YASKAWA

SIE-C815-14.7
DESCRIPTIVE INFORMATION

PROGRAMMABLE CONTROLLER

Memocon™-SC GL60S

USER'S MANUAL

REMOTE I/O SYSTEM

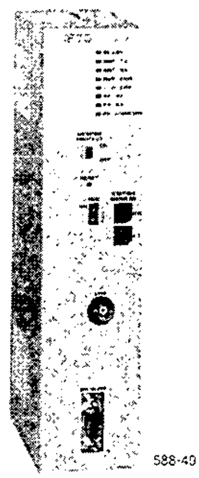
This manual describes the transmission line of ***Memocon-SC* GL 60S** remote I/O system. For wiring or cable selection, follow this manual. Since the description of GL60S is not included in this manual, refer to the following user's manuals if necessary.

SIE-C815-14.1 "***Memocon-SC* GL 60S** USER'S MANUAL-No. 1 DESIGN AND MAINTENANCE"

SIE-C815-14.2 "***Memocon-SC* GL 60S** USER'S MANUAL-No. 2 P 150 PROGRAMMING PANEL (BASIC INFORMATION)"

SIE-C815-14.3 "***Memocon-SC* GL 60S** USER'S MANUAL-No. 3 P 150 PROGRAMMING PANEL (SFC INFORMATION)

RIOD Module (JAMSC-IF62)



RIOR Module (JAMSC-IF70)

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1. CONFIGURATION

1.1 TRANSMISSION LINE

GL60S remote I／O is comprised of remote I／O driver (RIOD), remote I／O receivers (RIOR) and coaxial cables. (Refer to Fig. 2.1.) I／O allocation must be provided to GL60S CPU by Programming Panel P150.

Table 1.1 Transmission Line Specifications

Item	Specifications
Topology	Bus
Transmission Medium	Coaxial cable
Transmission Speed	0.5 Mbps／1 Mbps／2 Mbps／4 Mbps (selected by switch)
Transmission Code	Baseband (Manchester coding)
RAS	Failed station: Automatically disconnected from the line. Recovered station: Automatically connected to the line.
Synchronization	Frame synchronization
Frame Format	In compliance with HDLC
Insulation	Pulse transformer
No. of Channels	2
No. of Stations	Possible to connect Max. 31 RIOR modules／channel. 32 stations／channel · 1 master station (R28D) · 31 slave stations max. (R28D)

1.2 COMPONENTS IN TRANSMISSION LINE

1.2.1 Remote I/O Driver (RIOD)

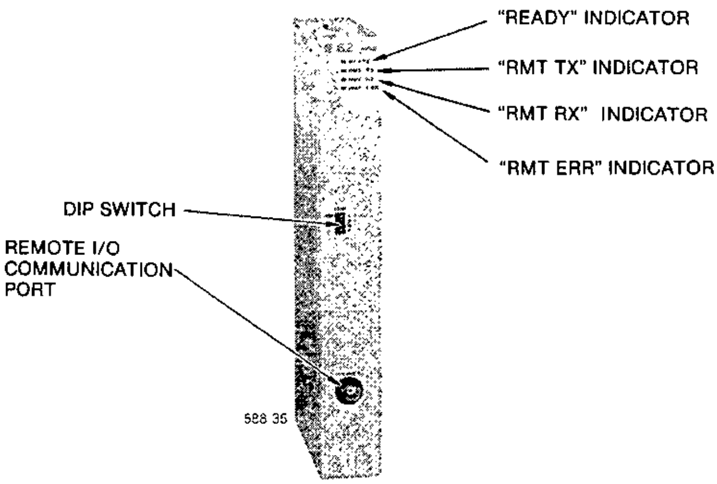


Fig. 1.1 RIOD Module

Table 1.2 RIOD Specifications

Item	Specifications
Type	JAMSC-IF62/IF62A
Function	· For driving remote I/O · Communicates with up to 31 remote I/O receivers · For driving ASCII modules communicates with up to 8 ASCII modules
Indicating Lamp	READY: Lights when RIOD module is proper. RMT TX: Lights at remote transmitting. RMT RX: Lights at remote receiving. RMT ERR: Lights at remote communication error.
Switch	DIP switch: Setting transmission speed, etc.
Mounting Location	MB60 mounting base (CPU base)
Dimensions in mm (inch)	37.3 (1.47) W×250 (9.84) H×94 (3.70) D
Approx. Weight in kg (lb)	0.5 (1.1)

1.2.2 Remote I/O Receiver (RIOR)

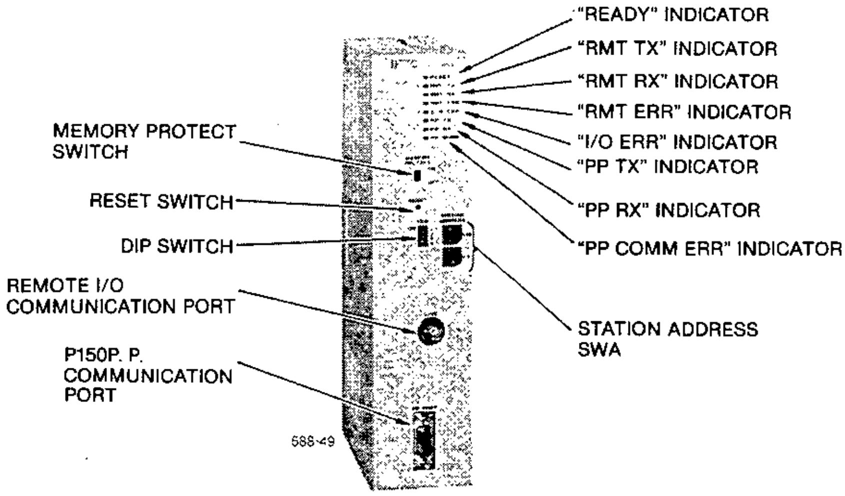


Fig. 1.2 RIOR Module

Table 1.3 RIOR Specifications

Item	Specifications	
Type	JAMSC-1F70	
Function	· Interface between remote I/O driver · One communication port communicates with P150 For programming, monitoring · 35 I/O modules max.	
Communication Port	Number of ports	1
	Transmission mode	EIA RS-232C
	Baud rate	9600 baud
	Device address	1
	Data bits	8-bit (RTU)
	Parity check	Even parity
	Protocol	Memobus protocol
	Connector	D-SUB 9 pin
Indicating Lamp	READY: Lights when RIOR module is proper. RMT TX: Lights at remote transmitting. RMT RX: Lights at remote receiving. RMT ERR: Lights at remote communication error. I/O ERR: Lights at I/O service error. PP TX: Lights at PP transmission. PP RX: Lights at PP receiving. PP COMM ERR: Lights at PP communication error.	
Switch	Rotary switch: Station address (1 to 31) DIP switch: Setting transmission speed.	
Mounting Location	MB70 mounting base (RIOR base)	
Dimensions in mm (inch)	59.8 (2.36) W×250 (9.84) H×94 (3.70) D	
Approx. Weight in kg (lb)	0.6 (1.3)	

1.2.3 Coaxial Cable

Coaxial cables with applications for in-panel and panel-to-panel are provided for trunk lines. The specifications of coaxial cables shown in Table 1.4 and those of short coaxial cables (with connector) which YASKAWA provides are shown in Table 1.5

Table 1.4 Coaxial Cable Specifications

Type (Made by Fujikura Ltd.)	Shielded for Static Electricity and Magnet	Application	Conditions	Signal Attenuation: Pas (dB/km)			
				0.5MHz	1MHz	2MHz	4MHz
3C-2V	Not Provided	In-panel	Exclusive duct	9.0	12.0	17.0	25.0
3C-2V (Cu, Fe) ZV	Provided	In-panel	Low power electrical duct				
5C-2V	Not Provided	Panel-to-Panel	Exclusive duct	5.1	7.6	11.0	16.0
5C-2V (Cu, Fe) ZV	Provided	Panel-to-Panel	Low power electrical duct				
5C-FB	Not Provided	Panel-to-Panel	Exclusive duct	4.8	7.4	10.5	14.0
5C-FB (Cu, Fe) ZV	Provided	Panel-to-Panel	Low power electrical duct				
7C-FB	Not Provided	Panel-to-Panel	Exclusive duct	4.2	5.8	7.6	10.0
7C-FB (Cu, Fe) ZV	Provided	Panel-to-Panel	Low power electrical duct				
7C-FL	Not Provided	Panel-to-Panel	Exclusive duct	2.9	3.8	5.6	8.1
7C-FL (Cu, Fe) ZV	Provided	Panel-to-Panel	Low power electrical duct				
11C-4AF	Not Provided	Panel-to-Panel	Exclusive duct	1.5	2.3	3.2	4.6
11C-4AF (Cu, Fe) ZV	Provided	Panel-to-Panel	Low power electrical duct				
12C-5AF	Not Provided	Panel-to-Panel	Exclusive duct	1.46	2.2	3.2	4.5
12C-5AF (Cu, Fe) ZV	Provided	Panel-to-Panel	Low power electrical duct				

Note:
1. Coaxial cables equivalent to the above can be applicable.
2. Signal attenuation: Pas (dB/km) shows reference values.

Table 1.5 Short Coaxial Cable Specifications (Made by YASKAWA)

Type JZMSZ-	Cable Length in m (inch)	Coaxial Cable Type	Connector Specification
W60-1	2 (78.74)	3C-2V (For in-panel)	Type BNC connectors at both ends
W60-2	3 (118.11)		
W60-3	5 (196.85)		
W61-1	2 (78.74)	5C-FB (For Panel-to-Panel)	Type F connectors (F-5FB) at both ends
W61-2	5 (196.85)		
W61-3	10 (393.7)		
W453-001	2 (78.74)	5C-FB (For Panel-to-Panel)	Type F connectors (FSPW-5PEF) at both ends
W453-002	5 (196.85)		
W453-003	10 (393.7)		

1.2.4 Coaxial Connector

Table 1.6 shows the list of coaxial connectors.

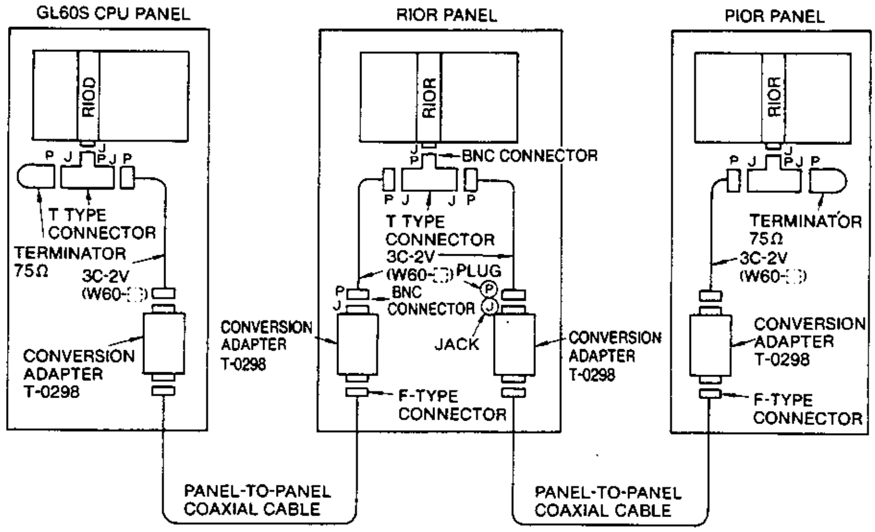
Table 1.6 Coaxial Connector

Connector	Name	Type	Description	Manufacturer
Connection	BNC Connetor	BNC-P-3Ni -CAu	For 3C-2V, contact gold-plated	Dai-ichi Electronic Ind.
	Type F Connector	FSPW-5-Ni -CAu	For 5C-2V, contact gold-plated	Fujikura Ltd.
		FSPW-5PEF	For 5C-FB, contact gold-plated	Fujikura Ltd.
		F-5FB	For 5C-FB, contact gold-plated	Fujikura Ltd.
		FSPW-7-Ni -CAu	For 7C-FL, contact gold-plated	Fujikura Ltd.
		F-7FB	For 7C-FB, contact gold-plated	Fujikura Ltd.
	Fitting Connector	FI-12C-2.9-TC	For 12C-5AF, contact gold-plated	Fujikura Ltd.
		FI-11C-4AF	For 11C-4AF, contact gold-plated	Fujikura Ltd.
		FI-7CFL	For 7C-FB, contact gold-plated	Fujikura Ltd.
Branch	Type T Connector	T-0298	For conversion connectors between BNC and F type	Yaskawa Electric
Conversion	Conversion adapter	BNC-TA-JPJ-Ni -CAu	For connection and branch of RIOD and RIOR modules	Dai-ichi Electronic Ind.
	Conversion connector	FTR-FJ	For conversion between fitting and F type connectors	Fujikura Ltd.
Conjunction	Conjunction connector	F-A	For connecting F type connectors to each other	Fujikura Ltd.
		FI-A	For connecting fitting connectors to each other	Fujikura Ltd.
Termination	Terminator	BNC-RC-75-Ni-CAu	For connection and termination of both ends of trunk line	Dai-ichi Electronic Ind.

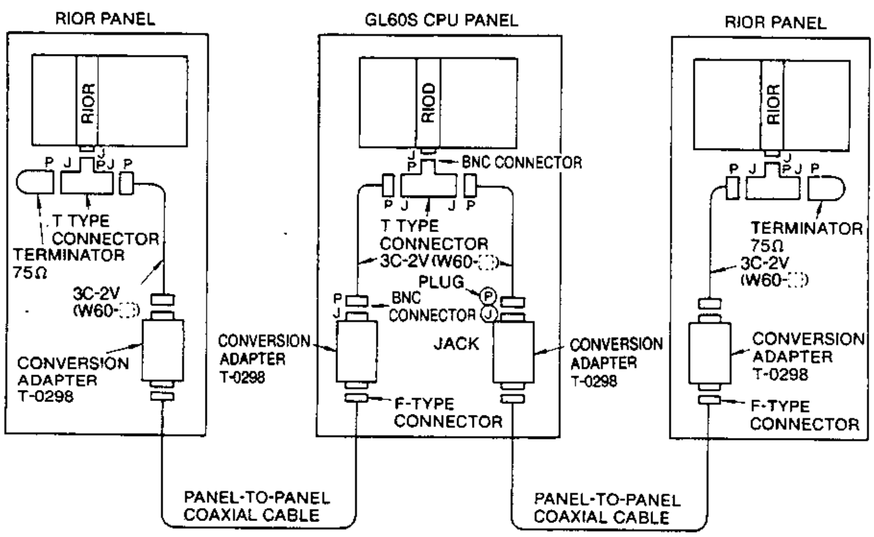
Note:
1. Connection loss is 0 dB for all.
2. Applying self-fusion tape on the junction of coaxial cable, protects it from water, and insulates the cable from grounding.

2. WIRING

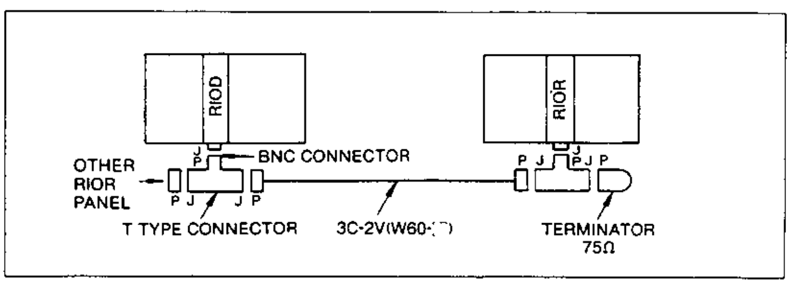
Fig. 2.1 shows configuration of remote I/O trunk line. The remote I/O trunk line is comprised of coaxial cables and coaxial connectors. As shown in Fig. 2.1, RIOD module does not have to be located at the end station of the trunk line. In-panel wiring and panel-to-panel wiring cables are provided for the trunk lines.



(a) CPU Panel at an End of Transmission Line



(b) RIOR Panel at Both Ends of Transmission



(c) RIOD and RIOR in Same Panel of Transmission Line

Fig. 2.1 Remote I/O Transmission Line Configuration

2.1 IN-PANEL WIRING

2.1.1 Applicable Cables

(1) Coaxial cable.
Type: 3C-2V, made by Fujikura, Ltd.

(2) Coaxial cable shielded with copper/iron
Type: 3C-2V (Cu, Fe) ZV, made by Fujikura, Ltd.

