

Ed. 01

# CDMA2000 BTS SCBS-519L10 Installation Manual

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# INTRODUCTION

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## Purpose

This manual describes the material, procedures, and methods required for installing the SCBS-519L10 Indoor BTS.

## Audience

This manual is intended for installation personnel of the SCBS-519L10.

## Manual Content and Organization

This manual is composed of two chapters as follows:

### CHAPTER 1. Before Installation

This chapter describes the safety rules and issues that must be understood and taken into full consideration for installing the SCBS-519L10 system.

### CHAPTER 2. Installation

- Environmental Construction
- Installing Accessories
- Foundation Construction
- Equipment Installation
- Earth
- Antenna Installation
- Pylon Installation
- Cable Installation
- Basic Checks

### ABBREVIATION

Describes the acronyms used in this manual.

## Conventions

The following types of paragraphs contain special information that must be carefully read and thoroughly understood. Such information may or may not be enclosed in a rectangular box, separating it from the main text, but is always preceded by an icon and/or a bold title.

**WARNING**

Provides information or instructions that the reader should follow in order to avoid personal injury or fatality.

**CAUTION**

Provides information or instructions that the reader should follow in order to avoid a service failure or damage to the system.

**CHECKPOINT**

Provides the operator with checkpoints for stable system operation.

**NOTE**

Indicates additional information as a reference.

**OPERATION PROCEDURES**

Indicates the operational procedures that should be executed in sequence.

## Revision History

EDITION	DATE OF ISSUE	REMARKS
00	05. 2004.	First draft
01	02. 2005.	Second Edition

# SAFETY CONCERNS

For product safety and correct operation, the following information must be given to the operator/user and shall be read before the installation and operation.

## Symbols

**Caution**

Indication of a general caution

**Restriction**

Indication for prohibiting an action for a product

**Instruction**

Indication for commanding a specifically required action

## **WARNING**



### **Adjust the height of ladders**

Adjust the height of ladders to prevent falls.



### **Workers During Operation**

When workers install power cables in a small area, do not apply excessive force. You may bump against a wall or equipment.



### **Fire and Burn**

Do not place inflammable materials near the system.



### **Cautions when connecting trunk cables**

To reduce risk of fire, use AWG No. 26 or a larger one as a trunk line.



### **Electric Shock**

Do not touch electronic devices or equipment with watered hand. That causes electric shock.

## CAUTION



### **Not to Damage Cable**

If power cable is pulled forcibly when installed, the sheath of the power cable may be damaged. Special caution should be taken.



### **Caution When cleaning rack**

Be careful not to damage the cabling when cleaning a rack.



### **Caution when cleaning power equipment**

Be careful not to interrupt power supply when cleaning a rack.



### **Moisture**

Since equipment can be corroded by moisture, maintain the equipment in dry condition.



### **Dust**

Dust may interrupt the operation of an adjacent system during job in a building.



### **Caution for pulling off FAN-P**

Since FAN-P(POWER AMP UNIT) weighs about 10 kg, the FAN-P should be pulled off with caution



### **Damaging Building**

When equipment is carried, take special caution not to damage building.



### **Do Not Leak Water**

If the water is leaking to a ground, insulation will fail in the place. Thus, do not leak water when performing leveling by a vinyl hose. Additionally, the vinyl hose should not be broken off or stepped on.



**Using the crane**

An extra person should assist the operation of a crane, and the crane should not be overloaded.



**Short circuits due to the metals**

Make sure short circuits do not occur due to metals such as watches and rings.



**No single-handed process**

Major processes should not be performed single-handedly.



**Using luminaries when installing lights**

Use sufficient luminaries when installing lights to prevent the ceiling from sagging or lighting equipment from falling.



**Cautions for storing paint**

Beware of fires since paints are inflammable, and seal leftover paints for storing.



**When Working with Power Cables**

Turn the power off before working with power cables to prevent injuries, rack damages, and electrical shock to related cables



**Wear protective gloves and glasses**

Wear protective gloves and glasses when making holes on walls or ceiling.



**Wear earplugs**

Wear earplugs in noisy areas where cutting machines, drills, or grinders are used.



**Wiring cables**

In order to wire power cables, connect the grounding cable first before connecting other cables to prevent equipment damages and injuries.





**Measuring Insulation Resistance of Extension Rack**

Use a sheet of insulation paper between the existing rack and the extension rack to perform insulation between the racks. Then, measure the insulation resistance of the extension rack for operating equipment. This is to prevent signaling flows from affecting the existing rack.



**Storing Racks**

Racks should be kept in more secure place at regular intervals so that no falling occurs.



**When Power Cable is Connected**

Check the polarity before connecting power cable in order to prevent the risk of a fire caused by reverse polarity.



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# CHAPTER 1. Before Installation

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## 1.1 Cautions for Installation

Adhere to the following safety instructions when installing the SCBS-519L10 system to prevent accidents.

### Before Starting Installation

- Post warning signs in areas where high-voltage cables are installed.
- Post restriction signs in areas where accidents are most expected.
- Use guardrails or fences and block open areas such as connecting parts, roof, and scaffold.
- Remember the locations and usage of fire alarms and fire extinguishers.
- Check the locations of the emergency exits.

### During Installation

- An extra person should assist the operation of a crane.
- The crane should not be overloaded.
- Power must be cut off before starting the installation.
- Wear protective gloves and glasses when making holes on walls or ceiling.
- Do not wear accessories such as watches and rings in order to prevent electrical shock.

### After Completing Installation

- Use hard covers and cover the cable holes drilled on the floor.
- Remove the debris and clean the surrounding area.

## 1.2 Cautions for Handling Units

All units of SCBS-519L10 are composed with highly integrated electronic components. Handle the units carefully to prevent static electricity.



### Static Electricity Prevention

Be careful not to cause static electricity when handling the system or a unit. Otherwise, the system or unit may be damaged by static electricity.

### When Mounting or Replacing Units

- Wear wrist straps and ground the straps before touching a unit.
- Grab the faceplate or the stiffener when holding a unit.
- Do not touch electrical elements or connectors with your hands.
- Check if the connector pins are normal before mounting a unit.
- Place a cover over unused optical connectors to protect the connector from dust.

### When Storing Units

- Unused units must be packed inside anti-static vinyl bags.
- Do not place a unit on top of another.
- Keep units away from materials that easily generate static electricity such as plastic, acryl boards, paper, and Styrofoam.

### When Transporting Units

Units should be kept inside anti-static vinyl bags when being moved.

## 1.3 Tools and Materials for Installation

### 1.3.1 Tools for Installation

The standard tools for indoor BTS installation are as follows:

NO	Category	Tool Name	Specification	Number
1	Driver	Driver(-)	4 × 100 mm	-
			5.5 × 75 mm	-
			6 × 200 mm	-
			10 × 250 mm	-
		Driver(+)	1 × 75 mm	-
			1 × 150 mm	-
			2 × 150 mm	-
			4 × 250 mm	-
		Nut driver(Nut Driver Set)	6/7/8/9/10(mm)	-
		Fist driver	No.660	-
2	Hammer	Hammer	146.001	-
		Rubber hammer	166.022	-
		Medium-sized steel hammer	3 Kg	-
		PVC hammer	Normal	-
3	Bit	Drill bit set	29 BONJO	-
		Drill bit set	8 mm	-
			10 mm	-
			12 mm	-
			12.7 mm	-
			6 mm	-
		Concrete bit	8 mm	-
			10 mm	-
		Hilti bit set	10 mm	-
			12 mm	-
			16 mm	-
		Wrapping bit & sleeve	0.65 mm	-

(Continued)

NO	Category	Tool Name	Specification	Number
4	Regular Tools	Adjustable angle wrench	12 Inch	-
			8 Inch	-
			4 Inch	-
		Diagonal Plier	6 Inch	-
			4 Inch	-
		Plier	8 Inch	-
		Diagonal cutting Plier	6 Inch	-
			4 Inch	-
		Vice grip pliers	6 NAP 56 10 inch	-
		Open wrench set	6 PCS	-
		Ring wrench set	6 PCS	-
		Box wrench	1/2 Inch	-
			1/4 Inch	-
		Hacksaw frame	Normal	-
		Hacksaw blade	HIS	-
		High speed cut-off blade	14 Inch	-
		Tool box	Large	-
			Medium	-
Tap set	3/4/5/6(mm)	-		
Sexangular wrench, pcs/set	1.5/2/2.5/3/4/5/6(mm)	-		
5	Electric Tools	Power extension cable	30 m	-
		Power multi tab	-	-
		Electric iron(220 V)	30~130 W	-
		Transformer(Slidacs)	3 kW	-
		Large vinyl tape	80 mm × 70 m	-
		Large rubber tape	-	-
6	Leveling Tools	Level	930-9	-
		Plumb bobs	500 g	-
		Angle finder	600	-
		Center punch	No.10	-
7	Ruler	Tape measure	5 m	-
			50 m	-
		'⌒'-shape ruler	300 mm	-

(Continued)

NO	Category	Tool Name	Specification	Number
8	Cabling Tools	Hand wrapping & unwrap	0.65 mm	-
		GTLA connector extraction tool	GTLA	-
		Cable cutter	325 mm	-
		Ladder	L1, M2, S2	-
		Gloves, 10 pcs/1set	Cotton	-
			Half Rubber Coating	-
		Silicon gun	Normal	-
		Silicon	Gray	-
		Safety helmet	Normal	-
		Light for construction	220 V	-
		Lamp	220 V/40 W	-
		Fire extinguisher	ABC	-
		Lantern	6 V	-
Vacuum cleaner	Normal	-		



CHECK

**Tools and Materials Used**

Other tools and materials available on site may be used.

### 1.3.2 Materials for Installation

No	Description	Specification	Unit	Q'ty
1	Power Cable Grand Bracket Ass'y (4Hole)	W:130, D:45.4, H:100, Al 2t, Medium Gray	Set	-
2	Power Cable Grand Bracket Ass'y (2Hole)	W:130, D:45.4, H:100, Al 2t, Medium Gray	Set	-
3	Carry Handle	M12, ZPC, L:140, D:25	EA	-
4	Pressure Terminal(2Hole)	60 mm <sup>2</sup> Hole Dist:16 mm, Hole d2:6.3	EA	-
5	Pressure Terminal(2Hole)	38 mm <sup>2</sup> Hole Dist:16 mm, Hole d2:6.3	EA	-
6	Pressure Terminal(2Hole)	38 mm <sup>2</sup> Hole Dist:17 mm, Hole d2:6.3	EA	-
7	Hex. Bolt	M6 x 20L, Brass	EA	-
8	Spring Washer	d2:6.3, Brass	EA	-
9	Plane Washer	d2:6.3, Brass	EA	-
10	Base Bakelite Plate	700 x 600 x 3t, Asetal(White)	EA	-
11	Earthquake Frame Support Ass'y	W:700, D:600, H:100, Steel, M16X35, ZPC3 Include	Set	-
12	600V CV Cable(Red)	CV Cable 60 mm <sup>2</sup> x 1 C(Red)	m	-
13	600V CV Cable(Black)	CV Cable 60 mm <sup>2</sup> x 1 C(Black)	m	-
14	600V CV Cable(Red)	CV Cable 38 mm <sup>2</sup> x 1 C(Red)	m	-
15	600V CV Cable(Black)	CV Cable 38 mm <sup>2</sup> x 1 C(Black)	m	-
16	Ground Wire	GV 38 mm <sup>2</sup> x 1C	m	-
17	Ground Wire	GV 100 mm <sup>2</sup> x 1C	m	-
18	Pressure Terminal (2Hole, Dist.45mm)	100 mm <sup>2</sup>	EA	-
19	Pressure Terminal (2Hole, Dist.45mm)	60 mm <sup>2</sup>	EA	-
20	Pressure Terminal (2Hole, Dist.45mm)	38 mm <sup>2</sup>	EA	-
21	Pressure Terminal(Square 1Hole)	38 mm <sup>2</sup> , d2:7, W:15,	EA	-
22	Pressure Terminal Cap(Red)	60 mm <sup>2</sup>	EA	-
23	Pressure Terminal Cap(Black)	60 mm <sup>2</sup>	EA	-
24	Pressure Terminal Cap(Green)	100 mm <sup>2</sup>	EA	-
25	Pressure Terminal Cap(Red)	38 mm <sup>2</sup>	EA	-
26	Pressure Terminal Cap(Black)	38 mm <sup>2</sup>	EA	-
27	Pressure Terminal Cap(Green)	38 mm <sup>2</sup>	EA	-
28	MGB Ass'y	350 x 100 x 7t, Insulator	Set	-
29	Hex. Bolt	M8 x 25L, Brass	EA	-
30	Hex. Bolt	M8, Brass	EA	-
31	Plane Washer(Brass)	D:8.3	EA	-

(Continued)

No	Description	Specification	Unit	Q'ty
32	Spring Washer(Brass)	D:8.3	EA	-
33	Hex. Bolt	M10 x 35L, (Brass)	EA	-
34	Hex. Bolt	M10, Nut	EA	-
35	Plane Washer(Brass)	D:10.3	EA	-
36	Spring Washer(Brass)	D:10.5	EA	-
37	Heat Shrink Tube	D:28 mm, (Black, Jelly Type)	m	-
38	Rubber Tape	Black	EA	-
38	Silicon(White)	White	EA	-
40	Tie Wrap(Black)	208mm(Pack for 100EA)	Pa	-
41	Tie Wrap(White)	100mm(Pack for 100EA)	Pa	-
42	Tying String	9Line 170 m, White, 230 g	EA	-
43	Vinyl Tape	Black	EA	-
44	Vinyl Tape	Red	EA	-
45	Wrist Strap	KS-1058, 9Ft	EA	-
46	Trunk Cable Form Ass'y -2	1E1, RG-179, 20 m, BNC Conn, Rx/Tx	Set	-
47	Horizontal Clamp	120 x 15 x 6.5t, Flange Bolt/Nut	EA	-
48	Corner Bracket Clamp	55 x 55 x 15 x 6.5t, Flange Bolt/Nut	EA	-
49	Cable Rack	300 mm x 2000 L x 6t	EA	-
50	'U' Type Angle	300 mm	EA	-
51	Anchor Bolt Ass'y	M12 x 100 L	Set	-
52	Threaded Rod(Stud Bolt)	M12 x 2000 L, ZPC3	Set	-
53	Connection Nut(Muff)	M12 x 50 L	EA	-
54	Plane Washer	ID:12.3(Zn Coating)	EA	-
55	Spring Washer	ID:12.3(Zn Coating)	EA	-
56	Insulator Bushing	M12, L:1.5(Ceiling)	EA	-
57	Hex. Nut	M12, ZPC3	Set	-
58	'J' Bolt	M 6 x 52L, 6t, Ni	Set	-
59	Hex. Nut	M 6, Ni Plt	Set	-
60	CRK End Rubber(Black)	Rubber 19 mm x 47mm	EA	-
61	Anchor Bolt Ass'y	M10 x 100L	EA	-
62	Insulation Bushing	M10, L:1.5, Asetal, White	EA	-
63	Insulation Bushing	M10 L:1.5, Asetal, White	EA	-
64	Rack Top Threaded Rod	M10 x 1000L, ZPC3	EA	-
65	Hi-PVC Pipe	16 mm x 4 m(Gray)	EA	-

(Continued)

No	Description	Specification	Unit	Q'ty
66	Threaded Rod End Cap	Ø12 x 15	EA	-
67	Hex. Nut	M10, ZPC3	EA	-
68	Spring Washer	D:10.3, ZPC3	EA	-
69	Plane Washer(Brass)	D:10.3, ZPC3	EA	-
70	Hex. Bolt	M4 x 25L, Brass	EA	-
71	Hex. Nut	M4, Brass	EA	-
72	Spring Washer	D:4.3	EA	-
73	Plane Washer(Brass)	D:4.3	EA	-
74	Earth Braid Kit	5.5 mm x 12L(Ring Type)	EA	-
75	CRK Wall Support Angle	300 mm (323 x38 x 38 x 3t, Dist:270 mm)	EA	-
76	Wall Support Bakelite Plate	300 mm(320 x 36 x 3t, Dist:109 mm)	EA	-
77	'U' Type Angle(Rack Top)	L:700 mm, Dist:620 mm	EA	-
78	'U' Type Angle(Rec. Top)	850 mm, Dist:750, Rec.	EA	-
79	'U' Type Angle-1(Rec. Top)	L:700 mm, Dist:600, Rec.	EA	-
80	GPS Antenna	GA1575A, ACE	EA	-
81	GPS Cable	LMR-400, Microwave	m	-
82	GPS Arrester	3402.17.K, Huber & Suhner	EA	-
83	GPS Arrester Capsule	Gas Filled Type, Huber & Suhner	EA	-
84	Connector N-Mail	Conn. N-Mail, LMR-400	EA	-
85	TNC Male Connector -50dB	-50dB, LMR-400	EA	-
86	GPS Antenna Fixing(Mount Type)	H:1.5m, D2:25.4, Bakelite	EA	-
87	GPS Antenna Fixing(Wall Type)	H:1.5m, D2:25.4, Bakelite	EA	-
88	GPS Fixing Clamp(Wall Type)	F/B 50 x 6t, D:50 Hole:14, L:152, ZINC	EA	-
89	Stainless Rod(Rod Type)	H:3m, D2:25.4, Bakelite	EA	-
90	GPS Antenna Fixing Pipe	Center:40, M10 x 60L, ZINC	Set	-
91	Anchor Bolt Ass'y	M8 x 70L, STS	EA	-
92	GPS Name Plate	70 x 50 x 2t(English)	Set	-
93	1/2" Feeder Cable	SCF 1/2-50J(Inside)	m	-
94	N-M(1/2")Connector	N-Male For SCF 1/2(Inside)	EA	-
95	1/2" Feeder Cable	LCF 1/2" Cu2Y-50Ω(RFS, Outside)	m	-
96	7/16 DIN-F Connector(1/2")	155 655 10(RFS, Outside), BN71 03 45	EA	-
97	7/16 DIN-Mail for LCF(1/2")	155 654 10(RFS, Outside), BN71 03 45	EA	-
98	Antenna Jumper Cable Kit 1/2" Harness	2m, Harness Ass'y	Set	-
99	7/16 DIN-FM(7/8")Connector	Din-Female For LCF 7/8"	EA	-



(Continued)

No	Description	Specification	Unit	Q'ty
100	7/16 DIN-Male Connector(1/2")	DIN-Male For SCF 1/2(Inside)	EA	-
101	7/16 DIN-Male Connector(7/8")	DIN-Male For LCF 7/8"	EA	-
102	7/8" Feeder Cable	LCF 7/8-50 J	m	-
103	Cold Shrink Kit	7/8"+1/2"(3M-CXS-2)	EA	-
104	Ground Kit For(7/8")	7/8" Ground Kit	Set	-
105	Silicon	Sealing Plast 2000, RFS, 20ccm	EA	-
106	Bulk Head(7/8")	350 x 99 x 160(H&S)	Set	-
107	Ram Clamp Ass'y (RF Cable, 3Hole)	30 x 40 x 30 x 4t, 7/8" 3EA	Set	-
108	Ram Clamp Ass'y (RF Cable, 2Hole)	30 x 40 x 30 x 4t, 7/8" 2EA	Set	-
109	Roxtec	Wall Type(7/8")	EA	-
110	Roxtec	Window Type(7/8")	EA	-
111	Feeder Cable(1 5/8")	LCF 1 5/8" Cu2Y-50 Ohms, 152 122 11 (RFS)	m	-
112	Connector DIN-Male(1 5/8")	7/16 DIN-Male for LCF 1 5/8", 155 754 02(RFS)	EA	-
113	Connector DIN-Female(1 5/8")	7/16 DIN-Female for LCF 1 5/8", 155 755 02(RFS)	EA	-
114	Ground Kit for(1 5/8")	Ground Kit for 1 5/8" 155 797 51	Set	-
115	Cold Shrink Kit(1 5/8")	1 5/8"+1/2"(3M-CXS-2)	EA	-
116	Silicon(1 5/8")	Sealing Plast 2000, RFS, 70 ccm	EA	-
117	Bulk Head(1 5/8")	440 x 200 x 160, Brass	Set	-
118	Roxtec(1 5/8")	Wall Type(1 5/8")	EA	-
119	Roxtec(1 5/8")	Window Type(1 5/8")	EA	-
120	Ram Clamp Ass'y (RF Cable, 3Hole)	30 x 40 x 30 x 4t, 1 5/8" 3EA	Set	-
121	Feeder Line Name Plate(English)	70 x 50 x 2t, Al	Set	-
122	Arrestor(3400.41.0121)	1885~2200 Mhz, 1700 W, DIN-F/DIN-F	EA	-
123	Copper Bar(IGB)	310 x 50 x 5t, Cu	EA	-
124	Copper Bar(TGB)	410 x 50 x 5t, Cu	EA	-
125	Hex. Bolt(STS)	M8 x 25L	EA	-
126	Hex. Nut(STS)	M8	EA	-
127	Spring Washer(STS)	D:8.3	EA	-
128	Plane Washer(STS)	D:8.3	EA	-
129	Antenna Fixing Pipe(GAL)	Ø 60.5 x 4t H: 3m	EA	-
130	Antenna Pipe Fixing 'U' Bolt(GAL.)	M12 x 112L, Center:76	EA	-

## 1.4 Safety Measures

### Observing Safety Regulations

Abide by safety rules to avoid safety hazards during installation.

### Sanitation

The working area should be kept clean to maintain the sophisticated work environment.

### First Aid

If an injury occurs due to an accident during installation, take emergency measures using first aid medicines at the site, and if necessary, transport the injured to a hospital for treatment.

### Safety Accident Prevention

- Open areas such as connecting parts, roof, and scaffold should be blocked using guardrails or fences.
- Warning signs should be attached to guardrails, steps, and doors.
- Facilities where safety accidents are expected should be set as restricted areas.
- Cable holes on the floor should be covered with hard covers.
- Wear protective gloves and glasses when making holes on walls or ceiling.
- An extra person should assist the operation of a crane.
- The crane should not be overloaded.
- Install lighting to optimize the working environment.
- Do not step on or apply excessive force on cables.
- Know the locations and usage of fire alarms and fire extinguishers.
- Check the location of the emergency exit.
- Make sure short circuits do not occur due to metals such as watches and rings.
- Major processes should not be performed single-handedly.
- Adjust the height of ladders to prevent falls.
- Wear earplugs in noisy areas where cutting machines, drills, or grinders are used.

## 1.5 Cautions in Construction Site

Heating and cooling should be thoroughly managed to maintain proper temperature and humidity in the equipment room, and power supply should not be interrupted to prevent delay of testing. All racks and equipment should be precisely set horizontally and vertically and should be firmly installed.

### Material Check

Based on the construction plan, thoroughly check the quantity of materials, whether they conform to standards and if any of them are damaged. The AC/DC power cables, fluorescent lamps, emergency lights, switches, and electrical conduits for light installation should conform to standards and electrical properties.

### Administrative Issues

- Site access: If the construction site is a restricted or limited access area, take proactive measures so that construction personnel have no problem accessing the construction site.
- Consultations: In relation to existing facilities, issues regarding connection work and test scope should be consulted with the execution office and operation office before construction.

## 1.6 Static Electricity Prevention

### 1.6.1 Damage Prevention

When handling items sensitive to static electricity, abide by the following rules to avoid damaging elements of circuit boards:

- Wear grounded wrist straps when handling a circuit board.
- Circuit boards should be kept away from materials that generate static electricity, such as plastic, acrylic board, paper, and styrofoam.
- Circuit boards should be stored in antistatic boxes.
- The humidity within the equipment room should always be 40~70 %.

### 1.6.2 Causes of Static Electricity

Factors of man-caused static electricity and the generated voltage are as follows:

**Table 1.1 Cause and Voltage of Static Electricity**

Cause	Average Voltage Generated(V)
Walking a linoleum floor	5, 000
PCB wrapped in styrofoam	5, 000
Removing a bubble plastic cover from a board	20, 000
Walking a carpet floor	15, 000
Ceramic DIPs wrapped in styrofoam	5, 000

### 1.6.3 Damage Voltage

Damage voltage of each element due to static electricity is as follows:

**Table 1.2 Damage Voltage due to Static Electricity**

Element	Damage Voltage(V)
MOSFET	100~200
JFET	240~10, 000
CMOS	250~2, 000
TTL	250~2, 000
Bipolar TR	300~2, 500
ELC	500 or higher
SCR	680~1, 000

## 1.6.4 Environment and Power

The following environmental conditions and power requirements must be met to guarantee stable operation of the system.

### Temperature and Humidity

Item	Specification	Standard
Temperature	0~50 °C(optimum temperature: °C)	GR-63-CORE-Sec.512
Relative humidity	5~95 %(optimum humidity: %)	GR-63-CORE-Sec.512

### Power

Item	Specification
DC Input Voltage	+26 VDC(+21 VDC~+30 VDC)

## 1.7 Cleaning

Cleaning should be thoroughly executed to remove dust and other substances from the equipment room. During construction, the floor, entrance, and corridors of the equipment room should be frequently cleaned.

Cleaning should be executed according to the following steps:



- 1) First cleaning: Execute after rack installation
- 2) Second cleaning: Execute after cabling and distribution
- 3) Third cleaning: Execute after installation test
- 4) Fourth cleaning: Execute at site opening



### Caution when cleaning rack

Be careful not to damage the cabling when cleaning a rack.



### Caution when cleaning power equipment

Be careful not to interrupt power supply when cleaning a rack.

삭제됨: —페이지 나누기—

—————페이지 나누기—————

## CHAPTER 2. Installation

### 2.1 Environmental Construction

Environmental construction refers to a preparatory process before moving equipment into the BSC site, which includes installing partition walls and lighting, flooring conducted linoleum and finishing the painting job.

Environmental construction is conducted according to the following steps:



- 1) Basic work
- 2) Lighting work
- 3) Painting work
- 4) Installing conducted linoleum

#### 2.1.1 Basic Work

##### Ceiling Repair

Polluted or damaged ceiling texes should be replaced with new ones made from the same material as existing ones. Gaps between texes should be minimized, and gaps greater than 2 mm should be caulked with silicon. Electrical conduits penetrating the ceiling and areas around the duct should also be caulked with silicon. Zinc-coated screws should be used for fastening the texes, and the gaps between the screws should be approximately 150 mm. M-Bar should be used for a light-weight ceiling, and out-of-shape or corroded channels should not be used.



NOTE

##### Caulking

Caulking refers to filling in and compressing gaps caused by cracks or junctions, and is normally used in borders of chassis or lines of glass blocks.

### Window Sealing

Before sealing windows, decide whether to install window for the entire surface of the wall or to use a light-weight partition wall for the window. If the size of the window exceeds 40 % of the entire wall surface, install a full-size partition wall for efficiency.

- Full surface installation: For two or more large-size windows
- Partial surface installation: For leased buildings or common windows
- Exception: Exclude glass block windows and reflection windows

Before installing the partition wall, seal the existing window with silicon after glass coating to block rainwater. After installing the partition wall, seal the wall for the last time. For full surface installation, environment should be considered when coating the glass.

### 2.1.2 Light Installation

Install two fluorescent lamps or relocate existing lights to increase the luminance to at least 300 LUX for the equipment. On the ceiling of the windproof room, install a sensor lamp that operates automatically by detecting movement.

Light installation is subject to the material of the ceiling as shown below:

- Down light: When tex is furnished
- Ceiling light: When the direction does not match that of tex or when the ceiling is made of block boards



#### Using luminaries when installing lights

Use sufficient luminaries when installing lights to prevent the ceiling from sagging or lighting equipment from falling.

### Emergency Light

This should be lit upon power failure manually or automatically for at least 30 minutes.

Take following cautions when installing an emergency light.

- Power outlet should be exposed.
- Emergency light should be installed at the front of the equipment within the office.
- Users should be able to bend the emergency light to all directions.
- The emergency light should be installed at 1800 mm from the floor.



### 2.1.3 Coating

Remove oil, dust, dirt or other pollutants from the target surface and perform coating on even corner parts. Apply putty if the surface is uneven. For metallic surfaces, remove rust, apply anticorrosive paint, and coat the surface with ready mixed paint.



NOTE

#### Putty

Putty is used for installing window glass, for coating boards, and for fixing iron tube joints. Generally tempered with oil varnish or lacquer, putty is used to even the surface before painting. Putty tempered with oil is used for filling holes or cracks when mounting window glass onto the pane or during painting.



CAUTION

#### Cautions for storing paint

Beware of fires since paints are inflammable, and seal leftover paints for storing.

### 2.1.4 Installing Conducted Linoleum

Installation of conducted linoleum is subject to the installation area as follows:

- Leased building: Install conducted linoleum up to 0.9 m around the equipment. However, install sufficiently for sites where extension is expected.
- Container: Do not install conducted linoleum where conducted tiles are installed over the access floor, but only repair damaged parts. However, conducted linoleum should be installed in sites floored with non-conductive tiles.
- Self-owned building: Install conducted linoleum on the entire floor of the equipment room.

The procedure for installing conducted linoleum is as follows:



- 1) If the floor surface is not even or if the flooring becomes loose, even the surface and remove the loosed area.
- 2) If existing floor is made of tiles, apply silver paper to junction parts.
- 3) Install linoleum. For flooring that requires conducted wax, apply the wax 2 times.
- 4) Install copper tape(20 mm 0.07 t) every 1 meter, and coat parts connected to walls.
- 5) To earth conducted linoleum, solder GV 14 mm<sup>2</sup>(AWG 6) and connect to the Main Ground Bar(MGB). Install two or more copper tapes to prevent disconnection.
- 6) Use AL molding for earth cable finishing.

## 2.2 Installing Accessories

This section describes procedures on installing additional devices, such as cooler and fire extinguishing devices, required for operating and maintaining the BSC.

### 2.2.1 Installing Cooler

The room temperature of the BSC office should maintain 25 °C. Temperatures higher than 35 °C may cause device failures.

#### Installing Indoor Device

Install two indoor coolers to the right and left side of the BSC. The coolers should be installed where there are no obstacles blocking the circulation of cold air released from above. Install the lower part of an indoor cooler in a leveled area to support easy drain, and install a vibration-proof pad to prevent vibration.

#### Installing Outdoor Device

When installing an outdoor device on the roof or on the veranda, install the device far away from, not forwarded to, the neighboring building.

### 2.2.2 Installing Halon Fire Extinguishing System

A halon fire extinguishing system automatically extinguishes fire by detecting heat or smoke and releasing halon gas. The halon equipment should be installed in a location where the gas can be evenly distributed and in an open area. In addition, the cooler wind should not be released directly to the equipment, and the wiring should be interlinked to the ventilating fan so that the fan stops when the equipment is activated.

The procedure for installing a halon fire extinguishing system is as follows:



- 1) Install package
- 2) Install control board
- 3) Install detector
- 4) Install audio alarm system
- 5) Install manual switch box
- 6) Install gas release indicator lamp
- 7) Interlink equipment
- 8) Install conduit
- 9) Wiring and piping

## 2.3 Foundation Construction

During foundation construction, the reference line is determined, marking and drilling are performed, and the cable rack is installed before installing cables and equipment into the BSC office.

The procedure for constructing foundation is as follows:



- 1) Marking: Mark the exact location where the system should be installed.
- 2) Drilling & Anchoring: Drill a hole in the ground and fix a rack by using the anchor bolt.
- 3) Installing cable rack: Install a cable rack used for fixing cables such as power cables and earth cable feeders.

### 2.3.1 Marking

Marking refers to marking the location of the equipment, cable rack hole, and the location of the anchor bolt, indicated on the floor plan, to the floor, walls, and ceiling. Measure the actual size of the equipment room and the location of pillars, and mark the reference points according to floor plan to mark the locations where racks should be installed.

The procedure for marking the floor is as follows:



- 1) Draw a reference line with a chalk based on the length of the equipment.
- 2) Draw a perpendicular line on the reference line.
- 3) Mark both line ends of the rack column with a chalk.
- 4) Draw the rack's front line and rear line with a chalk based on the reference line and end line of the rack column.
- 5) Mark the corner of the rack, location of the anchor bolt, name and number of the rack with a marking pen.
- 6) Mark the location of the cable hole.

#### 2.3.1.1 Drawing a Perpendicular Reference Line



- 1) Mark a reference point, 'A', on the floor that indicates a standoff distance from the rack side to the wall.  
Draw a reference line, 'a', parallel to the wall and passing the reference point 'A'.
- 2) Mark a reference point, 'B' over the reference line 'a', at three units away from the reference point 'A'.
- 3) Draw the circumference within four-unit radius on the basis of the reference point 'A', and draw the circumference within five-unit radius on the basis of the reference point 'B'.
- 4) Mark the point where the two circumferences meet as reference point 'C'.
- 5) Connect point 'A' and point 'C' to draw the perpendicular reference line.



NOTE

**XX Unit**

When the unit is cm, xx unit represents xx cm, and when the unit is mm, xx unit represents xx mm. For example, 3 units where the unit is mm represent 3 mm.

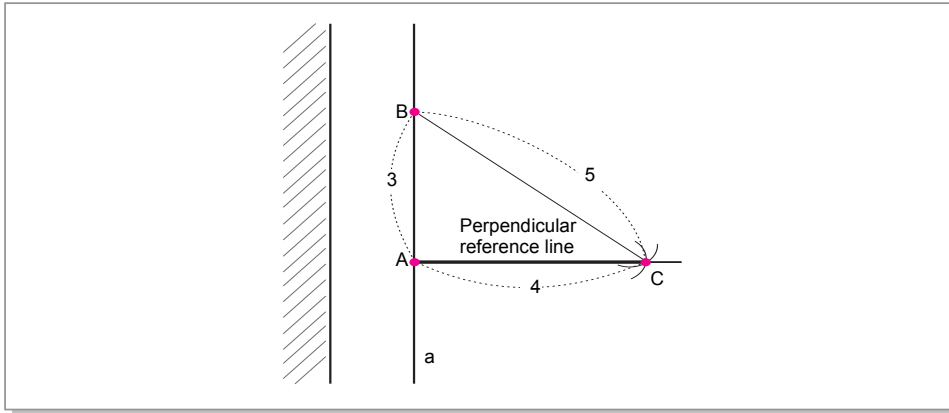


Figure 2.1 Drawing a Perpendicular Reference Line

**2.3.1.2 Drawing an Adjoint Line from a Pillar**

- 1) Draw a reference line from the pillar in one direction.
- 2) Set random points, 'A' and 'B', on the reference line. The distance between A and B should be at least 2 m.
- 3) Draw circumferences reaching a fixed radius(a) from points 'A' and 'B'.
- 4) Draw an adjoint line that adjoins both circumferences.
- 5) Set random points, 'C' and 'D', on the adjoint line. The distance between the point 'C' and the point 'D' should be at least 2 m.
- 6) Draw circumferences with the radius(a) from points 'C' and 'D'.
- 7) Draw an adjoint line that adjoins both circumferences drawn based on points 'C' and 'D'.

