



imnenb_LR3.0

LTE
Installation Manual
eNB

MB-14310050-001(E)-01

March, 2012

Copyright © 2012 by NEC Corporation

This document describes the current planned product and feature description and release. However, the specifications, configuration and the release plan contained in this document are subject to change without any notice due to NEC's continuing design improvement.

All rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated in any form for by any means without the written permission of NEC Corporation.

All designations used in this document can be trademarks, the use of which by third parties for their own purposes violates the rights of their owners.

Printed in Japan

Revision History

Issue	Date	Revision Description	Author	Approval	Remarks
1.0	March 30, 2012	1st release	T.Araki	K. Yoshida	

Preface

Purpose of This Manual

This manual describes the required knowledge and procedure to install the LTE system (eNodeB, hereafter referred to as eNB).

[i] This manual targets the 700MHz All-in-one Type eNB.

Target Reader

This manual is intended for the LTE system installation personnel and operation and maintenance personnel of a network operator.

Manual Structure

- Section 1 Overview
Describes the system structure, equipment names and the main specification of the equipment.
- Section 2 Equipment Appearance
Shows the appearance of eNB equipment and its dimensions.
- Section 3 Equipment Installation Conditions
Shows the required space to install eNB equipment.
- Section 4 Interface Conditions
Shows the cable connection system diagram and eNB equipment interface.
- Section 5 Installation
Describes the cautions when carrying the equipment and the procedure to install eNB equipment.
- Section 6 Cable Work
Describes the procedure to work on various types of cables.
- Section 7 Voltage Check
Describes the procedure to check the voltage of the eNB equipment.

Symbols Used in This Manual

In this manual, the following symbol is used to show notes. When reference to a note is required, it is expressed as "Refer to [i]."

[i] CCC...CCC (CCC...CCC : note text)

Precautions

The alert labels in this manual and attached to the eNB equipment body indicates the items you must follow to prevent potential injury and safety hazard to you and other people, and perform the operation safely. Please read this manual thoroughly before starting any operations.

Also, this manual must be kept in a safe place, so that you can read it whenever required.

When alert labels are directly attached to the equipment, always read the content.

This manual is intended for the LTE system installation personnel and operation and maintenance personnel of a network operator.

Safety Instructions

The "Safety Instructions" provides safety instructions for the LTE system installation operations. For other items, read the equipment manuals.

Definitions of Alert Categories

The following symbols categorize the dangers and level of damage that occurs when the content is ignored or wrong procedure was performed.



DANGER:

This symbol indicates that there is explicit life-threatening danger that may cause death or serious injuries if this item is ignored and the equipment is handled wrongly.



WARNING:

This symbol indicates that it may cause death or serious injuries if this item is ignored and the equipment is handled wrongly.



CAUTION:

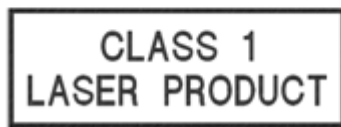
This symbol indicates that it may cause injuries and physical damage if this item is ignored and the equipment is handled wrongly.

Alert Labels

The following shows the alert labels attached to the equipment. If an alert label is attached, always follow the instruction written on the label.



All surfaces of this equipment heat up to a high temperature. Beware of burns when handling.



Class 1 laser is emitted from the BH(O) optical connector at the bottom face of equipment. Do not peep into it directly, to prevent eye injuries.

Federal Communications Commission

Changes or modifications not expressly approved by NEC Corporation could void the user's authority to operate the equipment. (Section 15.21)

Section 15.105 (a) Class A Warning Label

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

About the Safety Instructions

When you find a safety instruction in this manual, be sure to read the instruction before starting the work.

The following safety instructions, especially regarding items that may cause death or injury to you and other people in this manual are listed by their alert categories.

Alert Category: CAUTION



CAUTION:

About the Work in General

- Before starting the work, check the area of evacuation at the time of disaster.
- Do not work wearing slippers. They may cause injury by falling, etc.
- Be careful not to stumble over cables, parts and tools while working. It may cause injuries and accidents.
- Be careful not to get the sleeves and hems of the working clothes caught. It may cause injuries and accidents.
- Do not place liquid such as water into the equipment, and do not touch the equipment with wet hands. Moisture in the equipment may cause electrocution and equipment failure. In case liquid gets into the equipment, turn off the equipment power and request repair.
- Do not dismantle or alter the equipment. It may cause electrocution, fire and equipment failure.
- When installing or removing the equipment, cure the floor surface of the installed location to prevent damage by dropping parts.

About Handling the eNB Equipment and SFP

- When handling eNB equipment itself and SFP, wear gloves (thin cotton gloves). Working with bare hands may cause burns, injury and accidents.
- Use correctly the parts for testing such as SFP, tester and cable referring to their user manuals.
- When handling the eNB equipment and the SFP, wear a wrist band as an antistatic measure. If you do not take any antistatic measures, the static electricity may damage the equipment and the SFP.

About Handling High Voltage/ High Current

- Only the installation worker can touch the eNB equipment. Inside eNB equipment, there are high voltage/ high currents flows, and they may cause accidents.
- Always perform ground connection. Not following this instruction would cause system failure by lightening and electrocution.
- When measuring voltage/ current, take appropriate insulating measures such as covering the measurement terminal and the unused tool parts with insulating tapes. Contact of measurement terminal and other terminals, or short-circuit by tools may cause electrocution and accidents.

Notes on Running the System

In "Notes on Running the System", the notes to protect the equipment from failure are described. To run the system normally, follow the notes to operate.

Environment Conditions on Running the System

The following shows the usage conditions of eNB equipment. To run the system normally, consider the following items during installation operation.