Table 2.1 List of Standard Cable (with Connector)

Type	Cable Length in m (inch)	Connector
JZMSZ-W60-1	2 (78.74)	Type BNC connectors at both ends (BNC-P-3)
JZMSZ-W60-2	3 (118.11)	
JZMSZ-W60-3	5 (196.85)	

2.1.2 Connection between Devices

Fig. 2.2 shows the connections between RIOD/RIOR modules and conversion adapter or between modules. Connect T type connector for branch to BNC connector on the front panel. Connect one end of coaxial cables with BNC connectors to the other end to the right (or left) side of T type connector.

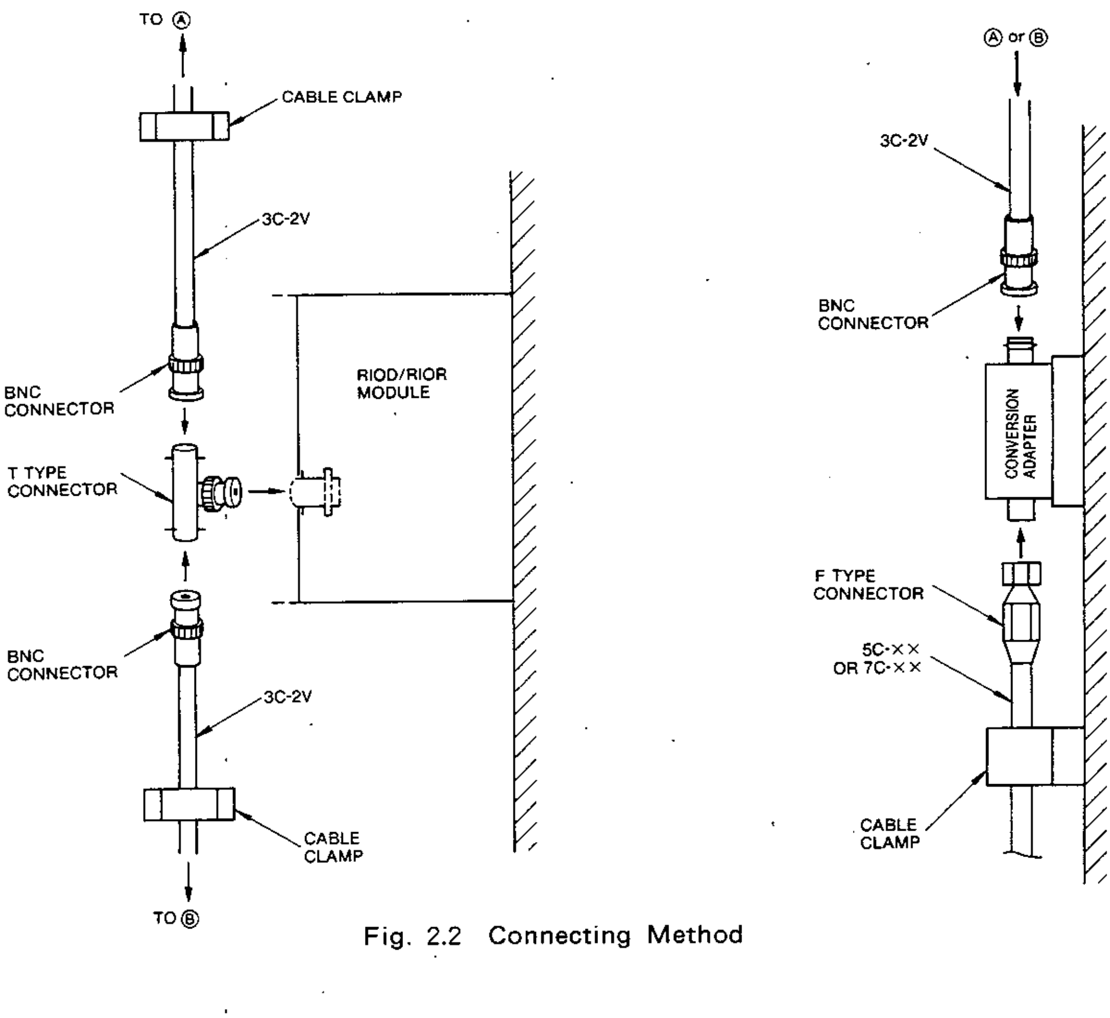


Fig. 2.2 Connecting Method

2.1.3 Shielding Treatment

Ground the shielding tape of the shielded coaxial cable at one point (Grounding resistance: 100Ω or less). For grounding, refer to Par. 2.4.

2.1.4 Wiring Separation

Separate the coaxial cables from other wiring systems.
The rule is shown below.

(1) Separation from low power electrical cable

Separate the coaxial cables from the low power electrical cables completely (more than 100mm is recommended). If it is not possible, use coaxial cable shielded with copper/iron (hereinafter described as shielded coaxial cable.)

The coaxial cable should be housed in a metallic conduit or a metallic duct.

(2) Separation from operational circuit cables

Separate the shielded coaxial cable from the operational circuit cable completely (more than 100mm is recommended). If it is not possible shield the operational circuit cables.

(3) Separation from main circuit cables

Separate the shielded coaxial cable from the main circuit cables (refer to Table 2.2). If it is not possible , shield the main circuit cables.

Table 2.2 Recommended Separation Distance

Main Circuit	Recommended Separation Distance in mm (inch)
125V, 10A	300 (11.81) or more
250V, 50A	450 (17.72) or more
440V, 200A	600 (23.62) or more
3 to 6kV, 800A	1200 (47.24) or more

2.2 WIRING PANEL-TO-PANEL (INDOORS)

2.2.1 Applicable Cables

Table 2.3

Cables	Type	Manufacturer
Coaxial Cable	5C-2V	Fujikura Ltd.
	5C-FB	
	7C-FL	
	7C-FB	
	11C-4AF	
	12C-5AF	
Coaxial Cable Shielded with Copper/Iron	5C-2V (Cu, Fe) ZV	
	5C-FB (Cu, Fe) ZV	
	7C-FL (Cu, Fe) ZV	
	7C-FB (Cu, Fe) ZV	
	11C-4AF (Cu, Fe) ZV	
	12C-5AF (Cu, Fe) ZV	

Table 2.4

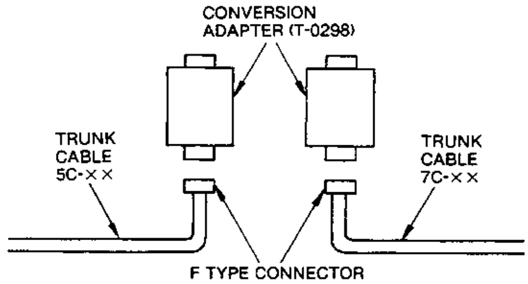
Type	Cable Length in m (inch)	Connector	Cable Type
JZMSZ-W61-1	2.5 (98.43)	F type connectors at both ends (F-5FB)	5C-FB
JZMSZ-W61-2	5 (196.85)		
JZMSZ-W61-3	10 (393.7)		

2.2.2 Connection between Devices

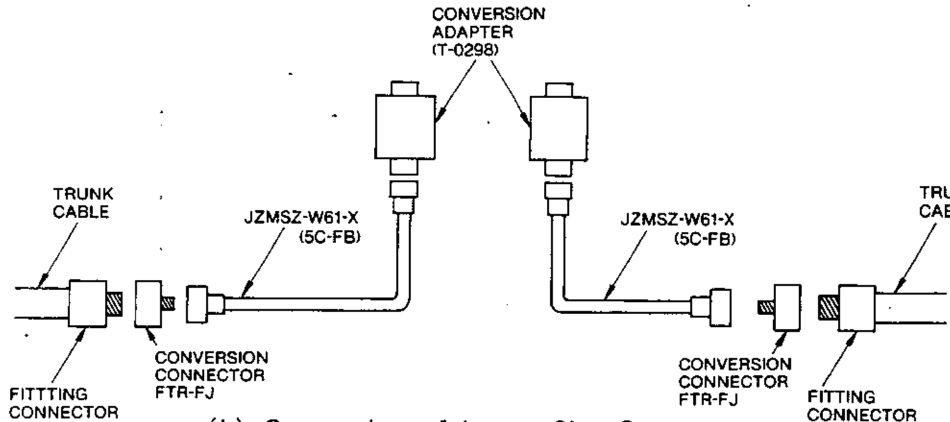
(1) In the case of using 5C-XX, 7C-XX coaxial cables, connect the cables to the conversion adapter with F type connectors as shown in Fig. 2.3 (a).

(2) In the case of using HC-4AF, 12C-5AF coaxial cables connect the cables to the conversion adapter with F type connectors after connecting to small size coaxial cables of 5C-XX or 7C-XX with the conversion connector as shown in Fig. 2.3 (b).

(3) When extending coaxial cables, connect one coaxial cable to another with conjunction connector as shown in Fig. 2.4.



(a) Connection of 5C-XX and 7C-XX



(b) Connection of Large Size Connectors

Fig. 2.3 Connection using F Type Connector

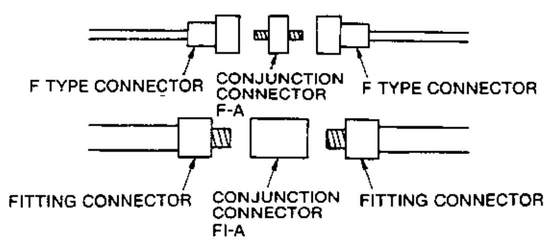


Fig. 2.4 Connection between Coaxial Cables

2.2.3 Shielding Treatment

Ground the copper／iron shielding tape at one point (Grounding resistance: 100Ω or less).

For details, refer to Par. 2.3.

2.2.4 Wiring Separation

• Shielded Coaxial Cables

(1) The shielded coaxial cables must be stored in low power electrical circuit ducts, which differ from general operational circuit ducts as shown in Fig. 2.5 (a).

If this is not possible separate the general operational circuit from the low power electrical circuit by more than 100 mm as shown in Fig. 2.5 (b).

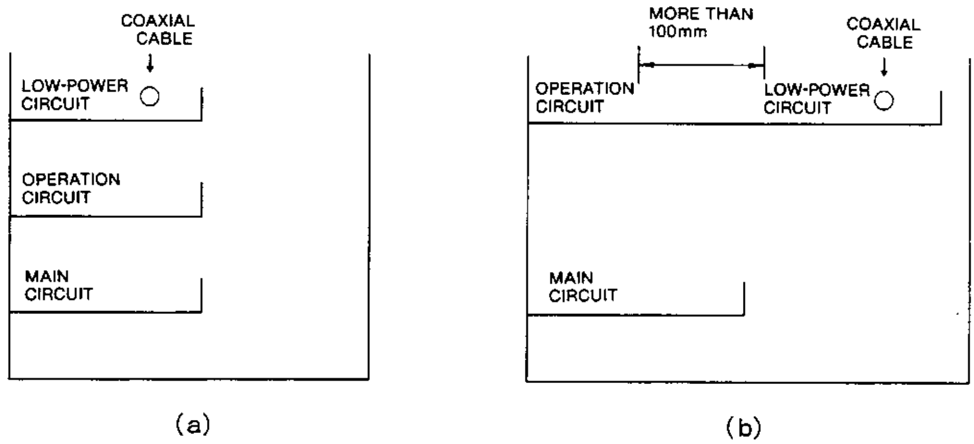


Fig. 2.5 Wiring Duct Separation

(2) Provide a special duct cover so that there will not be any space between the duct and the cover. Table 2.5 shows the recommended separation distance from the main circuit.

Table 2.5 Recommended Separation Distance

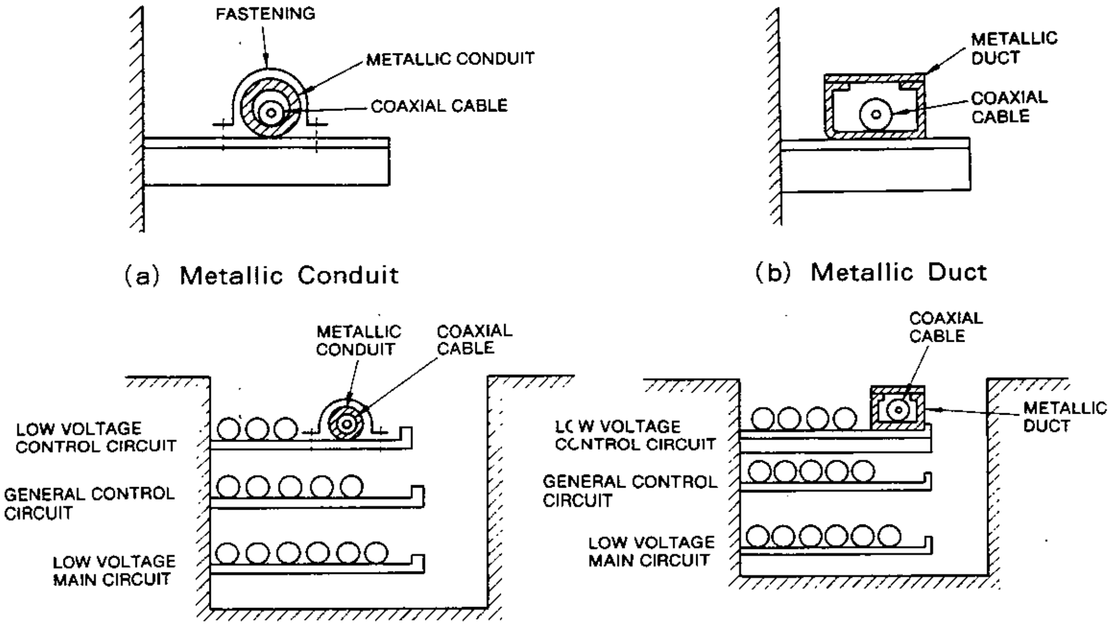
Main Circuit	Recommended Separation Distance in mm (inch)
125V, 10A	300 (11.81) or more
250V, 50A	450 (17.72) or more
440V, 200A	600 (23.62) or more
3 to 6kV, 800A	1200 (47.24) or more

2.2.4 Wiring Separation (Cont'd)

• Coaxial Cable without Shielding

Coaxial cables must be run individually in metal wiring conduit or metal duct as shown in Fig. 2.6. Ground both ends of metal wiring conduit or metal duct and at as many points as necessary.

Coaxial cables of 11C-4AF and 12C-5AF have difficulties to be run in conduit since they are inflexible. Run them individually in metal duct. See Fig. 2.6 (b) and (d).



(a) Metallic Conduit (b) Metallic Duct

(c) Metallic Conduit (When Pit-Stored) (d) Metallic Duct (When Pit-Stored)

Fig. 2.6 Coaxial Cable Installment

2.2.5 Coaxial Cable Bending

When bending coaxial cables: for 5C-XX and 7C-XX, bending radius must be 10 times or more of the finished bend diameter: for 11C-4AF and 12C-5AF, 20 times. (See Fig. 2.7 and Table 2.6.)

Use flexible conduit for the bent part of the metal conduit so that metal conduits can contact each other. In this case, for 5C-XX and 7C-XX, bending radius must be 20 times or more of the finished bend diameter. (See Fig. 2.8.)

