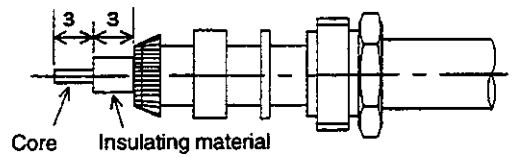
b) Place the clamp over the braided wire until it reaches the cut sheath end.

c) After placing the clamp, unbraid the braided wire.

3) Turn back the braided wires along the clamp taper, and cut them to the same dimension as the taper.

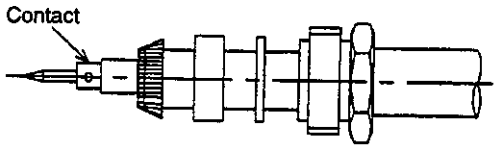


4) Remove the insulating material, leaving about 3 mm, to expose the core. Cut the core end, so that the bare core is 3 mm long.



Note Be careful not to damage the core.

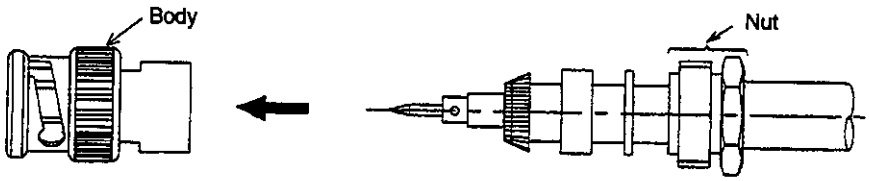
5) Thread the core through the contact, and solder it.



Note a) Solder quickly, being careful not to deform the insulating material.

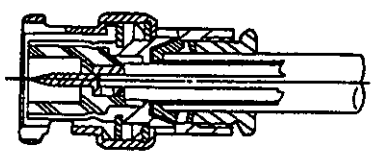
b) Do not permit the solder to form a lump or a gap between the contact and insulating material.

6) Insert the contact into the body.



Note Insert the contact all the way into the body.

7) Using a wrench, turn the nut to tighten the body. This completes connector installation.

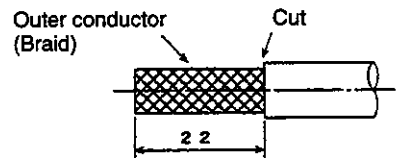


A.2 F-connector Installation

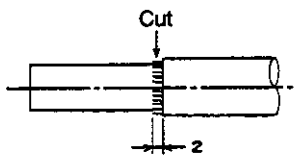
The following example is for a 5C-2V cable.

1) Prepare the ends of coaxial cable, using a cutter knife or pipe cutter (IFV1638).

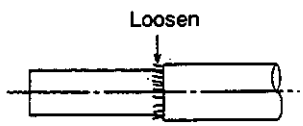
a) Remove the sheath to 22 mm from the cable end.



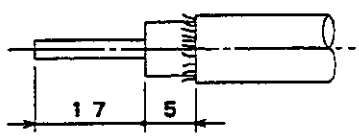
b) Using nippers, remove braided wires, leaving them about 2 mm long.



c) Loosen the braided wires.

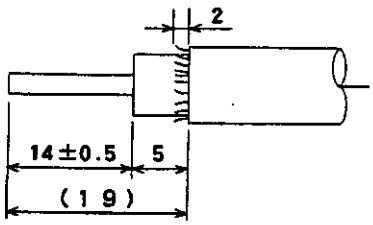


d) Pull out the insulating material 17 mm from the end.



Note Be sure not to damage the core.

e) Cut the core end, and adjust the bare core to 14 ± 0.5 mm.

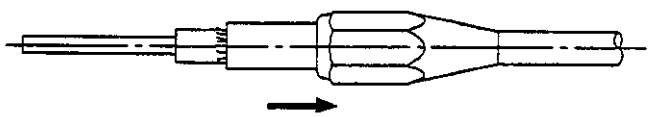


Note a) The bare core must be 14 ± 0.5 mm.

b) Leave aluminum foil about 5 mm.

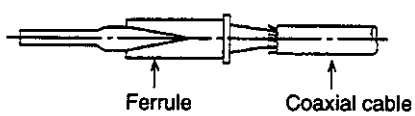
c) Leave the braided wires loose.

2) Insert the F-connector nut into the coaxial cable.