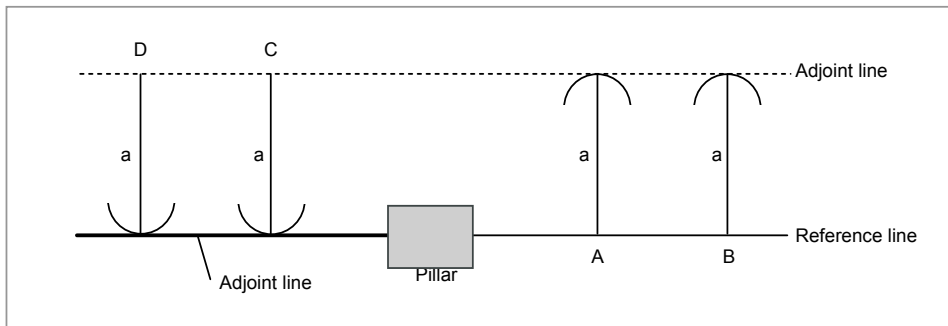


Figure 2.2 Drawing Adjoint line from the Pillar

### 2.3.1.3 Rack Marking



- 1) Check the direction of the equipment and mark a reference point on the right side of the front panel.
- 2) Mark the front reference line by drawing a horizontal line starting from the reference point.
- 3) For a 700x600 equipment, draw as many adjoint lines as the number('n')of racks to be placed in a single row at every 710mm distance, including the 10mm distance between racks. The last adjoint line should match the end line of the row.
- 4) Mark the four points of the 710x600 rectangle.  
There should be enough space in front of the equipment to let the door open.

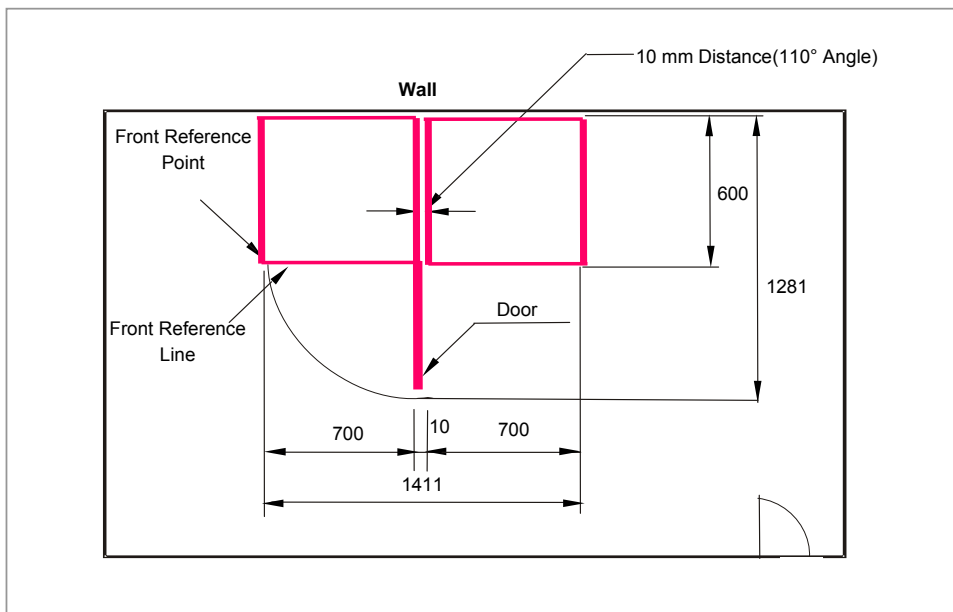


Figure 2.3 Drawing Extension Lines According to Rack Layout

### Checking Marking

Measure the length of the diagonal line in the rack installation area and check if  $d1=d2$ .

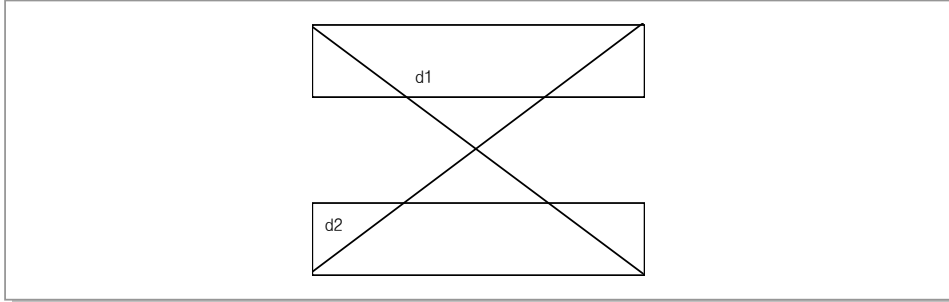


Figure 2.4 Checking Marking

## 2.3.2 Drilling and Anchoring

Drilling refers to making a hole in the ground to fix a rack to the ground using anchor bolts. Anchoring refers to inserting and fastening the anchor bolt in the drilled hole.

### 2.3.2.1 Drilling

Holes should be drilled at locations marked on the office floor. Drill 70 mm(2.75") deep holes using 22 mm(0.86") bit. Make sure that the wing of the anchor bolt is firmly pressed to the concrete when inserting the anchor bolt to the drilled hole. Depending on the office circumstances, the anchor bolt might not be used.

### 2.3.2.2 Anchoring



- 1) Drill a hole on the marked concrete surface. The size and depth of the hole should comply with the specification of the anchor bolt. The horizontal and vertical distances between the bolts should each be at least 50 mm and 100 mm.
- 2) Insert the anchor bolt into the drilled hole.
- 3) Fasten the anchor using the flat washer, spring washer, and nut, in that order.
- 4) As the nut is tightened, the anchor bolt moves toward the bottom part of hole and the anchor bolt is widened towards the outside, fastening the anchor bolt to the hole.

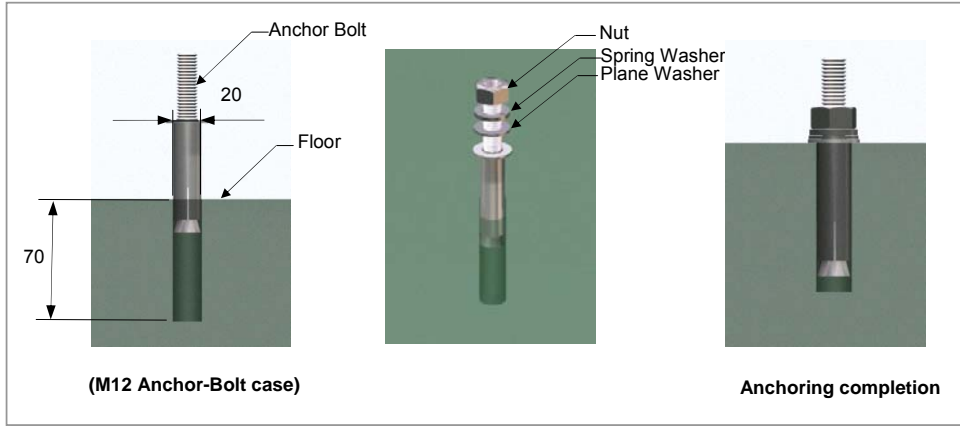
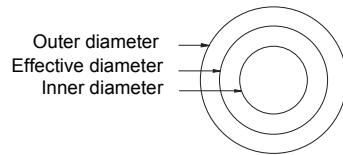


Figure 2.5 Drilling and Anchoring



**M12**

M represents mm and is used for specifications of bolts, nuts, and washers. For example, M12 nut means that the effective diameter is 12 mm. Effective diameter is the radius of a circle connected by middle points between the outer and inner diameters.



### 2.3.3 Installing Cable Holes

Drill a hole on the concrete and install a cable hole angle set to wire cables through the floor or ceiling. Cable holes should be installed on the floor or on the surface of a wall.



- 1) For floor installation, drill a hole according to specifications in the drawing and install a seating on the bottom surface of the floor.
- 2) For wall installation, drill a hole according to specifications in the drawing and install the cable rack.
- 3) The floor or wall surface where cables holes are installed should be well plastered and painted.
- 4) Finish the installation by covering the top of the seating and holes on the wall with silicon.

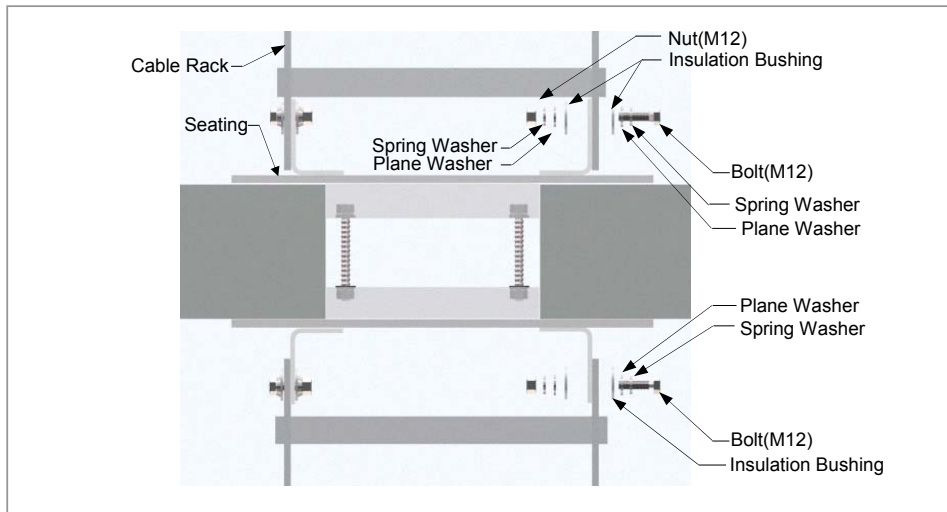


Figure 2.6 Cable Hole Structure



## 2.3.4 Installing Cable Racks

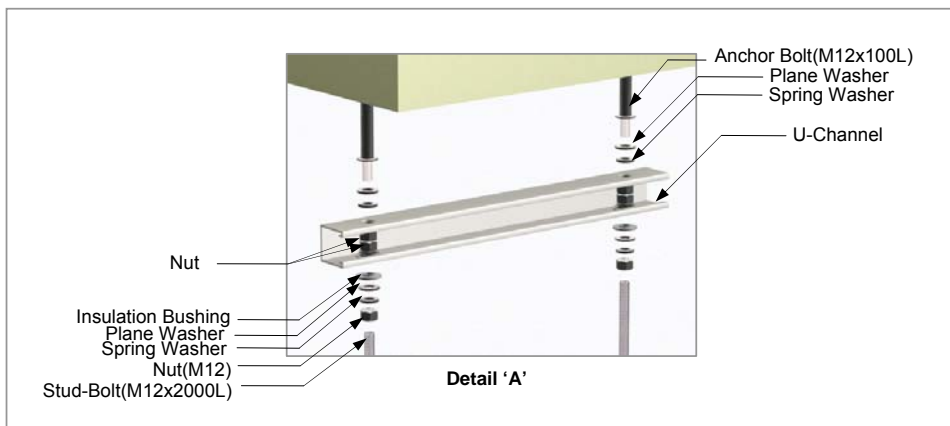
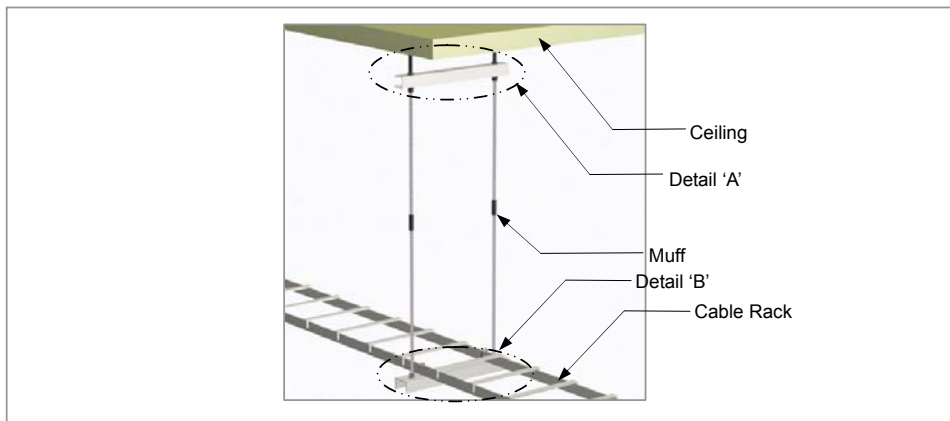
Install cable racks according to the floor plan using floor brackets, triangle brackets, and wall brackets, considering future extensions.

### 2.3.4.1 Installing Cable Rack to Ceiling

Follow the procedure below to fasten a ladder type rack to the ceiling:



- 1) Mark the ceiling, drill holes, and insert and fasten anchor bolts into the holes.
- 2) Connect U-Channels to the anchor bolts.
- 3) Use insulating bushings, washers, spring washers, and nuts to connect suspension bolts to the U-channels.
- 4) The length of a suspension bolt is 2 m, and can be extended using a muff.
- 5) Use insulating bushings, washers, spring washers, and nuts to connect the U-Channels to the bottom ends of the two suspension bolts.
- 6) Mount the cable rack on the U-Channels, and fasten the rack using 'J' bolts and flange nut.



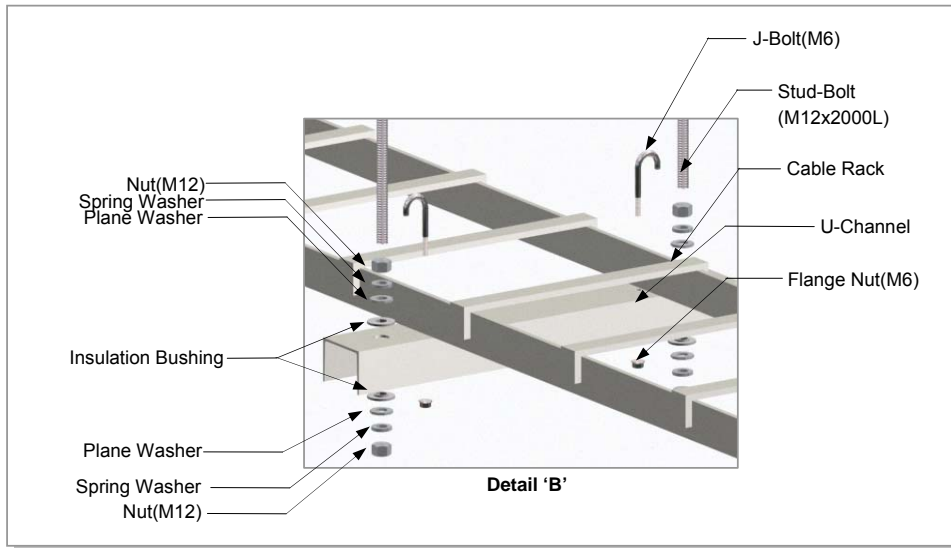


Figure 2.7 Installing Cable Rack to Ceiling

### 2.3.4.2 Installing Cable Rack on Floor



- 1) For vertical installation, connect the ends of the cable rack with the floor brackets by using horizontal connectors.
- 2) Use flat washers, spring washers, and nuts to connect the floor brackets with anchor bolts inserted to the floor.

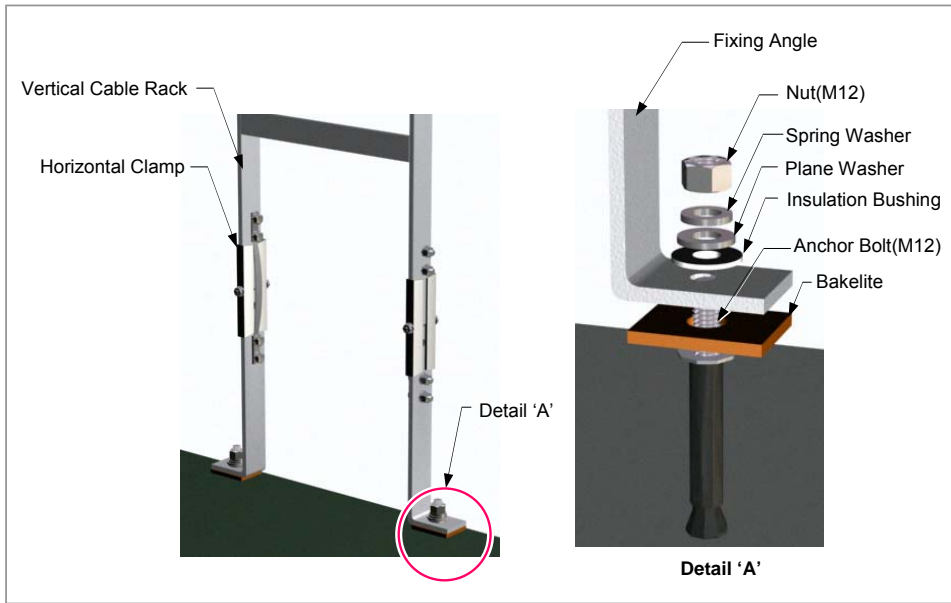


Figure 2.8 Installing Cable Rack on Floor

### 2.3.4.3 Installing Cable Rack on Walls

#### Using a Triangle Support Bracket

Specification of a triangle support bracket is subject to the specification(extent) of the cable rack.



- 1) Connect a triangle bracket to the anchor bolt inserted into the wall. Insulate the bracket using an insulating board and bushing.
- 2) Mount a ladder type cable rack on the triangle bracket and fix the rack with a 'J' bolt.

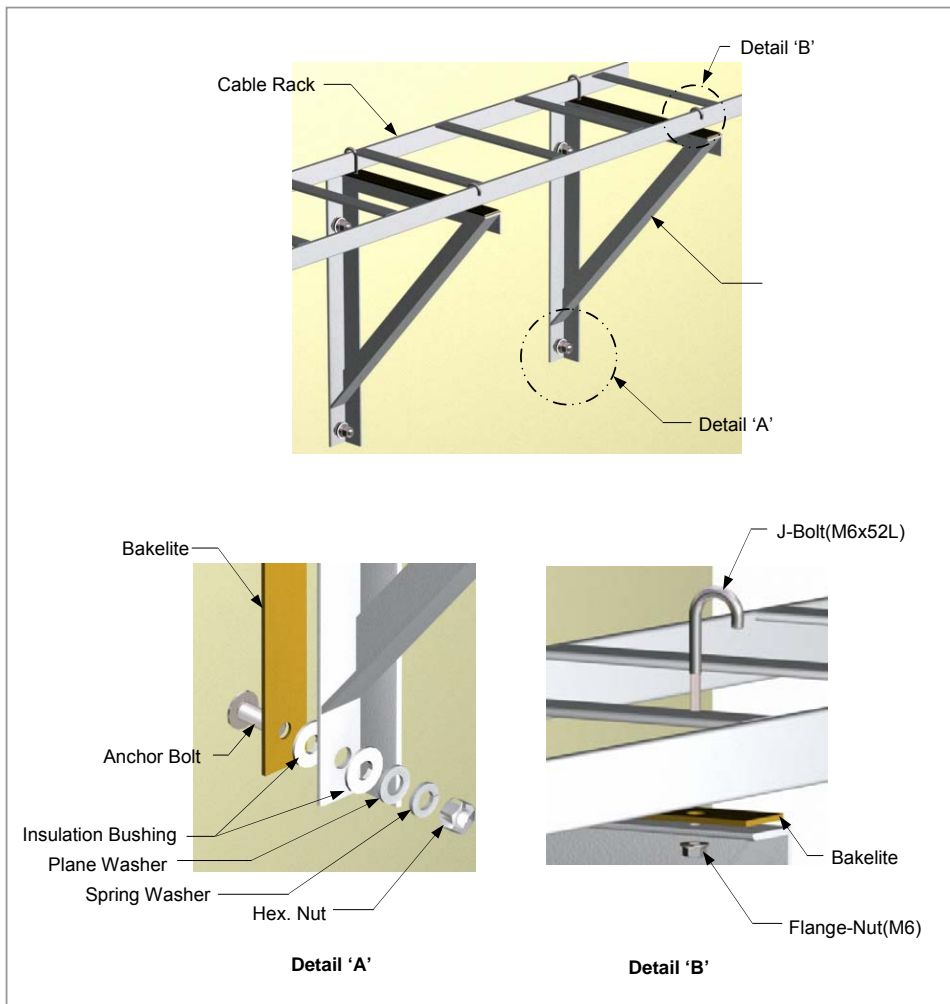


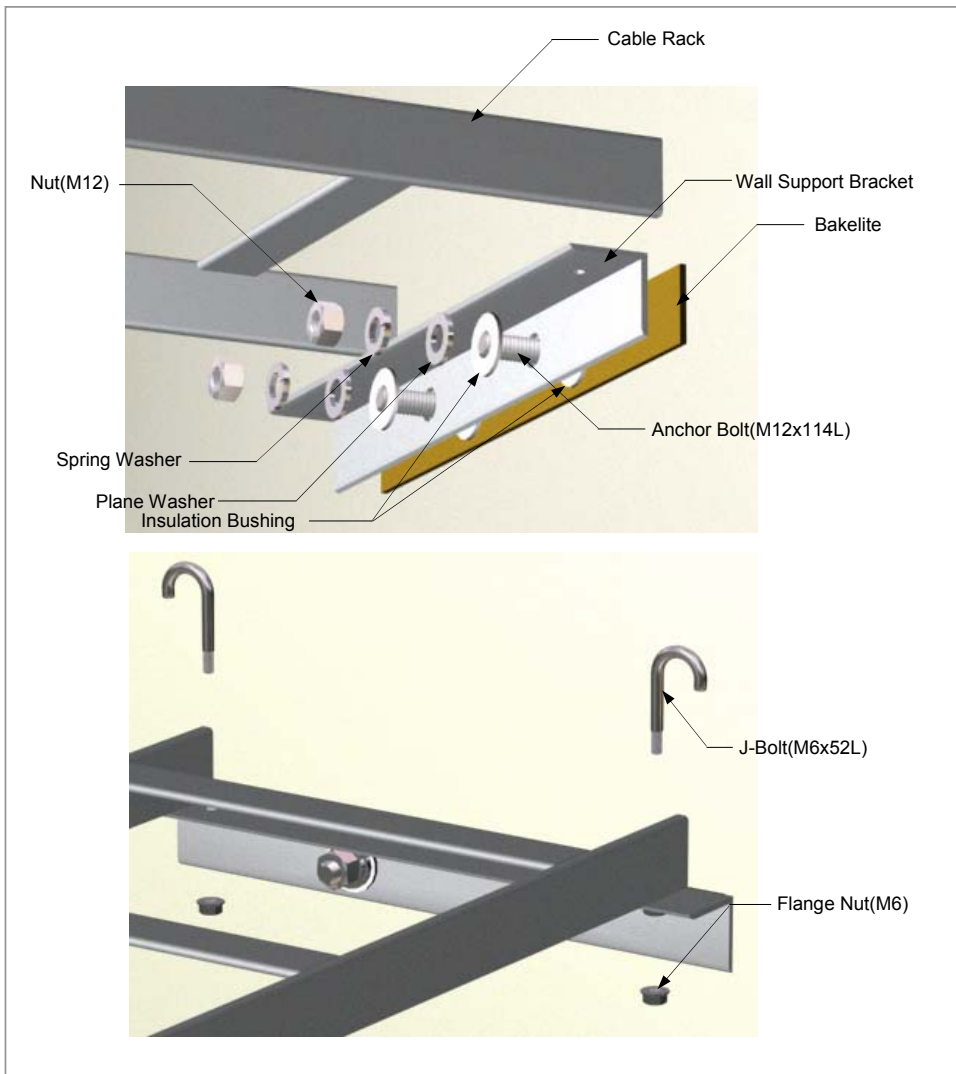
Figure 2.9 Installing Cable Rack Using Triangle Support Bracket

### Using a Wall Support Bracket

Fix the end of the cable rack to the wall as shown below to prevent the rack from shaking. The cable rack can be fixed to the wall using a wall support bracket. The specification of a wall support bracket is subject to the specification(extent) of the cable rack.



- 1) Fix the wall support bracket to the anchor bolt inserted into the wall. Insulate the bracket using an insulating board and bushing.
- 2) Mount the cable rack on the bracket and fix the rack with a 'J' bolt. The cable rack should be horizontally balanced.



**Figure 2.10** Installing Cable Rack Using Wall Support Bracket

### Vertical Wall Support



- 1) Fix mounting brackets to anchor bolts inserted into a vertical wall. Insulate the mounting brackets using insulating boards and bushings.
- 2) Connect a vertical cable rack to the mounting brackets using bolts, insulating bushings, flat washers, spring washers, and nuts.

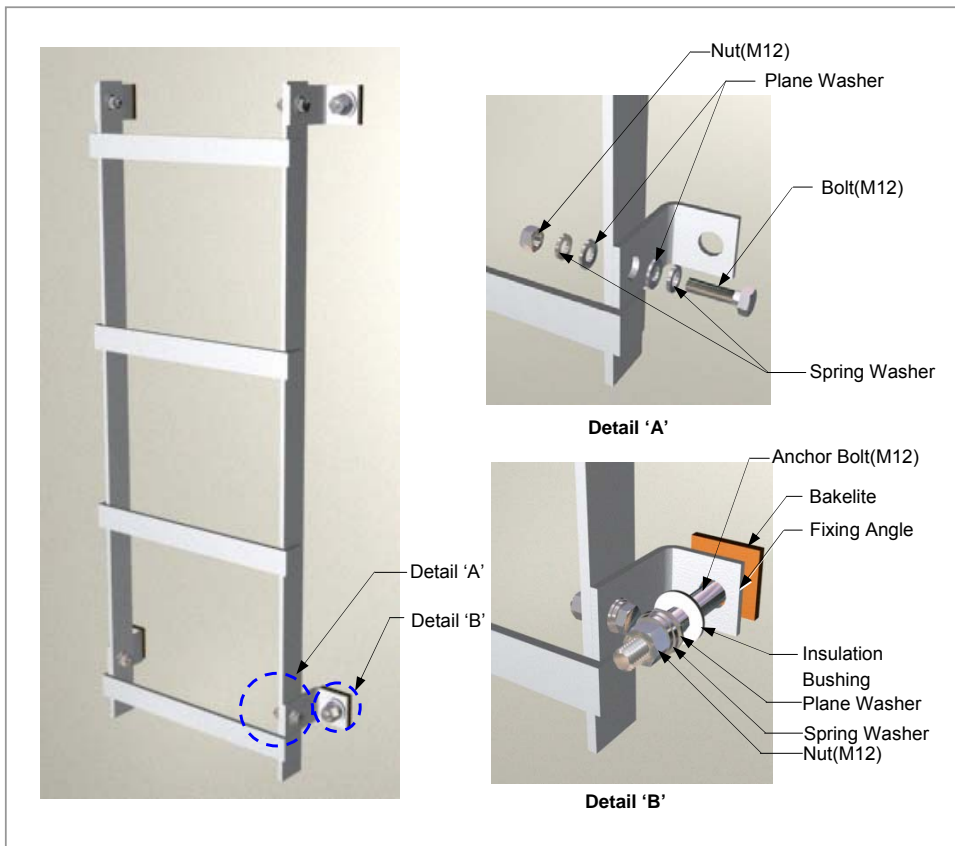


Figure 2.11 Vertical Wall Support for Cable Rack

### 2.3.4.4 Installing Curved Cable Rack

When wiring cables to upward/downward 90° vertical directions, assembly and install curved cable racks to the upper and lower sections to increase the curvature radius.



- 1) Connect the upper curved cable rack to the ladder type cable rack using a connection bar.
- 2) Fix the ladder type cable rack to the cable hole angle set using a mounting bracket. Execute the above steps for the lower curved cable rack.



Figure 2.12 Installing Upper/Lower Curved Cable Rack

### 2.3.4.5 Installing 2-Level Cable Rack

Connect two cable racks as shown below:

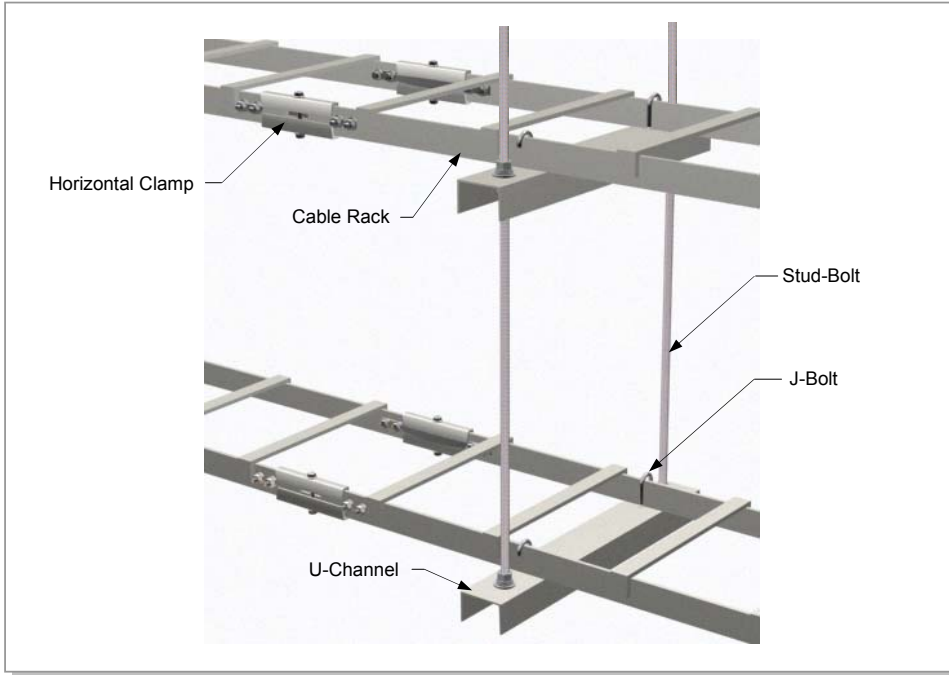


Figure 2.13 Installing 2-Level Cable Rack



### 2.3.4.6 Changing Cable Rack Elevation

Use a 45° connection bar and clamp to change the height of the cable rack. Level change clamps are used with flange nuts and bolts to connect two cable racks of different levels.

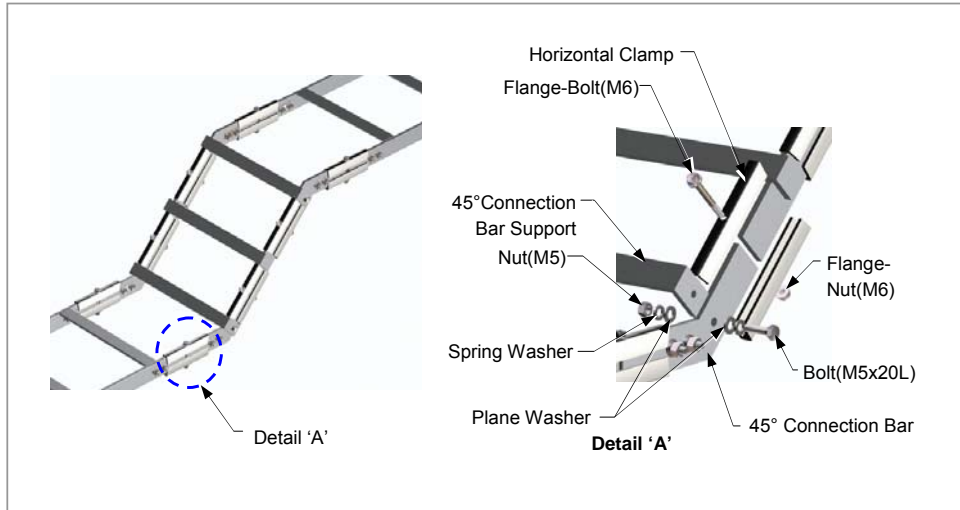


Figure 2.14 Cable Rack Level Change

### 2.3.5 Cable Rack Connection and Finishing

The procedure for connecting cable racks is as follows:



- 1) Apply horizontal connectors above and beneath the cable rack connecting sections.
- 2) Fasten the connectors to the rack using flange bolts and flange nuts.
- 3) Use bolts, washers, and nuts and install the earth kit.

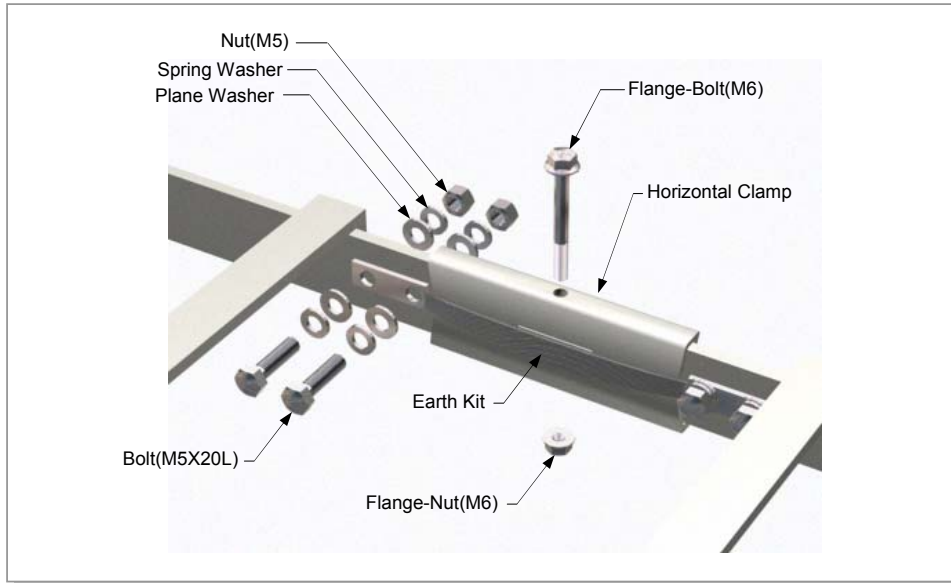


Figure 2.15 Horizontal Cable Rack Connection

Vertical connection of two cable racks is described below:



- 1) Apply vertical connectors to the upper and lower connecting parts of the two racks.
- 2) Fasten the connectors to the rack using flange nuts and flange bolts.
- 3) Use bolts, washers, and nuts and install the earth kit.

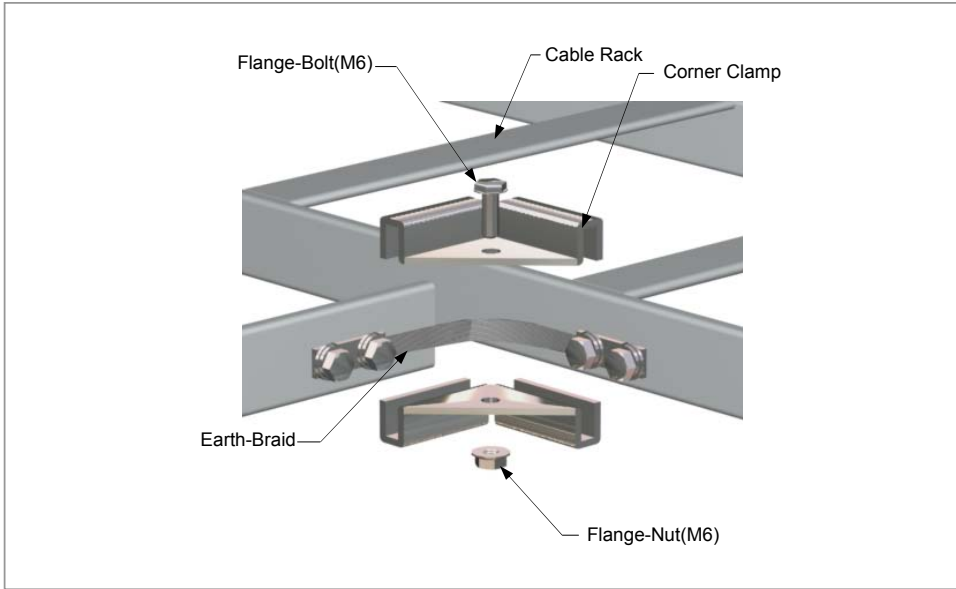


Figure 2.16 Vertical Cable Rack Connection

Use vertical connectors and horizontal connectors to connect two cable racks of different widths.