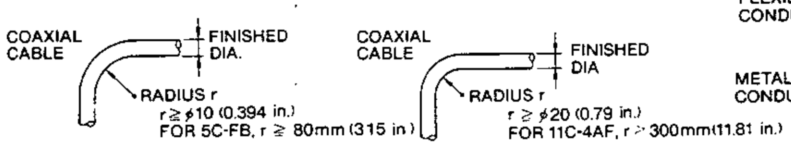


Fig. 2.7 Cable Bending

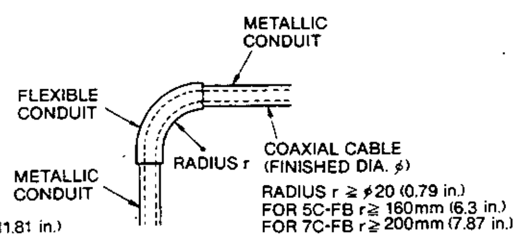


Fig. 2.8 Metallic Conduit Bending

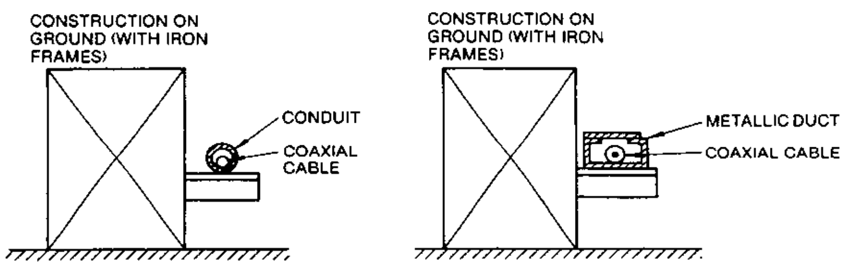
Table 2.6 Minimum Cable Bending Radius

Type (Made by Fujikura, Ltd.)	Finished Diameter in mm (inch)	Minimum Bending Radius in mm (inch)	
3C-2V	5.6 (0.22)	r =10 (0.394) ϕ	56 (2.21)
3C-2V (Cu, Fe) ZV	8.6 (0.339)		86 (3.39)
5C-2V	7.5 (0.295)		75 (2.95)
5C-2V (Cu, Fe) ZV	12.0 (0.472)		120 (4.72)
5C-FB	7.7 (0.303)		77 (3.03)
5C-FB (Cu, Fe) ZV	12.0 (0.472)		120 (4.72)
7C-FB	10.0 (0.394)		100 (3.94)
7C-FB (Cu, Fe) ZV	13.0 (0.512)		130 (5.12)
7C-FL	10.0 (0.394)		100 (3.94)
7C-FL (Cu, Fe) ZV	14.5 (0.571)		145 (5.71)
11C-4AF	15.3 (0.602)	r =20 (0.787) ϕ	306 (12.1)
11C-4AF (Cu, Fe) ZV	18.3 (0.72)		366 (14.4)
12C-5AF	15.3 (0.602)		306 (12.1)
12C-5AF (Cu, Fe) ZV	20.0 (0.787)		400 (15.7)

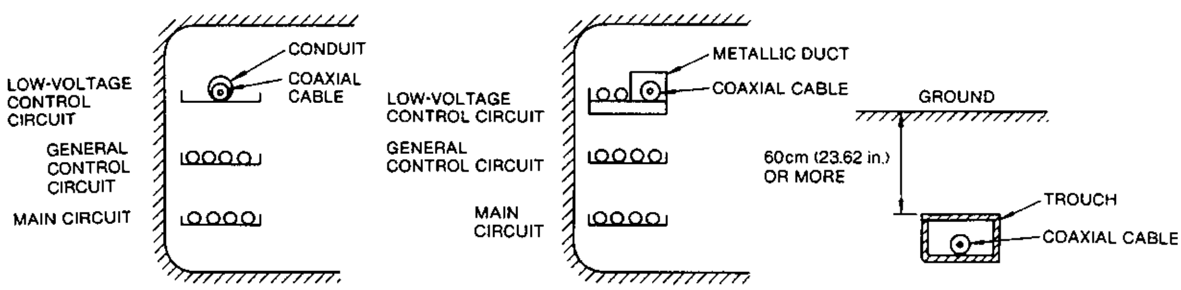
2.3 WIRING PANEL TO PANEL (OUTDOORS)

The wiring of the coaxial cables is the same as described in Par. 2.2, "Wiring Panel to Panel (Indoors)". When outdoors, pay special attention to the following.

(a) When laying coaxial cables outdoors, lay along the construction (with iron frames) on the ground. If no construction is available, house the cables in an underground pit or tunnel or bury the cables under the ground.



(a) Construction on Ground



(b) Underground

Fig. 2.9 Laying Coaxial Cables between Buildings

2.3 WIRING PANEL TO PANEL (OUTDOORS) (Cont'd)

(b) Do not run a bare coaxial cable overhead. In so doing, noise induced from airborne radiowaves is picked up and transmission errors may result. Since the G60S remote I/O system is not protected from lightning, the equipment may be damaged by lightning.

(c) The temperature coefficient of a coaxial cable is about 0.005% per ℃. For example, a coaxial cable of about 500 m (1640ft.) is extended by 25cm (9.84in.) by a temperature rise of 10℃.

Usually, this degree of expansion is absorbed midway along the cable route laid. But when coaxial cables are laid along a building, a large temperature change may occur and the change in the cable length may not be absorbed in some cases. So, provide proper allowance for the cable at inlet and outlet of the metal conduit, so that changes can be absorbed.

(d) If water collects in a tube or duct and freezes, mechanical stress is applied to the coaxial cables. Drill water drain ports in the metal ducts and conduits.

2.4 GROUNDING

2.4.1 Grounding GL60S

(1) Installation of Equipment

The mounting base on which a module of the GL60S is to be installed must be attached to a steel base (frame) of monolithic construction.

Keep coaxial cables separeted from grounding.

(2) Grounding Conductor

Attach an "E" terminal ground to the control panel, and connect the terminal to the cabinet of control panel. Also, connect the "E" terminal to the "GND" terminals of power supply modules. Use a grounding conductor of larger than 8 mm^2 between the "E" terminal and grounding rod and make the wiring distance as short as possible.

If the distance to the grounding rod is long, it is necessary to increase the size of the grounding conductor and the grounding resistance must be less than 100Ω.

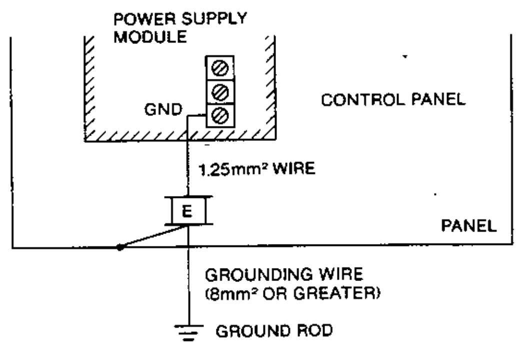


Fig. 2.10 Grounding Wire

(3) Grounding Rod

Grounding rod should be located as closes possible to the control panel containing the GL60S and as far as possible [farther than 15m (49.2ft.)] from the grounding rods for other power panels (Group B panels listed in Table 2.7). The grounding resistance must be less than 100Ω.

(4) Common Grounding

Grounding of the GL60S should be made independently, as a rule. However, if the common use of a grounding conductor or rod with other control panels is unavoidable, then those shown in Table 2.7 should be used as standards.

Table 2.7 Common Use of Grounding Conductor and Rod

Common Use Permitted (Group A Panel)	Computer panel, instrumentation control panel, I/O relay panel, ordinary control circuit panel, etc.
Common Use not Permitted (Group B Panel)	High-voltage main circuit panel, large-capacity thyristor panel, etc.

2.4.2 Shielded Coaxial Cables

Shielding tape for the shielded coaxial cables must be grounded at one point (Grounding resistance: 100Ω or less). Fig. 2.11 shows a grounding example. (Sa, Sb, Sc and Sd are relay terminals.)

(1) When Sb and Sc are connected:

Perform grounding at point Ea or Ed.

(2) When grounding cannot be performed at both points Ea and Ed:

Sb and Sc can be grounded at point Eb.

(3) When shielded coaxial cables are used in-doors:

Shielding tape of the cables (point e) must be connected with the tape of the in-door shielded coaxial cables (point d) at point Sd (relay terminal).

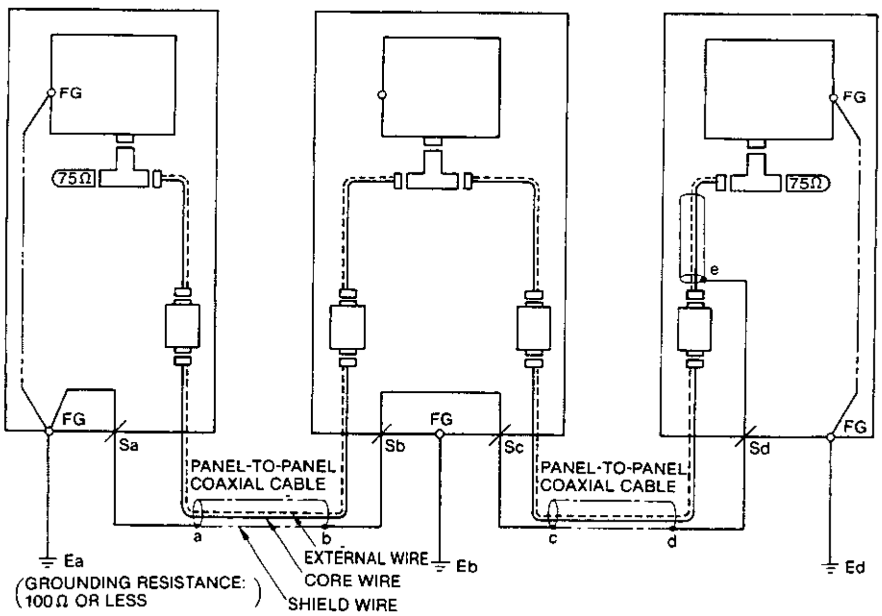


Fig. 2.11 Example of Coaxial Cable Grounding

2.4.3 Metal Conduit and Metal Duct

Ground both ends of the metal conduit or metal duct and at as many points as necessary.

2.5 INSTALLATION OF CONTROL PANEL

When the control panel containing GL60S CPU, RIOD, ROIR modules, etc. (hereinafter called "remote I/O panel") is installed, observe the following.

(1) Separation from Power Panels

Do not connect the remote I/O panel with a power panel (Group B of Table 2.7). Should the remote I/O panel be installed near a panel, locate the remote I/O panel as far as possible [more than 60cm (2.36 in.)] and keep their grounding wires or grounding rods separated from each other [approximately 60cm (2.36 in) or more for grounding wires, and 15m (49.21ft.) for gounding rods.]

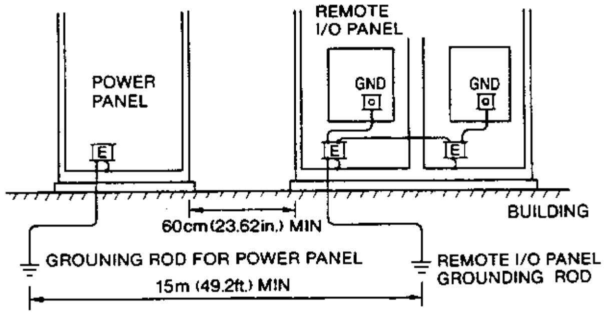


Fig. 2.12 Separation from Power Panel

(2) Connection with Other Control Panels

The remote I/O panel can be connected with the panels in Group A of Table 2.7. In this case, each space between panels is conducting through the channel base. However, to secure the grounding, provide wires of more than $8mm^2$ between terminals E of each control panel. Provide wiring from one terminal E to the grounding rod.

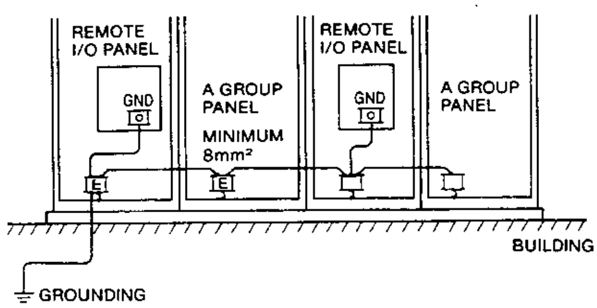


Fig. 2.13 Separation from Group A Panel

(3) Insulation of Remote I/O Panels

When the remote I/O panel is provided in an iron frame structured building, the remote I/O is grounded through the building, which presents no problem. However, when a power panel is located near the remote I/O panel, perform insulation to the whole unit of the remote I/O panel from the building so that grounding noise caused by grounding current from the power panel can be avoided. Then connect terminal "E" of the remote I/O panel to the grounding rod used exclusively for the remote I/O panel.

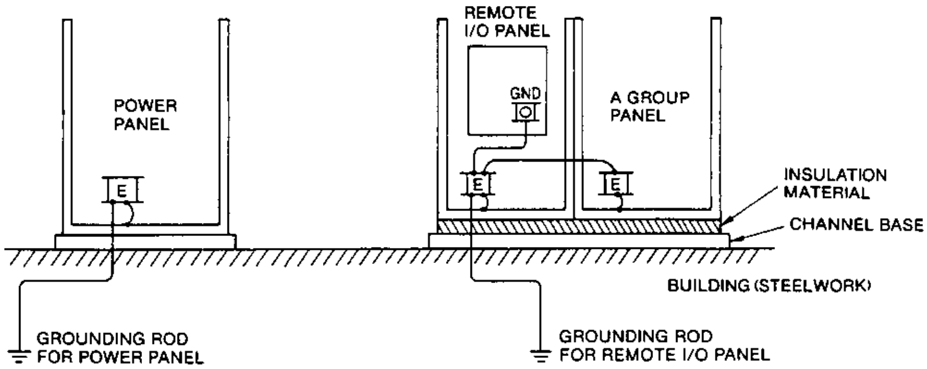


Fig. 2.14 Remote I/O Panel Insulation

3. LENGTH OF TRANSMISSOIN LINE

3.1 SETTING OF TRANSMISSION SPEED

(1) RIOD Module

Channels and transmission speed are set by dip switch (1 SW) on the front of the RIOD module.

Table 3.1 Setting of 1 SW

1 SW	Setting							
1	ON	Remote 1 (Channel 2)						
	OFF	Remote 2 (Channel 3)						
2	Not used (Turn OFF.)							
3	OFF	0.5Mbps	OFF	1Mbps	ON	2Mbps	ON	4Mbps
4	OFF		ON		OFF		ON	

(2) RIOR Module

Transmission speed are set by dip switch (1 SW) on the front of the RIOR module and station addresses are set by rotary switch.

Table 3.2 Setting of 1 SW

1 SW	Setting							
1	Not used (Turn OFF.)							
2	Not used (Turn OFF.)							
3	OFF	0.5Mbps	OFF	1Mbps	ON	2Mbps	ON	4Mbps
4	OFF		ON		OFF		ON	

Station addresses 1 to 31 are set. The same station address No. cannot be set in the same channel.

3.2 CALCULATING METHOD FOR LENGTH OF TRANSMISSION LINE

The length of remote I/O transmission line depends on the number of connected RIOR modules, transmission speed and the type of coaxial cable to be used. Connection loss of RIOD and RIOR modules and coaxial cable loss differ depending on the transmission speed.

Tramsmission line length L can be calculated from formula (1). Allowable loss of coaxial cables at each transmission speed is shown in Table 3.3. Connection loss of modules at each transmission speed is shown in Table 3.4 and signal attenuation in Table 3.5.

$$L = PL / Pa \ (km) \cdots\cdots\cdots\cdots\cdots (1)$$

$$PL = Pdr - Pm - Pt - Psn$$
$$= Pdr - 4.0 - 1.0 - Psn \quad (dB)$$

PL: Allowable loss of coaxial cable (dB)
Pa: Coaxial cable signal attenuation (dB)
Pdr: Level difference between transmitting signal and receiving signal (dB)

Pdr	=Pd − Pr + Px		
	=19.4dB + Px		
Pd	=68.9dBm (Ed=2.8Vp):	Transmission level	
Pr	=49.5dBm (Er=0.3Vp):	Receiving level	
Px	=−3.4, −2.4, −1.9, −1.4dBm:	Compensation (depending on transmission speed)	

Pm: Noise margin (dB)
Pt: Variation of power supply or temperature (dB)
Psn: Connection loss of module (dB)

Table 3.3 Allowable Loss of Coaxial Cables

Transmission Speed (Mbps)	Level Difference between Transmission and Receiving Pdr (dB)	Allowable Loss of Coaxial Cables: PL (dB)		
			n=1	n=31
4	16.0	PL (4) = 11.0−Psn (4)	10.78dB	7.5dB
2	17.0	PL (2) = 12.0−Psn (2)	11.76dB	8.1dB
1	17.5	PL (1) = 12.5−Psn (1)	12.22dB	8.0dB
0.5	18.0	PL (0.5) = 13.0−Psn (0.5)	12.66dB	7.5dB

Table 3.4 Connection Loss of Modules

Transmission Speed (Mbps)	Module Connection Loss: Psn (dB)			
	Ps	n=9	n=19	n=31
4	0.11dB/unit	1.1dB	2.2dB	3.5dB
2	0.12dB/unit	1.2dB	2.4dB	3.9dB
1	0.14dB/unit	1.4dB	2.8dB	4.5dB
0.5	0.17dB/unit	1.7dB	3.4dB	5.5dB

Note: Psn=Ps × (n+1)
n=The number of RIOR modules

Table 3.5 Coaxial Cable Signal Attenuation

Type (Made by Fujkura, Ltd.)	Signal Attenuation: Pa dB/km			
	0.5MHz	1MHz	2MHz	4MHz
3C-2V, 3C-2V (Cu,Fe) ZV	9.0	13.8	20	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

Note: Signal attenuation Pa is a value multiplied by 1.15 of the standard value.

3.3 MAXIMUM LENGTH OF TRANSMISSION LINE

Table 3.6 shows the maximum length of transmission line (Lmax) where the number of RIOR modules is 15 and in-panel cable 3C-2V is less than 50m (164ft.) in total.