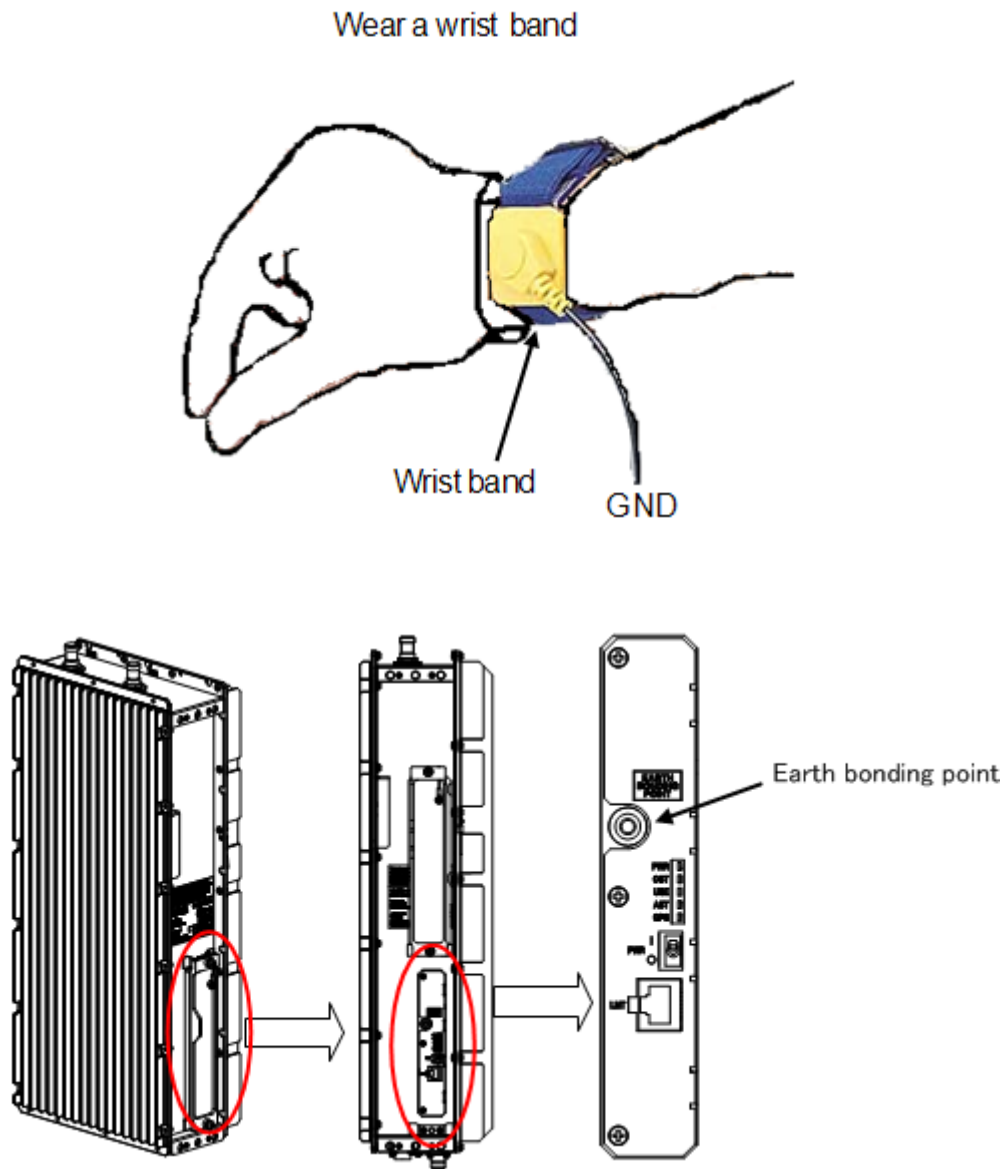
Category	Details
Installation	Install in a limited access area.
Temperature and humidity	- Do not ventilate outside air. - Refer to the following and check that the temperature and humidity are appropriate. Also, check that there is no condensation. Vertical Setup -33°C to +50°C (No sunlight) -33°C to +45°C (With sunlight) Horizontal setup -33°C to +45°C (No sunlight) -33°C to +40°C (With sunlight) The above temperature limits of operation environment drops by 2.5°C for every 1km of altitude rise.
Liquid	- Do not place liquid such as water and oil near eNodeB.
Vibration	eNodeB is a precision instrument, so do not expose to vibration of standard level (Telcordia NEBS GR-63-CORE Zone4) or more.
Heat dissipation	- Natural cooling of eNB satisfies all the environmental conditions. - To gain the expected heat dissipation, eNB has a radiator for natural cooling on its surface. Natural cooling radiator, for its physical characteristic, must be set up so that the fin part is vertical or horizontal. - No cooling method such as cooling by fans is used for eNodeB. - There is no periodic replacement parts such as air filters. - No always-driving part such as a fan is used for eNodeB.

Notes on Running the System in General

- Before installing the equipment, remove all connector caps attached to the equipment side external interface connectors to which external cables are planned to be connected.
Removing the connector caps, etc. in a high place may result in the connector caps dropping.
- If external cables are not connected right after equipment installation, place outdoor weather resistant tapes on the temporary connector caps as waterproof treatment.
- In case you touch the equipment for maintenance, there may be places on the equipment reaching high temperature.
Wear protection such as gloves when handling the equipment.
- Do not allow foreign objects such as screws, wire rods and metal scraps inside the eNB Equipment. They may cause eNB equipment failure by equipment damage and short-circuit.
- Wear antistatic shoes while working.
- When working after rain, wipe the water drops on the equipment before opening the maintenance window.

Notes on Handling the eNB Equipment and SFP

- To prevent static electricity, always wear globes (thin cotton gloves) and a wrist band as antistatic measures when working on the eNB equipment, inserting or removing SFP into/from the equipment.
By static electricity the electrical parts of the equipment or the SFP may be damaged. The grounding terminal of the wrist band is connected to the earth bonding point in the maintenance window of the equipment.



Notes on Handling the Power

- Do not turn the power ON/ OFF unless required.

Notes on Handling the Cables and Connectors

- Do not swing or bend the cable with force. It may cause the cable to break or damage the connector.
- Do not remove the optical connector cap unless connecting the connector. If the optical connector is damaged or gets dust on it, it may cause communication failure.
- Use the tools and parts such as cables correctly, referring to their user manuals.
- Tie the external cables without putting stress, meaning without twisting and pulling on the equipment connector part.
- When removing the connector or the waterproof cap to mate again, clean the mating parts.
- Depending on the environment condition, the FullAXS connector surface may become rough, and touching it by bare hands may cause the plastic toughening agent to irritate the skin. If the toughening agent gets on to your skin, wash it thoroughly.

Table of Content

	Revision History	3
	Preface	4
	Precautions	5
1	Overview	14
1.1	System Structure	14
1.2	Equipment Names	15
1.3	Main Specifications	15
2	Equipment Appearance	17
3	Equipment Installation Conditions	19
4	Interface Conditions	20
4.1	Cable Connection System Diagram	20
4.2	External Interface	22
4.2.1	Bottom Face External Interface Locations/ Names and Interface Details	22
4.2.2	Top Face External Interface Locations/ Names and Details	23
4.2.3	Maintenance Window Interface Locations/ Names and Details	24
5	Equipment Installation	25
5.1	Cautions on Carrying the Equipment	25
5.1.1	Temporary Placement of Equipment	25
5.1.2	Carrying the Equipment by the Handles	26
5.1.3	Carrying Equipment by Hoisting Up/ Down	27
5.2	Equipment Installation Forms	29
5.2.1	Installation Examples of Ladder/ Wall/ Pole/ Cross arm/ Suspension Mount	29
5.3	Ladder/ Wall/ Pole/ Cross Arm/ Suspension Installation	31
5.3.1	Dedicated Mounting Hardware for Installation	31
5.3.2	Installation Method	32
5.3.3	Installation Procedure	35
5.3.4	C-COVER (Connector Cover) Installation Procedure	39
5.3.5	F-COVER (Front Cover) Installation Procedure	43
5.4	List of Attachments and Tools	45
6	Cable Work	46
6.1	List of Used Cables and Connectors	46
6.2	Power Cable Connection (-48V DC)	48
6.2.1	Power Cable Connection Composition	49
6.2.2	Power Cable Connection Procedure	50
6.2.2.1	Floating Type Cable Connection Procedure	51
6.2.2.2	Fixed Type Cable Connection Procedure	54
6.3	Backhaul Cable Connection	55
6.3.1	Metal Type Backhaul Cable Connection (BH(E))	55
6.3.1.1	Backhaul Cable Connection Procedure (Electrical)	56
6.3.2	Optical Type Backhaul Cable Connection (BH(O))	58
6.3.2.1	Backhaul Cable Connection Procedure (Optical)	59
6.3.3	Notes on Handling Optical Cables	61

