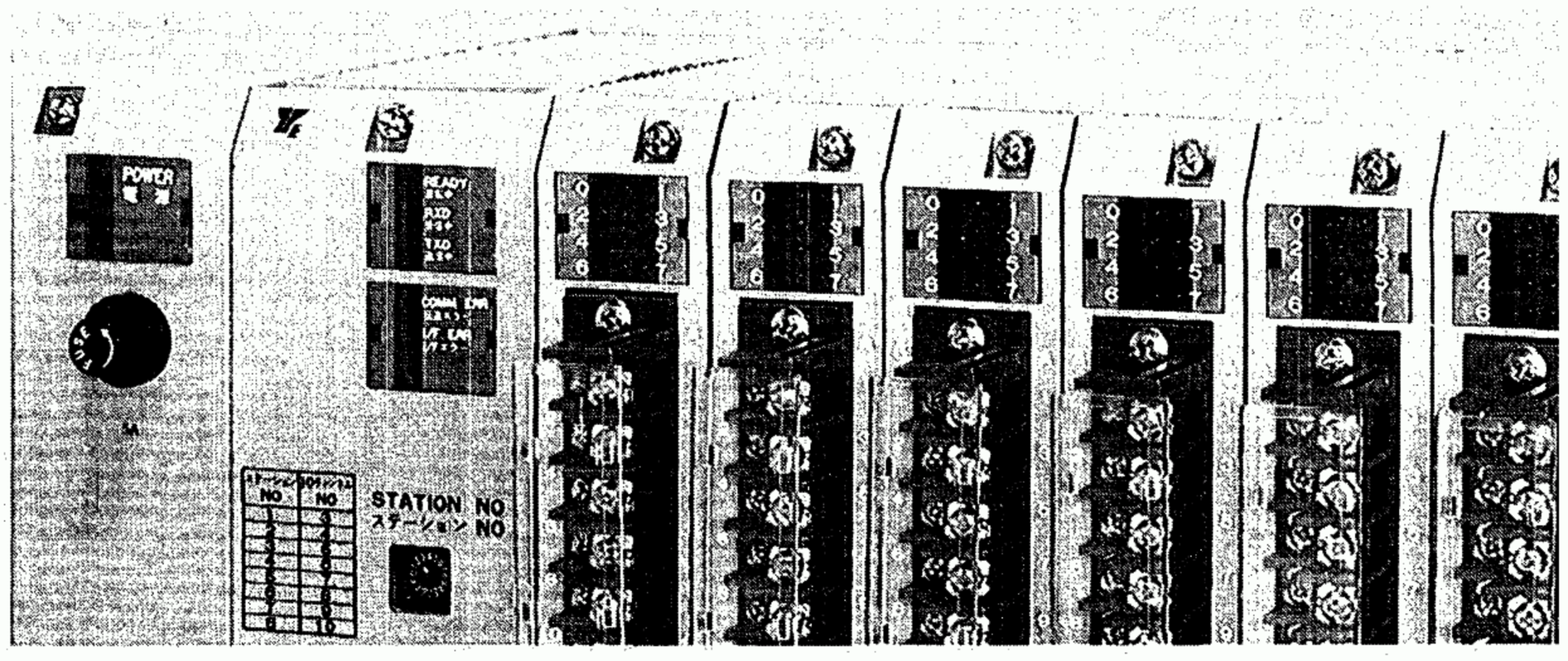
YASKAWA

MEMOCON-SC U84
DESCRIPTIVE INFORMATION

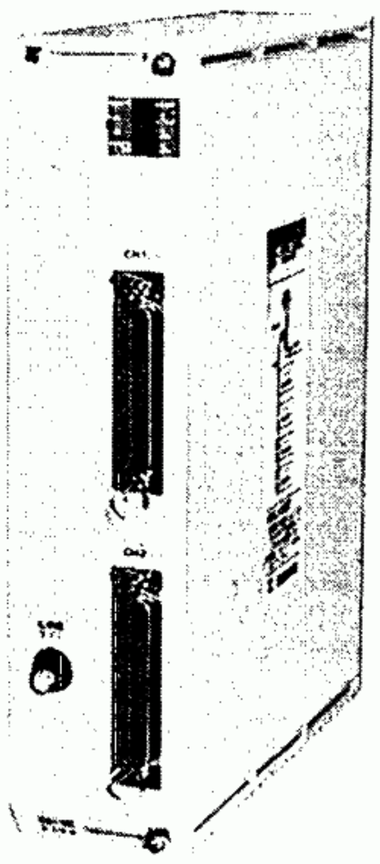
REMOTE I/O SYSTEM (ELECTRICAL TYPE)



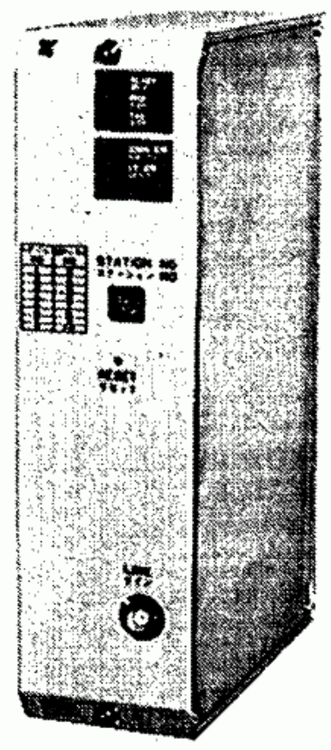
YASKAWA

MANUAL NO. SIE-C815-10.7C

This manual describes the specifications, configurations and methods of use of the electrical type remote I/O system. Before planning user's own remote I/O system, thoroughly read and understand this manual. Also refer to the following manual: Memocon-SC U84 User's Manual I–Design and Maintenance (SIE-C815-10.1)



Remote I/O Driver Module
Type JAMSC-C8130



Remote I/O Receiver Module
Type JAMSC-C8135

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1. INTRODUCTION

Memocon-SC U84 is large-capacity, enhanced function type programmable controllers that can be widely utilized for almost every kind of system ranging from a simple relay sequence control to a complicated data processing application.

The U84 alone is able to connect 2,048 points of discrete inputs and outputs and 256 register inputs and outputs. This permits the user to utilize various kinds of input/output modules, such as discrete I/O, register I/O and analog I/O modules, as well as counter, registration and PID modules.

In addition, U84 has remote input/output functions, with which input/output units can be installed, not only near the CPU (local I/O), but also far from the CPU (remote I/O). Moreover, the input/output modules can be freely positioned within the range of 2,048 points of discrete inputs and outputs and 256 register inputs and outputs in total.

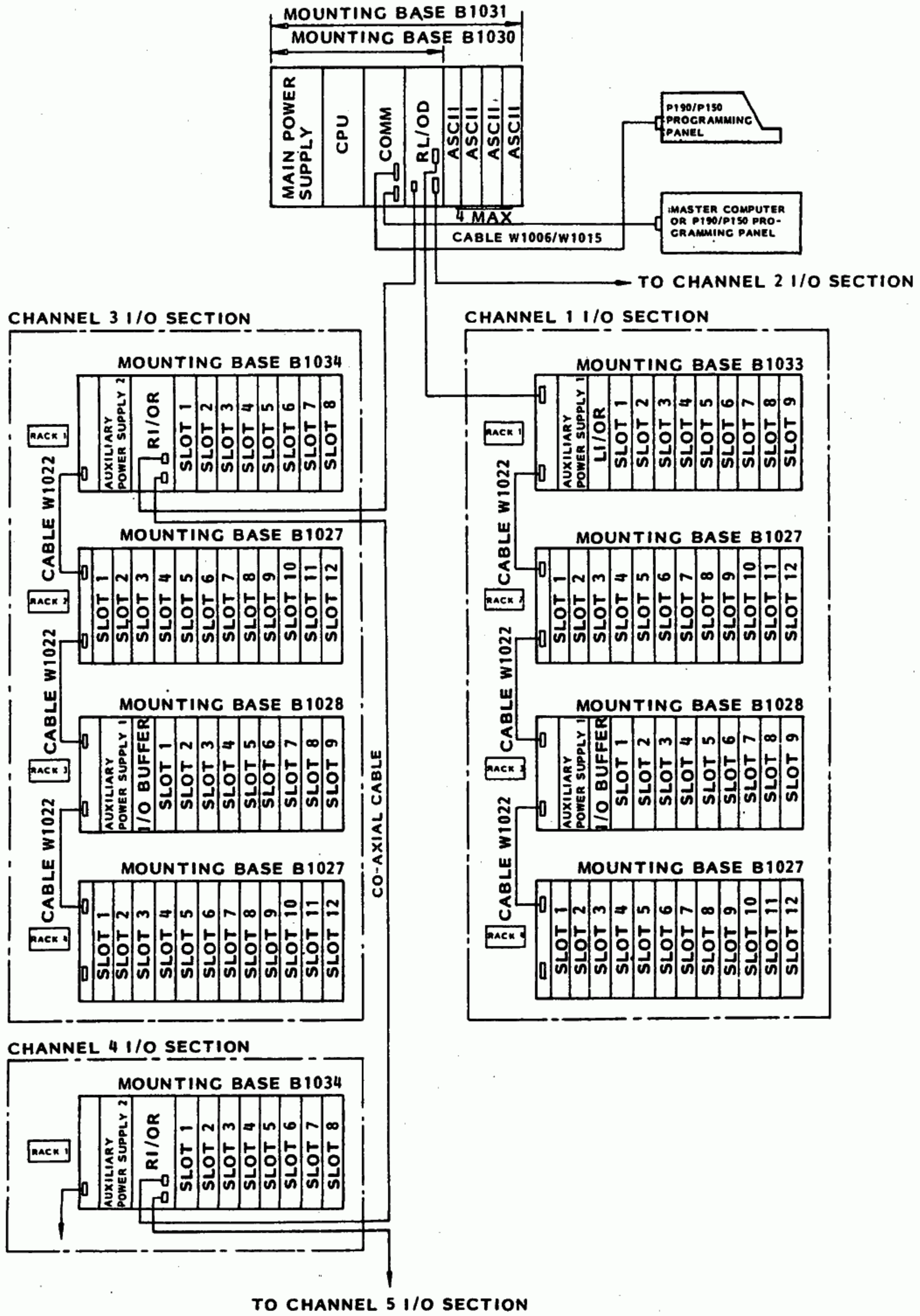
The remote I/O system of U84 comprises one remote I/O driver (master station at CPU side) and a maximum of eight remote I/O receivers (slave station at remote I/O side) with the transmission line of electrical type using coaxial cables or optical type using optical fiber cables.

This manual describes the specification, configurations and methods of use of the electrical type remote I/O system.

2. U84 CONFIGURATION

Table 2.1 U84 Configuration

Component	Description
CPU Module(CPU)	The CPU module includes a logic solver and memory. The ladder circuits are stored in the memory and solved according to input data sent from a local or remote I/O driver. The results are output to the local or remote I/O driver. The program memory is available in two types, 24k and 16k words. Regardless of the type of program memory, the U84 is capable of dealing with discrete inputs/outputs (ON/OFF signals) of up to 2,048 points and up to 256 register inputs/outputs (4-digit decimal or 16-bit binary data).
Power Supply Modules	The main power supply module provides DC power to the CPU module and peripheras modules including the communication module and local or remote I/O driver. The auxiliary power supply module 1 supplies DC power to the local I/O receiver, I/O buffer, and I/O modules and the auxiliary power supply module 2 to remote I/O receiver and I/O modules.
Communication Module (COMM)	The communication module includes two RS-232C ports (MEMOBUS) for communication with the P190 CRT Programming Panel and a computer. By operating the front Register Access Panel(RAP), it is possible to display the status of the coils and input relays, to perform simulation (forced ON/OFF), to display and alter the contents of the registers, and to set and display communication parameters.
Local I/O DRIVER (LI/OD)	Receiving the reference from the CPU module, the local I/O driver transfers input data fron the input module to the CPU module and output data from the CPU module to the output module for local I/O. The driver is used for two local I/O channels.
Remote I/O Driver (RI/OD)	Receiving the reference from the CPU module, the remote I/O driver transfers input data from the input module to the CPU module and output data from the CPU module to the output module for remote I/O. The driver is used for eight remote I/O channels and two local I/O channels.
Local I/O Receiver (LI/OR)	The local I/O receiver is used for local I/O channels, and it exchanges signals between the local or remote I/O driver and the I/O modules.
Remote I/O Receiver (RI/OR)	The remote I/O receiver is used for remote I/O channels, and it exchanges signals between the remote I/O receiver and the I/O modules.
I/O Buffer Module	The I/O buffer module is ued to install 22 or more I/O modules in one local I/O channel or 21 or more I/O modules in one remote I/O channel.
I/O Modules (1000 Series)	• Discrete signal modules One module is provided with inputs or outputs of 16 or 32 circuits. It is usable for numeric signals (by I/O allocation). • Numeric signal modules One module is provided with eight numeric inputs or outputs of 4-BCD digits or 16 bits in binary form (by I/O allocation). • Analog modules An A/D converter module has four circuits and a D/A converter module of two circuits. • Other modules Counter module, PID module, positioning module
Mounting Base	The CPU module, power supply module, peripheral modules, and I/O modules are mounted on a mounting base. The type of the mounting base varies with the type of module. The modules mounted on the base are connected to each other via a built-mother board. Connections between mounting bases are made with cables.
P190 Programming Panel	The programming panel permits storing a program, altering or deleting the stored program, monitoring status, and printing out a ladder diagram through a connected printer. Two types are available on request, CRT or plasma display.



Note:

1. The mounted position of the communication module and the remote I/O driver may be interchanged. They can be installed in any slots for ASCII module (on B1031). Only one of each module is available for mounting on the base.
2. Eight channels for remote I/O (41 slots max per channel) and 2 channels for local I/O (42 slots max per channel) are available in I/O section. Up to 412 I/O modules can be installed in the mounting bases for I/O. The combination of inputs and outputs can be arranged freely. However, there are the following limitations:
   - Discrete inputs + discrete outputs ≦ 2048
   - Register inputs + register outputs ≦ 256

Fig. 2.1 U84 Remote I/O System (Electrical Type)

3. U84 SPECIFICATIONS

3.1 BASIC U84 SPECIFICATIONS

Table 3.1 Basic U84 Specifications

Items	Specifications
Power Supply	Single-phase 85 to 121 VAC, 47.5 to 63 Hz
Dissipated Power	280 VA (main power supply module)
Holding Time	10ms
Ambient Timperature	Oto+55℃(excluding peripgeral devices)
Storage Timperature	−20℃to+85 ℃(excluding lithium battery)
Humidity	5% to 95% relative (non-condensing)
Vibration-Resistance	In compliance with JIS*C 0911 (excluding peripheral devices)
Shock-Resistance	10G max (excluding peripheral devices)
Environmental Condition	Free from explosive, inflammable, corrosive gases
Grounding	Grounding resistance: 100Ω or less
Dielectric Sterngth	1500VAC for 1 minute
Insulation Resistance	100M Ω or more at 500VDC
Noise Immunity	1500Vp−p, pulse width:1 μs, rising time: 1ns

*Japanese Industrial Standard

3.2 REMOTE I/O SPECIFICATIONS

Table 3.2 Remote I/O Specifications

Items	Specifications
Transmission Mode	Half duplex frame synchronous
Transmission Speed	1 Mbps
Transmission Route	Multi-point connection
Transmission Distance	2 km max between each station
Number of Stations	9 stations max • 1-master station (remote I/O driver) • 8-slave station (remote I/O receiver)
Type of Cable	Co-axial cable
Signal Format	In compliance with HDLC.
Signal Code	Manchester code
Error Check	CCITT-CRC ($\chi^{16}+\chi^{12}+\chi^{5}+1$), time out.

3.3 CPU MODULE

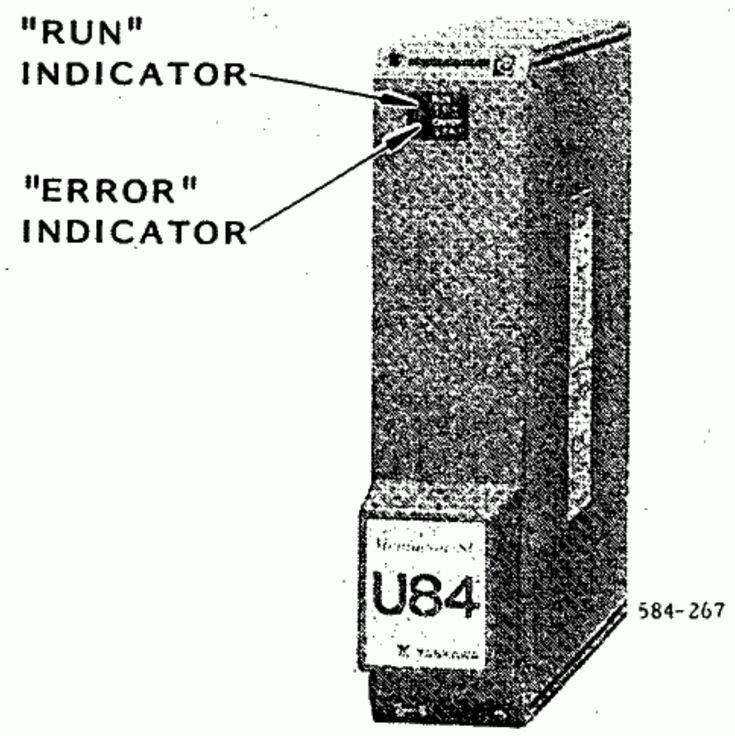


Fig. 3.1 CPU Module

Table 3.3 CPU Module Specifications

Items	Specifications	
Type	• DDSCR-U84-116. 16k words • DDSCR-U84-124. 24k words	
Control Method	Stored program and scan control	
Programming	Relay ladder diagram symbology	
Program Memory Size	16k, 24k CMOS RAM with battery back-up (24-bit per word)	
Data Memory Size	9999 words. CMOS RAM with battery back-up (16-bit per woud)	
Scan Time	• 20ms per 16k words (typical) • 0.35 μs per word (basic instruction)	
Logic Function	Relay	• Normally open contact, normally closed contact • Transitional contact (OFF to ON),or (ON to OFF) • Horizontal shunt, vertical shunt, vertical open • Coil, latched coil
	Timer	• Type: Seconds, tenths of seconds, hundredths of seconds • Maximum preset value: 4-digit decimal • Setting available from external device
	Counter	• Up counter, down counter • Maximum preset value: 4-digit decimal • Setting available from external device
	Arithmetic	• Addition, subtraction, multiply, divide (Aritmetic in 4-digit decimal)
	Move	R→T, T→R, T→T, BLKM, FIN, FOUT, SRCH, STAT
	Matrix	AND, OR, XOR, COMP, CMPR, MBIT, SENS, BROT
	Special Functicn	READ, WRITE (for ASCll module), Skip
	Square Arithmetic	Square root (SQRT), Double square root (DSQR)
	Double-precision Arithmetic	• Double-precision addition (DADD), Double-precision • subtraction (DSUB), Double-precision multiply • (DMUL), Double-precision divide (DDIV) • Arithmetic in 8-digit decimal
	Move with Index	• DIBT, DIBR • SIBT, SIBR
	Others	MROT, TWST
Input/Output Points	• Discrete I/O points: Input+Output≦2048 points • Register I/O points: Input+Output≦256 points • No. of local channels: 2(42 I/O modules max in use per channel) • No. of remote channels: 8(41 I/O modules max in use per channel)	
Diagnostic Function	• Checksum of memory • Watchdog timer checking • Battery monitoring • Parity checking • Internal code checking • Reference number checking • RTC checking, I/O allocation checking • CPU diagnostic, mimory diagnostic	
Backed-up Memory	• Kind: 1-lithium battery • Battery life: 5 years, at 25 ℃ • Memory contents holding time: 1 year, at 25℃	
Indicating Lamp	• RUN: Lights when CPU module is proper in operation. • ERROR: Lights when the output voltage of CMOS RAM back-up battery is low level, with AC power supply turned on.	
Mounting Location	On mounting base B1031 or B1030	
Dimensions in mm	69.5(W)×300(H)×232(D)	
Approx Weight	2kg	

3.4 POWER SUPPLY MODULES

(1) Main Power Supply Module

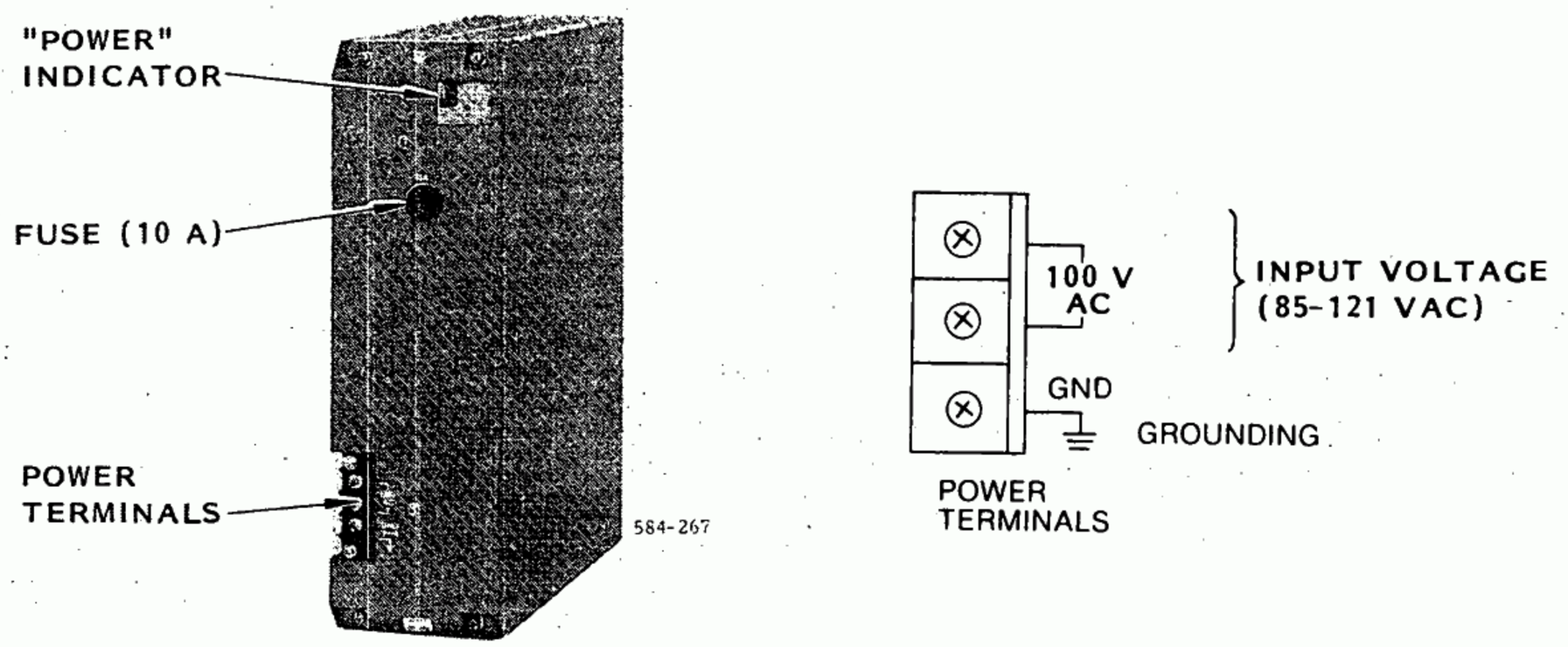
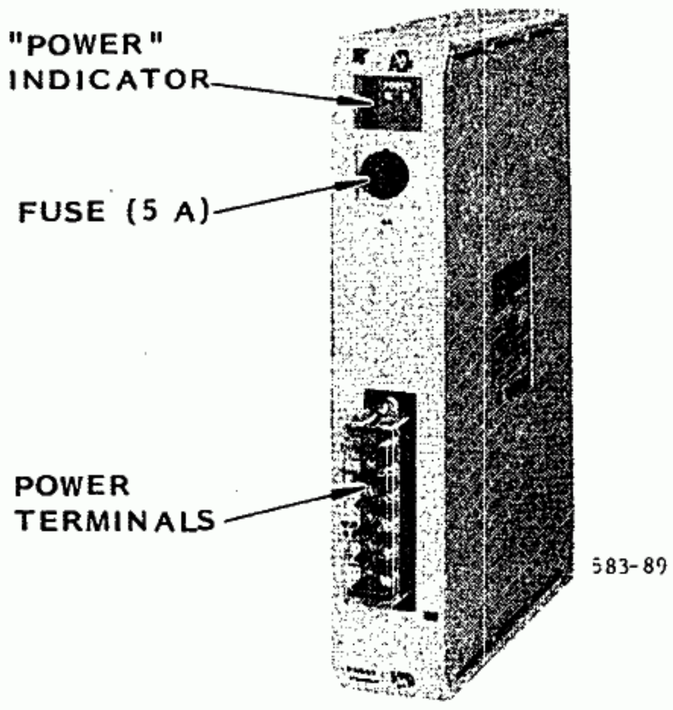


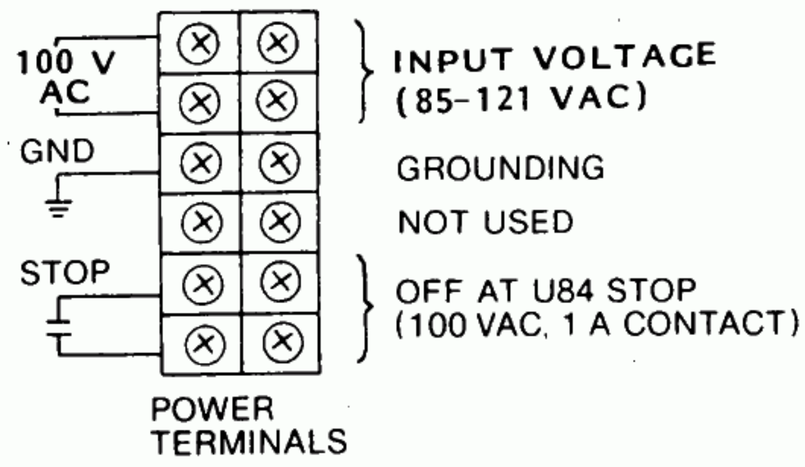
Fig. 3.2 Main Power Supply Module

Table 3.4 Main Power Supply Module Specifications

Items	Specifications
Type	JRMSP-P8101
Function	DC power supply for a CPU module, a communication module a local or a remote I/O driver module and four ASCII modules.
Input Voltage	Single-phase 85-121 VAC, 47.5-63 Hz, 280 VA
Transient Input Voltage	0-140 VAC (10ms)
Inrush Current	50A (peak) or less
Leakage Current	0.2mA or less
Fuse	Glass tube fuse (10A)
Indicating Lamp	POWER: Lights when power supply is proper.
Mounting Location	On mounting base B1031 or B1030
Dimensions in mm	90(W)×300(H)×232(D)
Approx Weight	5 kg

(2) Auxiliary Power Supply Module 1





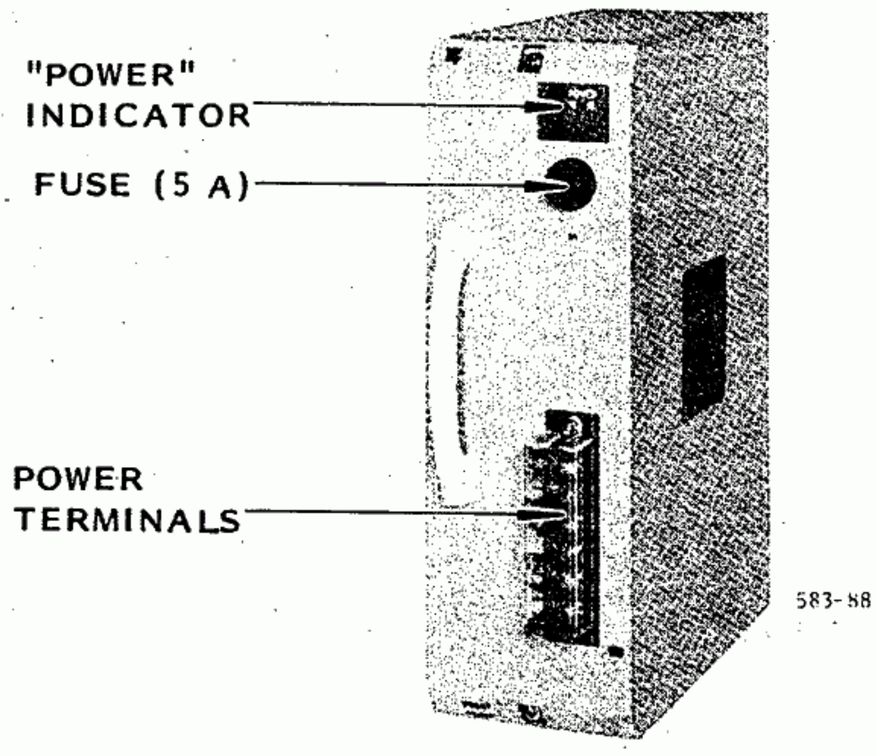
Note:- Each designated pair of terminals are in common.

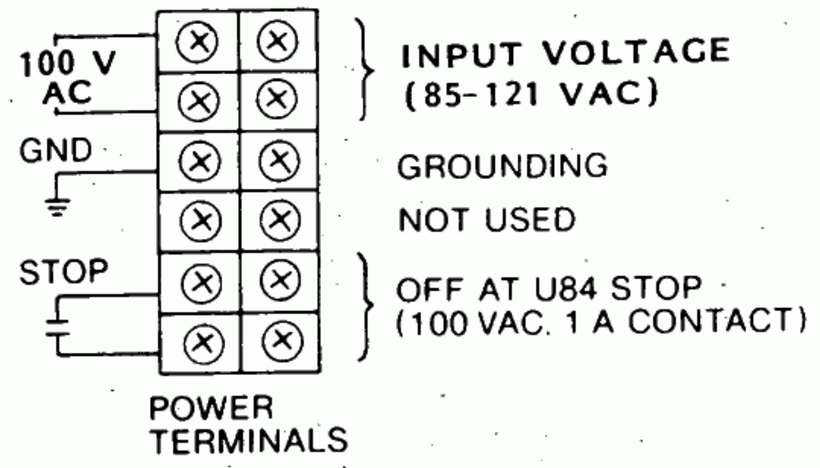
Fig. 3.3 Auxiliary Power Supply Module 1

Table 3.5 Auxiliary Power Supply MIdule 1 Specifications

Items	Specifications
Type	JRMSP-P8054
Function	DC power supply for local I/O receiver, I/O buffer module and I/O modules.
Input Voltage	Single-phase 85-121 VAC, 47.5-63Hz, 90 VA
Transient Input Voltage	0-140 VAC (10ms)
Inrush Current	30A (peak) or less
Leakage Current	0.2 mA or less
Fuse	Glass tube fuse (5A)
Indicatiog Lamp	POWER: Lights when power supply is proper.
Monitoring Contact	STOP: ON at U84 running, OFF at U84 stop (100 VAC, 1A contac)
Mounting Location	On mounting bases B1033 and B1028
Dimensions in mm	45(W)×250(H)×160(D)
Approx Weight	1.1 kg

(3) Auxiliary Power Supply Module 2





Note: Each designated pair of terminals are in common.

Fig. 3.4 Auxiliary Power Supply Module 2

Table 3.6 Auxiliary Power Supply Module 2 Specifications

Items	Specifications
Type	JRMSP-P8051
Function	DC power supply for remote I/O receiver and I/O modules.
Input Voltage	Single-phase 85-121 VAC, 47.5-63Hz, 170 VA
Transient Input Voltage	0-140 VAC (10ms)
Inrush Current	50A (peak) or less
Leakage Current	0.2 mA or less
Fuse	Glass tube fuse (5A)
Indicating Lamp	POWER: Lights when power supply is proper.
Monitoring Contact	STOP: ON at U84 running, OFF at U84 stop (100 VAC, 1A contact)
Mounting Location	On mounting base B1034
Dimensions in mm	80(W)×250(H)×160(D)
Approx Weight	2.8 kg

3.5 COMMUNICATION MODULE (COMM)

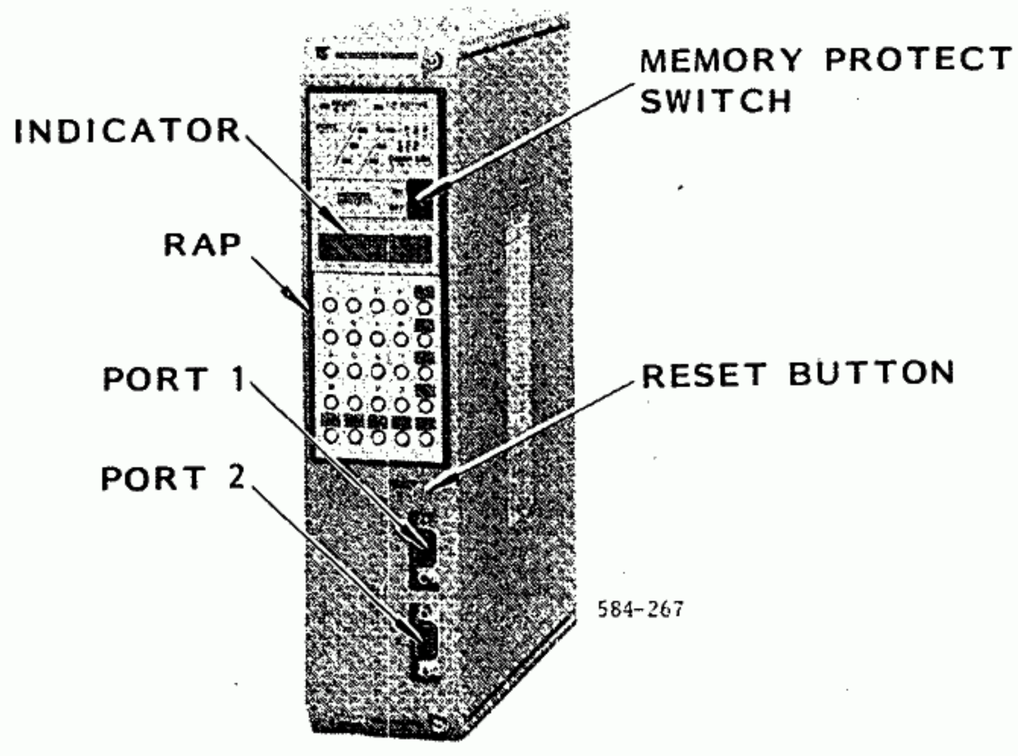


Fig. 3.5 Communications Module

Table 3.7 Communication Module Specifications

Items		Specifications
Type		JAMSC-C8110
Function		• For P190 CRT programming panel and MEMOBUS • (2ports per module) • Discrete I/O status indication, disable operation, register • contents indication, set, and alternation • (with register access panel)
Communication Port	No. of Ports	2ports per module
	Communication Specification	EIA RS-232C
	Baud Rate	19200/9600/4800/2400/1200/600/300/150
	Data Bits	7 or 8 bits
	Parity	Even, odd or non
	Stop Bits	1 or 2 bits
	Protocol	MEMOBUS protocol
	Transmission Check	CRC-16 or LRC (checksum)
	Connector	D-SUB 9 pin
Mounting Location		On mounting base B1031 or B1030
Dimensions in mm		69.5(W) ×300(H)×232(D)
Approx Weight		1.4 kg

3.6 REMOTE I/O DRIVER MODULE (RI/OD)

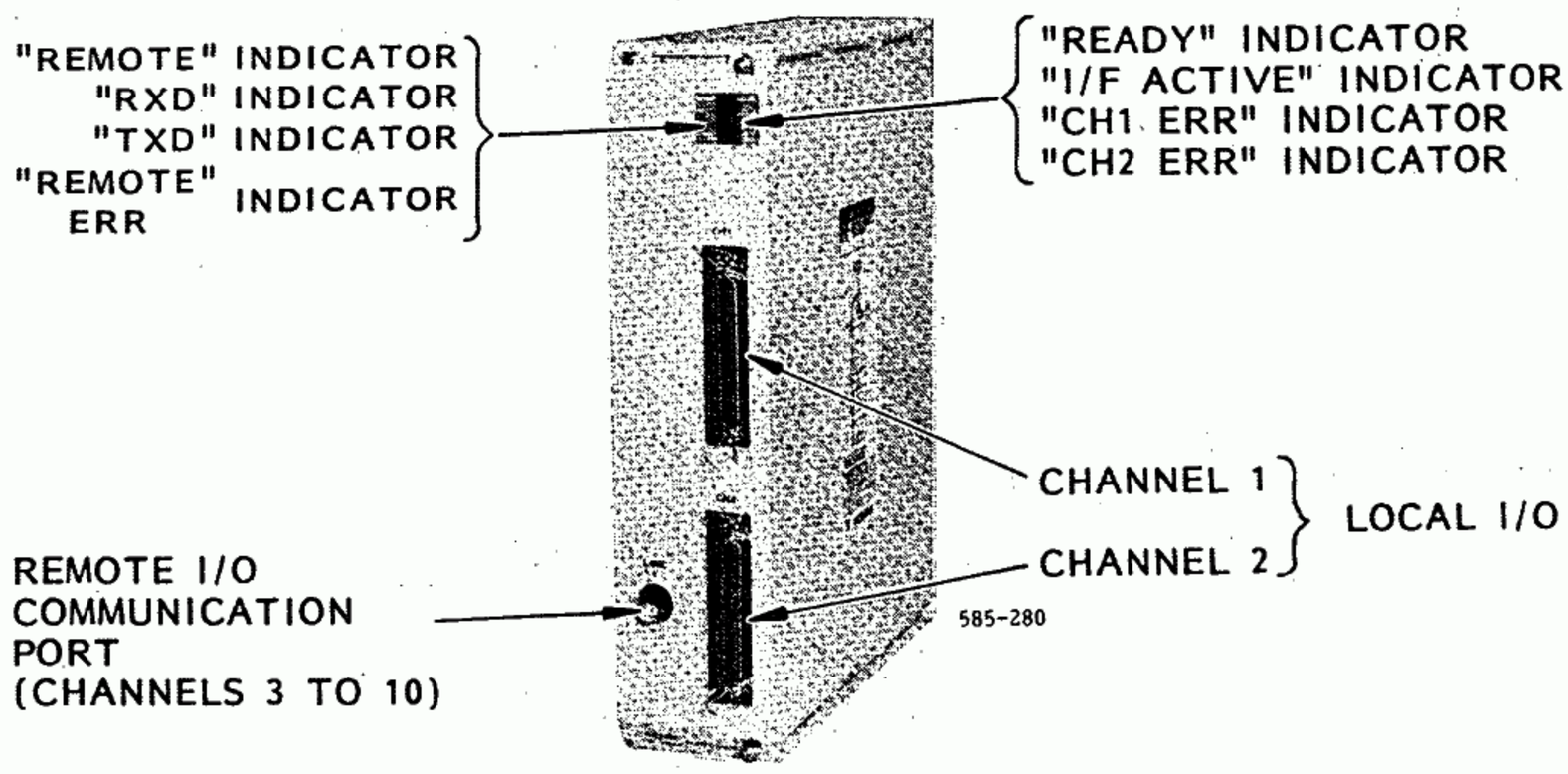


Fig. 3.6 Remote I/O Driver Module

Table 3.8 Remote I/O Driver Module Specifications

Items	Specifications
Type	JAMSC-C8130
Function	For driving both of local I/O and remote I/O • Local I/O: Communicates with up to 2 local I/O receiver modules, by references from CPU module. • Remote I/O: Communicates with up to 8 remote I/O receiver modules, by references from CPU module.
Indicating Lamp	• REMOTE: Lights when remote I/O channel is ready to use. • READY: Lights when remote I/O driver module is proper. • I/F ACTIVE: Lights when transmission from CPU module is proper. • RXD: Lights when data from remote I/O receiver module is received. • TXD: Lights when data is sent to remote I/O receiver module. • REMOTE ERR: Lights when communication with remote I/O receiver module is not proper. • CH1 ERR: Lights when communication with channel 1 local I/O receiver module is not proper. • CH2 ERR: Lights when communication with channel 2 local I/O receiver module is not proper.
Mounting Location	On mounting base B1031 or B1030.
Dimensions in mm	69.5(W)×300(H)×232(D)
Approx Weight	2.2 kg

3.7 LOCAL I/O RECEIVER MODULE (LI/OR)

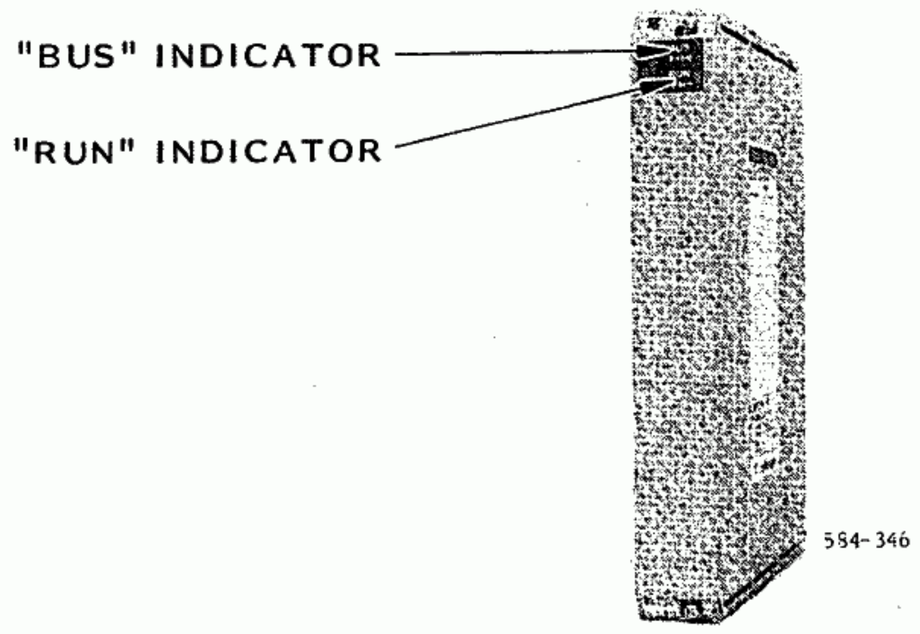


Fig. 3.7 Local I/O Receiver Module

Table 3.9 Local I/O Receiver Module Specifications

Items	Specifications
Type	JAMSC-S8125
Function	• Interface between local or remote I/O driver and I/O modules • 42 I/O modules max
Indicating Lamp	• BUS: Lights when transmission from local I/O driver module is proper. • RUN: Lights when communication with I/O module is proper.
Mounting Location	On mounting base B1033
Dimensions in mm	34.5(W)×250(H)×160(D)
Approx Weight	0.7 kg