Table 3.7 shows the maximun length of trasmission line (Lmax) where the number of RIOR modules is 31 and in-panel cable 3C-2V is less than 100m (328ft.) in total.

Lmax = in-panel cable length + panel-to-panel cable length

Table 3.6 Maximum Length of Transmission Line: Lmax (n =15)

Tramsmission Speed (Mbps)	Length of Coaxial Cables in m (ft.)				Max Transmission Line Length: Lmax in m (ft.)
	3C-2V	5C-2V	7C-FL	12C-5AF	
4	50 (164)	420 (1,378)	0	0	470 (1,542)
	50 (164)	50 (164)	0	1,290 (4,232)	1,390 (4,560)
	50 (164)	0	830 (2,723)	0	880 (2,887)
2	50 (164)	710 (2,329)	0	0	760 (2,493)
	50 (164)	50 (164)	0	2,270 (7,448)	2,370 (7,776)
	50 (164)	0	1,410 (4,626)	0	1,460 (4,790)
1	50 (164)	1,030 (3,379)	0	0	1,080 (3,543)
	50 (164)	50 (164)	0	3,350 (10,991)	3,450 (11,319)
	50 (164)	0	2,160 (7,087)	0	2,210 (7,251)

Table 3.7 Max Length of Transmission Line: Lmax (n =31)

Tramsmission Speed (Mbps)	Length of Coaxial Cables in m (ft.)				Max Transmission Line Length: Lmax in m (ft.)
	3C-2V	5C-2V	7C-FL	12C-5AF	
4	100 (328)	250 (820)	0	0	350 (1,148)
	100 (328)	100 (328)	0	520 (1,706)	720 (2,362)
	100 (328)	0	490 (1,608)	0	590 (1,936)
2	100 (328)	480 (1,575)	0	0	580 (1,903)
	10 (328)	100 (328)	0	1,300 (4,265)	1,500 (4,921)
	100 (328)	0	950 (3,117)	0	1,050 (3,445)
1	100 (328)	700 (2,297)	0	0	800 (2,625)
	100 (328)	100 (328)	0	2,060 (6,759)	2,260 (7,415)
	100 (328)	0	1,470 (4,823)	0	1,570 (5,151)

4. I/O SERVICE AND SCAN

In the GL60S, both the logic solving by CPU module and I/O processing by remote I/O driver are performed in parallel.

Because of this, a delay in scanning is created until an input signal is transmitted to the CPU module or until the result (output signal) of logic solving by the CPU module is transmitted to an external device. This must always be taken into account when using the GL60S.

4.1 LOGIC SOLVING AND I/O PROCESSING

Relation between the logic solving by CPU module and I/O processing by remote I/O driver is as shown in Fig. 4.1

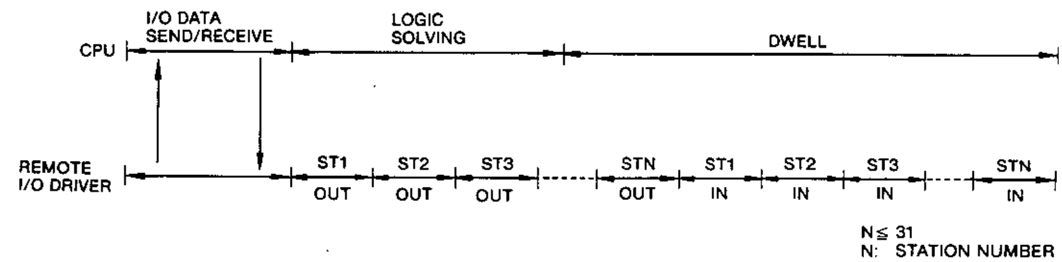


Fig. 4.1 Logic Solving and I/O Processing

4.2 I/O PROCESSING SEQUENCE

I/O processing is performed in the order of local, remote CH2 and remote CH3.

LOCAL → REMOTE CH 2 → REMOTE CH 3

In remote CH, I/O processing is performed for RIOR 1 to 31 in the order of station Nos. Fig. 4.2 shows the procedures for I/O processing in each station according to I/O allocation.

DISCRETE INPUT PROCESSING → DISCRETE OUTPUT PROCESSING →

→ REGISTER INPUT PROCESSING → REGISTER OUTPUT PROCESSING

Fig. 4.2 I/O Processing Order in Each Station

4.3 DELAY OF I/O SIGNAL

There is a delay in time from the change in the input signal to the change in output signal as the result of logic solving.

(1) Local I/O Channel

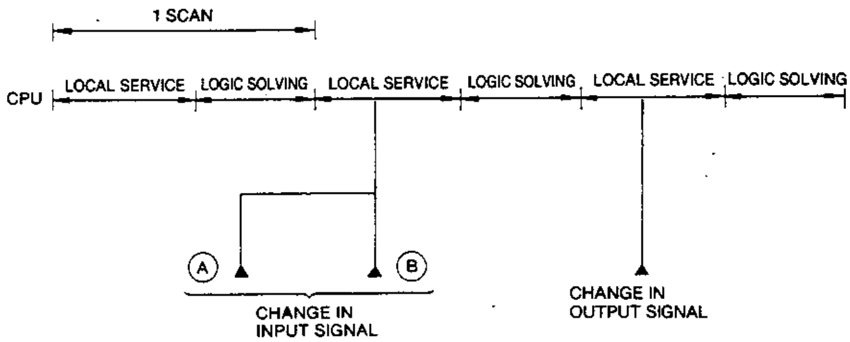


Fig. 4.3 I/O Timing of Local I/O Channel

(a) From the change in input signal to CPU module: 0 to 1 scan

This is the duration from the occurrence of a change in input signal to its arrival at CPU through input module.

If the change in input signal occurs near Ⓐ, shown in Fig. 4.3, a maximum delay of 1 scan occurs but the delay time becomes minimum if it occurs near Ⓑ.

(b) From CPU to the change output signal: $1 + \alpha$ (↑ By I/O allocation)

This is the duration from the logic solving by CPU module to the delivery of the results to the output module.

Therefore, a duration of <u>1 scan + α to 2 scans + α</u> is necessary until a change in input signal is reflected upon the output signal. However, α varies depending on the I/O allocation (0 to 1 scan).

(2) Remote I/O Channel

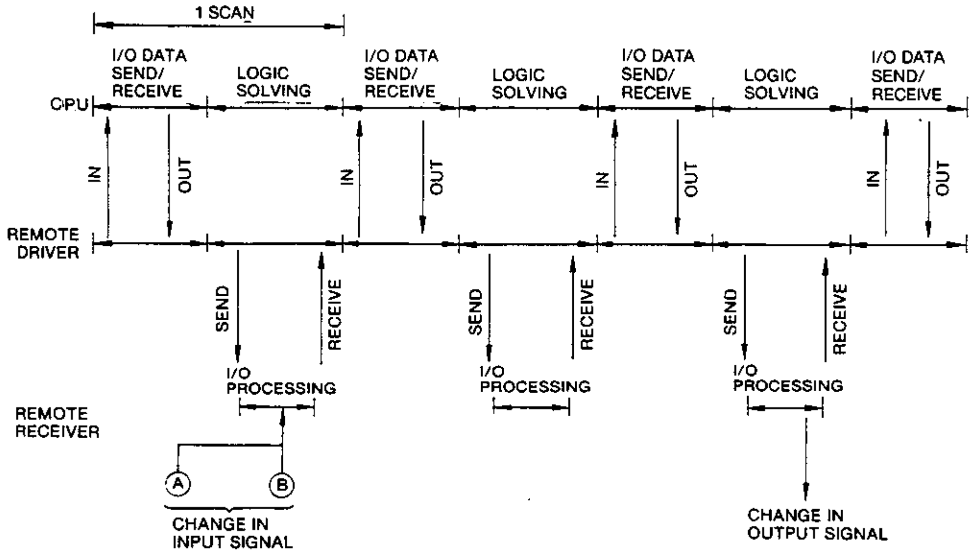


Fig. 4.4 I/O Timing of Remote I/O Channel

(a) From a change in input signal to remote I/O receiver: 0 to 1 scan

This is the duration until a change in input signal is delivered to remote I/O receiver though the input module. As shown in Fig. 4.4, if the change in input signal occurs near Ⓐ a delay of 1 scan maximum occurs but it becomes minimum if the change occurs near Ⓑ.

(b) From remote I/O receiver to CPU through remote I/O driver: 0 to 1 scan

(c) From CPU to remote I/O driver: 1 scan

(d) From remote I/O driver to the change in output through remote I/O receiver: less than 2 scans

4.4 I/O PROCESSING TIME

The I/O processing time of the remote I/O system of GL60S can be calculated by the following formula:

I/O processing time = Local I/O processing time + remote I/O processing time + remote I/O communication time

(1) Local I/O Processing Time

Local I/O processing time required by the CPU module for the I/O recessing of I/O module of local I/O channel depends on the I/O allocation.

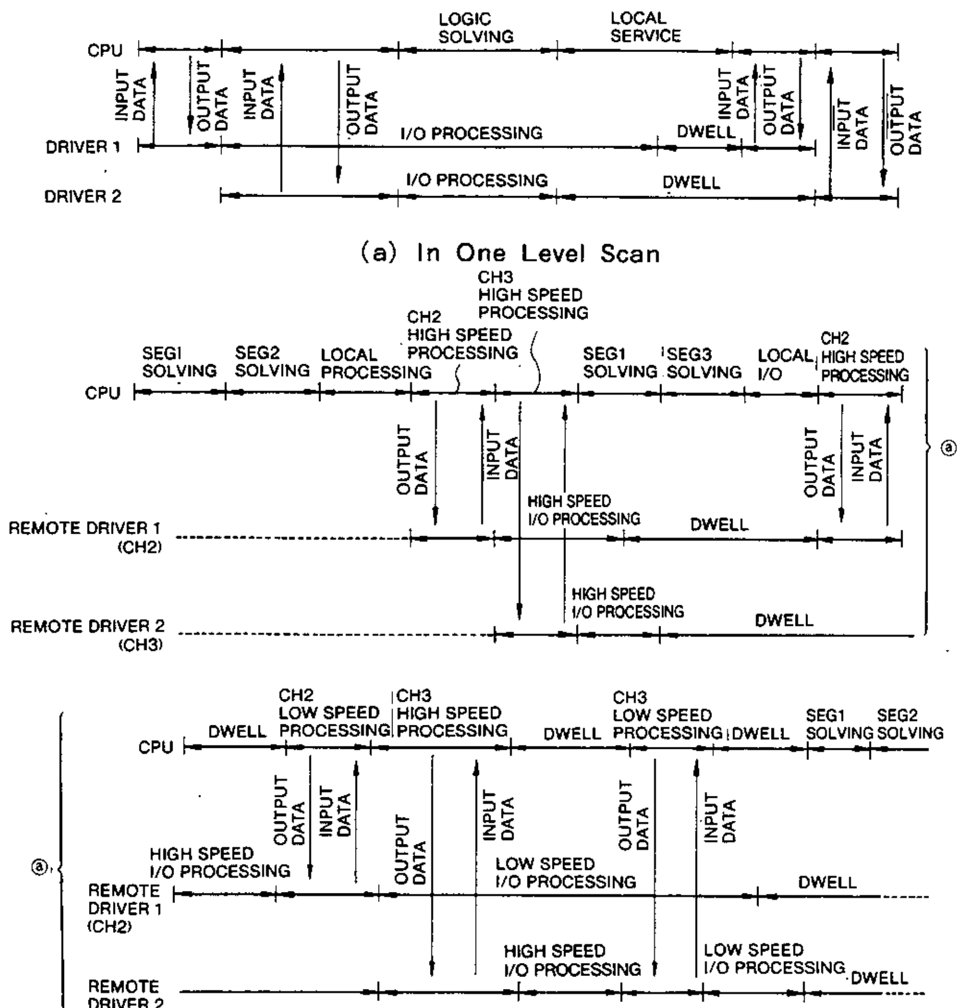
Table 4.1 shows the relation between the I/O allocation of local I/O channel and the processing time. The processing time is determined from Table 4.1 for every I/O module of the local I/O channel in accordance with respective I/O allocation, and the sum of the values of processing time becomes equal to the local I/O processing time.

Table 4.1 I/O Allocation of Local I/O Channel and Processing Time

I/O Allocation	Processing Time
Discrete Input	20 μs/8 points
Discrete Output	15 μs/8 points
Input Register	35 μs/register
Output Register	28 μs/register
Without Allocation (Prohibit)	0 μs

(2) Remote I/O Processing Time

Figs. 4.5 (a) and (b) show the relation in data send/receive between the remote I/O driver and CPU module.



(a) In One Level Scan

(b) In Two Level Scans (3 SEG)

Fig. 4.5 I/O Timing of Remote I/O Channel

Fig. 4.6 shows the relation in data send/receive between the remote I/O driver and remote I/O receiver.

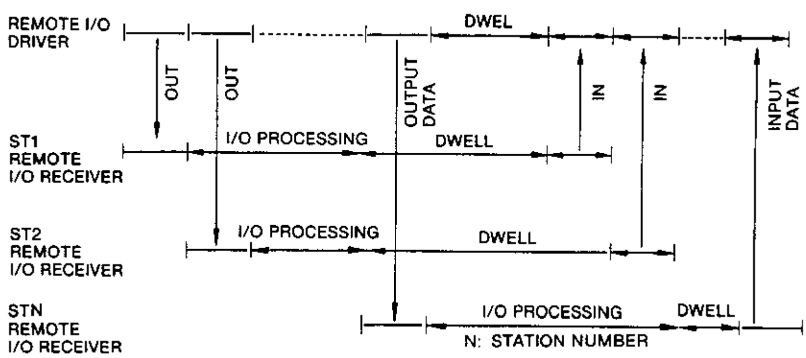
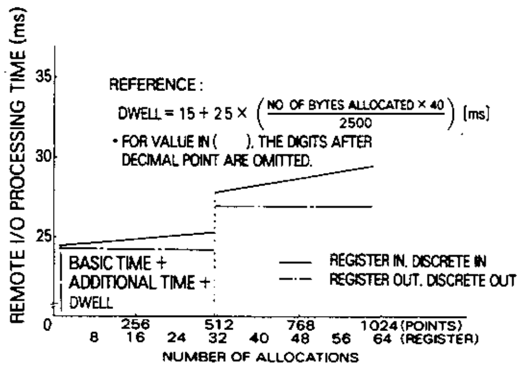


Fig. 4.6 I/O Timing of Remote I/O Station

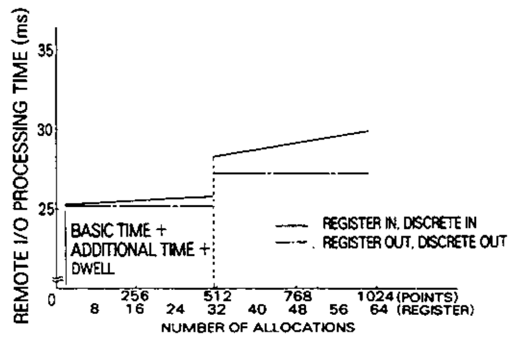
4.4 I/O PROCESSING TIME (Cont'd)

The remote I/O processing time cannot be formulated. The following data can be used as a reference. The remote I/O processing time will be the scan time, whichever is longer.