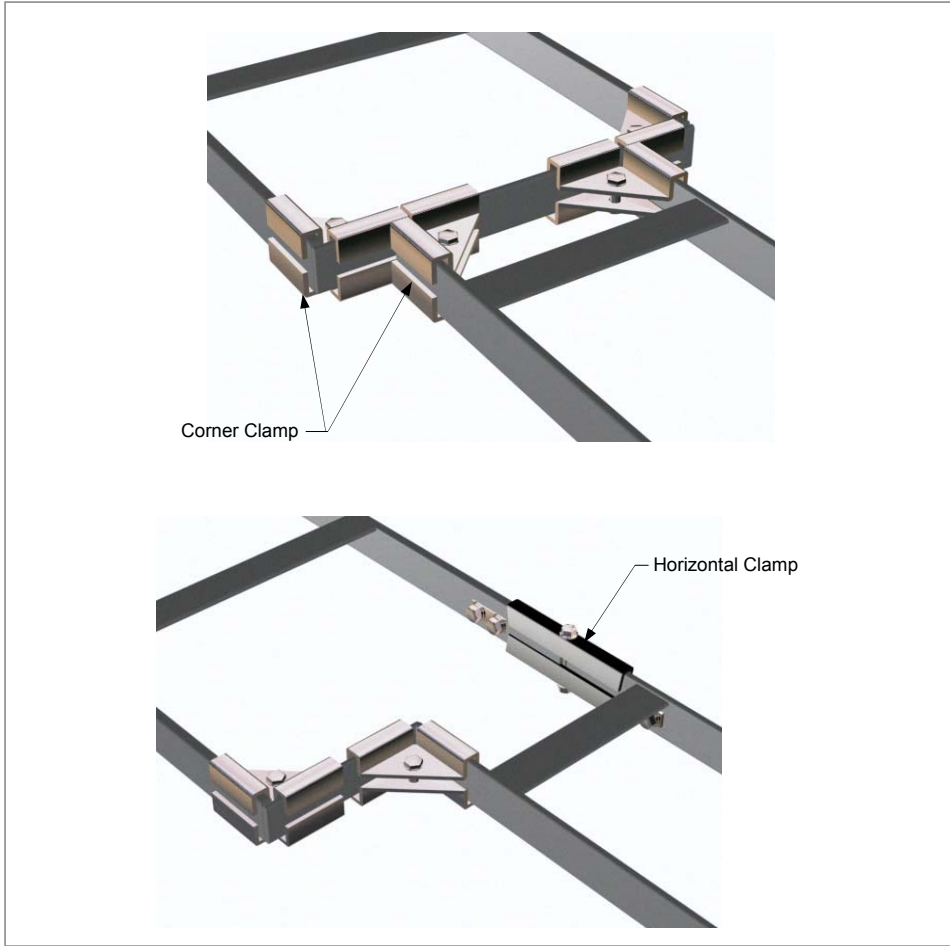


Figure 2.17 Connecting Cable Racks of Different Widths

## Finishing

Install a bar and fasten the bar using a vertical connector or cover the end section with a rubber caps.



Figure 2.18 Cable Rack Finishing

삭제됨: —페이지 나누기—

## 2.4 Equipment Installation

The procedure for installing equipment ahead of earth is as follows:



- 1) Carrying and Unpacking Equipment
- 2) Rack Installation
- 3) Circuit Pack Treatment
- 4) Equipment Arrangement
- 5) Cabling

### 2.4.1 Carrying and Unpacking Equipment

The operator should check if proper materials and goods are brought and if their quantities are correct according to the installation plan. AC power cables, DC power cables, switches, and conduit tubes should be selected for installing the system and lighting according to each standard. The operator should notify the workers movement in advance so that the workers can be allowed to go in and out the target office freely. In addition, the operator should discuss with departments of implementation and operation for an existing communication system and interface.

#### 2.4.1.1 Equipment Delivery Rule

Permissible shock level while equipment such as racks and materials is moved is as follows:

##### Packed Rack

Weight(kg)	Falling Height(mm)
Less than 450	300

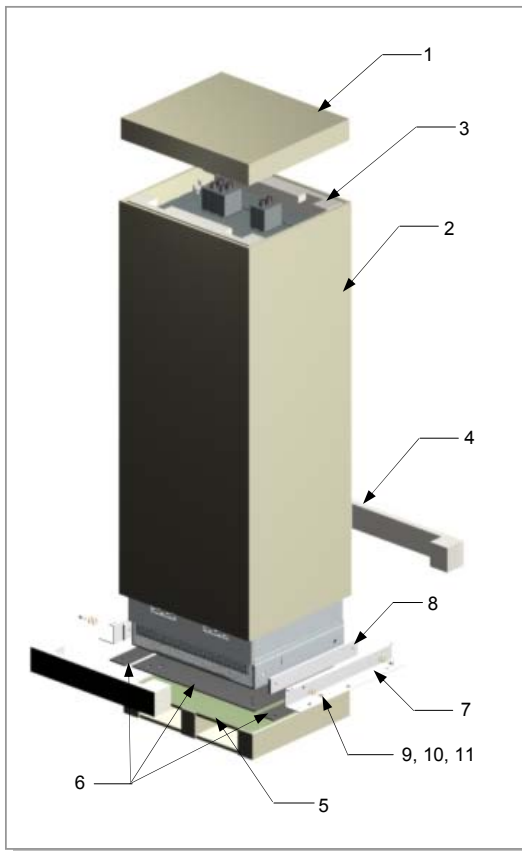
##### Unpacked Materials

Weight(kg)	Falling Height(mm)
0~10	100
10~25	75
25~50	50
50 or More	25

### 2.4.1.2 Bringing Equipment


Equipment should be brought while taking the cautions below:

- Regarding their weights and sizes, check the path to bring the equipment. Iron and veneer boards are required to carry them through stairs and doorsills smoothly.
- Prepare protective materials and fix them with tape to prevent the floor of entrance, walls and the ground of an office from damages when bringing the equipment to the office.
- When boards are carried, they should be packed. When the boards are performed installation tests, the package should be unpacked.
- When the PBAs are carried, they should be packed. When mounted, the PBAs should be unpacked.



NO.	DESCRIPTION	Q'TY
1	Cover, Box Triwall	1
2	Box Triwall	1
3	Cushion, Top	2
4	Cushion, Bottom	2
5	Pallet	1
6	Rubber Plate(t5.0)	1
7	Bracket, Side	2
8	Guide, Bracket Side	2
9	Hex Bolt, M12	4
10	Plane Washer, M12	4
11	Spring Washer, M12	4

Figure 2.19 Rack Package Configuration



**Damaging building**  
When equipment is carried, take special caution not to damage building.

CAUTION

**Storing Racks**

Racks should be kept in more secure place at regular intervals so that no falling occurs.

**Vibration Standard**

When the system is moved, fasten the system firmly not to exceed the proper vibration level from 1 to 500 Hz.

Follow the instructions below when installing equipment:

- System racks must be installed on a concrete floor in a location where external access is limited.
- Circuit packs and modules shall be installed on the system rack accurately.
- Since the rack is not equipped with a protective device against DC integrated devices, installation of a rectifier should be considered to protect against 190 A for A/B path and against 139 A for C path.

**2.4.1.3 Unpacking Equipment**

Procedure for unpacking the equipment is as follows:



- 1) Unpack the equipment until the equipment is carried to the installation place.
- 2) Classify and store the equipment according to the job specification. Thus, the equipment should not interrupt the job.
- 3) Install the equipment just after being unpacked. If the equipment cannot be installed promptly, keep the equipment in the corresponding place temporarily.

**Moisture**

Since equipment can be corroded by moisture, maintain the equipment in dry condition.

- 4) Remove just the outer cover without unpacking the equipment.
- 5) Arrange and unpack the equipment in the target place.
- 6) Stack other materials in a specific place and return them to the operation department.

**Dust**

Dust may interrupt the operation of an adjacent system during job in a building.



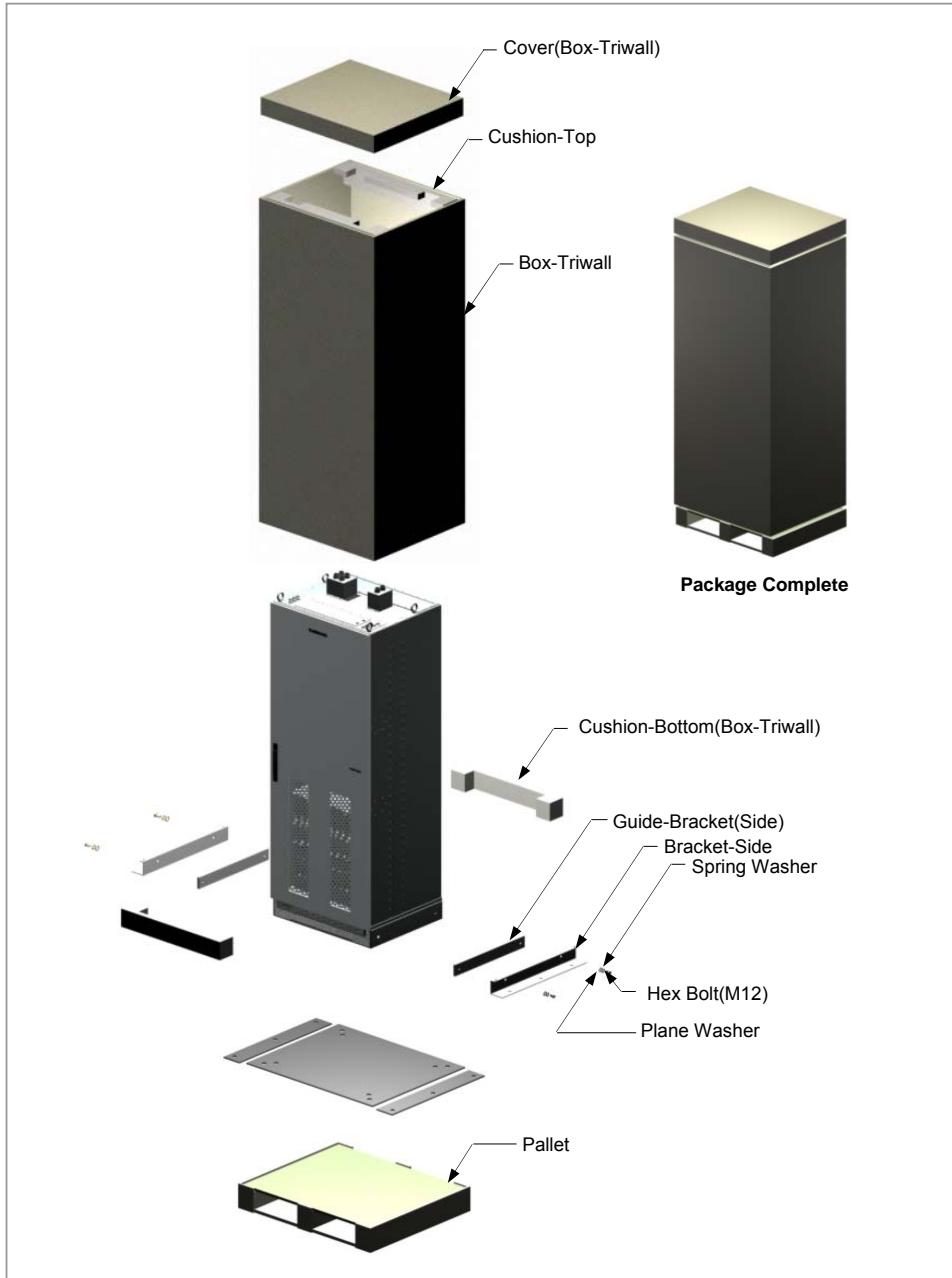


Figure 2.20 Exploded View of Rack Package

## 2.4.2 Rack Setup

The configuration diagram of the racks in Indoor BTS is shown below:

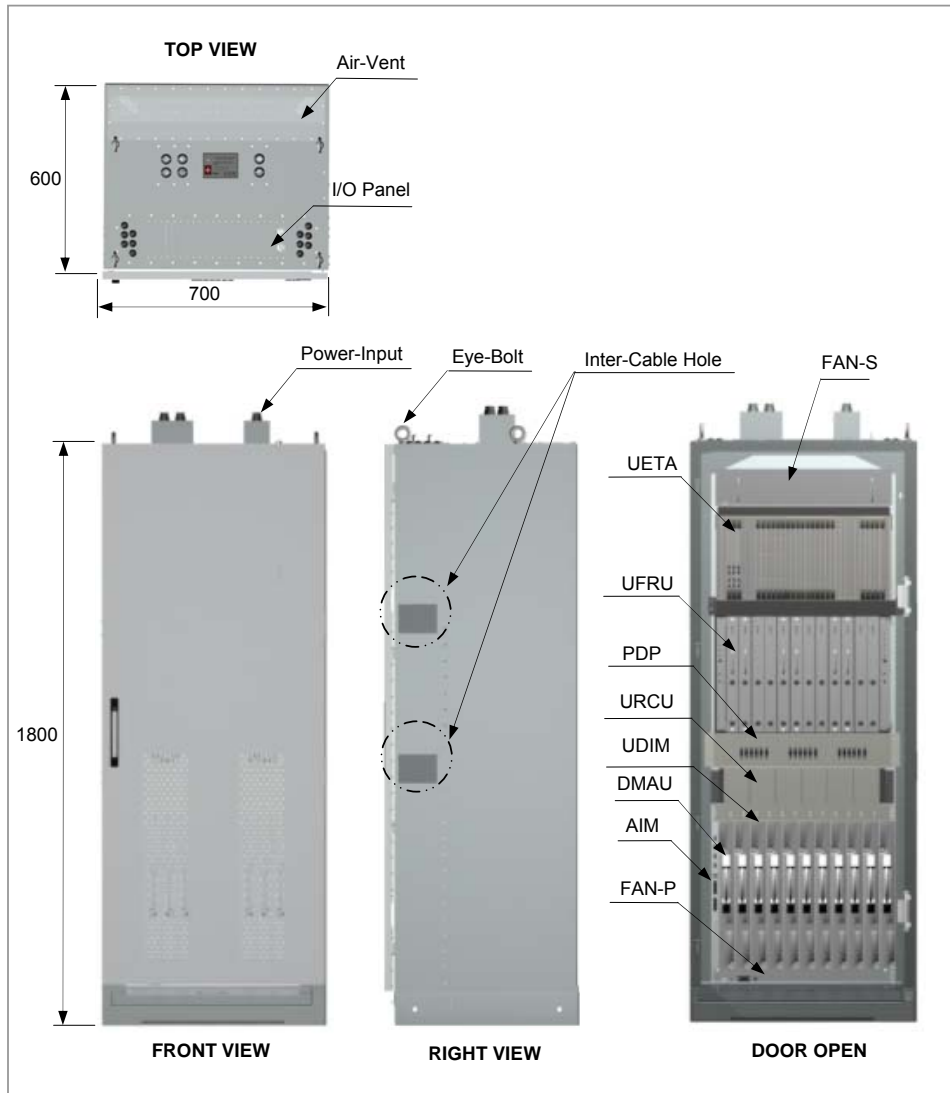
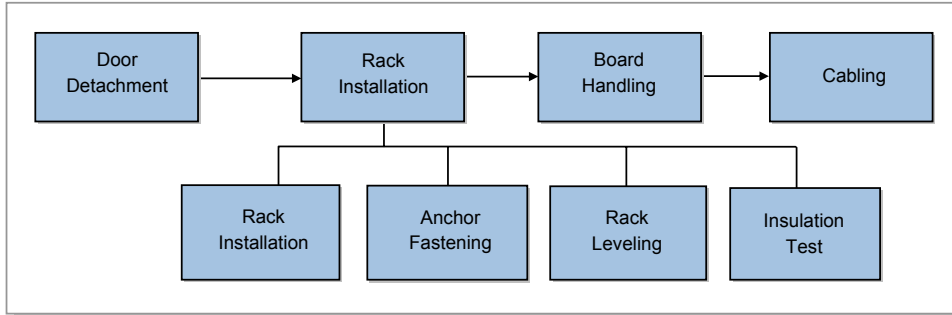


Figure 2.21 Configuration Diagram of the Rack

The rack should be installed with caution to prevent against damage such as scar or breakdown according to the procedures shown below:



### 2.4.2.1 Door Detachment

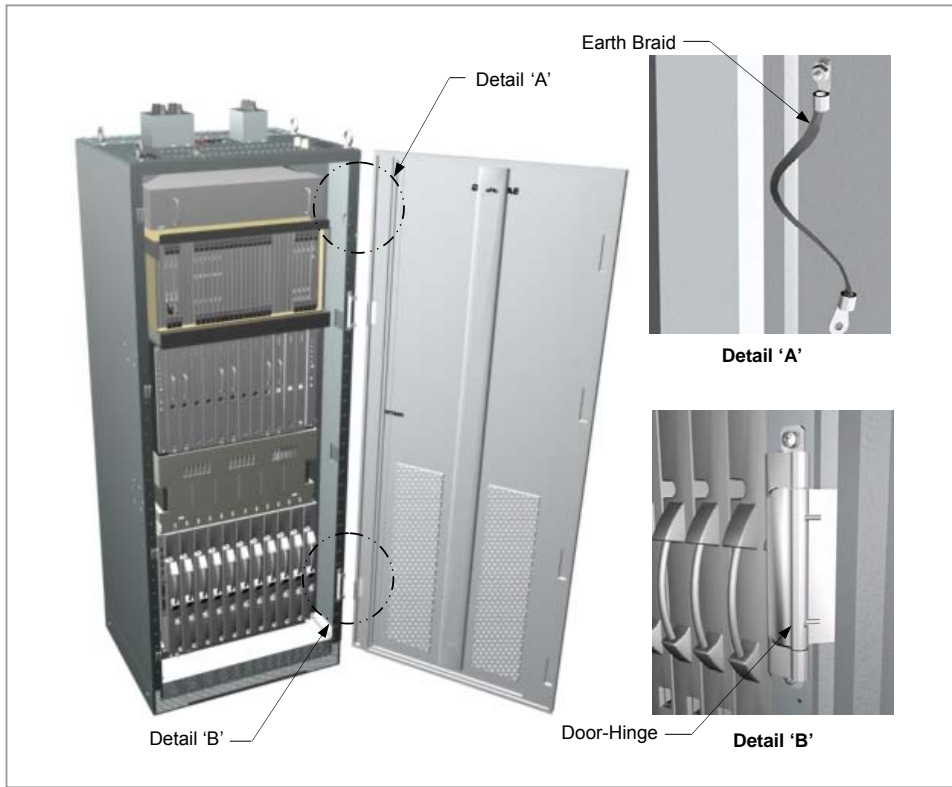


Figure 2.22 Door Detachment Diagram

Follow the steps below to detach the door:



- 1) Pull back the door.
- 2) A Earth-Braid is installed at the top of the door hinge. Unfasten the nut and washer by using a spanner and detach the Earth-Braid.
- 3) Two hinges exist on the door. Hinges are located in the rack frame and door. Each hinge on the door has a latch. Set the door hinge to the unlock position.
- 4) Grab both sides of the door with both hands.
- 5) Close the door a little and move the door to the right to detach the door from the frame.
- 6) To fasten the door, perform the procedures above in the opposite order.

The figure below shows procedures for detaching the door hinge from the door:

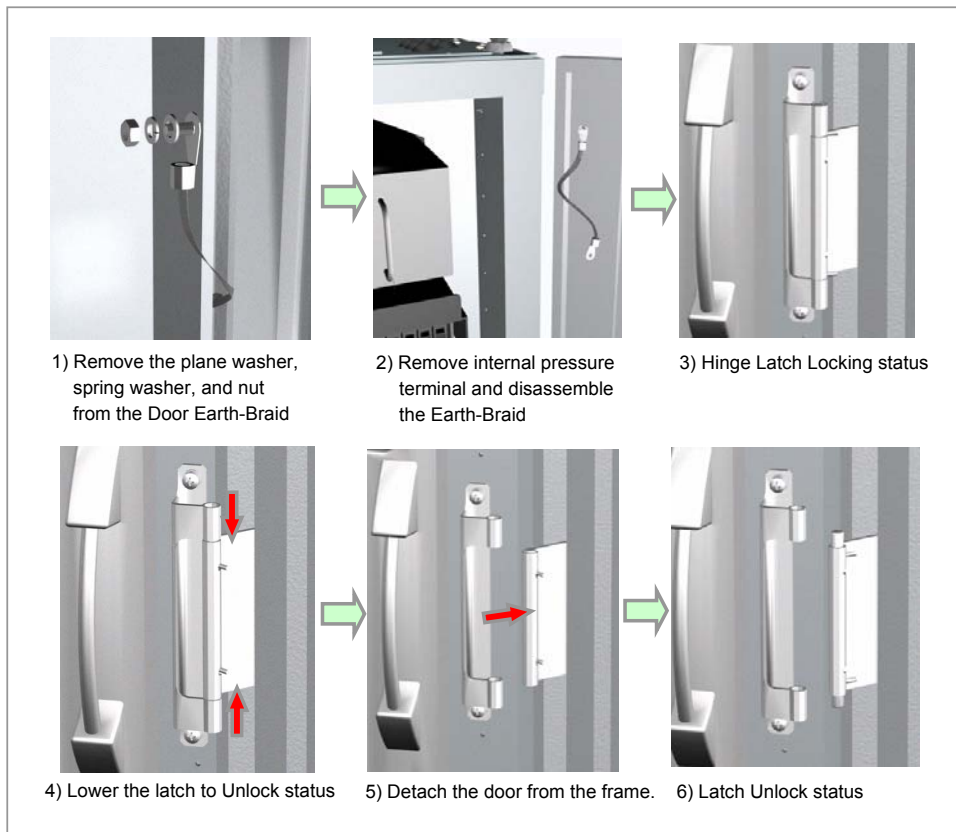


Figure 2.23 Method of Detaching Door Hinge

### 2.4.2.2 Rack Installation

Follow the steps below to install the rack:

The SEMS Screw of the intake cover is fasten in the front of the rack.



- 1) Unfasten four SEMS Screws by using a driver.
- 2) Intake cover is stuck in the stud; thus, the cover can be pulled off only to the front side. Pull off the cover.
- 3) Four captive screws exist at the top, bottom, left, and right on the front of the fan tray. Unfasten the screws in the same method as '2)'.
  - 4) Three cables(power cable, alarm cable, and bonding terminal) are connected to the front left of the fan tray. The power cable and alarm cable are connected by a latch-type connector; therefore, disconnect the cables with a hand. The bonding terminal is connected by the quick disconnecter. Disconnect the terminal with a hand.
- 5) Grab the knob at the center of the fan tray and pull off the rack to the front slowly. To assemble a rack, perform the procedures above in the opposite order.

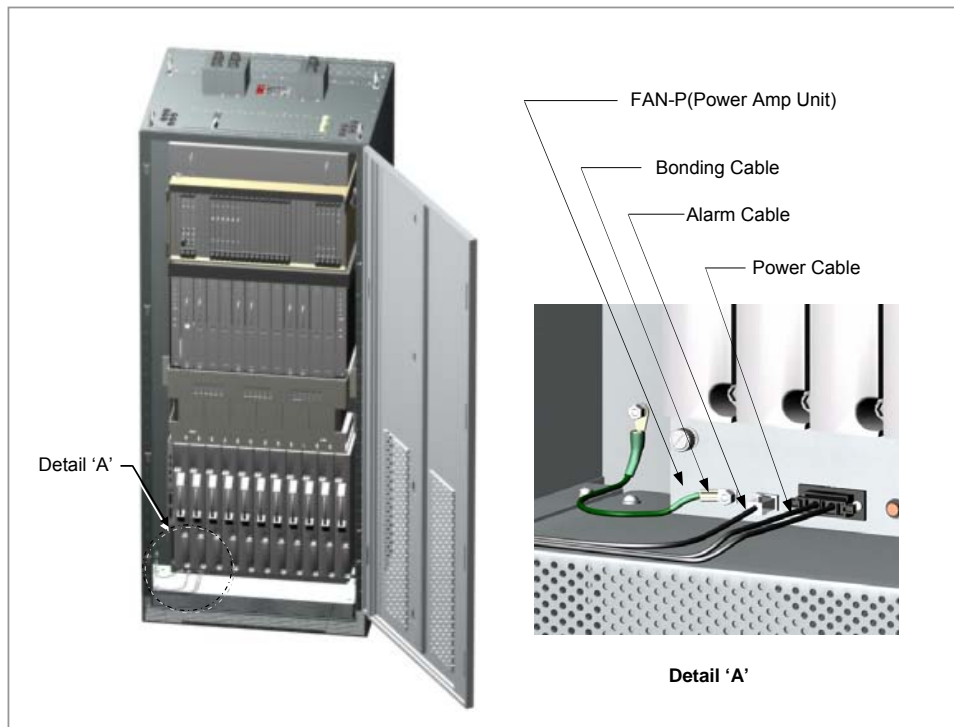
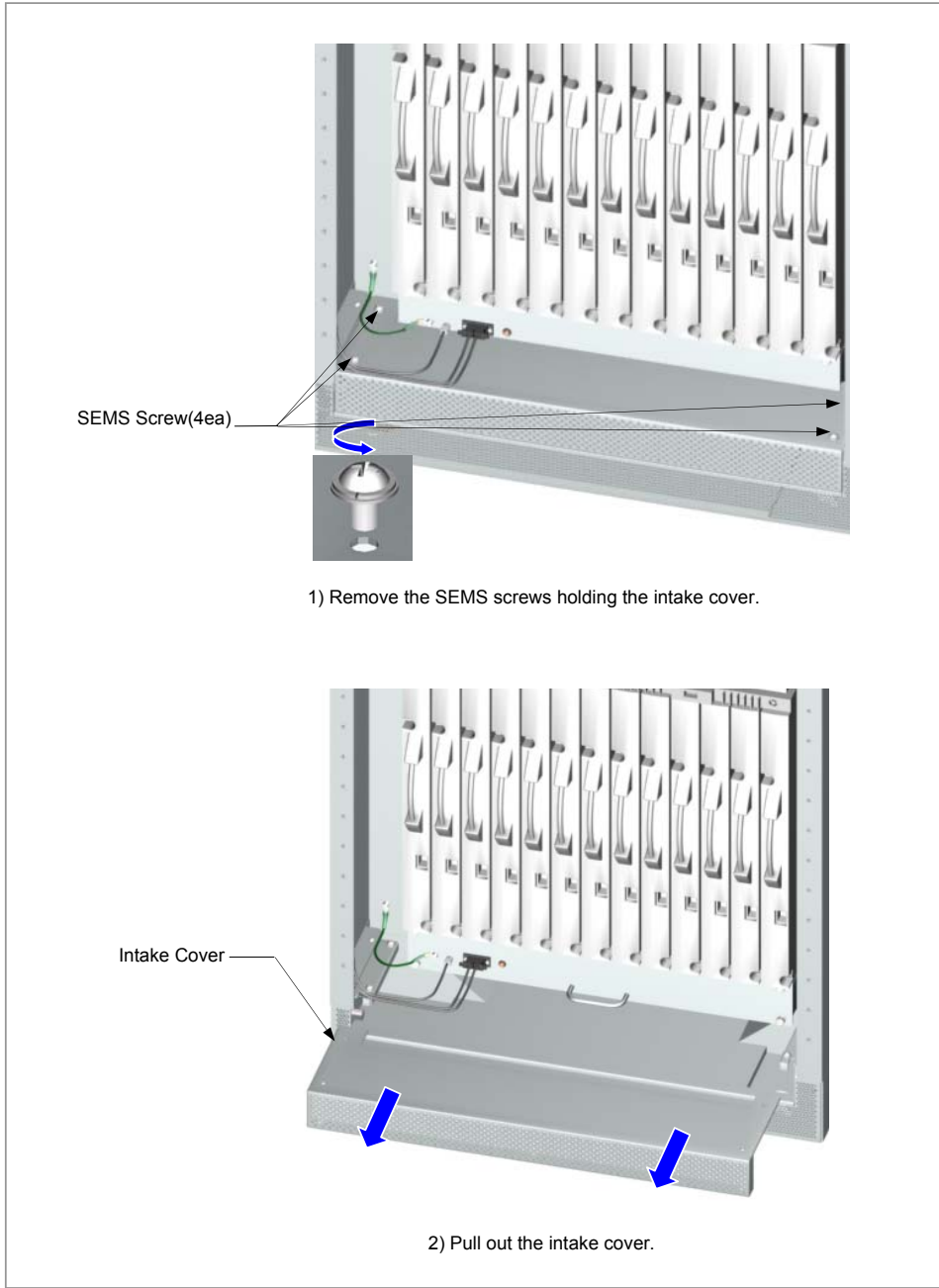
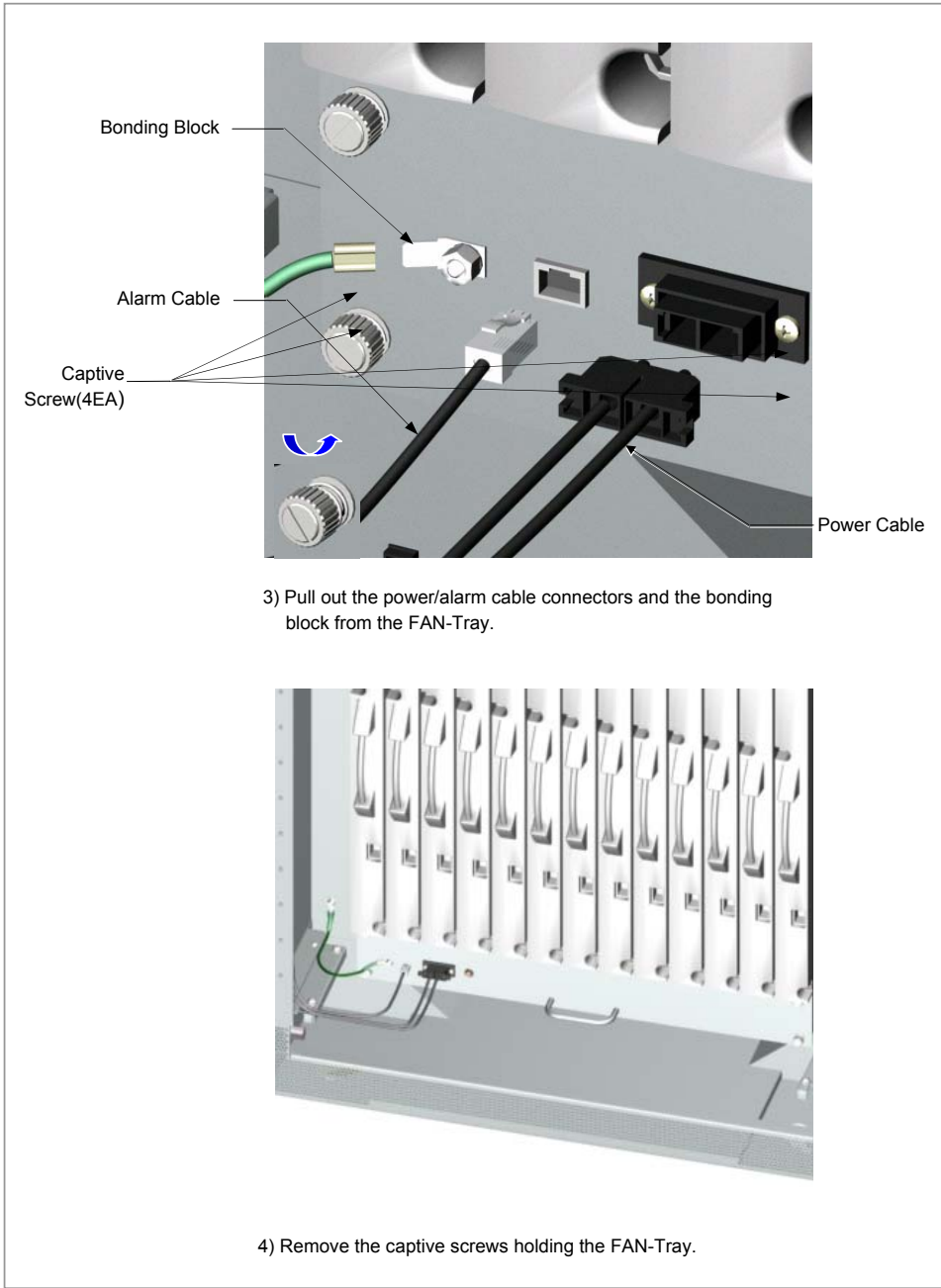


Figure 2.24 Detailed Diagram of Front Bottom of Rack

The figure below shows procedures for preparing anchoring for rack installation:





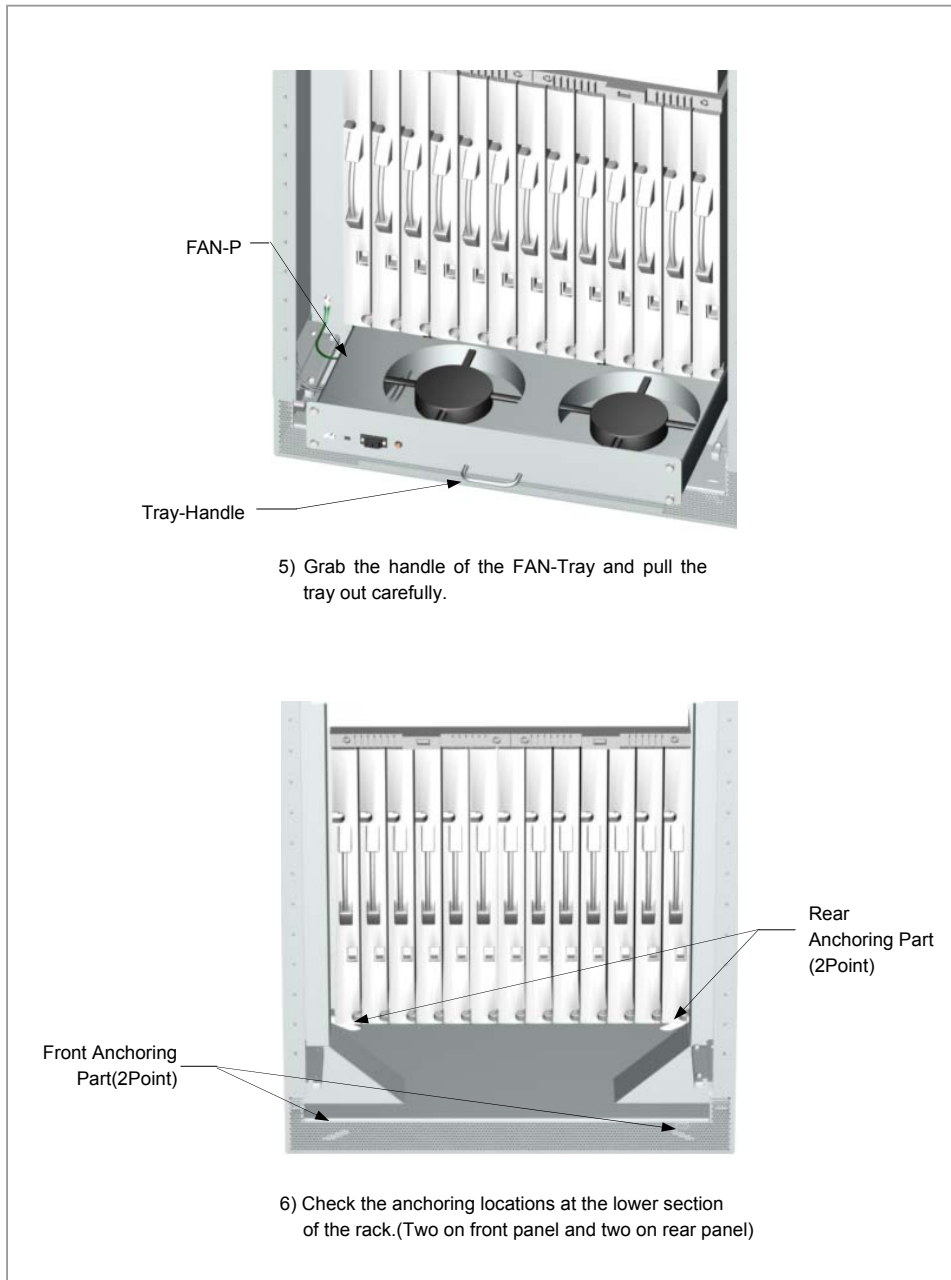


Figure 2.25 Detachment Procedures for Preparing Anchoring



**Caution for pulling off FAN-P**

Since FAN-P(POWER AMP UNIT) weighs about 10 kg, the FAN-P should be pulled off with caution



### 2.4.2.3 Anchor Fastening

#### Fastening Anchor on Raised Floor

Follow the steps below to fasten an anchor on raised floors:



- 1) Check the holes for rack fastening located on the bottom of the dismantled FAN-P tray(two on front panel and two on rear panel).
- 2) Insert an M16 anchor bolt into the drilled hole.
- 3) Fasten the four corners of the a supporter for preventing earthquake on the anchored spot.
- 4) Fasten the supporter on the anchored spot by using the plain washer, spring washer, and nut.
- 5) Place four bakelites on the supporter based on the anchoring hole of the spot where the rack will be placed.
- 6) Insert the M16 insulation bushing into the placed bakelite to fit the center of the anchor bolt.
- 7) Stand the rack and place it upright and slow on top of the anchor bolt.
- 8) Insert a stud bolt into the frame anchoring hole at the bottom of the rack to be connected to the bakelites and supporter.
- 9) Fix the stud bolt on the frame at the bottom of the rack by using the M16 insulation bushing, plain washer, spring washer, and nuts.
- 10) Fix the stud bolt at the bottom of the supporter by using the M16 insulation bushing, plain washer, spring washer, and nuts.