6.4	GPS Cable Connection (GPS)	62
6.4.1	GPS Cable Connection Procedure	62
6.5	External Alarm Interface Cable Connection (EXT ALM)	64
6.5.1	External Alarm Interface Cable Connection Procedure (EXT ALM)	64
6.6	FG Cable Connection (FG)	65
6.6.1	FG Cable Connection Procedure	65
6.7	Antenna Tilt Control Cable Connection (RET)	67
6.7.1	Antenna Tilt Control (RET) Cable Connection Procedure	67
6.8	Antenna Cable Connection (ANT0/ANT1)	69
6.8.1	Antenna Cable Connection Procedure (ANT0/ANT1)	69
6.9	Connector Details	71
6.9.1	Power Connector Pin Allocation	71
6.9.2	Antenna Tilt Control Connector (IEC60130-9)	72
6.9.3	External Alarm Interface (EXT ALM)	73
7	Voltage Check	74
7.1	Cable Side Power Connector Pin Location Polarity	74
7.2	Voltage Check Procedure	75

1 Overview

This manual describes the installation of eNodeB (hereafter called eNB) NL Rel 3.0.

I This manual is created as a standard version.

1.1 System Structure

The installation target in this manual, All-in-one Type eNB is a micro-miniature base station equipment which can be installed out of doors. Its micro-miniaturization was accomplished by unification of the parts: the interface part to upper level lines, call processing control part, monitor control part, Baseband processing part (BB part), TRXBB part, radio amplifier part and radio function part. By this, the space required for installation, installation man-hours, installation parts and maintenance man-hours are all reduced and the degree of freedom in selecting the installation location and direction is increased.

[Figure 1](#) shows the installation image of All-in-one Type eNB.

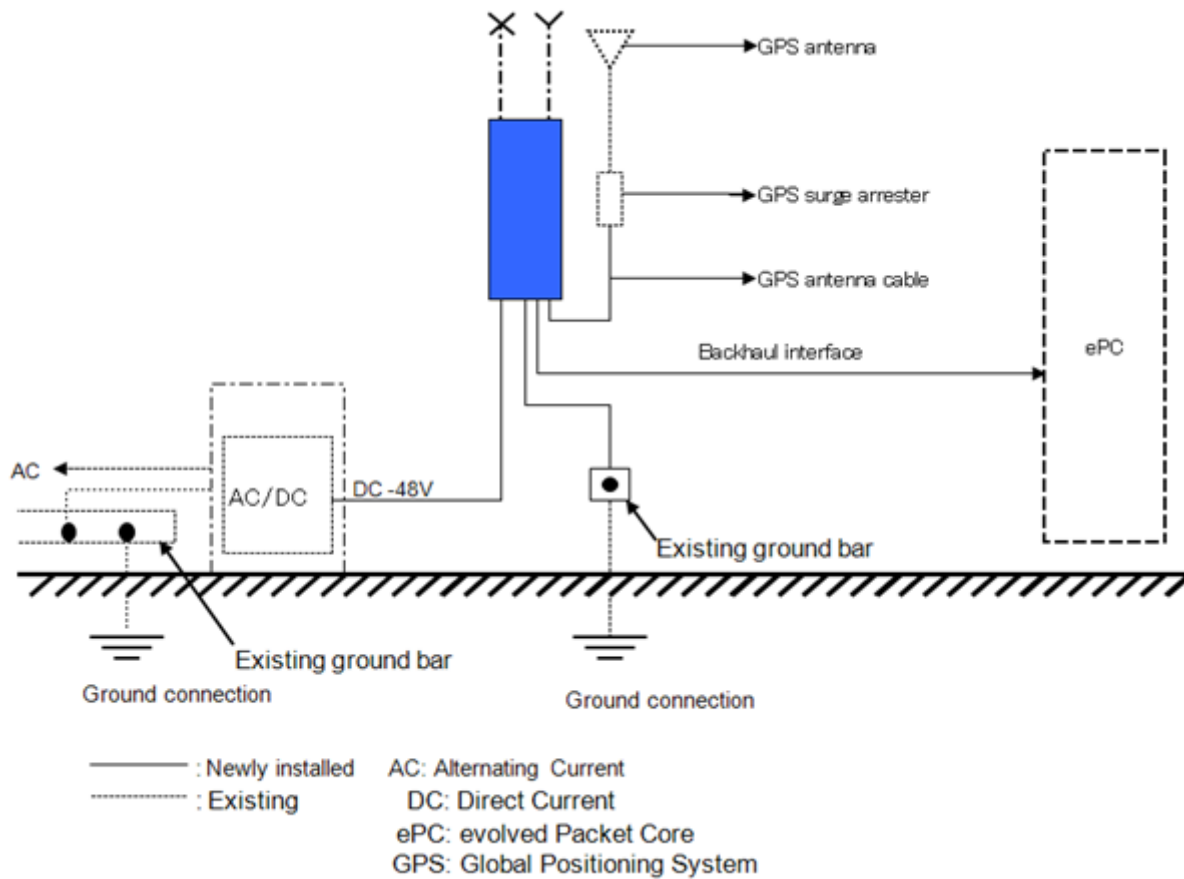


Figure 1 All-in-one Type eNB Installation Image

1.2 Equipment Names

[Table 1](#) shows the equipment type and displayed code applicable to this manual.

Table 1 Equipment List

No.	Equipment Type	Display Code	Note
1	Band 13: 700MHz	MB4300-n313	Power source: DC -48V Transmission output: 5w x 2ports

1.3 Main Specifications

[Table 2](#) shows the main specifications of All-in-one Type eNB.