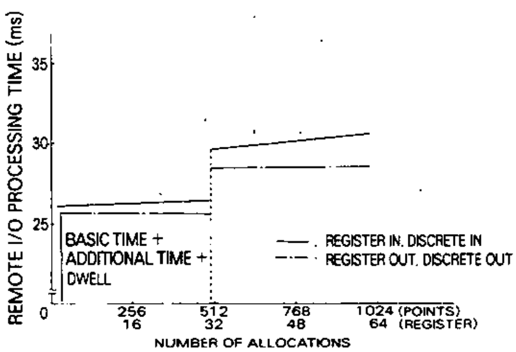
- One-Level Scan



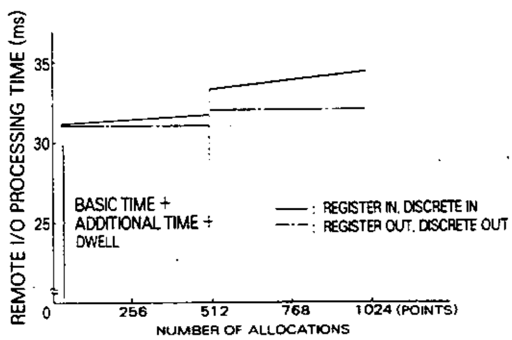
① Number of Stations: 1
Transmission Speed: 4 Mbps



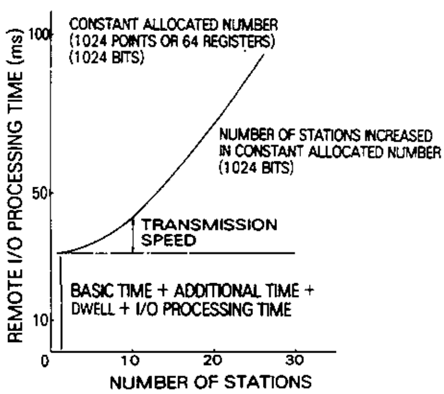
② Number of Stations: 1
Transmission Speed: 2 Mbps



③ Number of Stations: 1
Transmission Speed: 1 Mbps

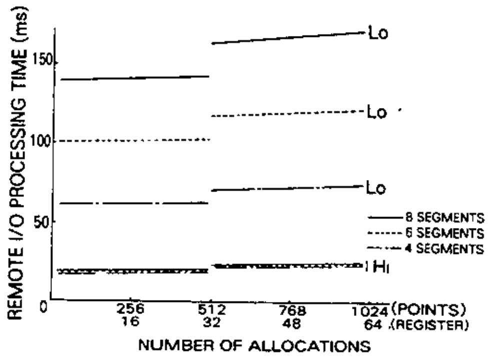


④ Number of Stations: 1
Transmission Speed: 0.5 Mbps

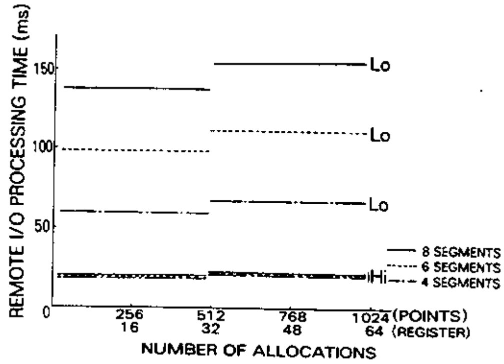


⑤ Number of I/O Allocations: 1024 bits constant

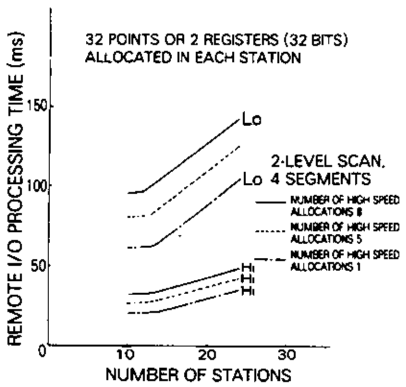
• Two-Level Scan



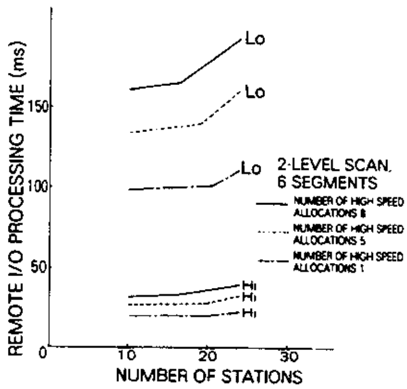
⑥ Number of Stations: 1
Transmission Speed: 4 Mbps
Input Processing



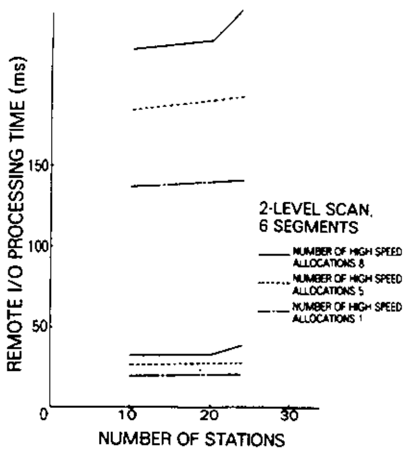
⑦ Number of Stations: 1
Transmission Speed: 2 Mbps
Output Processing



⑧ Number of I/O Allocations:
1024 bits constant
Transmission Speed: 4 Mbps
Number of Segments: 4



⑨ Number of I/O Allocations:
1024 bits constant
Transmission Speed: 4 Mbps
Number of Segments: 6



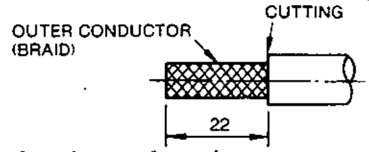
⑩ Number of I/O Allocations: 1024 bits constant
Transmission Speed: 4 Mbps
Number of Segments: 8

APPENDIX A COAXIAL CABLE CONNECTOR INSTALLATION PROCEDURE

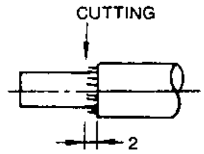
1. TYPE F CONNECTOR INSTALLATION PROCEDURE

(1) Treat the ends of a coaxial cable, using a cutter knife or pipe cutter (IFV 1638).

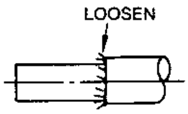
① Remove the sheath to 22mm from the cable leading end.



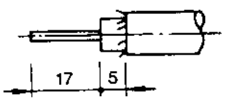
② Using pliers, remove braided wires, leaving them about 2 mm.



③ Loosen the braided wires.

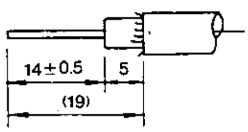


④ Pull out the insulating material 17mm from the leading end.



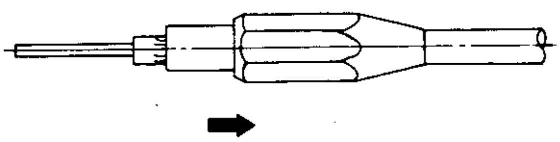
Note: Be sure not to damage the core.

⑤ Cut the core leading, and adjust the bare core to 14±10.5mm.



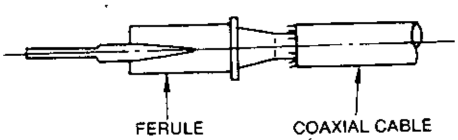
Note:
1. The bare core must be 14±0.5mm.
2. Leave aluminum foil about 5 mm.
3. Leave braided wires loose.

(2) Insert type F connector nut into the coaxial cable.



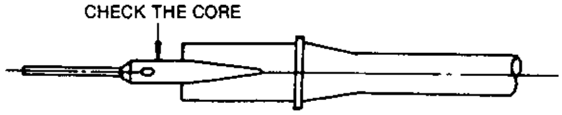
(3) Press a ferule into the coaxial cabel.

① Insert the cable leading into the ferule.



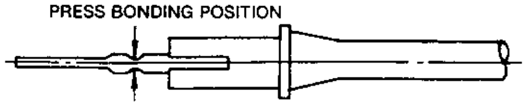
Note: During insertion, be careful not to turn up aluminum foil.

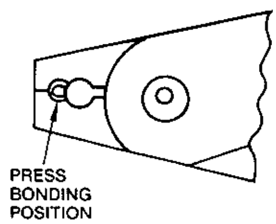
② Check through the contact window to make sure that the core is correctly inserted into the contact.



(4) Press to bond the ferule contact.

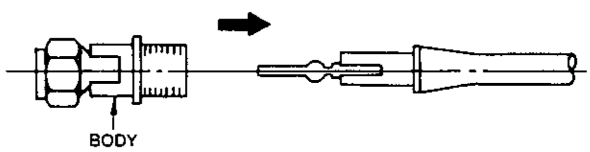
① For press bonding, use No. 2 connecting press. Use the bonding tool's leading end.
② The press bonding position is at the contact window.



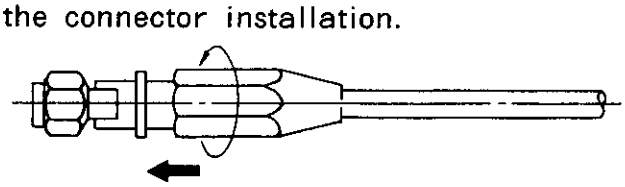


Note: Be careful not to bend the contact.

(5) Insert the body into the ferule.



(6) Using a wrench, tighten the nut until the rubber O-ring is half hidden. This finishes the connector installation.

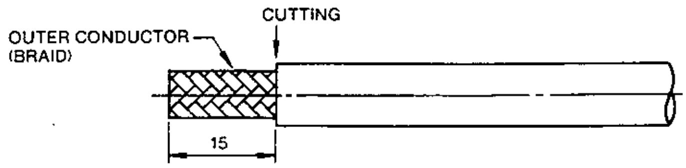


Note: Fix the body and turn the nut for tightening.

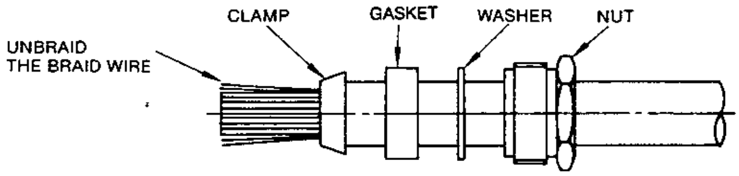
2. BNC CONNECTOR INSTALLATION PROCEDURE

(1) Remove the sheath to 15mm from the cable leading end.

Use a cutter knife or pipe cutter (IFV 1638).

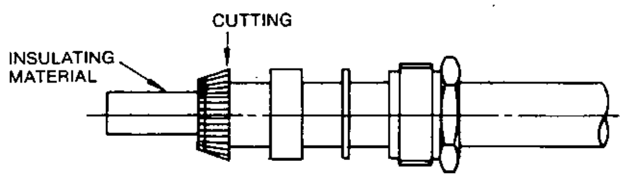


(2) Sequentially insert nut, washer, gasket, and clamp onto the coaxial cable.

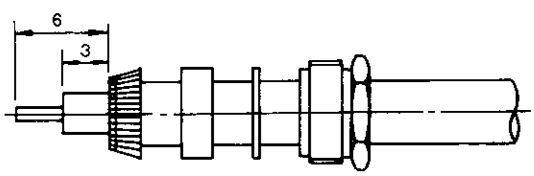


Note:
1. Place the nut, washer, and gasket over the sheath.
2. Place the clamp over the braided wire until it reaches the sheath cut surface.
3. After placing the clamp, unbraid the braided wire.

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

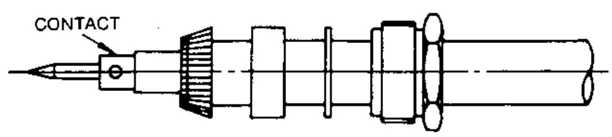


(4) Remove the insulating material, leaving about 3mm, to expose the core. Cut the core leading end, so that the bare core is 3mm.



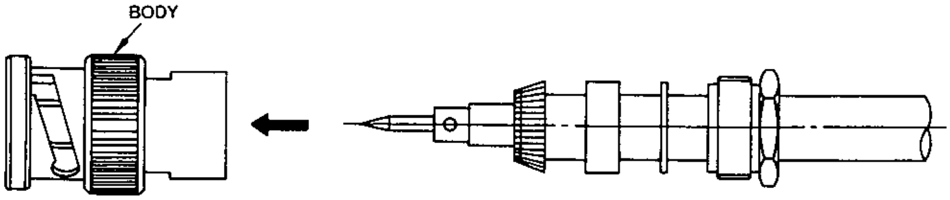
Note: Be careful not to damage the core.

(5) Pass the core through the contact, and solder.



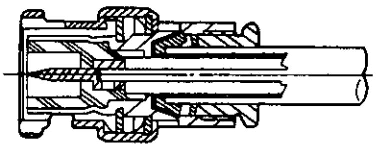
Note:
1. Solder quickly, being careful not to deform the insulating material.
2. Do not permit the solder to form in a lump, or a gap between the contact and insulating material.

(6) Insert the contact into the body.



Note: Insert the contact into the body to the end.

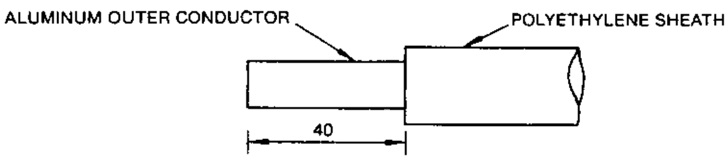
(7) Using a wrench, turn the nut to tighten the body. This completes connector installation.



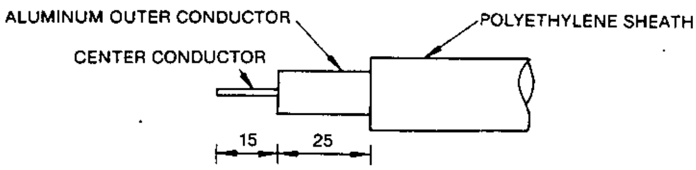
3. FITTING CONNECTOR INSTALLATION PROCEDURE

(1) Treat the ends of a coaxial cable, using a cutter knife or pipe cutter (IFV 1638).

① Remove the sheath to 40mm from the cable leading end.

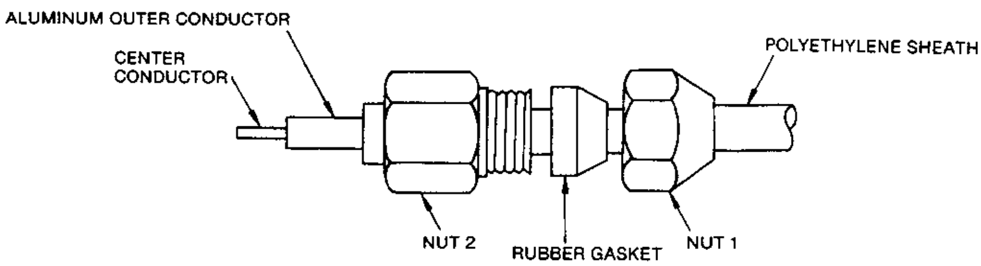


② Remove the aluminum outer conductor and insulating material to 15mm from the cable leading end.



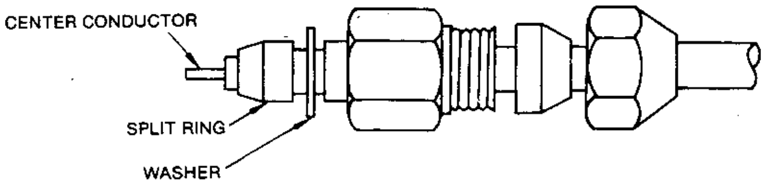
Note: Be careful not to bend or damage the center conductor.

(2) Sequentially insert nut 1, rubber gasket, and nut 2 onto the coaxial cable.

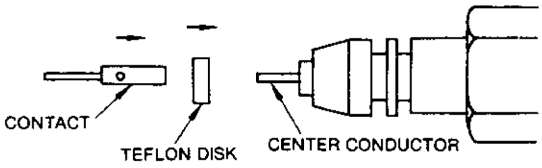


3. FITTING CONNECTOR INSTALLATION PROCEDURE (Cont'd)

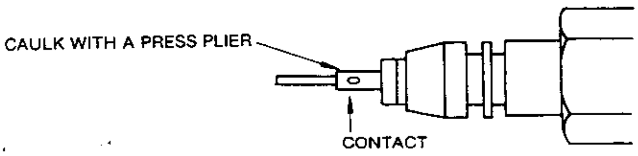
(3) Insert washer and split ring on to the aluminum outer conductor.



(4) Sequentially insert teflon disk and contact onto the center conductor.

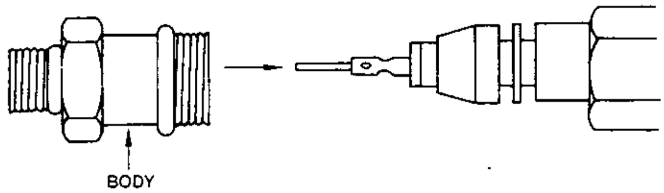


(5) Press to bond the contact, using a 9.5 mm coaxial-cable press-pliers.

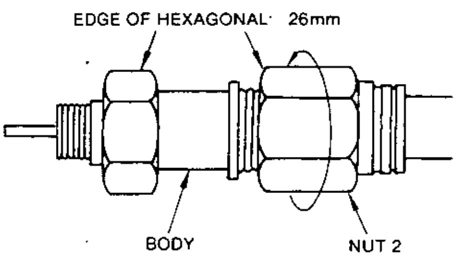


Note:
1. Check through the contact window to make sure that the contact is inserted deep into the center conductor.
2. Bond at only one position at the center of the contact.

(6) Insert the contact into the body.

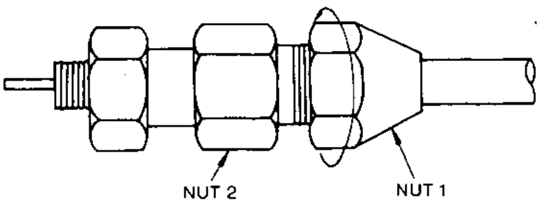


(7) Tighten the body and nut 2.