3.8 REMOTE I/O RECEIVER MODULE (RI/OR)

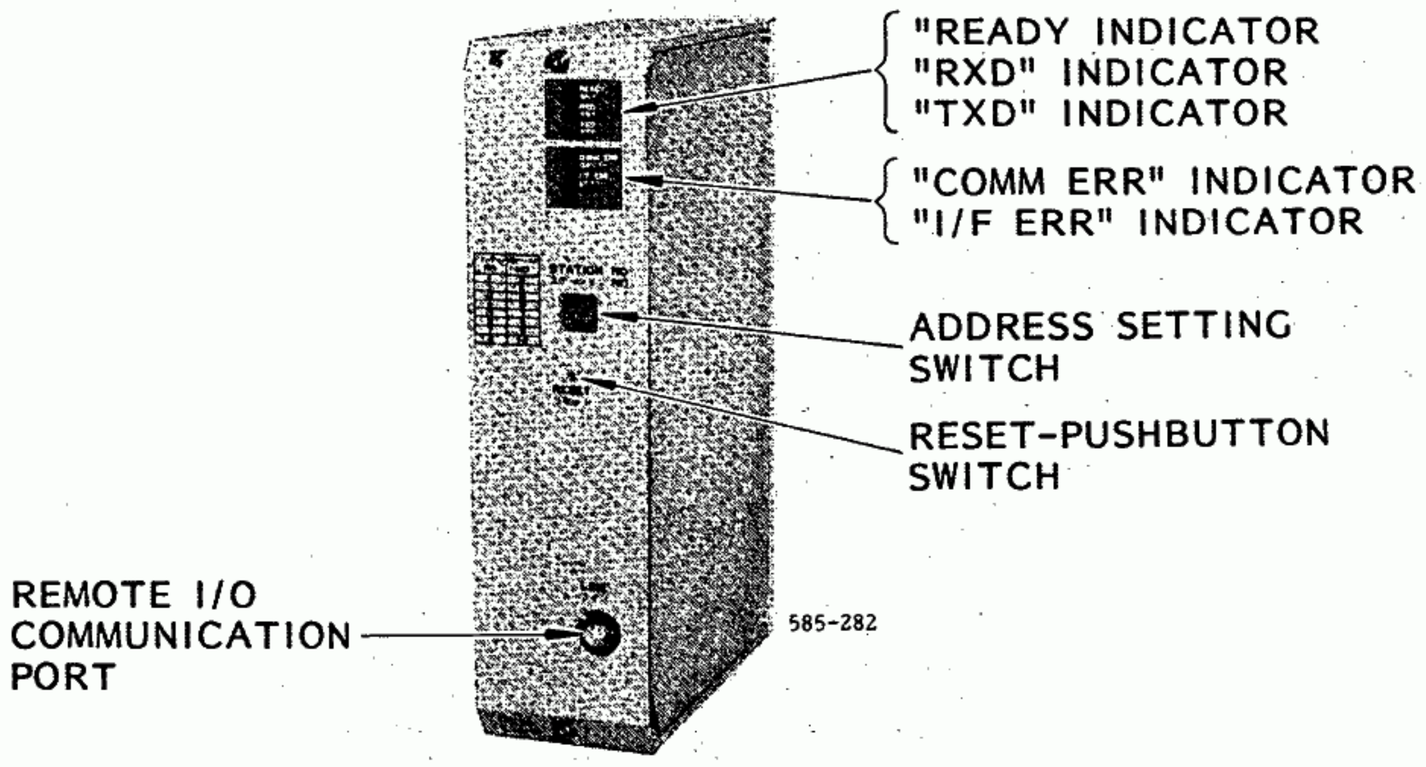


Fig. 3.8 Remote I/O Receiver Module

Table 3.10 Remote I/O Receiver Module Specifications

Items	Specifications
Type	JAMSC-C8135
Function	• Interface between remote I/O driver and I/O modules • 41 I/O modules max
Indicating Lamp	• READY: Lights when remote I/O receiver is proper. • RXD: Lights when data from remote I/O driver module is received. • TXD: Lights when data is sent to remote I/O driver module. • COMM ERR: Lights when communication with remote I/O driver module is not proper. • I/F ERR : Lights when communication with I/O modules is not proper.
Address Setting Switch	Used to set station No. of remote I/O receiver module: Station No. Setting / I/O Channel No. 1 / 3 2 / 4 3 / 5 4 / 6 5 / 7 6 / 8 7 / 9 8 / 10 Ineffective setting: 0,9,A,B,C,D,E,F
Reset-pushbutton Switch	Hardware reset switch of remote I/O receiver module.
Mounting Location	On mounting base B1034
Dimensions in mm	65(W)×250(H)×160(D)
Approx Weight	0.8kg

3.9 I/O BUFFER MODULE

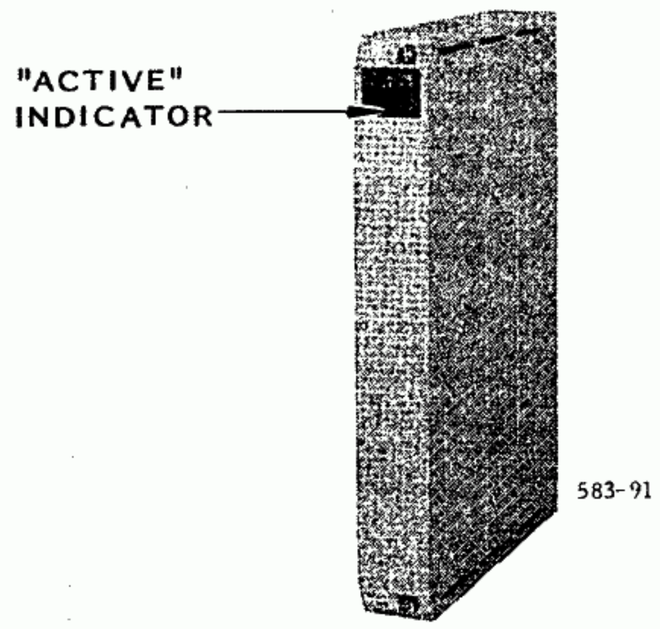
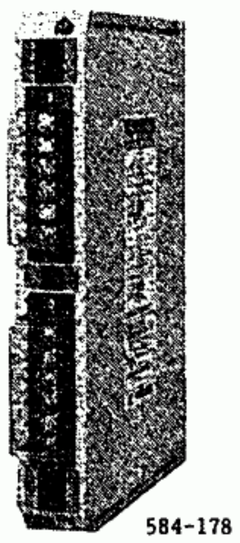


Fig. 3.9 I/O Buffer Module

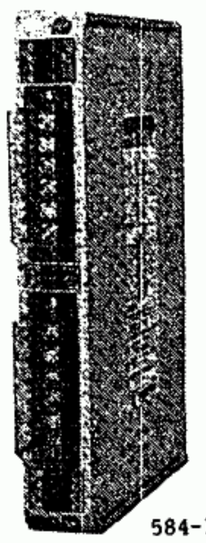
Table 3.11 I/O Buffer Module Specifications

Items	Specifications
Type	JAMSC-B1011
Function	• I/O bus buffer • When rack 3 and/or rack 4 is required due to numbers of I/O • modules.
Indicating Lamp	ACTIVE: Lights (or blinks) when I/O signal transmission is proper.
Mounting Location	On mounting base B1028
Dimensions in mm	34.5(W)×250(H)×160(D)
Approx Weight	0.7 kg

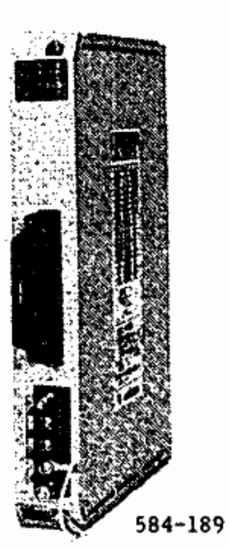
3.10 I/O MODULES



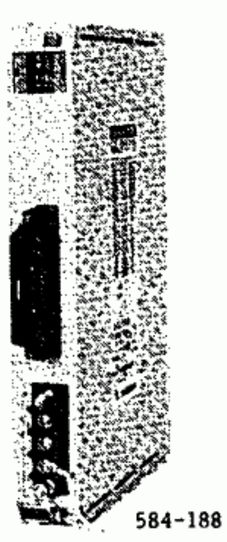
Input Module



Output Module



Register Input Module



Register Output Module

Fig. 3.10 I/O Modules

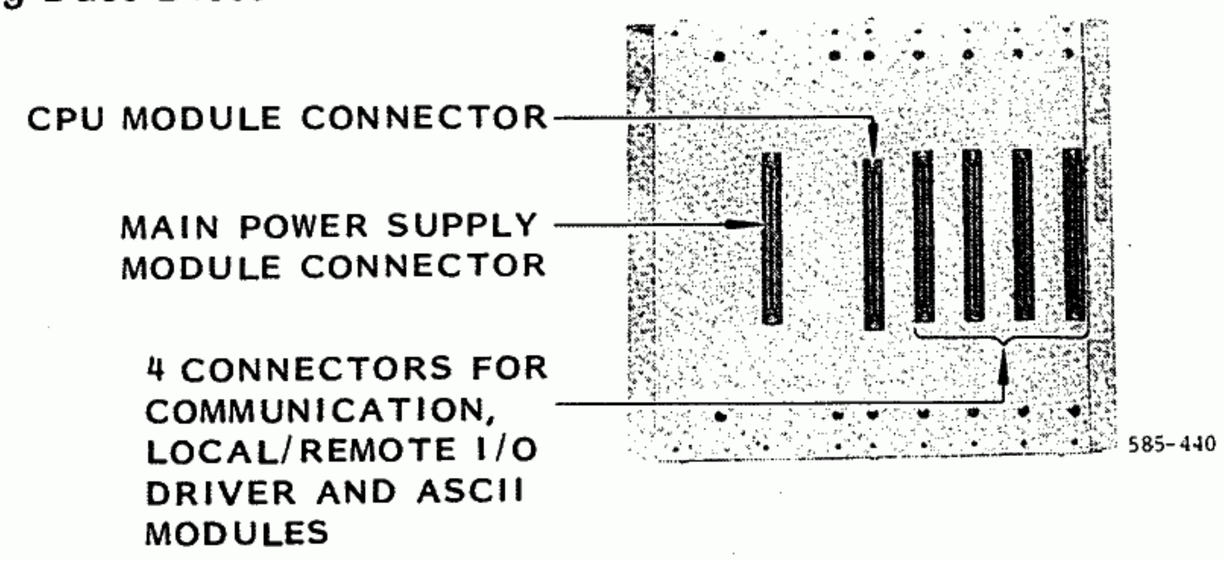
Table 3.12 I/O Module Specifications

Modules			Type JAMSC-	Voltage	Current	Input impedance	External Power Supply	Maximum Response Time	No. of I/O's	Module Span
Input	AC	100 V	B1051B	80 to 130 V	13 mA	7.5 kΩ	–	OFF→ON 10 ms ON→OFF 20 ms	16	1
		200 V	B1055	160 to 260 V	6.5 mA	30 kΩ	–		16	1
	DC	5-12V	B1053	4.75 to 13.2 V	5 V: 4.5 mA 12 V: 11.5 mA	1 kΩ	–		16	1
		48 V	B1057	38 to 58 V	10 mA (48 V)	4.8 kΩ	–		16	1
		24 V	B1059C	19 to 29 V	11 mA (24 V)	2.4 kΩ	–		16	1
		24 V	B1061	20.4 to 26.4 V	5 mA (24 V)	4.8 kΩ	–		64	1
		24 V	B1063	20.4 to 26.4 V	10 mA (24 V)	2.4 kΩ	–		32	1
		24 V	B1065	19 to 29 V	6 mA (24 V)	4 kΩ	–		32	1
	Register		B1071	–	–	12 kΩ	External power: +24 V at 200 mA.	64 ms	8	1
	Analog		B1073–1	0 to +10 V	–	2 MΩ	• Resolution: 1/1024 (10 bits) • External power: +15 V 120 mA. −15 V 40 mA.	–	4	1
			B1073–2	+1 to +5 V	–	2 MΩ		–	4	1
			B1075–1	0 to +10 V	–	2 MΩ	• Resolution: 1/4096 (12 bits) • External power: +15 V 120 mA. −15 V 40 mA.	–	4	1
			B1075–2	+1 to +5 V	–	2 MΩ		–	4	1
Output	AC	100 V	B1050	80 to 130 V	2 A per output 5 A per 8 outputs	–	Min load current: 10 mA (rms).	10 ms	16	1
		200 V	B1054	160 to 260 V	1 A per output 5 A per 8 outputs	–	Min load current: 10 mA (rms).	10 ms	16	1
	DC	5-12V	B1052	4.75 to 13.2V	5 V: 0.1A per output 12V: 0.3A per output	–	OFF current: less than 1 mA.	1 ms	16	1
		48 V	B1056	38 to 58 V	2 A per output 5 A per output	–	OFF current: less than 1 mA.	1 ms	16	1
		24 V	B1058	19 to 29 V	2A per output 5 A per 8 outputs	–	OFF current: less than 1 mA.	1 ms	16	1
		24 V	B1060	20.4 to 26.4 V	0.1 A per output 0.4 A per 8 outputs	–	OFF current: less than 1 mA.	.1 ms	64	1
		24 V	B1062	20.4 to 26.4 V	0.3 A per output 0.6 A per 4 outputs	–	OFF current: less than 1 mA.	1 ms	32	1
		24 V	B1064	19 to 29 V	0.3 A	–	OFF current: less than 0.2 mA. (without fuse)	1 ms	32	1
	AC/DC*		B1090B	• 220 VAC, 0.8 A (PF: 0.4) • 110 VAC, 1.2 A (PF: 0.4) • 24 VDC, 1 A (TM†: 40 ms)		–	Miniature relay, coil voltage: 24 VDC	OFF→ON 7 ms max ON→OFF 3 ms max	16	1
			B1094	• 220 VAC, 1A (PF: 0.4) • 110 VDC, 0.5A (TM†: 100 ms)		–	Power reed relay coil voltage: 24 VDC		8	1
	Register		B1070	–	50 mA	–	External power: +24 V at 200 mA	64 ms	8	1
	Analog		B1072B–1	0 to +10 V	10 mA	–	• Resolution: 1/1024 (10 bits) • External power: +15 V 100 mA, −15 V 40 mA.	–	2	1
			B1072B–2	0 to +5 V	10 mA	–		–	2	1
			B1072B–3	−5 to +5 V	10 mA	–		–	2	1
			B1072B–4	−10 to +10V	10 mA	–		–	2	1
			B1074–1	0 to +10 V	10 mA	–	• Resolution: 1/4096(12 bits) • External power: +15 V 100mA, −15 V 40 ms .	–	2	1
			B1074–2	0 to +5 V	10 mA	–		–	2	1
			B1074–3	−5 to +5 V	10 mA	–		–	2	1
			B1074–4	−10 to +10 V	10 mA	–		–	2	1
Motion Control	Reversible Counter		B1081C	–	–	–	Max count speed: 40 Kpps. External power: +12 V at 100 mA.	–	1	1
	Preset Counter		B1082C	–	–	–		–	1	1
	Positioning		B1083C	–					1	2
PID			B1080	–					1	1
Power Supply			B1089	–			Power supply for PID module.	–	1	1

*Requires power supply for exciting the coil of relay built-in.
†Time constant

3.11 MOUNTING BASE

(1) Mounting Base B1030



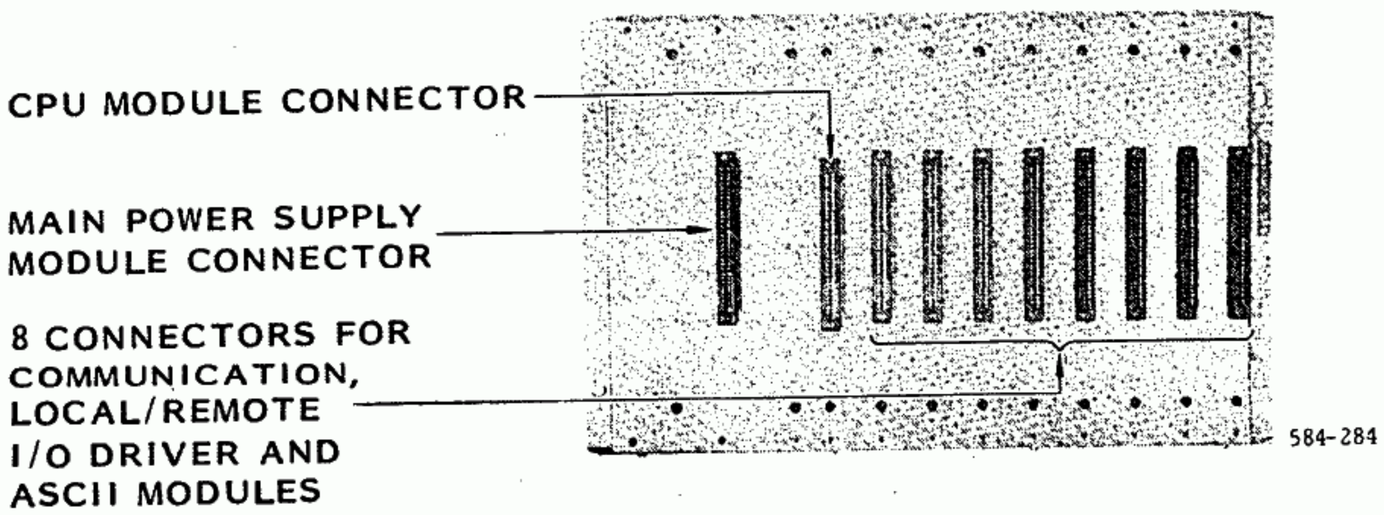
Note: Four connectors are available for communication, local/remote I/O driver or ASCII Modules, any one of which can be used. One ASCII module can be mounted only when local I/O driver is mounted.

Fig. 3.11 Mounting Base B1030

Table 3.13 Mounting Base B1030 Specifications

Items	Specifications
Type	JRMSI-B1030
Application	For mounting main power supply module, CPU module, communication module, local or remote I/O driver module and one ASCII module. Where remote I/O driver module is mounted, ASCII module is not used.
Dimensions in mm	340(W)×300(H)×28(D)
Approx Weight	2.0 kg

(2) Mounting Base B1031



Note: Eight connectors are available for communication, local or remote I/O driver modules, any one of which can be used. Up to 4 ASCII modules are available using any connectors.

Fig. 3.12 Mounting Base B1031

Table 3.14 Mounting Base B1031 Specifications

Items	Specifications
Type	JRMSI-B1031
Application	For mounting main power supply module, CPU module, communication module, local or remote I/O driver module and up to 4 ASCII modules.
Dimensions in mm	480(W)×300(H)×28(D)
Approx Weight	2.8 kg

(3) Mounting Base B1033

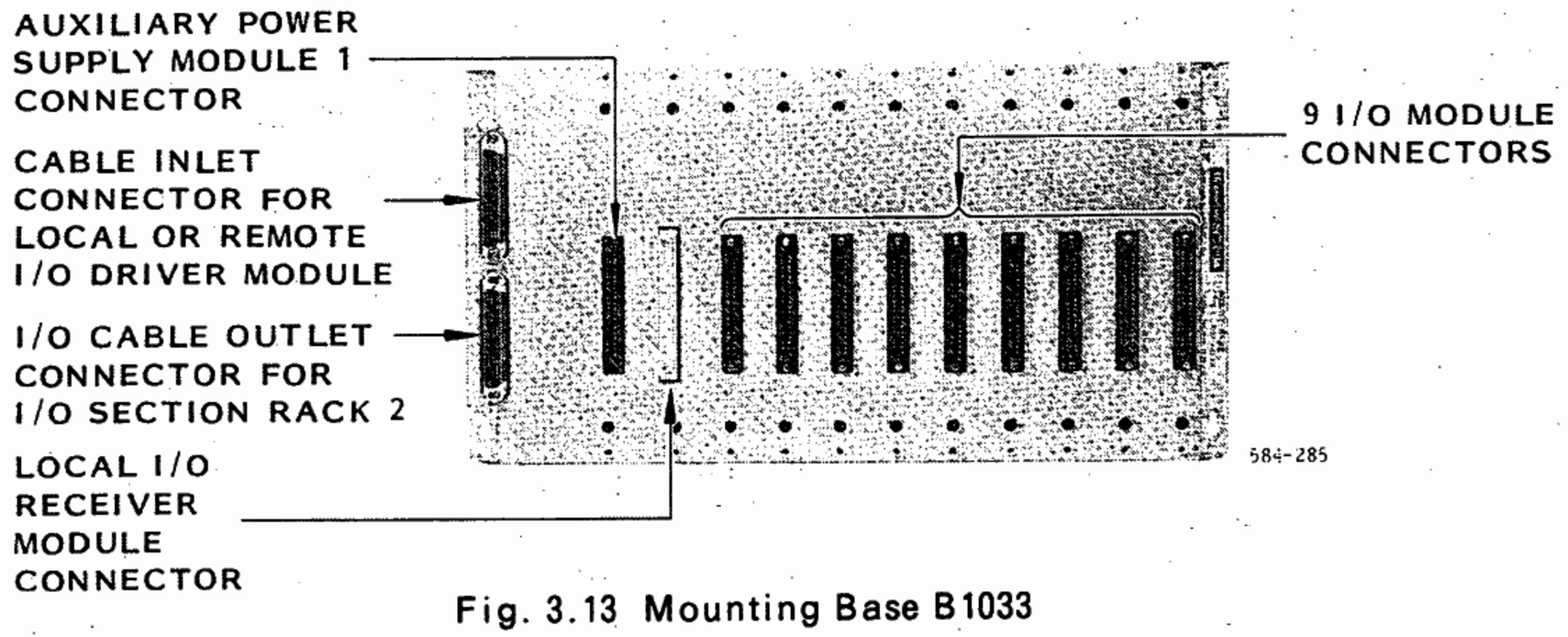


Fig. 3.13 Mounting Base B1033

Table 3.15 Mounting Base B1033 Specifications

Items	Specifications
Type	JRMSI-B1033
Application	For mounting auxiliary power supply module, local I/O receiver module and up to 9 I/O modules as I/O section rack 1.
Dimensions in mm	480(W))×250(H)×28(D)
Approx Weight	2.5 kg

(4) Mounting Base B1034

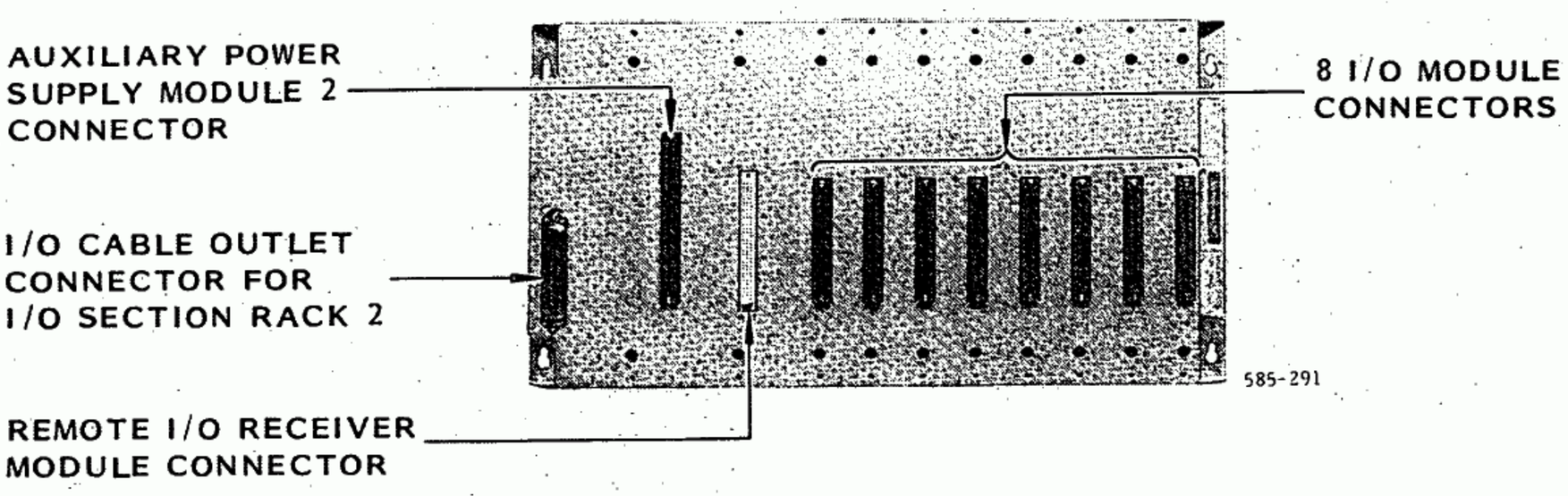


Fig. 3.14 Mounting Base B1034

Table 3.16 Mounting Base B1034 Specifications

Items	Specifications
Type	JRMSI-B1034
Application	For mounting auxiliary power supply module 2, remote I/O receiver module and up to 8 I/O modules as I/O section rack 1 .
Dimensions in mm	480(W)×250(H)×28(D)
Approx Weight	2.5 kg

(5) Mounting Base B1027

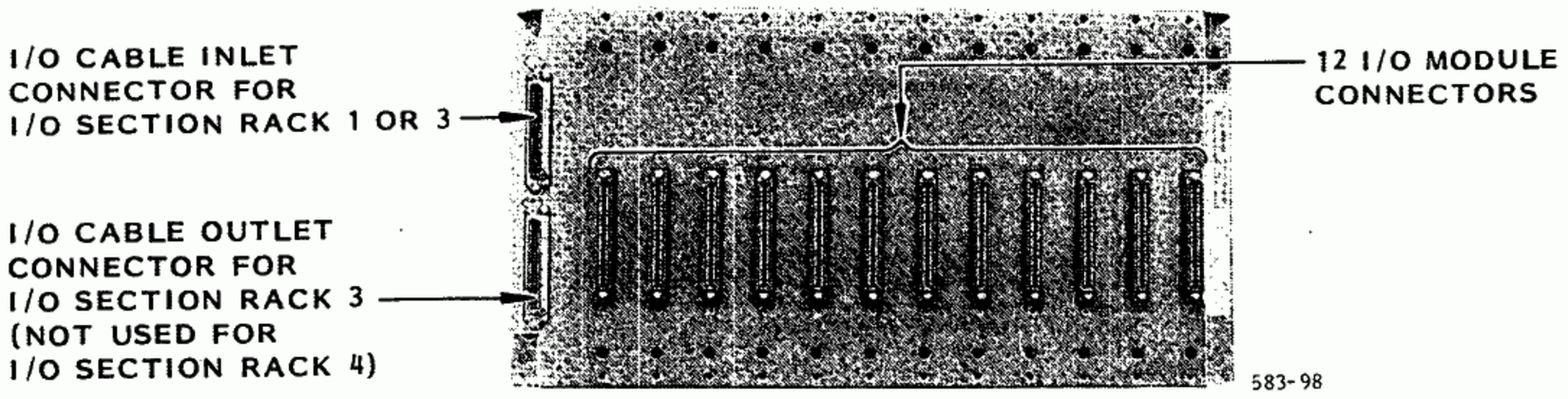


Fig. 3.15 Mounting Base B1027

Table 3.17 Mounting Base B1027 Specifications

Items	Specifications
Type	JRMSI-B1027
Application	For mounting up to 12 I/O modules as I/O section racks 2 and 4
Dimensions in mm	480(W)×250(H)×28(D)
Approx Weight	2.5 kg

(6) Mounting Base B1028

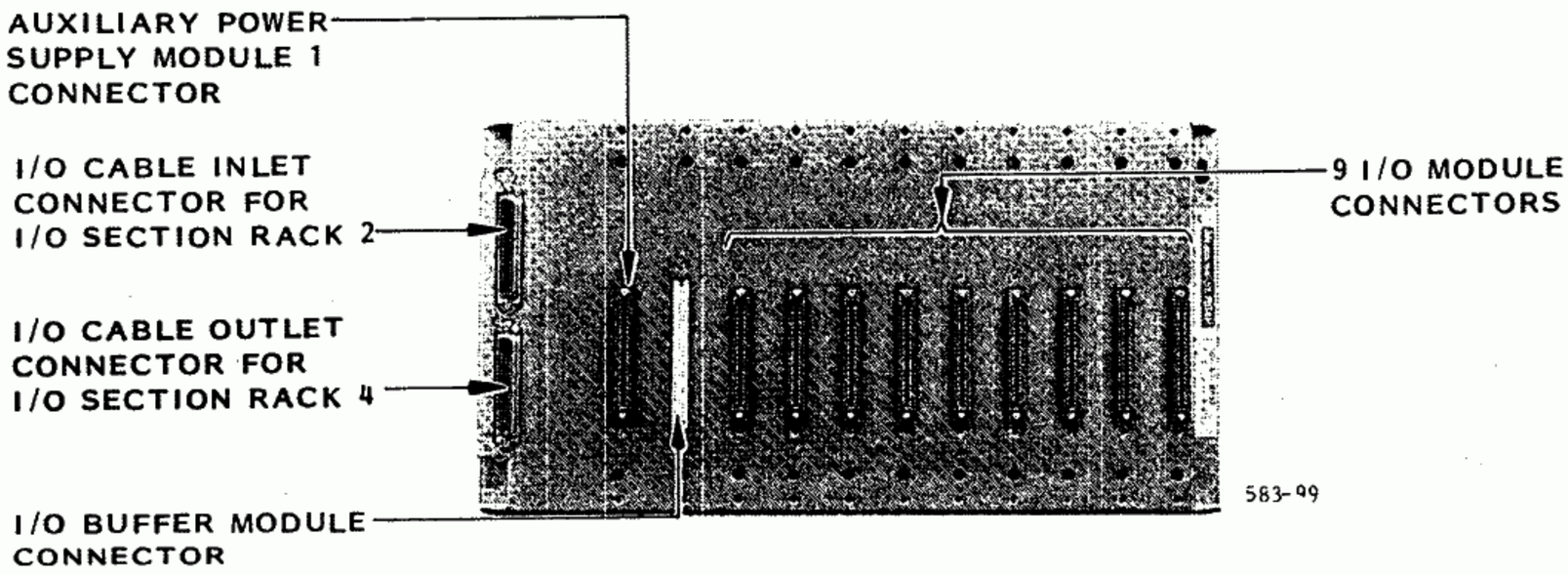


Fig. 3.16 Mounting Base B1028

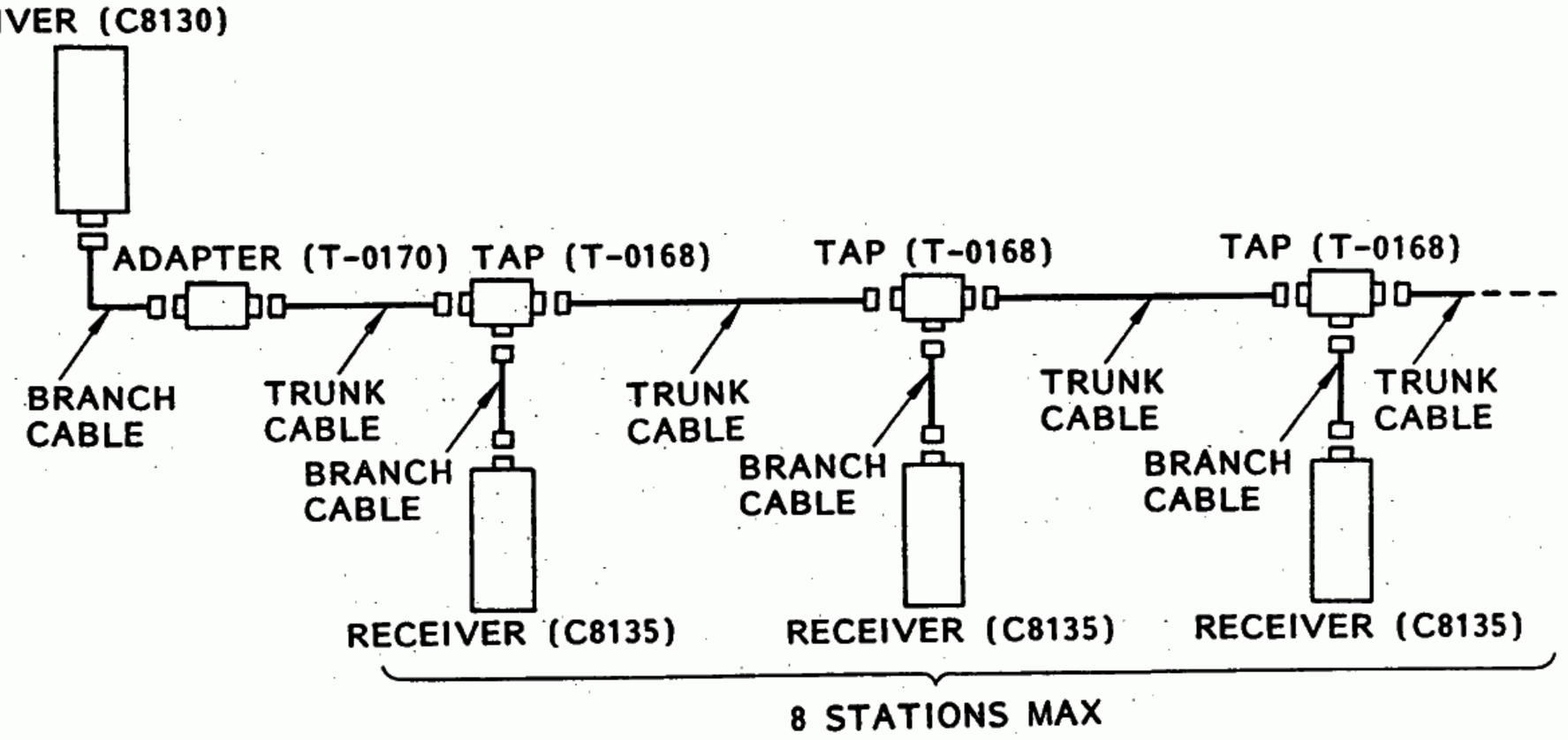
Table 3.18 Mounting Base B1028 Specifications

Items	Specifications
Type	JRMSI-B1028
Application	For mounting auxiliary power supply module 1, I/O buffer module and up to 9 I/O modules as I/O section rack 3 .
Dimensions in mm	480(W) ×250(H)×28(D)
Approx Weight	2.5 kg

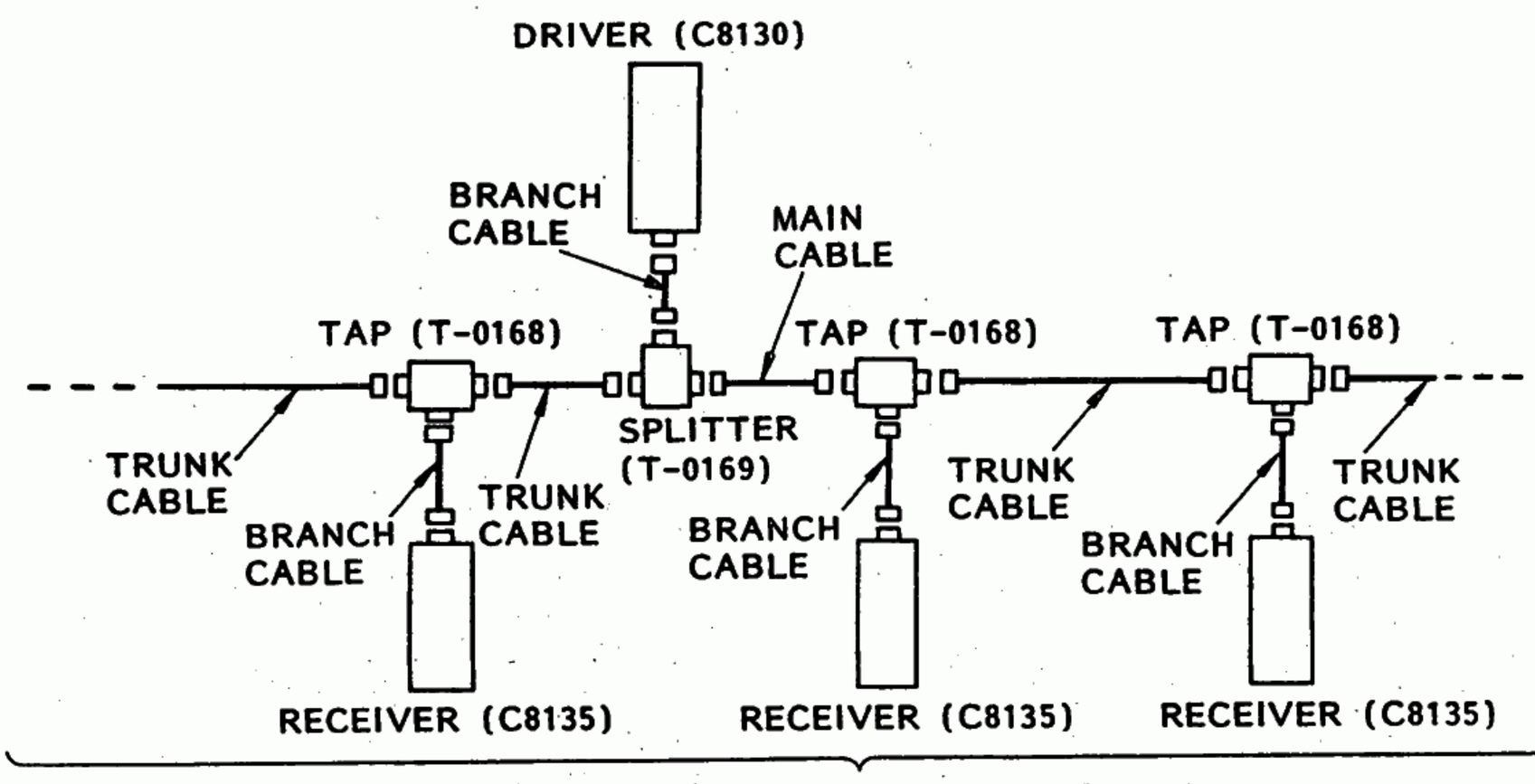
4. REMOTE I/O SYSTEM CONFIGURATION

The U84 remote (electric) I/O system comprizes the remote I/O driver, remote I/O receiver, coaxial cables, and branch devices such as taps, splitters, and junction adapters. One Remote I/O driver (master station) can accomodate a maximum of eight remote I/O receivers (slave stations).

As Fig 4.1 shows, there are two configurations for U84 remote I/O system.



(a) Configuration Using No Splitter



(b) Configuration Using Splitter

Fig. 4.1 Remote I/O System Configuration

4.1 COMPONENTS IN TRANSMISSION LINE

The remote I/O transmission line (between remote I/O driver and remote I/O receiver) comprizes coaxial cables, branch devices, and connectors.

4.1.1 Coaxial Cable

Coaxial cables are used for the transmission trunk line, and branch lines from the trunk line to the remote I/O driver ane remote I/O receivers.

(1) Trunk Line Cable

Use coaxial cable (size 5C or larger) for the trunk line, as shown in Table 4.1. The greater the cable size, the smaller the attenuation and thus the longer the cable length that can be used (see par. 3.2).

Table 4.1 Trunk Line Coaxial Cable

Type	Attenuation (1 MHz)	Characteristic Impedance	Outer Conductor	Manufacturer
5C-FB	10 dB/km	75Ω	Steel braid	Fujikura Ltd.
5C-SVF				Sumitomo Electric Industries, Ltd.
5C-FB				The Furukawa Electric Co., Ltd.
7C-FB	8 dB/km	75Ω	Steel braid	Fujikura Ltd.
7C-SVF				Sumitomo Electric Industries, Ltd.
11C-4AF	3 dB/km	75Ω	Aluminum sheet	Fujikura Ltd.
12C-SA				Sumitomo Electric Industries, Ltd.

Note:
1. Obtain trunk coaxial cables directly from the manufacturer. Cables manufactured by other companies may be used if they have equivalent specifications.
2. Yaskawa provides the short cables shown in Table 4.2.

Table 4.2 Short Trunk Cable

Type JZMSZ-	Cable Length	Connector	Remarks
W453-001	2 m	Type F connectors at both ends	Connects branch devices with each other
W453-002	5 m		
W453-003	10 m		
W1004	10 m	Type BNC connector at both ends	Directly connects remote I/O receiver and remote I/O driver

Note: These cables are all 5C-FB type.

(2) Branch Line Cable

For branch line, use coaxial cable, size 5C, 10 m or less in length. Generally, use cables as shown in Table 4.3.

Table 4.3 Branch Line Cable

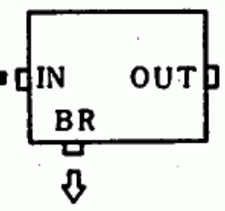
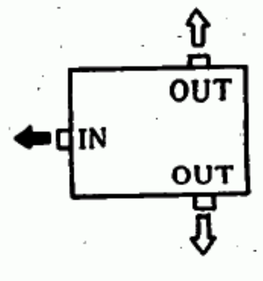
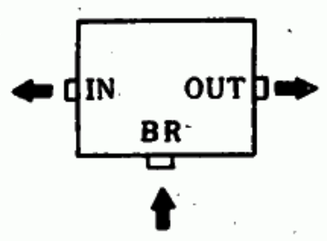
Type JZMSZ-	Cable Length	Remarks
W1003 - 1	2.5 m	BNC connector for remote I/O driver and remote I/O receiver; Type F connector for trunk line cables.
W1003 - 2	5 m	
W1003 - 3	10 m	

Note: These cables are all 5C-FB type.

4.1.2 Branch Devices

Connect the trunk line and branch line cables with branch devices as shown in Table 4.4.

Table 4.4 Branch Devices

Name	Type	Function and Use
Tap (Branch Device)	T-0168	Used to branch (one direction) from the trunk line cable. ·Trunk line from the preceding tap. ·Trunk line from splitter. ·Branch line from driver.  ·Trunk line to the next line. ·Branch line to receiver Terminator (75Ω). Branch line to receiver. [Attenuation] · IN↔OUT: −1 dB · IN↔BR: −10 dB · OUT↔BR: −10 dB
Splitter (Distributer)	T-0169	Used to branch the trunk line cable in two directions. Trunk line to tap. Branch line from driver.  Trunk line to tap. [Attenuation] · IN↔OUT: −3 dB · OUT↔OUT: −30 dB
Junction Adapter (Branch Device)	T-0170	Used to connect both branch line and the trunk line cables, through type F connectors. ·Branch line from driver. ·Trunk line from the preceding tap.  ·Trunk line to the next tap. ·Branch line to driver. Not used. [Attenuation] · IN↔OUT: 0 dB

Note:
1. Install the above devices together with the attached insulating plate. In principle, install them inside the control cabinet.
2. Splitter can be used only at remote I/O driver.
3. One terminator (resistance) is attached to each tap and each splitter.
4. T-0170 BR terminal is provided with a metal cap. Generally, the BR terminal is not used. Therefore, do not tamper with nor remove the metal cap.
5. Connector for tap, splitter or junction adapter should be used type F.

4.1.3 Connectors

Connectors differ depending on the manufacturer and size of the coaxial cables to be used. Manufacturers provide connectors adaptable to their own coaxial cables. So procure the appropriate connectors. To install a connector to a coaxial cable, use the tools and procedure specified by the manufacturer. To connect a remote I/O driver module to a remote I/O receiver, use a BNC connector; to connect the module to a tap or splitter, use type F connector. Table 4.5 shows connectors.

Table 4.5 Connector Listing

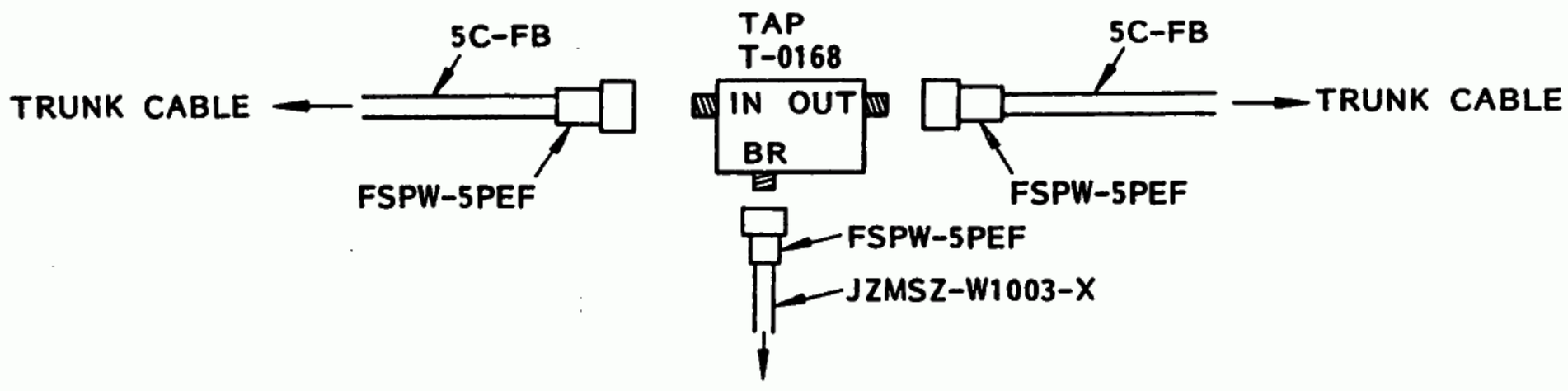
Name	Type	Function and Use		Manufacturer
Type F Connector	FSPW-5PEF	For 5C-FB For 5C-SVF For 5C-FB	For trunk line side of branch cable and for trunk line cable.	Fujikura Ltd.
	5C-SVF • F-P			Sumitomo Electric Industries, Ltd.
	F3-NFS			The Furukawa Electric Co., Ltd.
Type F Connector	FSPW-7PEF	For 7C-FB For 7C-SVF	For trunk line cable	Fujikura Ltd.
	7C-SVF • F-P			Sumitomo Electric Industries, Ltd.
Fitting Connector	FI-11C4AF	For 11C-4AF For 12C-SA	For trunk line cable	Fujikura Ltd.
	12C-SA • FT			Sumitomo Electric Industries, Ltd.
Conversion Connector	FTR-FJ	Connects fitting connectors and type F connector.		Fujikura Ltd.
Junction Connector	F-A	Connects type F connectors each other		Fujikura Ltd.
	FI-A	Connects fitting connectors each other		Fujikura Ltd.
BNC Connector	BNC-P-5-NI	For 5C-FB	For near the driver and receiver of branch line cable.	Dai-Ichi Electronic Ind.