#### Fastening Anchor on Normal Floor

Follow the steps below to fasten an anchor on normal floors:



- 1) Check long holes(two on the front, two on the back) for fixing racks at the bottom of the dismantled FAN-P tray.
- 2) Insert the M16 anchor bolt into the drilled hole.
- 3) Place a rubber plate on the floor to fit it into the anchoring hole at the bottom of the rack.
- 4) Place four bakelites on the rubber plate based on the anchoring hole where the rack will be placed.
- 5) Insert the M16 insulation bushing into the placed bakelite to fit the center of the anchor bolt.
- 6) Stand the rack and place it upright and slow on top of the anchor bolt.
- 7) Fix the rack on the anchor bolt of the frame at the bottom of the rack by using the M16 insulation bushing, plain washer, spring washer, and nuts.

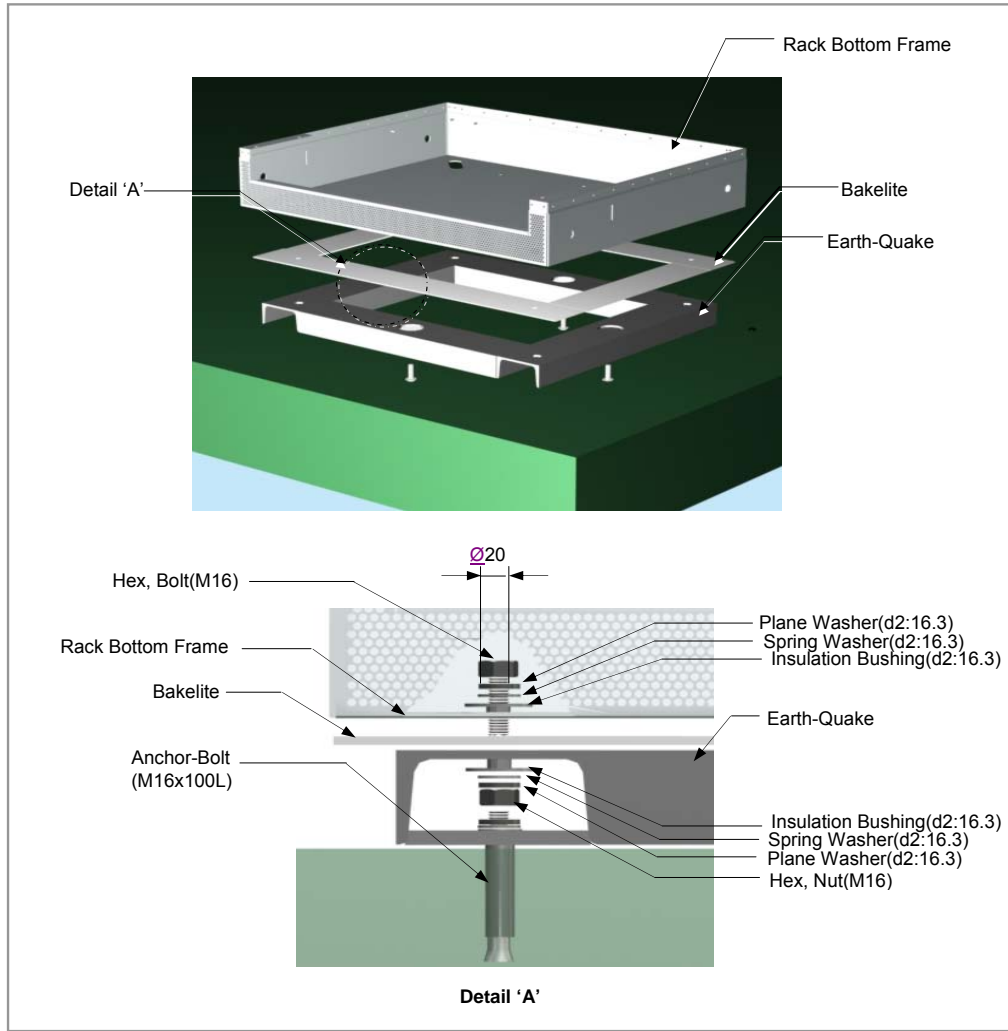


Figure 2.26 Anchoring Location (When Installing a Supporter for Preventing Earthquake)

Follow the steps below to fasten an anchor on a common floor:

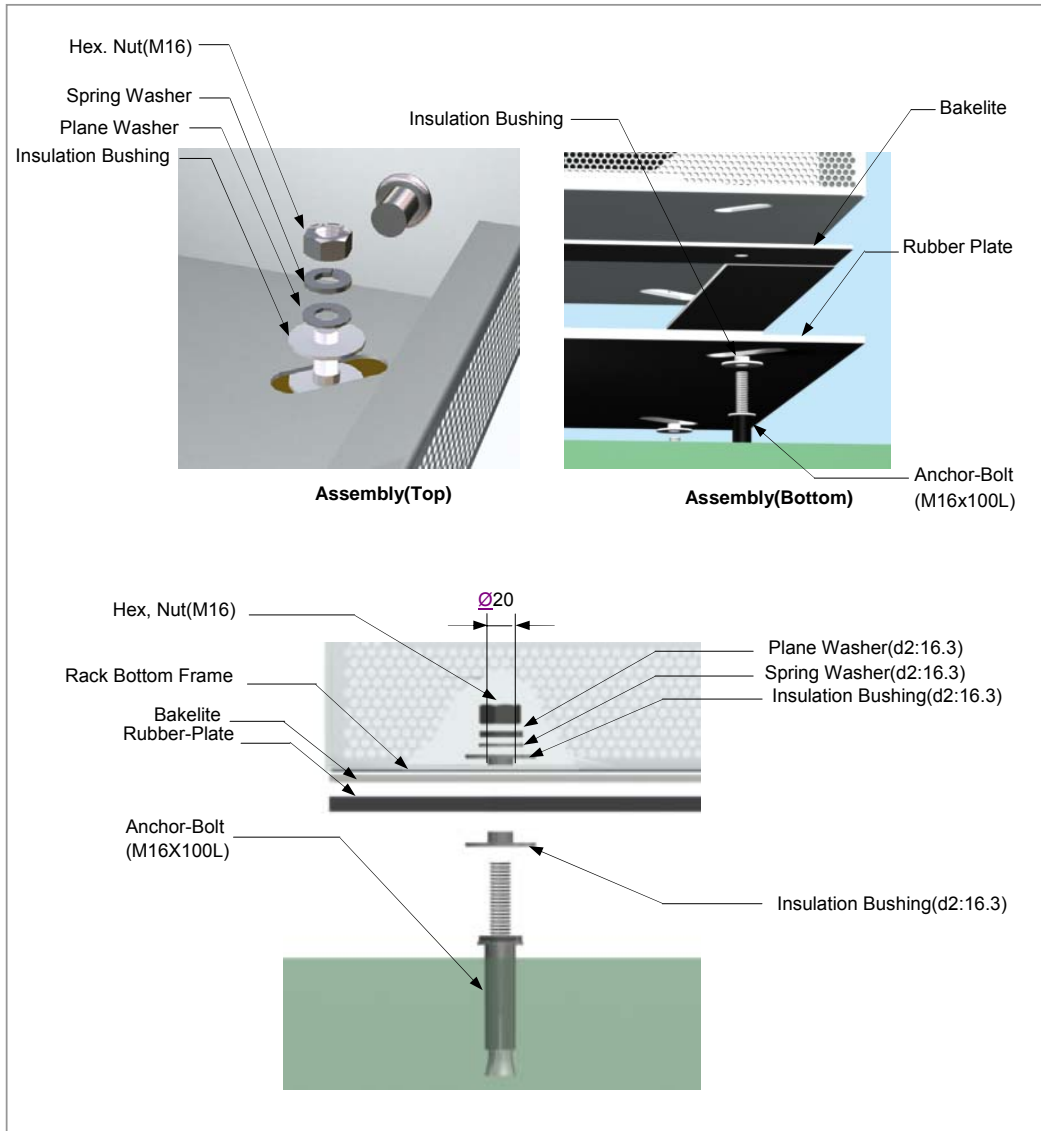


Figure 2.27 Anchoring Location (Normal Floor)

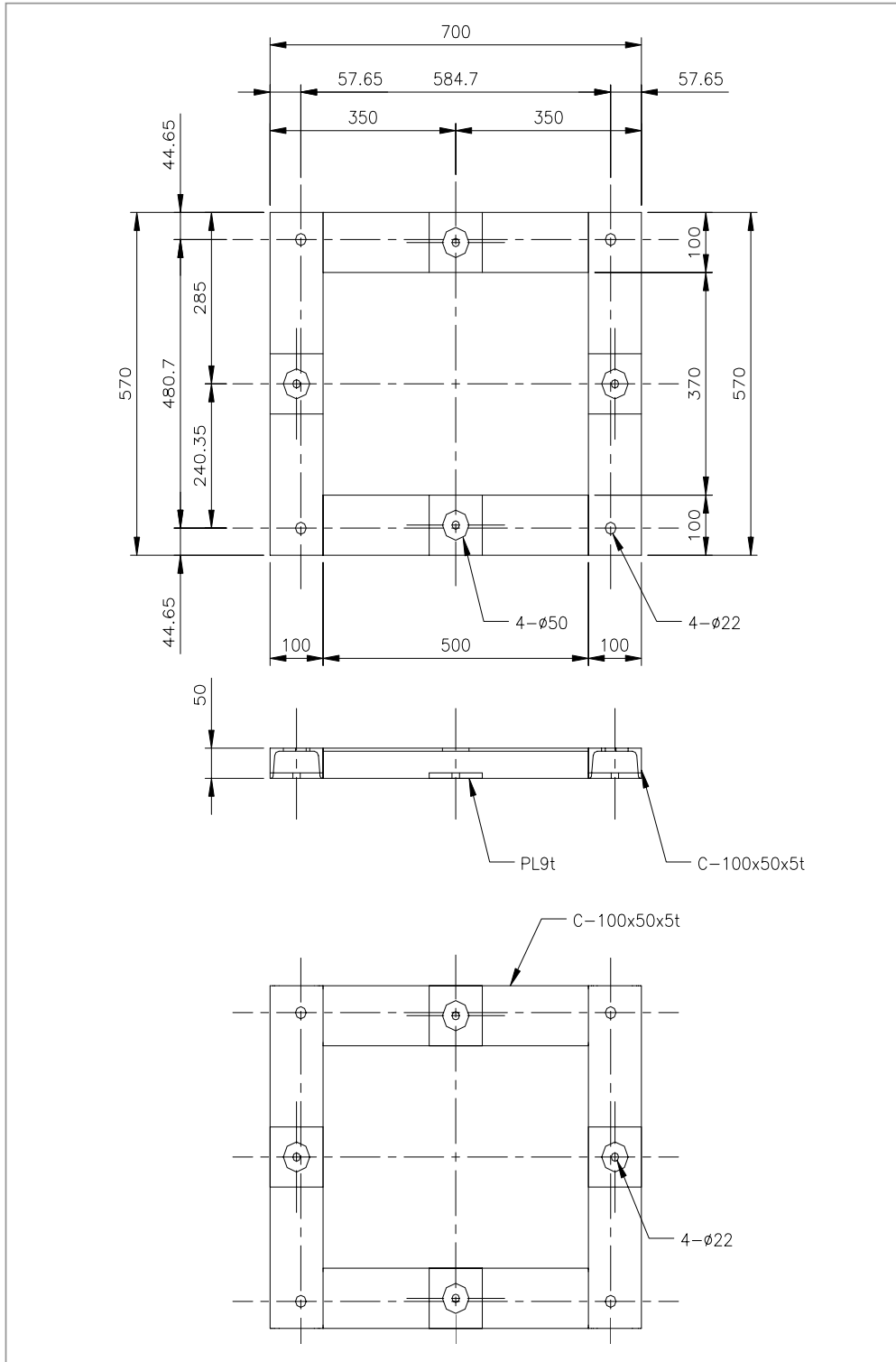


Figure 2.28 Layout of Supporter for Preventing Earthquake

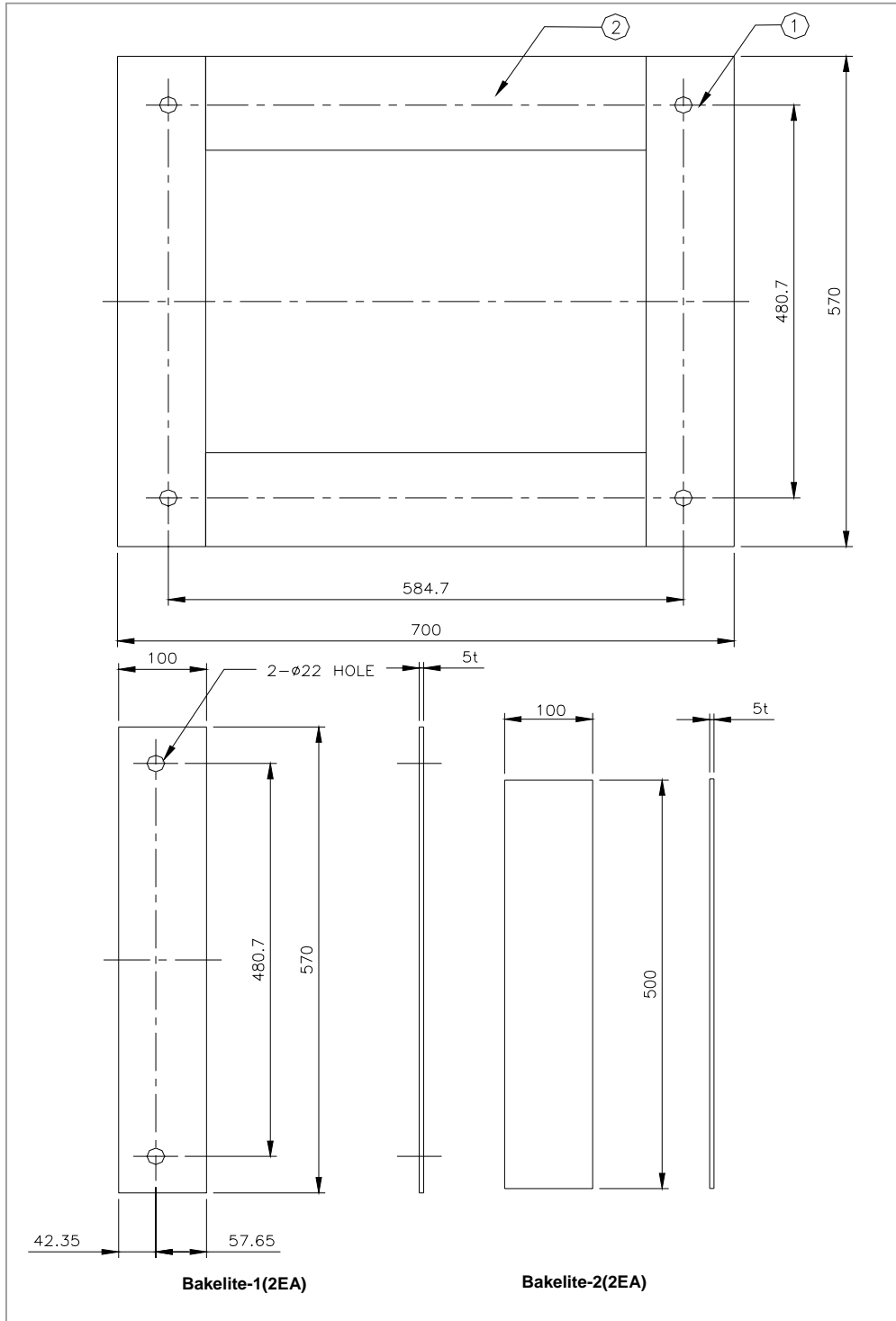


Figure 2.29 Bakelite Layout

### 2.4.2.4 Rack Leveling

Leveling is used to balance the floor for equipment in a vertical/horizontal way.

As leveling methods, there are the method by the foot, the method by the vinyl hose, and the method by the weight.

Since the foot is not applied to the corresponding system, the method by the foot will not be mentioned.

#### Leveling by a Vinyl Hose



- 1) Fill a vinyl hose with the water without any bubble.
- 2) Make the vinyl hose stand at the edge of the rack, and set datum point(A) and horizontal point(B) when the water is horizontal on both sides of the hose. If the atmospheric pressure is the same, A and B are horizontal.
- 3) Align the datum point(A) with the left side of the upper rack.
- 4) Control the leveling bolt or the foot of the lower part of the rack to level the right side of the upper rack with the horizontal point(B).

If the water of the hose is leveled with the right and left sides of the rack, this leveling is completed.

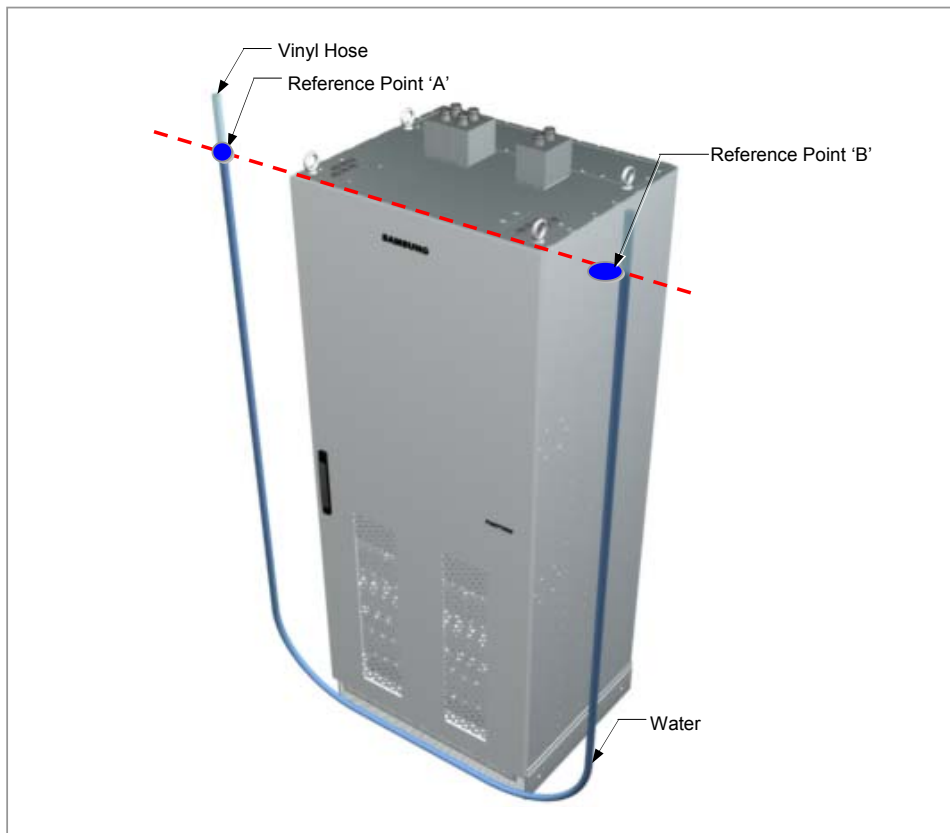


Figure 2.30 Leveling by Vinyl Hose

**Do Not Leak Water**

If the water is leaking to a ground, insulation will fail in the place. Thus, do not leak water when performing leveling by a vinyl hose. Additionally, the vinyl hose should not be broken off or stepped on.

**Rack Leveling by a Plumb**

- 1) Install the two poles on the front and those on the side to install plumbs.
- 2) Connect a plumb with a pole by using thread and drop the plumb to the near bottom. The plumbs and the ground surface should not be attached.
- 3) Measure the length between the thread and the upper part of the rack ( $a$ ) and between the thread and the lower part of the rack ( $a'$ ).
- 4) Check if the lengths of the upper part ( $a$ ) and the lower part ( $a'$ ) are identical.
- 5) If  $a$  and  $a'$  are identical, this leveling is completed.



**Figure 2.31 Leveling by a Plumb**

### 2.4.2.5 Insulation Test

Insulation resistance must be measured before mounting a board using a measuring instrument.



- 1) Connect a lead of an insulation tester to an anchor bolt.
- 2) Connect another lead to a rack frame.
- 3) Measure insulation resistance by using the insulation tester.  
The insulation resistance should be over 20 MΩ.



#### Measuring Insulation Resistance of Extension Rack

Use a sheet of insulation paper between the existing rack and the extension rack to perform insulation between the racks. Then, measure the insulation resistance of the extension rack for operating equipment. This is to prevent signaling flows from affecting the existing rack.

If the resistance is less than 20 MΩ, the insulation fails. Thus, check the following and perform the insulation test again.

- Check if the connection between the rack and the anchor bolt is proper.
- Check if the insulated bushing is damaged.
- Replace the insulator or parts if they have any problems.

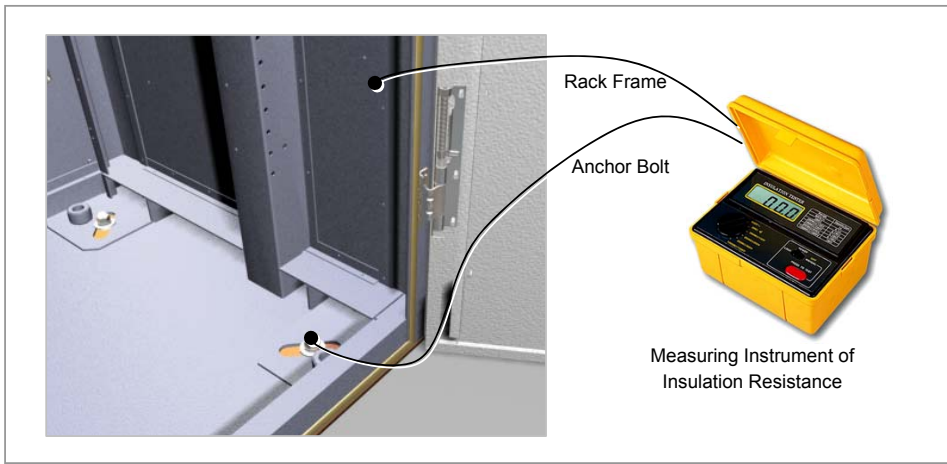


Figure 2.32 Insulation Test Model



### 2.4.3 Handling Boards

Take the cautions below when handling boards:

- Do not touch the stiffener, the pins or parts of the edges of a board.
- Mount a variety of boards into the corresponding accurate locations depending on the PBA Mounting Diagram after switching off the power unit.
- Insert a board by using the injector/ejector. Check if the board is completely inserted into the connector, which is attached to the backboard, by pressing the board with both thumbs slightly.

To delete a board, untie the injector/ejector, and hold the stiffener using the left hand and the lower part of the board using the right hand. Then, force the same degree of strength to each and pull out the board carefully.

### 2.4.4 Posting Equipment



- 1) The BTS rack should be extended in the order of SHIR1 and SHIR2. Viewed from the front, SHIR1 should be extended in the left, and SHIR2 should be extended in the right.
- 2) Because all works can be done in the front side, the distance from the back side of the BTS rack to the wall of the back side does not need to be considered, but the distance should be decided considering the situation of the field.
- 3) A space for operation on the front of the rack should be more than 700mm to open or close the system door completely. Also, secure a space of 800mm for the movement of equipment and workers in general.
- 4) Minimum distance length of more than 10 mm from the left side of the system should be maintained.
- 5) Minimum distance length of more than 10 mm from the right side of the system should be maintained, but to open the door 180 degrees, more than 700 mm should be separated from each equipment.
- 6) The upper end of the system is the place, which the cooled air in the system is coming out. There should not be the blockage in the distance of at least more than 300 mm from the system. When necessary, the upper end of the system is posted considering the space for SHIR2.

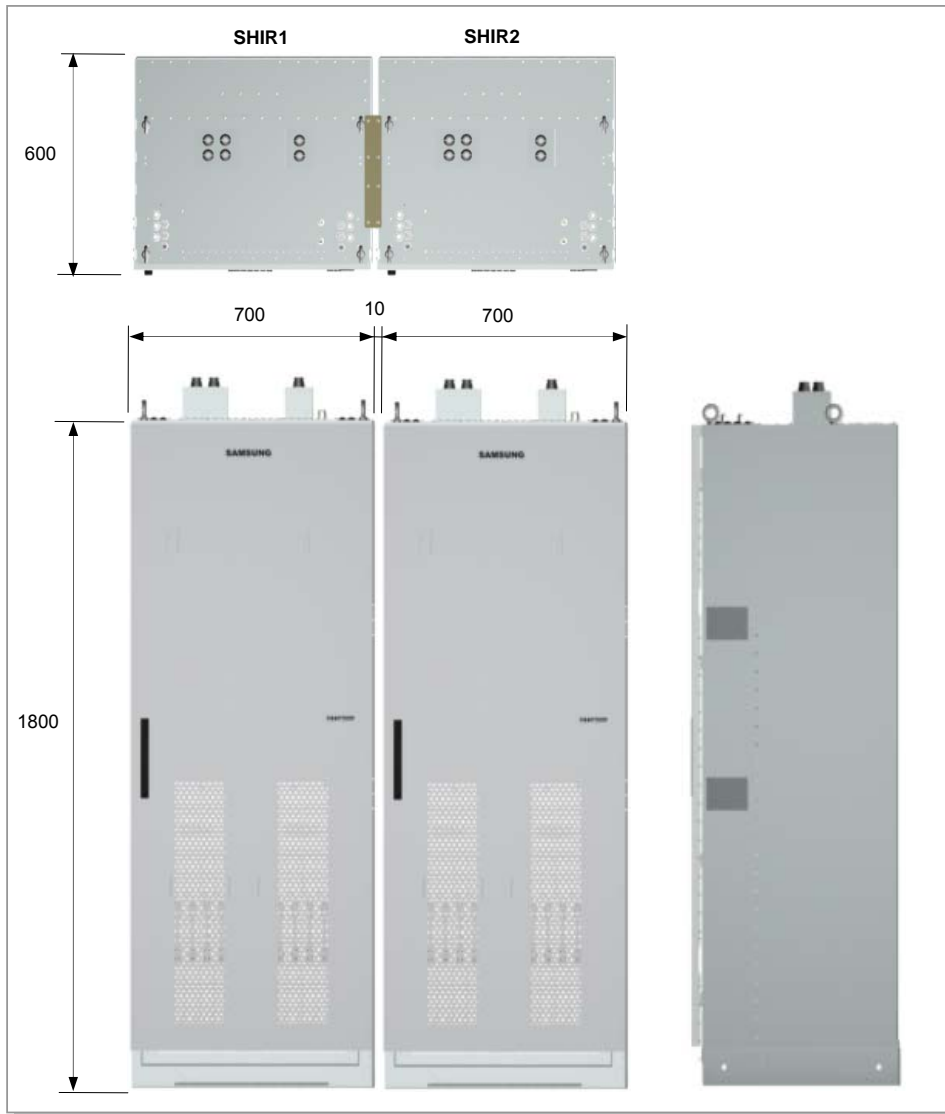


Figure 2.33 Rack Extension Posting Chart

The assembly diagram using the rack FIXING BRACKET when the extended rack is applied as below:

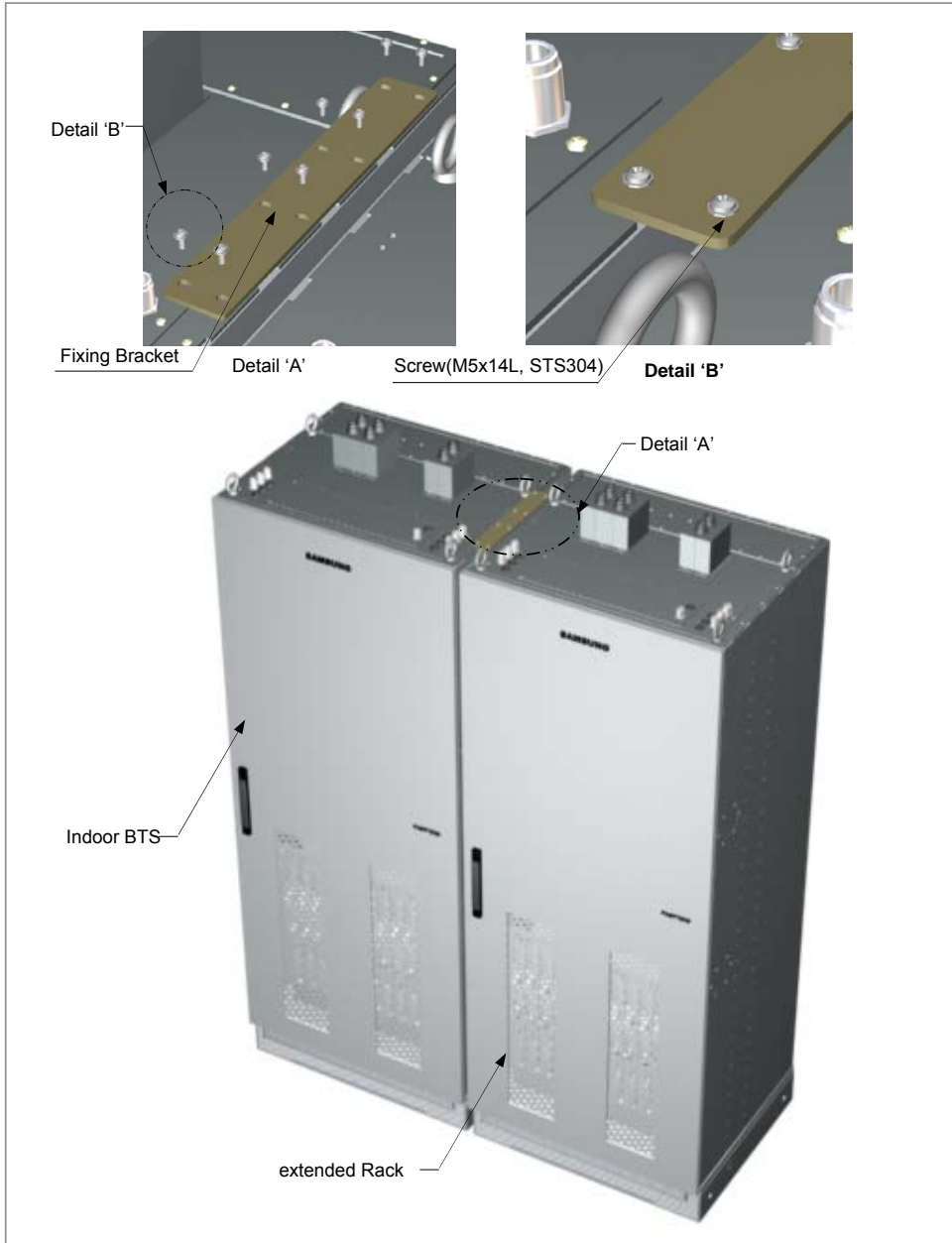


Figure 2.34 Connection Diagram when Rack is Extended

## 2.4.5 Installing and Tying Cable

Cable installing and tying are performed as follows:

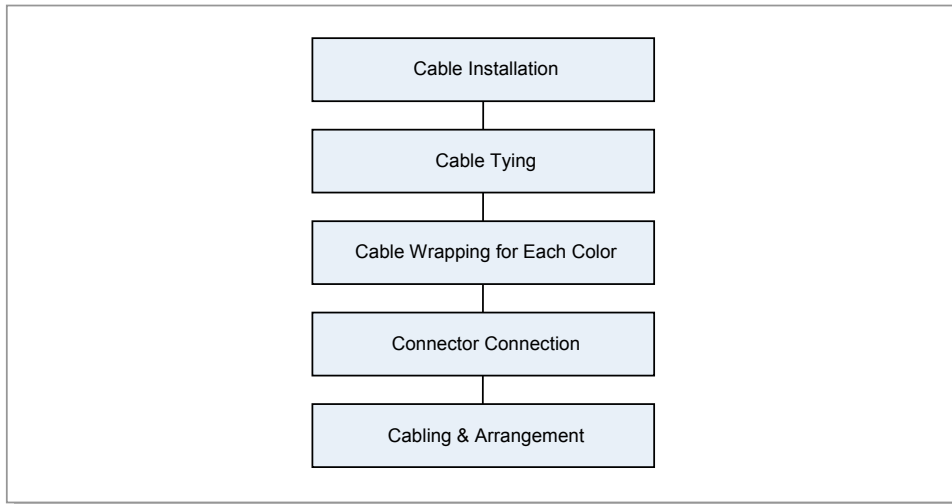


Figure 2.35 Cable Work Flow

### 2.4.5.1 Installing Cable

Cables are classified into the communication cable and power cable. Install a cable by using the cable rack in and out of the equipment room. When a cable is installed, use an identification tag to easily distinguish various cables. Cable identification tag is as follows:

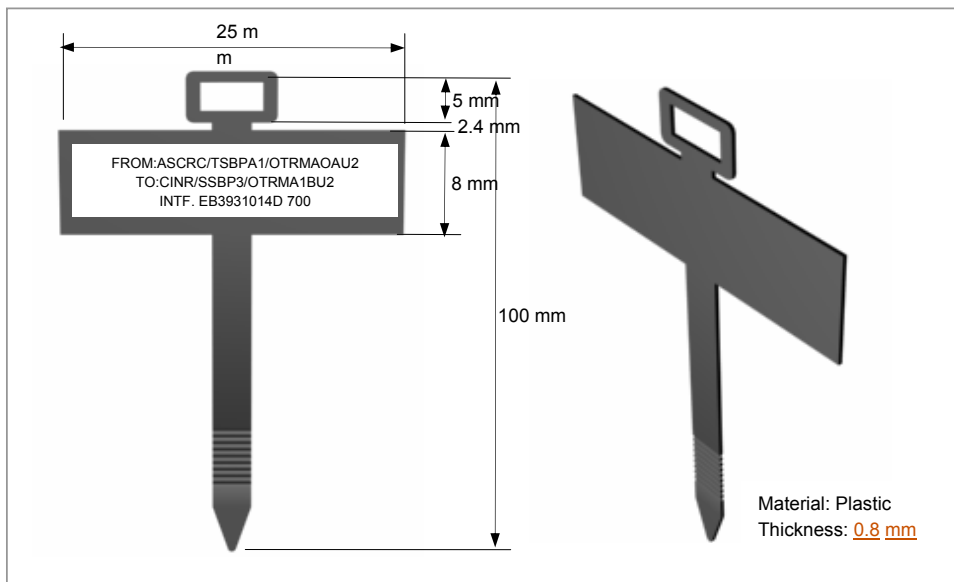


Figure 2.36 Cable Identification Tag

Since power cables are heavier and less flexible than communication cables, take special caution when handling the power cables.