Note: Fully insert the body and tighten nut 2.

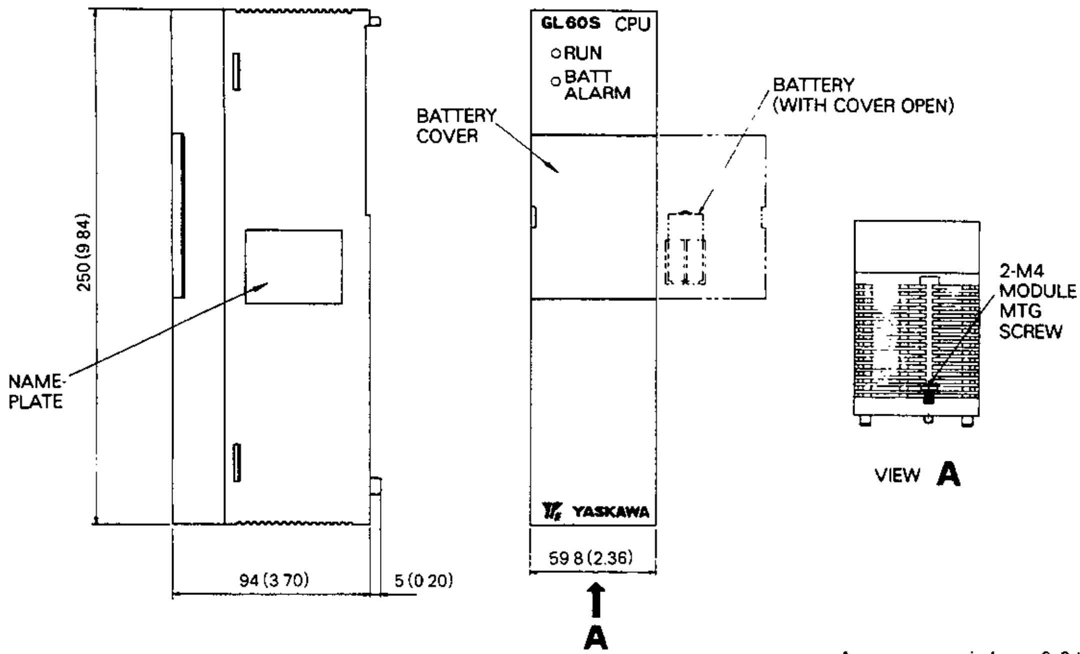
(8) Tighten nut 1. This completes the connector installation.



Note: Secure nut 2, then turn to tighten nut 1.

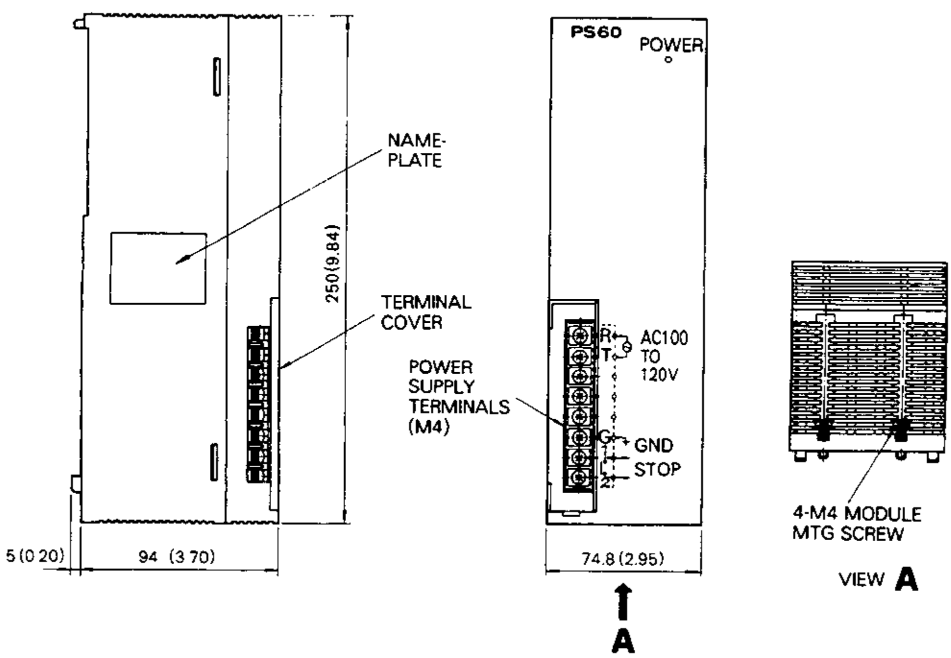
APPENDIX B DIMENSIONS in mm (inches)

(1) CPU Module (Type DDSCR-GL60S)



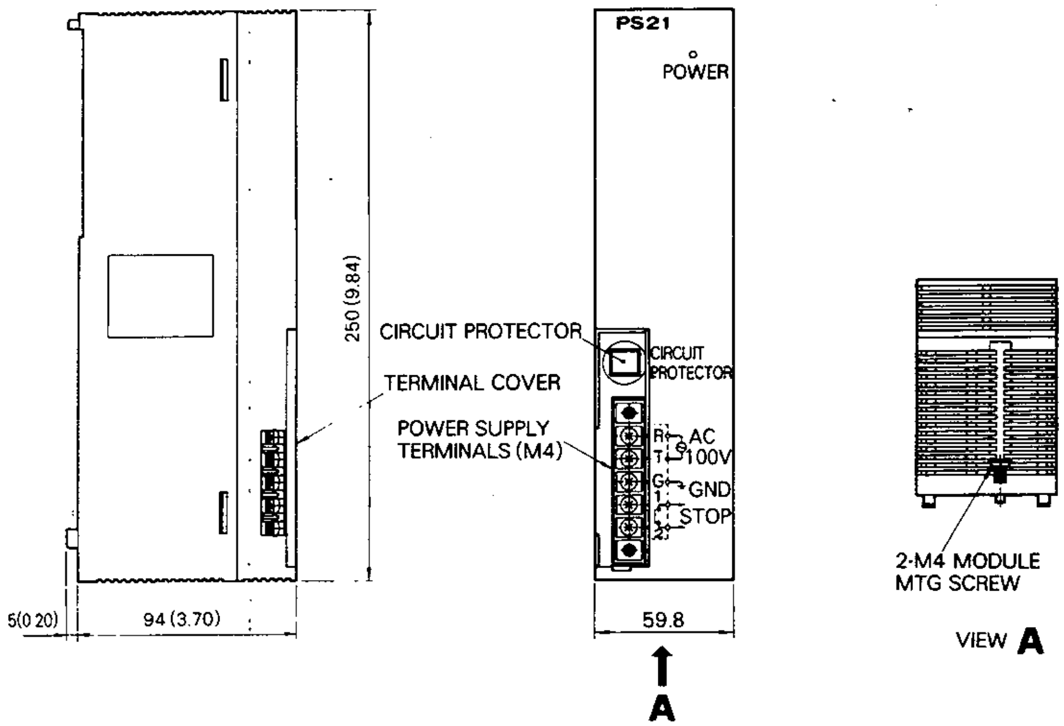
Approx. weight: 0.6 kg 1.3 lb

(2) Main Power Supply Module (Type JRMSP-PS60)



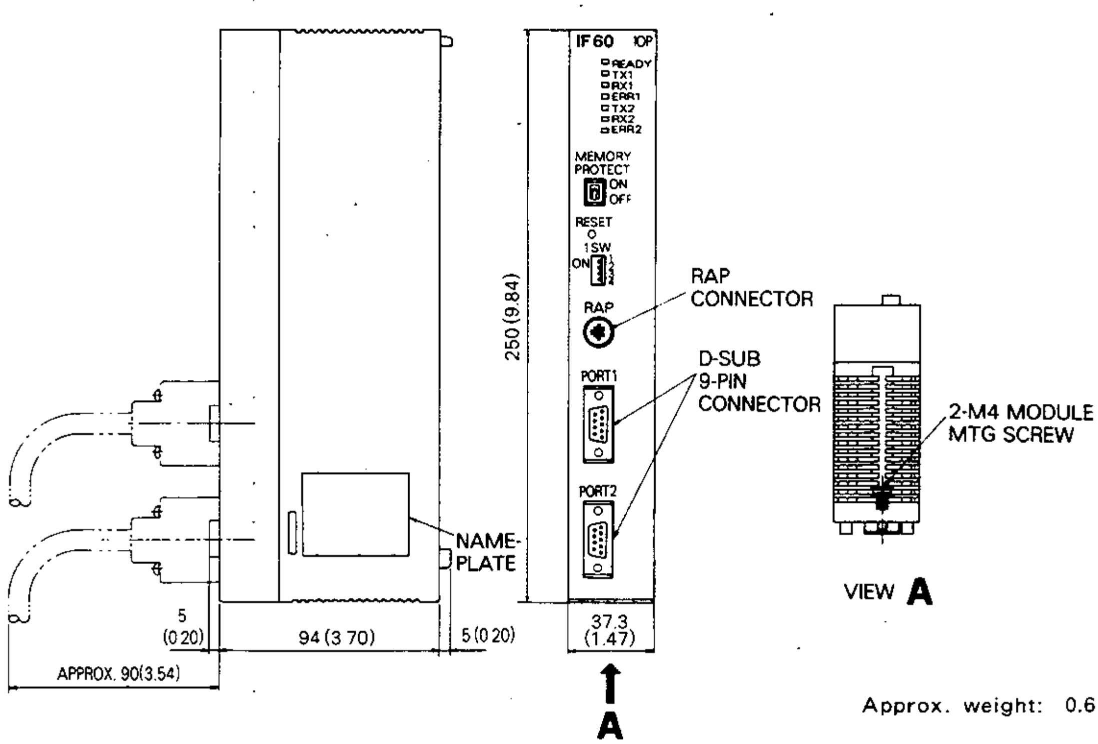
Approx. weight: 0.9 kg 2 lb

(3) Auxiliary Power Supply Module (Type JRMSP-PS21)



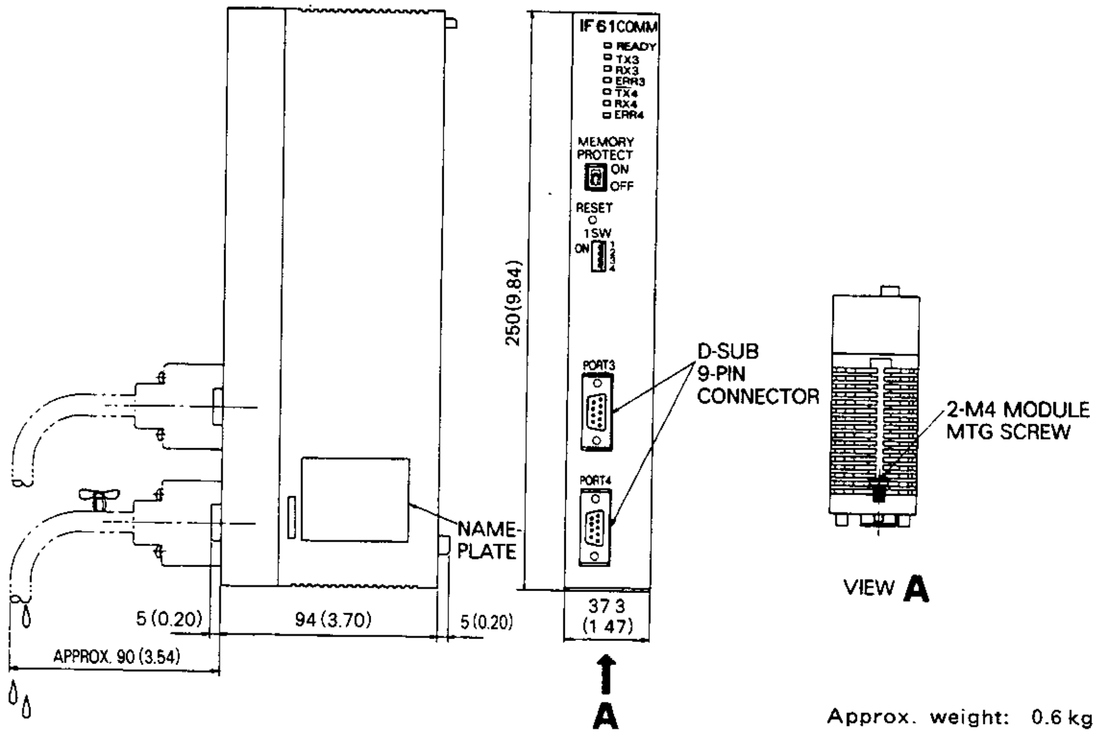
Approx. weight: 0.7 kg 1.6 lb

(4) IOP Module (Type JAMSC-IF60)



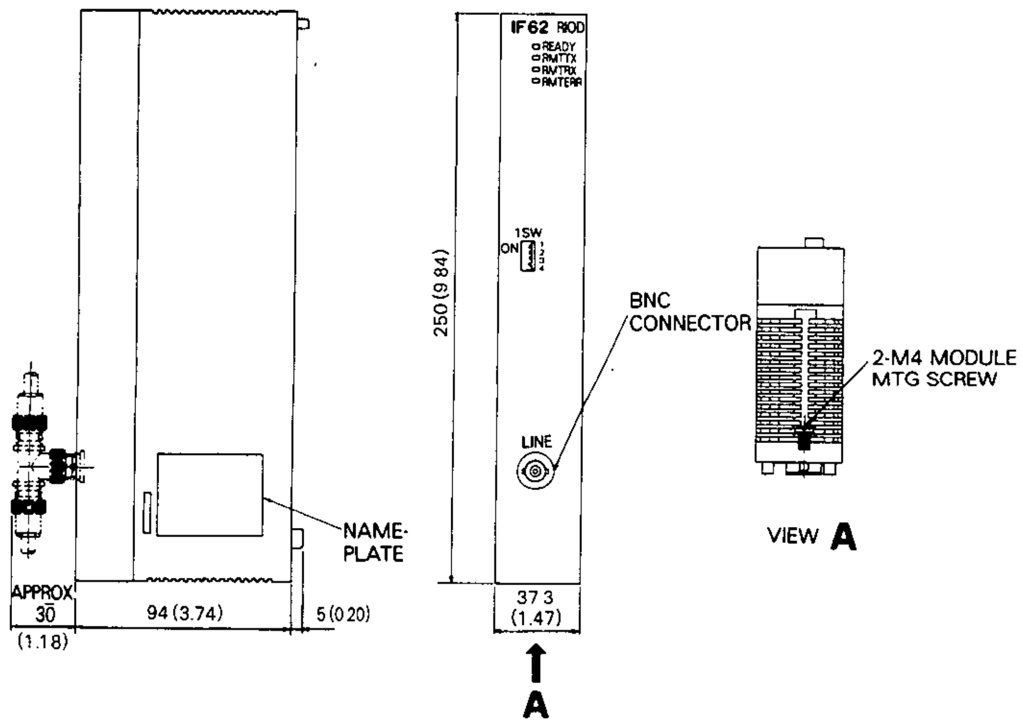
Approx. weight: 0.6 kg 1.3 lb

(5) COMM Module (Type JAMSC-IF61)



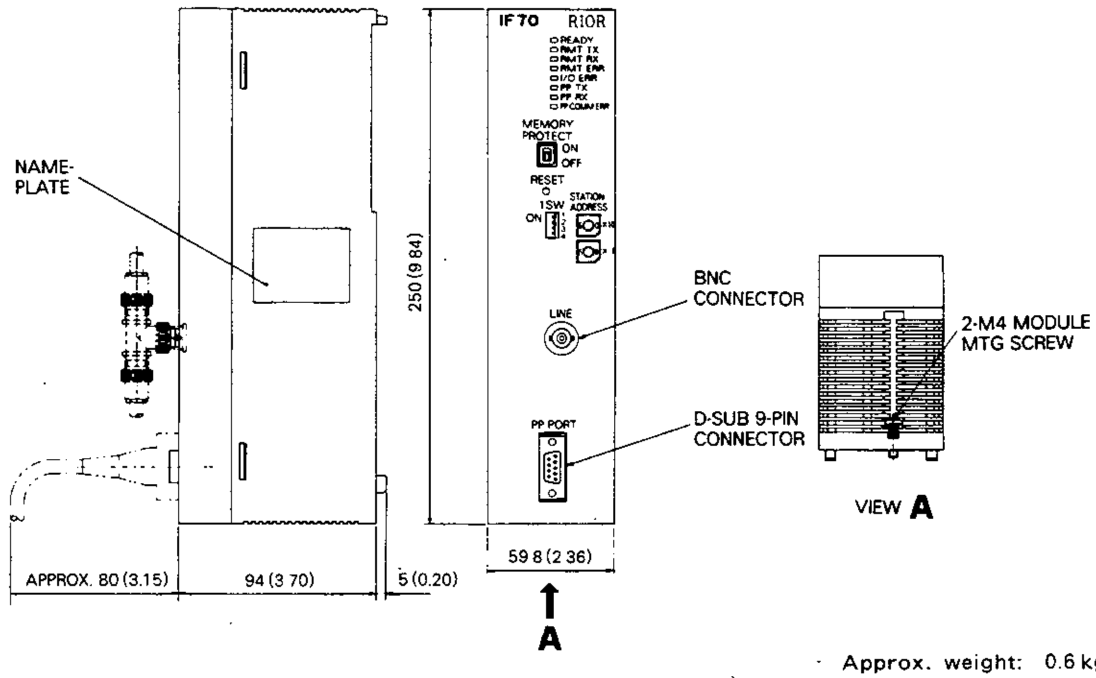
Approx. weight: 0.6 kg 1.3 lb

(6) RIOD Module (Type JAMSC-IF62)