Note:
1. Connector attenuation 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 ground.
3. When connecting type F connectors to each other inside the contol box, use a junction adapter (T-0170) instead of junction connector (F-A).

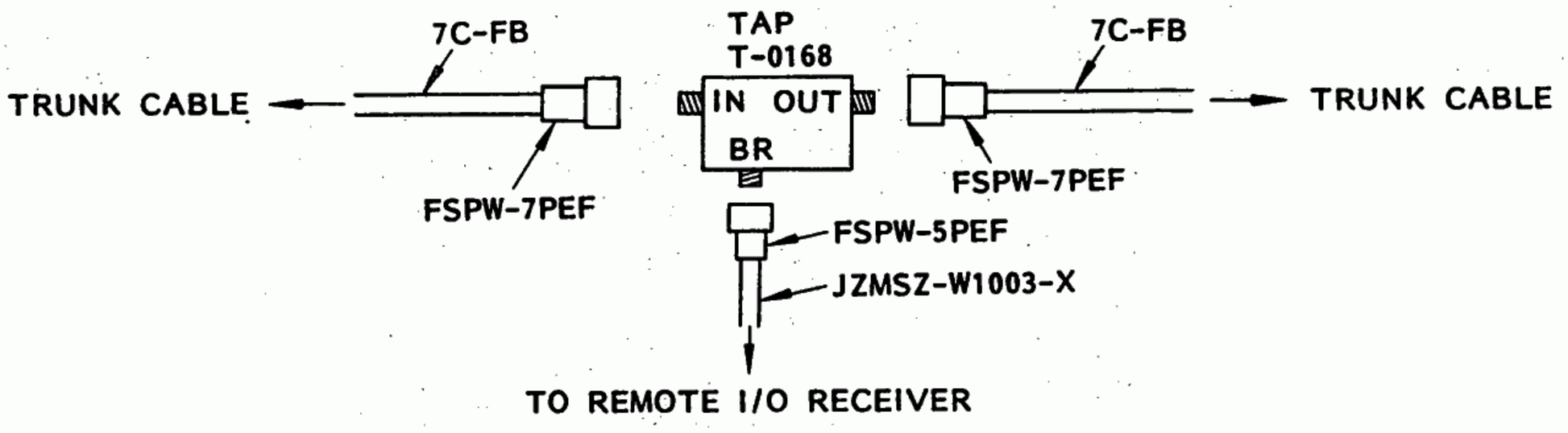
4.1.4 Connection between Devices

(1) Connection between Coaxial Cables and Taps

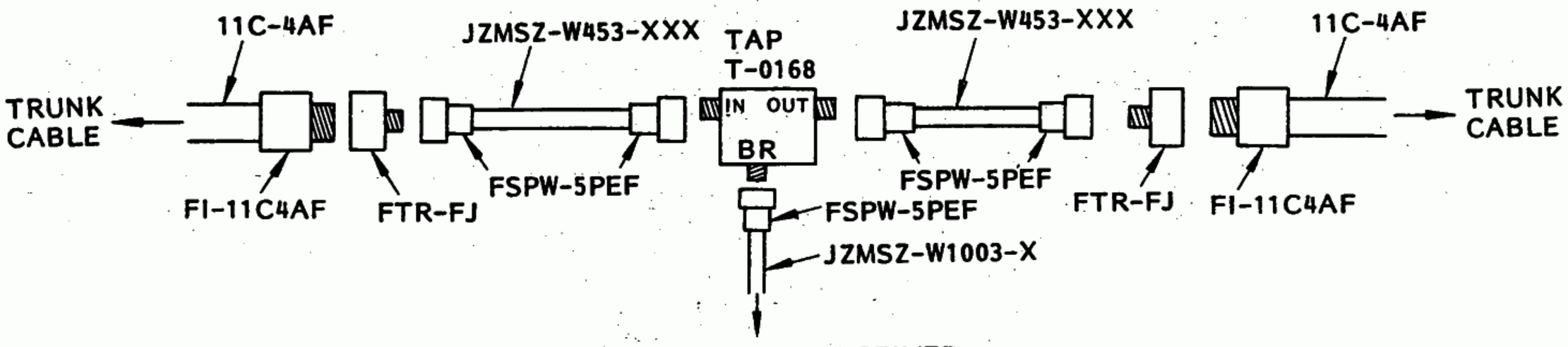
Fig. 4.2 (a) to (c) show typical connections between coaxial cables and taps. Splitters are connected in the same way.



(a) Where Using 5C-FB of Trunk Cable



(b) Where Using 7C-FB of Trunk Cable



(c) Where Using 11C-4AF of Trunk Cable

Fig. 4.2 Example of Connections between Coaxial Cable and Tap

(2) Connection between Coaxial Cables

Fig. 4.3 shows the connection between coaxial cables.

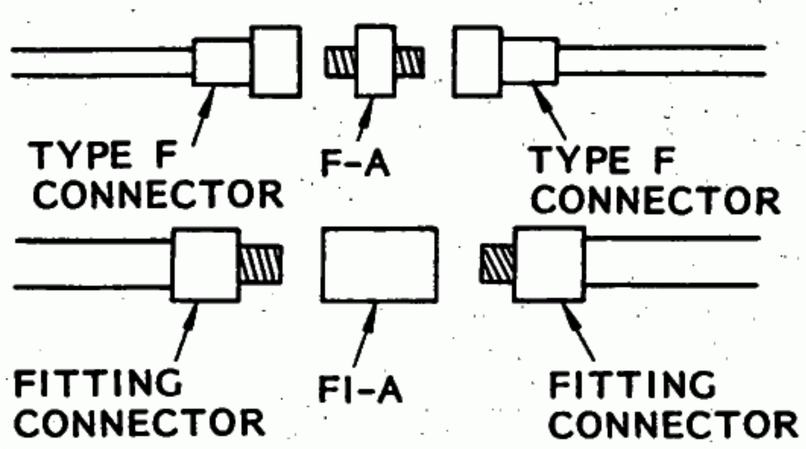


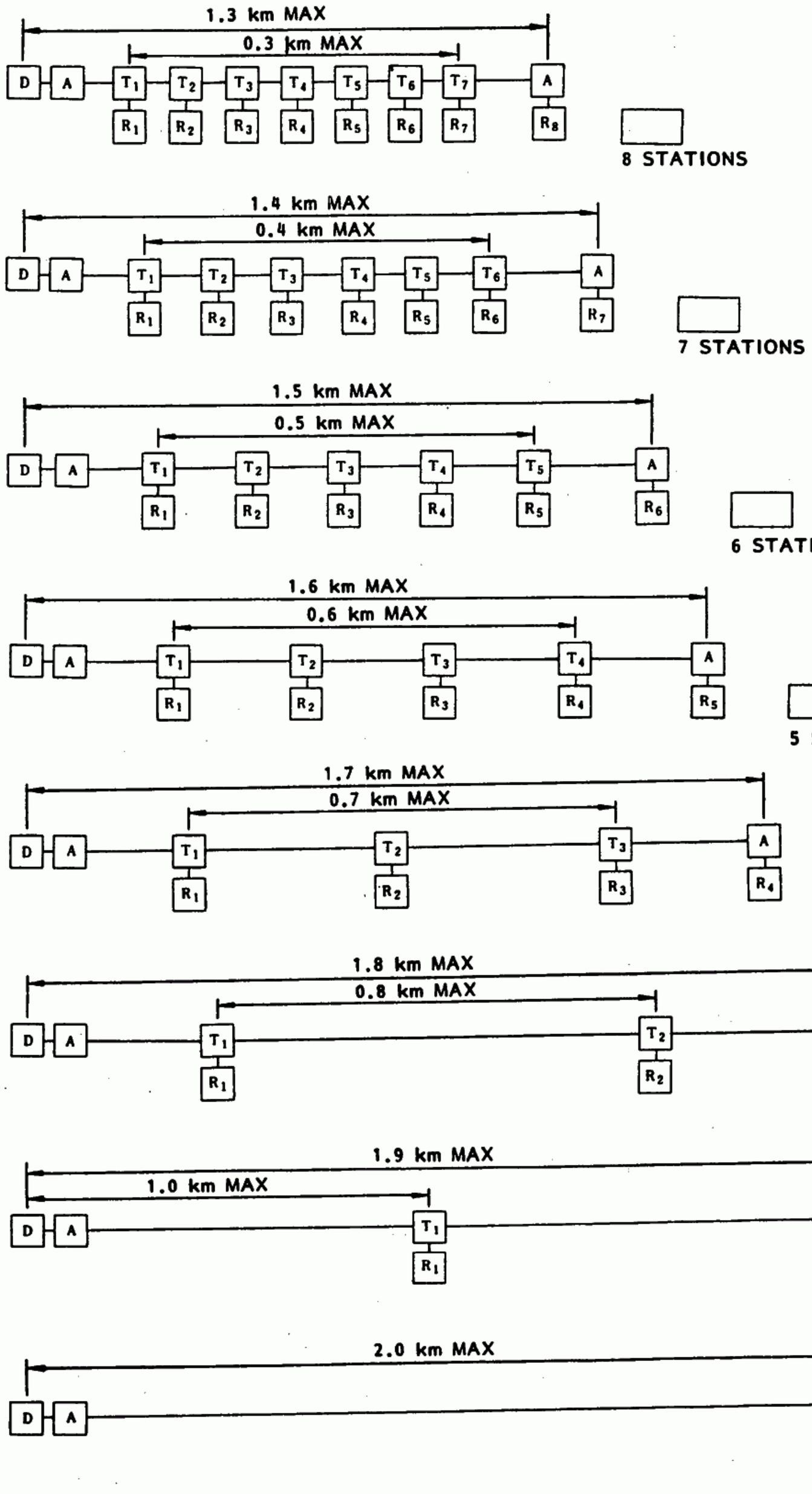
Fig. 4.3 Connections between Coaxial Cables

Note: When connecting type F connectors to each other in the control panel, use a junction adapter (T-0170), not a junction connector (F-A).

4.2 LENGTH OF TRANSMISSION LINE

The length of remote I/O transmission line (the length of coaxial cable) depends on the number of remote I/O receivers (slave stations) and the type of coaxial cable to be used. It also depends on whether or not a splitter is used.

Figs. 4.4 and 4.5 show the maximum length of the transmission line when 5C-FB coaxial cable is used. To determine the remote I/O configuration, make sure the distance is shorter than the length shown here. When 7C-FB or 11C-4AF coaxial cable is used, the lengths shown in Figs.4.4 and 4.5 are changed as shown in Table 4.6. If 7C-FB or 11C-4AF replaces 5C-FB, for example, the limit length is extended from 1km to 1.2 km or 2.5 km.

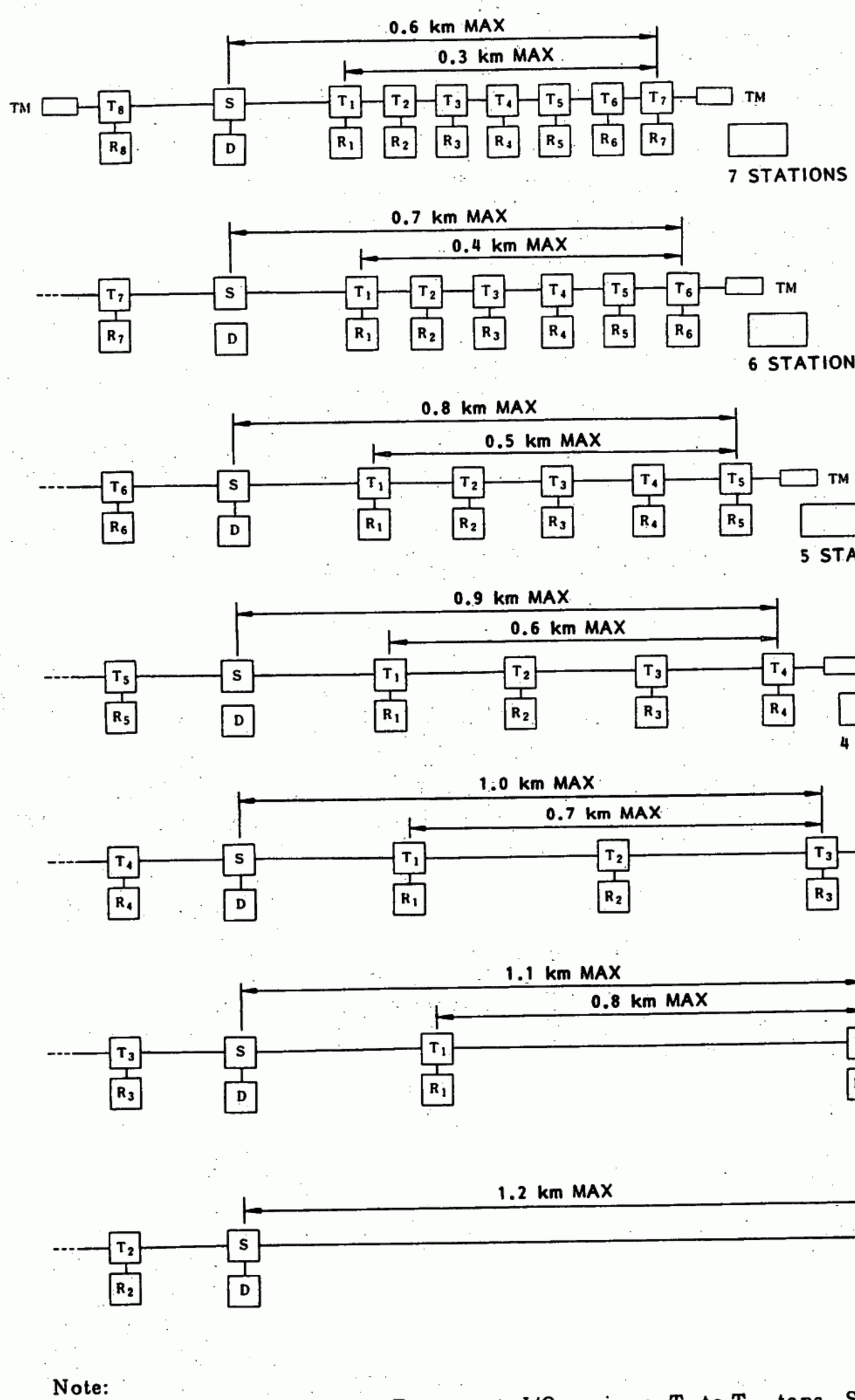


Note:

1. D — remote I/O drivers, R_1 to R_8 — remote I/O receivers, T_1 to T_8 — taps,
   A — junction adapters.
2. Each distance shown above is in use of SC-FB cable.

Fig. 4.4 Transmission Line Configuration of Remote I/O (Without Splitter)

4.2 LENGTH OF TRANSMISSIONLINE (Cont'd)



Note:
1. D—remote I/O drivers, R_1 to R_8—remote I/O receivers, T_1 to T_8—taps, S—splitters, TM—terminals.
2. Each distance shown above is in use of 5C-FB cable.
3. For configuration of left side of splitter, the same configuration shown above (right side of splitter) is applied.

Fig. 4.5 Transmission Line Configuration of Remote I/O (With Splitter)

Table 4.6 Transmission Distance of Each Coaxial Cable

5C-FB	7C-FB	11C-4AF
0.3	0.4	0.7
0.4	0.5	1.0
0.5	0.6	1.2
0.6	0.7	1.5
0.7	0.8	1.7
0.8	0.9	2.0
0.9	1.1	2.2
1.0	1.2	2.5
1.1	1.3	2.7
1.2	1.4	3.0
1.3	1.5	3.2
1.4	1.7	3.5
1.5	1.8	3.7
1.6	1.9	4.0
1.7	2.0	4.2
1.8	2.2	4.5
1.9	2.3	4.7
2.0	2.4	5.0

Note: Transmission distance must be determined in accordance with type of coaxial cable to be used, as shown above.

5. INPUT/OUTPUT ALLOCATION AND PROCESSING

5.1 INPUT/OUTPUT ALLOCATION

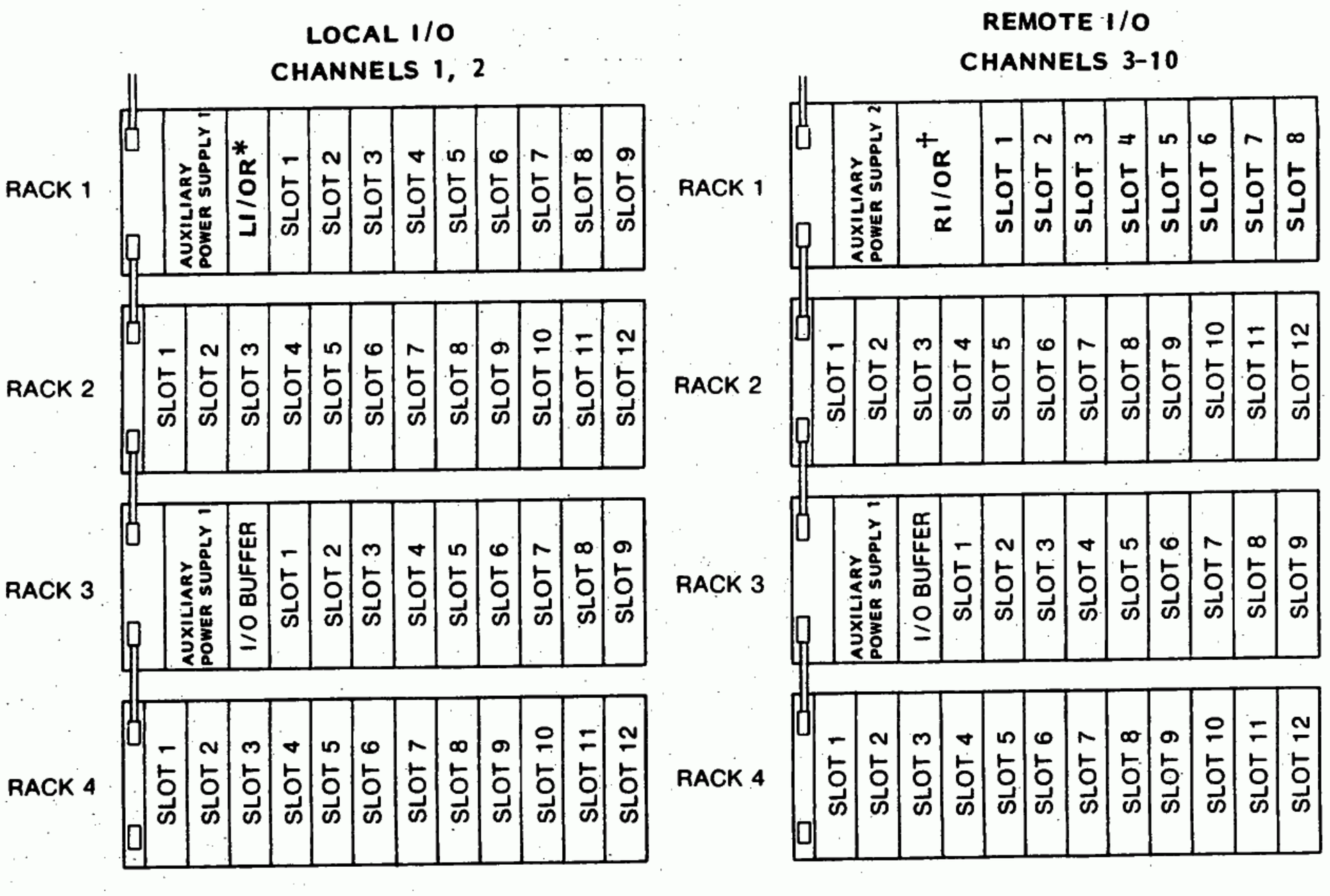
Since I/O module can be located at any module slot corresponding to I/O allocation, a variety of combination of I/O modules is available. Befor operating U84 Controller, be sure to set I/O allocation table to the CPU module memory using the programming panel.

I/O allocation is made independently to each location. A change of I/O allocation made to a location does not affect those for the other locations. For the operation of I/O allocation, refer to the "P190 CRT Programming Panel User's Manual II" (SIE-C815-10.2).

(1) I/O Section Configuration

The U84's input/output section consists of two channels (see Fig. 5.1) and each channel accommodates up to 42 I/O modules.

I/O modules may be installed at any location in a range of 2048 discrete input/output points and 256 register input/output points.



* Local I/O receiver module
† Remote I/O receiver module

Fig. 5.1 I/O Section Configuration

(2) I/O Modules Layout

I/O modules may be installed at any location of channels 1 and 2 only in a range of 2048 discrete input/output points and 256 register input/output points. They need not be installed in contiguous locations. However, it is recommended that the I/O modules be installed in groups (by input and output, voltage level, application, etc.). Fig. 5.2 shows a sample layout of I/O modules.

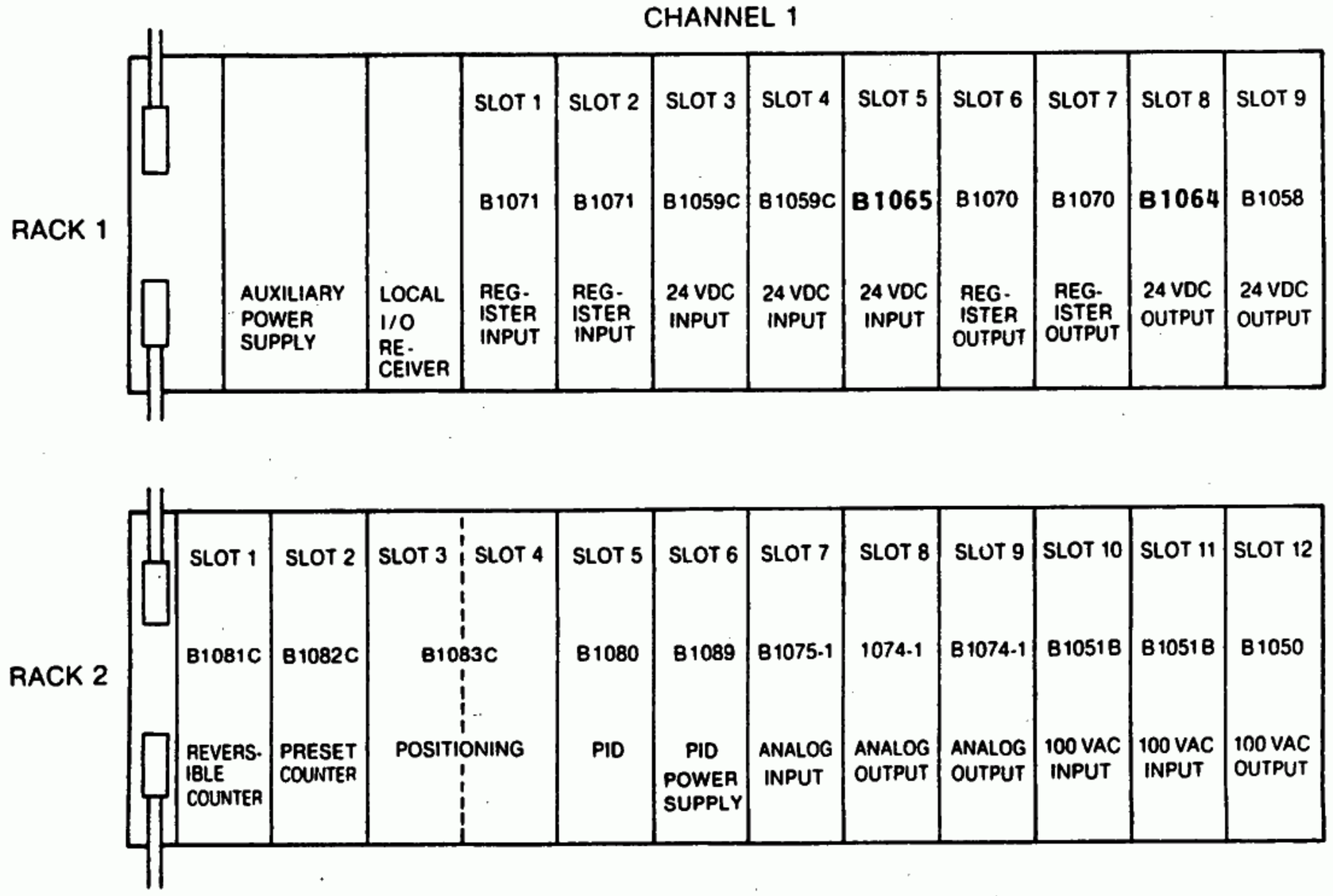


Fig. 5.2 Sample Layout of I/O Modules

(3) I/O Numbers

I/O signals include discrete inputs/outputs and register inputs/outputs (numerical value). The reference number is used as the I/O number.

Table 5.1 I/O Number List

Input/Output Type	I/O Number (Reference Number)
Discrete Input (Input Relay)	10001 – 12048
Register Input (Input Register)	30001 – 30256
Discrete Output (Output Coil)	00001 – 02048
Register Output (Output Register)	40001 – 40256

Note: The table above shows the range of I/O numbers as signable to each group of I/O signals. Note the following limitations:

- Discrete inputs +discrete outputs ≦ 2048
- Register inputs +discrete outputs ≦ 256

(4) I/O Module Location

The location of an I/O module is defined a channel number, a rack number, and a slot number.

(a) Local I/O
- Channel number: 1 or 2
- Rack number: 1 to 4
- Slot number: 1 to 9 (racks 1 and 3), 1 - 12 (racks 2 and 4)

(b) Remote I/O
- Channel number: 3 to 10
- Rack number: 1 to 4
- Slot number: 1 to 8 (rack 1), 1 to 9 (rack 3), 1 to 12 (racks 2 and 4)

It is permissable to assign a pair of discrete input and output or a pair of register input and output to a slot. This is possible owing to the modules, such as the counter, PID, and positioning module, each of which deals with discrete inputs/outputs and register inputs/outputs (called a modular module). The number of input/output points allocated to a slot is given in Table 5.2

Table 5.2 Number of Input/Output Points Allocated to a Slot

Input/Output Type	Allowable I/O Points in Allocation
Discrete Input	8,16,24,32
Discrete Output	8,16,24,32
Register Input	1–8
Register Output	1–8

Note
1. Any I/O allocation is available in the range of I/O points given above. To a slot where a 16–point discrete output module is installed for example, 8 or 16 discrete outputs must be allocated. If 24 or 32 points are allocated to the slot (it is possi • ble through the P190 Programming panel), the outputs may be degraded.
2. Up to 128 discrete I/O points can be allocated in units of 8 points for future expansion. At present, however, no I/O module can deal with more than 32 discrete inputs/outputs.
3. BCD or binary must be specified for register inputs and outputs. Both BCD and binary cannot be specified for the same number.

(5) Types of I/O Modules and I/O Allocation

The maximum number of I/O points for allocation is specified in accordance with the type of I/O module as shown in Table 5.3 . Refer to Table 3.8 and the followings.

- Registers can be allocated, in both BCD and binary forms, to a discrete module.

- I/O allocation for the register module can be performed in BCD or binary form, but not in discrete form. If BCD and binary forms are mixed and allocated in the same slot, BCD is assigned first to the specified number of registers then binary to the remaining registers.

- Analog modules must be allocated in binary form, not in discrete form.

- Both discrete and register points must be allocated to counters, PID, and positioning modules. The register I/O allocation must be performed in binary form.

- Two slots are reserved for positioning modules and the connector is installed in the right slot. Allocation should therefore be made to the right slot but it is not necessary for the left slot.

- Allocation is not necessary for the power supply module because it does not deal with I/O signals.

Table 5.3 Number of Points for Allocation by Module Type

Modules	Type	Number of Input Point			Number of Output Point		
		Discrete	BCD	Binary	Discrete	BCD	Binary
16-point Discrete Input Module	B1051B,B1055 B1053,B1057 B1059C	16	0	0	0	0	0
		0	1	0	0	0	0
		0	0	1	0	0	0
32-Point Discrete Input Module	B1063,B1065	32	0	0	0	0	0
		0	2	0	0	0	0
		0	0	2	0	0	0
64-point Discrete Input Module	B1061	64	0	0	0	0	0
		0	4	0	0	0	0
		0	0	4	0	0	0
Register Input Module	B1071	0	8	0	0	0	0
		0	0	8	0	0	0
Analog Input Module	B1073−1,B1073−2 B1075−1,B1075−2	0	0	4	0	0	0
8-point Discrete Output Module	B1094	0	0	0	8	0	0
16-point Discrete Output Module	B1050,B1054 B1052,B1056 B1058,B1090B	0	0	0	16	0	0
		0	0	0	0	1	0
		0	0	0	0	0	1
32-point Discrete Output Module	B1062,B1064	0	0	0	32	0	0
		0	0	0	0	2	0
		0	0	0	0	0	2
64-point Discrete Output Module	B1060	0	0	0	64	0	0
		0	0	0	0	4	0
		0	0	0	0	0	4
Register Output Module	B1070	0	0	0	0	8	0
		0	0	0	0	0	8
Analog Output Module	B1072B−1,B1072B−2 B1072B−3,B1072B−4 B1074−1,B1074−2 B1074−3,B1074−4	0	0	0	0	0	2
Reversible Counter Module	B1081C	8	0	2	8	0	2
Preset Counter Module	B1082C	16	0	2	16	0	8(2)*
PID Module	B1080	8	0	2	8	0	3
Positioning Module	B1083C	16	0	4	16	0	4
Power Supply Module	B1089	0	0	0	0	0	0

(6) I/O Allocation Example

When you have fixed the layout of I/O modules, make an I/O allocation table as shown in Table 5.4 and enter the reference numbers and the numbers of points in pairs.

The reference number should be the first number allocated to the slot. For discrete I/O allocation, the reference numbers must begin with fixed numbers as follows.

- First number of discrete output = 00001 + 8n (n=0, 1, 2, ..., 255)
- First numbre of discrete input = 10001 + 8n (n=0, 1, 2, ..., 255)

The following limitations exist in relation to the range of the U84 reference numbers (see Table 5.2).

- First number of discrete output + number of points ≦ 02049
- First number of discrete input + number of points ≦ 12049
- First number of register input + number of points ≦ 30257
- First number of register output + number of points ≦ 40257

Table 5.4 shows the I/O allocation table of the sample layout of I/O modules shown in Fig. 5.2 .

Table 5.4 Example of I/O Allocation Table

Channel	Rack	Slot	I/O Module	Function	Input Allocation					Output Allocation				
					Discrete		Register			Discrete		Register		
					Reference	No.of Point	Reference	BCD	Binary	Reference	No. of Point	Reference	BCD	Binary
1	1	1	B1071 Register Input	BCD 4 digit 8 sets/module			30001	8						
		2	B1071 Register Input	Binary 16-bit 8 sets/module			30009		8					
		3	B1059C 24 VDC 16-point Input	Binary 16-bit 1 sets/module			39017		1					
		4	B1059C 24 VDC 16-point Input	Discrete 16 points	10001	16								
		5	B1065 24 VDC 32-point Input	Discrete 32 points	10017	32								
		6	B1070 Register Output	Binary 16-bit 8 sets/module								40001		8
		7	B1070 Register Output	BCD 4-digit 8 sets/module								40009	8	
		8	B1064 24 VDC 32-point Output	Discrete 32 points						00001	32			
		9	B1058 24 VDC 16-point Output	Discrete 16 points						00033	16			
	2	1	B1081C Reversible Counter	–	10049	8	30018		2	00049	8	40017		2
		2	B1082C Present Counter	–	10057	16	30020		2	00057	16	40019		8
		3	B1083C Positioning Control	–										
		4		–	10073	16	30022		4	00073	16	40027		4
		5	B1080 PID	–	10089	8	30026		2	00089	8	40031		3
		6	B1089 DC Power lor PID	–										
		7	B1075-1 Analog Input	–			30028		4					
		8	B1074-1 Analog Output	–								40034		2
		9	B1074-1 Analog Output	–								40036		2
		10	B1051B 100VAC 16 point Input	Discrete 16 points	10097	16								
		11	B1051B 100VAC 16 point Input	Discrete 16 points	10013	16								
		12	B1050B 100VAC 16 point Output	Discrete 16 points						00097	16			

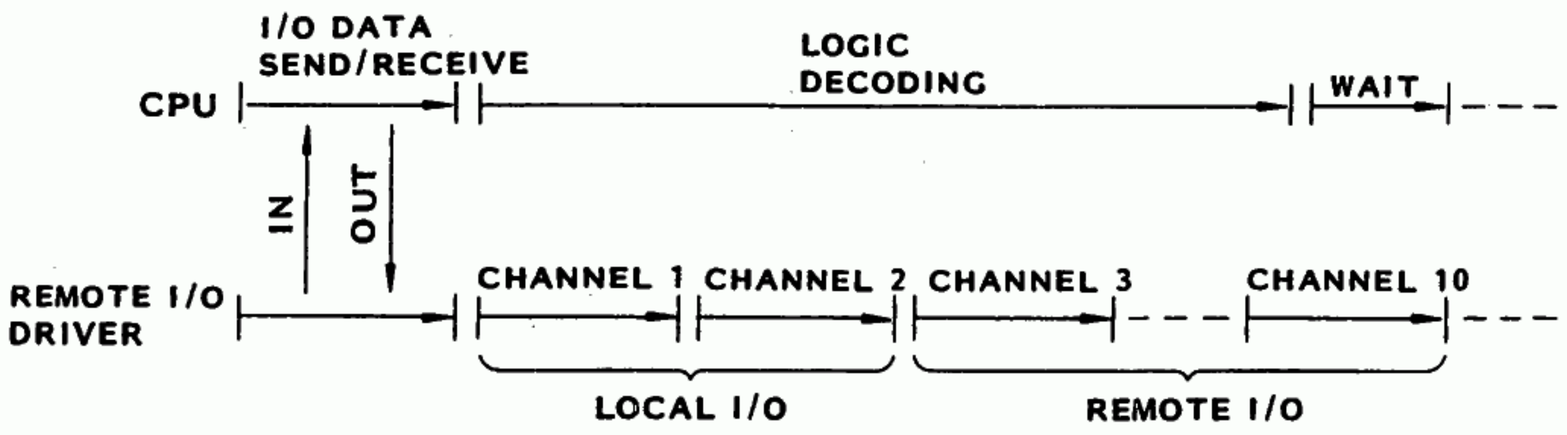
5.2 INPUT/OUTPUT PROCESSING OPERATION

In the U84, both the logic decoding by CPU module and I/O processing by remote I/O driver are performed in parallel. I/O data are given or received at a rate of once per scan between the CPU module and remote I/O driver.

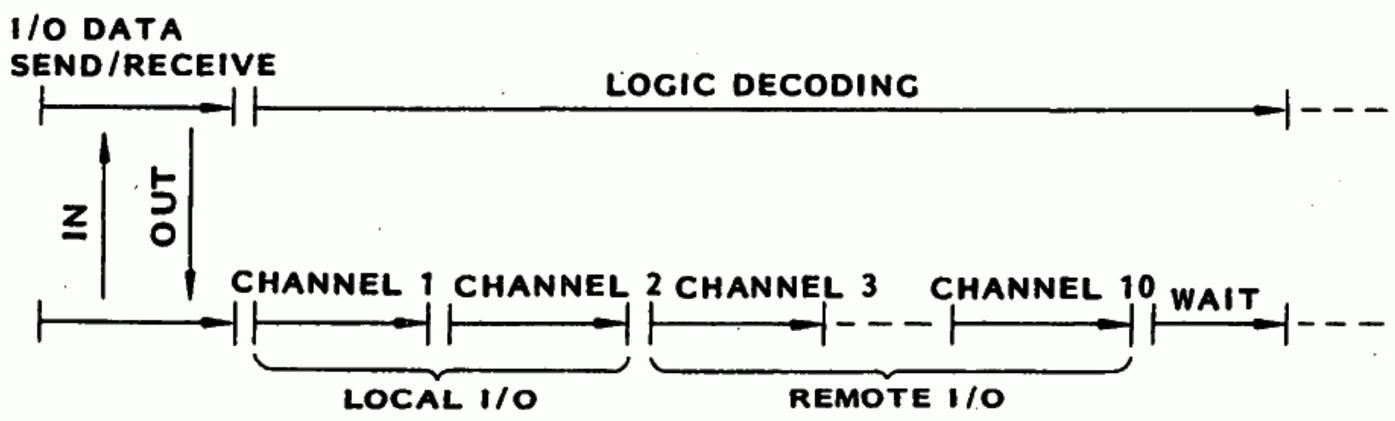
Because of this, a delay in scanning is created until an input signal from an external device connected to the input module is transmitted to the CPU module or until the result (output signal) of logic decoding by the CPU module is transmitted to an external device connected to the output module. This must always be taken into account when applying the U84 .

5.2.1 Logic Decoding and I/O Processing

Relation between the logic decoding by CPU module and I/O processing by remote I/O driver is as shown in Fig. 5.3 .



(a) I/O Processing Time > Logic Decoding Time



(b) Logic Decoding Time > I/O Processing Time

Note: I/O processing is not performed for a channel having no I/O allocation.

Fig. 5.3 Logic Decoding and I/O Processing

5.2.2 I/O Processing Sequence

I/O processing is performed in the ascending order of channel number. The I/O processing within each channel is performed in the sequence indicated in Fig. 5.4 in accordance with the I/O allocation.

Note:
1. Each processing shown above is performed in the ascending order of rack and slot number in accordance with I/O allocation.
2. If both the BCD and binary registers are allocated for the same slot, BCD register is processed first.

Fig. 5.4 I/O Processing Sequence within Each Channel

5.2.3 Delay of I/O Signal

There is a delay in time from the occurrence of a change in the input signal and the recognition and logic decoding of the change by the CPU module to the appearance of the results of decoding as a change in output signal.

(1) Local I/O Channel (Fig. 5.5)

In this case, delay time in I/O processing is the sum of values of delay time of (a) to (d), stated below.

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

This is the duration from the occurrence of a change in input signal to its arrival at remote I/O driver through input module and local I/O receiver.

If the change in input signal occurs near Ⓐ, shown in Fig. 5.5, a maximum delay of 1 scan occurs but the delay time becomes minimum if it occurs near Ⓑ.

(b) From remote I/O driver to CPU module: 1 scan max

This is the time required until an output from the remote I/O driver enters the CPU module. This duration varies depending on where the input signal is allocated to, and it becomes the longest when the input signal is allocated to slot 1, rack 1 of channel 1.

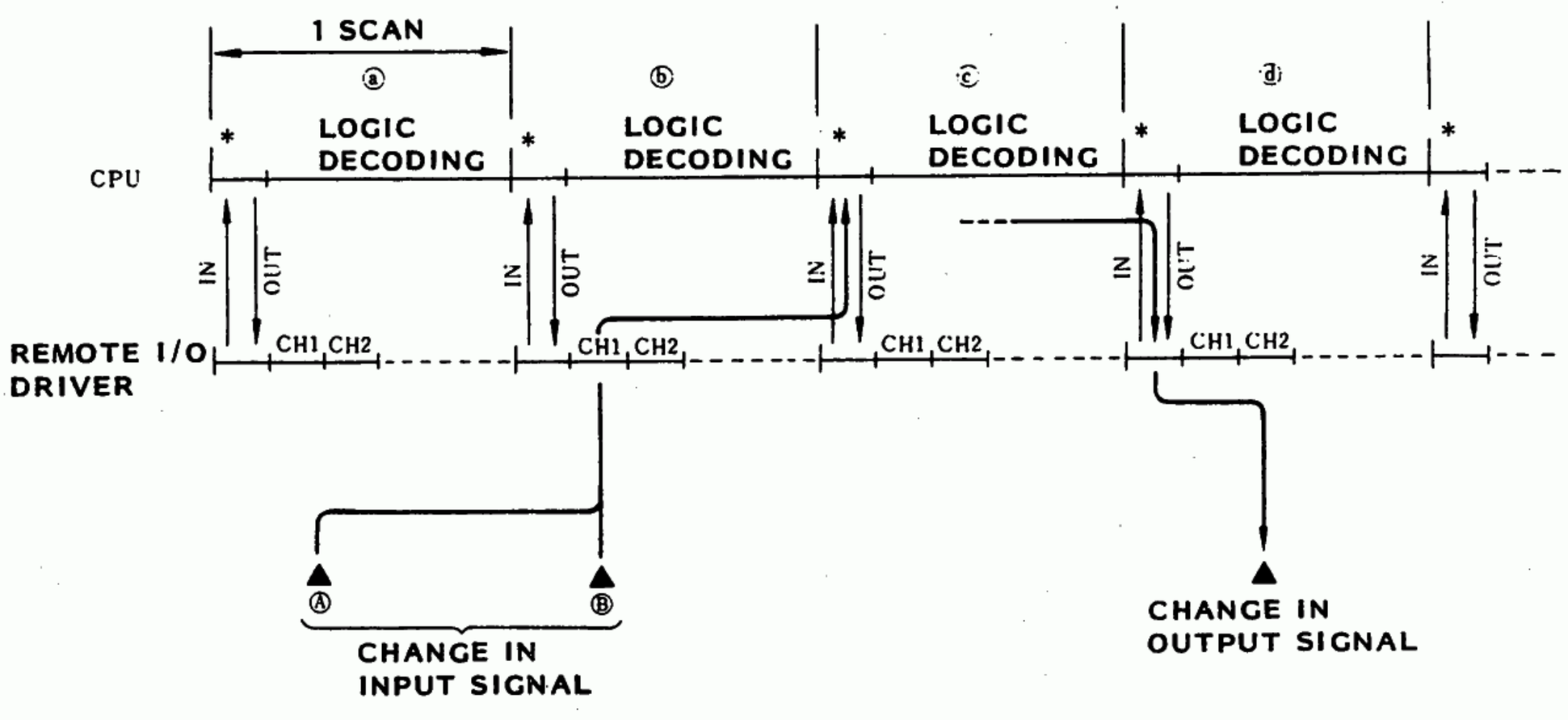
(c) From CPU module to remote I/O driver: 1 scan

This is the duration from the logic decoding by CPU module to the delivery of the results to the remote I/O driver. However, it is assumed that the program (ladder circuit) has been prepared in such a manner that the results of logic decoding will appear in 1 scan.

(d) From remote I/O driver to change in output signal: α (by I/O allocation)

This is the duration until the output from remote I/O driver appears as a change in the output signal through the local I/O receiver and output module. This duration varies depending on where the output signal is allocated to and becomes longest when it is allocated to slot 12, rack 4 of channel 2.

Therefore, a duration of 2 scans + α to 3 scans + α 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).



* I/O DATA SEND/RECEIVE

Note: logic decoding is to be performed based on the input signal from channel 1 and the results are to be output to channel 2.

Fig. 5.5 I/O Timing for Local I/O Channel

(2) Remote I/O Channel (Fig. 5.6)

In the case of remote I/O channel, the delay time in I/O processing is the sum of the values of delay time shown in (a) to (e) below.

(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. 5.6, 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 remote I/O driver: 1 scan

This is the duration until an output from remote I/O receiver is input to the remote I/O driver.