The curvature radius of the top/bottom and left/right curved part should be maximized to protect the cable.



CHECK

**When Cable Is Installed**

Cables should not be crossed or twisted, and future expansions should be taken into consideration before installing the cables. The DC power cable and data transmission cable should maintain a certain distance from the AC power cable to prevent electromagnetic induction.

Communication cables are classified into the connector part cables and office cables.

**Installing Connector Part Cable**

Connector part cables are installed to the upper-rack unit and the upper-rack cable channel. According to the installation section, connector part cables are classified into in-rack cables and between-rack cables. According to the application, they are classified into rack cables and optical cables. Take the cautions below when installing connector part cables:

- Connector part cables should be installed without connector damages and should be connected properly according to the identification tag.
- The installation procedure of connector part cables is identical with that of the office cables. Use the cable duct on the left and right sides of the rack and the upper-rack unit to install the connector part cables between racks.
- Cables installed in the same rack should be installed ahead of the cables that must pass the upper-rack cable channel.
- Cables from the upper-rack cable channel should be installed starting from the nearest location to the starting point. Same types of cables should be installed on the same route.
- When optical cables are installed, they should not be broken off and the radius should be at least 5 cm.
- The connector should not be damaged when the connector part cables are installed.
- Check if any cracks, breakages, or damages on the assembly area occur. If any abnormalities are discovered, replace the component and restart the operation.

### Installing Office Cable

Office cables are installed in the ladder-type rack and are classified into the subscriber cables and the digital trunk cables by the installation section. Follow the procedure below to avoid cable concentration:

- Cables between adjacent racks should be installed behind the cable rack to prevent line twist.
- Cables between distant racks should be installed inside the cable rack to prevent line twist.
- Cables in distant racks of the same row should be installed inside the cable rack to prevent line twist.

The subscriber cables and the digital trunk cables should be installed using the Quick Distribution Frame(QDF) or Digital Distribution Frame(DDF).

### 2.4.5.2 Tying Cable

The cables with the same size should be tied by using ‘tying’ strings when installing the cables into the ladder-type cable rack. Take the caution below:

- Cables should not be twisted.
- Do not apply excessive force on the cable core.
- The tying interval should be approximately 20~40 cm.
- When tying a cable core, insert a PVC insulating tube into the support.

#### Using a Tie Wrap

Tie wrap is used for tying or arranging a cable rack or a rack cable channel on top of the rack. The head of the tie wrap should be out of the cable surface to avoid pressure.

#### Using a Tying String

The procedures for making basic knots are as follows:

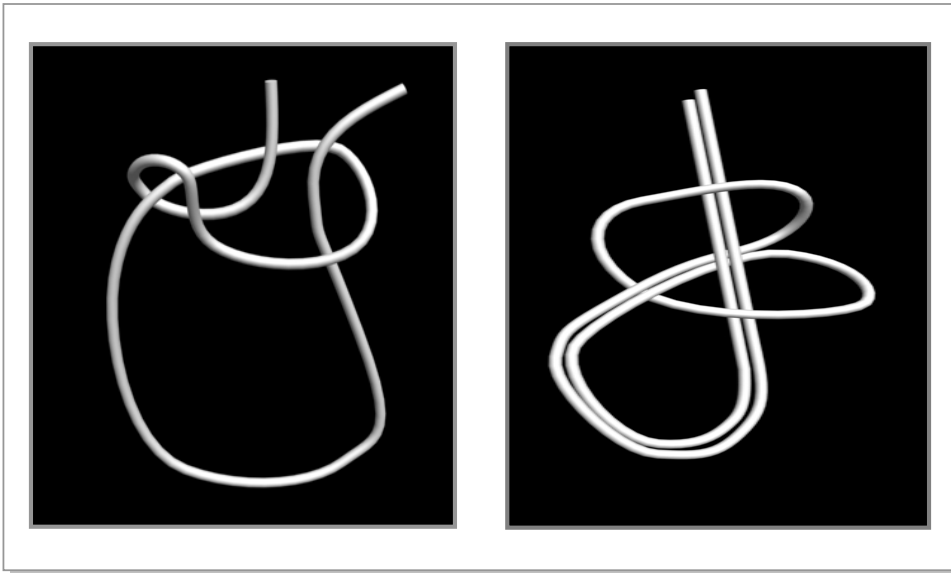


Figure 2.37 Basic Knot

If the strings are too short, connect tying strings together as shown below:

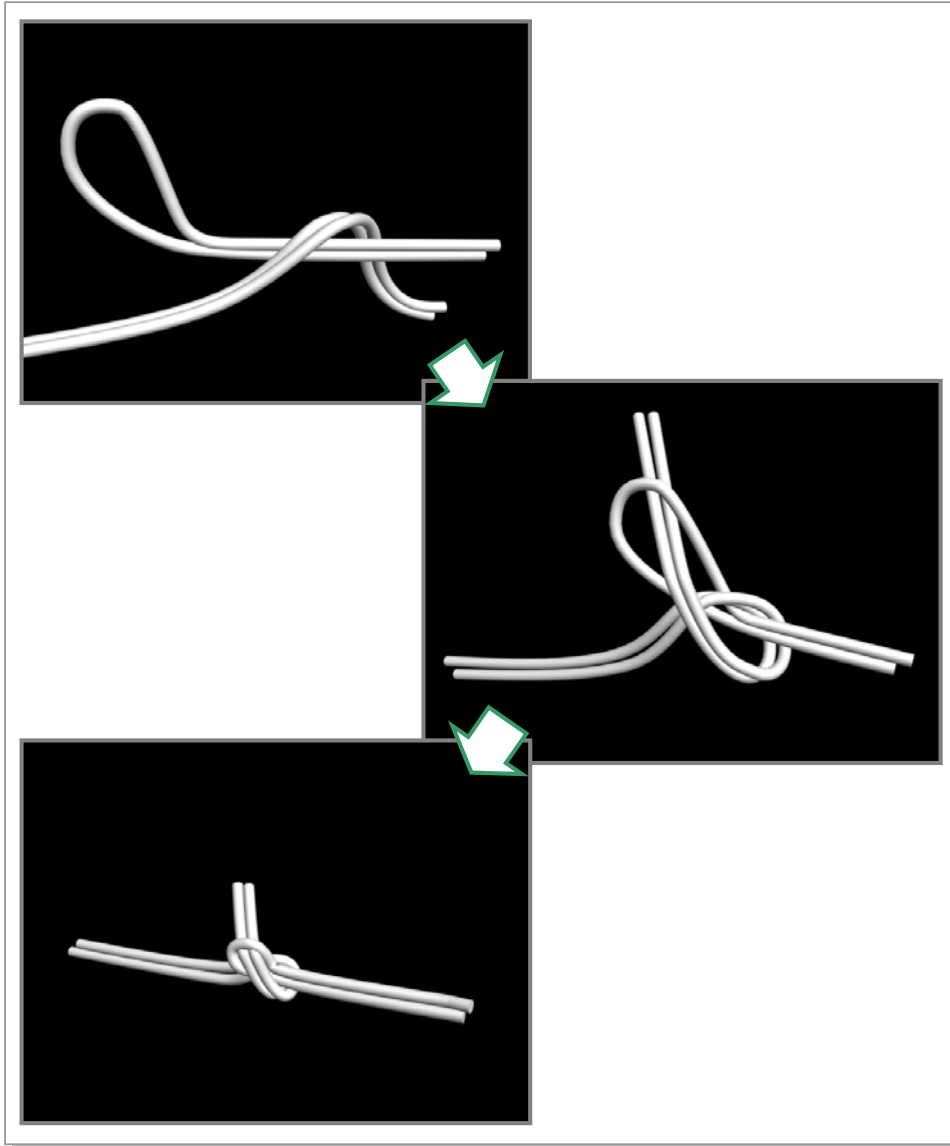


Figure 2.38 Tying String Connection



### 2.4.5.3 Removing Cable Sheath

Remove cable sheath while taking the caution below:

- Check a cable identification tag to see if the cable is installed at the correct location.
- Adjust the depth of a blade before using the tool.
- Strip the cable to the proper length depending on the distance to the terminal to be wrapped.
- Do not entirely turn around the cable sheath and the border indicating string or the core should not be damaged during the operation.
- If the length of the extra cable is too long, it might cause some difficulty in the work. The proper length of the extra cable is 30 cm.
- If the PVC sheath is thick, turn around the screw to adjust the depth of the blade.
- Move the slide for adjusting cable size according to the cable size.
- Leave about 2 cm of the extra length from where to finally tie the cable. Use a cable cutter to remove the DDF cable sheath.

### Removing Insulation Sheath of Cable Core

Depending on the cable core thickness and terminal type, use a device for removing insulation sheath, cutter, and Skinner. When removing an insulation sheath, do not damage a bare wire and curve to push the wire to the home of a wrapping machine.

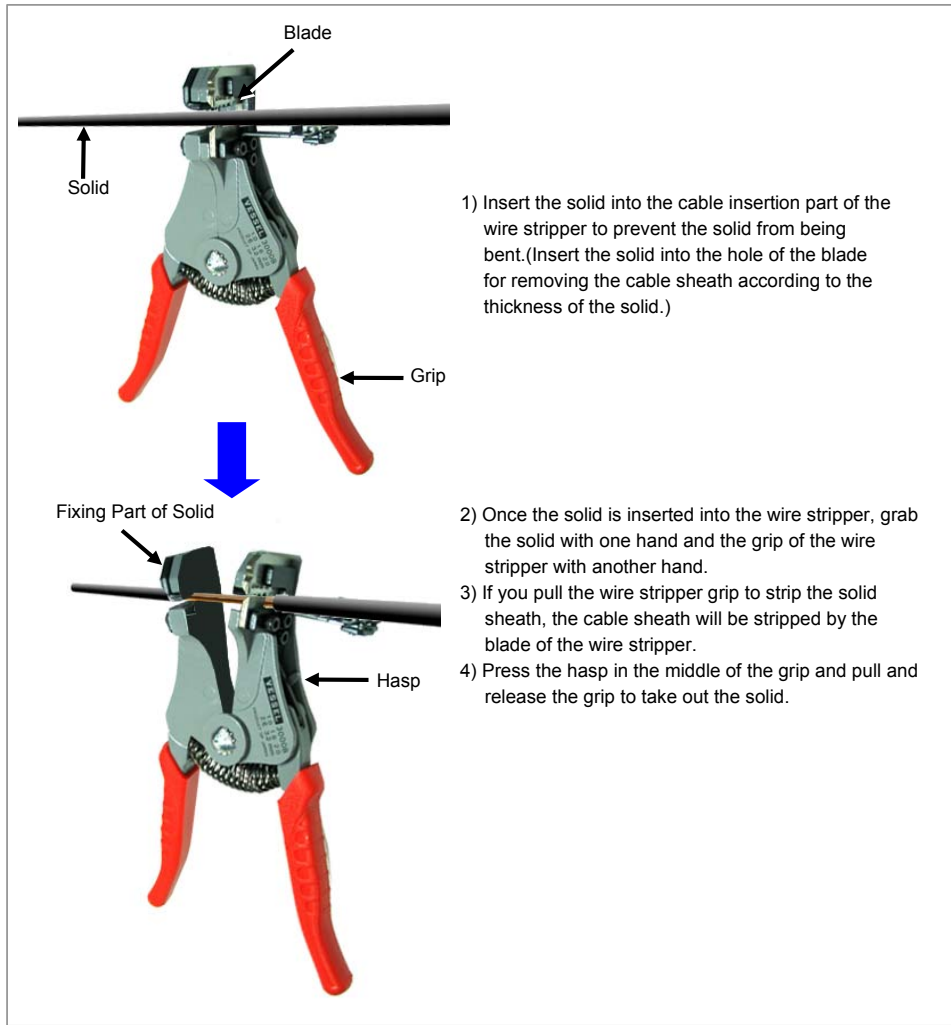


Figure 2.39 Device for Removing Insulation Sheath

### 2.4.5.4 Wrapping Cable

The procedure for performing cable wrapping is as follows:



- 1) Assemble the suitable sleeve and bit into a wrapping machine, depending on the thickness of the cable core and terminal.
  - 2) Push the cable core in the bit hole until the sheath entirely reaches the bit.
  - 3) Hang and curve the cable core at the core inserting hole of the bit, and push in the wrapping machine so that the terminal pin entirely is placed in the terminal hole of the wrapping machine.
  - 4) The wrapping machine should maintain its initial state as inserted in the terminal pin.
  - 5) Pull the trigger of the wrapping machine to wind the cable core around the pin.
- Be careful not to move the wrapping machine during this operation.

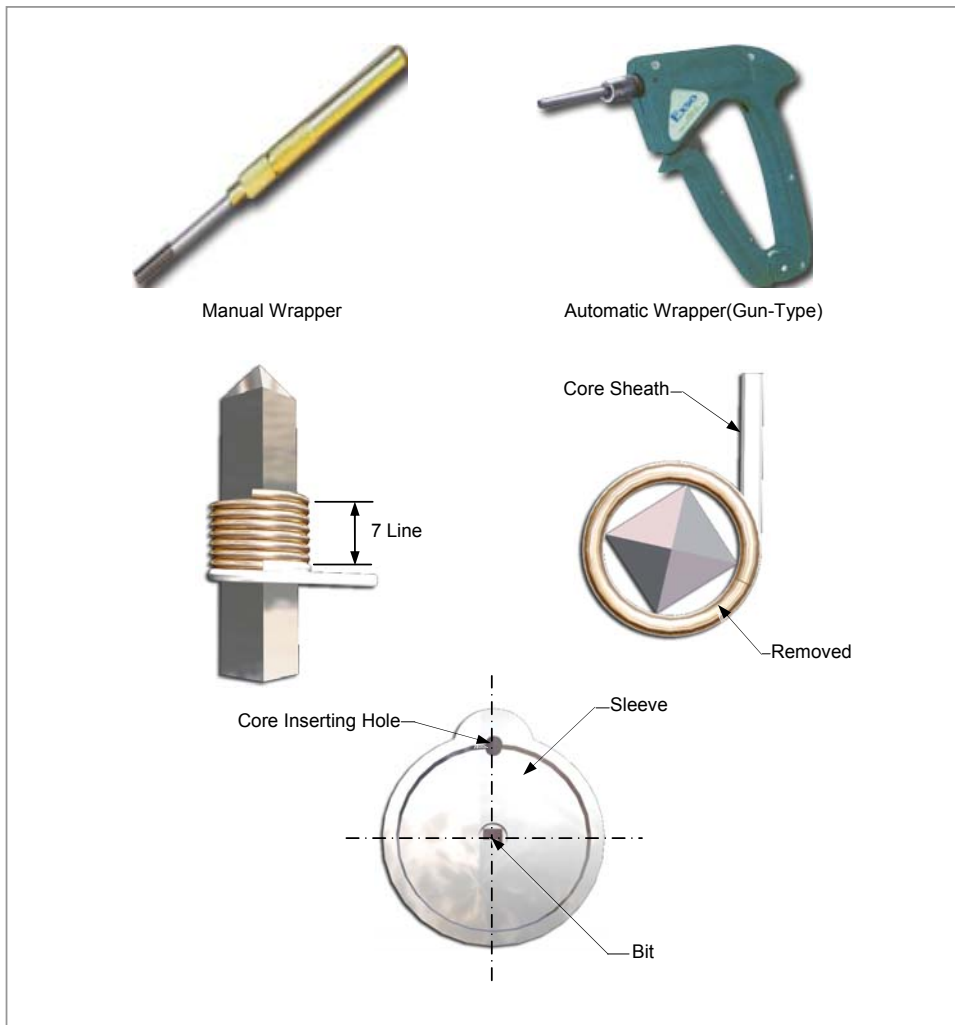


Figure 2.40 Wrapping Method

Use a un-wrapper in the following cases:

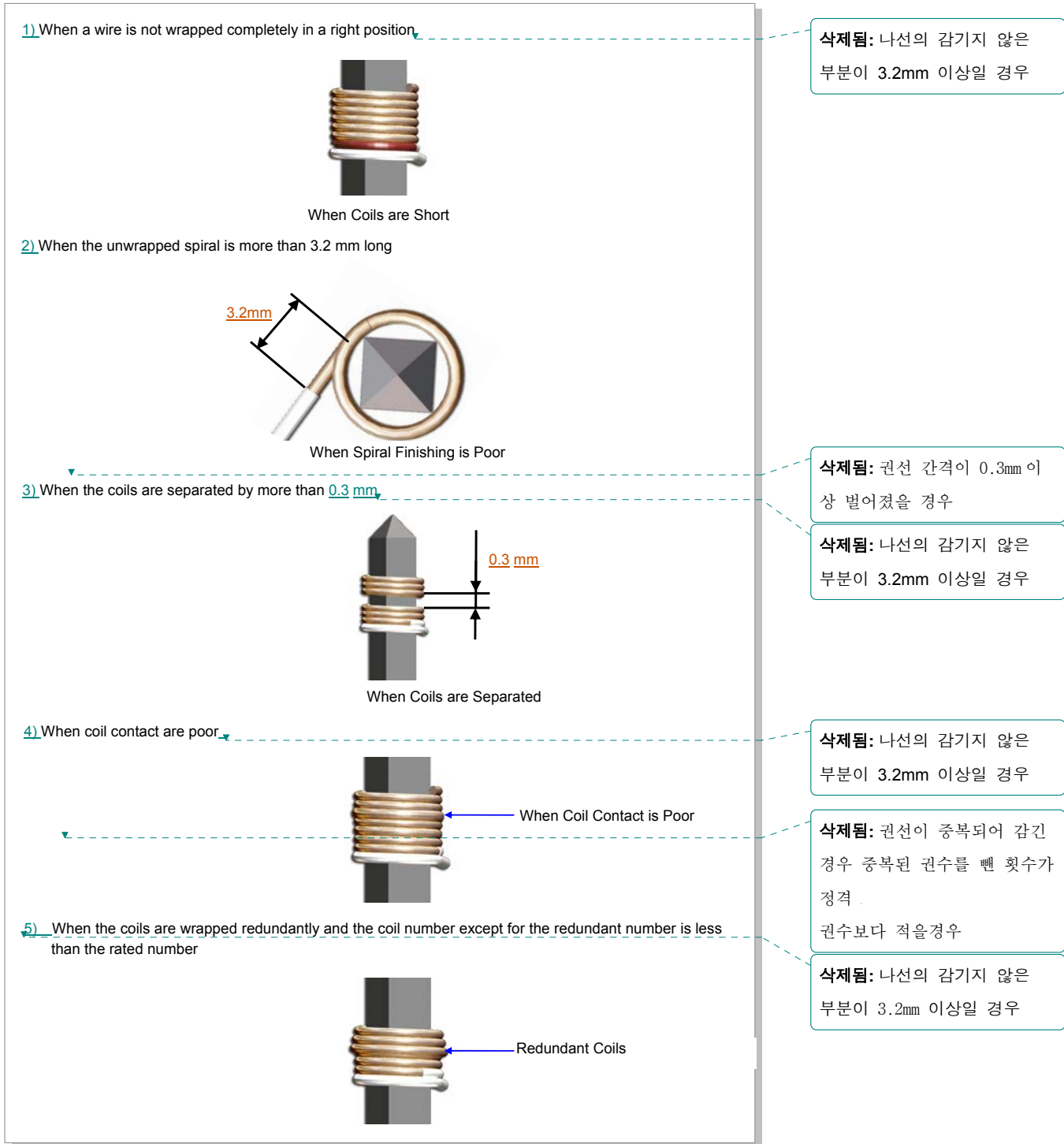


Figure 2.41 Examples of Inferior Wrapping

### 2.4.5.5 Unwrapping Cable

The unwrapping is the operation for correcting the inferior wrapping by using an unwrapper.



- 1) Insert an unwrapper in the terminal board up to the wrapped cable core.
- 2) When the unwrapper reaches the cable core, smoothly push and turn this machine to the left for unwrapping the cable core.
- 3) For re-wrapping the cable core, first cut off the already wrapped cable core and use the extra cable core.
- 4) When connecting the short cable core, remove the insulating sheath by the length of 12~15 mm and fix the sleeve to the cable core. Twist and solder the open wire.

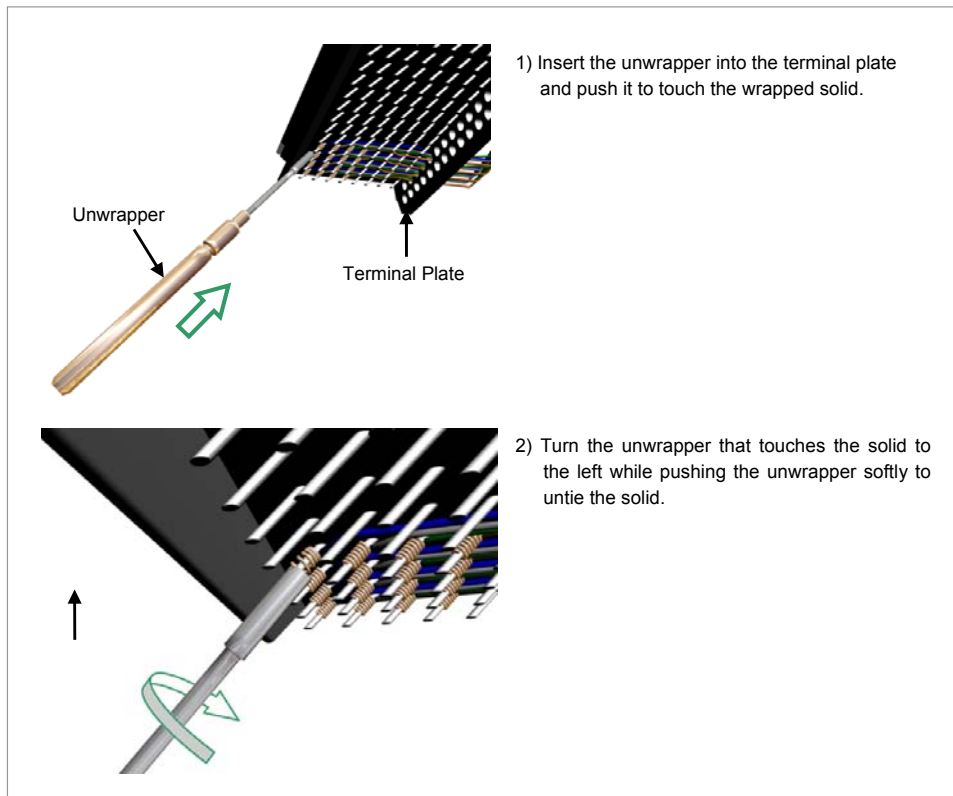


Figure 2.42 Using Unwrapper



#### Unwrapping

When wrapping an unwrapped solid again, cut the wrapped solid and wrap the solid using a spare solid.

### 2.4.5.6 Connecting Solid

If the solid is short, connect another solid as shown in the figure below:

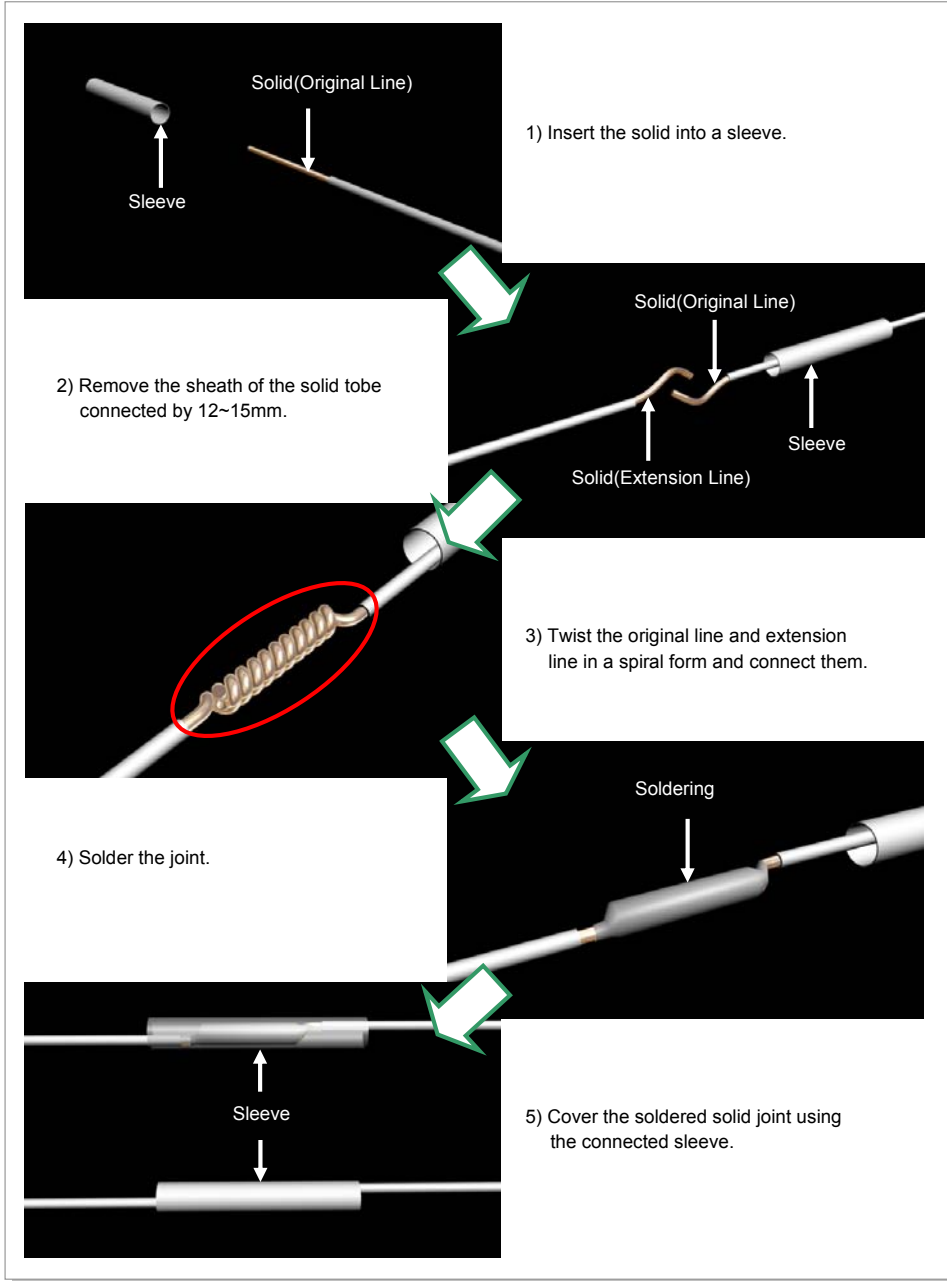


Figure 2.43 Connecting Solid

### 2.4.5.7 Connecting Connector

Take the caution below when cable is connected to the connector:

- Check the identification tag of the installed cable and the cable wire list to see if the cable is installed at the correct location.
- Check if the connecting pin is curved.
- Check the equipment location number of a connector and plug straight.
- The location number indicates a rack name, backboard name and access location.
- Connect the connector to the correct location according to the wire plan. The cut cable core and other wastes should not be inserted into other pins or cause disconnection of cables.

### 2.4.5.8 I/O Port & Cable spec for SHIR1

The I/O panel is configured as follows:

- The feeder line ports at the front left and right of the rack are designed to accommodate up to 12 ports. Each port is configured with N-Terminal, and an unconnected port should be capped to be protected from a falling object.
- GPS Antenna Ports A and B are located inside of the feeder line on the front right of the rack.
- A UACA board for REC cables is connected to the HDLC port next to the feeder line port at the left of the rack. Monitor the rectifier alarm of the office.
- A modem cable is connected to the 'Modem' port of the UACA board to interface with the modem of the office.
- A UDA port for connecting UDA cables is located at the bottom of the modem terminal to monitor the equipment alarm.

### 2.4.5.9 I/O Panel Specification

The following table shows the specification of the SHIR1 I/O panel:

Item		Description		Cable	No.	I/O Silk	Entry Panel	
		Inner Source	Outer Destination				Terminal	Mating
1) Trunk line	E1/T1 (Option)	LPM-(UETA0-E1/T1) LPM-(UETA0) (UETA0-E1/T1) LPM-(UETA1) (UETA1-E1/T1) LPM-(UETA1) (UETA1-E1/T1) LPM-(UETA2) (UETA2-E1/T1) LPM-(UETA2) (UETA2-E1/T0)	User	PCM	6	Trunk 0~11 (Option)	RJ-45 Plug With Shielded	RJ-46 Jack With Shielded
2) Power	+26 VDC	DC Filter(200A)	Rec.	60 mm <sup>2</sup>	2	Path A/B	(M6, 2Hole, 16mm)	Pressure- Terminal
				38 mm <sup>2</sup>	1	Path C		
3) GPS		UCRU A, B ANT.	GPS ANT.	Inner: MF86 Outer: LMR-400or S07212BD	2	GPS A GPS B	N-Series 50ohm, Bulkhead, Jack	N-Series 50ohm, Straight, Lug
4) Ant.	a) Omni	UFRU 0, 1, Antenna	ANT.	Inner: S07212BB	2	A-0 A-2		
	b) 3Sector	UFRU 0, 2, 4, 6, 8, 10, Antenna	ANT.	Outer: LMR-400or S07212BB	6	A-0, 2, 4, 6, 8, 10		
5) GND	-	-	MGB	38SQ-1C	1	-	M6 Screw	2Hole Compress ion Lug



## 2.5 Earth

Earth is required for protecting complex electronic or electric systems such as power system, communication system, and control system from lightning, over-current, over-voltage, and electric noise. Thus, the systems can operate properly and protect human life from electrical shock. Earth equipment minimizes the electrical potential of the electronic device to that of the ground, which is zero electrical potential, so that it can prevent static electrification from occurring.

The purposes of earth are as follows:

- To prevent human life and the system from over-current, over-voltage, and lightning
- To provide a discharge path for surge voltage generated by lightning and power switch
- To protect the system from static electricity
- To eliminate or minimize the high-frequency potential in the equipment rack and housing
- To provide a conductor for the balance and stability of high-frequency current
- To stabilize the potential of the circuit against the ground

The earth resistance should be measured every month for a year after construction.

### 2.5.1 Earth Method

According to the location where an earth electrode was laid under the ground, the earth method is divided into the following:

- Driven rod construction: Mountains and vacant lots
- San earth typical installation: Concrete structures(e.g., tunnels, basements, highways, etc.)
- San earth strap installation: Normal areas

#### 2.5.1.1 Driven Rod Construction



- 1) Make a trench to lay an earth rod. The width for the upper part is 0.5m and that for the lower part is 0.3 m. The distance between the bear copper wire and the ground surface should be over 0.75 m.
- 2) Lay the earth rod. The interval between the earth rods is 2 m.
- 3) The connection between the bear copper wire and the earth rod is established through cad welding.
- 4) The earth cables and the bear copper wire will be connected to an earth terminal board in a building through cad welding.
- 5) Connect the earth cable connected to the bear copper wire to the earth terminal board.

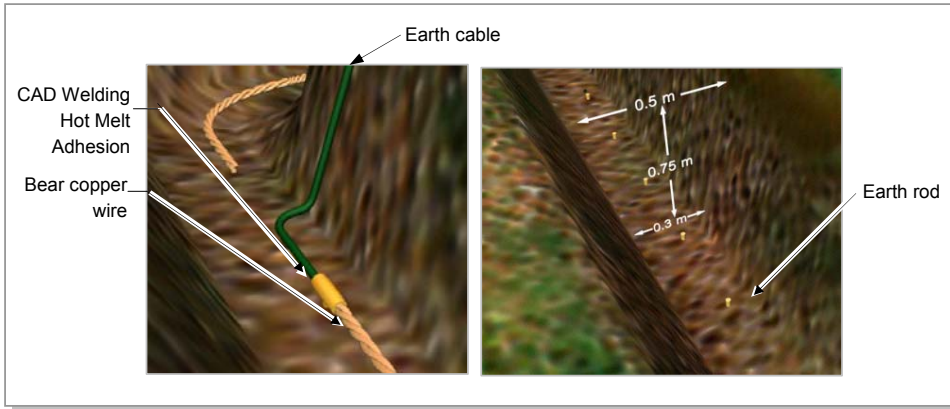


Figure 2.44 Driven Rod Construction

### 2.5.1.2 San Earth Typical Installation



- 1) Remove dust completely and wash the target area.
- 2) Install a bear copper wire. Fix the bear copper wire with a concrete nail.
- 3) Mix a 25 kg bag of san earth with 10 L of water to cover the bear copper wire 30 cm in width and 3 cm in thickness.
- 4) The earth cable and the bear copper wire will be connected to an earth terminal board in a building through cad welding.
- 5) Connect the earth cable connected to the bear copper wire to the earth terminal board.

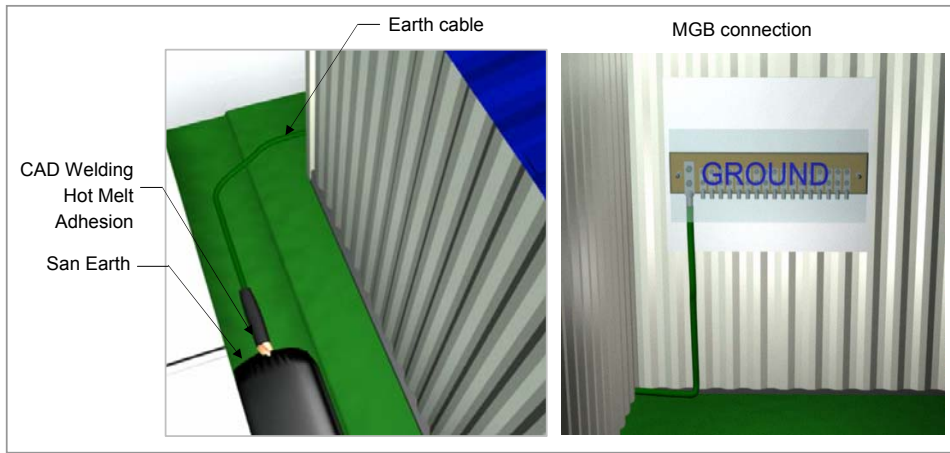


Figure 2.45 San Earth Typical Installation

### 2.5.1.3 San Earth Strap Installation



- 1) Make a trench over 0.5 m in width and over 0.75 m in depth.
- 2) The interval between earth rods is 4 m.
- 3) Install a bare copper wire.
- 4) Connect the earth rod to the bare copper wire through cad welding.
- 5) Mix a 25 kg bag of san earth with 10 L of water to cover the bare copper wire 30 cm in width and 3 cm in thickness.
- 6) Connect the earth cable and the copper wire to an earth terminal board in a building through cad welding.
- 7) Fill the trench with smooth soil from the edge to the center to cover the trench about 10 cm in thickness after separating smooth soil from rocks and lumps of soil. Then, step on the ground from the edge to the center.