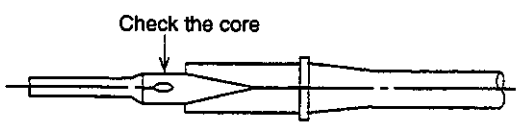
3) Press a ferrule into the coaxial cable.

a) Insert the cable end into the ferrule.



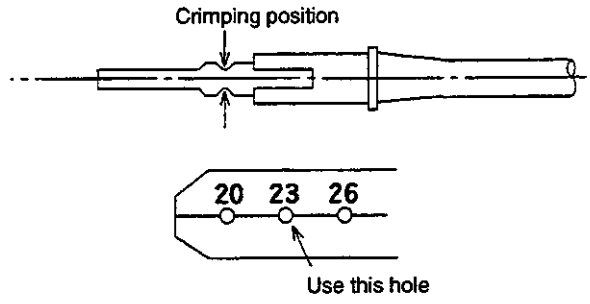
Note During insertion, be careful not to turn up the aluminum foil.

b) Check through the contact window to make sure that the core is correctly inserted into the contact.



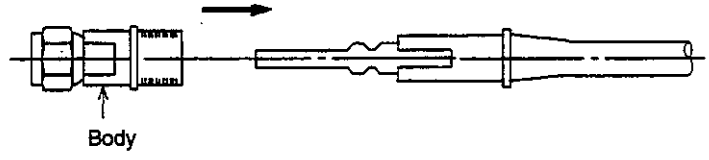
4) Crimp the ferrule contact.

Always use a crimping tool (FC-1, DIA 23 mm, manufactured by Fujikura, Ltd.) to crimp the ferrule contact. The crimping position must be at the contact window.

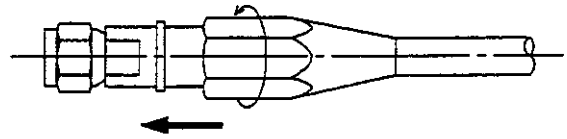


Note Be careful not to bend the contact.

5) Insert the body into the ferrule.



6) Using a wrench, tighten the nut until the rubber gasket is completely hidden. This completes the connector installation.

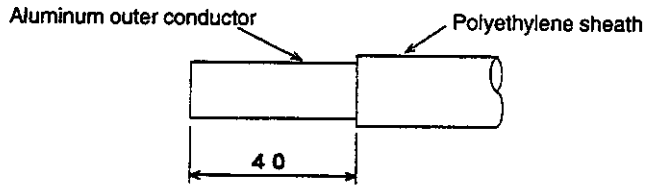


Note Fix the body with a wrench (12 mm width across flat) or an adjustable spanner and firmly tighten the nut with a wrench (14 mm width across flat) or an adjustable spanner.

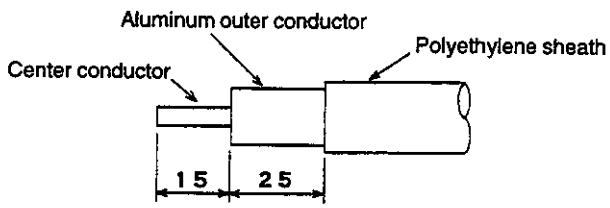
A.3 Fitting Connector Installation

1) Prepare the ends of a coaxial cable, using a cutter knife or pipe cutter (IFV1638).

a) Remove the sheath to 40 mm from the cable end.

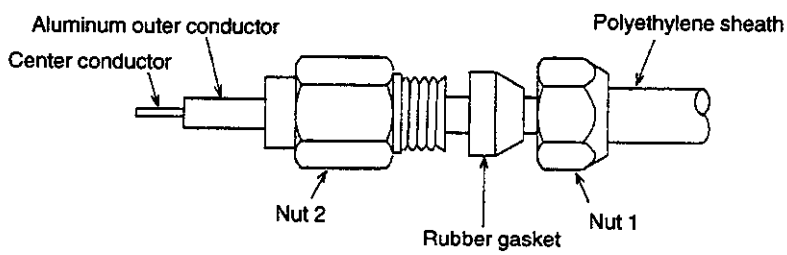


b) Remove the aluminum outer conductor and insulating material to 15 mm from the cable end.