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

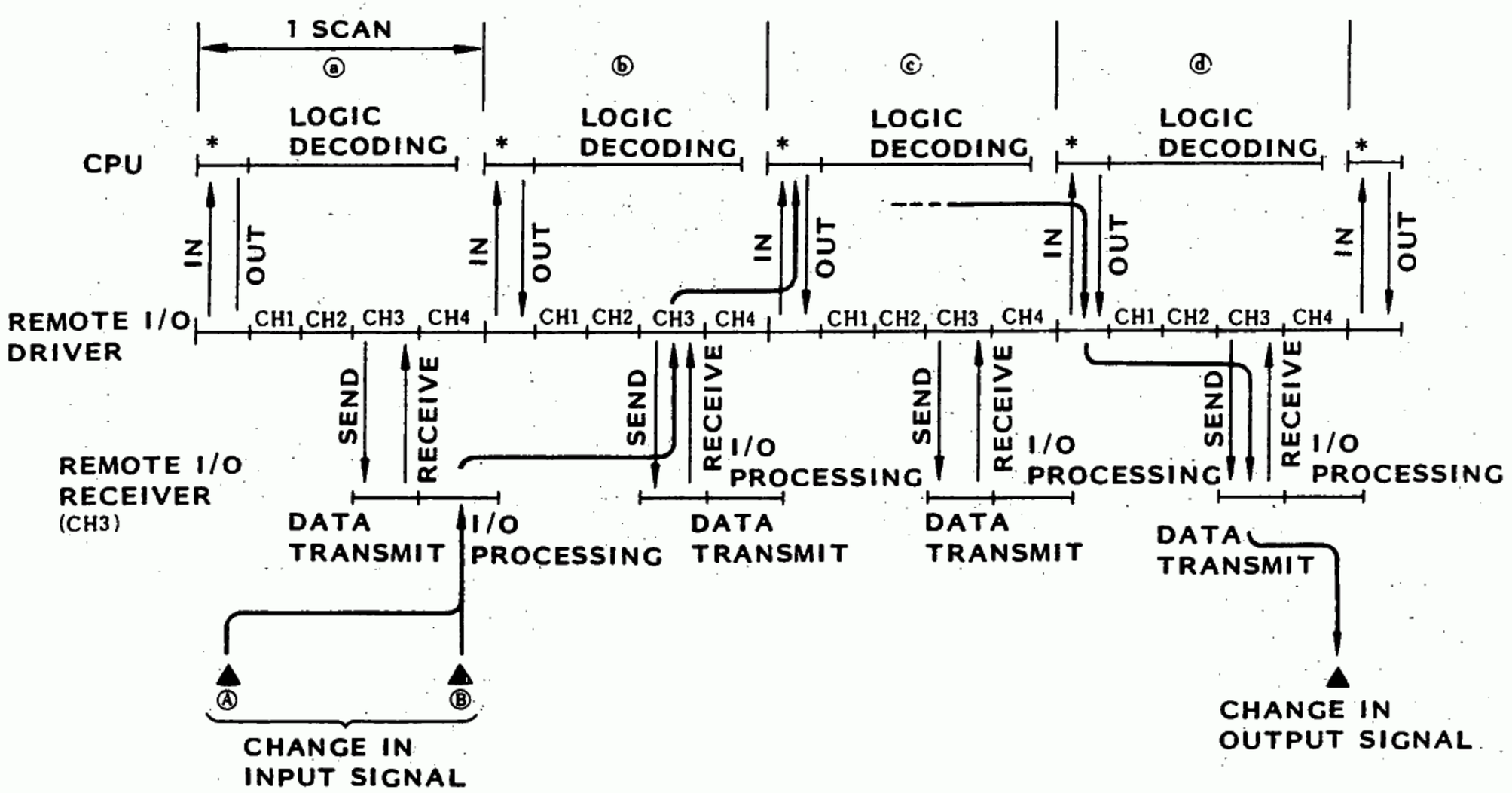
This is the duration until an output from remote I/O driver is input to the CPU module. This duration varies depending on where the input signal is allocated to and becomes maximum when it is allocated to slot 1, rack 1 of channel 3 and there is no I/O allocation to channels 1 and 2.

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

This is the duration until the CPU module performs logic decoding and delivers the results to remote I/O driver. However, the program (ladder circuit) has to be prepared in such a manner that the results of logic decoding can be output in 1 scan.

(e) From remote I/O driver to remote I/O receiver: α (by I/O allocation)

This is the duration until an output from remote I/O driver appears as an output signal through the remote I/O receiver and output module. This duration varies depending on where the output signal is allocated to and becomes maximum when it is allocated to slot 12, rack 4 of channel 1. Thus, a duration of 3 scans+α to 4 scans+α is required until the change in input signal is reflected upon the output signal. However, α varies depending on the I/O allocation (0 to 1 scan).



* I/O DATA SEND/RECEIVE

Note: Logic decoding is to be performed based on the input signal from channel 3 and the results output to channel 3.

Fig. 5.6 I/O Timing for Remote I/O Channel

5.3 I/O PROCESSING TIME

5.3.1 Calculating Method

The I/O processing time of the remote I/O system of U84 can be calculated by the following calculating formula:

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

(1) Local I/O Processing Time

This is the time required by the remote I/O driver for the I/O processing of I/O module of local I/O channel and varies depending on the I/O allocation.

Table 5.5 shows the relation between the I/O allocation of local I/O channel and the processing time. The processing time is determined from Table 5.5 for every I/O module of the local I/O channel in accordace with respective I/O allocation, and the sum of the values of processing time becomes equal to the local I/O processing time.

Table 5.5 I/O Allocation of Local I/O Channel and Processing Time

I/O Allocation		Processing Time
Discrete Input		85 μs/8 points
Discrete Output		80 μs/8 points
Input Register	BCD	210 μs/register
	Binary	180 μs/register
Output Register	BCD	280 μs/register
	Binary	230 μs/register
Without Allocation (Prohibit)		0 μs

(2) Remote I/O Processing Time

This is the time required by the remote I/O driver for processing the I/O data of the remote I/O channel and varies depending on the I/O allocation.

Table 5.6 shows the relation between the I/O allocation of remote I/O channel and the processing time. The processing time is determined from Table 5.6 for every I/O module of remote I/O channel in accordance with respective I/O allocation, and the sum of the values of processing time becomes equal to the remote I/O processing time.

Table 5.6 I/O Allocation of Remote I/O Channel and Processing Time

I/O Allocation		Processing Time
Discrete Input		43 μs/8 points
Discrete Output		35 μs/8 points
Input Register	BCD	110 μs/register
	Binary	82 μs/register
Output Register	BCD	130 μs/register
	Binary	82 μs/register
Without Allocation (Prohibit)		0 μs

5.3.1 Calculating Method (Cont'd)

(3) Remote I/O Communication Time

This is the time required by the remote I/O driver for communicating with all the remote I/O receivers connected to the driver and varies depending on the number of I/O points allocated to each remote I/O receiver.

It is necessary to first determine the number of allocated input poins (x) and the number of allocated output points (y) from the following formulas for each remote I/O channel:

- Number of input points: x=Number of discrete input points+16×Number of input registers
- Number of output points: y=Number of discrete output points+16×Number of output registers

Then, the remote I/O communication time of each remote I/O channel should be calculated using the following formula:

- Remote I/O communication time=4.6+1.7 k
  (For one remote I/O channel)

where, the value of k is defined as follows:

- When $x \geqq y$: The smallest integer satisfying $0<x \leqq 112+128k$.
- When $x<y$: The smallest integer satisfying $0<y \leqq 128+128k$.

Finally, calculate the sum of values of the remote I/O communication time calculated for each remote I/O channel. The remote I/O communication time of the channel (x=y=0) having no I/O allocation becomes zero.

5.3.2 Calculation Examples

The I/O processing time for the examples of I/O allocation shown in Table 5.7 is calculated below.

Table 5.7 Example of I/O Allocation

Channel No	No.of Discrete Inputs	No. of Discrete Outputs	No. of Input Registers		No. of Output Registers	
			BCD	Binary	BCD	Binary
1	304	256	0	20	0	10
2	208	160	10	15	20	0
3	240	208	0	0	0	8
4	144	64	16	10	15	20
5	160	128	8	8	0	18
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0

(1) Local I/O Processing Time

- Discrete input: (304+208) ÷8×85 μs=5.44 ms
- Discrete output: (256+160) ÷ 8 ×80 μs=4.16 ms
- Input register (BCD): (0+10) ×210 μs=2.10 ms
- Input register (binary): (20+15) ×180 μs=6.30 ms
- Output register (BCD): (0+20) ×280 μs=5.60 ms
- Output register (binary): (10+0) ×230 μs=2.30 ms

By adding the above, the local I/O processing time=25.9 ms

(2) Remote I/O Processing Time

- Discrete input: (240+144+160) ÷8×43 μs=2.92 ms
- Discrete output: (208+64+128) ÷8×35 μs=1.75 ms
- Input register (BCD): (0+16+8) ×110 μs=2.64 ms
- Input register (binary): (0+10+8) ×82 μs=1.48 ms
- Output register (BCD): (0+15+0) ×130 μs=1.95 ms
- Output register (binary): (8+20+18) ×82 μs=3.77 ms

By adding the above, the remote I/O rocessing time=14.5 ms

(3) Remote I/O Communication Time

(a) Channel 3

- Number of input points: x=240+16× (0+0)=240
- Number of output points: y=208+16× (0+8)=336

Therefore, k=2 when x<y, and the remote I/O communication time of channel 3 is 4.6+1.7k=4.6+1.7×2=8.0 ms

(b) Channel 4

- Number of input points: x=144+16× (16+10)=560
- Number of output points: y=64+16 ×(15+20)=624

Therefore, k=4 when x<y, and the remote I/O communication time of channel 4 is 4.6+1.7 k=4.6+1.7×4=11.4 ms

(c) Channel 5

- Number of input points: x=160+16× (8+8)=416
- Number of output points: y=128+16× (0+18)=416

Therefore, k=3 when x=y, and the remote I/O communication time of channel 5 is 4.6+1.7 k=4.6+1.7×3=9.7 ms

5.3.2 Calculation Examples (Cont'd)

(d) Channel 6 to channel 10

- Number of input points: x=0
- Number of output points: y=0

Therefore, the remote I/O communication time of channel 6 to channel 10 is zero.

By adding the values of time for (a) to (d) stated above, the remote I/O communication time for the examples of I/O allocation is 29.1 ms

Finally, by adding the values of time determined in (1) to (3), the I/O processing time is given by 25.9 + 14.5 + 25.1=69.5 ms

5.3.3 Scan Time and I/O Processing Time

Logic decoding by CPU module and I/O processing by remote I/O driver module are performed in parallel. However, since the I/O data are exchanged once per scan between the CPU module and remote I/O driver module, the scan time of the U84 depends on the logic decoding time or I/O processing time, whichever is longer. That is, the module which first completed the processing has to wait until the processing is completed by the other module (refer to Fig. 5.3).

Scan time T(ms) of the U84 when using the remote I/O driver module can be approximately calculated from the following formula:

T=(Fixed time)+(Variable time)

- (Fixed time)=11 ms:

This the time required for processing, such as the self-diagnosis of CPU module and its exchange of I/O data with remote I/O driver module.

- (Variable time):

This is the logic decoding time by CPU module or I/O processing time by remote I/O driver module, whichever is longer.

The logic decoding time can be calculated from the following formula by using the processing time by element show in Table 5.8 .

$$\text{(Logic decoding time)} = \{(\text{Number of networks}) \times 6.7 + \Sigma(\underline{\text{Processing time by element}})\} \div 1000 \text{ (in ms)}$$

(Refer to Table 5.)

Table 5.8 Processing Time of Elements

Element (Function)	Condition	Processing Time (μs)		Remarks
		Non Execution	Execution	
Coil, Latched Coil	ENABLE	—	12.3	—
	DISABLE	—	8.4	
Contact, Horizontal Open/Shunt	—	—	0.35	
Transitional Contect	—	—	6.0	
Timer	—	15.1	15.4	
Counter	—	22.1	23.8	
Addition	—	16.8	19.3	
Double-precision Addition	—	17.2	67.9	
Subtraction	—	16.8	20.3	
Double-precision Subtraction	—	17.2	105	
Multiply	0×0	17.2	22.1	—
	9999×9999		103	
Double-precision Multiply	0×0	17.2	27.0	—
	99999999×99999999		401	
Divide	Quotient overflow	16.8	23.1	—
	For remainder		106	
	For decimal part		186	
Double-precision Divide	Quotient overflow	11.9	23.5	—
	For remainder		331	
	For decimal part		514	
R→T	—	19.6	24.5	—
T→R	—	19.6	25.6	
T→T	—	19.6	25.6	
FIN	—	19.6	25.9+1.4n	n: Table size (1≦n≦100)
FOUT	Coil as destination	20.7	28.7	—
	Register as destination		27.3	
BLKM	Coil as destination	18.2	27.0+4.9n	n: Table size (1≦n≦100)
	Register as destination		23.8+2.5n	
STAT	Coil as destination	11.9	17.9+4.2n	n: Table size (1≦n≦21)
	Register as destination		15.8+2.1n	
SRCH	Compare	19.3	27.0+2.1n	n: Table size (1≦n≦100)
	Non compare		23.5+2.1n	
AND, OR, XOR	Coil as destination	18.6	25.6+4.6n	n: Table size (1≦n≦100)
	Register as destination		23.1+2.5n	
COMP	Coil as destination	18.6	25.6+4.2n	n: Table size (1≦n≦100)
	Register as destination		23.1+2.1n	
CMPR	Miscompare	20.0	26.6+2.1m +3.2n	m: Bit number in miscompare (0≦m≦15)
	Non miscompare		22.8+3.2n	n: Table size (1≦n≦100)
MBIT	Coil as destination	22.1	37.5	—
	Register as destination		36.1	
SENS	—	20.3	34.0	—
BROT	Coil as destination	18.2	32.6+5.6n	n: Table size (1≦n≦100)
	Register as destination		31.2+3.5n	
MROT	Shift	18.2	27.3+11m +2.8n	m: Number of bits for shift (0≦n≦15)
	Rotate		28.4+11m +2.8n	n: Table size (1≦n≦100)
TWST	—	11.9	29.4+2.8n	n: Table size (1≦n≦100)
SQRT	$\sqrt{0}$	11.9	15.4	—
	$\sqrt{9999}$		154	
DSQR	$\sqrt{0}$	11.9	16.8	—
	$\sqrt{99999999}$		265	
DIBT	—	20.3	29.4+2.5n	n: Table size (1≦n≦100)
DIBR	—	20.3	29.4+2.5n	
SIBT	—	20.3	28.4+2.5n	
SIBR	—	20.3	26.6+2.5n	

Note:
1. The processing time for a vertical short is zero.
2. The data given above simply provide you with a basis for calculating processing time. It is recommended to measure the actual processing time by using a ladder circuit.

6. CONTROL PANEL

The U84 will be supplied to the user in the form of separate units of CPU module, power supply modules, peripheral modules, I/O modules, mounting base, etc. Precautions to be taken when building the U84 in a control panel, arrangement of units as well as wiring in the panel will be explained below.

Also refer to the external dimensions of units and modules shown in App. A and the layout and drilling plan in App. B.

6.1 CONSTRUCTION OF CONTROL PANEL

The following construction is recommended:

(1) Enclosed Steel Housing: self- standing type or wall-mounted type
(2) Dustproof or Semi-dustproof Construction
(3) Cooling Fan

If the temperature inside the panel enclosure may exceed 55℃ (optimum ambient temperature of the U84), install a cooling fan on the ceiling of the control panel enclosure or cool it by other means. The cooling fan should be installed in such a manner that air will be discharged from the panel enclosure.

When cooling by forced air through an outside duct, it is necessary to prevent condensation. Also, install an air filter in the air duct, as required.

(4) Size

The size of the control panel should be determined by referring to the external dimensions and inner layout of the units and modules shown in App B.

Also, the quantity of heat generated from equipment installed in the panel should be taken into account. Table 6.1 shows the quantity of heat generated from each module of the U84 when all the I/O modules are turned on.

Table 6.1 Heating Value of Modules

Module (Type)		Heating Value W
CPU Module	U84 - 116	24
	U84 - 124	
Main Power Supply Module	(P8101)	150
Auxiliary Power Supply Module 1	(P8054)	25
Auxiliary Power Supply Module 2	(P8051)	60
Communication Module	(C8110)	10
Local I/O Driver Module	(C8120)	10
Remote I/O Driver Module	(C8130)	16
ASCII Module	(C8160)	10
Local I/O Receiver Module	(S8125)	4
Remote I/O Receiver Module	(C8135)	6
I/O Buffer Module	(B1011)	1
100 VAC Input Module	(B1051B)	5
200 VAC Input Module	(B1055)	5
5 – 12 VDC Input Module	(B1053)	5
48 VDC Input Module	(B1057)	7
24 VDC Input Module	(B1059C)	4
24 VDC Input Module	(B1061, B1063)	8
24 VDC Input Module	(B1065)	5
100 VAC Output Module	(B1050)	10
200 VAC Output Module	(B1054)	10
5 – 12 VDC Output Module	(B1052)	7
48 VDC Output Module	(B1056)	10
24 VDC Output Module	(B1058)	10
24 VDC Output Module	(B1060)	8
24 VDC Output Module	(B1062)	13
24 VDC Output Module	(B1064)	14
Relay Output Module	(B1090B)	10
Power Reed Relay Output Module	(B1094)	5
Register Input Module	(B1071)	6
Register Output Module	(B1070)	6
Analog Input (A/D) Module	(B1073, B1075)	4
Analog Output (D/A) Module	(B1072, B1074)	4
Reversible Counter Module	(B1081C)	10
Preset Counter Module	(B1082C)	10
Positioning Module	(B1083C)	8
PID Module	(B1080)	2
Power Supply Module	(B1089)	12

Note:
1. The heat generation from the mounting base is negligible.
2. The heating value of input and output modules when they are OFF (all points) is below 2W.

6.2 COMPONENT LAYOUT IN CONTROL PANEL

As shown in the Appendix C, the units and modules of the U84 can be arranged in various ways, such as in rows or back - to - back. The layout of the U84 in the control panel should be determined by taking into account the size of the control panel, location of other equipment and those items explained below.

(1) Connecting Sequence for Mounting Bases

Each module of the U84 should be installed on a mounting base. The remote I/O system of the U84 will need a maximum of 5 different kinds of mounting bases. The mounting bases must always be connected in the sequence as shown in Fig. 6.1.

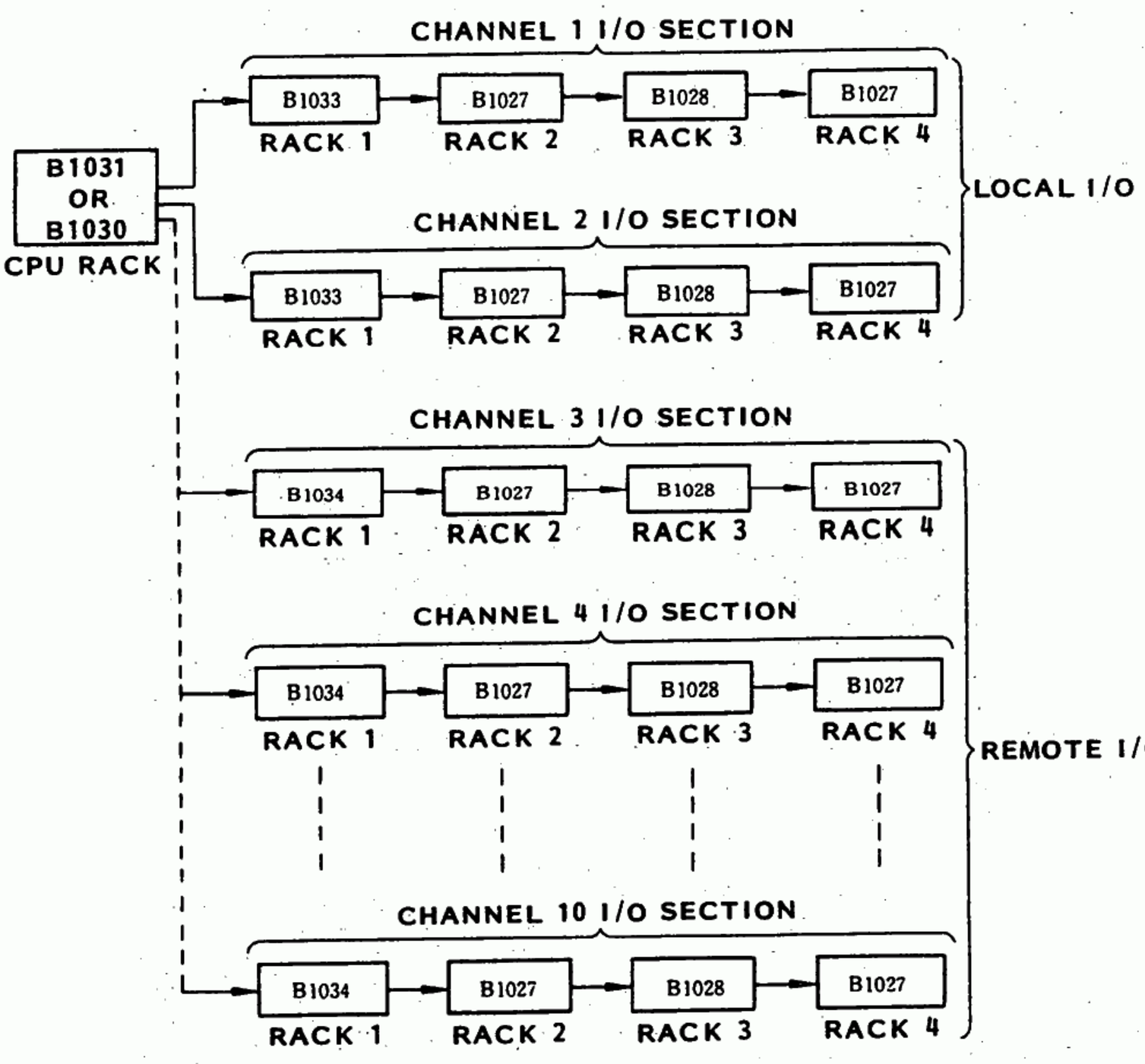


Fig. 6.1 Mounting Base Connection

The I/O cables shown in Table 6.2 are used for connection between mounting bases.

Table 6.2 I/O Cable Specifications

Type JZMSZ-	Length m	Application
W1011-1	1	Used connecting a local I/O driver module connector on the mounting base B1030 or B1031 to the connector on the upper place of the B1033.
W1011-2	5	
W1021	1.5	Used for connecting across each mounting base (B1033 or B1034,B1027, B1028),respectively.
W1022	0.4	

Note: Only one W1021 can be used for a channel.

As for the two connectors provided on the left side of the B1033, B1027, and B1028, one on the top side is used for input lines and the other on the bottom side for output lines. B1034 has only lower connector for output (see Fig.6.2).

Fig. 6.2 Connectors for Connecting across Each Mounting Base (B1033,B1034,B1027,B1028) respectively

To determine the layout of mounting bases, take into consideration the order of connection (Fig. 6.1) and the types and lengths of the cables. The cables must be connected so that signal flows from the output to the input.

(2) Weight (Table 6.3)

Table 6.3 Weight of Module

Module (Type)	Approx Weight kg	Module (Type)	Approx Weight kg
CPU Module (U84 -116,U84-124)	2.0	16 -point Discrete Output Module (B1050, B1054, B1052, B1056, B1058, B1090B)	1.1
Main Power Supply Module (P8101)	5.0	Register I/O Module (B1071, B1070)	0.8
Auxiliary Power Supply Module 1 (P8054)	1.1	Analog I/O Module (B1073, B1075, B1072B, B1074)	1.0
Auxiliary Power Supply Module 2 (P8051)	2.8	Reversible Counter Module (B1081C)	0.8
Communication Module (C8110)	1.4	Preset Counter Module (B1082C)	0.9
Local I/O Driver Module (C8120)	1.2	Positioning Module (B1083C)	1.8
Remote I/O Driver Module (C8130)	2.2	PID Module (B1080)	1.0
ASCII Module (C8160)	1.0	Power Supply Module (B1089)	1.0
Local I/O Receiver Module (S8125)	0.7	Mounting Base (B1030)	2.0
Remote I/O Receiver Module (C8135)	0.8	Mounting Base (B1031)	2.8
I/O Buffer Module (B1011)	0.7	Mounting Base (B1033, B1034, B1027, B1028)	2.5
16-point Discrete Input Module (B1051B, B1055, B1053, B1057, B1059C)	0.8	I/O Cable (W1011-)	0.3
32-point Discrete I/O Module (B1063, B1065, B1062, B1064)	0.8	I/O Cable (W1011-2)	1.4
64-point Discrete I/O Module (B1061,B1060)	0.8	I/O Cable (W1021)	0.5
8-point Discrete Output Module (B1094)	1.1	I/O Cable (W1022)	0.3

(3) Electrical Noise

- Do not install the U84 in the same enclosure in which high-voltage, large-current* equipment is also located.
- Installing the U84 in the same enclosure, in which low-voltage main circuit† is also located, is not recommended.
- If it is unavoidable to install the U84 together with low-voltage main circuit in the same enclosure, the U84 and its wiring should be separated as far as possible from the equipmint and wiring related to the low-voltage main circuit.
- The wiring related to the U84 should be placed in a wiring duct separate from the wiring for ordinary control circuits‡.
- The mounting bases must be attached to a steel panel (frame) of monolithic construction (never attach them to insulating material). If the enclosure (frame) is painted, remove paint from the holes for mounting bolts in order to achieve perfect grounding and prevent noise before attaching the mounting bases.

* A circuit with a voltage exceeding 600 VAC or 750 VDC or with a current larger than 800 A.
† A circuit with a voltage lower than 600 VAC or 750 VDC with a current greater than 20 A.
‡ A circuit with a voltage lower than 600 VAC or 750 VDC with a current lower than 20 A.

(4) Power Supply Circuit

- If the condition of power source is poor, connect a line filter (noise filter) or an insulating transformer to the power line of power supply module and I/O modules. In this case, the wiring of the primary circuit of the line filter or transformer must be separated from the secondary circuit.
- Capacity of power supply should be determined by taking into account the I/O modules to be used and load to be connected.
- The U84 immediately starts the decoding operation when the power is turned on. Thus, for certain systems, it may become necessary to first turn on the power supply for I/O and determine I/O condition before turning on the power for the power supply module of U84 .
- For the remote I/O system of U84, the power for remote I/O receiver should be turned on first as a rule. If the power for the remote I/O driver is first turned on, the I/O conditions are not determined (all are off) until the remote I/O receiver comes up.

(5) Wiring in Panel

The wiring related to U84 in the panel is in types shown in Table 6.4. Use the wires of the listed sizes.

Table 6.4 Types of Wiring in Panel

Type of Wiring	Wire Size mm^2	Description
Power Supply	1.25	To be connected to the power supply terminal "100VAC" of power suppy module, via circuit breaker, etc.
I/O Signal	0.3-1.25 *	To be connected to input and output signal lines and input and output module terminals (two 1.25 mm^2 wires can be connected to one terminal).
Grounding	1.25	Connection between with the GND terminal of the power supply module and the control panel housing (ground).

Note: For 32-point discrete module and register module, the wire size should be 0.3 mm^2 or less.

6.3 INSTALLATION OF MOUNTING BASES

Determine the layout of mounting bases and prepare the mounting holes in advance by referring to Par. 6.2 (1) and App. B. Each mounting base has 4 holes and thus it should be mounted by using 4 screws (M5). Also attach wiring ducts as required.

NOTE

Each connector on the mounting base is provided with a connector cover. Do not remove this cover from the connector during installation to prevent foreign matter entering the connector.

6.4 INSTALLATION OF MODULES

All the modules of the U84 must be mounted on the predetermined mounting bases during use. Fig. 6.3 shows the method of installing the module on the mounting base. Remove the cover from the connector to which the module is to be attached, and push the guide posts of the module in the guide holes of the mounting base using straight, forward pressure. Then, bolt the module to the mounting base with the mounting screws (M4) attached to the module.

NOTE

Do not remove the cover from the connector to which no module will be attached.

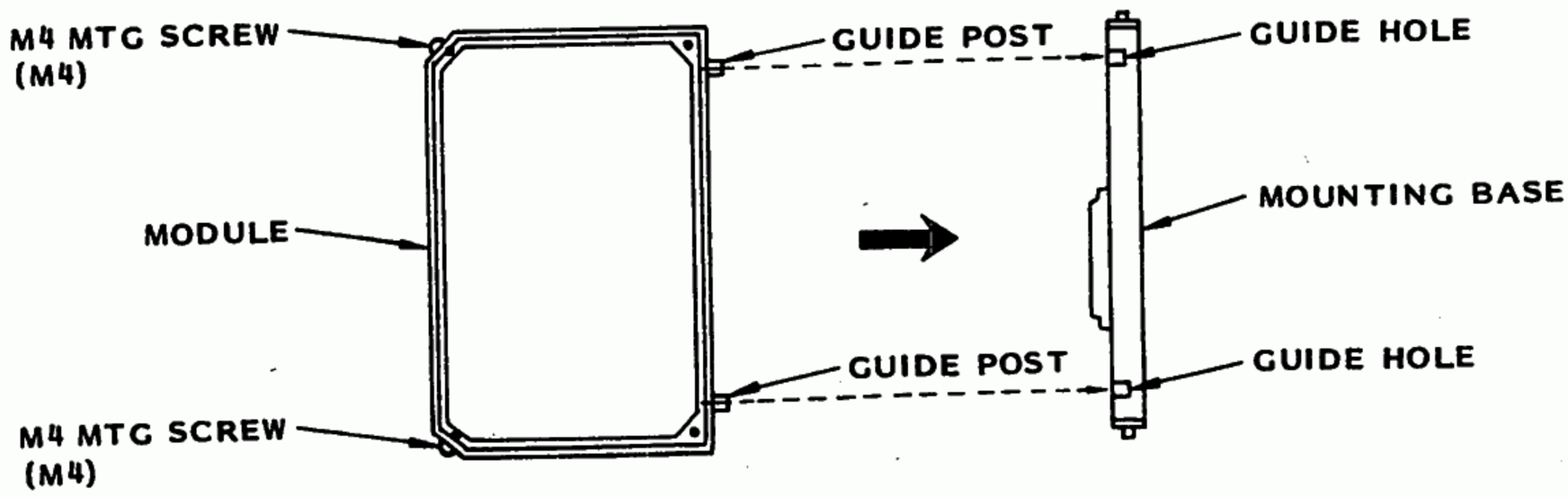


Fig. 6.3 Module Mounting

6.4 INSTALLATION OF MODULE (Cont'd)

The type of mounting base and the mounting location are determined depending on module types. Figs. 6.4 to 6.9 show mounting place of each module on the mounting base.

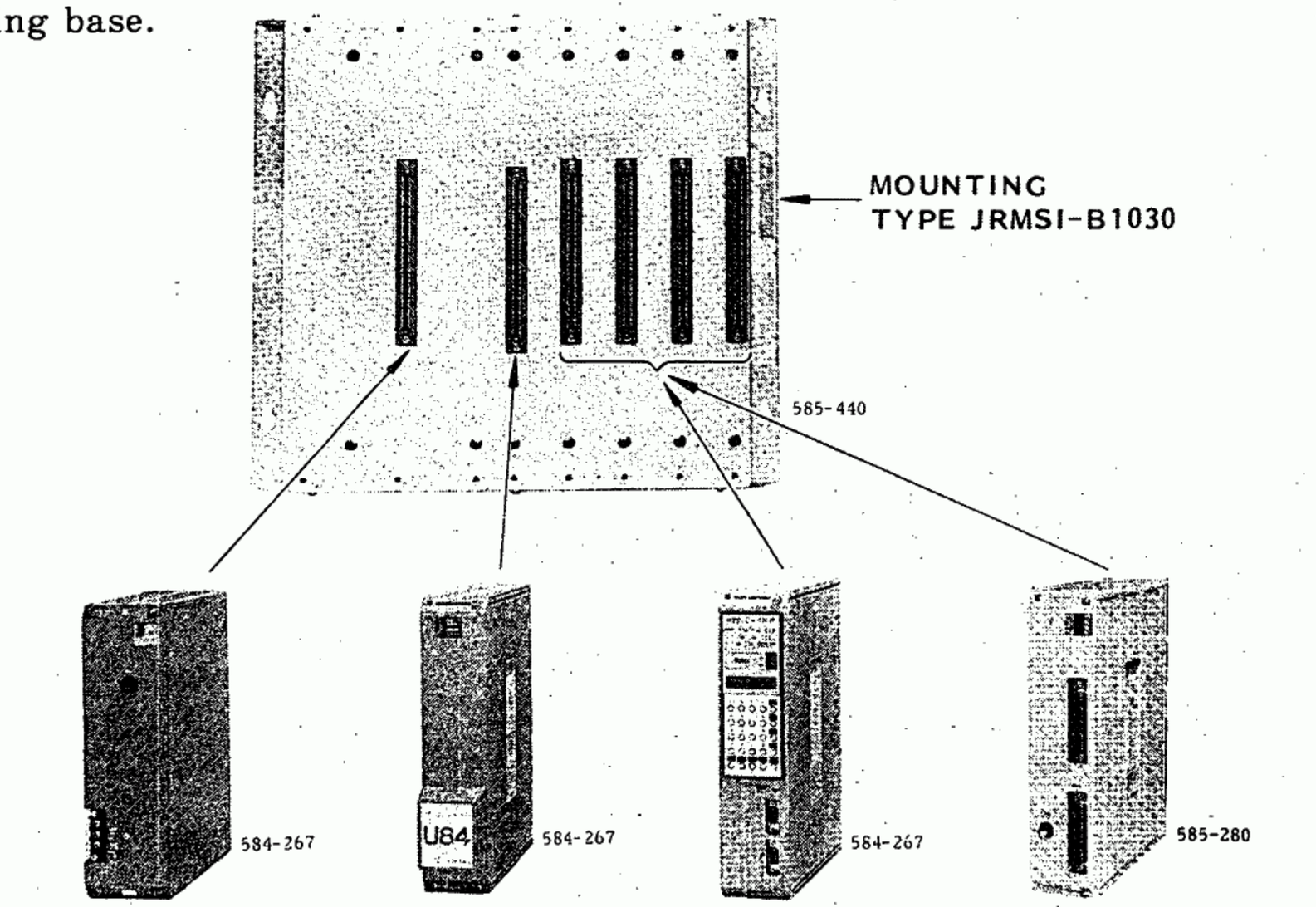
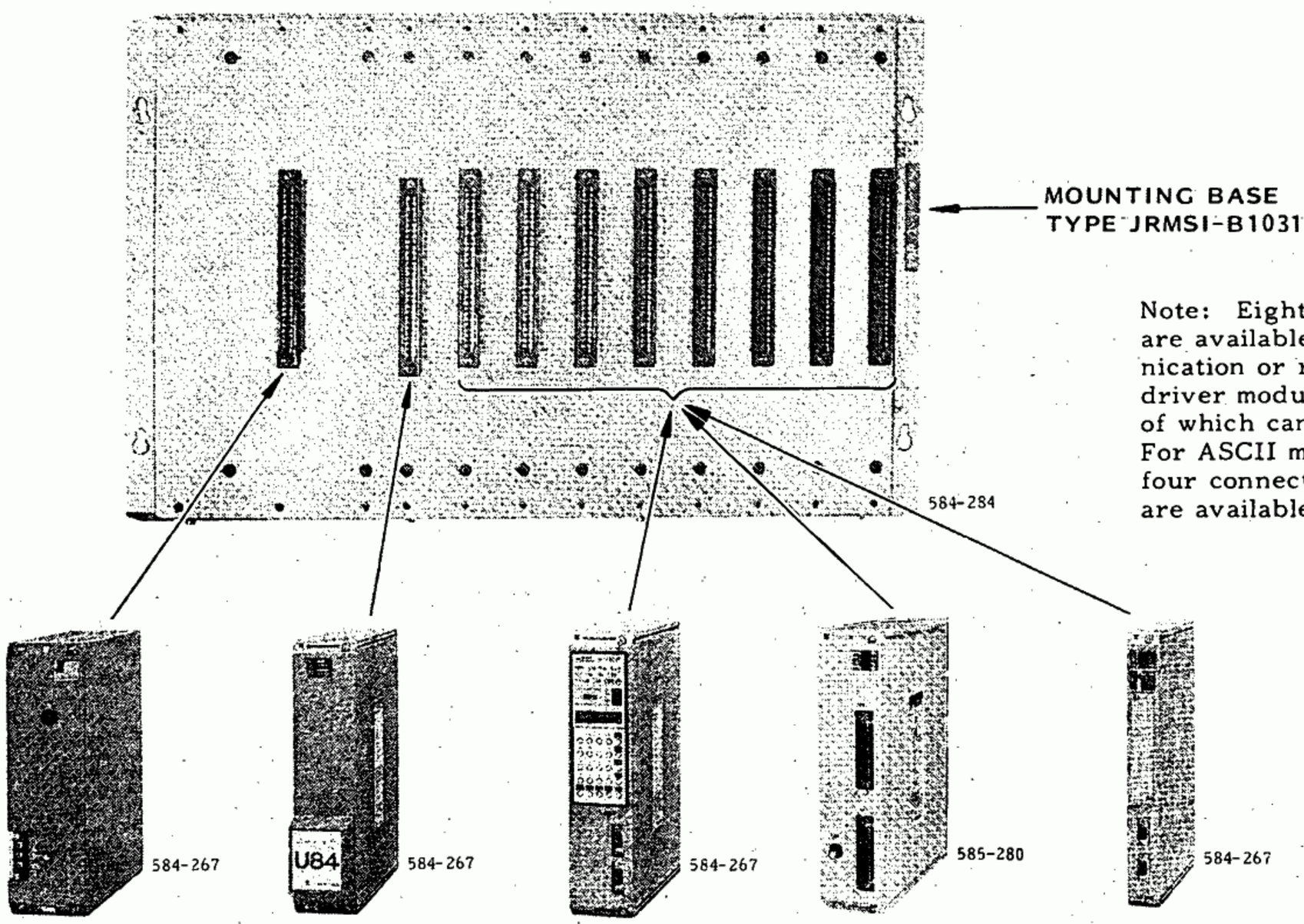


Fig. 6.4 Module Mounting on Mounting Base B1030



Note: Eight connectors are available for communication or remote I/O driver modules, any one of which can be used. For ASCII module, any four connectors, in all, are available.

Fig. 6.5 Module Mounting on Mounting Base B1031

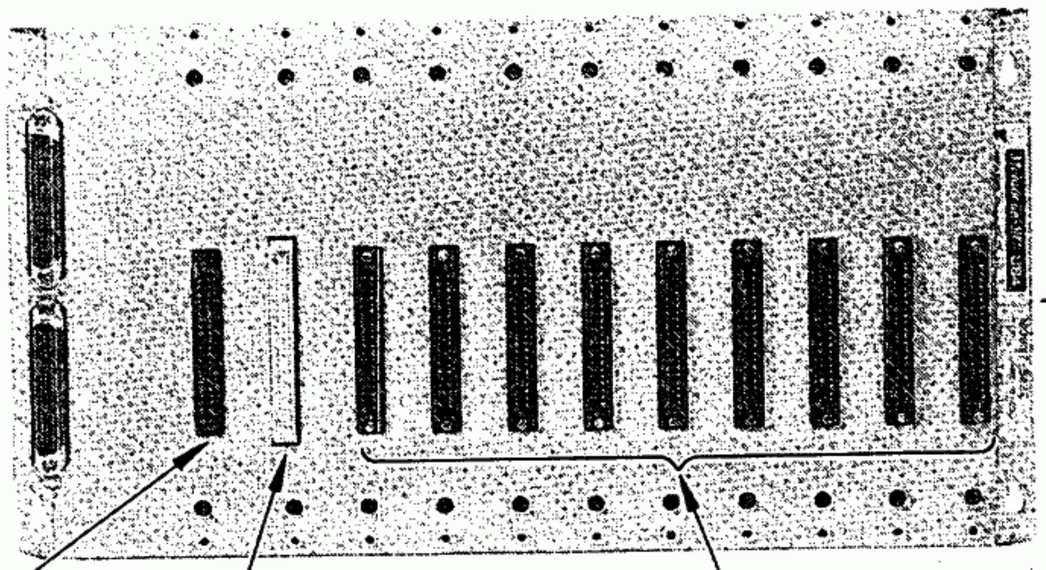


Fig. 6.6 Module Mounting on Mounting Base B1033

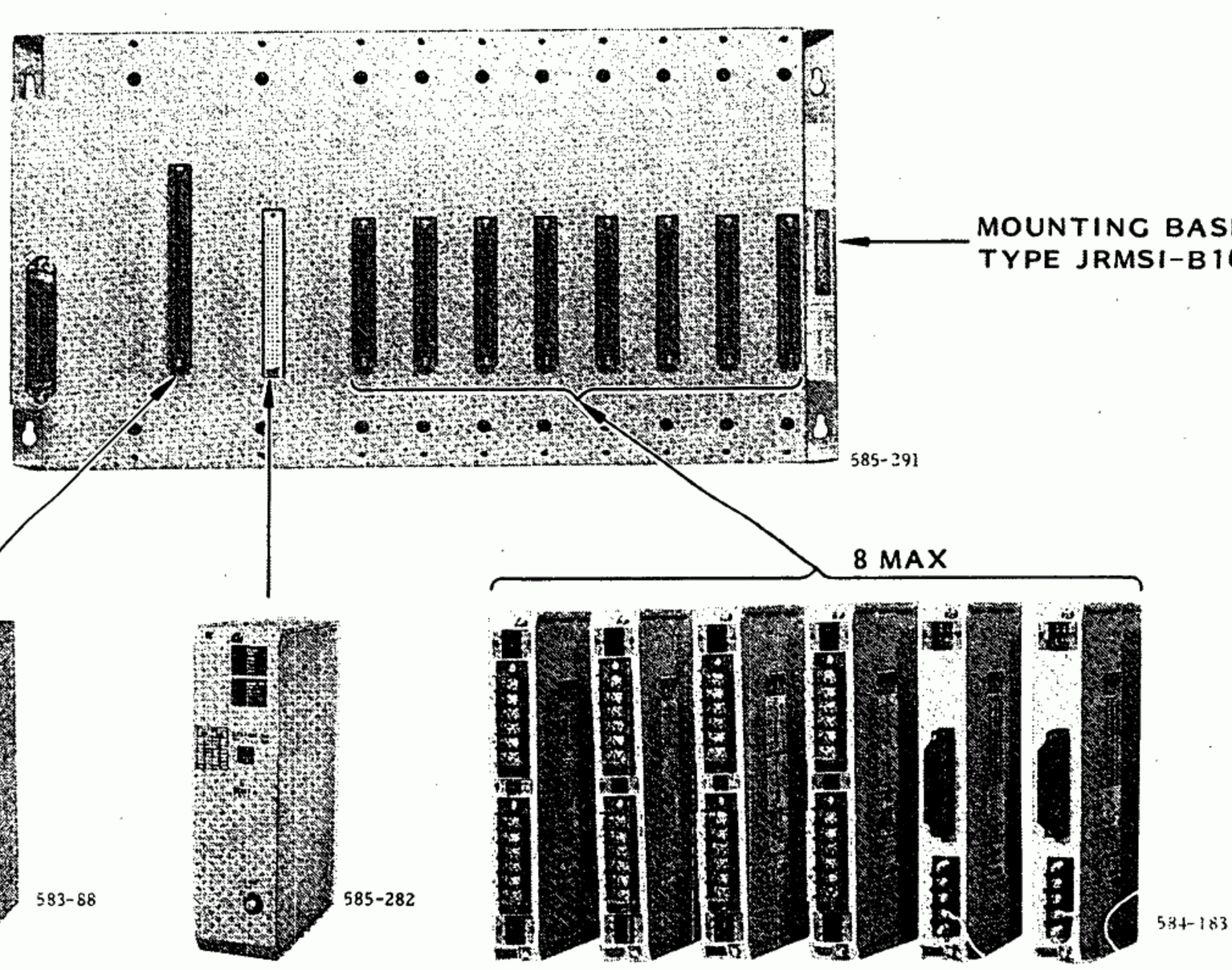


Fig. 6.7 Module Mounting on Mounting Base B1034

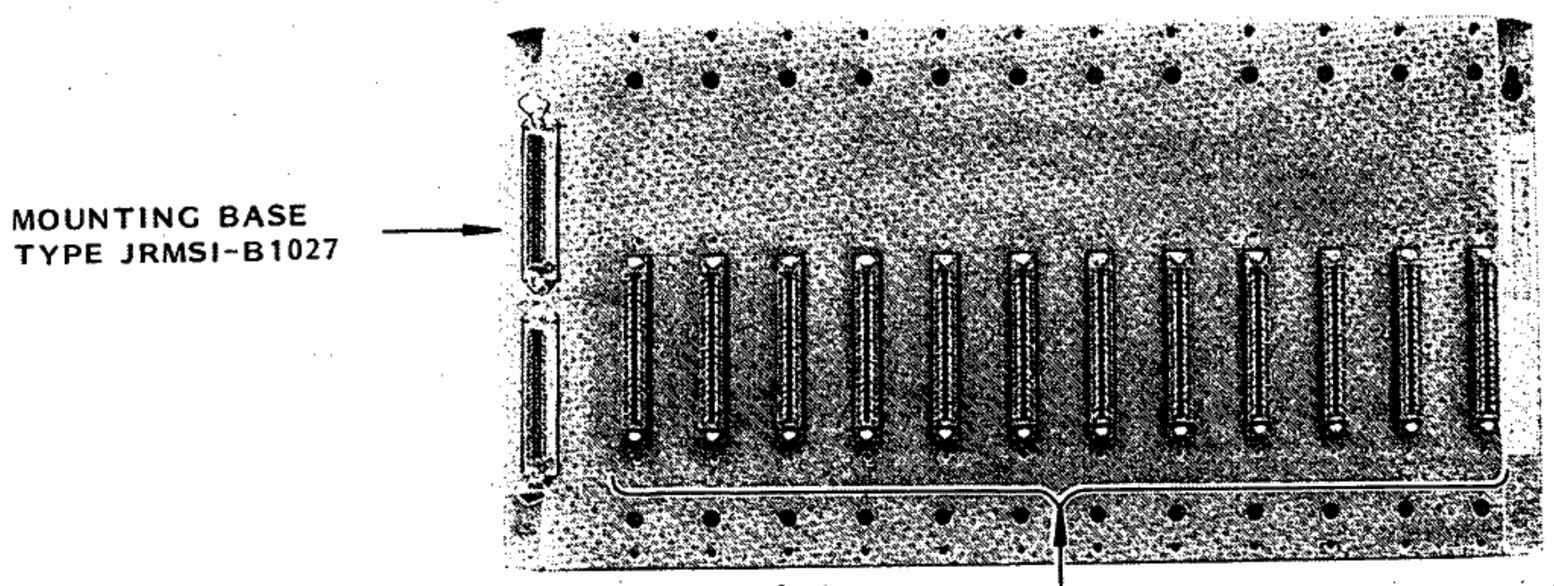


Fig. 6.8 Module Mounting on Mounting Base B1027

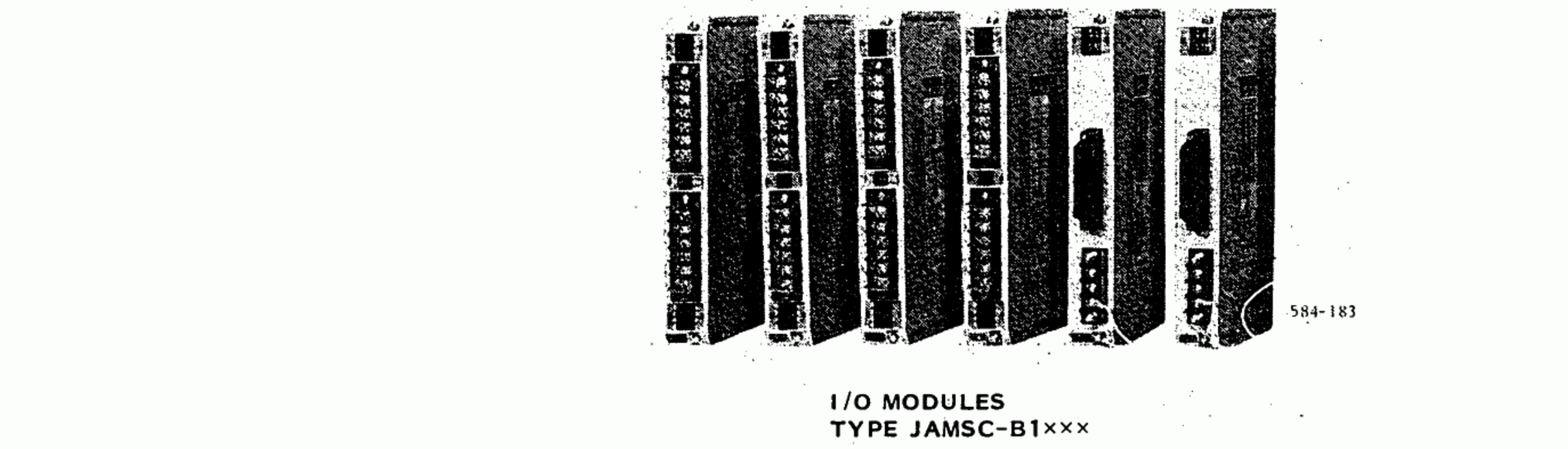
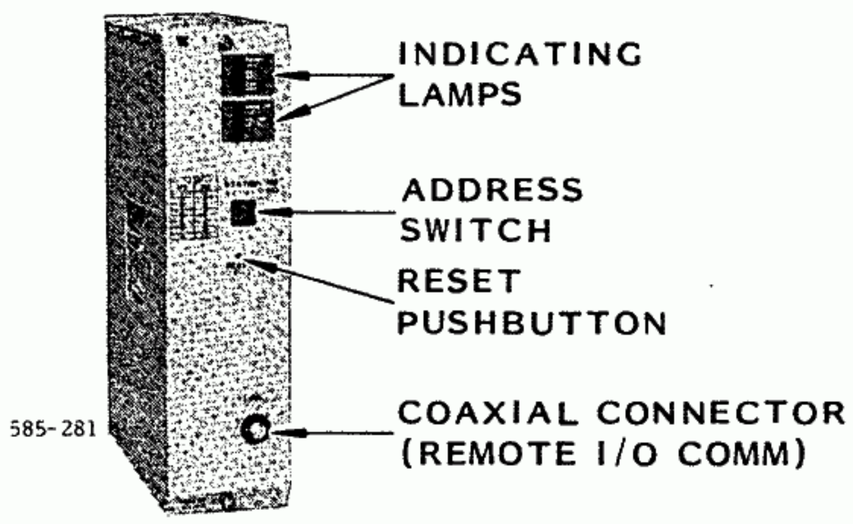


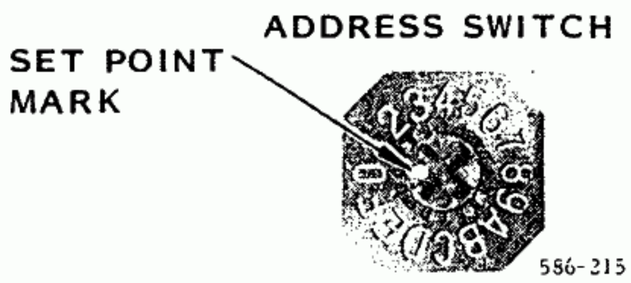
Fig. 6.9 Module Mounting on Mounting Base B1028

6.5 ADDRESS SETTING AT REMOTE I/O RECEIVER

In the remote I/O system of the U84, a maximum of 8 remote I/O receivers (slave stations) are connected to one remote I/O driver (master station) for communication between them. Thus, addresses (station No.) must be set in order to permit the remote I/O driver to indentify the remote I/O receivers.