Table 2 Main Specifications of All-in-one Type eNB

No.	Item	Performance/ Characteristic/ Applied Method
1	Transmission/ Reception Frequency	[DL] 746 - 756MHz [UL] 777 - 787MHz
2	Dimensions	251.0 $\pm$ 2.5[mm](W) 562.0 $\pm$ 4.0[mm](H) 149.0 $\pm$ 2.5[mm](D) (Excluding protrusions)
3	Mass	17.0[kg] Excluding mounting hardware, F-COVER (Front Cover) and C-COVER (Connector Cover).
4	Power Specification	DC-48 [V]: -43.2V to -57.0V
5	Rated current	7[A]
6	Maximum Power Consumption	Including AISG consumption: 206.6[W] Excluding AISG consumption: 198.6[W]
7	Operation Environment Temperatures	Vertical setup -33°C to +50°C (No sunlight) -33°C to +45°C (With sunlight) Horizontal setup -33°C to +45°C (No sunlight) -33°C to +40°C (With sunlight) The above temperature limits of operation environment drops by 2.5°C for every 1km of altitude rise.
8	Relative Humidity	5% - 95%

Table 2 Main Specifications of All-in-one Type eNB

No.	Item	Performance/ Characteristic/ Applied Method
9	Quake Resistance	- Telcordia NEBS GR-63-CORE Zone 4 - IEC 60721-2-6: Zone 4
10	EMC Standard	FCC Part15 Subpart B Class A
11	Waterproof/Dustproof	IP65 (IP66 with cover)
12	Surge Limit	- Power voltage (outdoors) Conforms to CE marking L-E 1.2/50μs, ± 0.5kV 8/20μs L-L 1.2/50μs, ± 0.5kV 8/20μs - External alarm interface Conforms to CE marking L-E 1.2/50μs, ± 1kV 8/20μs - Backhaul interface Conforms to CE marking L-E 1.2/50μs, ± 1kV 8/20μs - Lightening SURGE L-E 1.2/50μs, 10kV 8/20μs, 5kA L-L 1.2/50μs, 2.5kV 8/20μs, 1.25kA
13	Safety Standards	CSA 60950-1, 60950-22

2 Equipment Appearance

The following shows the equipment appearance and equipment flat surface appearance of All-in-one Type eNB.

1 Equipment Appearance

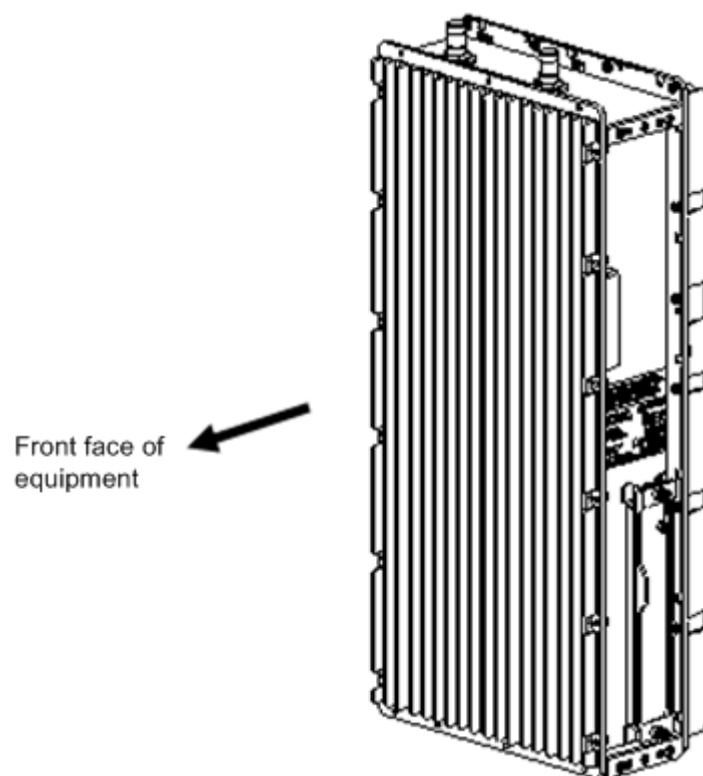


Figure 2 Equipment Appearance

2 Equipment Flat Face Appearance

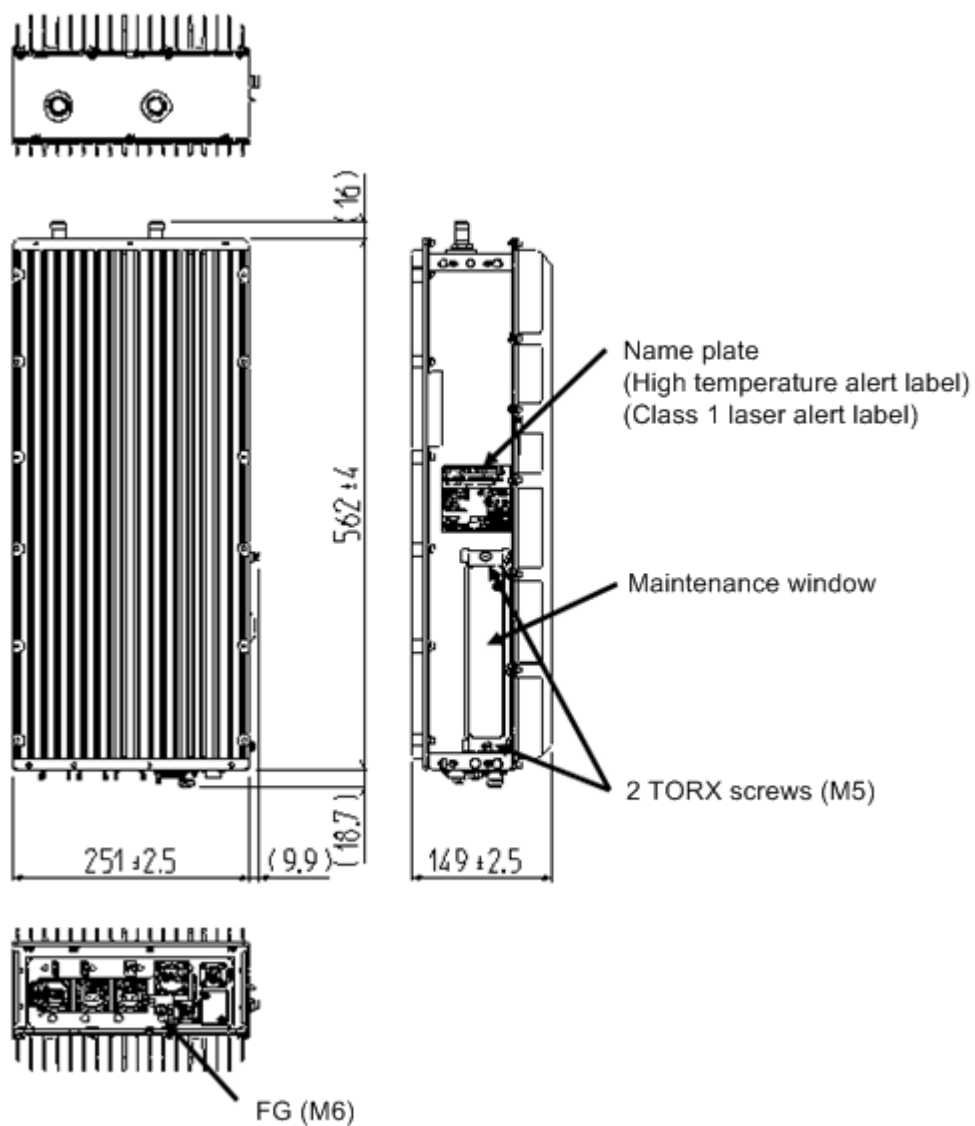


Figure 3 Equipment Flat Face Appearance

3 Equipment Installation Conditions

The following shows the clearance condition for single installation of All-in-one Type eNB. (In case of "Ladder mount/ wall mount/ pole mount/ cross arm mount or suspension mount" .)