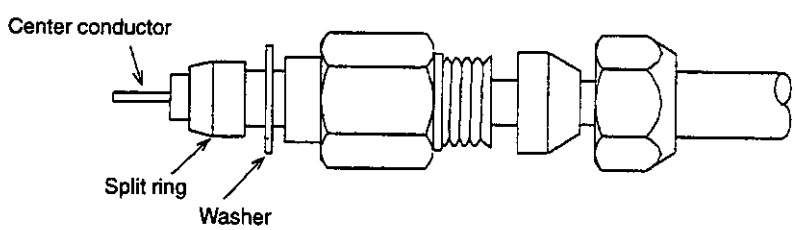


Note Be careful not to bend or damage the center conductor.

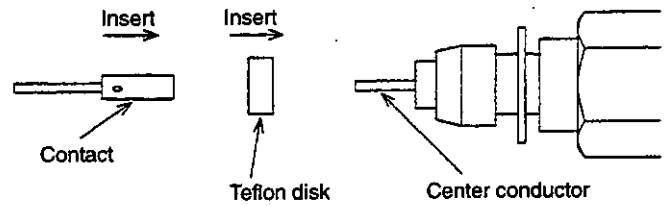
2) Slide nut 1, rubber gasket, and nut 2 onto the coaxial cable in this order.



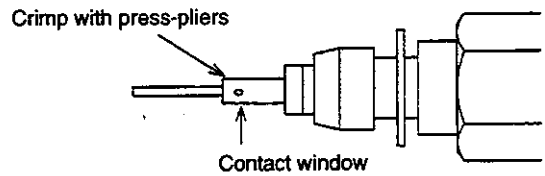
3) Slide a washer and split ring onto the aluminum outer conductor.



4) Slide the Teflon disk and contact onto the center conductor in this order.

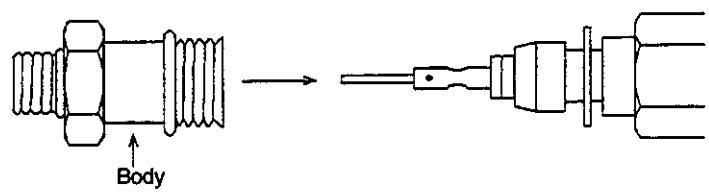


5) Crimp the contact, using 9.5 mm coaxial-cable press-pliers.

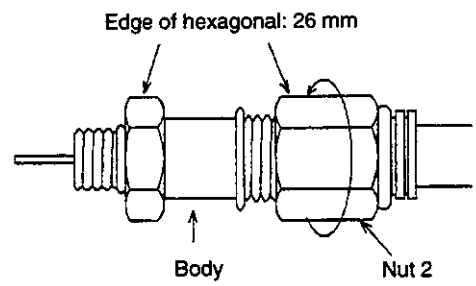


Note Check through the contact window to make sure that the contact is inserted all the way in.

6) Insert the contact into the body.

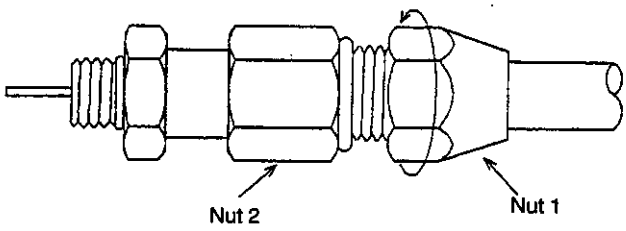


7) Tighten the body and nut 2.



Note Fully insert the body and tighten nut 2.

8) Tighten nut 1. This completes the connector installation.



Note Secure nut 2, then tighten nut 1.

A.4 Tool List

Coaxial Cable Stripper CST

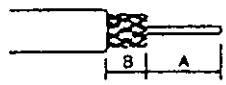
Manufacturer: Nihon Weidmuller Co., Ltd.