The remote I/O receiver has an address switch at the front and the address can be set using this switch. Fig. 6.10 shows the address switch of the remote I/O receiver. Set the setting mark to a desired set number (1 to 8) by using a small screwdriver. Relation between the address of remote I/O receiver and I/O channel number is as indicated in Table 6.5.





Note:

1. Addresses of multiple remote I/O receivers can be given in any desired order and are not required to be sequential. But the same address is not permitted for two or more remote I/O receivers.
2. Address setting should be done before turning power on for remote I/O receivers. Address setting cannot be changed while the power is on. In this case, turn off and then turn on the power, or depress the reset pushbutton.

Fig. 6.10 Adress Setting of Remote I/O Receiver

Table 6.5 Address of Remote I/O Receivers and I/O Channel No.

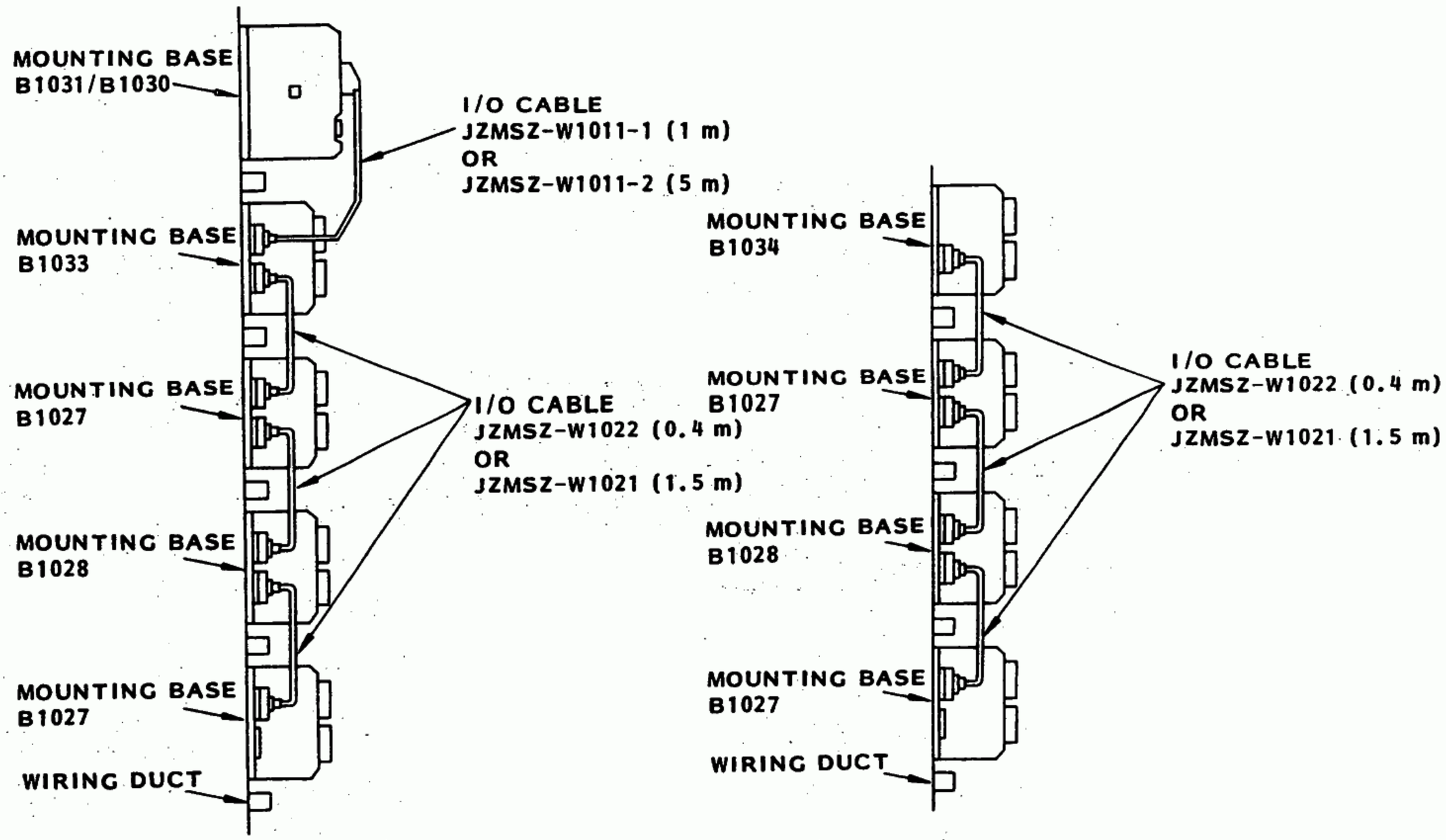
Address (Station No.)	I/O Channel No.
1	3
2	4
3	5
4	6
5	7
6	8
7	9
8	10

Note: Address setting other than the above (0.9, A to F) is invalid.

6.6 CONNECTING I/O CABLES

After completing the installation of modules, connections have to be made between the mounting bases with preselected I/O cables. When connecting the I/O cables, first remove the connector covers and then make connections in accordance with the connecting sequence as shown in Fig. 6.1. The connections have to be made in such a manner that signals flow from output to input (refer to Fig. 6.2). The upper connector of the of the B1033 mounting base must be connected to CH1 or CH2 connector of the remote I/O driver installed on a B1031 or B1030 mounting base.

Connections of I/O cables are illustrated in Fig. 6.11.



Note:

1. Only one W1021 cable can be used for a channel.
2. The W1011 cable is directional (the connector cases have different forms) and it cannot be connected in the opposite direction but the W1021 and W1022 cables are non-directional.
3. After connecting the I/O cable, lock the cable connector with the wire loops.

Fig. 6.11 Connection of I/O Cables

7. INSTALLATION AND WIRING

The U84 remote I/O (electric) system connects a remote I/O driver and remote I/O receivers with coaxial cables to perform high-speed data transmission. The line signal level is low, and so very vulnerable to external noise. Stable system operation, therefore, requires very meticulous consideration for external noise.

This section describes the U84 grounding and the coaxial cable laying procedures in consideration of reducing noise interference. For items not clearly indicated in this text, follow applicable laws and regulations, such as the Electric Equipment Technical Standards.

7.1 GROUNDING

7.1.1 Grounding U84

Control panel in which the U84 has been installed must be grounded exclusively with class 3 grounding or better (grounding resistance of lower than 100Ω).

(1) Installation of Equipment

The mounting base on which a module of the U84 is to be installed must be attached to a steel base (frame) of monolithic construction. If the steel base (frame) is painted, the paint must be removed first from the bolt holes to provide positive grounding and then the mounting base should be attached.

In installation, make sure to elevate taps, splitters, and adapters from the ground. For this purpose, use the insulating plate mounted on every tap, splitter, and adapter.

(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 of U84 (P8101, P8054 and P8051). Use a grounding conductor of larger than 8 mm^2 between the "E" terminal and grounding pole and make the wiring distance as short as possible. The grounding conductor must be separated more than 10 cm from ordinary control circuits and more than 60 cm from the main circuit. If the lines must be run in, the distance should be as short as possible.

If the distance to the grounding pole is long, it is necessary to increase the size of grounding conductor in such a manner that the sum of grounding resistance and the resistance of grounding conductor will be less than 100Ω.

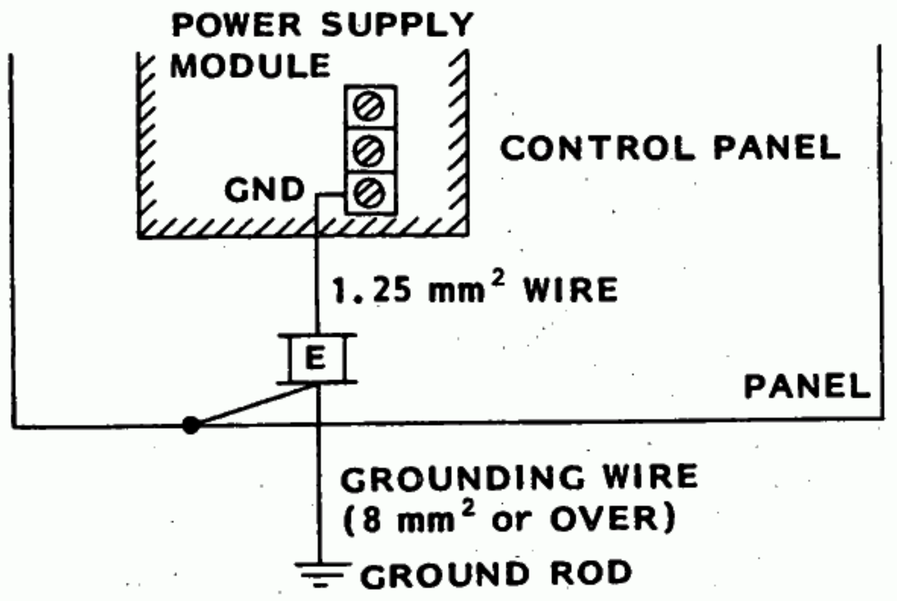


Fig. 7.1 Grounding Wire

(3) Grounding Rod

Grounding rod for grounding conductor should be located as close as possible to the control panel containing the U84 and as far as possible (farther than 15 m) from the grounding rods for other power panels (Group B panels listed in Table 7.1). The grounding resistance must be lower than 100Ω.

(4) Common Grounding

Grounding of the U84 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 7.1 should be used as standards.

Table 7.1 Common Use of Grounding Conductor and Rod

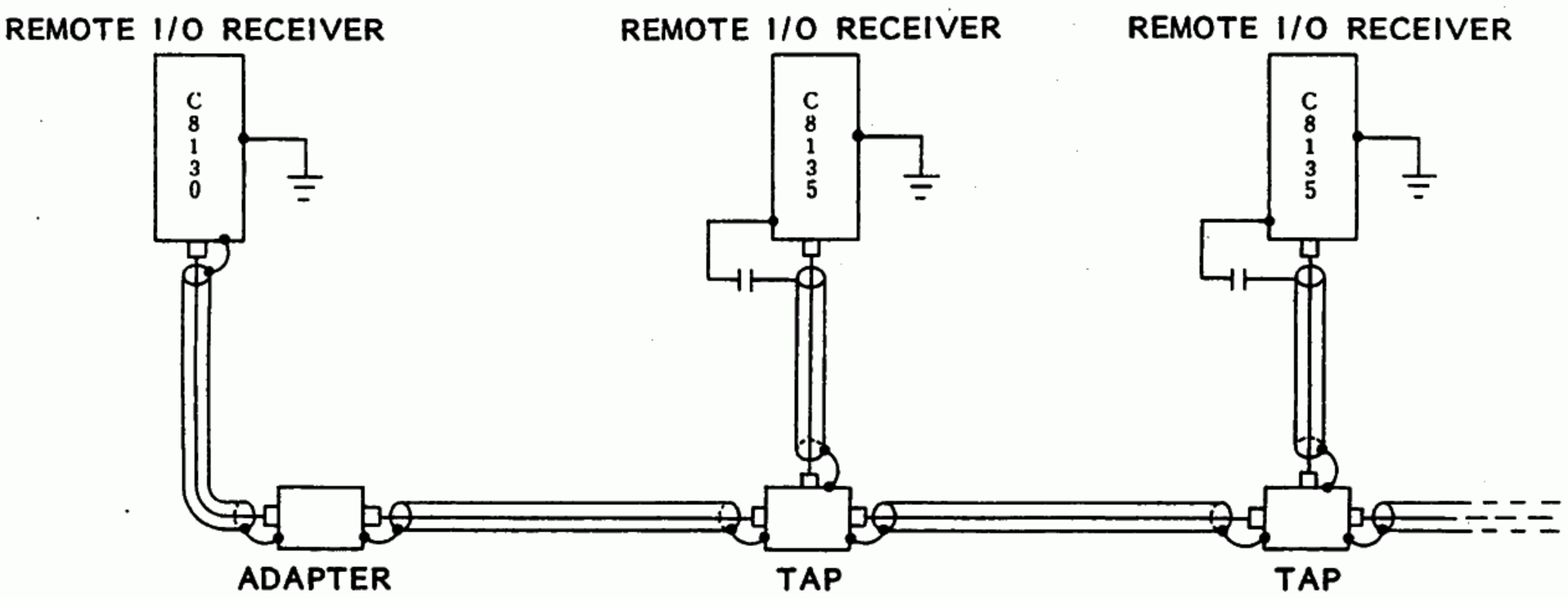
Common Use Permitted (Group A Panels)	Computer panel, instrumentation control panel, I/O relay panel, ordinary control circuit panel, etc.
Common Use not Permitted (Group B Panel)	High-voltage main circuit panel, low-voltage main circuit panel, large-capacity thyristor panel, etc.

7.1.2 Remote I/O System Ground Line

The U84 remote I/O system comprizes equipment components such as U84 CPU, remote I/O driver, and remote I/Os. These components are distributed to serve the system, and each component must be grounded at its installed location.

Fig.7.2 shows the U84 remote I/O system ground lines. The remote I/O driver and the remote I/O receivers are connected through the respective mounting bases to the GND terminal of the power supply module.

As Fig. 7.2 shows, the coaxial cable external conductor is directly grounded at the remote I/O driver, and is grounded through the capacitor at the remote I/O receivers. Thus, the remote I/O transmission line is grounded at one point at a low- frequency zone, and at multiple points at high-frequency zones.



Note: Tap and adapter must be insulated from the ground.

Fig. 7.2 U84 Remote I/O System Ground Lines

7.2 INSTALLATION OF CONTROL PANELS

Control panels (hereinafter called"remote I/O panels") containing U84 CPU, remote I/O driver, remote I/O receiver, etc. should be installed as fllows.

(1) Separation from Power Panels

Remote I/O panels should never be installed in rows together with power panels (Group B panels listed in Table 7.1). If the installation of a remote I/O panel near a power panel is unavoidable, then the remote I/O panel should be located as far as possible(farther than 60 cm) from the power panel, and also the respective grounding conductor and rod should be separated as far as possible. A separation of more than 60 cm is necessary between grounding conductors and of more than 15 m between grounding rods.

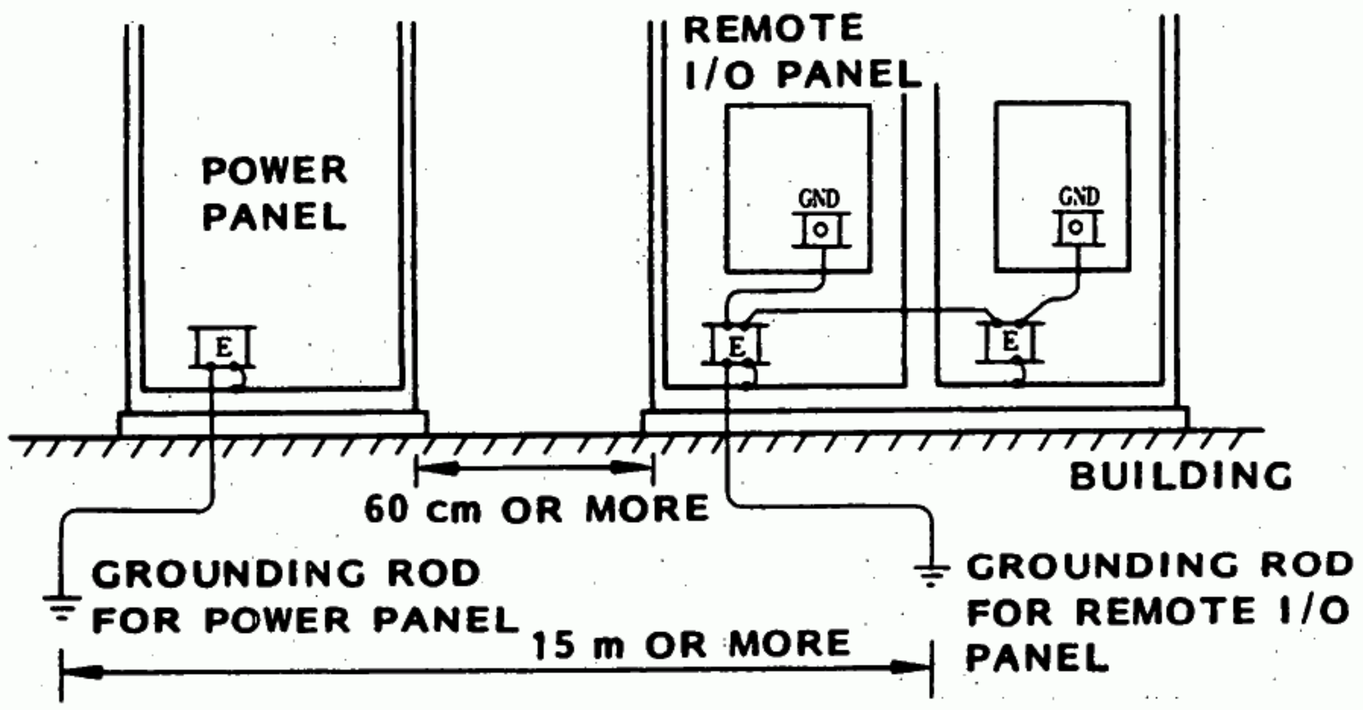


Fig. 7.3 Separation from Power Panels

(2) Series-connected Control Panels

The remote I/O panel may be placed in series with the group A panels as shown in Table 7.1. In this case, every control panel is electrically connected through channel bases. To ensure good ground, connect the E terminal of each control panel to one another, using cables of 8 mm² or more, and connect one of the E terminals to the grounding rod.

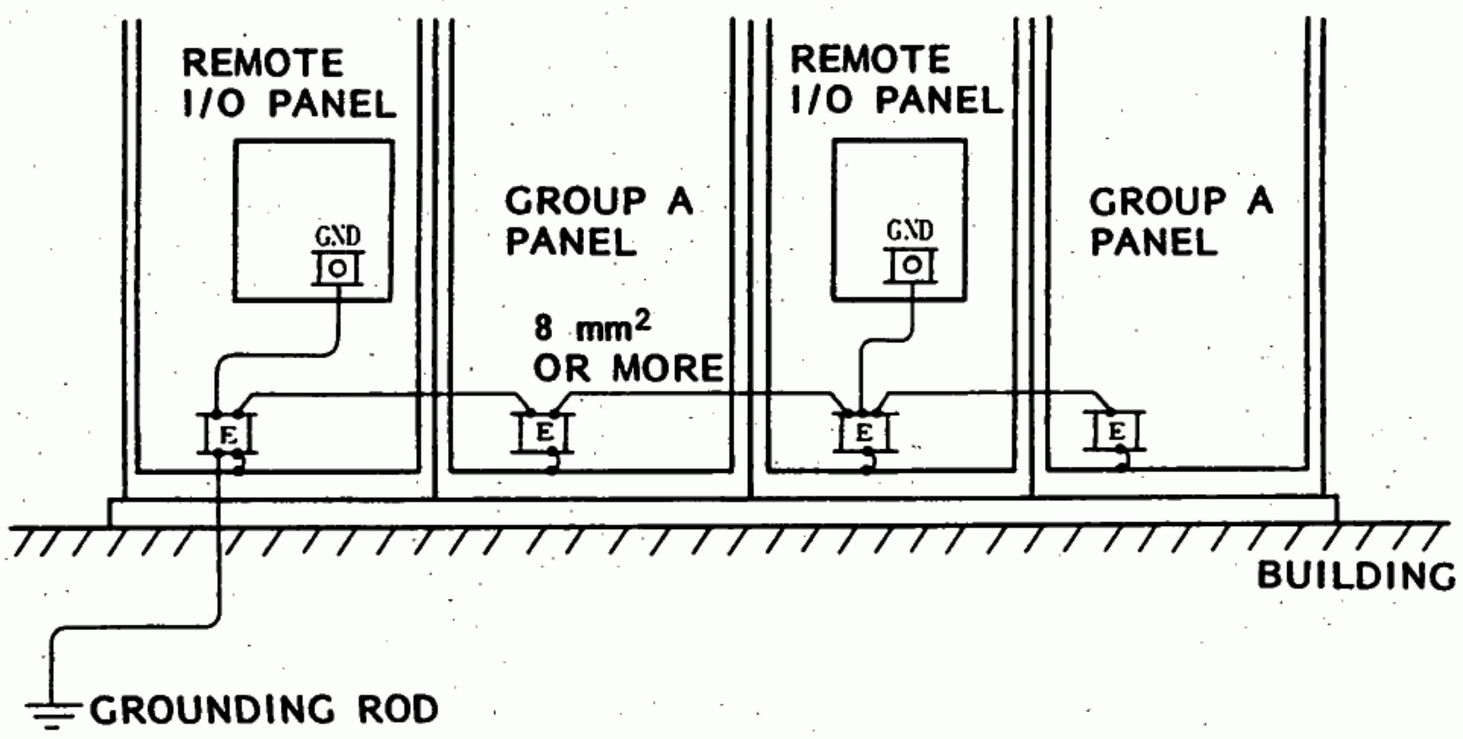


Fig. 7.4 Lined-up Panel with Group A Panel

(3) Remote I/O Panel Insulation

When a remote I/O panel is installed in a building of reinforced concrete, the remote I/O panel is grounded through the building. But be aware that if a high power panel is located near the remote I/O panel, ground noise may occur from the ground current of the high power panel. So, insulate the remote I/O panel (together with the control panel) from the building, and connect the remote I/O panel E terminal to the special grounding rod of the remote I/O panel.

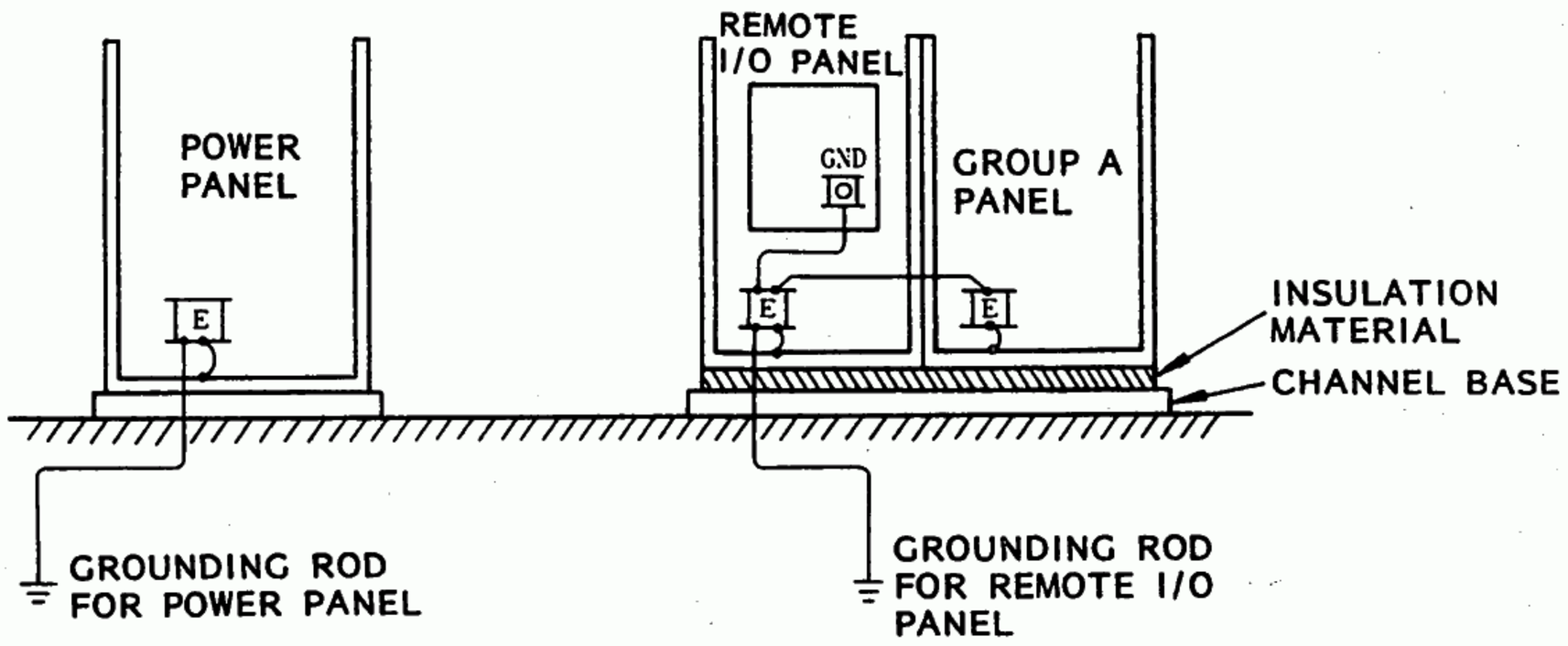


Fig. 7.5 Insulation of Remote I/O Panel

7.3 LAYING I/O SIGNAL LINES

Lay I/O signal lines connecting the remote I/O panel to external I/O devices, as follows. The I/O signal lines are connected to the I/O modules inside the remote I/O panels.

(1) I/O Signal Line Cables

Select I/O signal line cables used as external wiring by considering mechanical strength, electrical noise, wiring length, and applied voltage.

As Table 7.2 shows, separate the input and output signal lines, depending on the wiring length.

Table 7.2 I/O Signal Line Cable Installation

Wiring Distance	Description
30 m max	• DC output signal lines and DC input signal lines may be contained in the same duct. AC output signal lines and AC input signal lines also may be contained in the same duct. • DC input/output signal lines and AC input/output signal lines should be contained in their respective ducts, separately.
3-300 m	• DC input signal lines, DC output signal lines, AC input signal lines and AC output signal lines should be contained in their respective ducts, separately. • Where induced voltage is high, connect a dummy resistor or use the totally shielded cables.
300 m min	• Do not use cables over 300 m, in view of the rush current to the output module. • Where the wiring distance is over 300 m, use a relay, and limit the wiring length between the relay and the control panel within 300 m.

Note: Ground the shield of shielded cable at one point at the I/O panel side.

(2) Wiring Line to be Laid

As Table 7.3 shows, classify the signal cables to be laid into three groups, and handle the U84 -related input/output signal line cables as group 1 .

Table 7.3 Wiring Line to be Laid

Group	Contents
Group 1 Low-voltage Control Circuit	Low-voltage control circuits of 200 VAC or less and 250 VDC or less.
Group 2 General Control Circuit	Circuits of 600 VAC or less and 750 VDC or less with a current of 20 A or less.
Group 3 Low-voltage Main Circuit	Circuits of 600 VAC or less and 750 VDC or less with a current of 20 A or more.

(3) Separation of Cables being Laid

As Table 7.3 shows, classify the signal cables to be laid into three groups. Then, the U84-related input/output signal line cables (Group 1) must be laid 10 cm apart from Group 2 and 20 cm apart from Group 3.

If the separation is impossible, use group- shielded cables and partition them with steel plates.

7.4 LAYING COAXIAL CABLES

7.4.1 Wiring in Panel

(1) Use coaxial cables sized 5C or more in the panel. Select the proper coaxial cables from Tables 4.2 and 4.4. These are all 5C-FB cables attached with connectors.

(2) Do not place the coaxial cable in the conduit duct. Separate the U84 input and output signal lines and lay each singly.

(3) When bending a coaxial cable, its radius must be 10 times or greater than the finished diameter of the coaxial cable. If the bend is too sharp, the characteristic may be degraded and a transmission error may result.

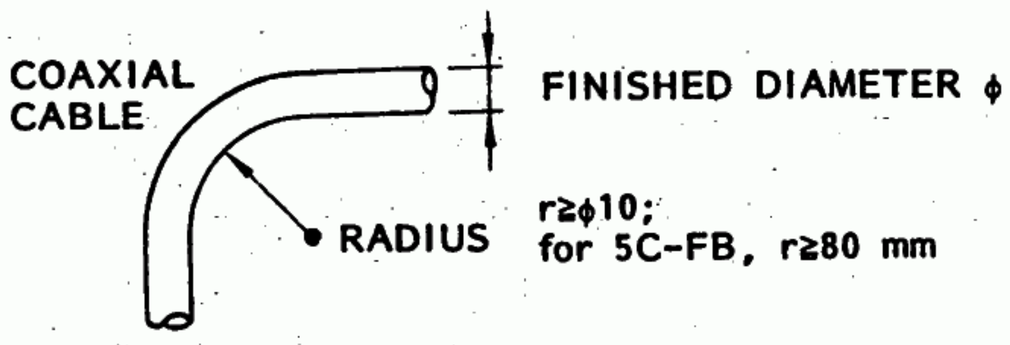


Fig. 7.6 Bending Coaxial Cable (Class 5C-FB)

(4) Firmly tighten type F connector, if used to connect taps or junction adapter. Poor contact may result in transmission error.

(5) When a type F connector or BNC connector is connected to a tap, splitter, junction adapter, remote I/O driver, or remote I/O receiver, clamp the coaxial cable as shown in Fig. 7.7, so that no force is imposed on the connected area.

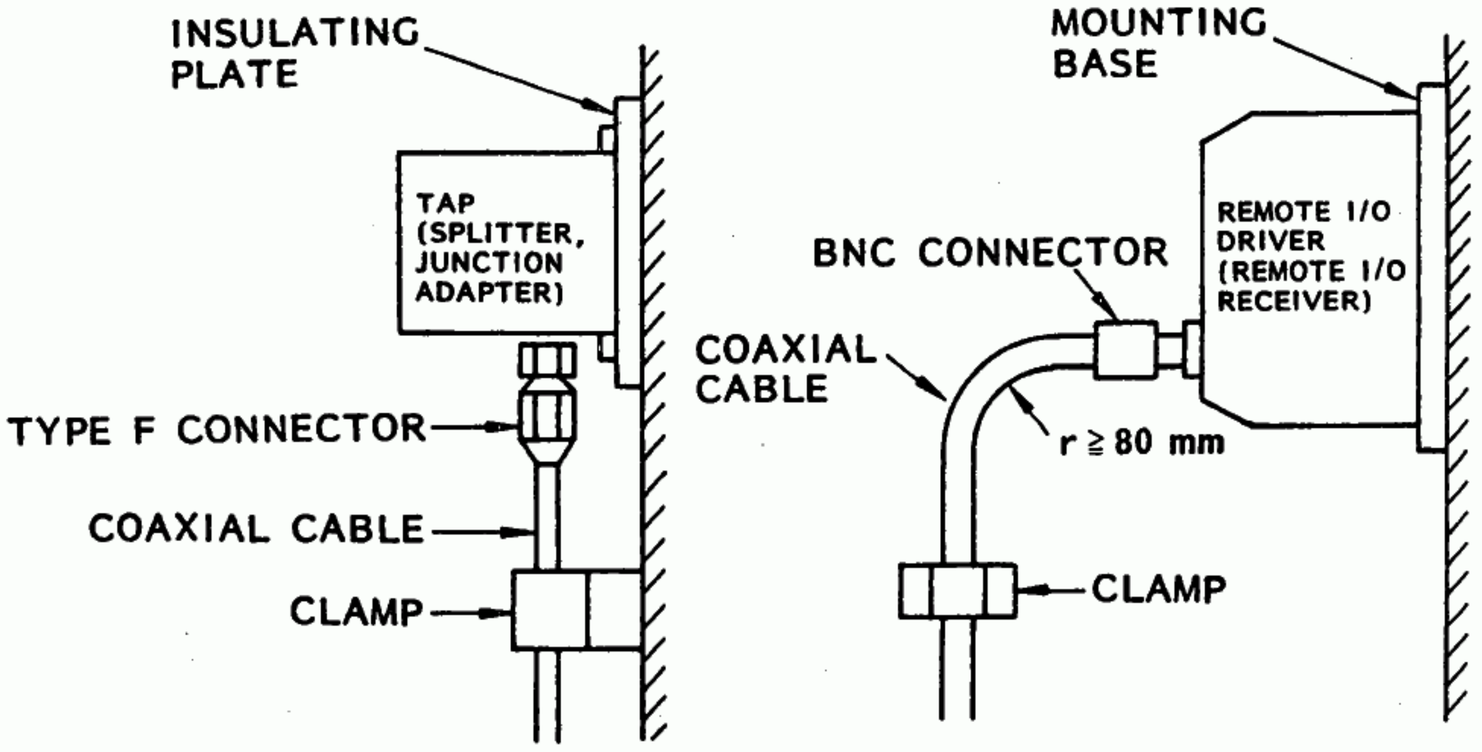


Fig. 7.7 Clamping Coaxial Cables

(6) Install tap, splitter, and junction adapter in the remote I/O panel. Install a tap through the attached insulating plate.

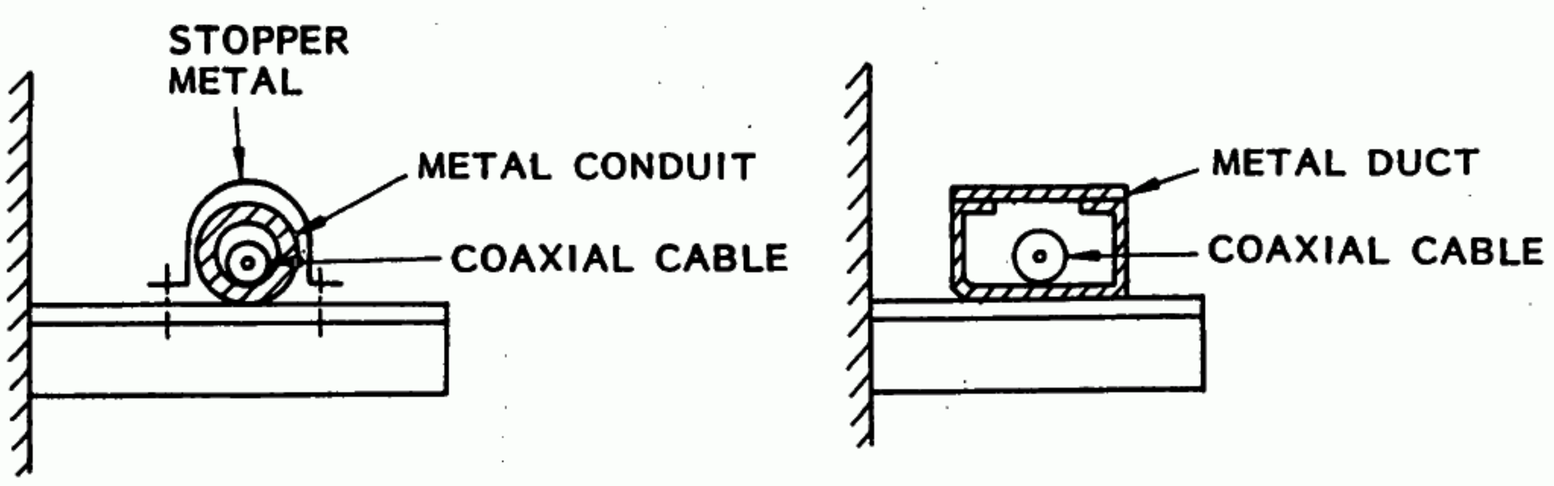
7.4.2 Wiring Panel to Panel (Indoors)

Use coaxial cables sized 5C or more to connect remote I/O panels to one another (indoors). From Table 4.1, select the proper trunk-line coaxial cable to meet the transmission length being used.

As described in Par. 4.2, the transmission length is limited by the number of remote I/O receivers and the size of coaxial cables used.

(1) For Classes 5C-FB and 7C -FB

(a) Place a coaxial cable of 5C-FB or 7C-FB class singly in metal conduit or duct. Make sure to ground the metal conduit or duct at both ends and at as many intermediate positions as necessary.



(a) Metal Conduit (b) Metal Duct

Fig. 7.8 Laying Coaxial Cables (Classes 5C-FB and 7C-FB)

(b) Using a flexible conduit connect, metal conduit to make conductive where it is bent. The radius of bent conduit must be 20 times or greater than the finished diameter of the coaxial cable.

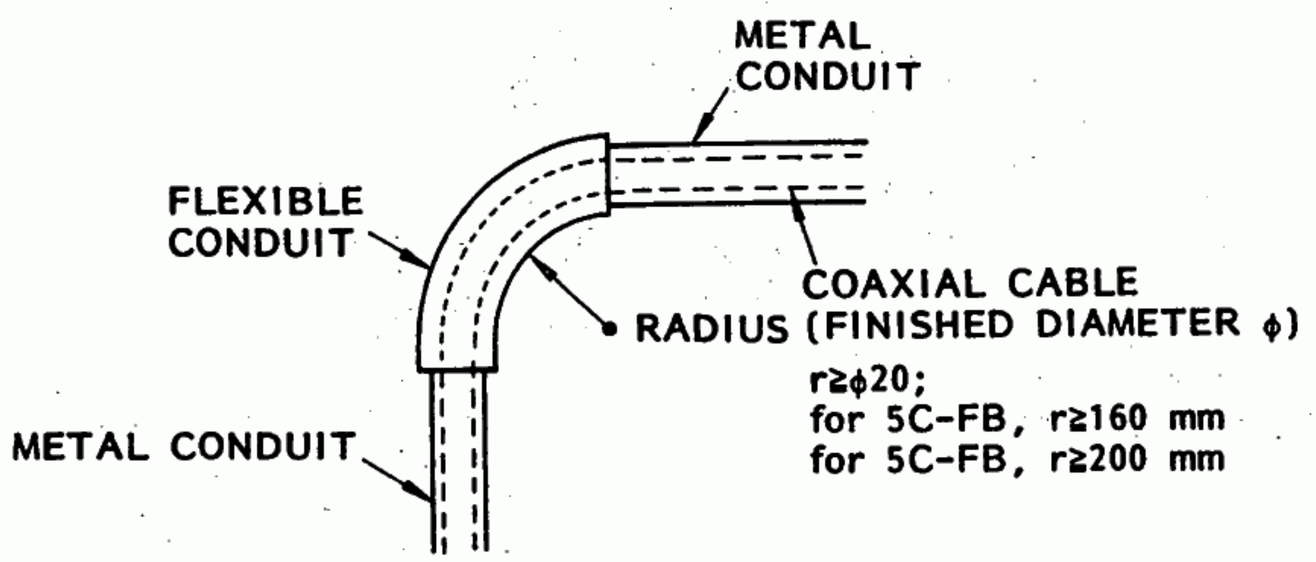


Fig. 7.9 Bending Metal Conduit

(c) When a class 5C-FB or 7C-FB coaxial cable is housed in the same pit used for general control circuits and low-voltage main circuits, separate the trays (as shown in Fig. 7.10) as far as possible.