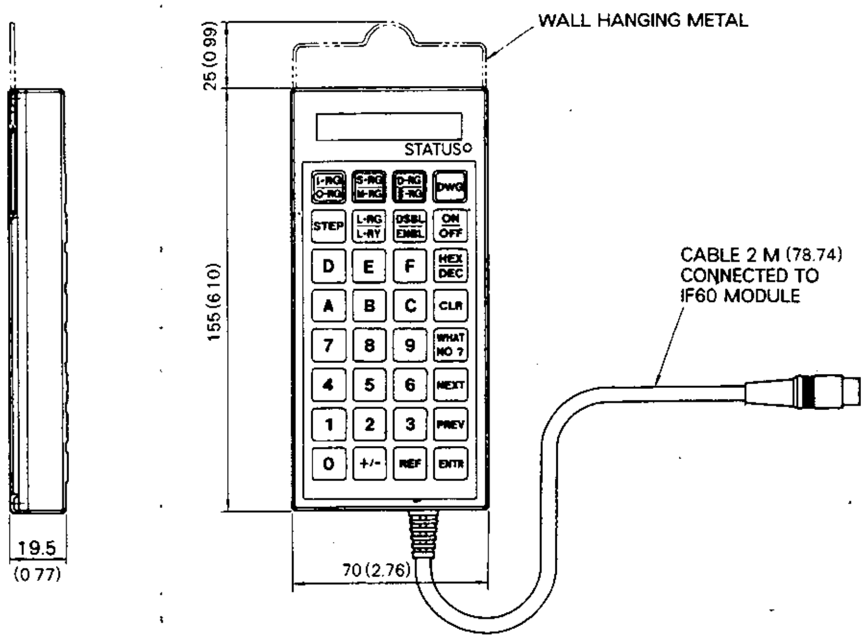
Approx. weight: 0.5 kg 1.1 lb

(7) RIOD Module (Type JAMSC-IF70)



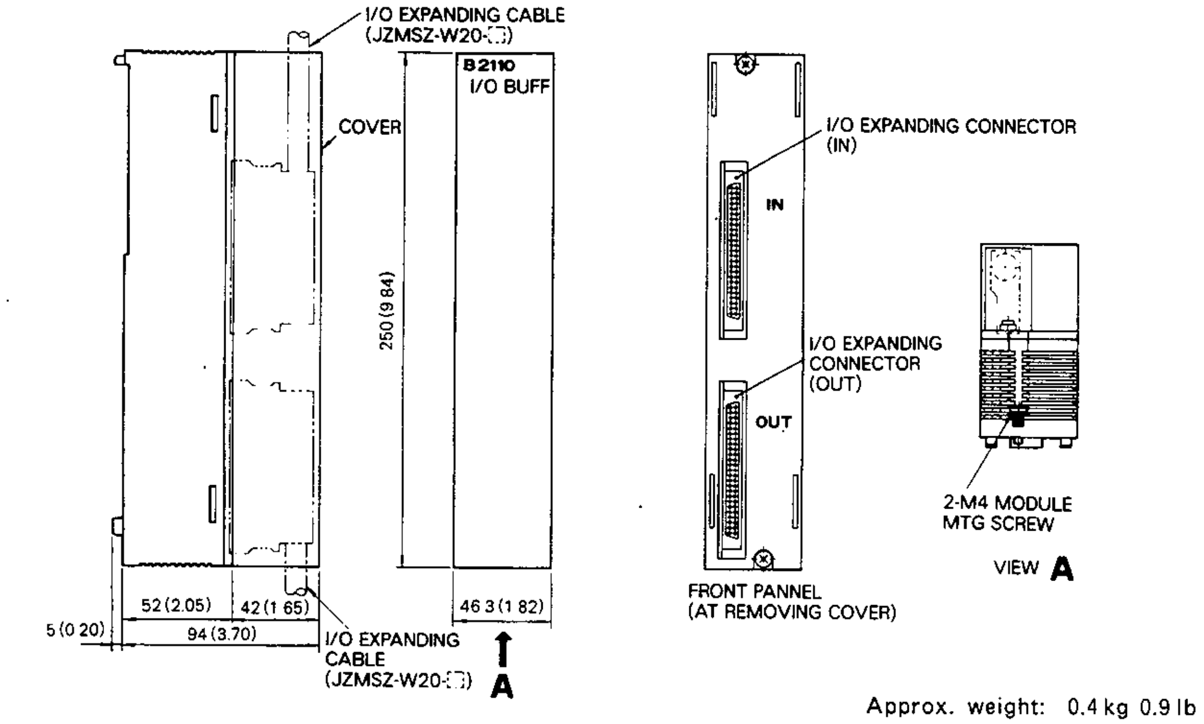
Approx. weight: 0.6 kg 1.3 lb

(8) Register Access Pannel: RAP (Type DISCT-IF69)



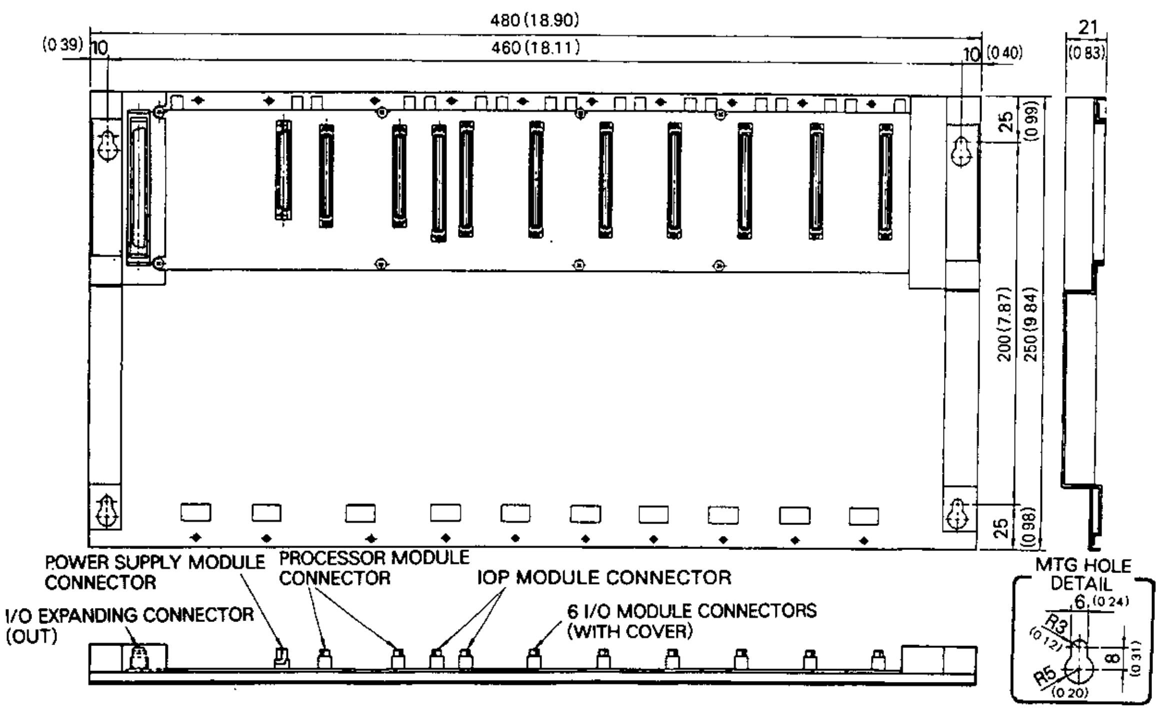
Approx. weight: 0.3 kg 0.7 lb

(9) I/O Buffer Module (Type JAMSC-B2110)



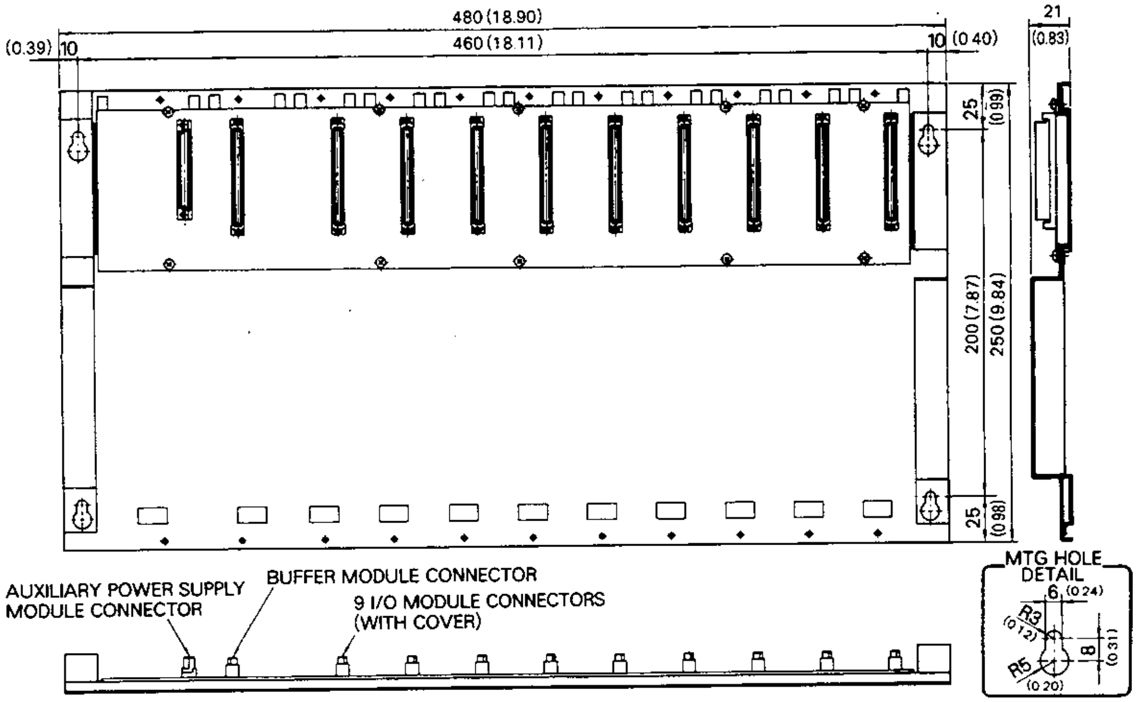
Approx. weight: 0.4 kg 0.9 lb

(10) MB60 Mounting Base (Type JRMSI-MB60)



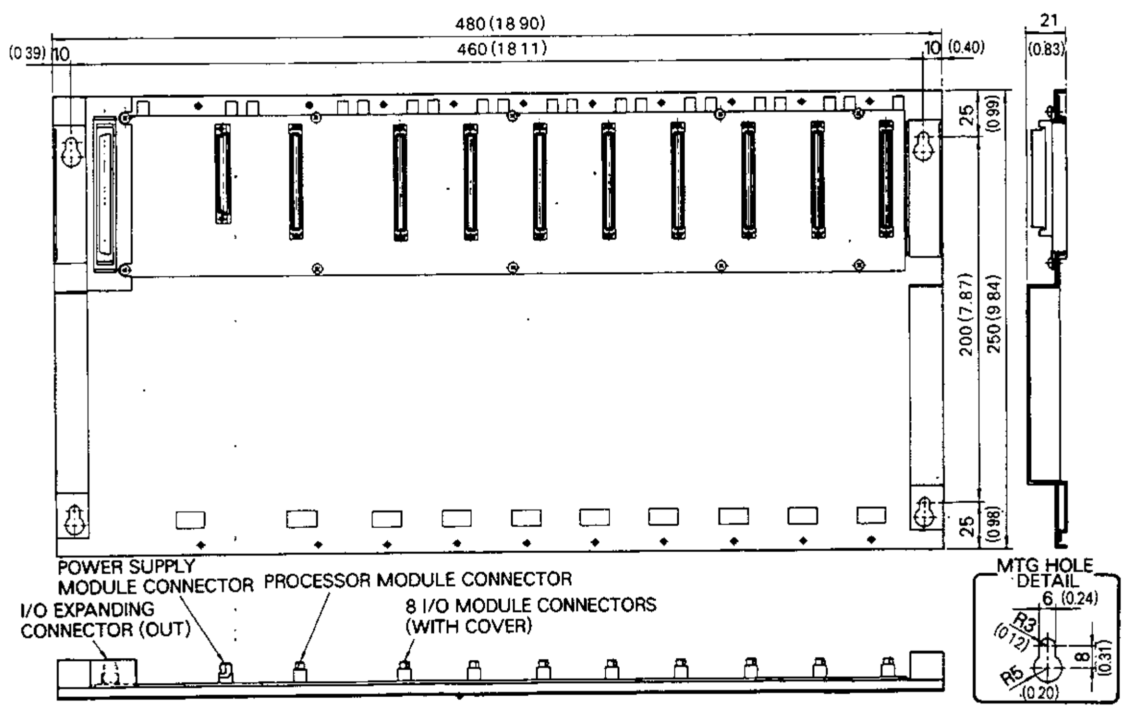
Approx. weight: 1.4 kg 3.1 lb

(11) MB21 Mounting Base (Type JRMSI-MB21)



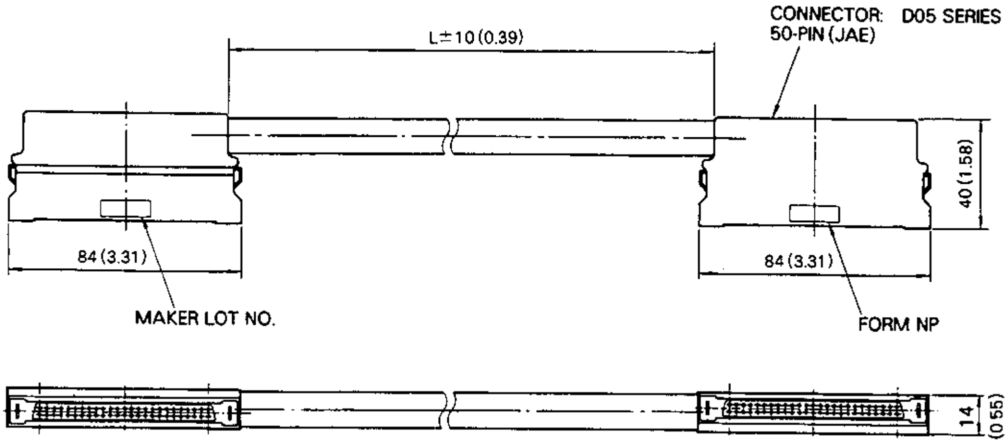
Approx. weight: 1.3 kg 2.9 lb

(12) MB70 Mounting Base (Type JRMSI-MB70)