Table A.1 Coaxial Cable Stripper

Specifications		
Length	100 mm	
Mass	65 g	
Height	42 mm	
Width	26 mm	
Sheath Trim		
Coaxial Cable	2.8 to 8 mm Dia	
	RG58, 59, 62, 71, 174, 187, 188	
Order Data		
Type	No.	Sheath Trim (Refer to the following diagram)
Coaxial Cable Stripper CST	903050	
Screw Holder (Spare)	903206	
Blade Cassette (Gray)	903205	Approx. 3.9 mm (B)
Blade Cassette (Red)	903204	Approx. 6 mm (B)
Blade Cassette (Yellow)	903203	Approx. 12 mm (B)
Blade Cassette (Blue)	903202	Approx. 6.5 mm (B)
Blade Cassette (Brown)	903201	Approx. 7.5 mm+ Approx. 3.5 mm (C+B)
Blade Cassette (Green)	903200	Approx. 7.1 mm + Approx. 5.1 mm (C+B)

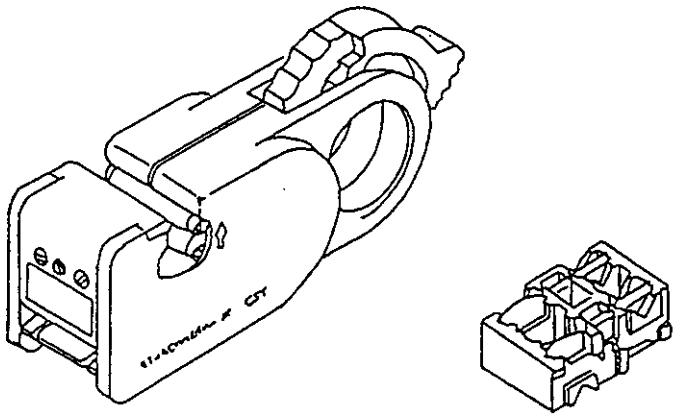
Sheath Trimming Dimensions

Blade Cassette:
Gray/Red/Yellow/Blue



Blade Cassette:
Green/Brown

Coaxial cable stripper cannot be used for the cable type 7C, 7C2V, 11C, and 12C.



Coaxial cable stripper

Blade cassette

Figure A.1 Coaxial Cable Stripper and Blade Cassette

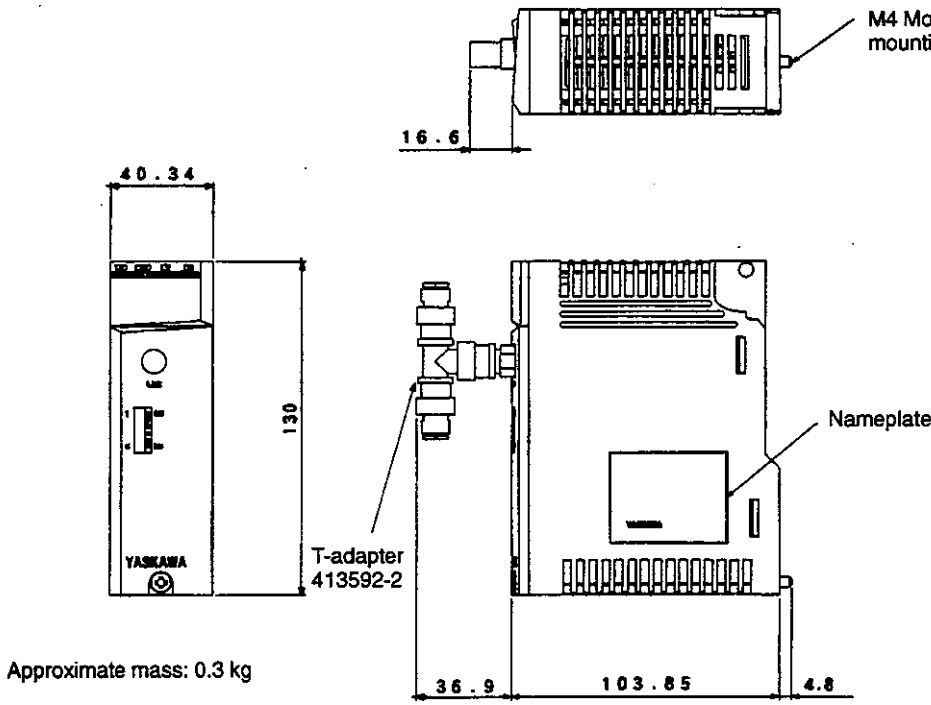
Appendix B

Remote I/O Module External Dimensions

This appendix shows external dimensions of Remote I/O Modules and related products.