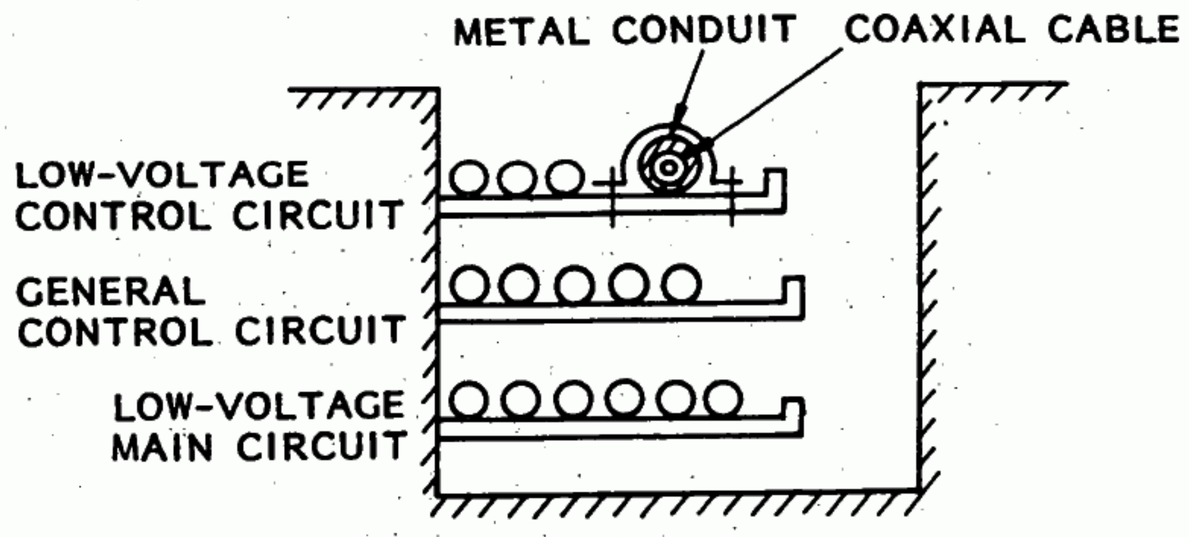


Fig. 7.10 Separating Trays(Classes 5C-FB and 7C-FB)

(d) When extending coaxial cables of class 5C-FB or 7C-FB, use type F-A junction connectors. However, when extending in the control panel, use type T-0170 junction adapters.

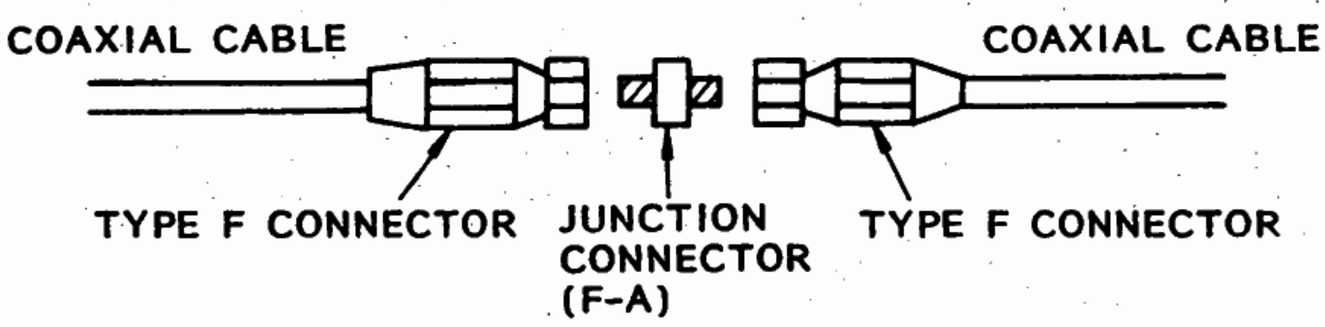


Fig. 7.11 Connecting Coaxial Cables

Apply self-fusion tape to protect the connection of junction connector from moisture. Also insulate the connection from ground. To connect type F connectors, do so after laying coaxial cables. If connected before laying, undue force may be applied to the connection and the type F connector may be disconnected from the coaxial cable.

(2) For Class 11C-4AF

(a) Run a class 11C-4AF coaxial cable singly in a metal duct, because it is difficult to run it in a conduit.

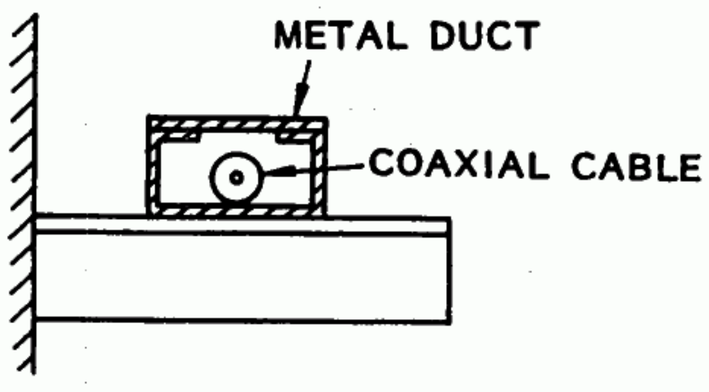


Fig. 7.12 Laying Coaxial Cables (Class 11C-4AF)

(b) When bending a class 11C-4AF coaxial cable, the bending radius must be 20 times or greater than the finished bend diameter of the coaxial cable.

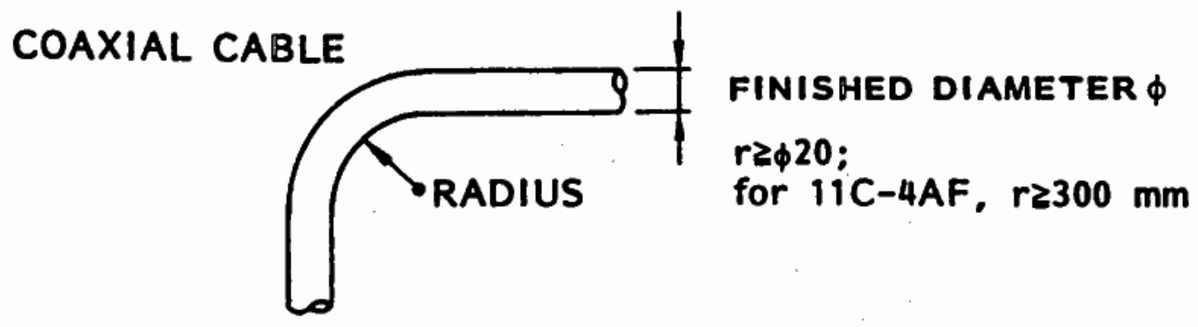


Fig. 7.13 Bending Coaxial Cable (Class 11C-4AF)

(c) When connecting class 11C-4AF coaxial cables to tap, first connect it to a class 5C-FB coaxial cable outside the panel, as shown in Fig. 7.14, then draw it into the remote I/O panel.

Apply self-fusion tape to protect the connection (conversion adapter zone) of the class 11C-4AF or 5C-FB coaxial cables from moisture. Also secure the connection so that it is not blocked. When securing, insulate the connection from ground.

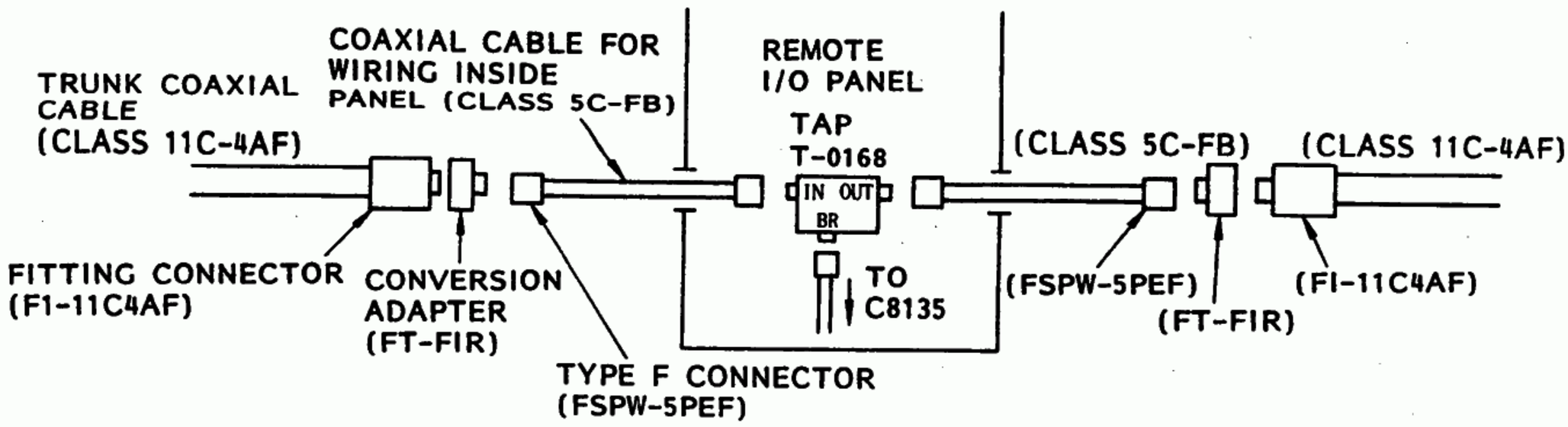


Fig. 7.14 Leading in Coaxial Cable of Class 11C-4AF

7.4.2 Wiring Panel to Panel (Indoors) (Cont'd)

(d) When class 11C-4AF coaxial cables are housed in the same pit used for general control circuit and main circuits, separate the trays as shown in Fig. 7.15

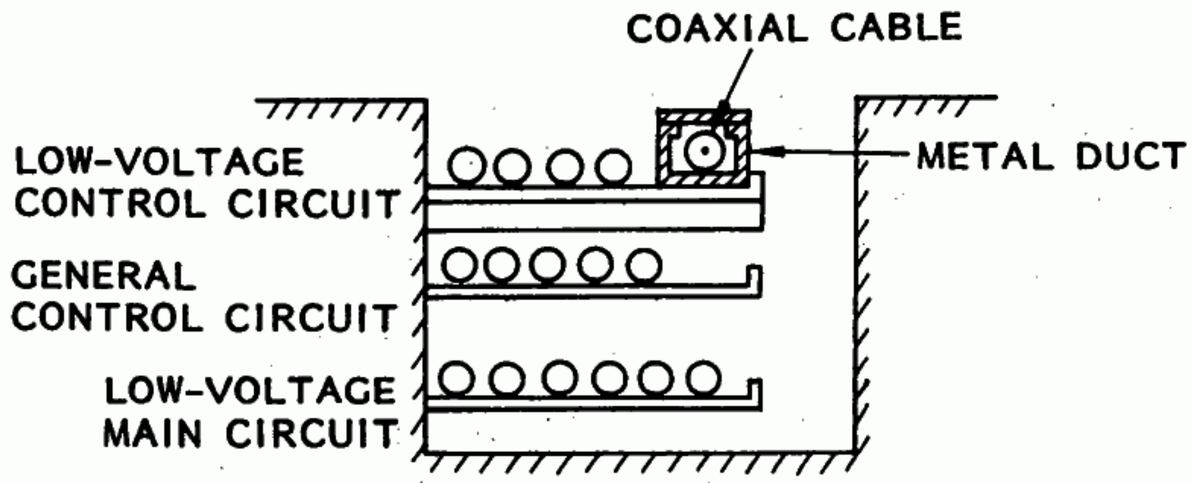
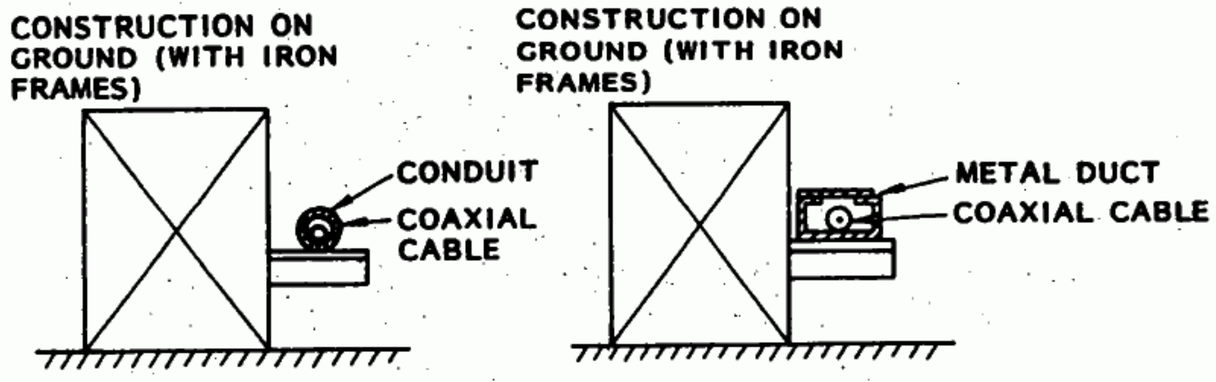


Fig. 7.15 Separating Trays (Class 11C-4AF)

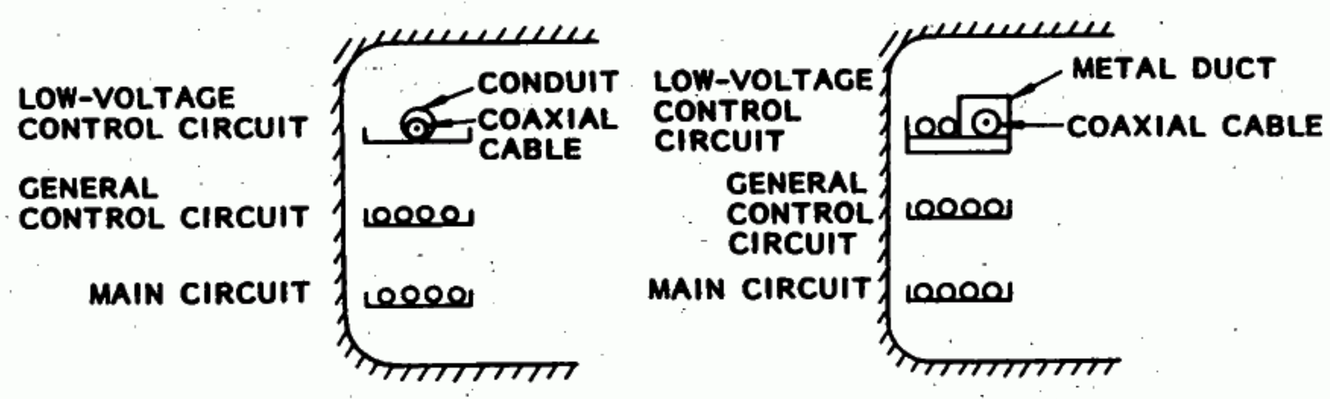
7.4.3 Wiring Panel to Panel (Outdoors)

Use class 7C-FB or 11C-4AF trunk coaxial cable, depending on transmission length. The laying procedure of coaxial cables is the same as described in Par. 7.4.2. Wiring Panel to Panel (Indoors). When outdoors, pay special attention to the following.

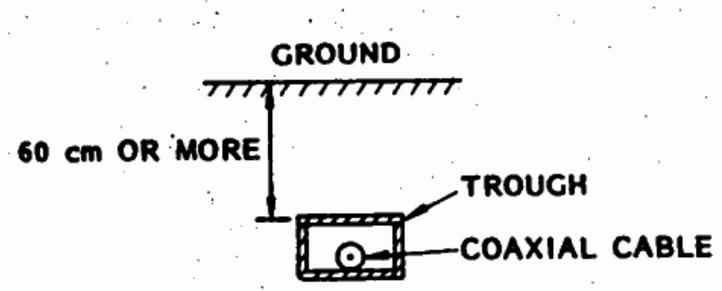
(a) When laying coaxial cables outdoors, lay along the construction (with iron frames) on the ground. If no construction is available, house the cables in an underground pit or tunnel or bury the cable in the ground.



(a) Construction on Ground



(b) Underground Pit or Tunnel



(c) Underground

Fig. 7.16 Laying Coaxial Cables between Buildings

(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 U84 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 is extended by 25 cm 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 to the cable at the inlet and outlet of the metal conduit, so that the change 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.

8. U84 SYSTEM STATUS

It is possible to display the U84 system status by entering a special number which is described below. 3 and 0 are fixed.

30××××

Adress (hex) of Location Storing System Status

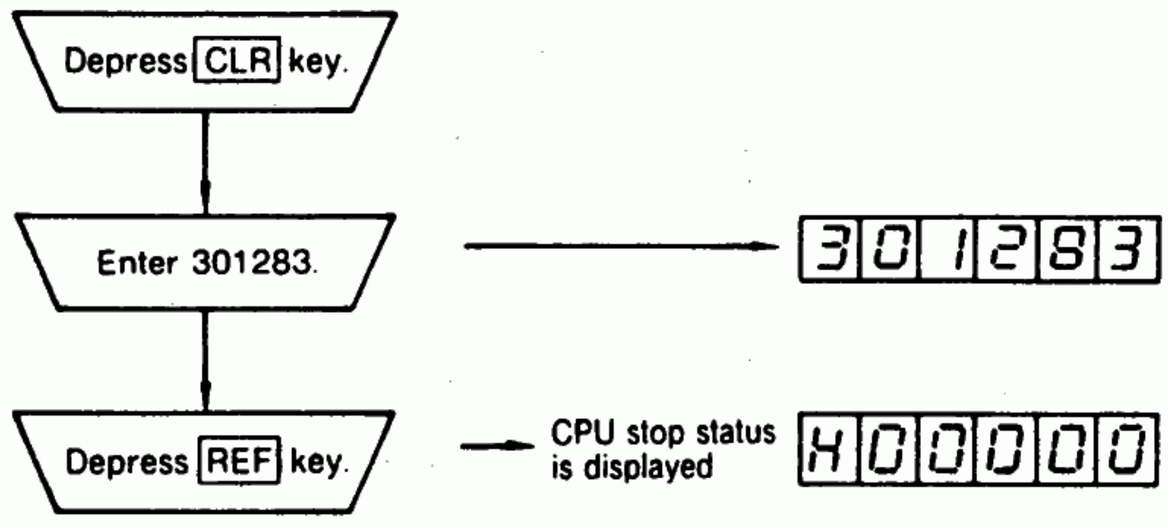
Table 8.1 shows the addresses of the locations where the U84 system status is stored.

Table 8.1 U84 System Status

Address (Hexadecimal)	System Status	Order	Page
1282	U84 machine status	1	55
1283	U84 stop status	2	55
1284	Local I/O CH1 status	3	56
1285	Local I/O CH2 status	4	56
1286	Remote I/O CH1 status	5	56
1287	Remote I/O CH2 status	6	56
1288	Remote I/O CH3 status	7	56
1289	Remote I/O CH4 status	8	56
128A	Remote I/O CH5 status	9	56
128B	Remote I/O CH6 status	10	56
128C	Remote I/O CH7 status	11	56
128D	Remote I/O CH8 status	12	56
128E	Communication module status	13	56
128F	Local I/O driver module status	14	56
1290	No.1 ASCII module status	15	57
1291	No.2 ASCII module status	16	57
1292	No.3 ASCII module status	17	57
1293	No.4 ASCII module status	18	57
1294 to 1096	For future expansion	19 to 21	–

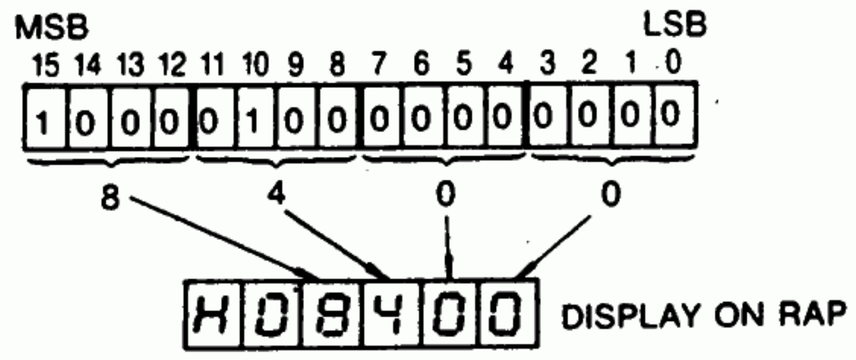
Note: The status shown above may be read with a STAT Command in a ladder circuit. The order means that read with STAT.

Operate as follows to read the CPU stop status, for example.



- The data is displayed in hex form at first.
- The address ×××× is incremented (decremented) by one every time you push NEXT (PREV).

The system status is indicated by bit patterns or codes. A 16-bit binary data can be displayed in hex form as follows.



Each hex digit is displayed by four binary digits as follows. The relationship between the binary and hex indications permits us to know what bits are 1 from the indication on RAP.

Hexadecimal	Binary	Hexadecimal	Binary
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

8. U84 SYSTEM STATUS (Cont'd)

(1) U84 Machine Status (Address 1282)

Bit	Description
Bit 0(0001)	No allocation
Bit 1(0002)	
Bit 2(0004)	
Bit 3(0008)	For future expansion
Bit 4(0010)	Watchdog timer error of No.1 ASCII module
Bit 5(0020)	Watchdog timer error of No.2 ASCII module
Bit 6(0040)	Watchdog timer error of No.3 ASCII module
Bit 7(0080)	Watchdog timer error of No.4 ASCII module
Bit 8(0100)	Watchdog timer error of communication module
Bit 9(0200)	Watchdog timer error of local or remote I/O driver module
Bit 10(0400)	Scan stop
Bit 11(0800)	CPU No. in dual system (0: No.1, 1: No.2)
Bit 12(1000)	Battery voltage drop
Bit 13(2000)	No allocation (always 1)
Bit 14(4000)	Program memory size: (0: 16 k words, 1: 24 k words)
Bit 15(8000)	Dual flag (0: single, 1: dual)

(2) U84 Stop Status (Address 1283)

Bit	Description
Bit 0(0001)	For future expansion
Bit 1(0002)	
Bit 2(0004)	Local or remote I/O driver module error
Bit 3(0008)	System bus error
Bit 4(0010)	Status memory parity error
Bit 5(0020)	Status memory total check error
Bit 6(0040)	Program memory parity error
Bit 7(0080)	Program memory total check error
Bit 8(0100)	Total check error in I/O allocation table
Bit 9(0200)	Logic solver error
Bit 10(0400)	Real time clock error
Bit 11(0800)	Watchdog timer error
Bit 12(1000)	Illegal network data error
Bit 13(2000)	No start of network
Bit 14(4000)	No end of logic
Bit 15(8000)	U84 system stop

Note: This status alone will be displayed also on the P190 programming panel as follows.
STOPPED U84 SYSTEM ERROR: ××××(hexadecimal)

(3) Local I/O CH1 Status (Address 1284) and CH2 Status (Address 1285)

Status Codes (Hexadecimal)	Description
0000	CH1 or CH2 normal
0001	I/O bus error
0002	I/O busy time out
0004	I/O busy error
0008	No allocation
0010	
0020	

(4) Remote I/O CH1 to CH8 Status (Address 1286 to 128D)

Status Codes (Hexadecimal)	Description
0000	Channel normal
0001	I/O bus error
0002	I/O busy time out
0004	I/O busy error
0008	No response from remote I/O receiver
0010	No I/O data in remote I/O receiver.
0020	Communication error with remote I/O receiver.

(5) Communication Module Status (Address 128E)

Status Codes (Hexadecimal)	Description
00A0	Module normal
00A1	ROM error
00A2	RAM(work address) error
00A3	RAM (for interface) error
00A4 to 00AB	For internal processing
00AC to 00AF	No allocation

(6) Local or Remote I/O Driver Module Status (Address 128F)

Status Codes (Hexadecimal)	Description
0080	Module normal
0081	ROM error
0082	RAM error
0083	I/O allocation table error
0084	I/O channel error
0085	For internal check
0086 to 008E	No allocation
008F	Watchdog timer error

8. U84 SYSTERM STATUS (Cont'd)

(7) No.1 ASCII Module Status (Address 1290)

Status Codes (Hexadecimal)	Description
0010	Module normal (at a standstill)
0018	Module normal (at a RUN)
0011	RAM (message format) error
0012	RAM (message pointer) error
0013	RAM (for interface) error
0014	ROM error
0015	RAM (port parameter) error
0016	Low battery voltage (at a standstill)
001E	Low battery voltage (at a RUN)
0017	No allocation
0019 to 001D	
001F	

(8) No.2 to No.4 ASCII Module Statuses (Address 1291 to 1293)

Only 10-digit number of each status codes is different from those of No.1 ASCII module:

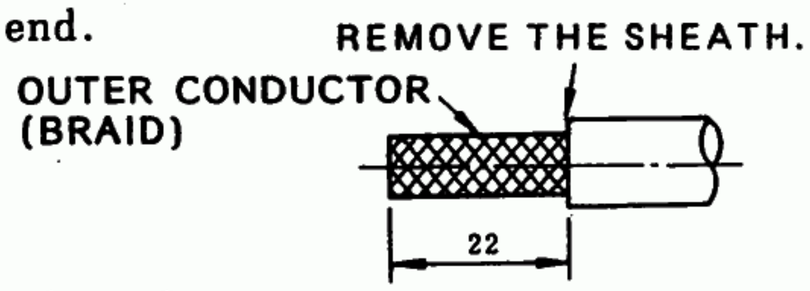
- For No.2 ASCII module–××2×
- For No.3 ASCII module–××3×
- For No.4 ASCII module–××4×

APPENDIX A
COAXIAL CABLE CONNECTOR INSTALLATION PROCEDURE

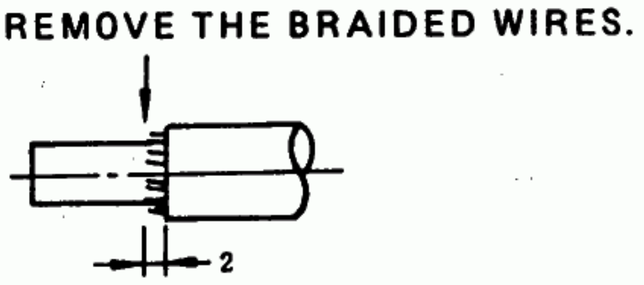
1. Type F Connector Installation Procedure

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

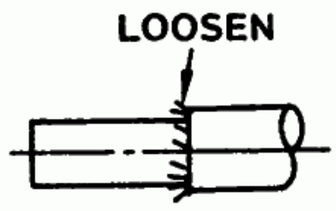
① Remove the sheath to 22㎜ from the cable leading end.



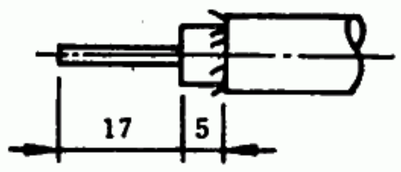
② Using pliers, remove braided wires, leaving them about 2 mm.



③ Loosen the braided wires.

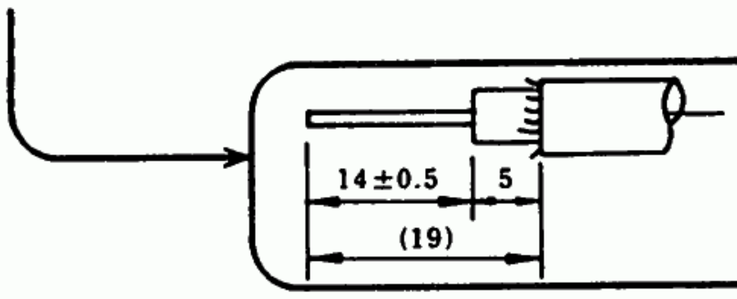


④ Pull out the insulating material 17mm from the leading end.



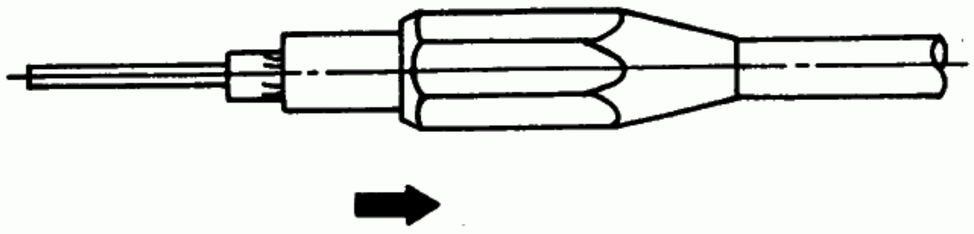
Note: Be sure not to damage the core.

⑤ Cut the core leading, and adjust the bare core to 14±0.5 mm.



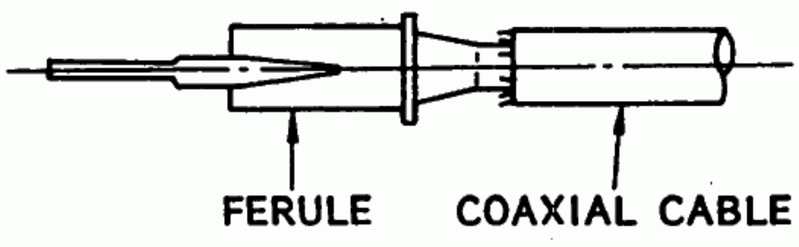
Note:
1. The bare core must be 14±0.5 mm .
2. Leave aluminum foil about 5 mm .
3. Leave braided wires loose.

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



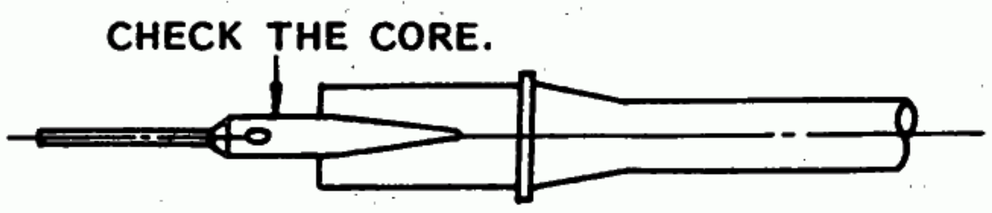
(3) Press a ferule into the coaxial cabel.

① Insert the cable leading into the ferule.



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

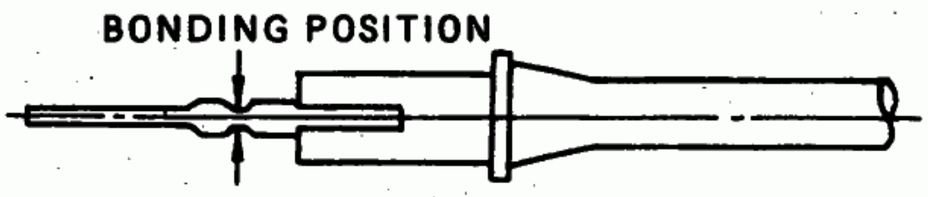
② Check through the contact window to make sure that the core is correctly inserted into the contact.

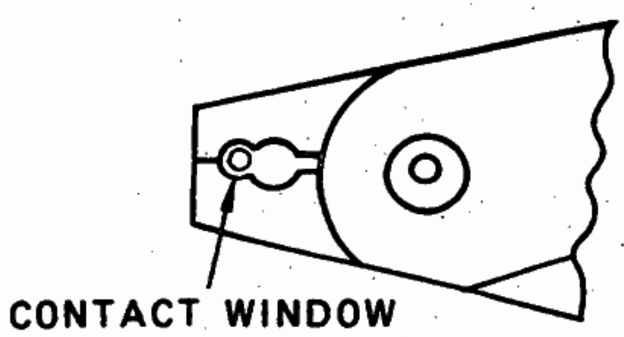


(4) Press to bond the ferule contact.

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.

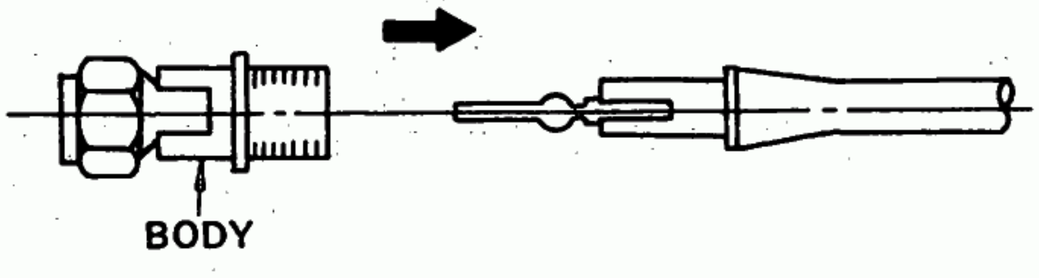




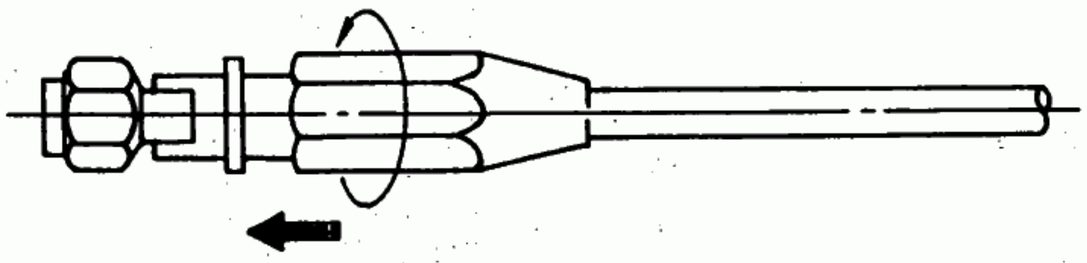
NOTE

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.

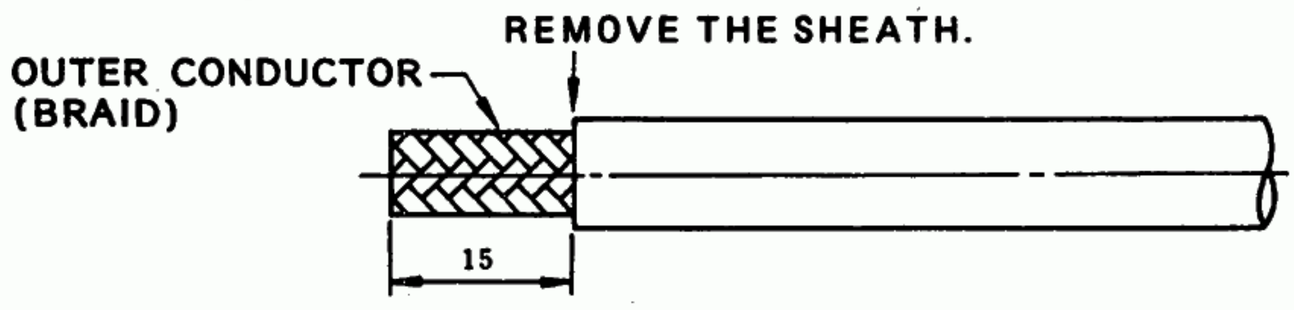


NOTE

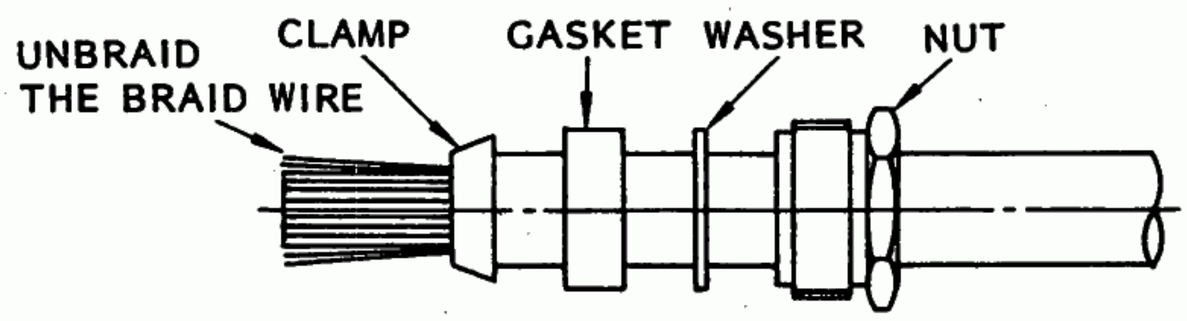
Fix the body and turn the nut for tightening.

2. BNC Connector Installation Procedure

(1) Remove the sheath to 15 mm from the cable leading end.
Use a cutter knife or pipe cutter (IFV 1638).



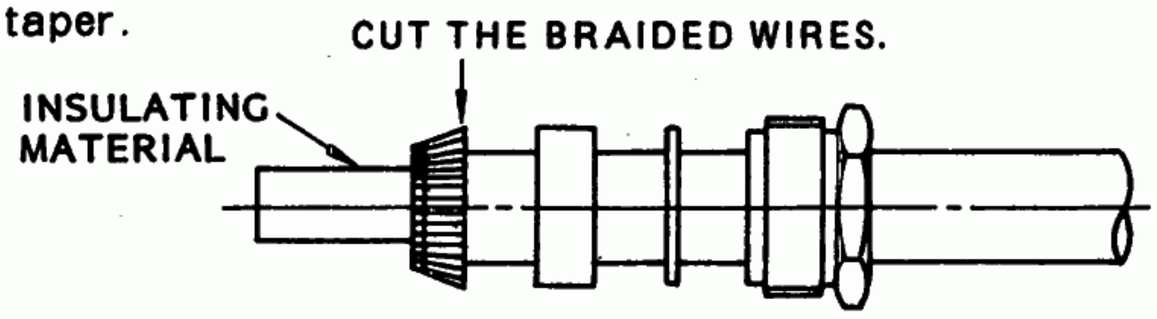
(2) Sequentially insert nut, washer, gasket, and clamp onto the coaxial cable.



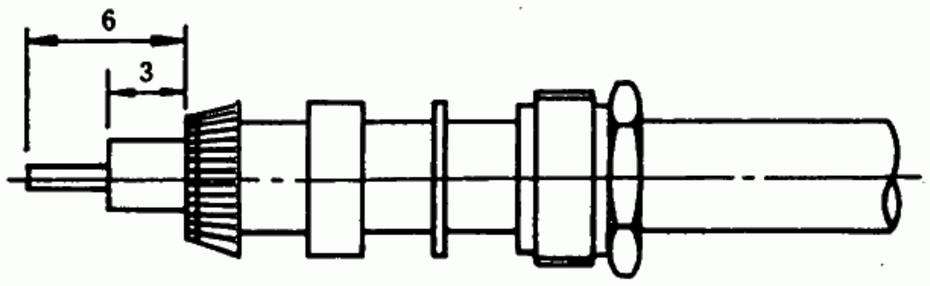
NOTE

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.



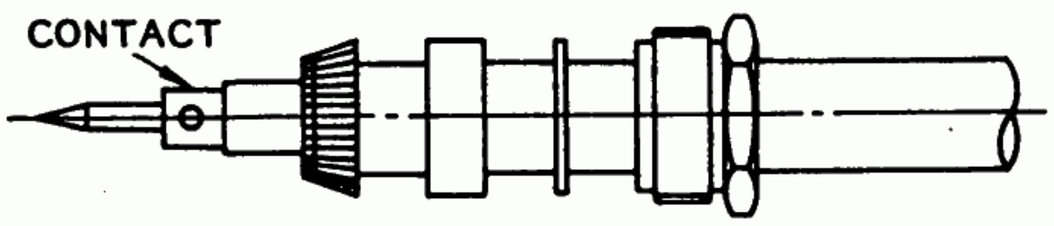
(4) Remove the insulating material, leaving about 3 mm, to expose the core. Cut the core leading end, so that the bare core is 3 mm.



NOTE

Be careful not to damage the core.

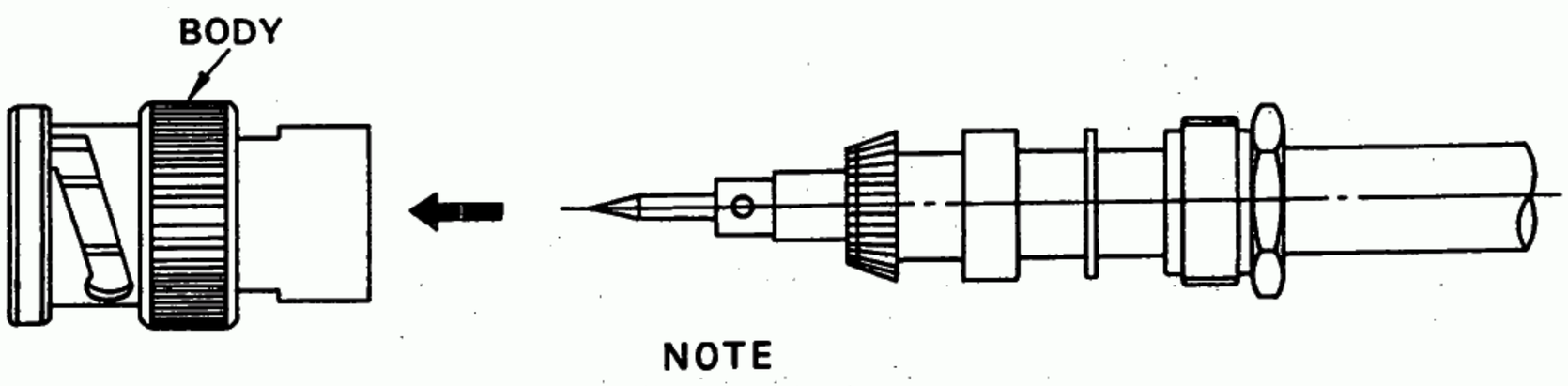
(5) Pass the core through the contact, and solder.



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.

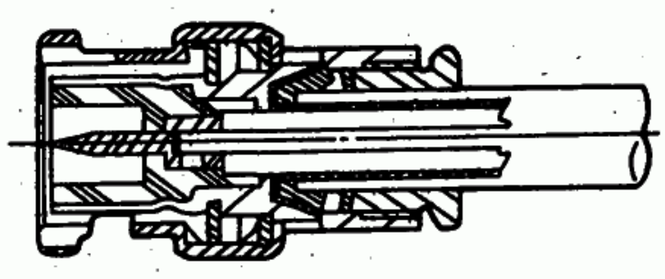
(6) Insert the contact into the body.



NOTE

Insert the contact into the body to the end.

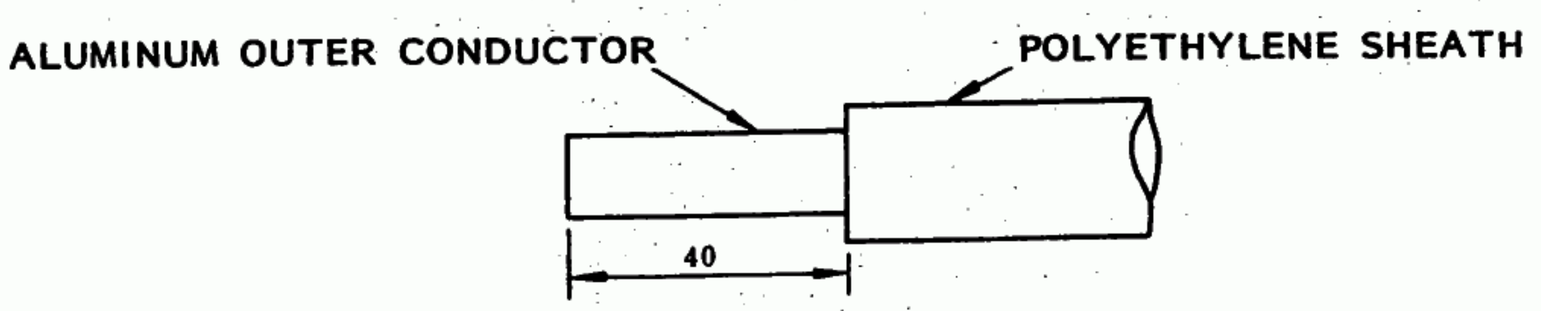
(7) Using a wrench, turn the nut to tighten the body. This completes connector installation.