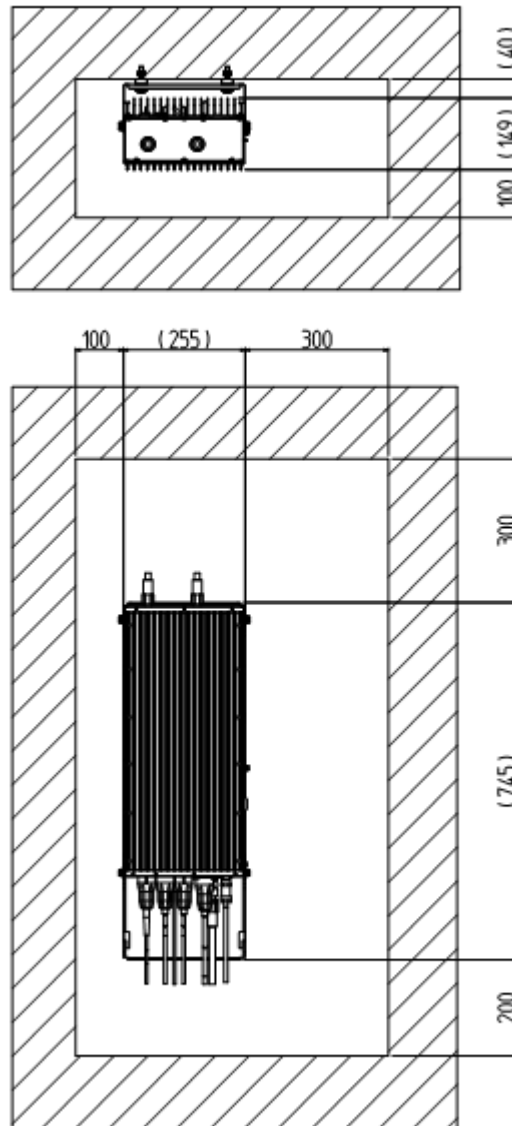


Figure 4 Single Installation Clearance



- 1 Make sure the temperature is 50°C or lower at all the front, back, left and right sides.
- 2 Make sure air ventilation is possible through the top face.

4 Interface Conditions

4.1 Cable Connection System Diagram

[Figure 5](#) shows the cable connection system diagram for All-in-one Type eNB. [Table 3](#) shows the list of connectors and legends.

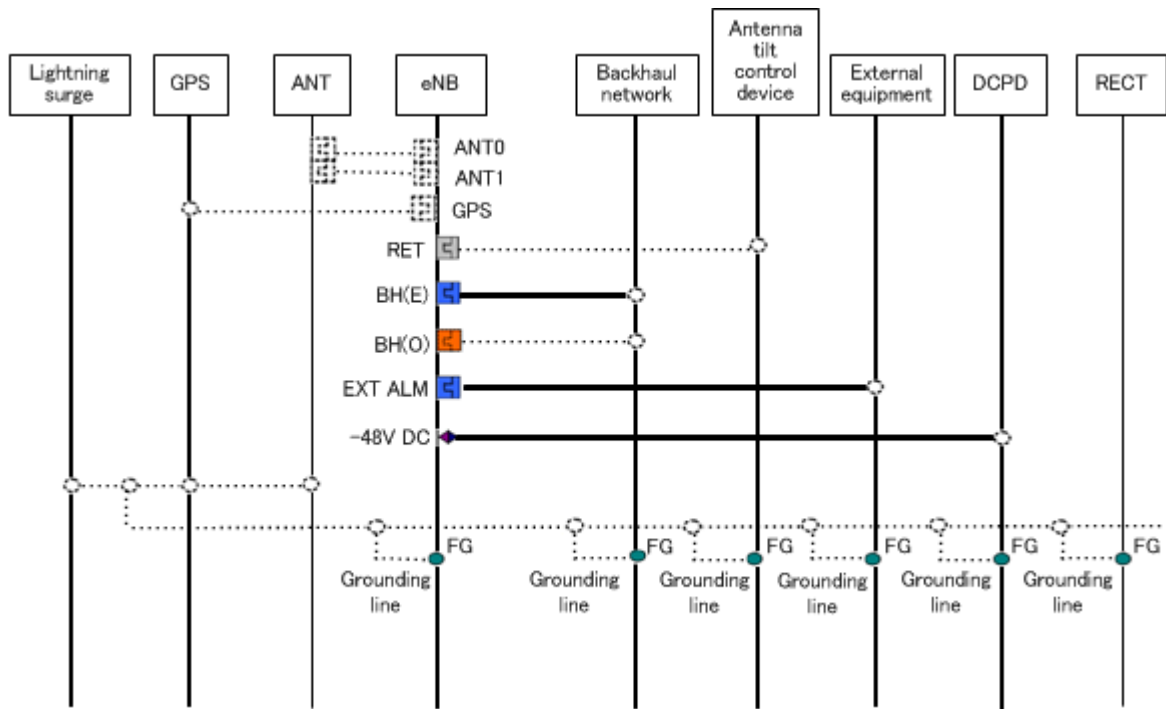


Figure 5 Cable Connection System Diagram



- 1 Install dedicated power supply cable and breaker to the eNB equipment from the power source facility (DCPD). Breaker would work as the equipment's breaker.
- 2 Connector type on the backhaul network side depends on the remote equipment.
- 3 [Figure 5](#) omits ACPDB master, ACPDB, storage battery, UPS equipment, etc.
- 4 Broken line in [Figure 5](#) may change depending on installation contract, scope of work and installation design.

Table 3 Connector List/ Legend

Symbol	Details	Symbol	Detail
.....	Out of preparation range		Round waterproof (P) IEC60130-9
—	Attachment to equipment main body/ installation cables		Round waterproof (J) IEC60130-9
	N type waterproof (P)		Optical 2-core waterproof boots (P)
	N type waterproof (J)		Optical 2-core waterproof boots (J)
	Out of preparation range, or parts different by office condition or design		Square waterproof boots (P)
	RJ-45+waterproof boots (P)		Square waterproof boots (J)
	RJ-45+ waterproof boots (J)		M6 crimping terminal

4.2 External Interface

The following shows the interface locations, names and details on bottom face, top face and maintenance window of All-in-one Type eNB.