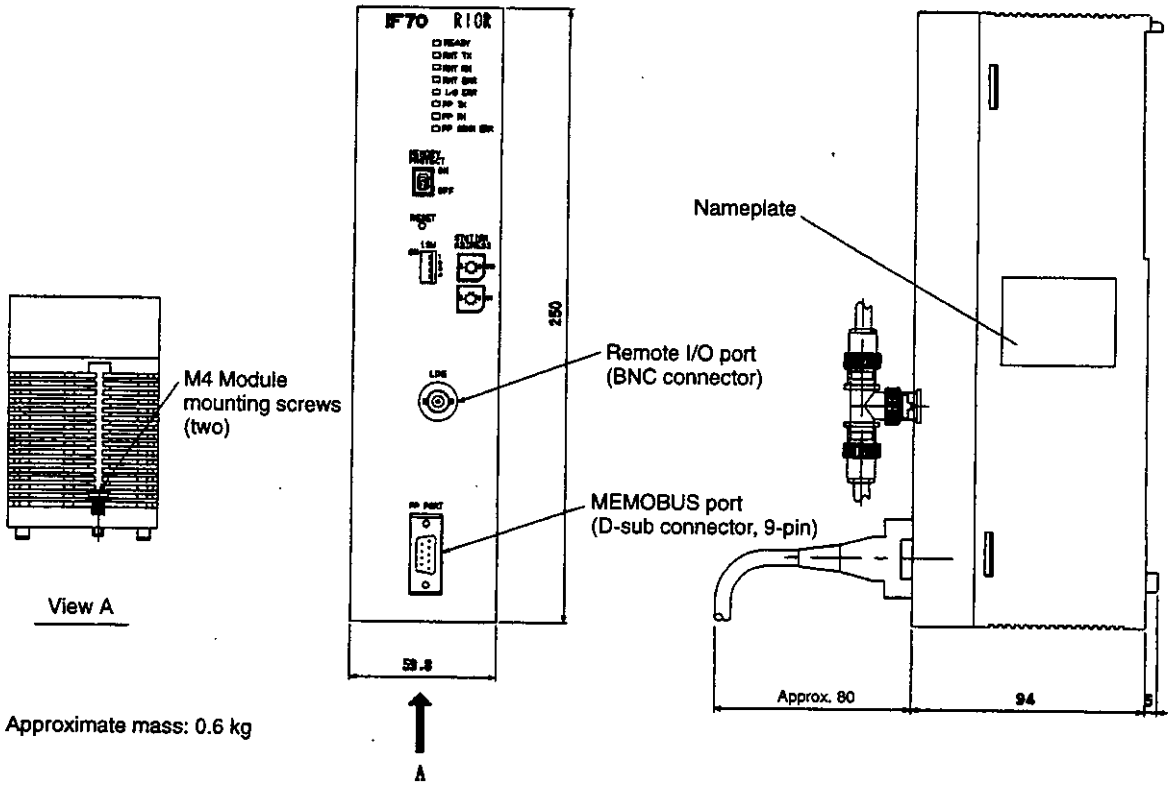
Remote I/O Module External Dimensions in mm

1) 2000-series Remote I/O Driver Module (JAMSC-120CRD13110)