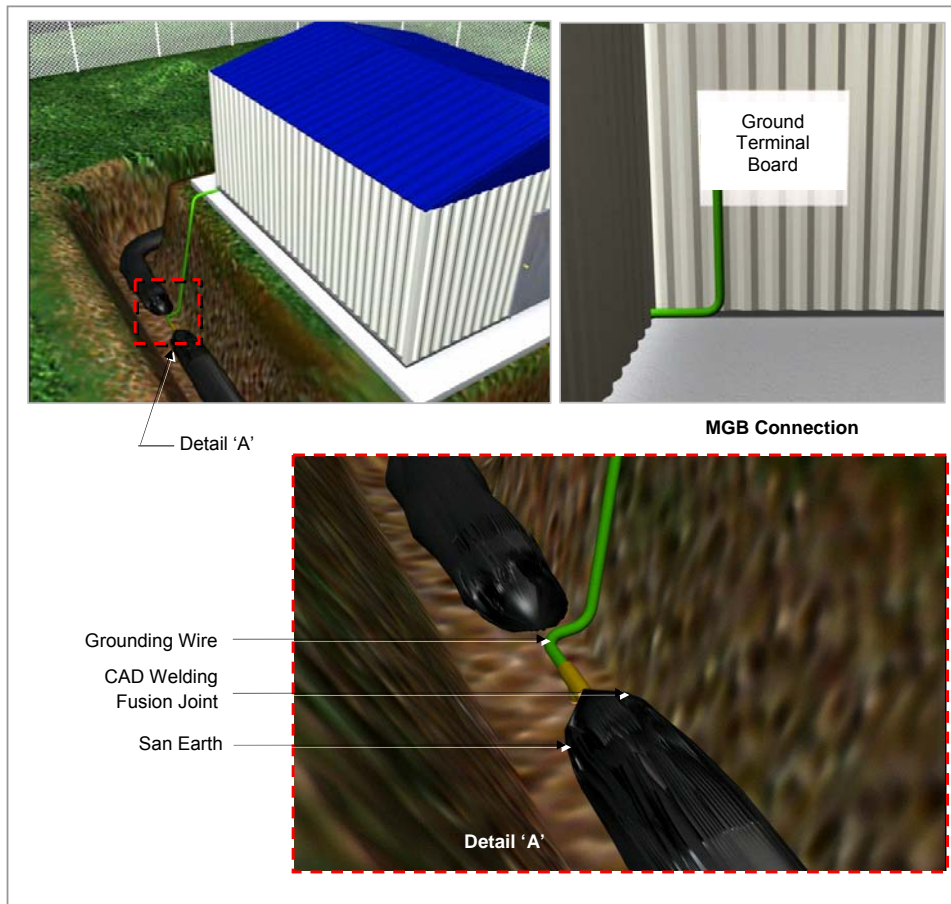


Figure 2.46 San Earth Strap Installation

## 2.5.2 Installing Earth Facility

### 2.5.2.1 Installing Main Ground Bar (MGB)

MGB should be plated with silver on the surface and be installed firmly by using insulator to prevent corrosion. Protect the MGB by using acryl board to protect human life and to prevent the corrosion of an earth terminal board. Installation place should be the nearest from the earth point and the proper length is within 1250 mm from a building and within 600 mm from a container. If earth terminals are insufficient, install the 2<sup>nd</sup> and 3<sup>rd</sup> subsidiary earth terminal board with the interval of 200 mm from existing MGB, and connect through GV 100 mm<sup>2</sup>(AWG 4/0).

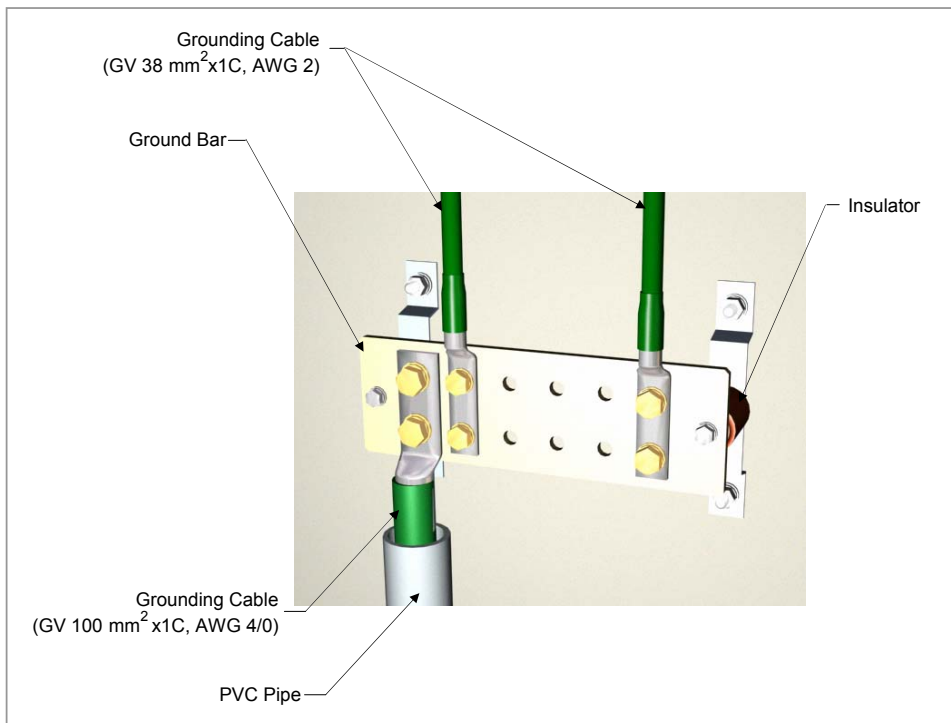


Figure 2.47 MGB Installation

### 2.5.2.2 Grounding Wire

- Grounding wires shall not be coated with metal and shall not pass through an iron pipe. (inductive resistance increase)
- Grounding wires shall not be buried in walls, mortar or cement.
- Copper wires without protective coating shall not be carried into the building.
- At least KSC 3302(600 V vinyl insulated wire) class standard wires shall be used for coated copper wires.
- Over-current circuit breakers shall operate within 0.1 seconds at 20 times the rated current.
- Fault current on a grounding wire shall be 20 times the rated current of the over-current circuit breaker.
- The temperature of a grounding wire without fault current shall be 30 °C.
- The temperature of a grounding wire with fault current shall not exceed 150 °C.

**Wiring cables**

In order to wire power cables, connect the grounding cable first before connecting other cables to prevent equipment damages and injuries.

### 2.5.2.3 Rack Earth

The grounding cable connection of the indoor BTS is as follows:



- 1) Starting from the Main Ground Bar(MGB), install the grounding cable GV38 mm<sup>2</sup> x1C(AWG No.2, 139 A, 0.258" diameter) along the cable rack.
- 2) Move the wired cable and the pressure-terminal to the upper section of the rack.
- 3) Connect the pressure-terminal 38 mm<sup>2</sup> at the end of the grounding cable to the grounding terminal by pulling the cable down over the M6 Tap 2Hole at the upper right corner of the equipment and accurately connecting the center point of the two terminals.
- 4) Use an M6 flat washer, spring washer and bolt to tightly fasten the pressure-terminal to the grounding terminal at the upper section of the rack. The torque for tightening should comply with KSC C 2620 standard, 40.8-50.5 kgf.cm.

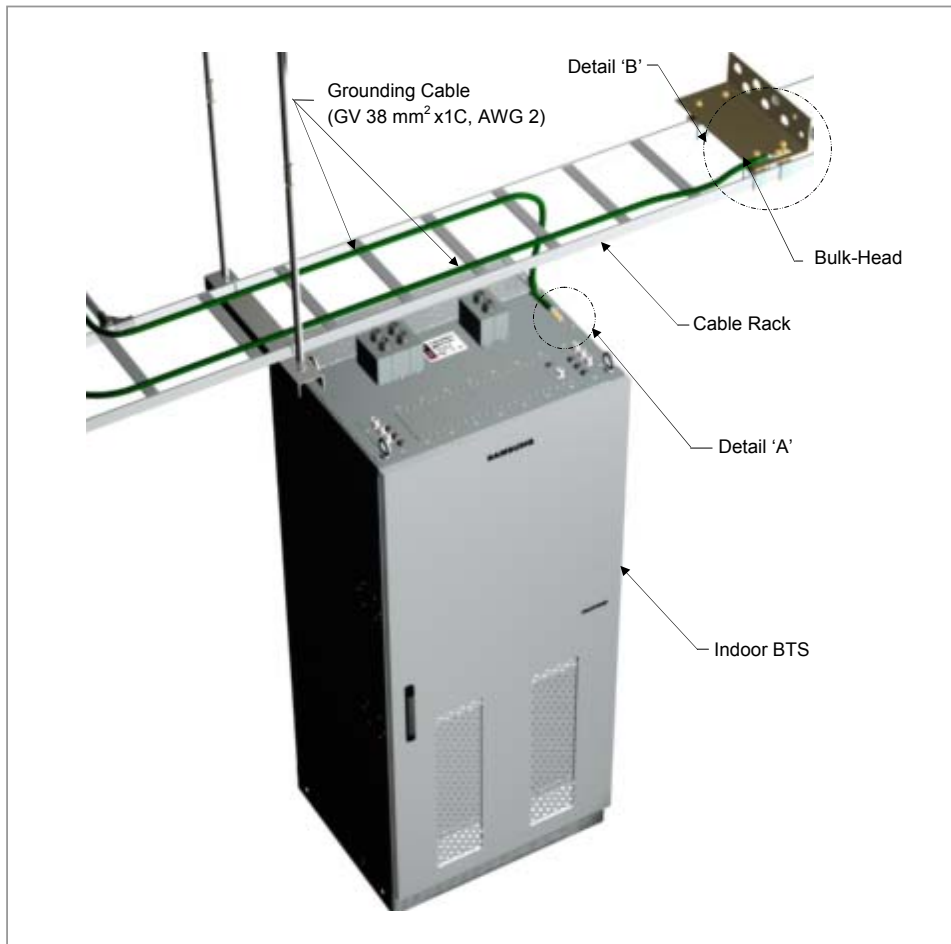


Figure 2.48 Indoor BTS Rack Earth

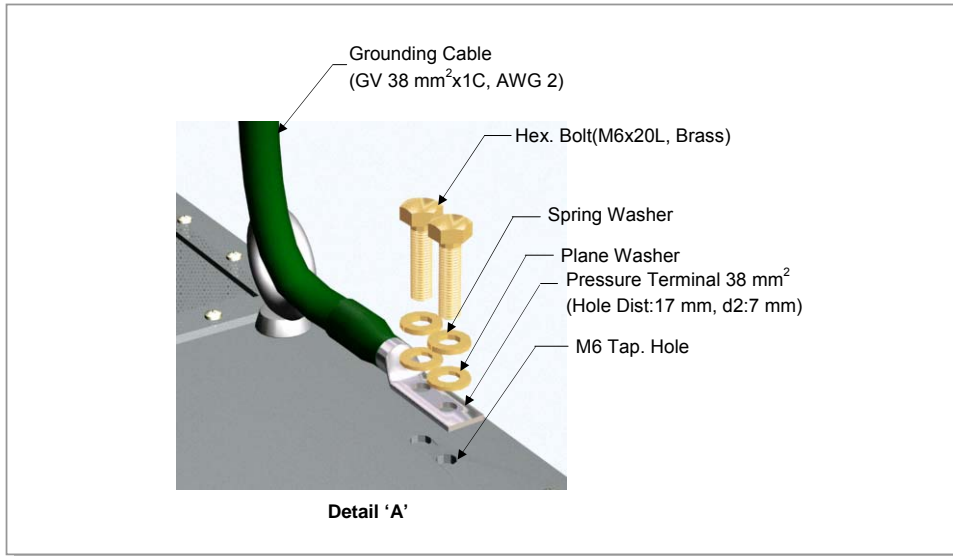


Figure 2.49 Rack Grounding

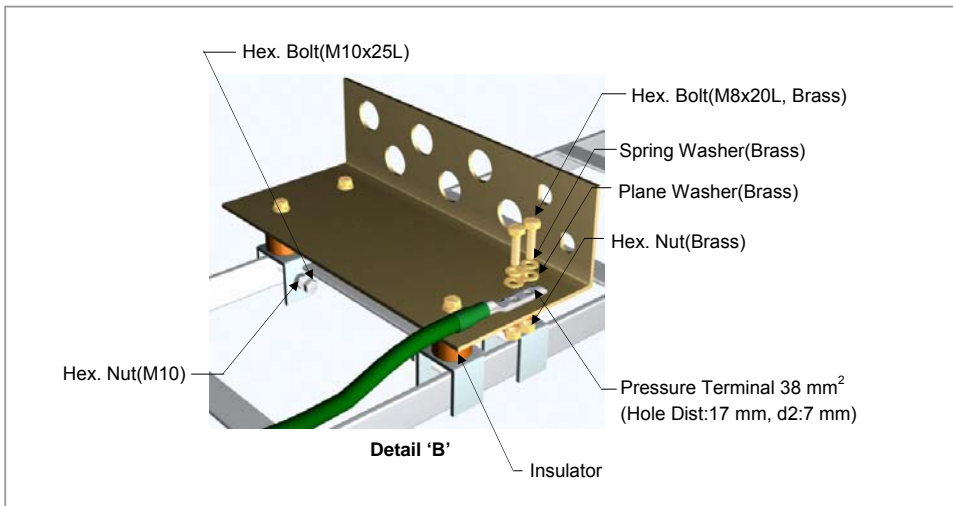


Figure 2.50 BulkHead Assembly

### 2.5.2.4 Antenna Feeder Cable Grounding

The antenna feeder cable should be earthed by using the ground kit under the copper plate(TGB, Tower Ground Bar) installed within the lower part of the iron tower or the antenna feeder cable duct.

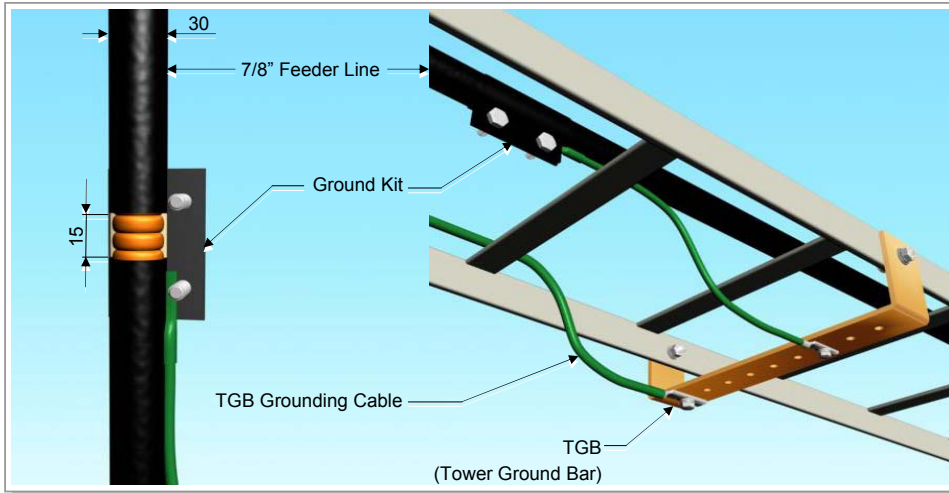


Figure 2.51 Antenna Feeder Cable Grounding

The procedure for performing the grounding of the antenna feeder cable is as follows:



- 1) Remove the covering of the 7/8 inch feeder about by 15 mm.
- 2) Connect the ground kit to the feeder, and lift up to where the covering of the feeder is stripped off.
- 3) Wrap the cable of the ground kit about by 7~10 cm with the vinyl tape, and wrap the cable by using the insulation tape again.
- 4) Fix the driven rod(GND BAR) in the ground kit and the iron tower copper rod by using the copper bolt.

The TGB location and the method of connecting to the iron tower grounding cable are as follows:

Table 2.1 TGB Location and Method of Connecting to Iron Tower Grounding Cable

Item	Description
TGB location	Bottom of feeder line port or tower/Top of tower
Material	Pure copper
Installing method	Separate from the iron tower electrically by using insulator.
Installing method	Draw the GV 38 mm <sup>2</sup> grounding cable(AWG 4) towards the surface, and weld to the iron tower grounding cable.



### Tower Grounding

- 1) Install Tower Ground Bar(TGB) at the end of the cable rack at the bottom of the tower.
- 2) Install TGB in a multipoint method starting from the lightning rod ground wire of GV 38 mm<sup>2</sup>x1C.
- 3) Fix the ground kit, which is the feeder line ground assembly, on the TGB grounding terminal and tower hole using the pressure terminal attached to the end of the ground wire for the ground kit.

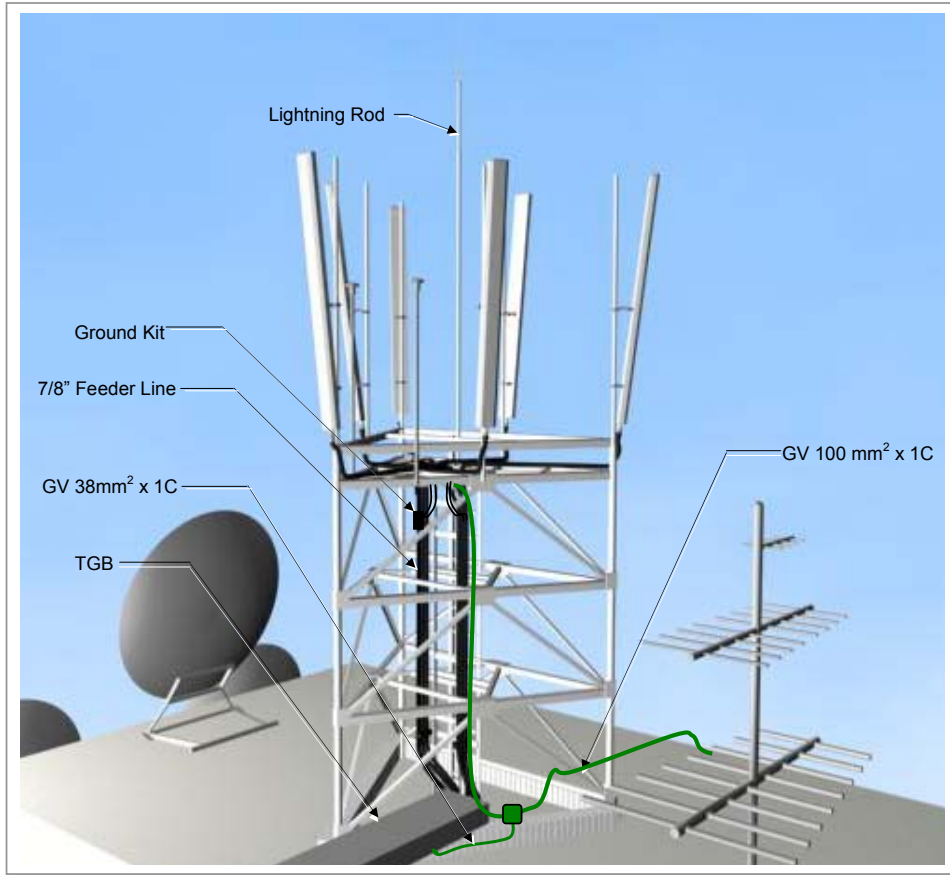


Figure 2.52 Connecting Ground Wire on Tower

### 2.5.2.5 Grounding Lightning Rod

You can ground a lightning rod as follows:

#### Installing Ground Pole

- Excavation: Height of Ground Rack=0.75 m, Width=0.5 m
- Driven Rod:  $\varnothing 19 \times 2400$  mm(Diameter  $\times$  Height)
- Ground wire for a new installation site should be made of plastics to prevent an accident due to body contact.

#### Grounding Lightning Rod

- Lightning wires should not be connected.
- Take two wires out of the metal sleeve and compress the wires. In such a case, the metal sleeve should be more than ten times as long as the outer diameter of the wires.
- Wind the wires at a distance of more than ten times as long as the outer diameter of the wires and solder the wires to connect them.
- Either wind wires or use a metal sleeve to ground lightning rods.

#### Grounding Method

If a tower is grounded to a building, check the earth resistance. If the earth resistance does not reach the reference resistance, connect an additional ground pole to the existing ground. If the earth resistance of the building meets the specification of the reference resistance, connect the main grounding cable to the existing ground. Grounding cables should be thick and short. Take the cables out of at least one spot of a building, and connect the cables to the ground. Connect the tower to the grounding cable through welding. Connect the grounding cable of the tower ring as follows:

**Table 2.2 Connecting Tower Ring Grounding Cable**

Tower Type	Grounding Method
Mono Pole-Type Tower	Perform grounding using the panel for connecting inside of the top platform to the foundation at the bottom of the tower.
Triangular Tower	Perform grounding to the inside of the first platform at the bottom of the tower.
Rectangular Tower	Perform grounding to the inside of the tower foundation.

Install a driven rod as follows:

- Connect the driven rod to the grounding cable through welding. The driven rod should be buried more than 750 mm in depth.
- The distance between the driven rods should be twice as long as either of the driven rods.(This is subject to change depending on circumstances.)
- Mark the date of ground measurement and earth resistance on the front of ground terminal board in a printed format, and install a terminal for earth measurement.
- If the earth resistance does not meet the specification, use either a ground plate or a driven rod depending on circumstances.

### 2.5.2.6 Grounding Test

#### Insulation Test of Floor and Input Power

One of the lead of the insulation measurement instrument should be connected to the anchor bolt attached to the wheel of the rack , and the other lead should be connected to the power input terminal(+26 V, GND) of the rack of the instrument to be measured, and test it. The basic value should be indicated as more than 100  $\Omega$  when measured by the 500zVDC insulation resistance measurement instrument.

#### Checking when Insulation is Failed

When the result of measuring the insulation is failed, the engineer should check as below:



- 1) Examine whether the floor of the rack is contacted with the metal device, and also examine the damage of the supporting rod for the rack fixing through the naked eye.
- 2) Measure whether to be short-circuited between the housing of the supporting rod rack by using the insulation resistance measurement instrument.
- 3) Perform the test after checking.

## 2.6 Antenna Construction

### 2.6.1 Installing Antenna

The antenna should be installed after the clamp is fixed. The methods of fixing the antenna according to the antenna types are as follows:

#### Omni Antenna

The omni antenna should be installed in order to be maintained with  $\pm 1^\circ$  vertically.

#### Sector Antenna

The direction of the sector antenna should be adjusted in order to be maintained within  $\pm 3^\circ$  for each sector.

The number of antennas according to the antenna types is as follows:

**Table 2.3 Number of Antennas According to the Antenna Types**

Antenna Type	Number of Antennas	
Omni	2/office	
Sector	2 types	
	Mono: 2/sector	Dual: 1/sector
GPS	1~2/office	

Take the following cautions when installing an antenna:

- Do not scratch or change the form of an antenna because an antenna is sensitive.
- Use proper device when moving an antenna. The weight of the rated device should exceed 200 % of that of the antenna considering safety.
- Protect the antenna from impact.
- Do not connect a feeder or antenna when raining.
- The metal to be used for connecting an antenna should be coated with fused zinc.
- Adjust the direction of an antenna and fix the antenna.
- The distances between an iron tower and an antenna and between Rx antenna and Tx antenna should follow the antenna posting standard.
- Install an antenna on the spot according to the drawing.
- Fix an antenna on the front panel or corner of the iron tower.
- Fix an antenna on the center of an iron tower that can support the weight of the antenna.
- Install an antenna considering radiation direction in order not to change antenna characteristics.

- Clean the area where an antenna is installed.
- Check the Voltage Standing Wave Ratio(VSWR) of an antenna. The value should be within the corresponding standard.

The method of installing a sector antenna is described as follows:



- 1) Fix mast pipe on the platform or iron-frame of an iron tower.
- 2) Fix a sector antenna by using clamp on the mast pipe.
- 3) Adjust the antenna with maximum 20° vertically, considering electric wave strength.

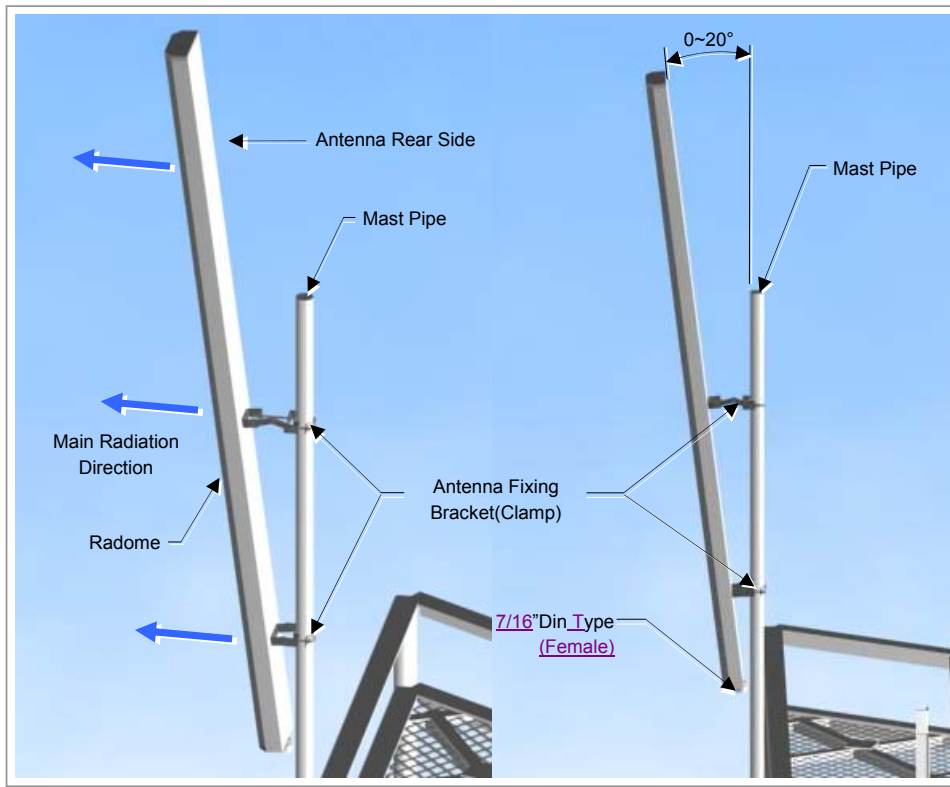


Figure 2.53 Sector Antenna

The method of installing an omni antenna is described as follows:



- 1) Install a mast pipe.
- 2) Fix an omni antenna on the left by using clamp.
- 3) Fix the clamp.

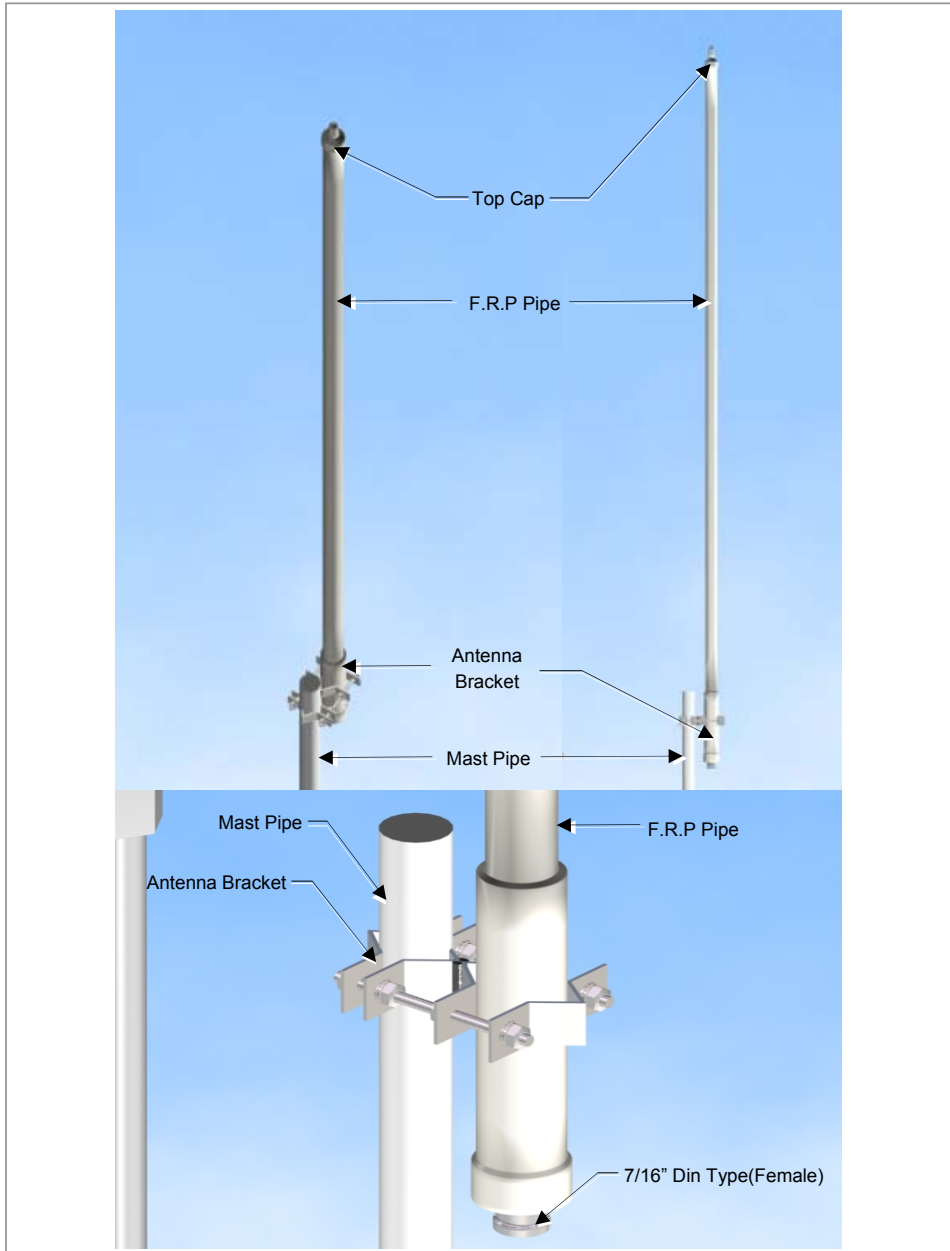
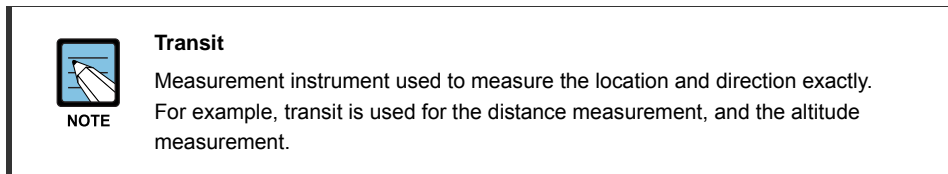
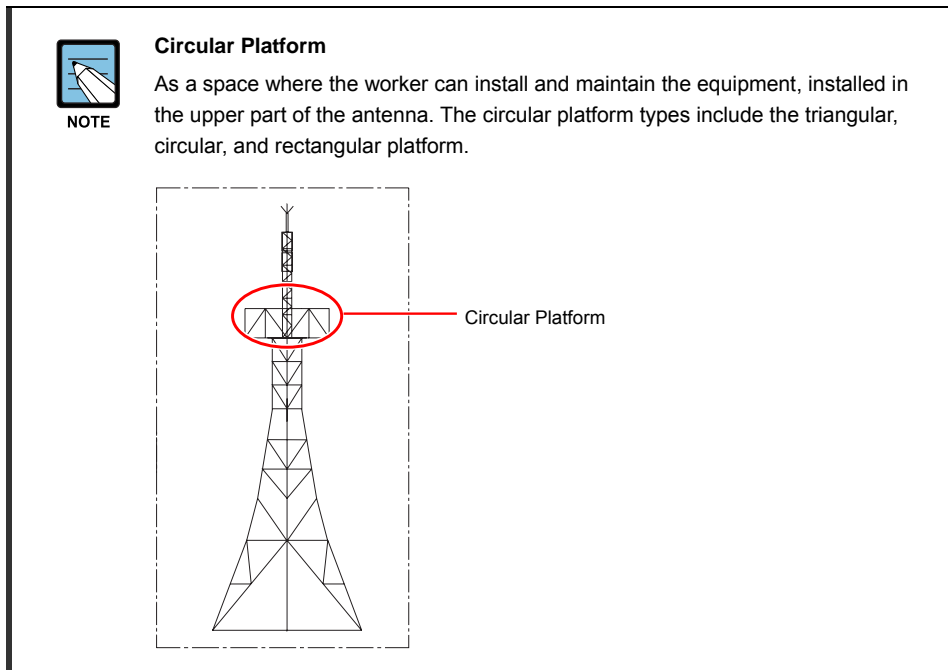


Figure 2.54 Omni Antenna

## 2.6.2 Antenna Posting

The method of posting the sector antenna is as follows:

- Adjust the antenna installing direction exactly by using the transit in case of the triangular lap pool iron tower.
- The sector antenna should be fixed with the angle which is the same as the angle set when the cell is designed, after the triangular lap pool iron tower is installed.
- The antennas of each sector should be lined up to the vertical direction from the sector beam angle by the distance between the antenna and the iron tower being adjusted. As for a reference, the central office whose directions between each sector are not  $120^\circ$  should be installed regarding the tilt and the azimuth so that the directions of the iron tower and the antenna should be different.
- The circular platform should be installed by the interval of the antenna being separated as much as possible so that the real distance from the radiation direction should be more than 3,600 mm.