4.2.1 Bottom Face External Interface Locations/ Names and Interface Details

1 Bottom Face External Interface Locations and Names

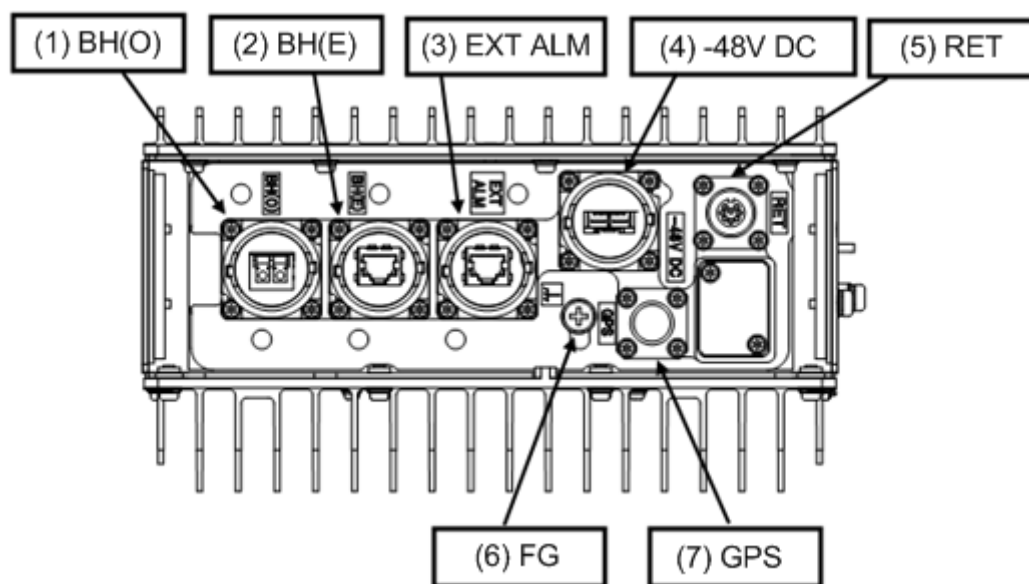


Figure 6 External Interface Locations and Names (Bottom Face)

2 Interface Details

Table 4 External Interface Details (Bottom Face)

No. in Fig	External Interface Label	External Interface Name
(1)	BH (O)	Backhaul interface (Optical)
(2)	BH (E)	Backhaul interface (Electrical)
(3)	EXT ALM	External alarm interface
(4)	-48V DC	Power input interface
(5)	RET	Antenna tilt control interface
(6)	FG	Frame ground
(7)	GPS	L1 GPS interface

4.2.2 Top Face External Interface Locations/ Names and Details

1 Top Face External Interface Locations and Names

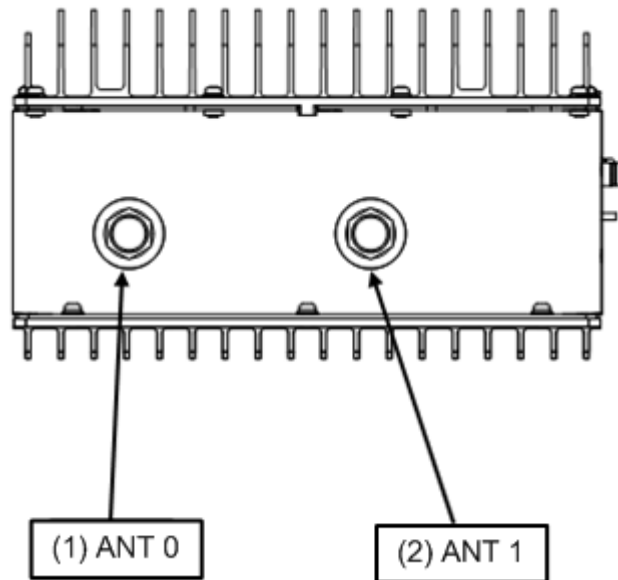


Figure 7 External Interface Locations and Names (Top Face)

2 Interface Details

Table 5 External Interface (Top Face)

No. in Fig	External Interface Label	External Interface Name
(1)	ANT 0	RF antenna interface 0
(2)	ANT 1	RF antenna interface 1

4.2.3 Maintenance Window Interface Locations/ Names and Details

1 Maintenance Window Interface Locations and Names

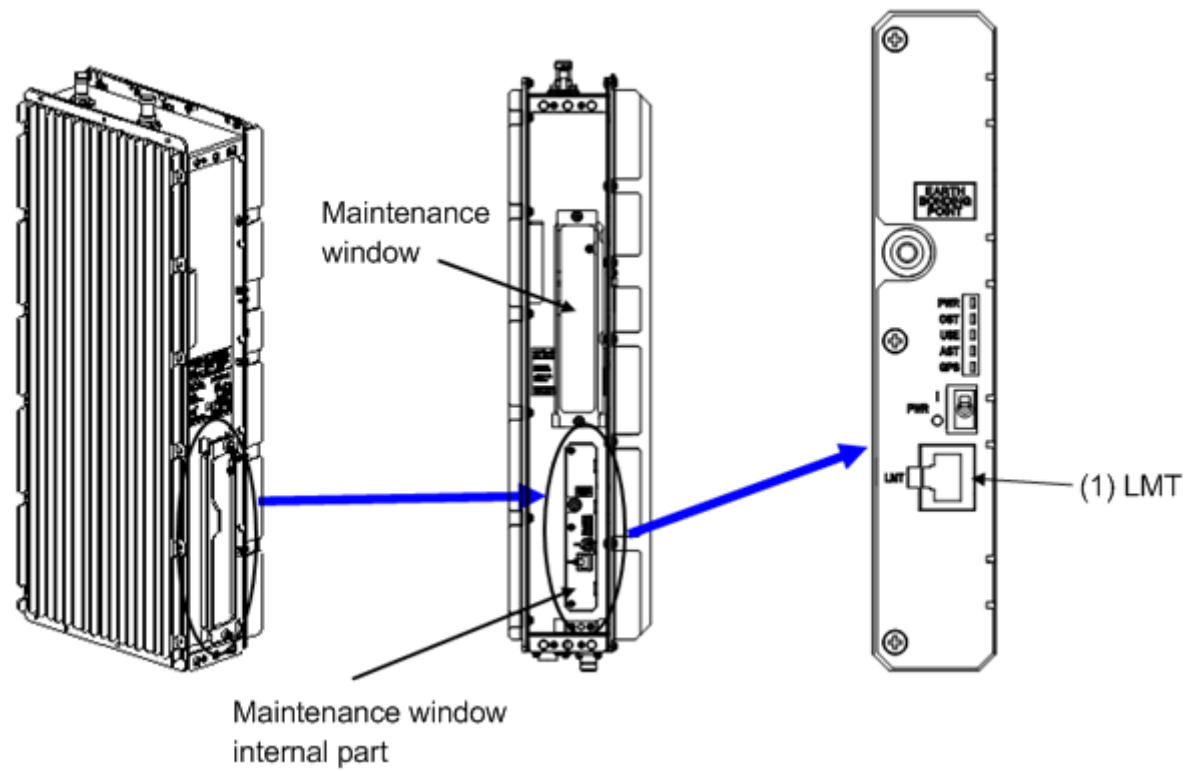


Figure 8 Maintenance Window Image

2 Interface Details

Table 6 Maintenance Window Interface Details

No. in Fig	External Interface Label	External Interface Name
(1)	LMT	LMT interface