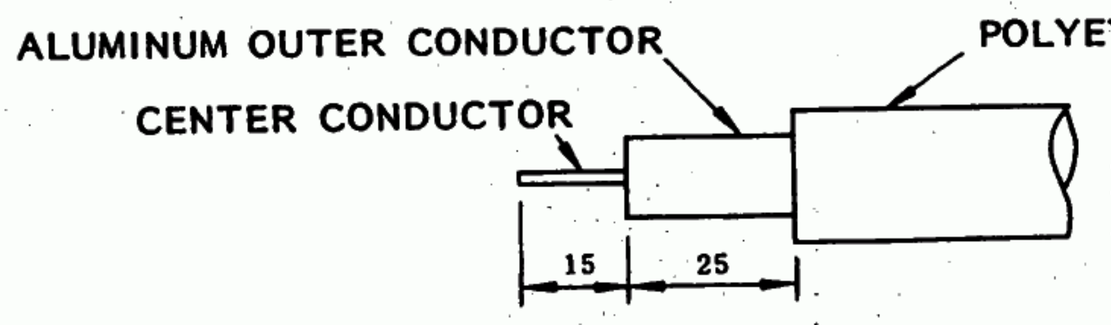
3. Fitting Connector Installation Procedure

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

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



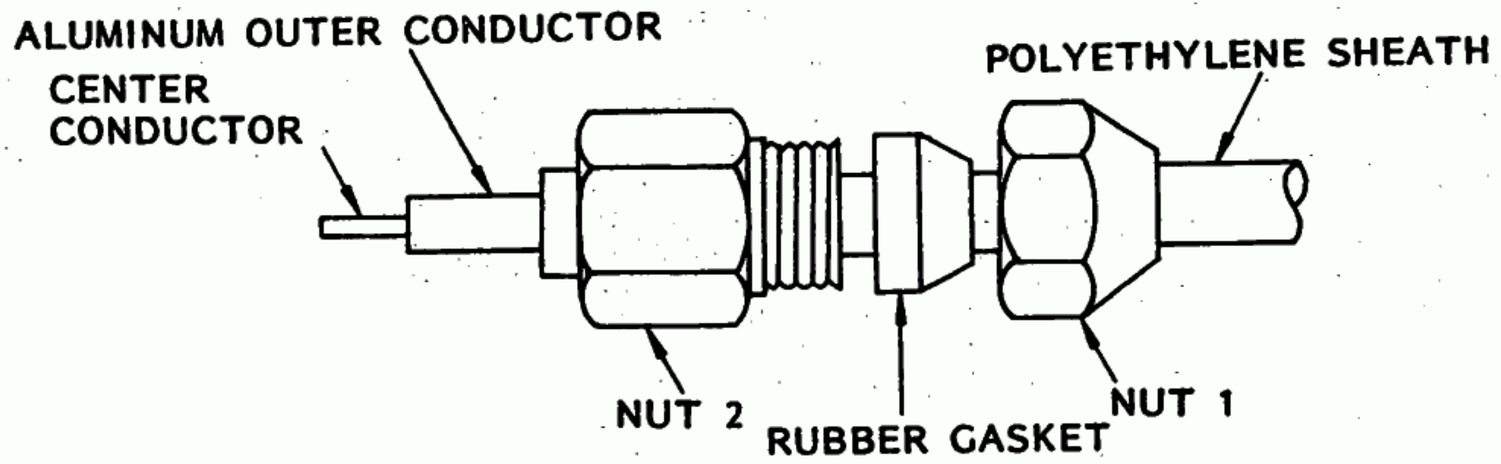
② Remove the aluminum outer conductor and insulating material to 15 mm from the cable leading end.



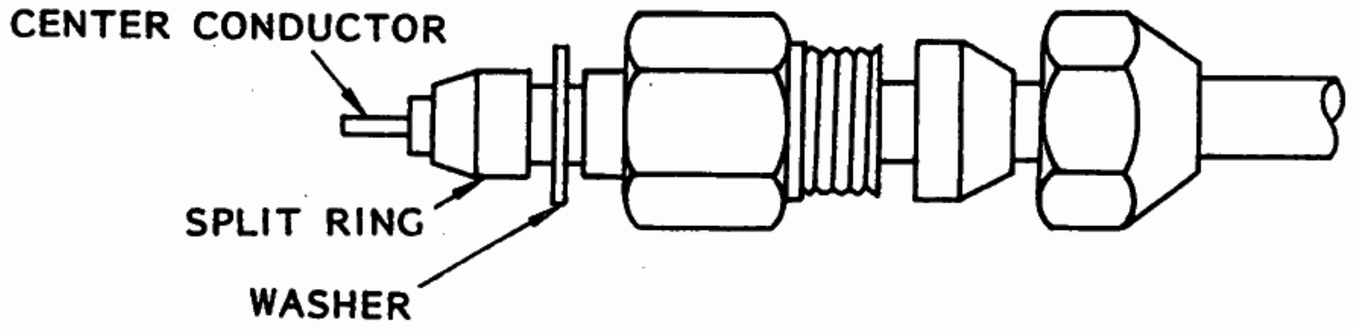
NOTE

Be careful not to bend or damage the center conductor.

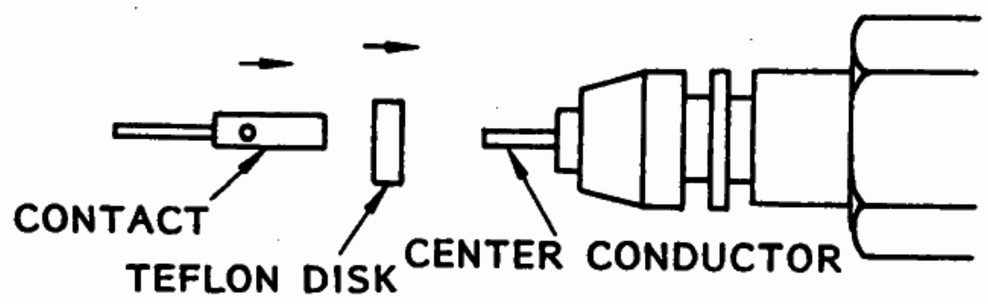
(2) Sequentially insert nut 1, rubber gasket, and nut 2 onto the coaxial cable.



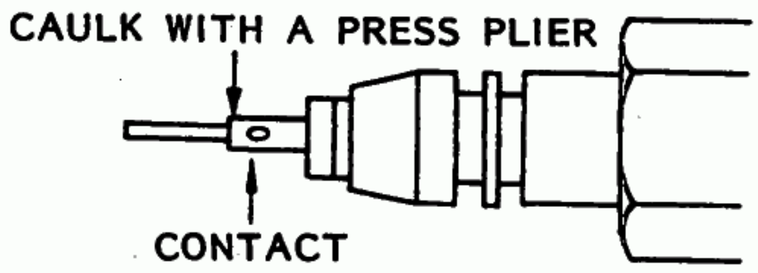
(3) Insert washer and split ring onto the aluminum outer conductor.



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



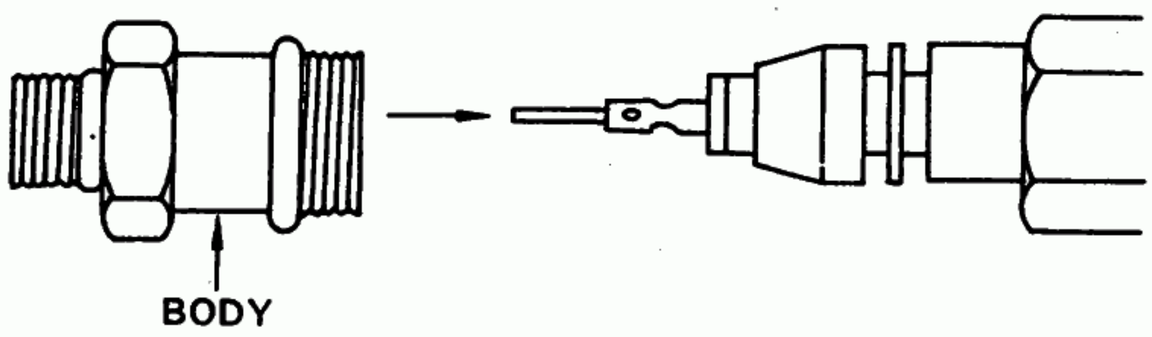
(5) Press to bond the contact, using a 9.5 mm coaxial-cable press -pliers.



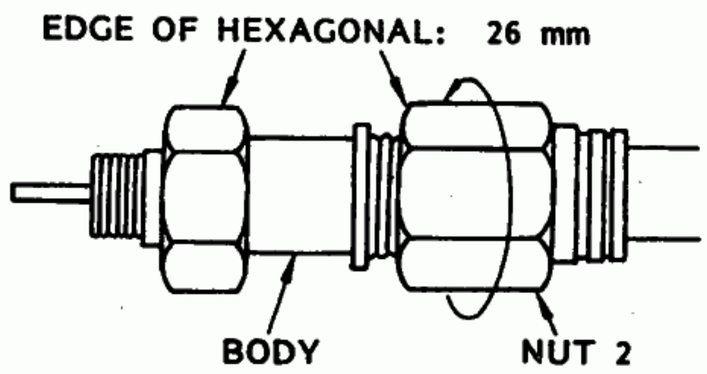
NOTE

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.



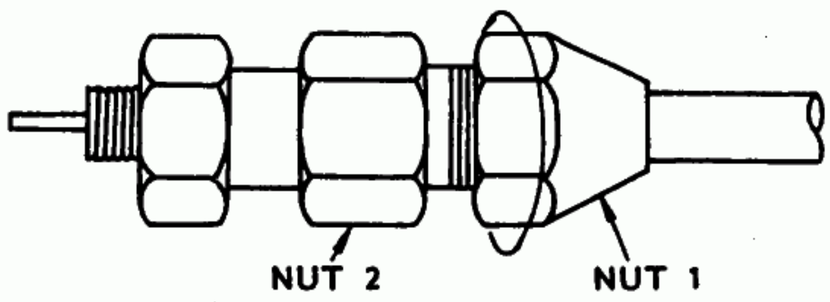
(7) Tighten the body and nut 2 .



NOTE

Fully insert the body and tighten nut 2.

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

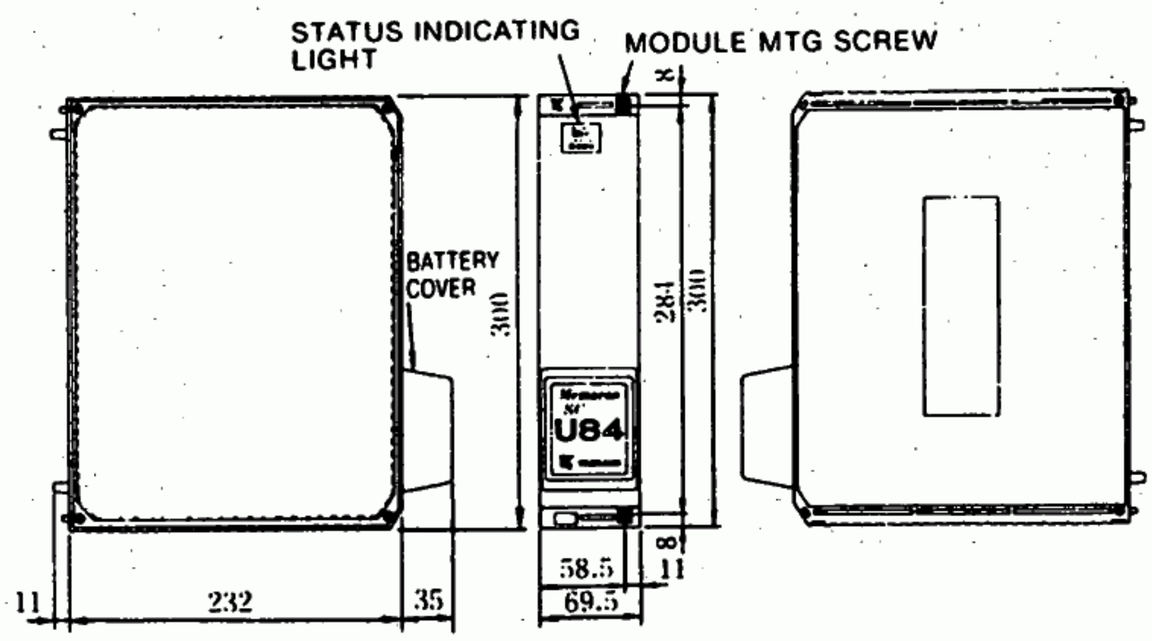


NOTE

Secure nut 2, then turn to tighten nut 1.

APPENDIX B
DIMENSIONS in mm

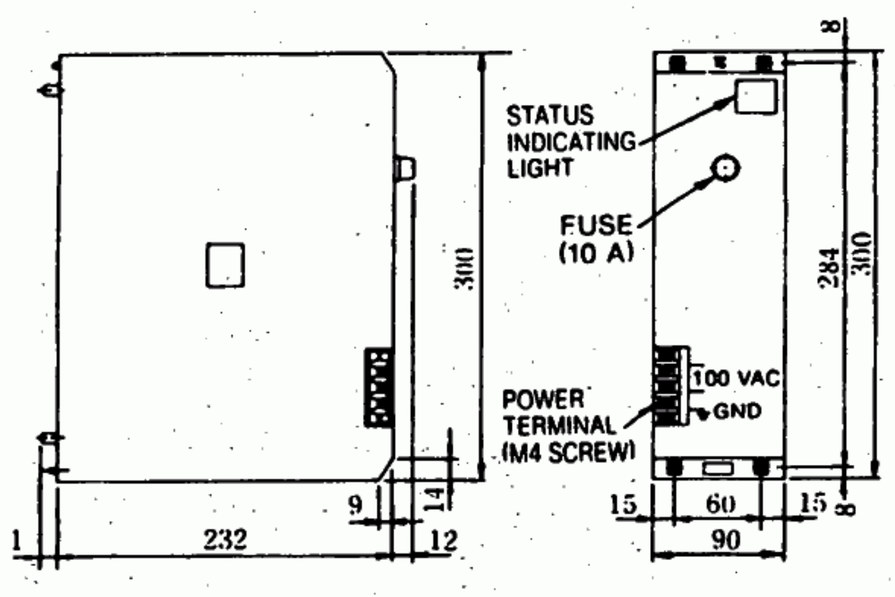
(1) CPU Module Types DDSCR-U84-116, U84-124



APPROX WEIGHT: 2.0kg

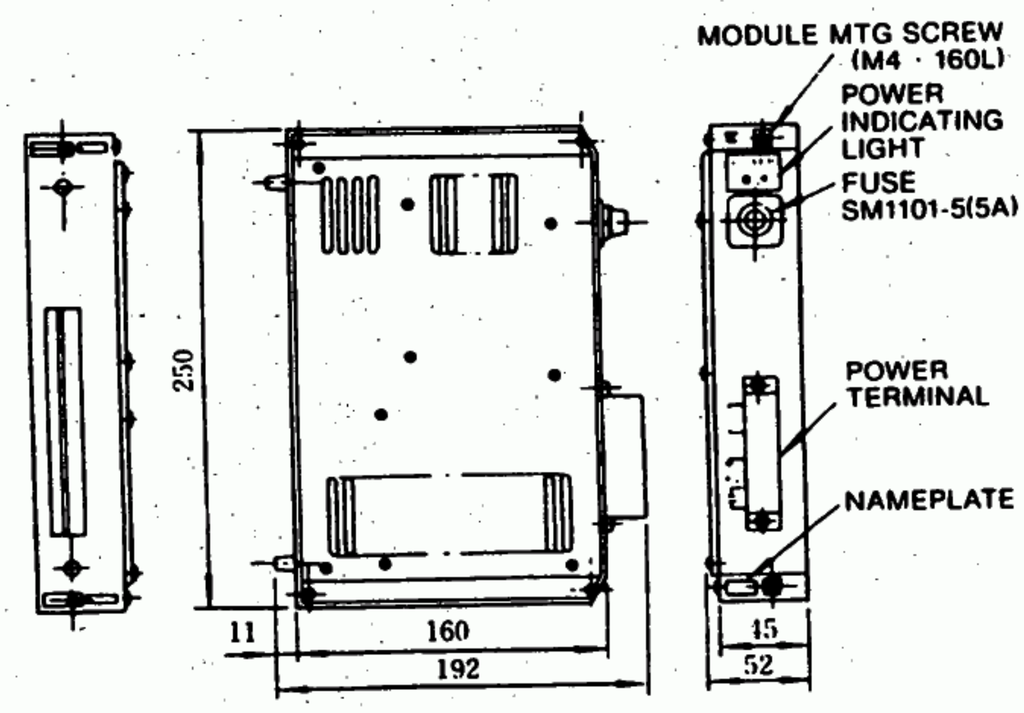
PROGRAM MEMORY	TYPE
16 k	DDSCR-U84-116
24 k	DDSCR-U84-124