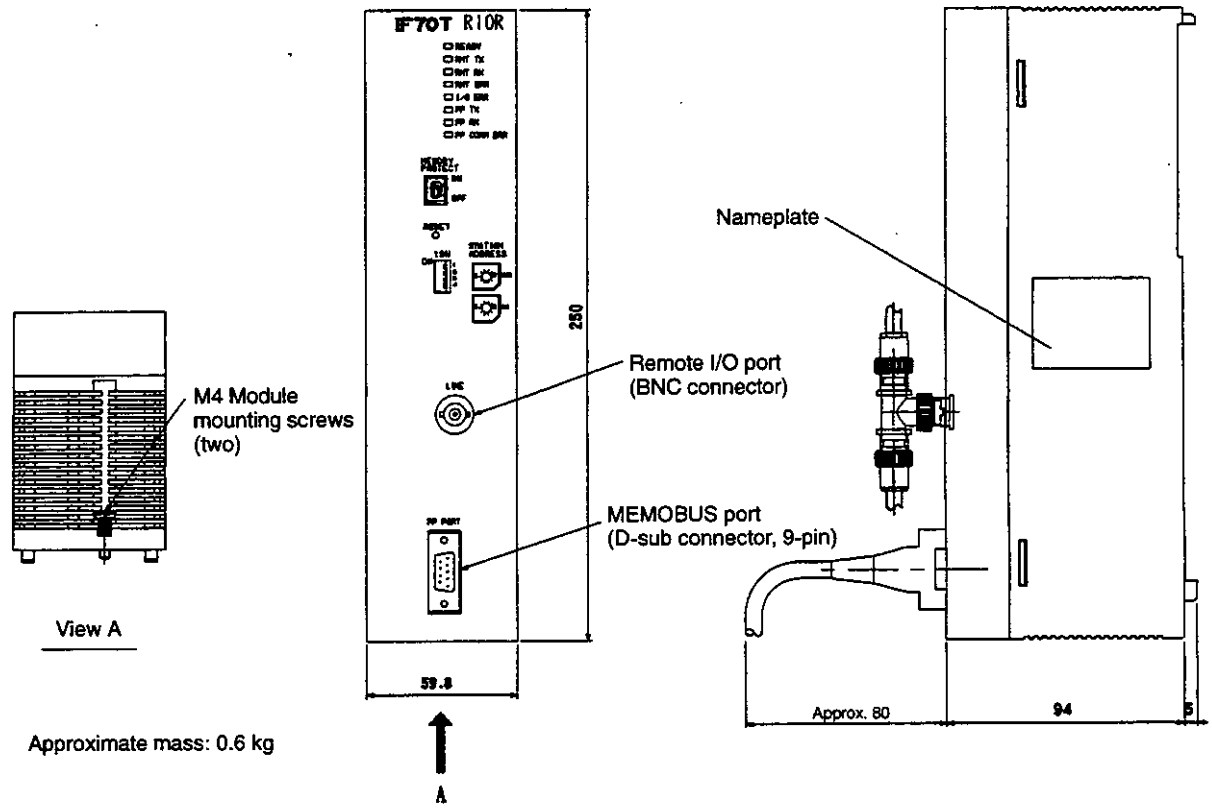
Approximate mass: 0.3 kg

2) 2000-series Remote I/O Receiver Module (JAMSC-IF70)

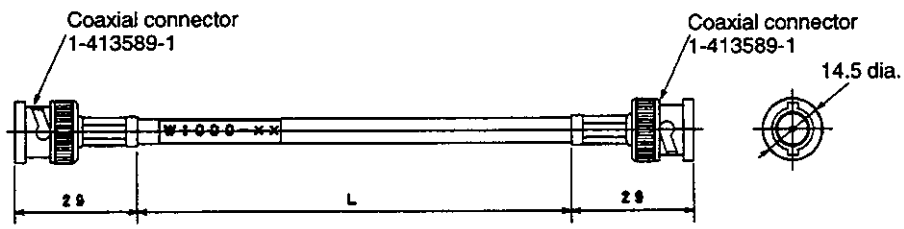


B

3) 1000-series Remote I/O Receiver Module (JAMSC-IF70T)

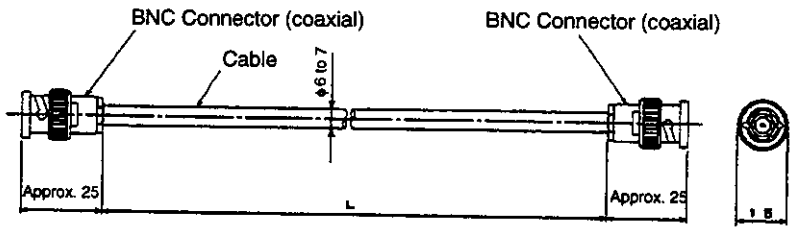


4) W1000 Cable (JZMSZ-W1000-□)



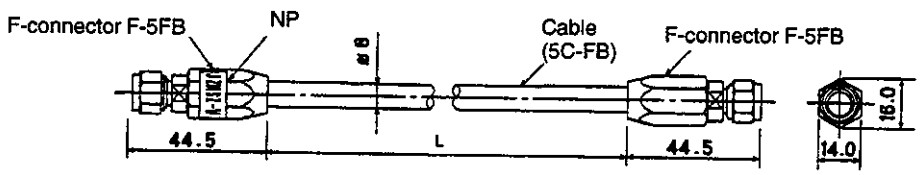
Model	Length (L)	Approximate Mass
JZMSZ-W1000-02	2,000 mm	0.3 kg
JZMSZ-W1000-03	3,000 mm	0.4 kg
JZMSZ-W1000-05	5,000 mm	0.5 kg

5) Coaxial Cable (JZMSZ-W60-□)