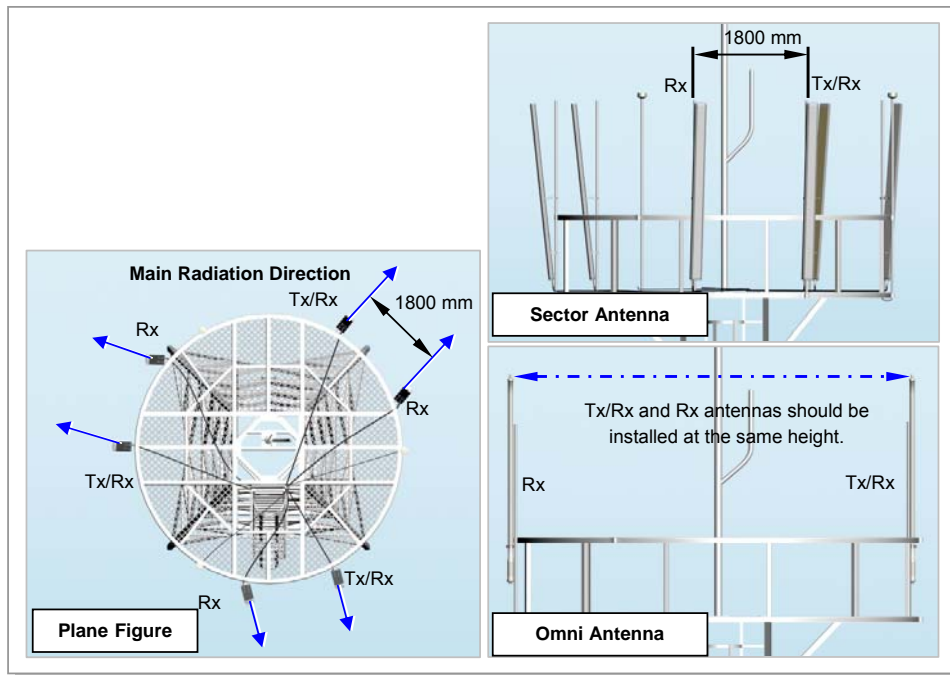
The method of posting the omni antenna is as follows:

- The transmitting antenna should be installed much higher than the receiving antenna in order to increase the separation between the antennas.
- The lag distance between the antennas should be set according to the antenna posting standard.

The lag-distance when the antenna is installed is shown in the table below:

**Table 2.4 Antenna Lag-Distance**

Category	Distance(m)	Note
Transmission(Tx)-Transmission	Over 1.8	Between two ends of antenna
Reception(Rx)-Reception	Over 3.6	
Transmission-Reception (between neighboring sectors)	Over 1.8	
Transmission-Reception (Perpendicular)	Over 1.8	
Iron Tower-Antenna	Installed considering the beam angle of the sector	



**Figure 2.55 Antenna Posting Method**



## 2.7 Installing Feeder Installation

The order of installing the feeder is as follows:



- 1) Feeder path search
- 2) Feeder cutting
- 3) Feeder installation
- 4) Feeder connection
- 5) Fixing GPS antenna
- 6) Feeder connection check
- 7) Identification tag attachment

### 2.7.1 Searching Feeder Path

The method of searching the feeder path is as follows:

- Search the feeder installation path from the antenna of the iron tower to the equipment transceiver.
- Select the path where the length of the feeder can be minimized.
- Installing the feeder should not be hindered, and the place where the feeder is not damaged should be selected.

### 2.7.2 Cutting Feeder

The feeder cutting produces the exactly needed length through the path search, and cuts by using the iron saw for cutting the feeder or instrument.

Take cautions about the followings when cutting the feeder.

- Cut the feeder into the fixed exact length.
- Mark the cutting edge clearly, and cut the feeder. All cutting edges should be cut at a right angle into the fixed length.
- Cut carefully so that other alien substances such as moist, iron, lead pieces should not be in.
- When the feeder is cut, the knife or the rasp is used.
- Clean the cutting edge of the feeder by using the solvent.
- Clean the corner of the feeder by using the brush.

### 2.7.3 Installing Feeder

The method of installing the feeder of the antenna is as follows:



- 1) Connect from the antenna of the iron tower to the antenna line amplifier.
- 2) Connect from the line amplifier to the arrester.
- 3) Arrester should be grounded to MGB.
- 4) Feeder should be connected from the arrester to the cable connection part of the indoor BTS.

When the antenna feeder is supplied to the central office, the common duct in the central office should be used. When there is no common duct, the antenna feeder can be supplied through the window.

The cautions when the feeder is installed are as follows:

- Install the plate so that the surface of the feeder should not be damaged to start the installation of the feeder. If the external form of the feeder is damaged, the damaged part should be cut off before the feeder is installed.
- After connecting the antenna with the feeder, complete the connection part of the contraction pipe with the contraction tube.
- Attach the labeling tape to the both ends of the feeder so that the both ends can be easily identified.
- When the feeder is fixed by the ram clamp, the upper part of the feeder should be tightened with the flat washer, and the lower part of the feeder should be tightened with the spring washer and flat washer.
- When connecting the rack, antenna, and arrester with the feeder, connect them tightly so that the reflected wave should not occur.
- When connecting the rack with the arrester, and connecting the antenna with the 7/8 inch feeder, use the jumper wire, and the jumper wire should not be twisted.
- The radius of the curvature should be enlarged as much as possible, and the minimum radius of the curvature should be maintained.
- The feeder should not be caught in at the entrance such as the iron wire and ladder.
- The connector should be connected to the antenna in a straight line, and the caution should be taken in order not to give excessive pressures after connection.
- The electrical adhesive vinyl tape and the heat shrinkable tube should be used for the external bare area of the connector so that the water should not be leaked.
- Wrap the electrical adhesive vinyl tape over the connection part of the connector more than twice, and wrap the magnetic fusing rubber tape more than three times. Then, cover it with the heat shrinkable tube.
- When connecting the 1/2 inch feeder with the 7/8 inch feeder, use the electrical adhesive vinyl tape to enlarge the 1/2 inch feeder connection part by 7/8 inch, and cover it with the heat shrinkable tube.

### 2.7.3.1 Connecting Feeder

Feeder is connected as shown below:

#### Connecting Feeder Connector

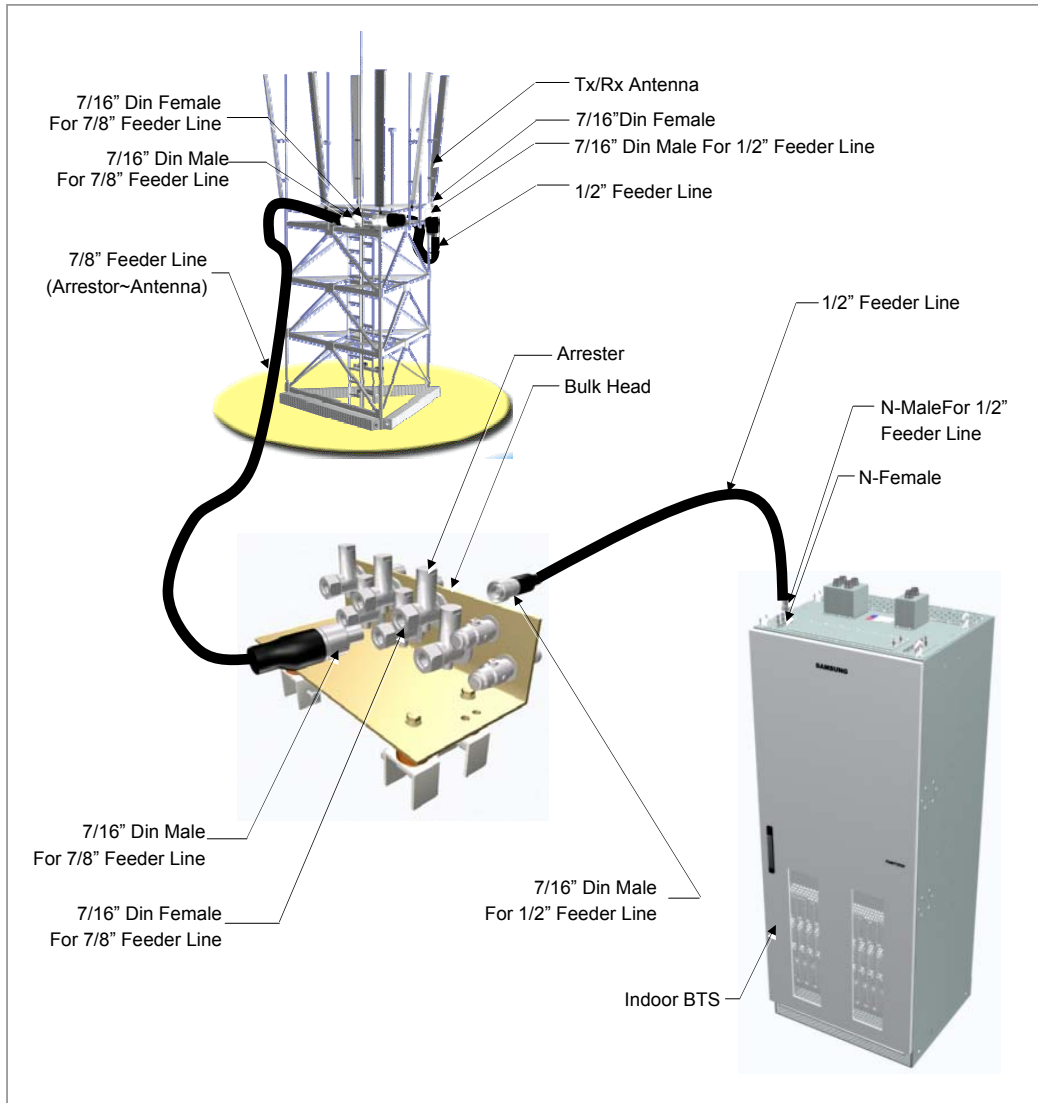


Figure 2.56 Connecting Feeder Connector

#### Feeder Connector Connection

Since connecting the feeder connector is an important process, only the personnel, who completed the related training course, should perform the work.

### Connecting Feeder Cable of Indoor BTS

Feeder cable of indoor BTS is connected as shown below:

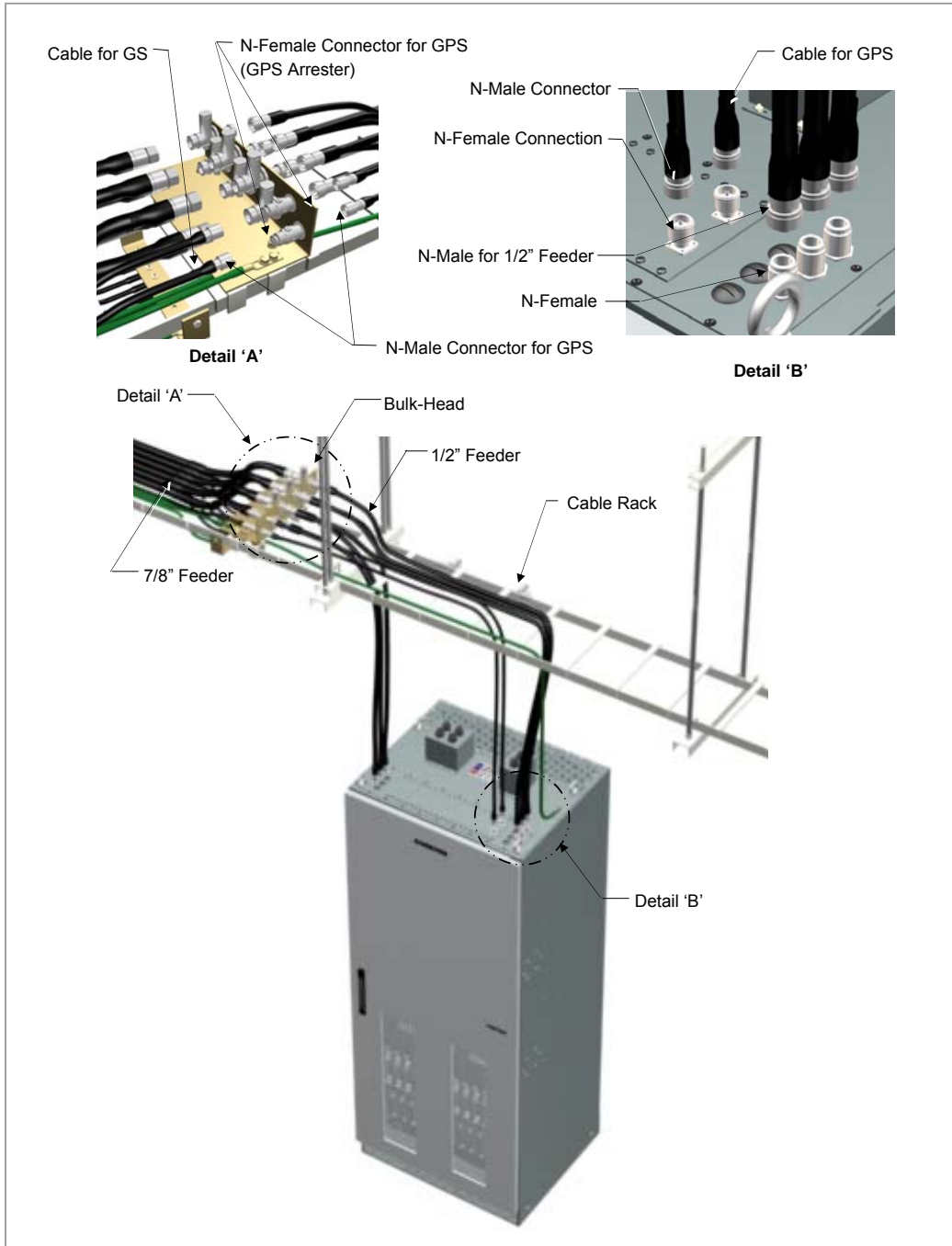


Figure 2.57 Connecting Feeder of Indoor BTS

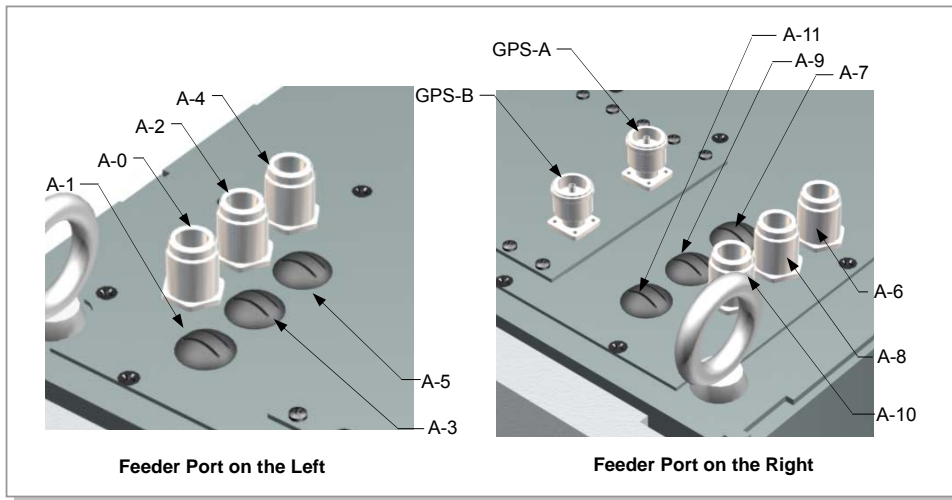


Figure 2.58 Feeder Port on the Upper Part of Rack

Table 2.5 Feeder Connection Port for Each System

Port No.	Omni	3 Sector
A-0	UFRU #0	UFRU #0
A-1	UFRU #1	UFRU #1
A-2	N.C.	N.C.
A-3	N.C.	N.C.
A-4	N.C.	UFRU #4
A-5	N.C.	UFRU #5
A-6	N.C.	N.C.
A-7	N.C.	N.C.
A-8	N.C.	UFRU #8
A-9	N.C.	UFRU #9
A-10	N.C.	N.C.
A-11	N.C.	N.C.

Feeder duct of an indoor BTS cable should be handled as shown below:

- The feeder duct should be rounded considering the curvature radius.
- The distance between the areas where a duct is connected should be within 1 mm.
- Bolts and nuts should be firmly fixed.
- Feeder duct width(Omni: 300 mm, Sector: 400 mm)

The antenna feeder should be connected as follows:(On the premise that the terminal is connected to the feeder)



- 1) The connected numbers of the feeder are different according to the system specification. First, find out the capacity of the system.
- 2) Discard the protection covering the feeder terminal.
- 3) Check the labeling tape attached to the feeder, and tighten to the feeder terminal of the system with hands.
- 4) When the radius of the curvature is over  $7/8$  inch, it should be more than 250 mm, and in case of  $1\frac{5}{8}$  inch, it should be more than 510 mm.
- 5) The feeder should be fixed by using the ram clamp. When installing and binding the feeder, perform the work neatly.
- 6) To the antenna feeder cable and GPS cable, the arrester should be connected in order to protect the equipment when the thunderbolt falls.

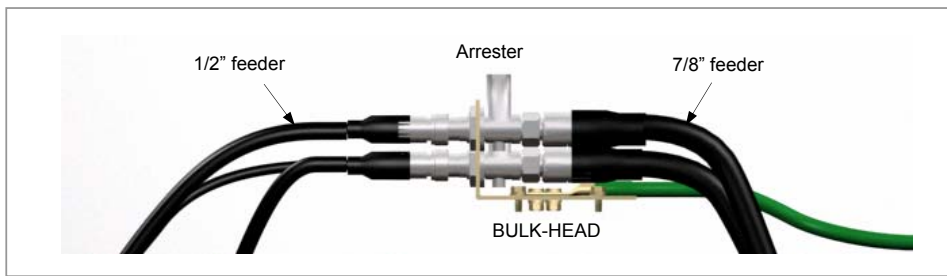


Figure 2.59 Arrester Connection Diagram

### 2.7.3.2 Connecting GPS Cable

GPS cable is connected as shown below:

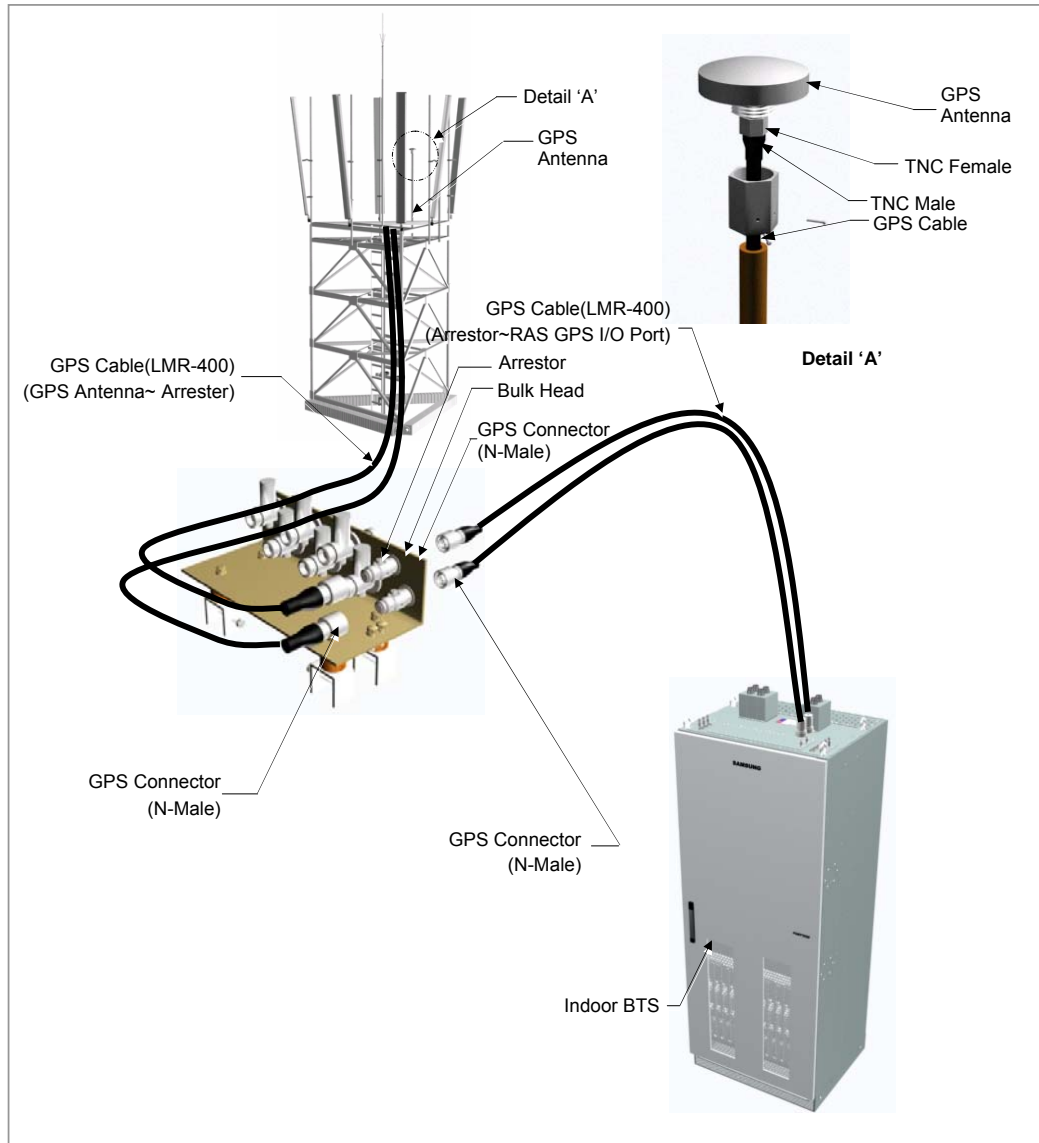


Figure 2.60 Connecting GPS Cable

### 2.7.3.3 Fixing GPS Antenna

When installing a GPS antenna on an iron tower or railing, use a ‘U’ bolt on the following stainless pipe(D: 25.4 mm).

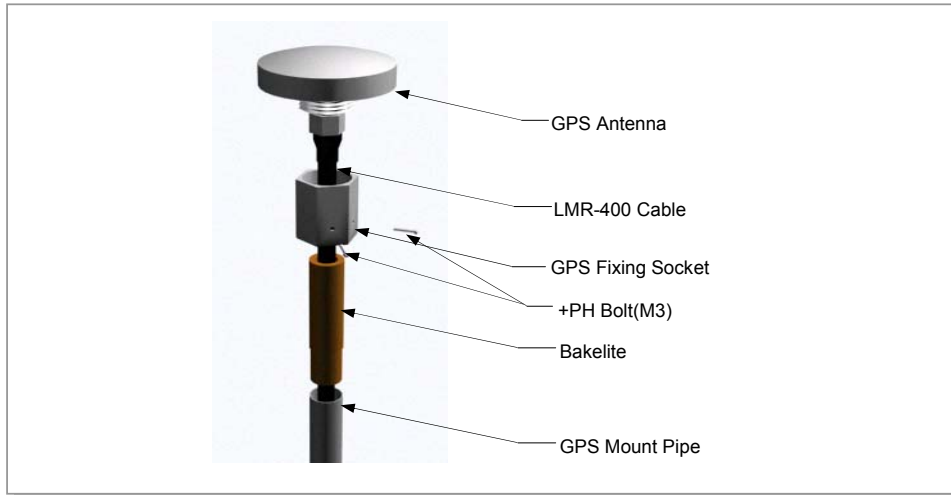


Figure 2.61 GPS Antenna Assembly Diagram



#### Using Devices for Installing GPS

GPS installation device may be changed depending on GCRU.

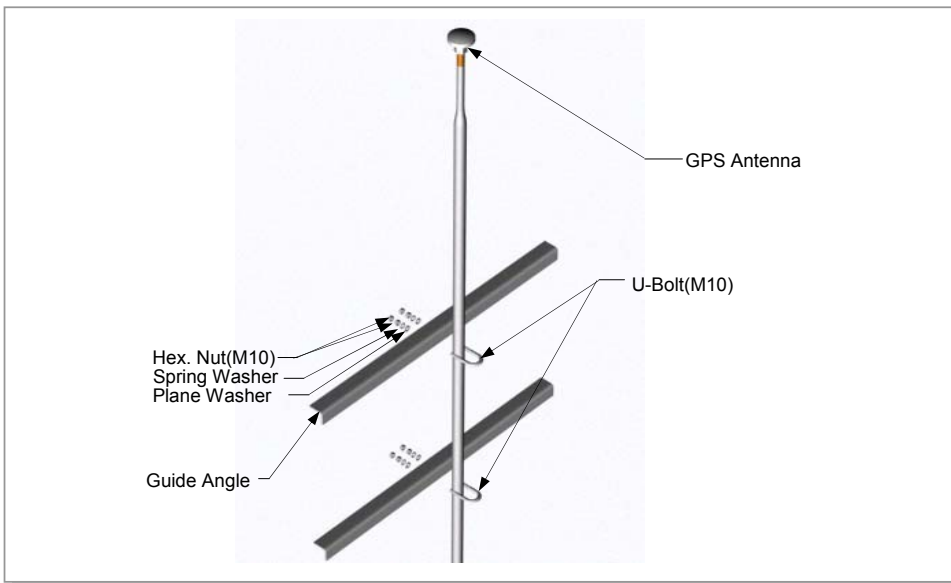
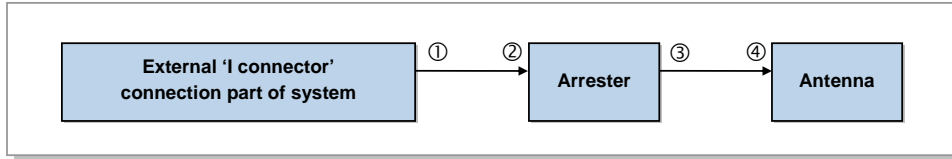


Figure 2.62 Fixing GPS Antenna



## 2.7.4 Checking Feeder Connection

After assembling the GPS connector, be sure to perform the continuity test and implement the return loss to check if the feeder is replaced, and measure the standing wave ratio(VWSR) of the antenna and feeder.



The section for measuring the standing wave ratio is as follows:

- 1) Measure ①~④ sections.  
At this time, the standing wave ratio should be less than 1.3. When the standing wave ratio is beyond the standardization value with the standing wave ratio exceeding 1.3, then disjoint and measure again for each section.
- 2) Measure ③~④ sections.  
When the result of measuring the standing wave ratio is more than 1.15;1, reassemble the connector or install the feeder again.

## 2.7.5 Installing Identification Tag

The labeling tape should be attached to the antenna of the feeder as shown in the table below:

**Table 2.6 Feeder Identification Tag**

Category	Description
Installing location	Attach the identification tag to the both ends of antenna.
Material	The vinyl-coated aluminum material is used for the identification tag.
Fixing method	Fix the feeder to two holes at the both ends of the antenna by using the black tie wrap.

## 2.8 Constructing Iron Tower

Before constructing the iron tower, examine the related paper and drawing closely.

When a failure or confusion is in the paper or drawing, the constructor should confer with the designer to complement or correct, and then proceed the construction.

The caution, when the iron tower construction, is as follows:



- 1) Construct based on the standard when digging the lot basically.
- 2) Tighten completely by using the washer when tightening the bolt or nut.
- 3) Neatly complete the closing treatment of the external base concrete.
- 4) The coating test report for the iron tower material should be previously handed in.
- 5) The triangular platform is installed to be maintained within  $\pm 3^\circ$  from the regulated angle for each face.
- 6) The protection angle should be at least more than  $45^\circ$ , and at most less than  $60^\circ$  when the arrest is installed.
- 7) Remove the welding slag completely so that the surface is even. Do not use the materials without the fusion zinc galvanizing process.

Considerations according to the iron tower location are as follows:

**Table 2.7 Considerations According to Iron Tower Location**

Iron Tower Location	Considerations
Rooftop iron tower	Directions of each face of sectors should be all measured.
Ground iron tower	Structure of ground(Earth and sand type) Lot depth Steel bar-arrangement Concrete cast and curing

Measure the location first before constructing so that the iron tower should be installed at the designated place exactly. The installing location can be changed within the range where the service area is not intervened according to the field location.

The location of the iron tower post is standardized to be parallel to the central office building in principle, but can be changed according to the direction of the antenna.

When base is a rock in the location for installing, the anchor blot is used within the allowable range.

## 2.8.1 Measuring Location

The constructor measures the location of the iron tower to check the drawing for installment and the state of the location before constructing the iron tower. When the constructor measures the location of the iron tower, consider the  $\alpha$ ,  $\beta$ ,  $\gamma$  direction of the antenna.

- Direction Measurement: Measure more than twice of changing the location for measurement by using the compass system with the transit survey instrument or the ruler.
- Direction Adjustment: When the marking work is performed, the constructor should mark with the spray paint in each direction, and check again.

## 2.8.2 Iron Tower Constructing Procedure

### Iron Tower Base Concrete and Steel Bar-Arrangement Work

Since the base concrete of the iron tower affects the security of the iron tower according to the concrete stress, the constructor should work carefully. According to the standard of form and installing location of the iron tower, the base concrete can be constructed in various methods, and constructed generally by the general constructing method. In particular, the constructor should construct the rooftop iron tower having waterproofing.

The drying period required from the concrete cast to assembling is as follows:

**Table 2.8 Concrete Curing Period**

Temperature	General Cement	Crude Steel Cement
8 °C	8 days	4 days
15 °C	7 days	3 days

### Assembling Iron Tower

Fill up the groundwork, and cast the concrete. Then, assemble the iron tower after the concrete is completely dried.

The cautions when the iron tower is assembled are as follows:

Take cautions so that the base concrete should not be impacted and damaged.

When there is an interrupt in the electric wave path such as the existing TV antenna near the iron tower, in principle, the iron tower should be posted by using the construction.

The antenna should be installed in a place as far as from the system. When the antenna cannot be installed after being moved to another place, the antenna should be installed after being moved to the corner of the triangular mobile pole or the height of the antenna should be able to be adjusted.

For the bolt nut of the iron tower, the direction of fixing should be selected so that the maintenance is easily provided.

Vertically installing: Fix so that the nut is on the upper part.(Fix the extension metal part in the lower part)

Horizontally installing: Fix so that the nut should be to the outward direction.

Installing the hole for drainage: Divide the  $\varnothing 100$  PVC tube into two pieces, and put on and install them on the pole.

### Grounding Establishment

In principle, when the iron tower and the arrester are grounded, the separating grounding method that distinguishes from the grounding pole should be used, but according to the given condition of the field, the common grounding method can be used. At this time, the grounding resistance is decided by the regulated grounding resistance value.



NOTE

#### Damage of Obstacle and Lumbering

When the iron tower is constructed inevitably in the site or construction beyond the designated installing location, the notification to the administrator(owner) should be given previously. When the building is damaged in order to install the antenna in the other place, the damaged building should be repaired and restored completely. Even though the construction is hindered due to the obstacle such as the tree, the construction should go through the administrative procedure.

## 2.9 Installing Cable

### 2.9.1 Power Device Installation

The electric power construction is a process to supply the power to the base station.

When the power is supplied to the base station, and if the power is supplied to the inside of the building, the required power should be secured first by consulting with the owner of the building about the quantity of the power for use, before the electric power construction is performed. If the power for use runs short, the power should be supplied by extension or additional supply of the power.

The power supplies are classified into the power supply for the central office and the power supply for communication. The power supply for communication is the electric energy that supplies to the establishment for communication, and the power supply device for communication is the power supply device for the communication loading facility.

The power supply device of the base station is configured with the followings based on the AC distributing switch, rectifier, and storage battery.

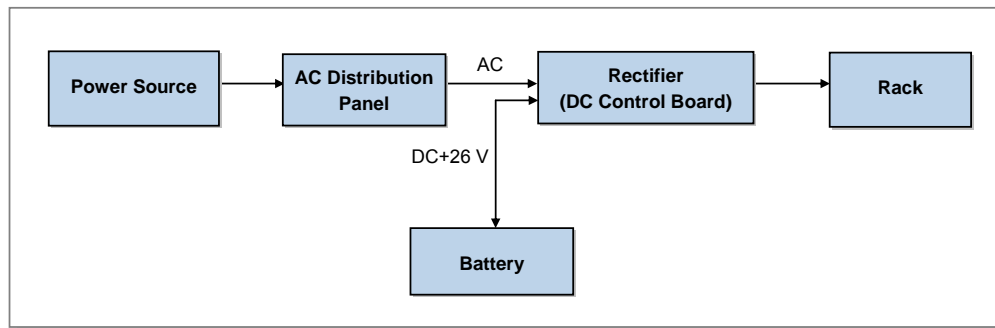


Figure 2.63 Power Device Configuration Diagram

Take the caution below when installing the power device:

- Maintain proper interval between the power device and the baseline location, a wall, and a pillar according to the installation plan.
- The rectifier should be installed/placed over 1.5 times of the rectifier width away from the wall or the neighboring obstacle. However, when there is no difficulty in the operation, this caution is not applicable.
- Arrange and construct the rectifier with the shortest distance between the battery charge/discharge line and the load supply line.
- Construct the power equipment horizontally and vertically.
- The fuse for each switch rack in the DC control board should have a rated capacity.
- Embed the anchor bolts and use the insulation bushing to fix the power device on the floor. In this way, the power device can maintain insulation from the floor.
- Install the battery close to the rectifier as much as possible.

- Insulation resistance should be over 5 MΩ when measuring it with a DC 500V measuring device.
- Tightly fix the bolts and nuts between batteries.

**Electric Shock**

Do not touch electronic devices or equipment with watered hand. That causes electric shock.

**Fire and Burn**

Do not place inflammable materials near the system.

**Not to Damage Power Cable Sheath**

If power cable is pulled forcibly when installed, the sheath of the power cable may be damaged. Special caution should be taken.

**Workers During Operation**

When workers install power cables in a small area, do not apply excessive force. You may bump against a wall or equipment.

**When Power Cable is Used**

Since power cable is heavier and less flexible than communication cable, take special caution.

**When Working with Power Cables**

Turn the power off before working with power cables to prevent rack damages, and electrical shock to related cables.

### **Installing Breaker**

The breaker is installed in the location that is convenient to the power manipulation and monitoring.

### **Installing PVC Duct**

When there is no ceiling panel or the ceiling is high, the PVC duct should be installed in the sensor wiring and the light.

### **Installing Power Outlet**

The power outlet is installed in the local where the equipment is installed with an appropriate capacity(grounding type), and the local outlet container and switch are also installed together when the container is constructed.(Prevent a fire due to overheating)

### 2.9.1.1 Installing Power Cable

Power cable of an indoor BTS is connected as shown below. DC +26V is supplied to the indoor BTS through the power cable on the upper part of the rack. Power device is installed in the form of cabinet and is connected as shown below:



- 1) Power line should be twisted pair wire. +26 V line is red, and return line is black. If it is impossible, the two lines should be black and be labeled to identify its polarity.
- 2) 4 CV60 mm<sup>2</sup>(AWG 1/0, current 190 A, diameter 0.325") are used for A and B paths, and 2 CV38 mm<sup>2</sup>(AWG 2, current 139 A, diameter 0.258") are used for C path.