5 Equipment Installation

This section shows the installation procedure of All-in-one Type eNB.



- 1 Before installing the equipment, remove all connector caps attached to the equipment side external interface connectors to which external cables are planned to be connected.
Removing the connector caps, etc. in a high place may result in the connector caps dropping.
- 2 If external cables are not connected right after equipment installation, place outdoor weather resistant tapes on the temporary connector caps as waterproof treatment.

5.1 Cautions on Carrying the Equipment

The following shows the cautions on when carrying the All-in-one Type eNB.



- 1 Carrier of All-in-one Type eNB must wear working gloves and shoes.
- 2 When carrying the equipment into the premise, perform required curing on the route.
- 3 Carry the equipment in its package box to prevent damage while carrying.
- 4 When the equipment goes through the inspection door, cure the opening to prevent damage to the building and equipment.

5.1.1 Temporary Placement of Equipment

If temporarily placing All-in-one Type eNB on the floor, place it carefully as shown in [Figure 9](#) to prevent damage to connectors and protrusions.

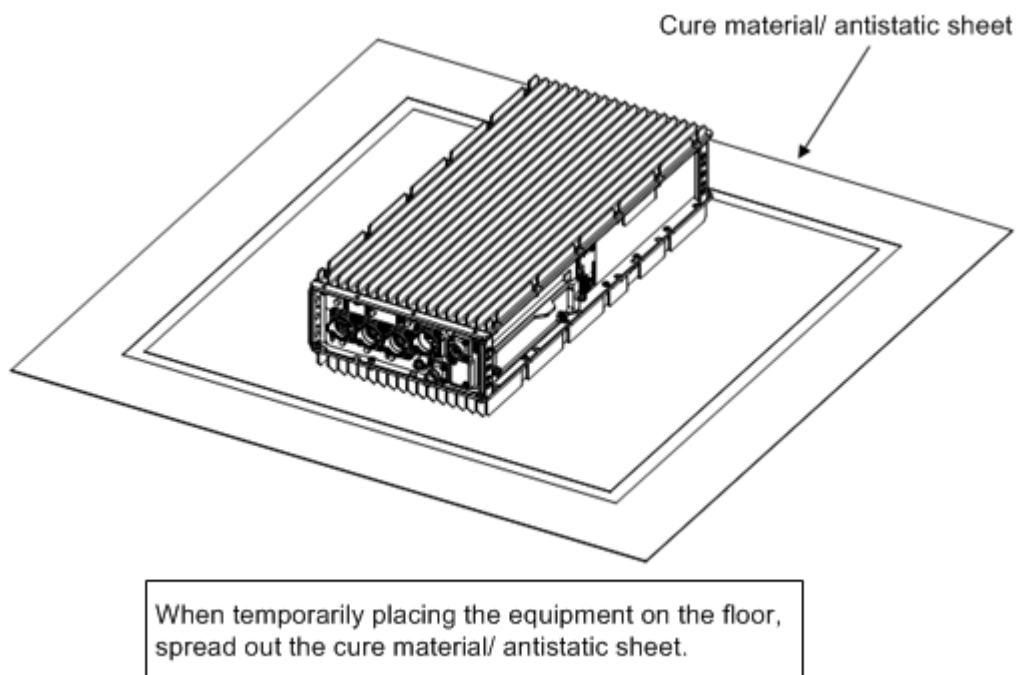


Figure 9 Temporary Placement Image

5.1.2 Carrying the Equipment by the Handles

When carrying All-in-one Type eNB, the flange part (shaded part) on both sides of the main body can be used as handles. Refer to [Figure 10](#).

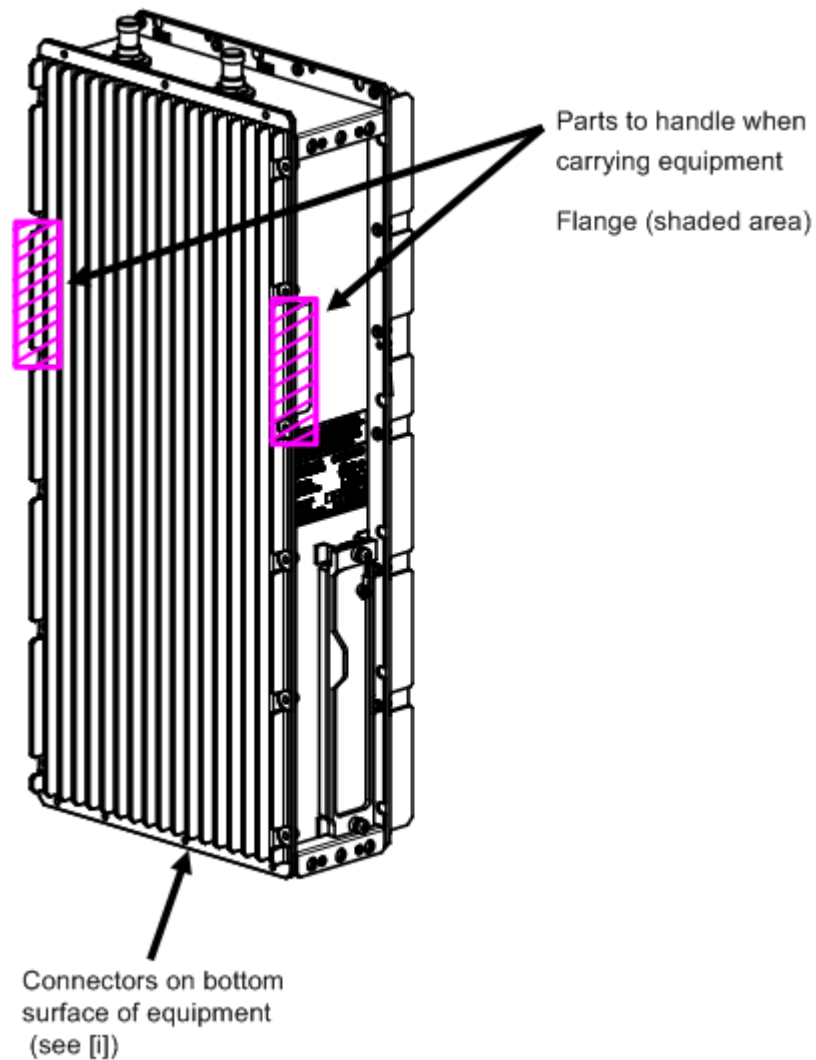


Figure 10 Handling Parts Used for Carrying

- [i]** When handling the equipment, be careful not to damage the connectors on the bottom face of equipment. If you place the equipment vertically on the floor, it may damage the connectors on the bottom face.