(2) Main Power Supply Module Type JRMSP-P8101



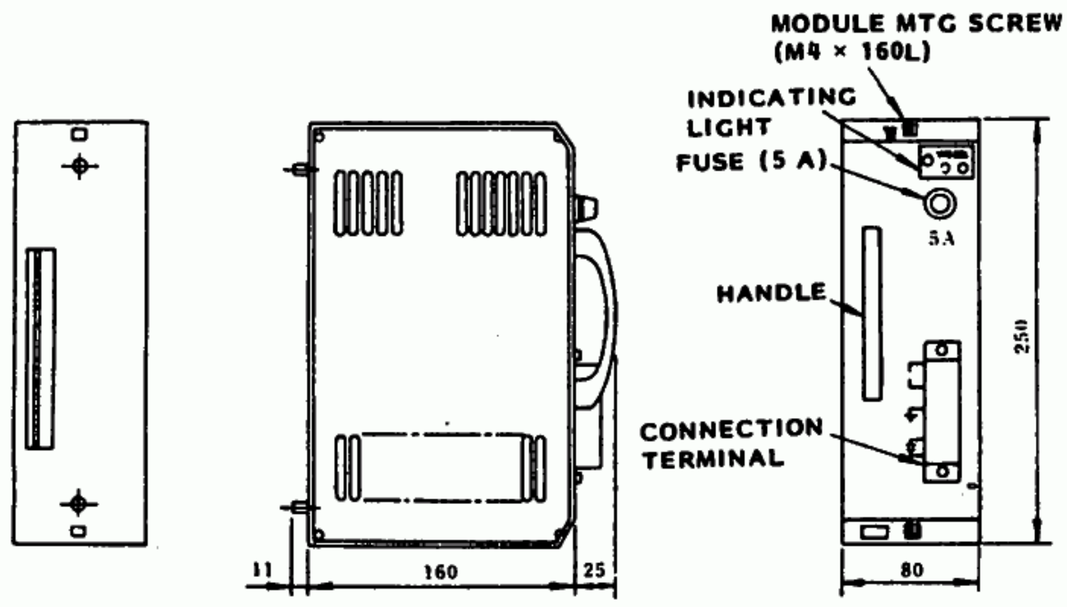
APPROX WEIGHT: 5.0kg

(3) Auxiliary Power Supply Module 1 Type JRMSP-P8054



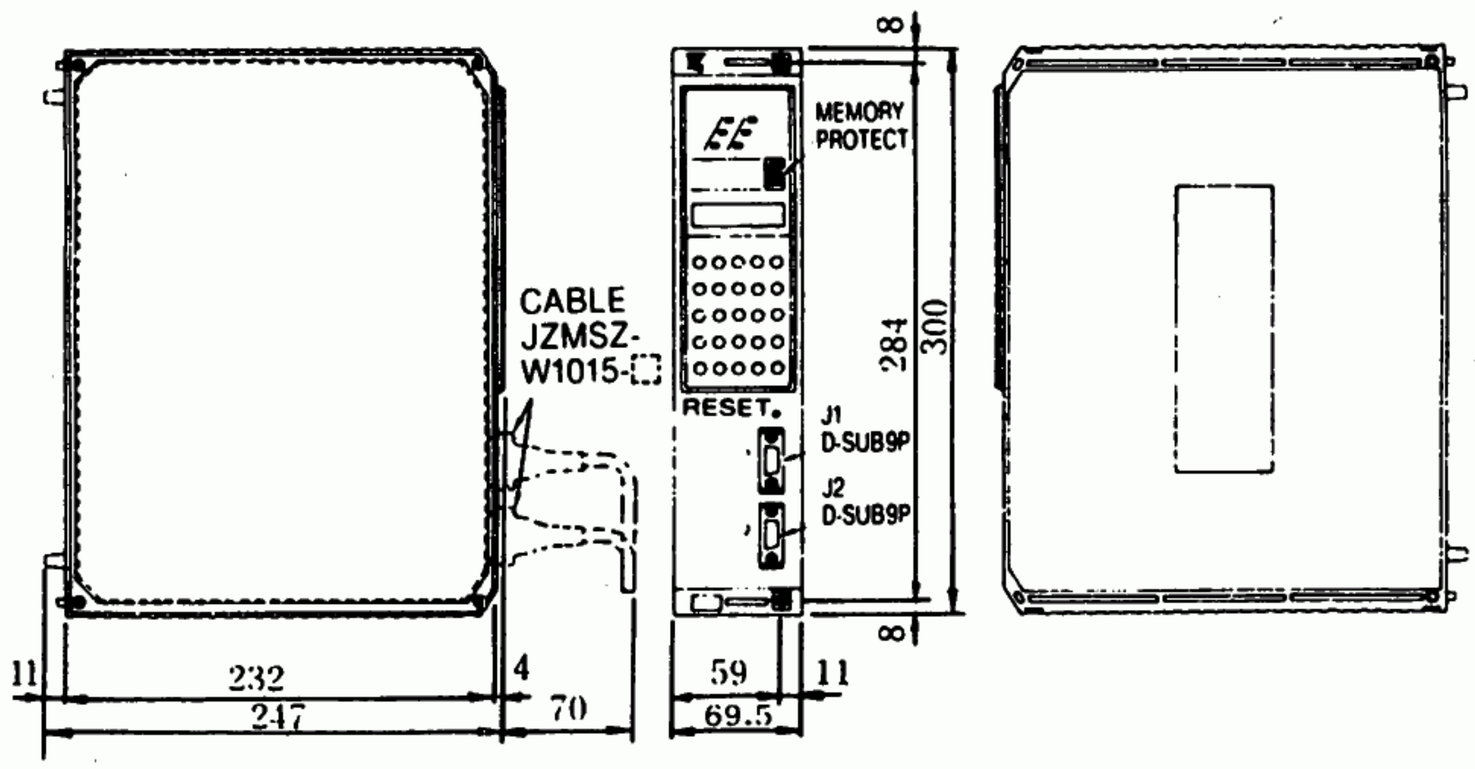
APPROX WEIGHT: 1.1kg

(4) Auxiliary Power Supply Module 2 Type JRMSP-P8051



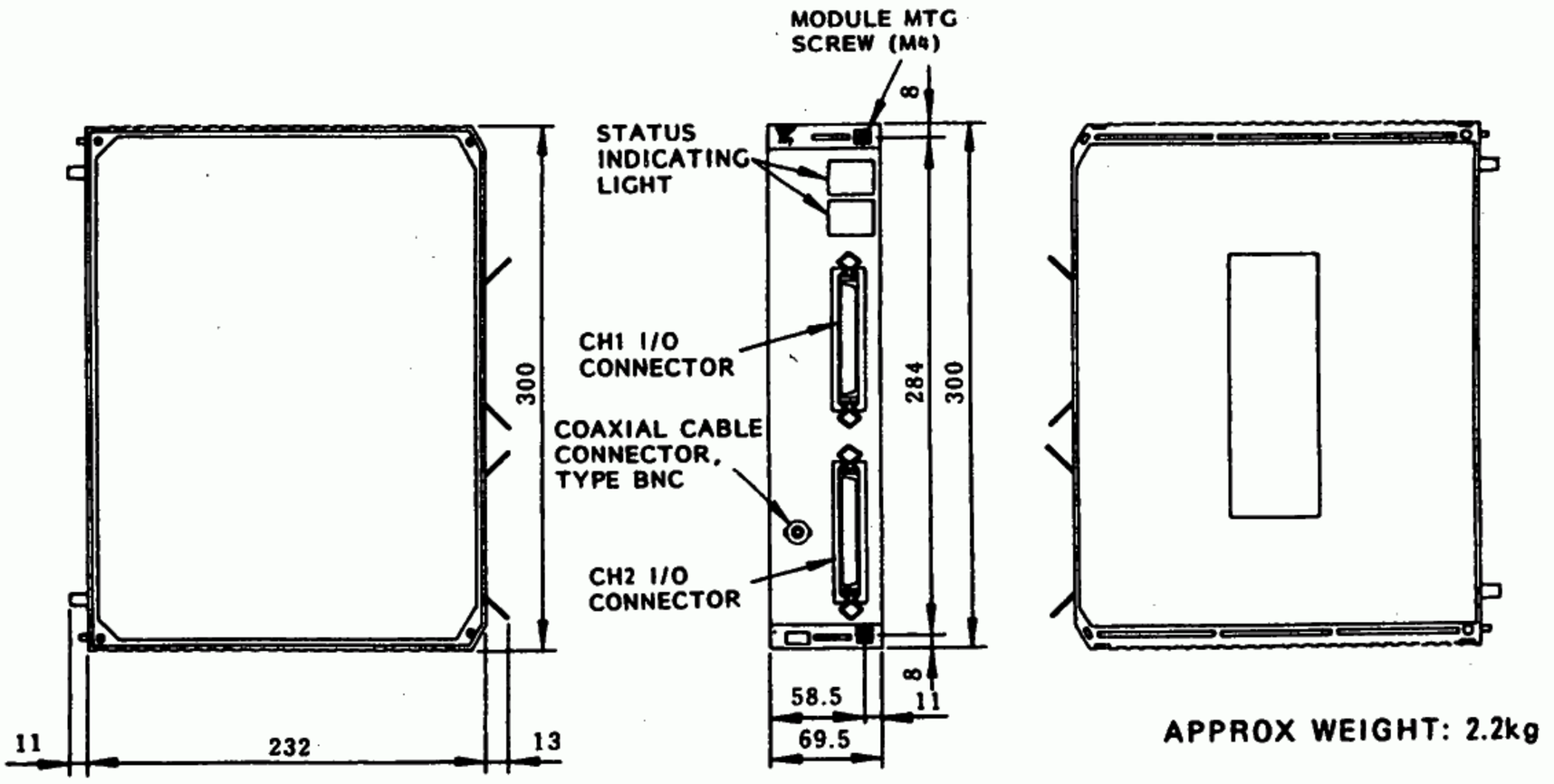
APPROX WEIGHT: 2.8kg

(5) Communication Module Type JAMSC-C8110



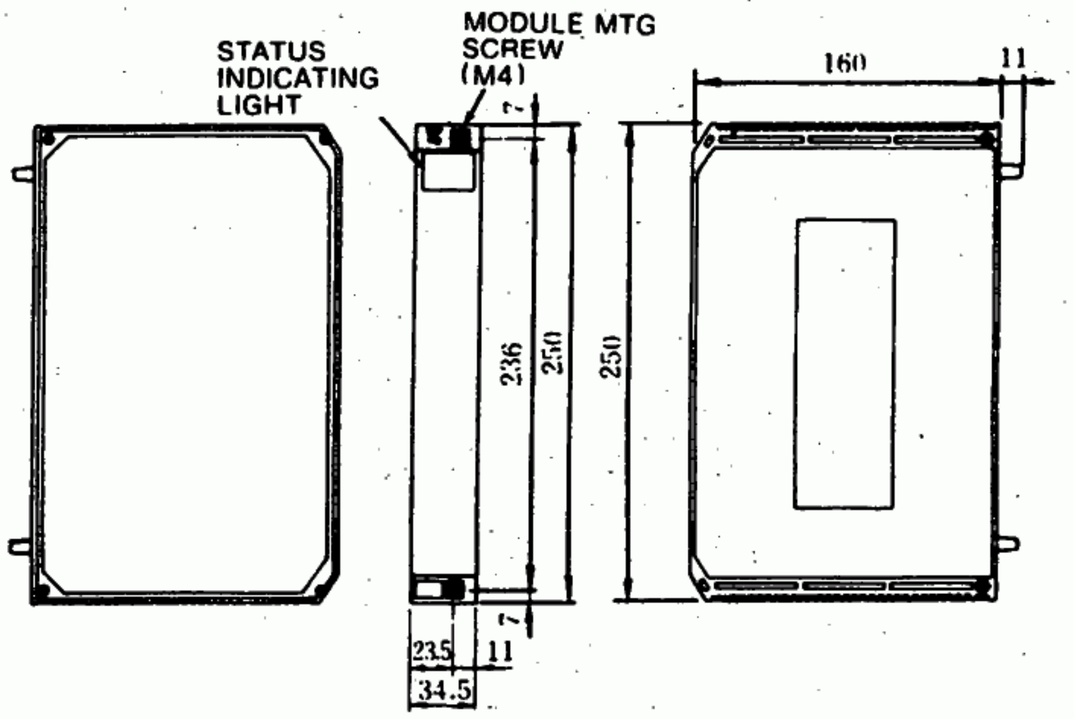
APPROX WEIGHT: 1.4kg

(6) Remote I/O Driver Module Type JAMSC-C8130



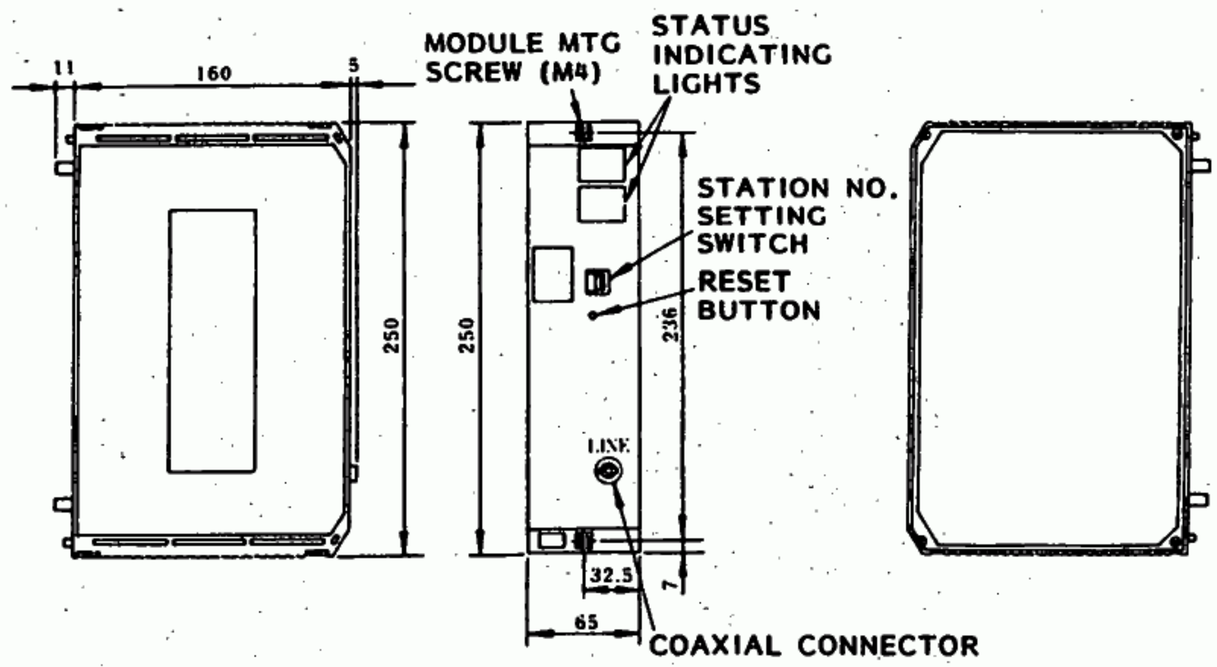
APPROX WEIGHT: 2.2kg

(7) Local I/O Receiver Module Type JAMSC-S8125



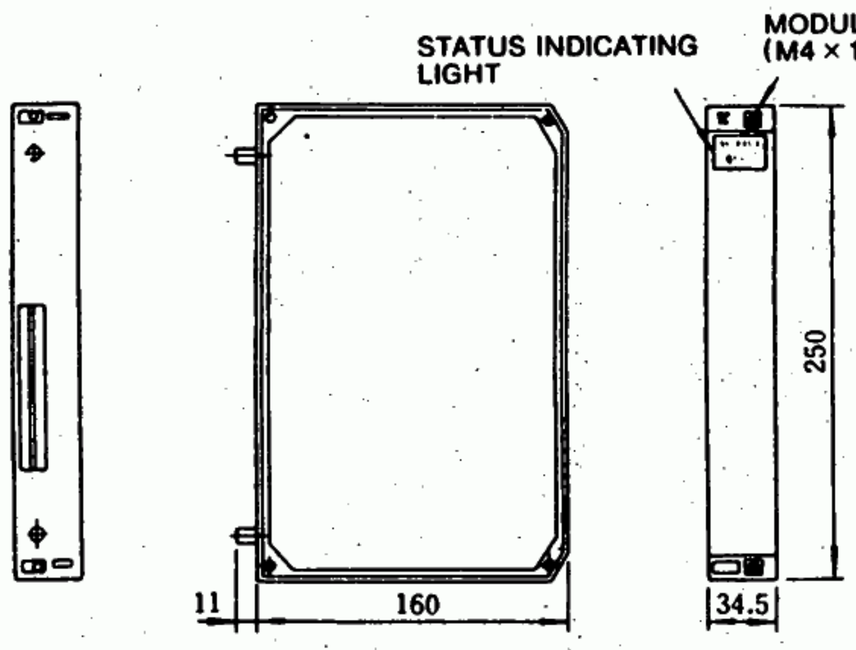
APPROX WEIGHT: 0.7kg

(8) Remote I/O Receiver Module Type JAMSC-C8135



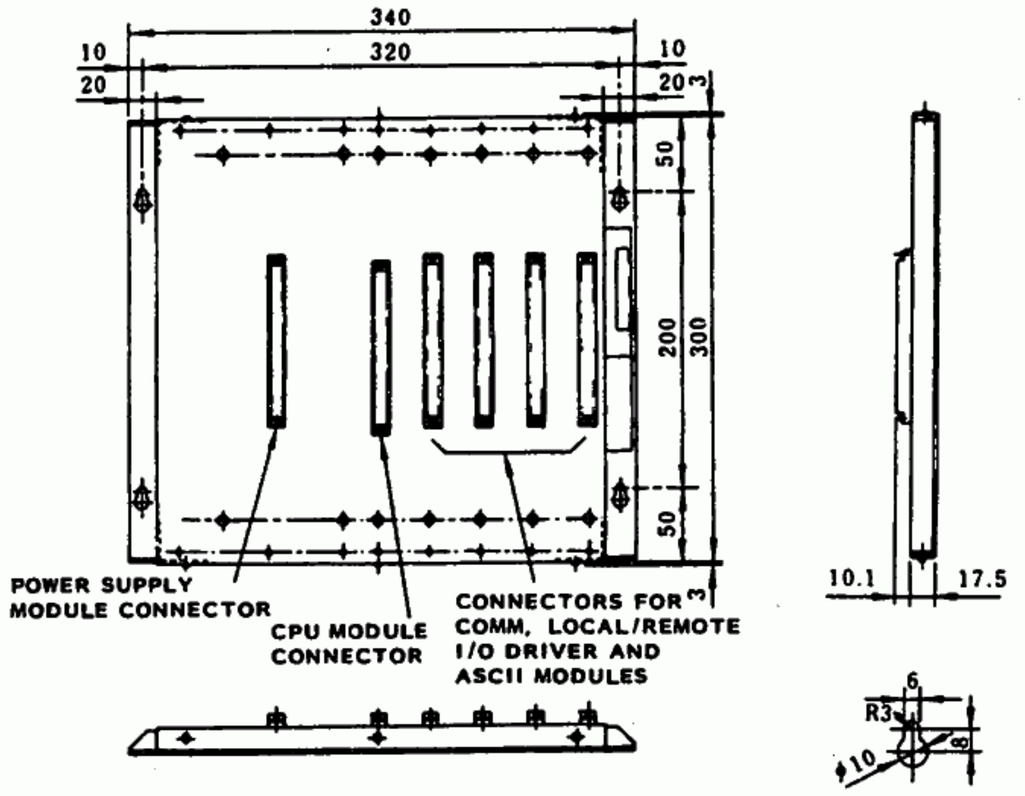
APPROX WEIGHT: 0.8kg

(9) I/O Buffer Module Type JAMSC-B1011



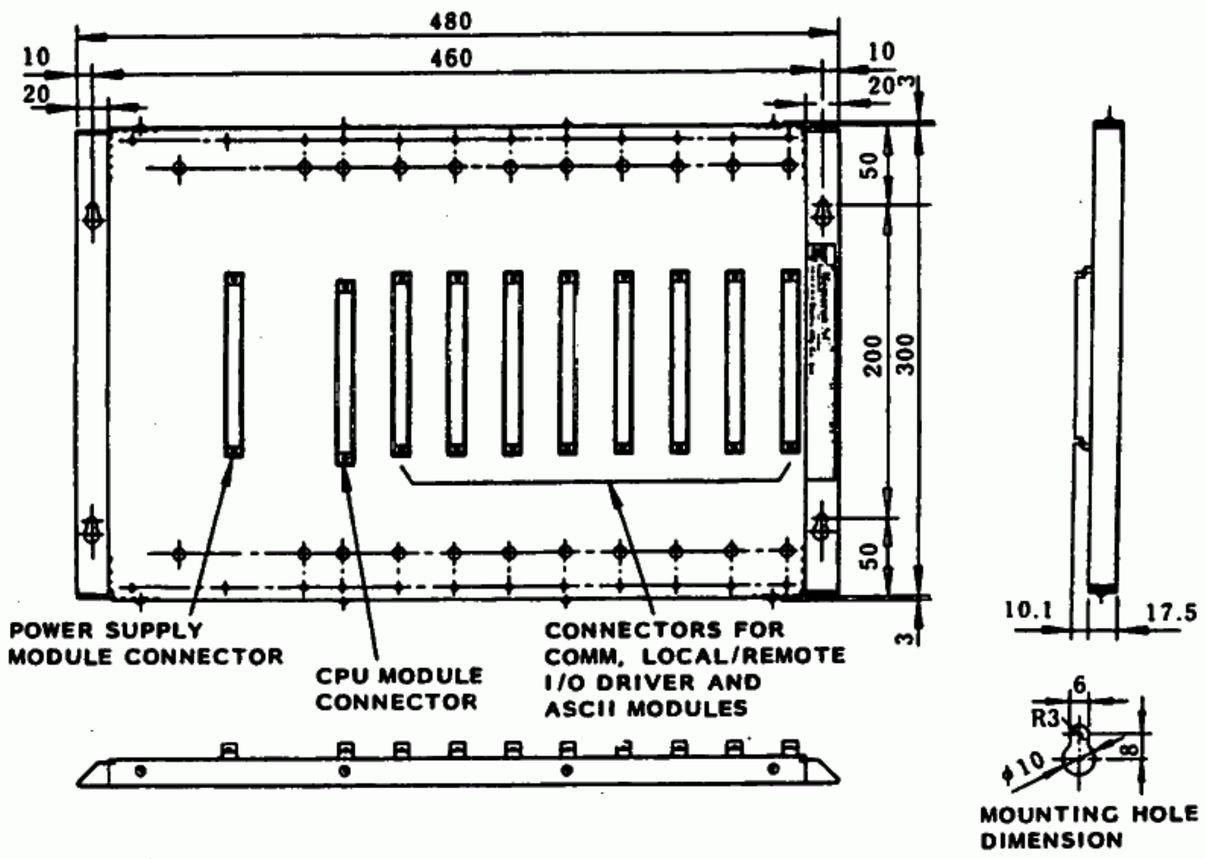
APPROX WEIGHT: 0.7kg

(10) Mounting Base Type JRMSI-B1030



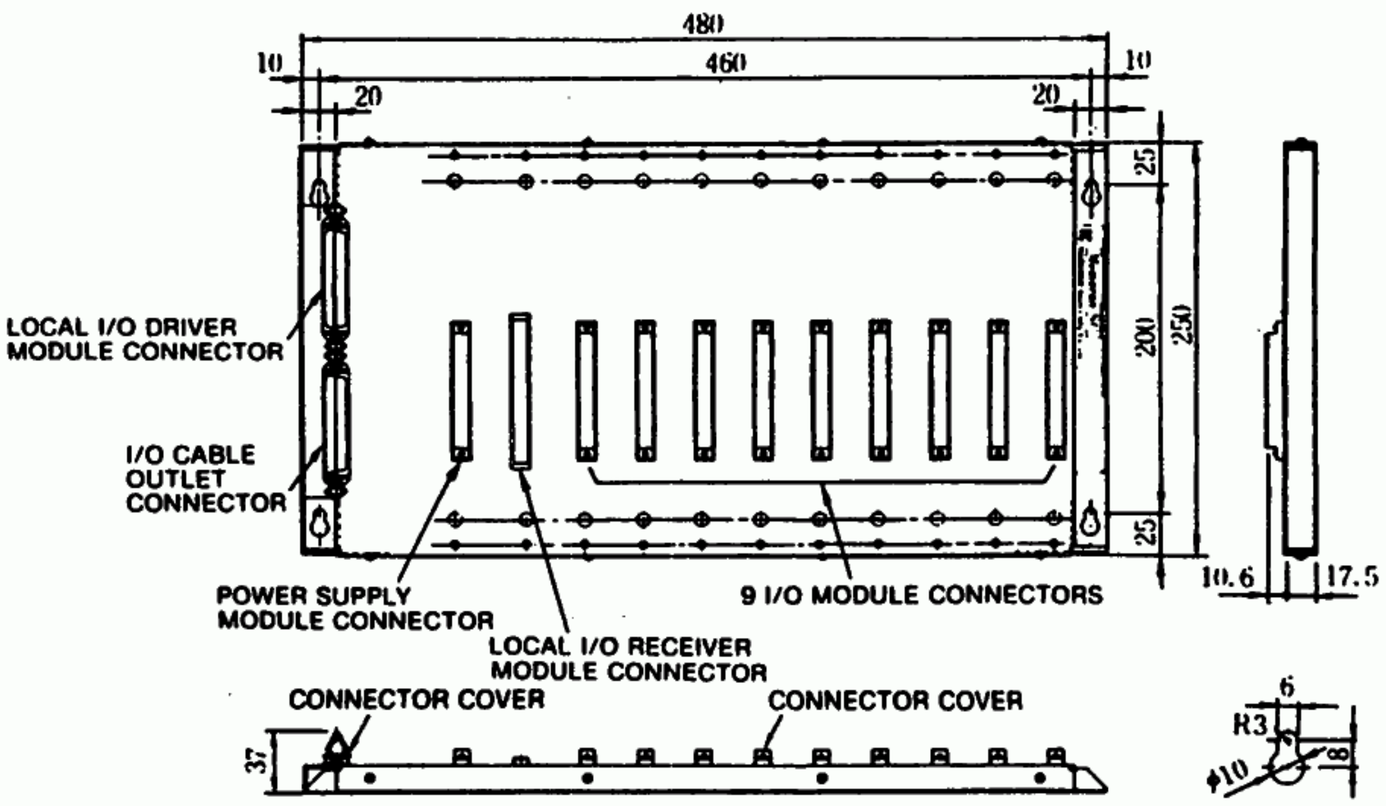
APPROX WEIGHT: 2.0kg

(11) Mounting Base Type JRMSI-B1031



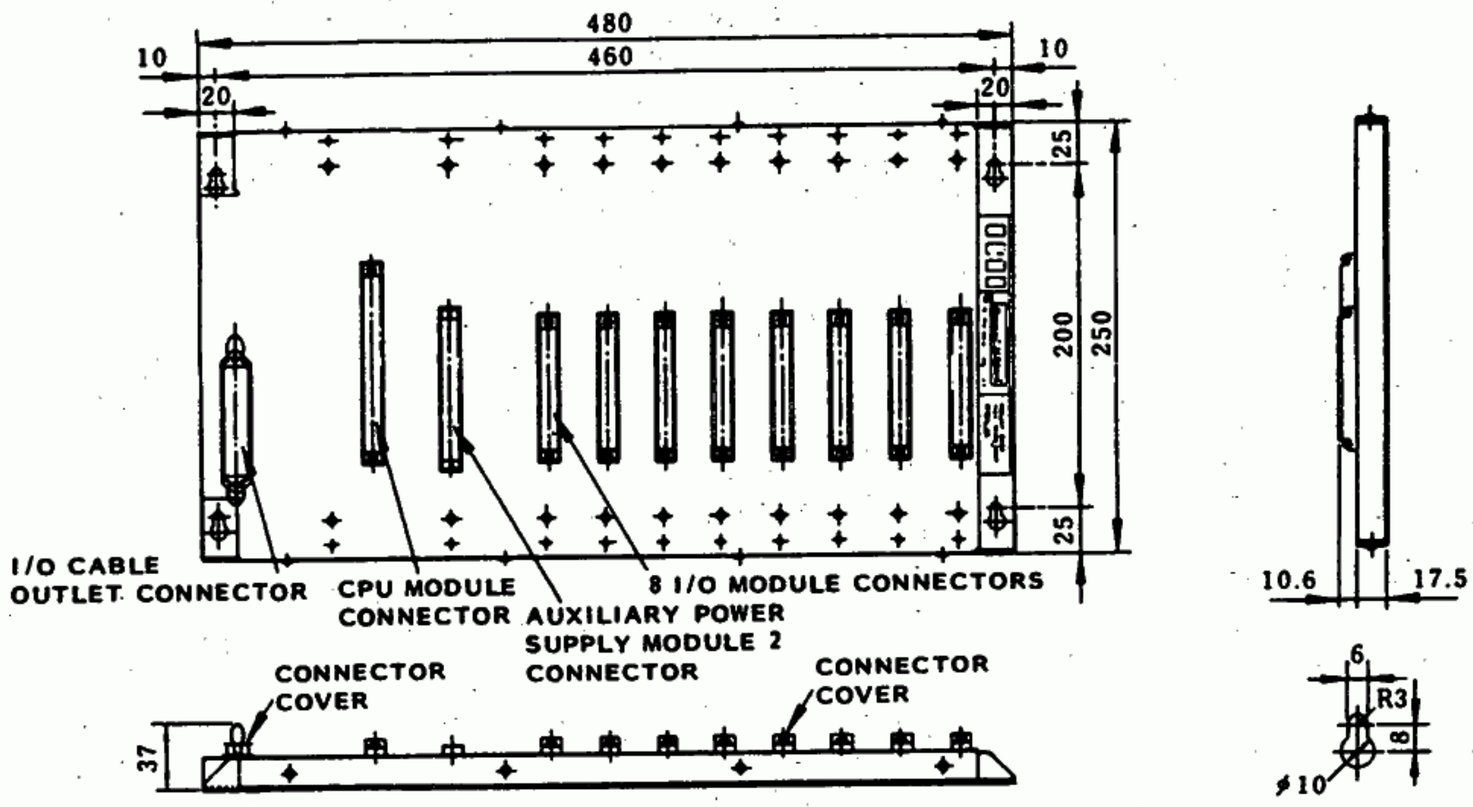
APPROX WEIGHT: 2.5kg

(12) Mounting Base Type JRMSI-B1033



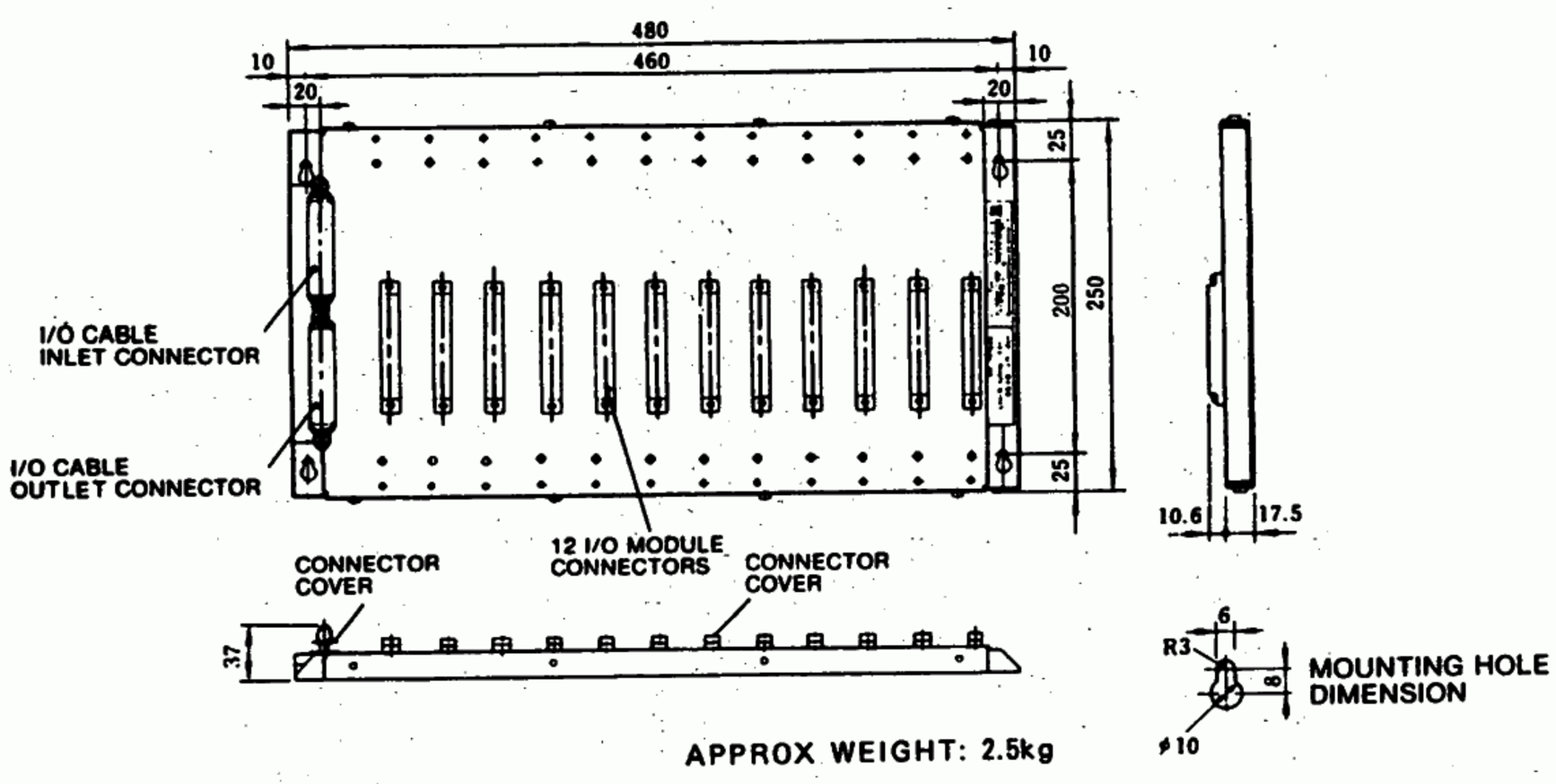
APPROX WEIGHT: 2.5kg

(13) Mounting Base Type JRMSI-B1034



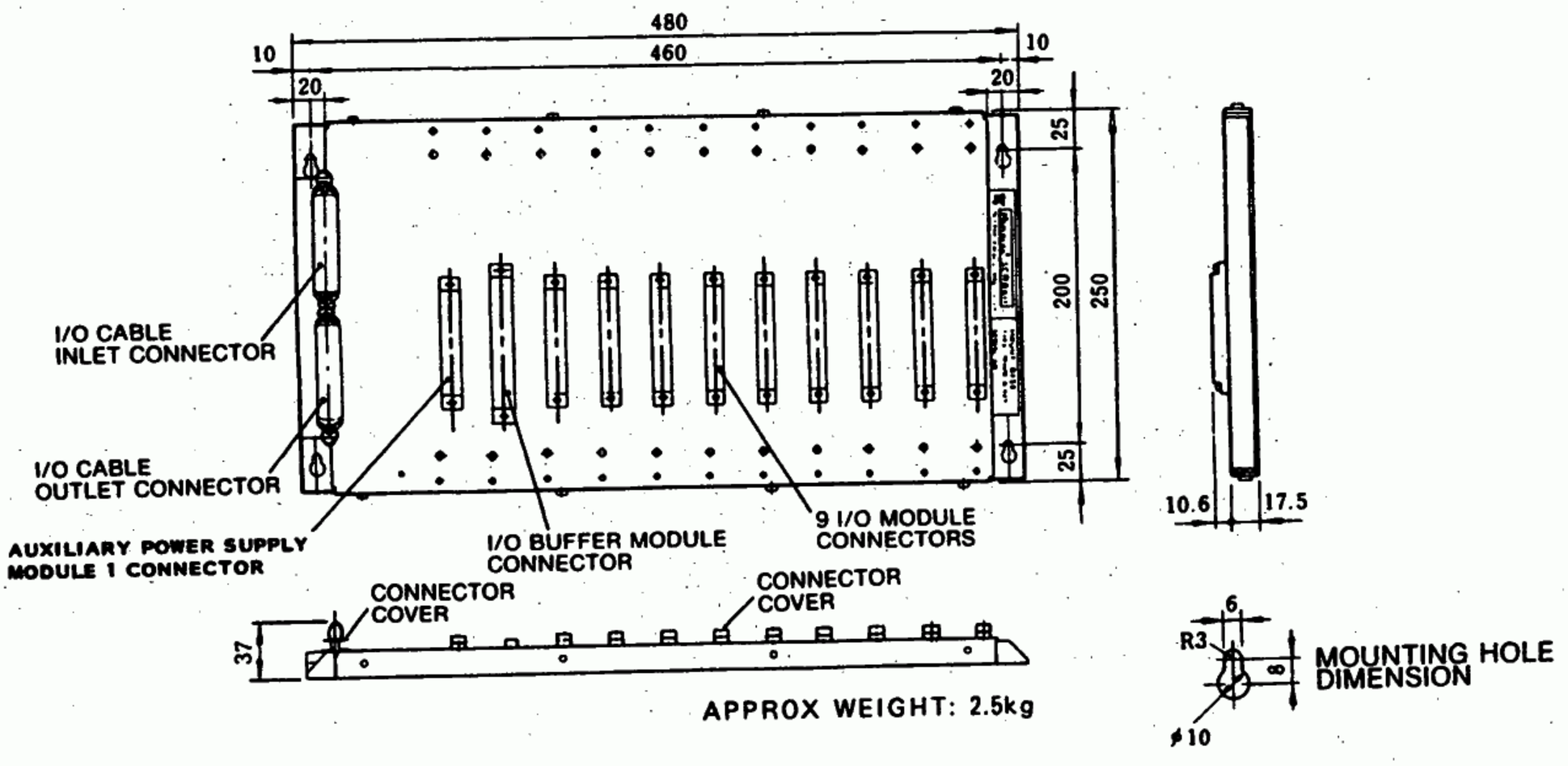
APPROX WEIGHT: 2.5kg

(14) Mounting Base Type JRMSI-B1027



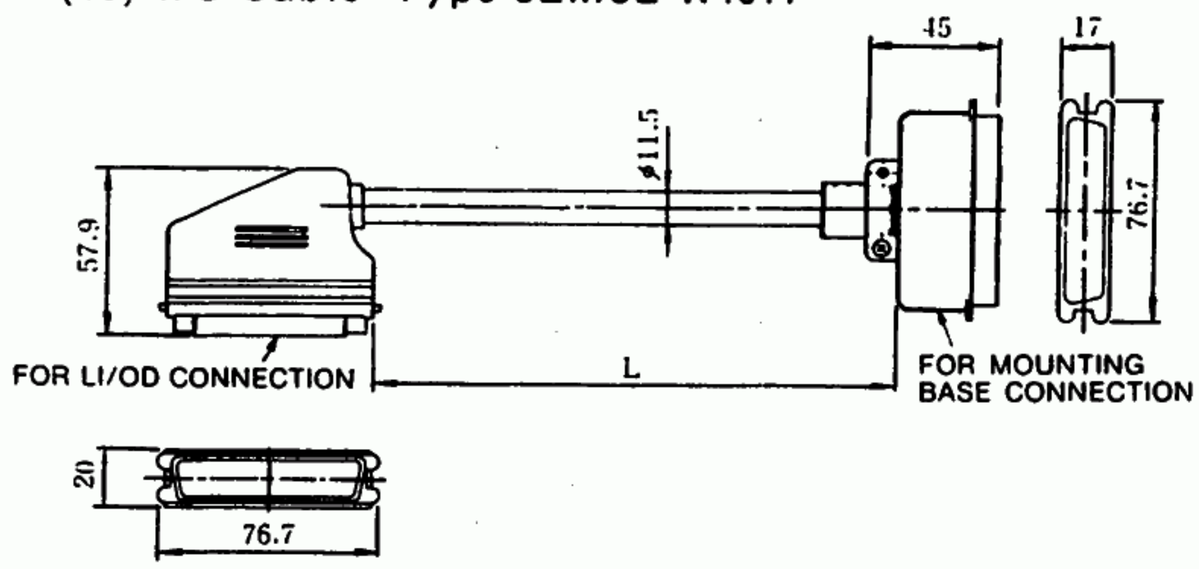
APPROX WEIGHT: 2.5kg

(15) Mounting Base Type JRMSI-B1028



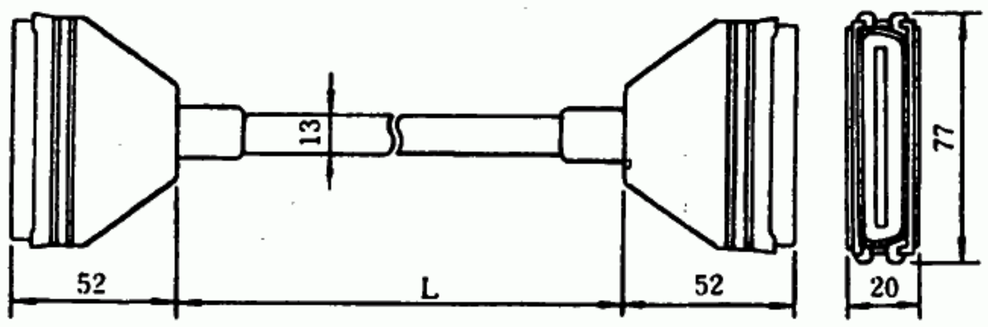
APPROX WEIGHT: 2.5kg

(16) I/O Cable Type JZMSZ-W1011



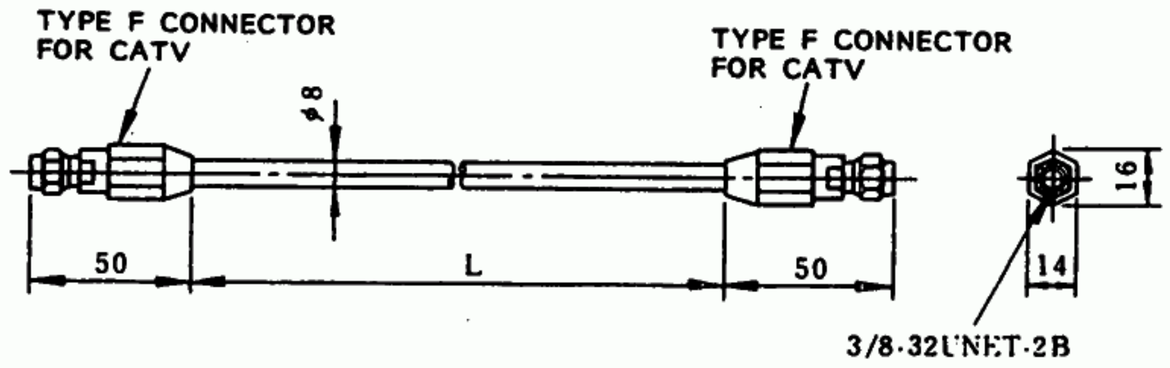
Type	Length L	Approx Weight
JZMSZ-W1011-1	1000	0.3 kg
JZMSZ-W1011-2	5000	1.4 kg

(17) I/O Cable Types JZMSZ-W1021, -W1022



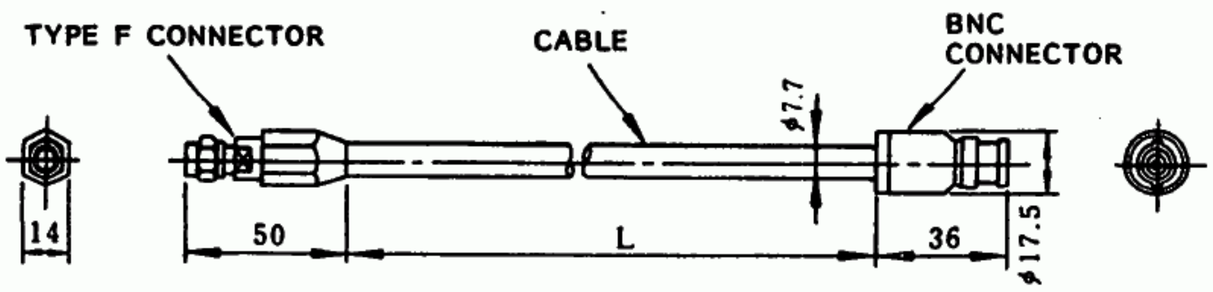
Type	Length L	Approx Weight
JZMSZ-W1021	1500	0.5 kg
JZMSZ-W1022	400	0.3 kg

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



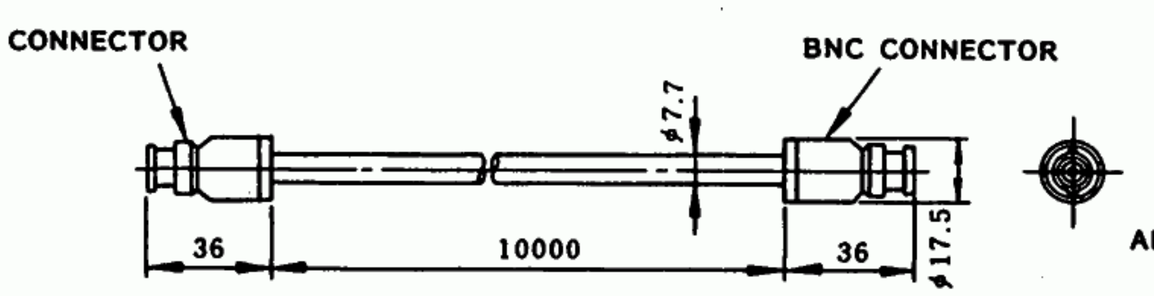
Type	Length L	Approx Weight
JZMSZ-W 453-001	2000	0.3kg
JZMSZ-W 453-002	5000	0.5kg
JZMSZ-W 453-003	10000	0.8kg

(19) Coaxial Cable Type JZMSZ-W1003-×



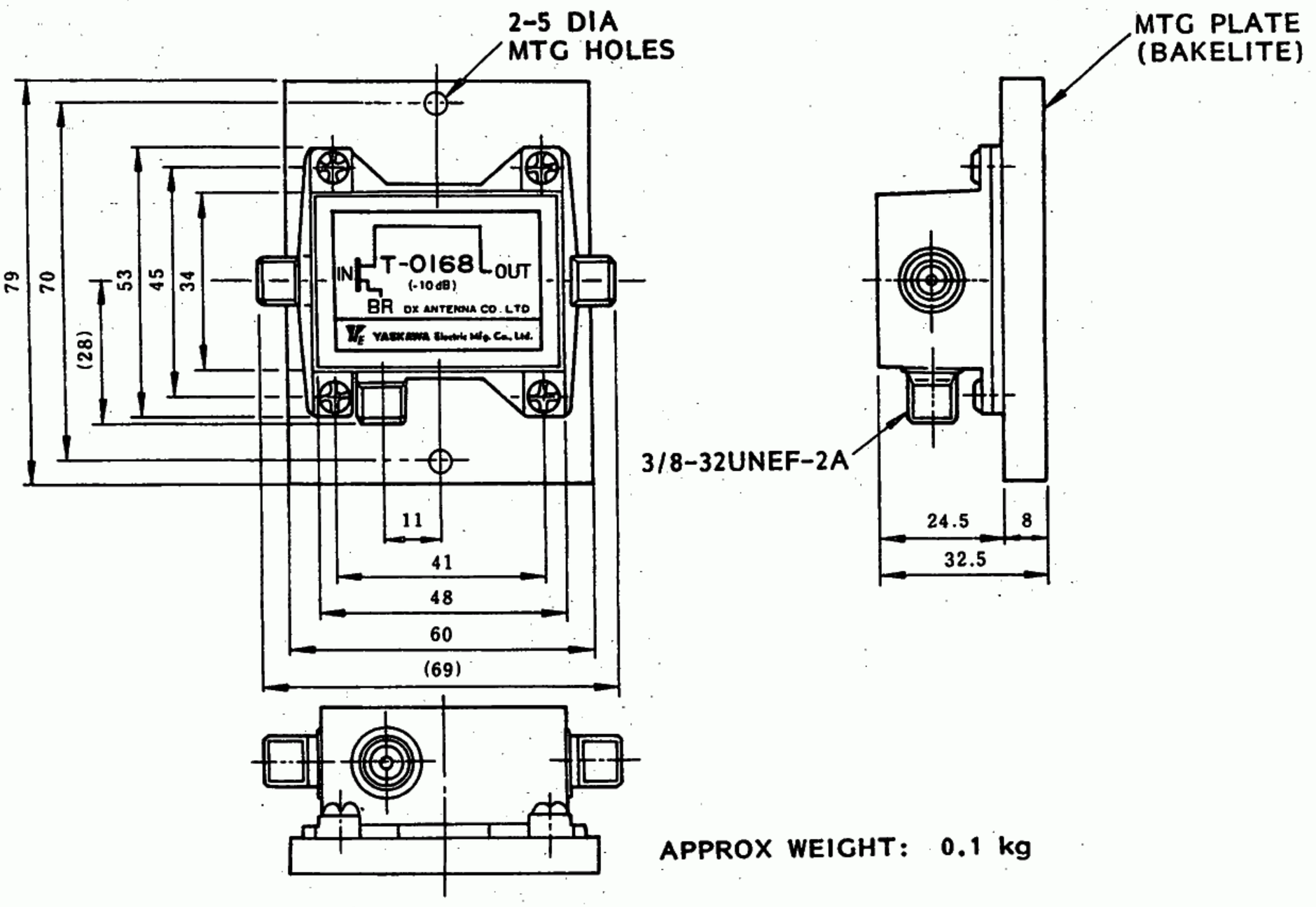
Type	Length L	Approx Weight
JZMSZ-W 1003-1	2500	0.3kg
JZMSZ-W 1003-2	5000	0.5kg
JZMSZ-W 1003-3	10000	0.8kg

(20) Coaxial Cable Type JZMSZ-W1004



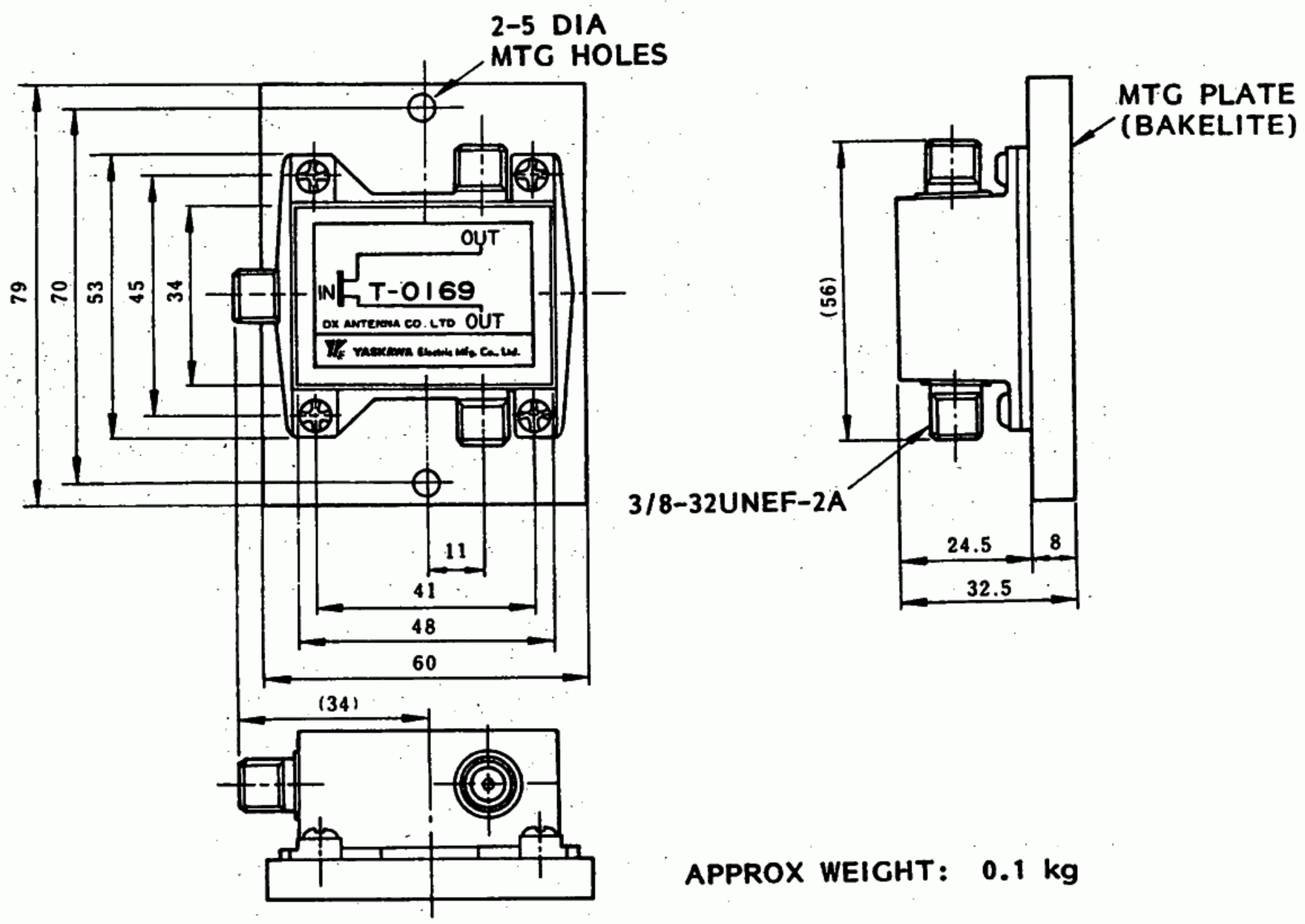
APPROX WEIGHT: 0.8 kg

(21) Tap Type T-0168



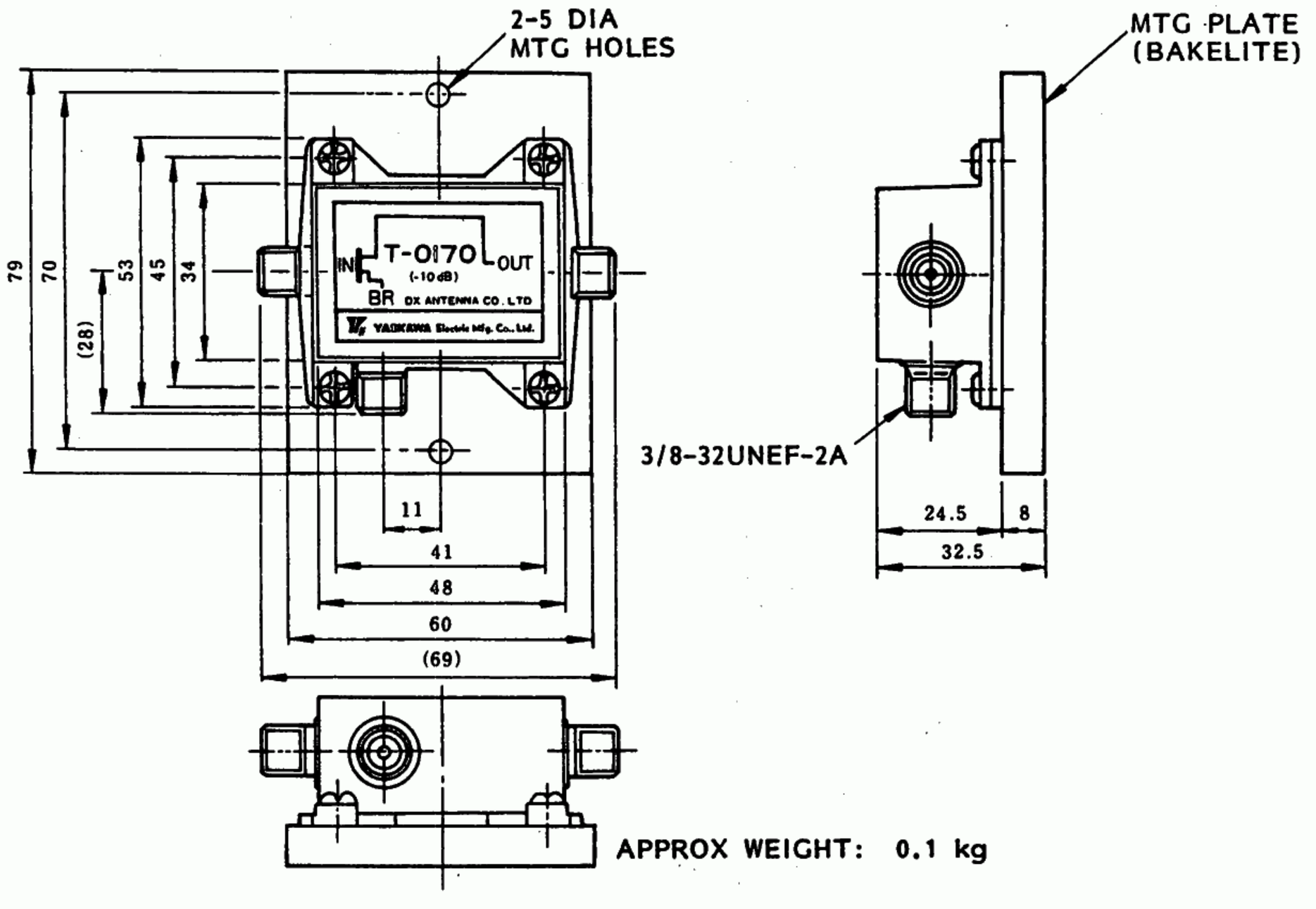
APPROX WEIGHT: 0.1 kg

(22) Splitter Type T-0169



APPROX WEIGHT: 0.1 kg

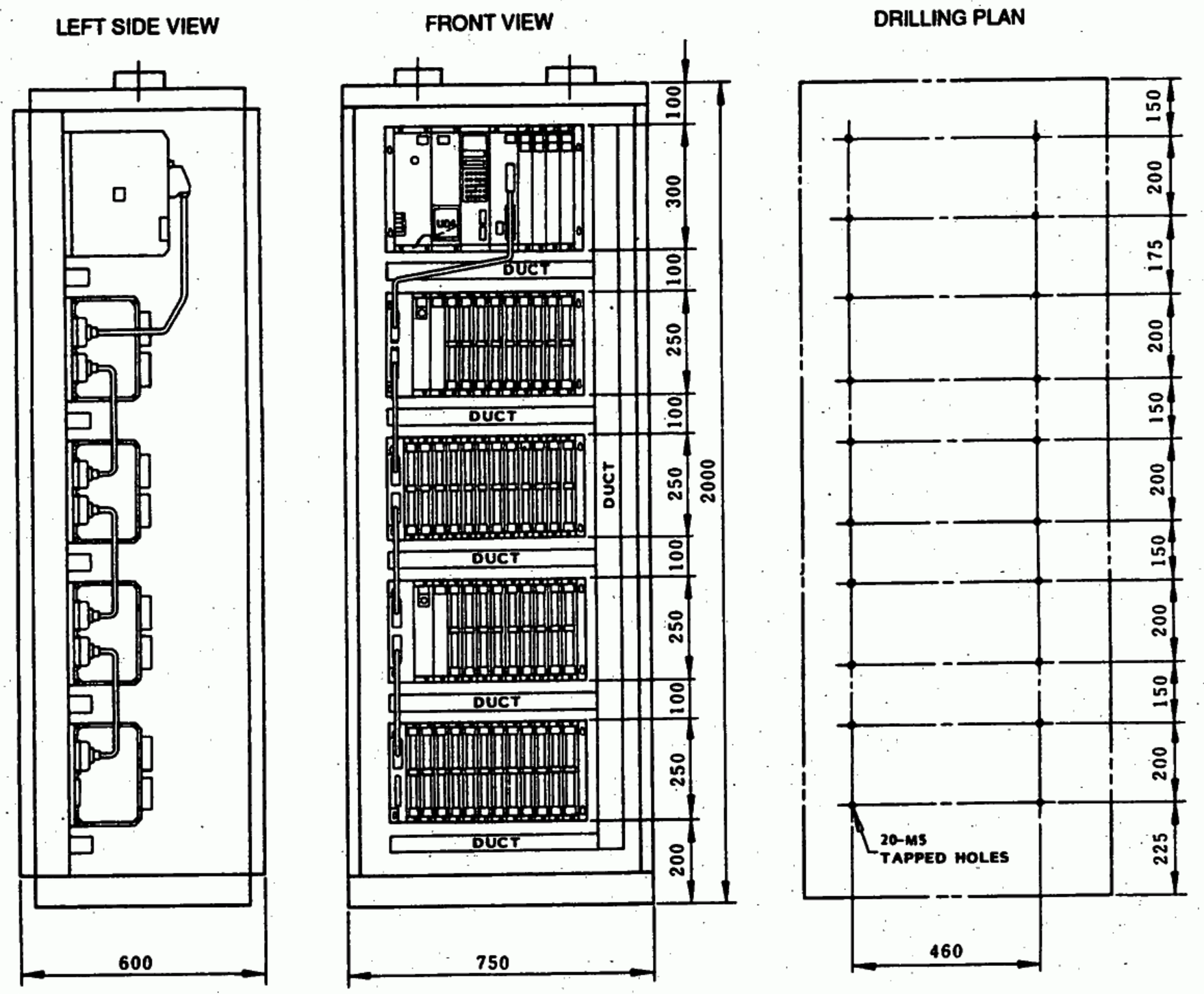
(23) Junction Adapter Type T-0170



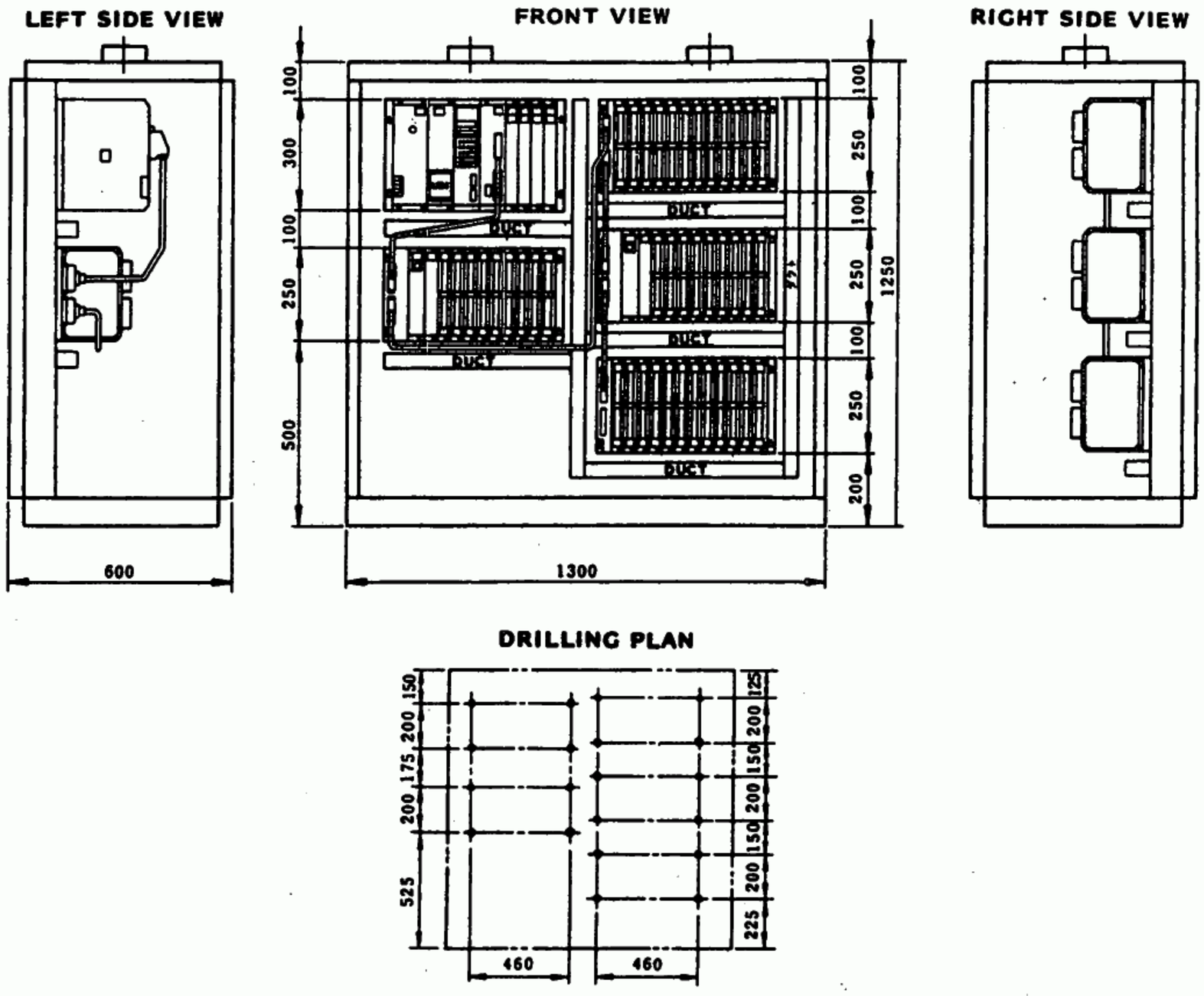
APPROX WEIGHT: 0.1 kg

APPENDIX C
U84 LAYOUT AND DRILLING PLAN in mm

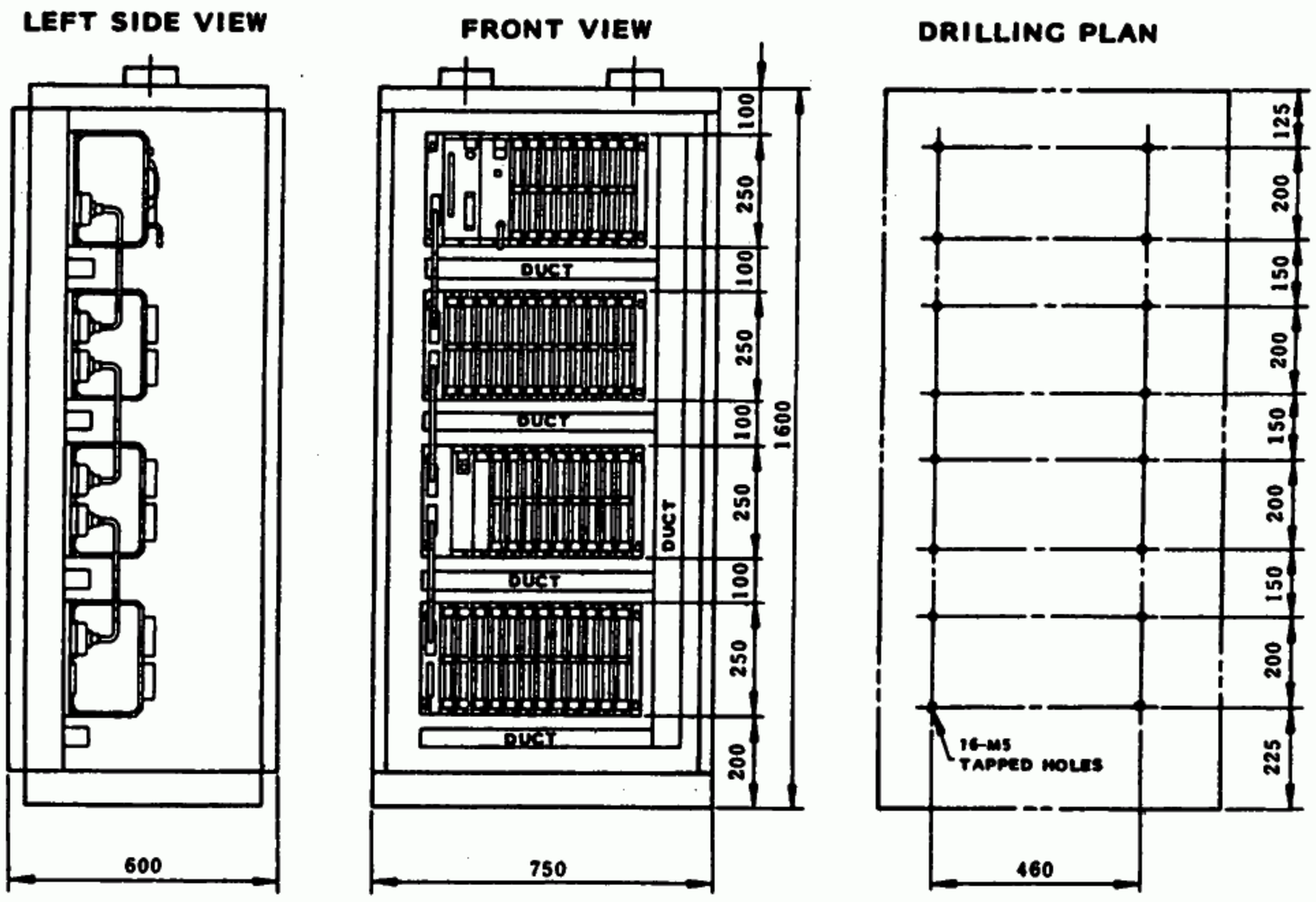
Example 1 Local I/O Channel



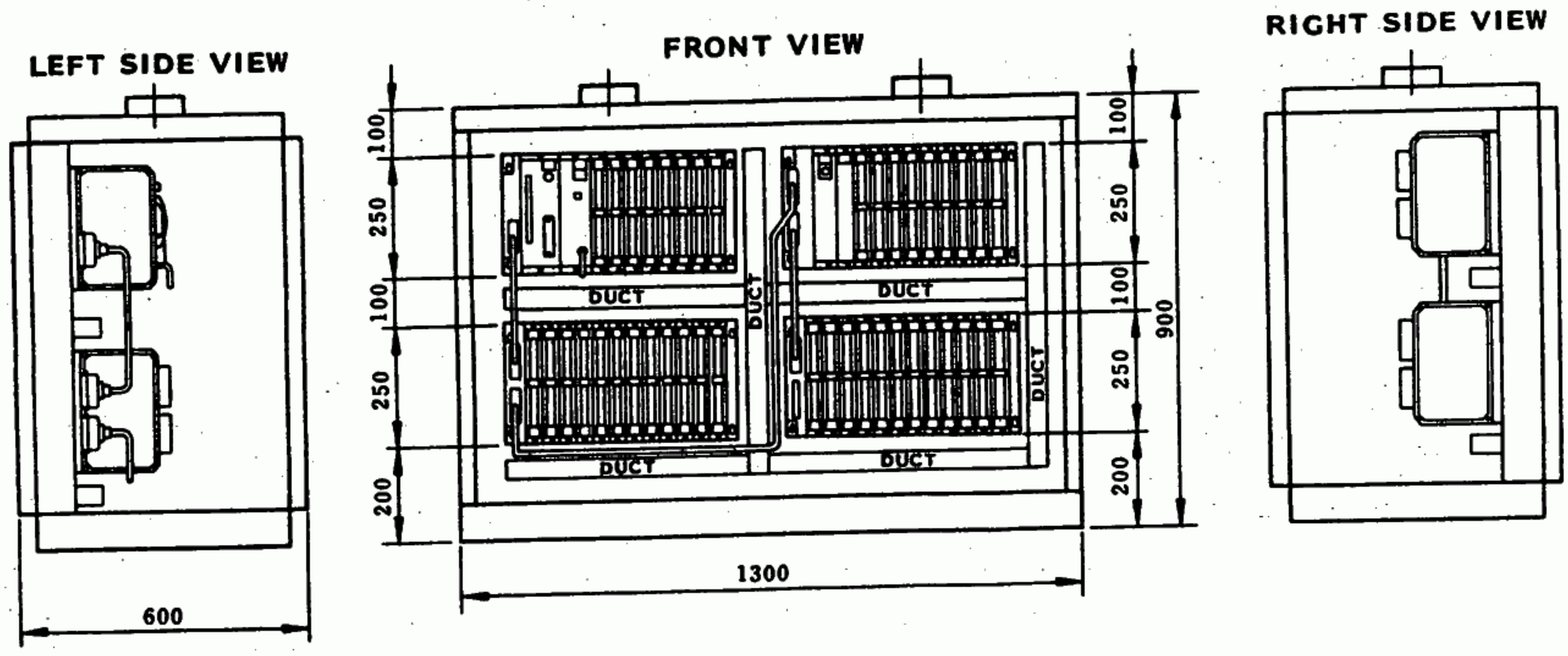
Example 2 Local I/O Channel



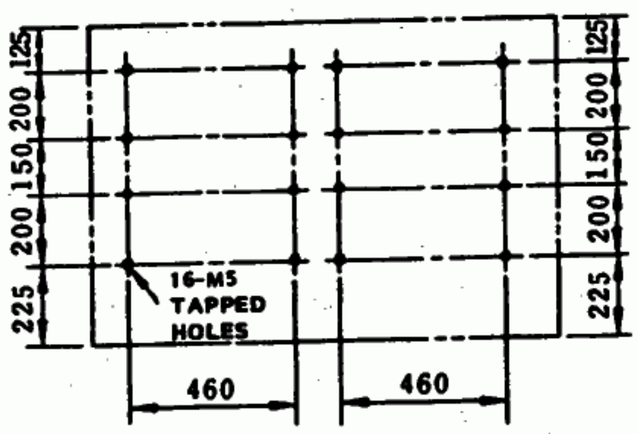
Example 3 Remote I/O Channel



Example 4 Remote I/O Channel



DRILLING PLAN



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