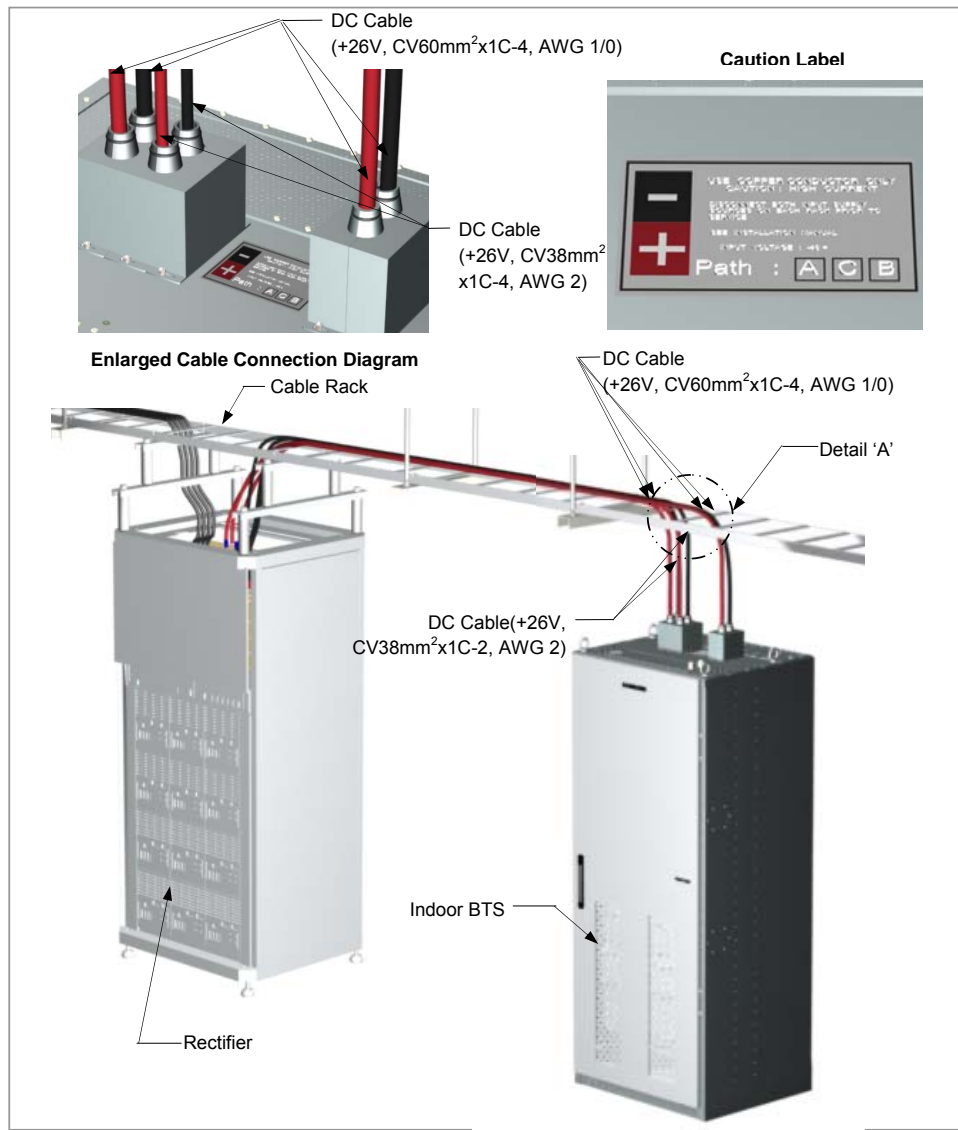


Figure 2.64 Connecting BTS Power Cable



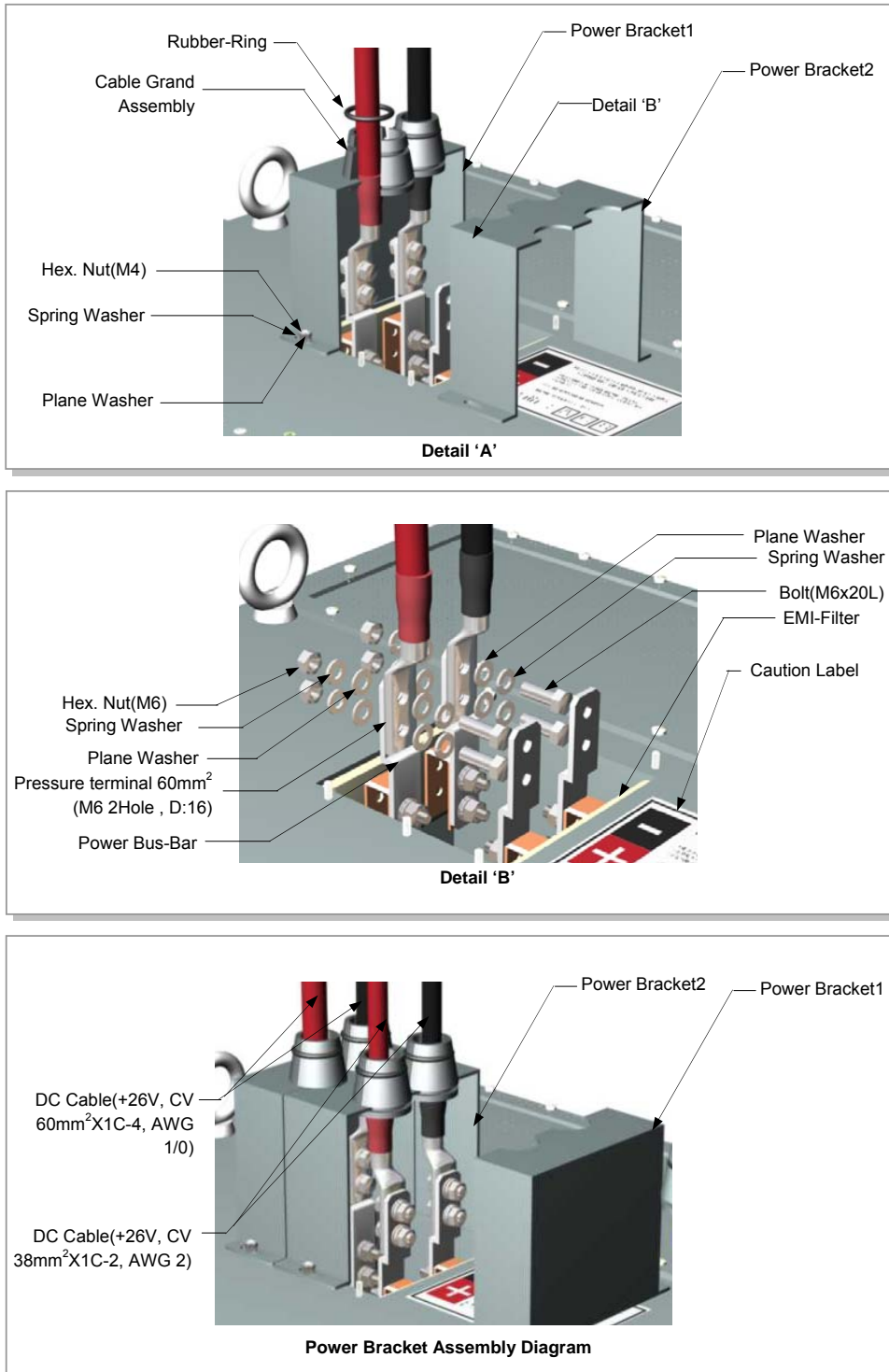


Figure 2.65 Power Terminal Assembly Diagram

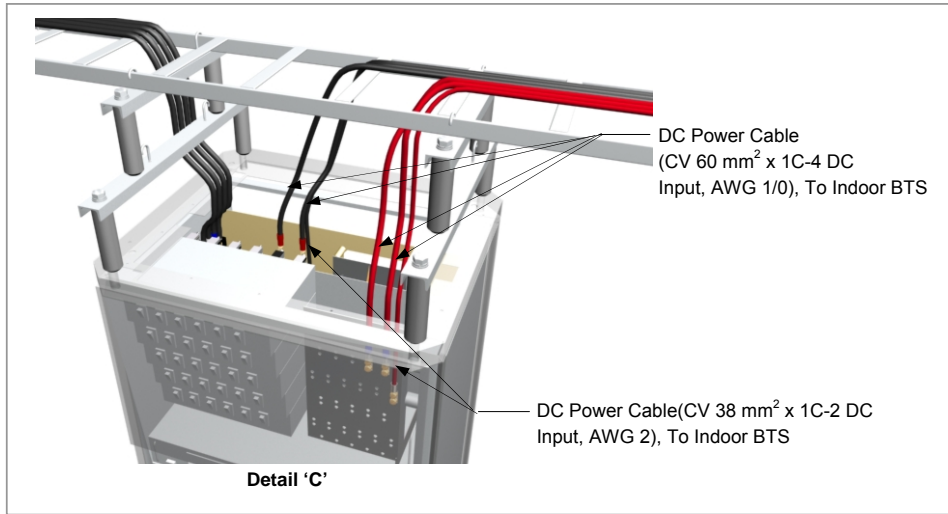


Figure 2.66 Rectifier Cable Diagram

Power cable and power bus-bar are connected as shown below:

- 1) Unfasten the rubber ring from the cable grand ass'y, and widen and mount on the six cables. Note that the rubber ring should be connected first.
- 2) Fix shrinkable tube on the six cables connected to the rectifier.
- 3) Mount the terminal of A, C, B paths(+) of the rectifier on the stud of A, C, B paths(+) of the system.
- 4) Mount plain washer and spring washer on a stud, and fasten the nut.
- 5) Mount plain washer and spring washer on the other stud, and fasten the nut.
- 6) Mount the terminal of A, C paths(-) of the rectifier on the stud of A, C paths(-) of the system.
- 7) Mount plain washer and spring washer on a stud, and fasten the nut.
- 8) Mount plain washer and spring washer on the other stud, and fasten the nut.
- 9) The above steps 2) through 8) also apply to the B path(+) and(-) of the rectifier.
- 10) Fasten the 12 nuts with torque wrench by using a spanner.  
When fastening with torque wrench, torque value should be set to 40.8-50.5 kgf.cm according to KSC C 2620.
- 11) Move the shrinkable tube connected to the cable to the terminal, and contract the tube by heat.
- 12) There is a groove on the cable grand ass'y connected to A, C paths(+), which can be connected to bracket1. Mount the bracket1 to the cable grand ass'y, and connect the rubber ring to the groove of the cable grand ass'y.
- 13) Connect the cable grand ass'y connected to A, C paths(-) to bracket2, and connect the rubber ring to the groove of the cable grand ass'y.

- 14) Fasten power bracket1, 2 with four screws. Also fasten the cable grand ass'y.
- 15) Fasten power bracket1 on the left side of B path with two nuts.
- 16) Mount the cable grand ass'y connected to B path(+) on bracket2, and connect the rubber ring to the groove of the rubber.
- 17) Mount the cable grand ass'y connected to B path(-) on bracket2, and connect the rubber ring to the groove of the rubber.
- 18) Fasten power bracket1 on the right side of B path with two nuts. Note that rubber should not be loosened.

**When Power Cable is Connected**

Check the polarity before connecting power cable in order to prevent the risk of a fire caused by reverse polarity.

**When Power Cable is Maintained**

Turn off the switch of a rectifier or distributing board before maintaining the power cable.

When connecting the cable, be careful about the followings:

- When the power is connected with the reverse polarity, a fire can occur, be sure to check the polarity before connecting the cable. In the side of the power terminal located in the top plate of the system, the label is attached as shown in the figure below: Connect +26 V line of the rectifier to the front side of the system, and connect the return line to the back side of the system by adjusting them to the polarity of the label.
- The system is supplied with the power by the rectifier through three power lines. Since the quantities of the current supplied for each line are different, the constructor should check the path designated in the label exactly before connecting the lines.
- When the maintenance of the system is provided, the power of the rectifier should be turned off or the switch of the electric panel should be shut off beforehand. Also, since the remaining energy can be left over even after the power is shut, ten seconds after the switch is shut, the constructor should check if the remaining voltage is less than 1 V before starting maintenance.

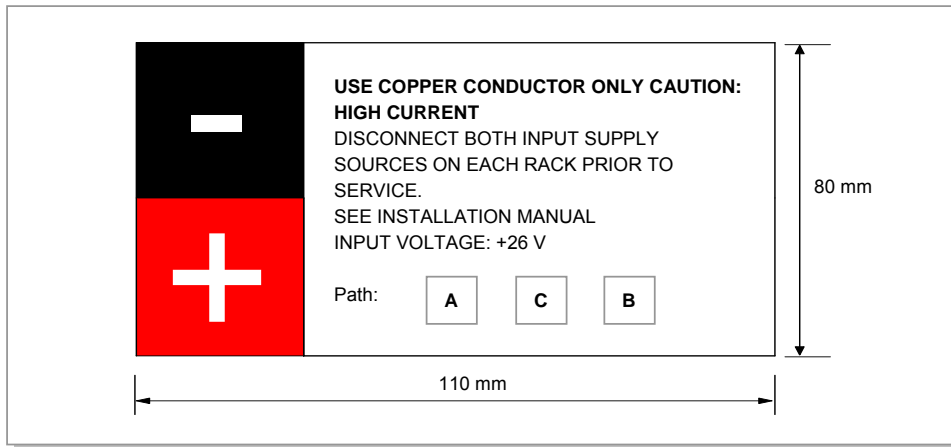


Figure 2.67 Power Terminal Caution Label

Since the power of the system is implemented in a permanent connection system, all power of the system cannot be turned off by a single switch. To cut the power supply to the entire system, use the main power switch of the rectifier.

The procedure for cutting off power is as follows:

- If equipment needs to be cut off from the main power supply, turn off the switch of the rectifier or of any related power switches applied during installation.
- The following methods are allowed for cutting power:
  - power supply cord plug
  - Main plug that can be directly connected to the equipment
  - Circuit breaker
  - Main power switch of rectifier
- Available current for each type of power cable is described as follows:
  - Path A: AWG No. 1/0, current 190A, diameter: 0.325"
  - Path B: AWG No. 1/0, current 190A, diameter: 0.325"
  - Path C: AWG No. 2, current 139A, diameter: 0.258"

### 2.9.1.2 Installing Distributing Switch

The distributing switch should be installed at the height of 1800 mm, which is the same as that of the existing distributing switch. When the distribution switch is laid, the stainless duct is used for the upper part of the distributing switch for the neat installation. The vertical section of all flexible tubes should be completed with the connector.

The power should be laid for each phase according to the cable colors below:

- R-red
- S-white
- T-blue
- N-black

## 2.9.2 Connecting Trunk Cable

The trunk cable of the indoor BTS is the T1 cable for the communication between BSC and BTS. In the central office, the connection should be made from the trunk terminal block to the connector input end of the upper part of the rack.

The trunk cable of indoor BTS is connected as follows:

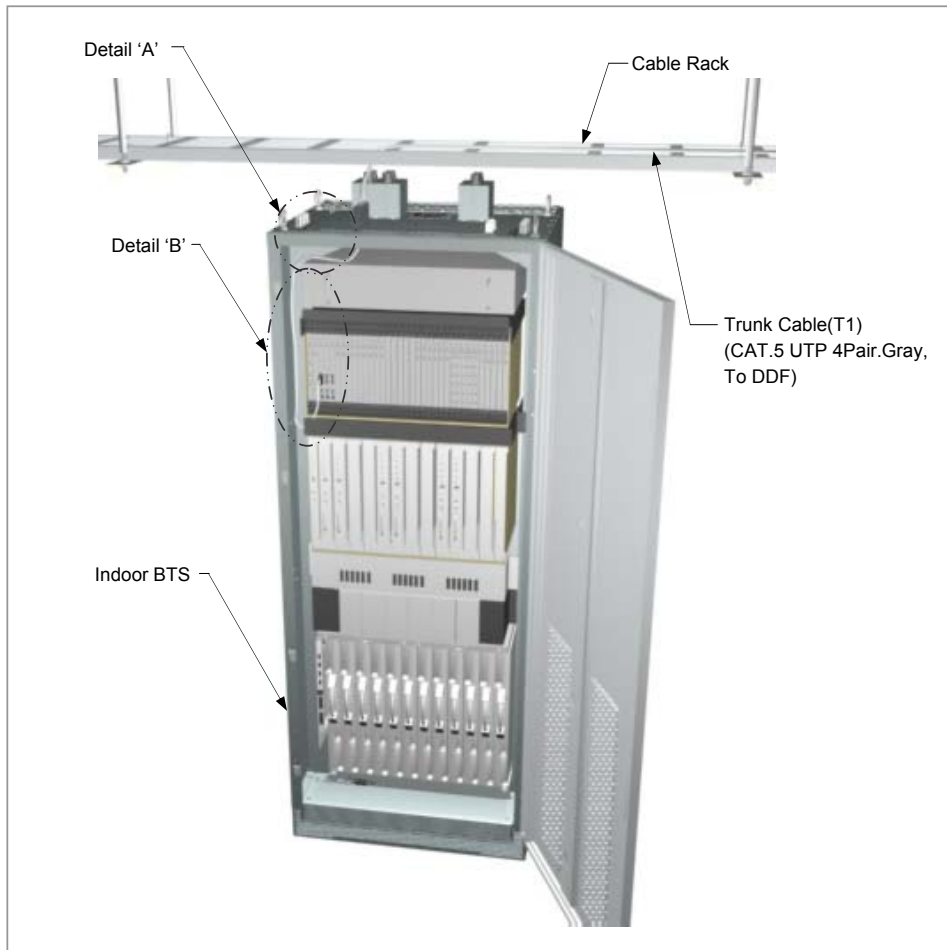


Figure 2.68 BTS Trunk Cable Connection

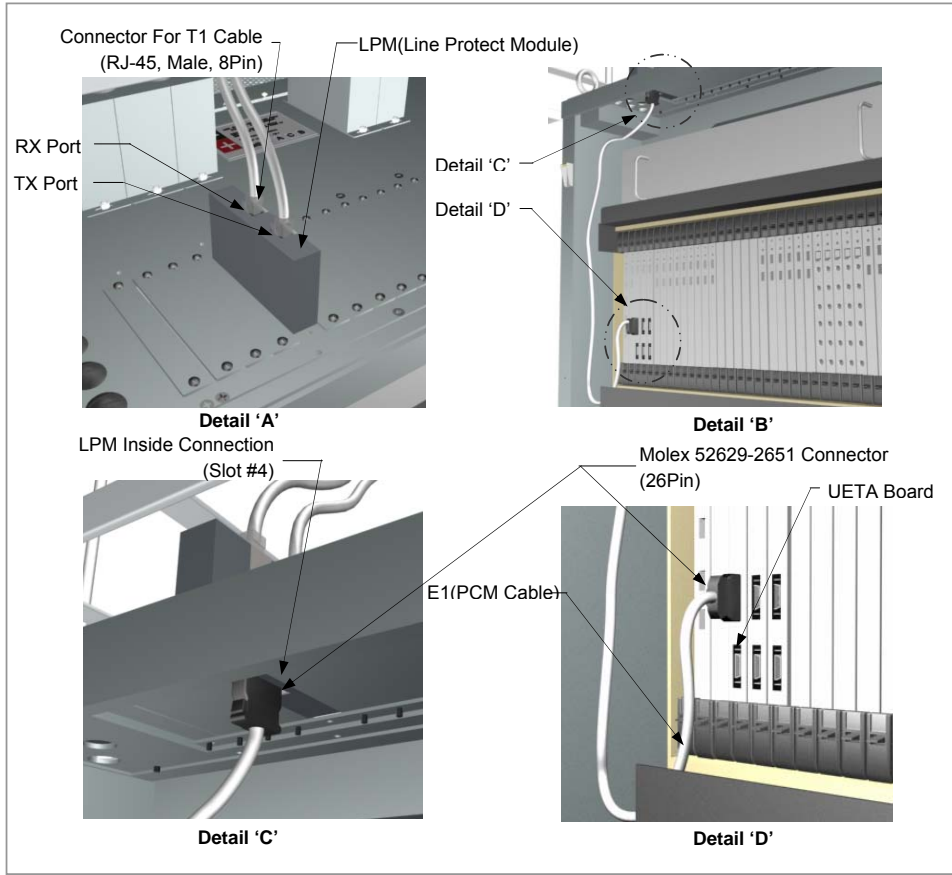


Figure 2.69 Trunk Cable Connector Diagram

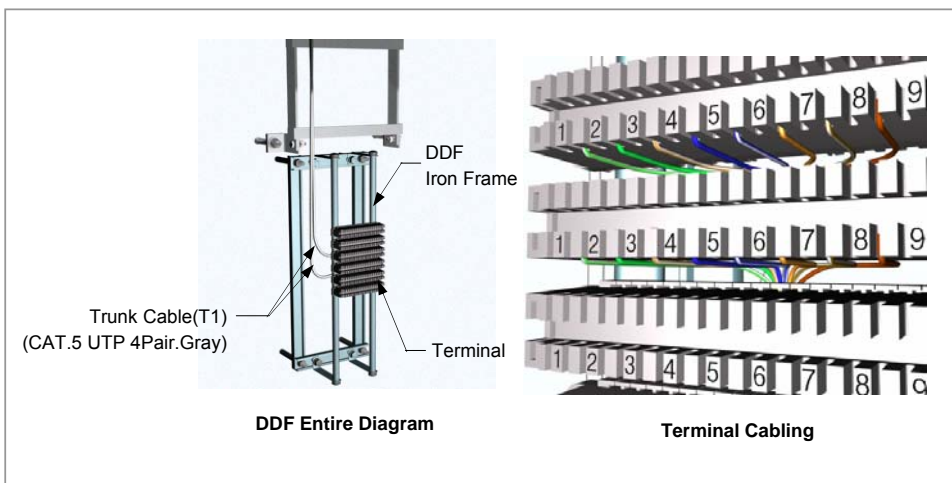


Figure 2.70 DDF Cable Diagram

The trunk line types are E1/T1, E3/T3(DS3), and optic mode according to the system specification. Trunk line is minimally connected when this product first come into the market, and is expanded in the field.

E1/T1 trunk cable is connected as shown below:



- 1) E1/T1 port is located at slot #4, 5, 6, 7, 8, 9 of I/O panel, and 4 E1/T1s can be connected to each slot.
- 2) Check if the label of a cable correctly identifies the cable.
- 3) Check if Tx port exists on the front and if Rx port exists on the back.
- 4) A Tx port and a Rx port exist on RJ-45 jack, and four tips and rings exist on each port.



#### Cautions when connecting trunk cables

To reduce risk of fire, use AWG No. 26 or a larger one as a trunk line.

### RJ-45 Pin Description

Since the configuration of the terminal is different from that of the LAN, the pin configuration is defined arbitrarily by Samsung as follows: The cable should use STP 4 pairs in order to prevent the EMI and surge input and keep the secured signal.

Pin	EIA/TIA 568A	TX	RX
1	White/Green	TX3 Tip	RX3 Tip
2	Green/White(Solid Green)	TX3 Ring	RX3 Ring
3	White/Orange	TX2 Tip	RX2 Tip
4	Blue/White(Solid Blue)	TX2 Ring	RX2 Ring
5	White/Blue	TX1 Tip	RX1 Tip
6	Orange/White	TX1 Ring	RX1 Ring
7	White/Brown	TX0 Tip	RX0 Tip
8	Brown/White	TX0 Ring	RX0 Ring



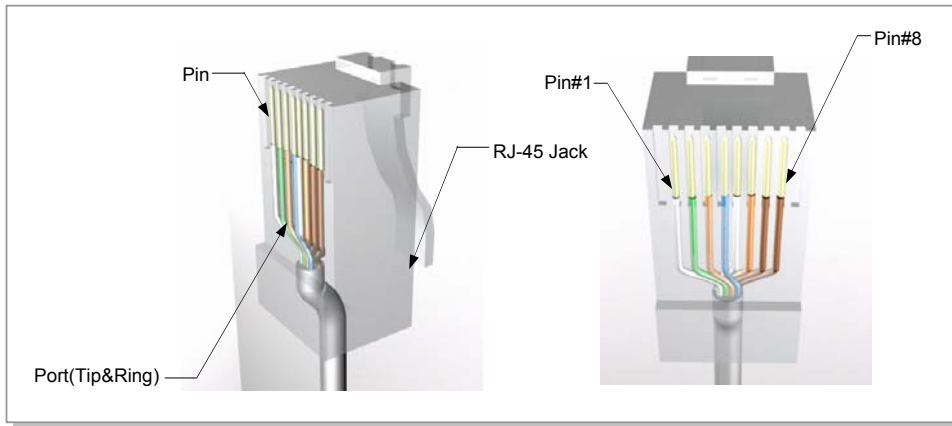


Figure 2.71 RJ-45 Jack Configuration Diagram

## 2.9.3 Alarm Cable

### 2.9.3.1 UDA Cable

The User Define Alarm(UDA) cable, which monitors alarms of various devices in the site, is connected to the “UDA” port of the UACA board as shown below:

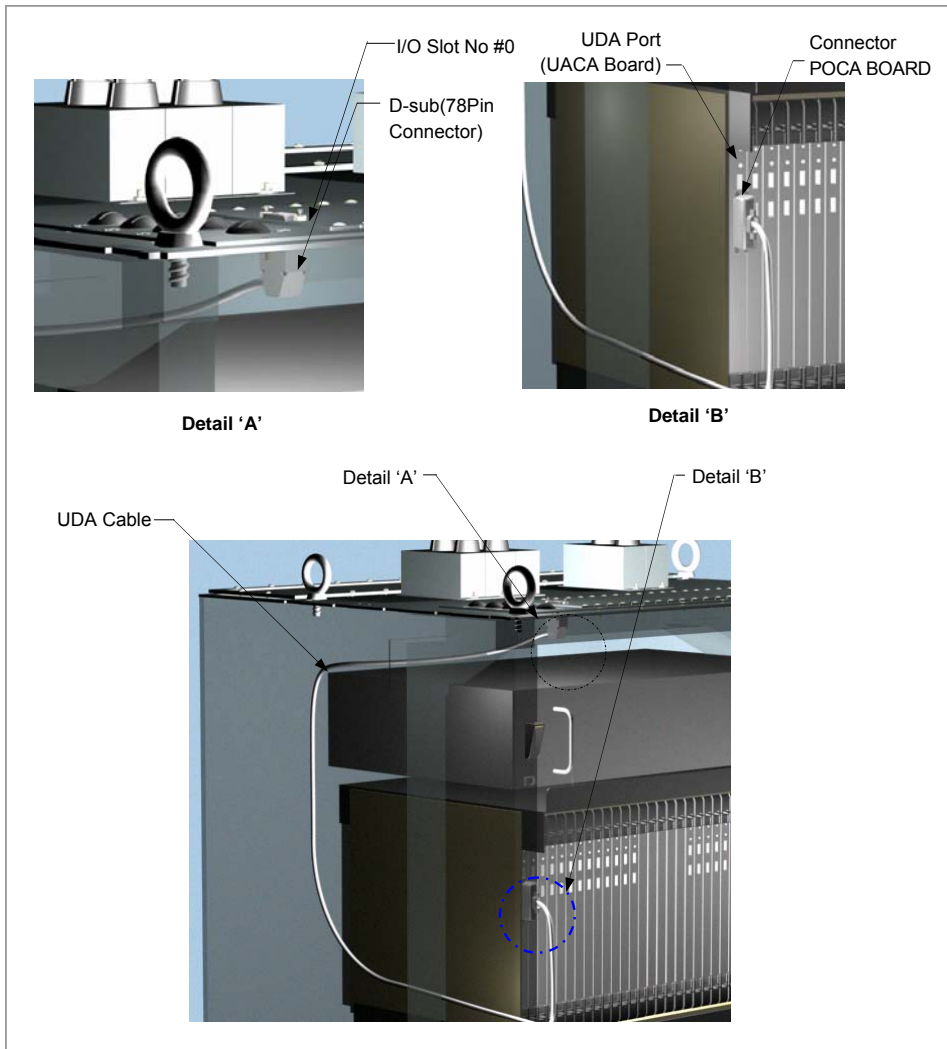


Figure 2.72 UDA Cable Connection

### 2.9.3.2 Connecting Rectifier Alarm Cable

A rectifier alarm cable used for monitoring a rectifier alarm of an office is connected to the "HDLC" port of UACA. Cable connection diagram is described as follows:

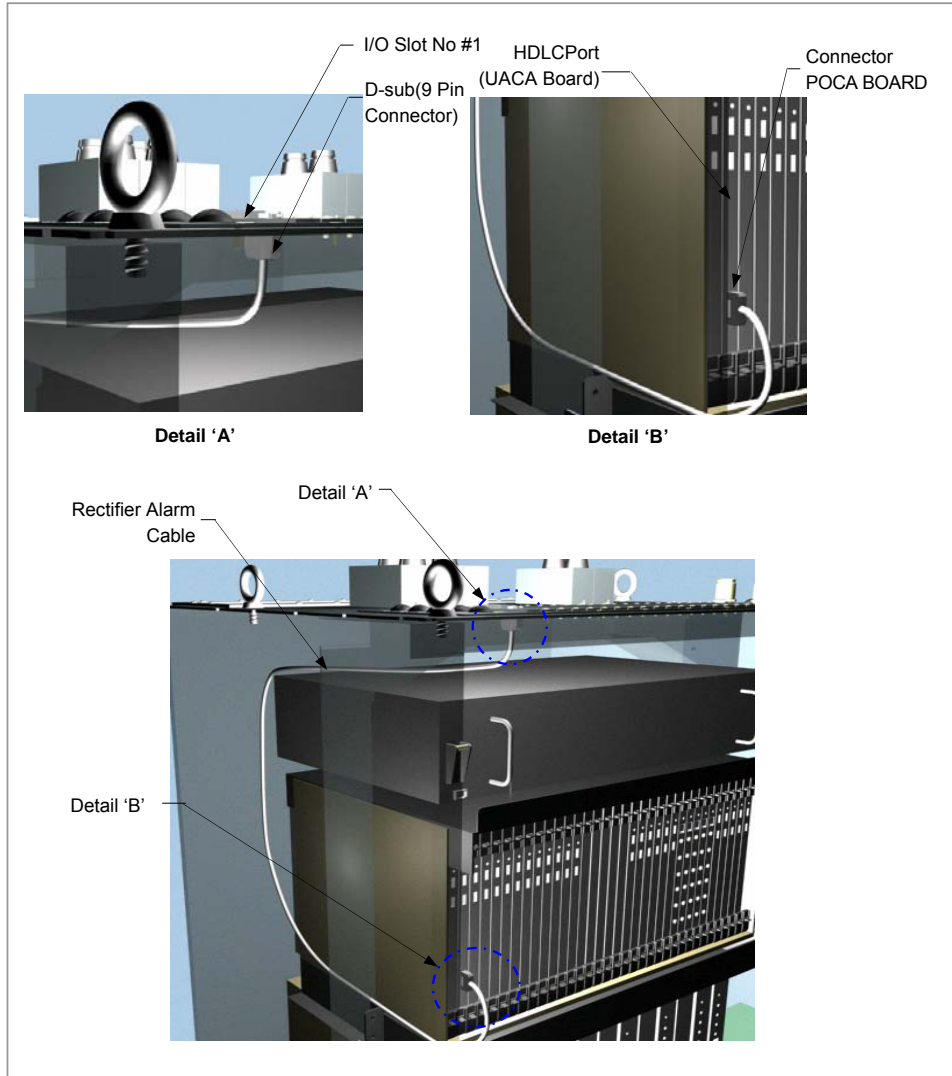


Figure 2.73 Rectifier Alarm Cable Connection Diagram

The following table describes the I/F terminal pins of FAN-P and FAN-S alarm ports:

Pin	Name	Function	I/O	Status
1	COMM	Alarm signal common pin	COMM	GND
2	Temp.(+)	Temp. sensor	Output	-
3	Temp.(-)		Output	-
4	N.C	-	-	-
5	N.C	-	-	-
6	Fan fail	Fan-fail, Voltage-fail, Power-off	Output	Open(Alarm)/ Close(Normal)
7	Temp. fail	High temp. alarm	Output	Active Low
8	N.C	-	-	-



CHECK

#### Using Pin

Pin Nos. # 2, 3, and 7 should be used only for development. I/F terminals of UACA and UAIU are 4pin USB connector, and pins are arranged as shown below:

1: N.C, 2: FF, 3:N.C, 4: GND

## 2.9.4 Exposed Pipe

The exposed pipe is made with the rigid vinyl steel conduit(Hi-PVC), and installed on the ceiling or along the wall. When pipes are laid along the wall vertically, the pipes should be supported by a clamp to the direction of the wall. If the tube is slender, or the number of bone(the unit of the pipe length) is small, the saddle can be used to fix the tube.

When the exposed pipe is laid, the followings should be considered carefully.

- The radius of the curvature should be more than six times as long as the caliber of the tube, and the angle of the curvature should not exceed 90°. (At the curvature whose angle is 90°, the general band is used.)
- If the length of the pipe exceeds 30 m horizontally, and 15 m vertically, the full box can be additionally installed.
- The cutting edge of the pipes should be processed smoothly.
- The full box, in principle, should be firmly fixed on the slab and other structures by using four anchors.
- The curvature points and divergent points should secure the required minimum curvature radius based on the maximum standard electric wire installed in the pipes.
- The connection box should be manufactured with over stainless 27 type 1.5 T in order to prevent the oxidation of the inside.
- When the connection box has the curvature to the up and down, and perpendicular direction, the rubber plate should be attached so that the covering of the electric wire should not be damaged.
- When the underground electric wire lines are laid, the firmness of the surrounding ground, the level of the normal times, whether or not the dangerous things is laid, whether or not the induced hindrance damaged articles exist, whether or not the local load exists from the earth's surface are examined. Also, the water pipe should be installed with 1/100 inclination so that the water is naturally supplied, and the warning tape that indicates the laying of the cable should be attached.



NOTE

### Exposed Pipe

The exposed pipe indicates that the wire tube is installed to be viewed by the human eye. For example, the apartment is installed with the internal laying of the pipe, so the wire tube cannot be viewed, and the gas tube of the gas lens is installed with the exposed pipes, so the gas tube of the gas lens can be viewed by the naked eye.



NOTE

### Normal Bend

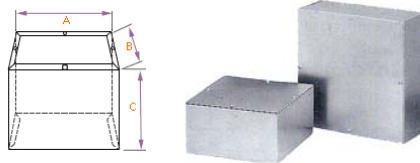
When the wire tube is laid, the normal band is used for the part that bends at the right angle, and the both ends of the normal bend are the right angle towards the axis.



NOTE

### Full Box

The full box is the connection part of the cable installation. When the cable is installed in the pipes, if the length of the pipe is too long, the cable can not be passed by into the inside of the pipes easily, so the full box is used.



NOTE

### Saddle

As the material to fix the wire tube, the saddle types are the single saddle, and double saddle according to the form and usage.



Double Saddle

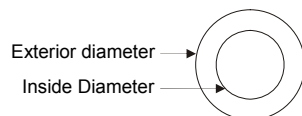
Single Saddle



NOTE

### Inside Diameter of Tube

Indicate the inside diameter of the tube.



## 2.10 Test for Installation

When the indoor BTS installation is completed, the test for installation should be performed to check the state of the system. This test is to operate the system in a stable way by clearing every problem that can occur after starting the indoor BTS. As a result of the test, if there is a failure, the recovery should be performed, and the analysis table for failures should be drawn up.

The test for installation is performed in the order of the power test, board mounting, and functional test.

### Power Test

The test for the power is performed according to the following order:



- 1) Shut off all power switches so that the power should not be supplied to the indoor BTS.
- 2) Turn on the power input main switch.
- 3) Turn on the power switch for each shelf.
- 4) Check if the power for each shelf is normally supplied before the board is mounted.

### Board Mounting

The board is installed in the indoor BTS according to the following procedures:



- 1) Shut off all power switches so that the power should not be supplied to the indoor BTS.
- 2) Press the ejector with both fingers to insert the board completely into the back panel.
- 3) Combine the module required to be tightened with a screw by using the driver.

### Function Test

If all boards are mounted, the items as below should be tested.

- Initialization Test
- Fault Processing Test
- Call Processing Test
- Processor Status Control
- Diagnosis
- Maintenance Test
- Operator Matching Test
- Overload Control Test





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# ABBREVIATION

## B

BTS Base station Transceiver System

## D

DDF Digital Distribution Frame

## G

GPS Global Positioning System

## I

IGB Inner Ground Bar

## M

MGB Main Ground Bar

## O

ODA Office Data Assembly

## S

SHIR1 SAMSUNG High density Indoor Rack 1

SHIR2 SAMSUNG High density Indoor Rack 2

## T

TGB Tower Ground Bar



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삭제됨: <http://www.samsungnetwork.com>

## CDMA2000 BTS SCBS-519L10 Installation Manual

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