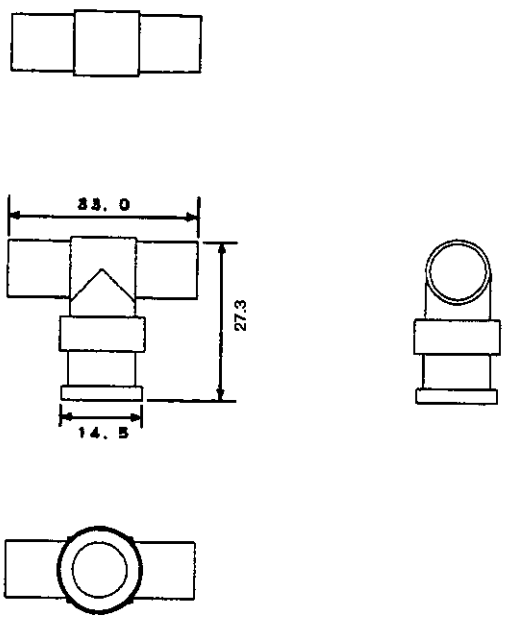
Model	Length (L)	Approximate Mass
JZMSZ-W60-1	2,000 mm	0.3 kg
JZMSZ-W60-2	3,000 mm	0.4 kg
JZMSZ-W60-3	5,000 mm	0.5 kg

6) Coaxial Cable (JZMSZ-W61-□)

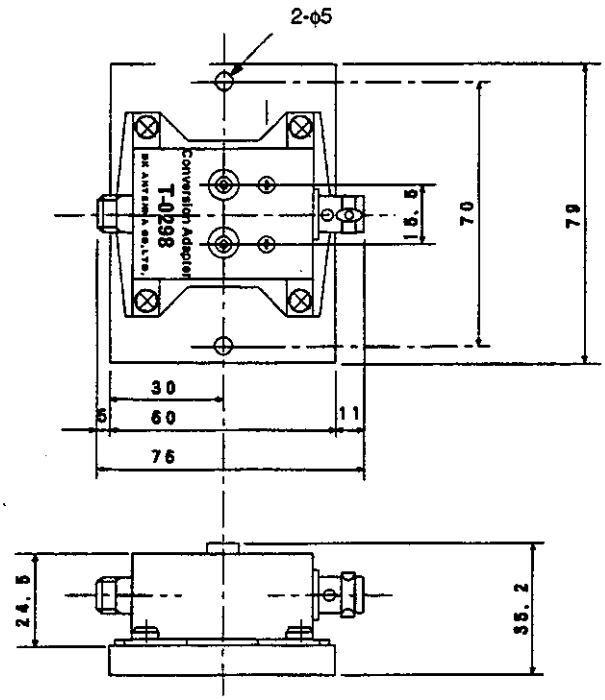


Model	Length (L)	Approximate Mass
JZMSZ-W61-1	2,000 mm	0.3 kg
JZMSZ-W61-2	5,000 mm	0.5 kg
JZMSZ-W61-3	10,000 mm	0.8 kg

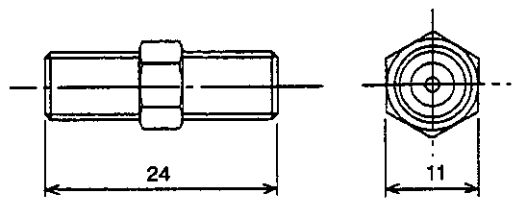
7) T-adapter (413592-2)



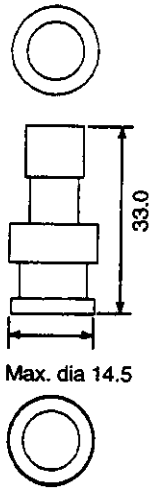
8) Conversion Adapter (T-0298)



9) Junction Connector (F-A)

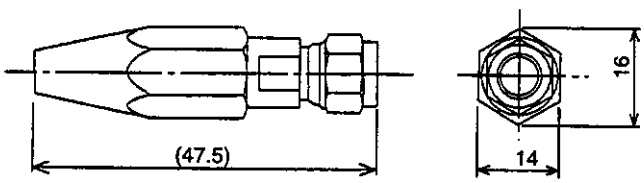


10) Terminator (221629-5)



Resistance: 75 Ω

11) F-connector (F-7FB)



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