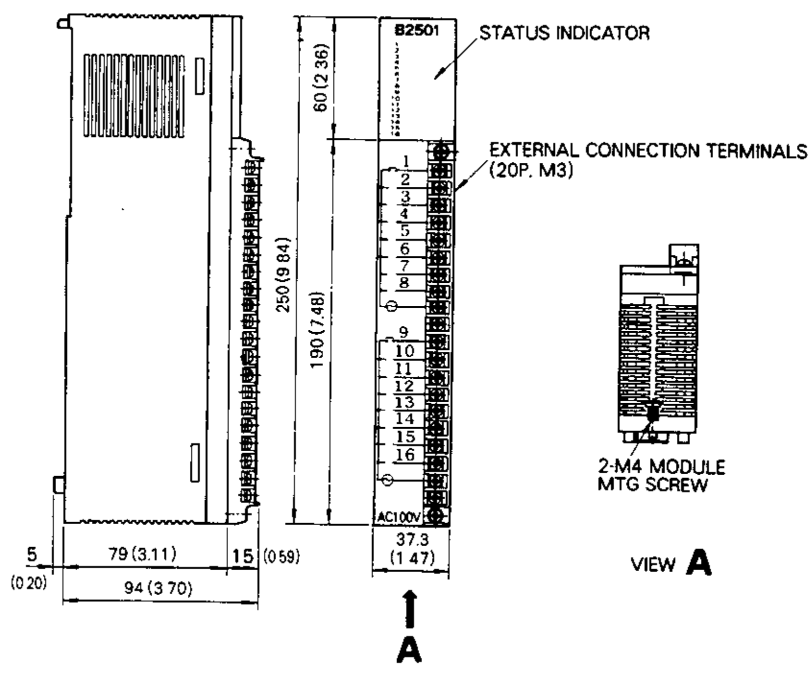
Approx. weight: 1.3 kg 2.9 lb

(13) I/O Cable (Type JZMSZ-W20-1, -2)



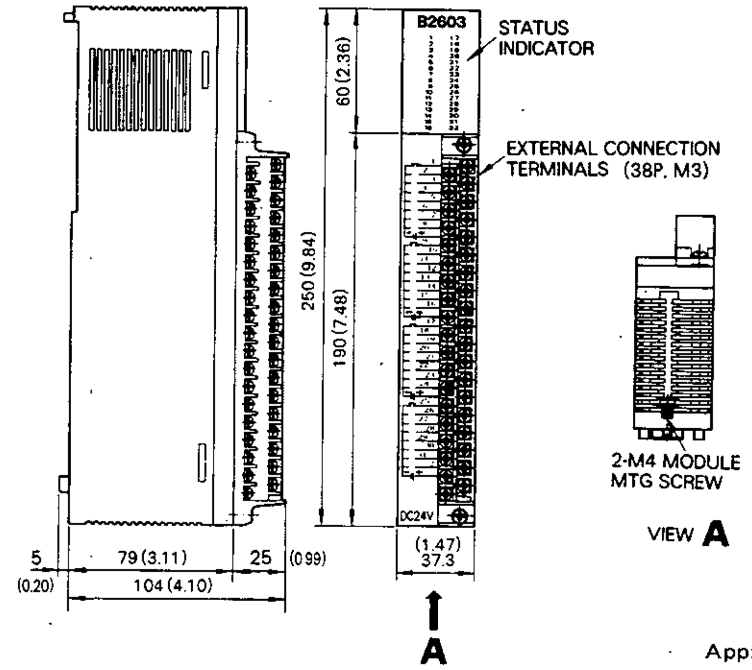
Type JZMSZ-	Length
W 20 - 1	500 (19.69)
W 20 - 2	1500 (59.06)

(14) I/O Module (Type JAMSC-B2501)



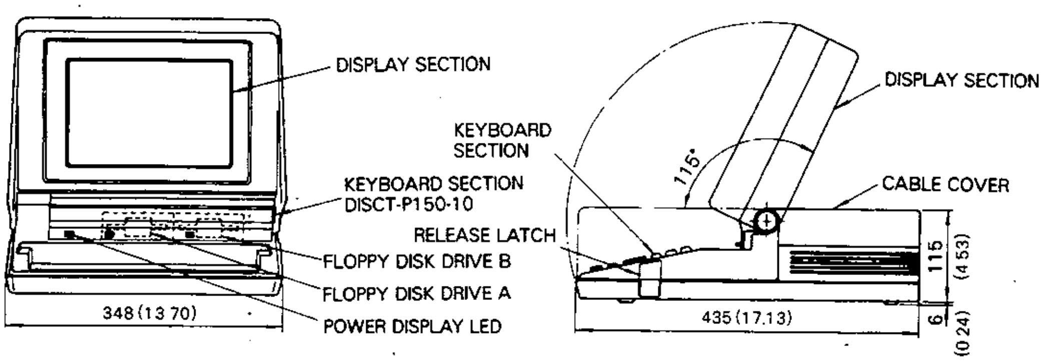
Approx. weight: 0.4 kg 0.9 lb

(15) I／O Module (Type JAMSC-B2603)

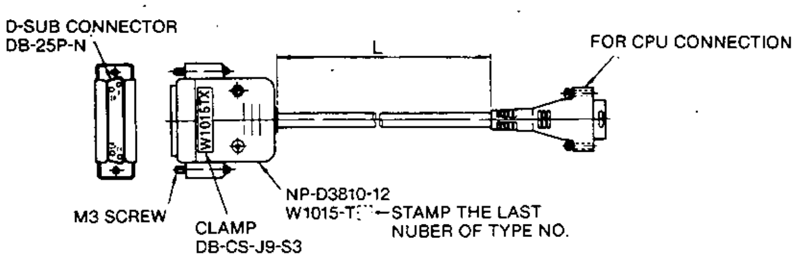


Approx. weight: 0.5 kg 1.1 lb

(16) Programming Pannel P150 (Type DISCT-P150)

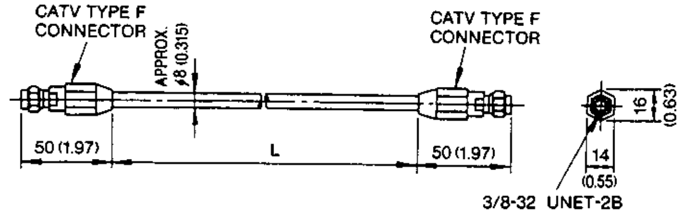


(17) Interface Cable (Type JZMSZ-W1015-T☐)



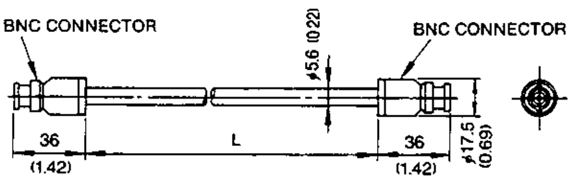
Type	Length	Approx. Weight
W1015-T1	2500 (98.42)	0.2kg (0.4lb)
W1015-T2	15000 (590.6)	1.0kg (2.2lb)

(18) Coaxial Cable (Type JZMSZ-W453-×××)



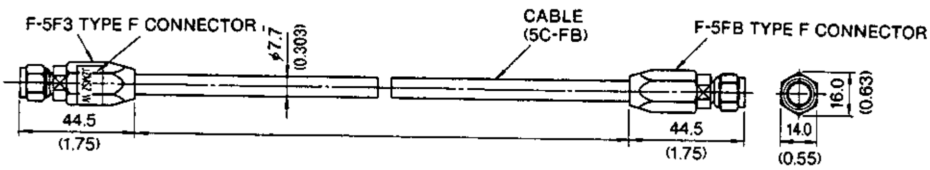
Type JZMSZ-	Length	Approx. Weight
W 453-001	2000 (78.74)	0.3 kg (0.7 lb)
W 453-002	5000 (196.85)	0.5 kg (1.1 lb)
W 453-003	10000 (393.7)	0.8 kg (1.8 lb)

(19) Coaxial Cable (Type JZMSZ-W60-×)



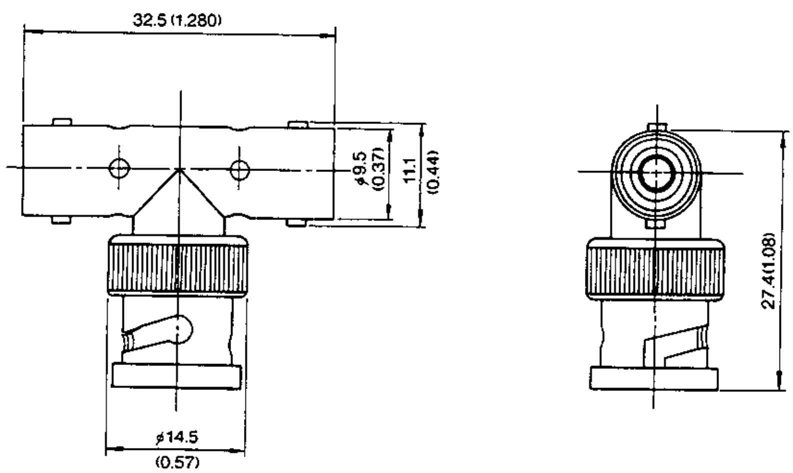
Type JZMSZ-	Length	Approx. Weight
W 60-1	2000 (78.74)	0.3 kg (0.7 lb)
W 60-2	3000 (118.11)	0.4 kg (0.9 lb)
W 60-3	5000 (196.85)	0.5 kg (1.1 lb)

(20) Coaxial Cable (Type JZMSZ-W61-×)

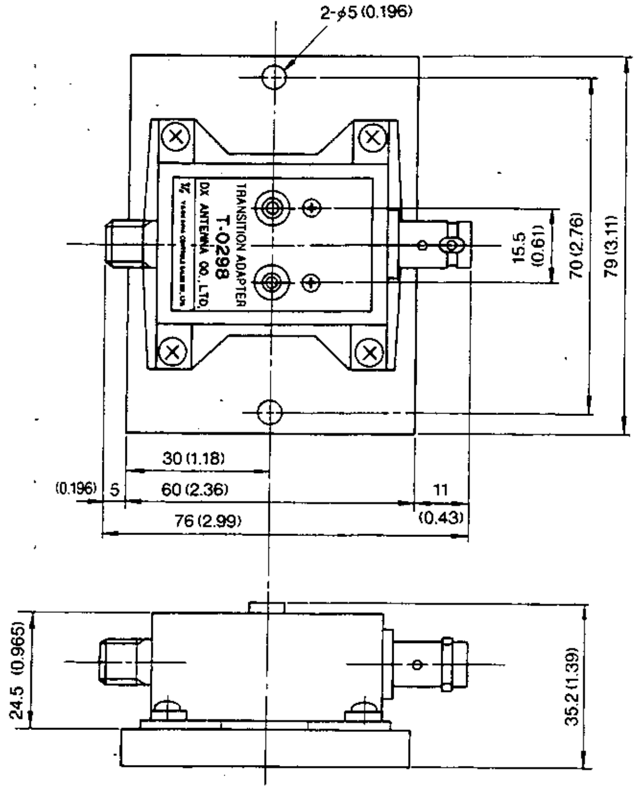


Type JZMSZ-	Length	Approx. Weight
W 61-1	2000 (78.74)	0.3 kg (0.7 lb)
W 61-2	5000 (196.85)	0.5 kg (1.1 lb)
W 61-3	10000 (393.7)	0.8 kg (1.8 lb)

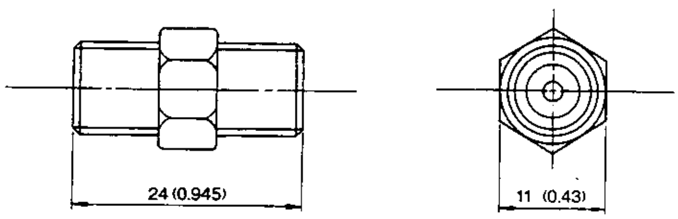
(21) Type T Connector (BNC-TA-JPJ-NICAU)



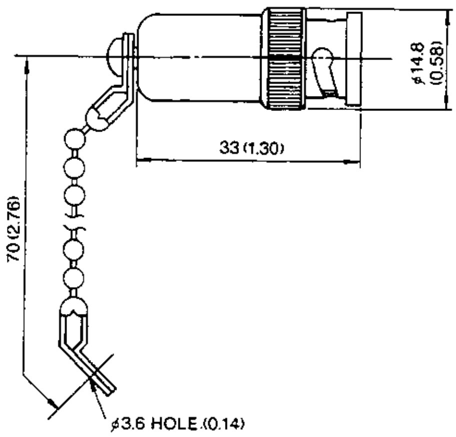
(22) Conversion Adapter (T-0298)



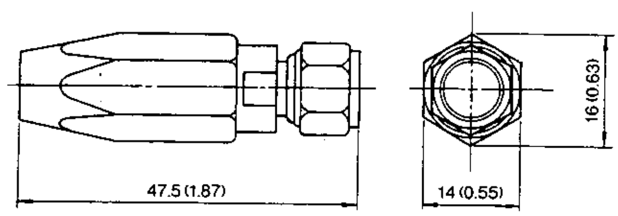
(23) Conjunction Connector (F-A)



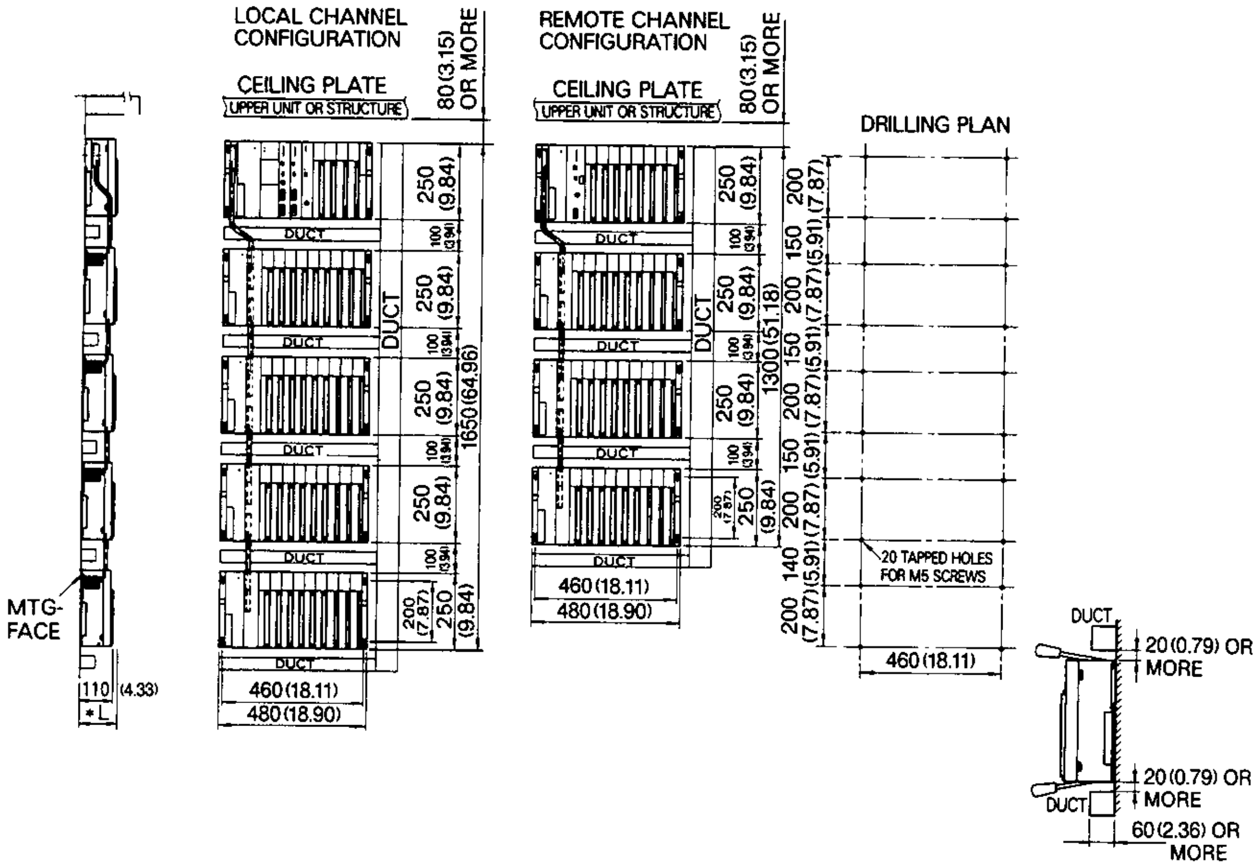
(25) Terminator (BNC-RC-75Ω-NICAU)



(24) Type F Connector (F-7FB)



APPENDIX C *Memocon-SC* GL60S LAYOUT AND DRILLING PLAN in mm (inches)



MOUNTING PRECAUTIONS

Observe the following when mounting the controller in a frame or other structure. The diagram above can be used as a reference.

1. Provide a spacing of more then 80m from the upper module unit or from the top part of the structure to ensure proper ventilation and for easy module replacement.
2. Apply a philips screwdriver (+) slightly diagonally when mounting or removing a module. Provide spaces at the top and the bottom of modules taking screwdriver and duct sizes into consideration.
3. The mounting side of the mounting base is plated to ensure conduction for better noise resistance. The mounting plate of the frame or of the other structure must also allow conduction with the mounting base.
4. Check the *L dimension (required maximum dimension) in the outline drawings of the modules if the module connectors are mounted on the panel surfaces.

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Specifications are subject to change without notice
for ongoing product modifications and improvements.