5.1.3 Carrying Equipment by Hoisting Up/ Down

When hoisting the equipment up/ down, use eye-bolts and follow the procedure below.

- 1 Insert eye-bolts into the screw holes on the sides of the equipment as shown in [Figure 11](#).

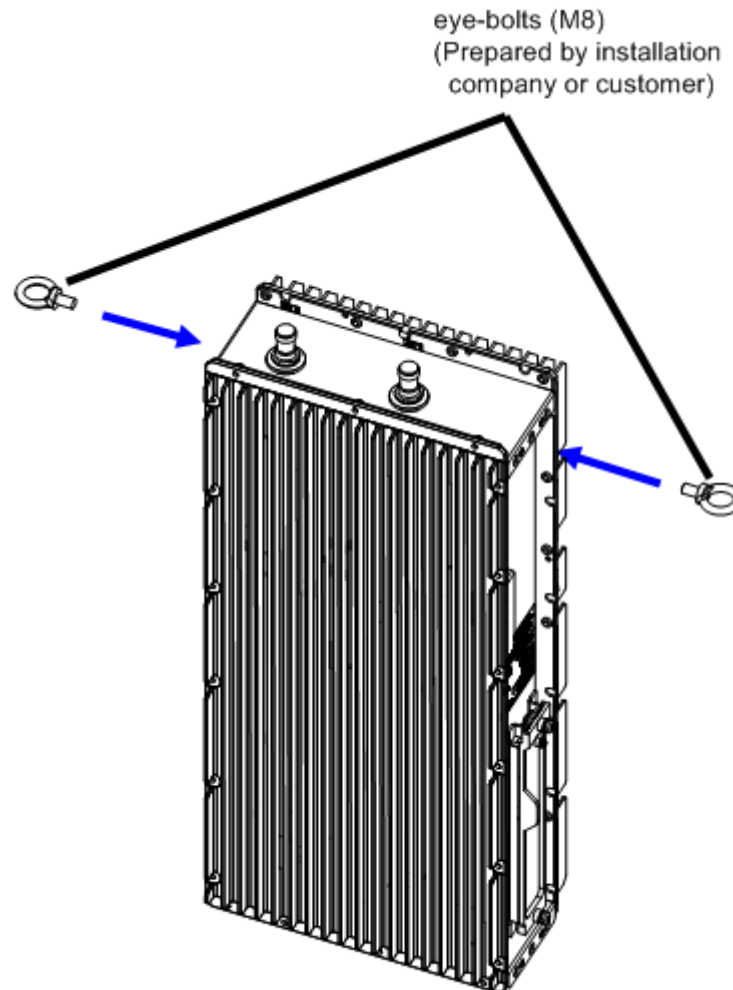


Figure 11 Attaching eye-bolts

- 2 Hoist the equipment using a crane, etc. up to a higher place or down to a lower place by placing ropes in the eye-bolts as shown in [Figure 12](#).
- 3 After carrying the equipment, remove the eye-bolts.

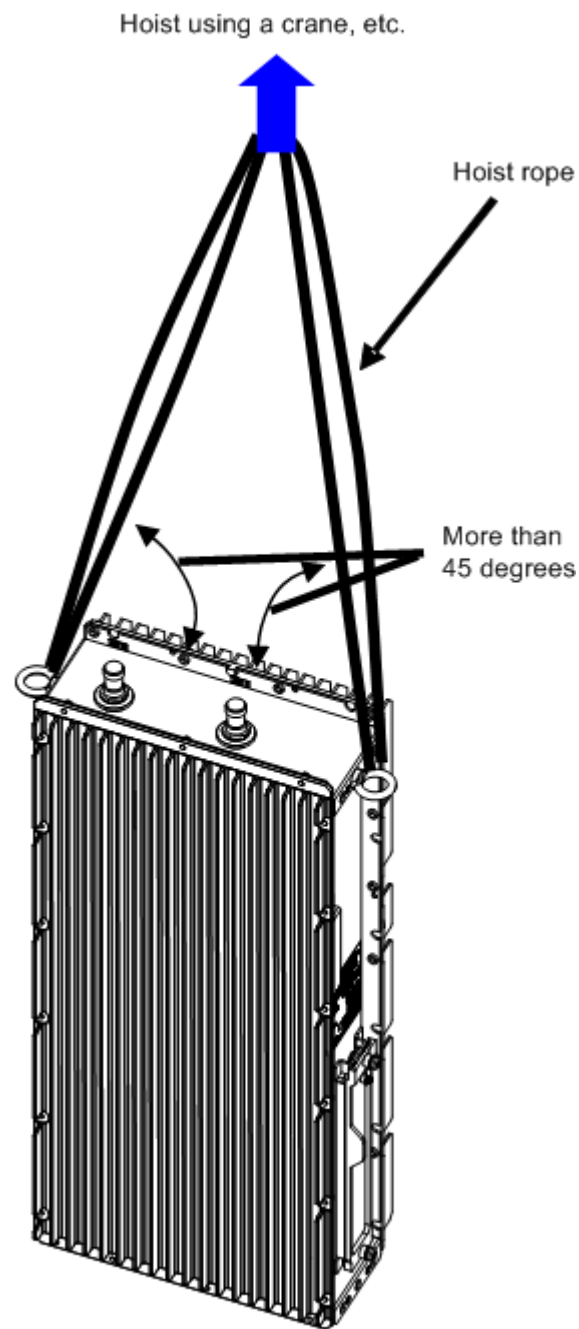


Figure 12 Hoist up/down Image

5.2 Equipment Installation Forms

All-in-one Type eNB has the following installation forms considering the ease of installation.

- Ladder mount/ Wall mount/ Pole mount
Vertical setup
- Cross arm mount/Suspension mount
Horizontal setup

5.2.1 Installation Examples of Ladder/ Wall/ Pole/ Cross arm/ Suspension Mount

The following shows the images of ladder/ wall/ pole/ cross arm/ suspension mount of All-in-one Type eNB.

- 1 Ladder mount/ Wall mount/ Pole mount

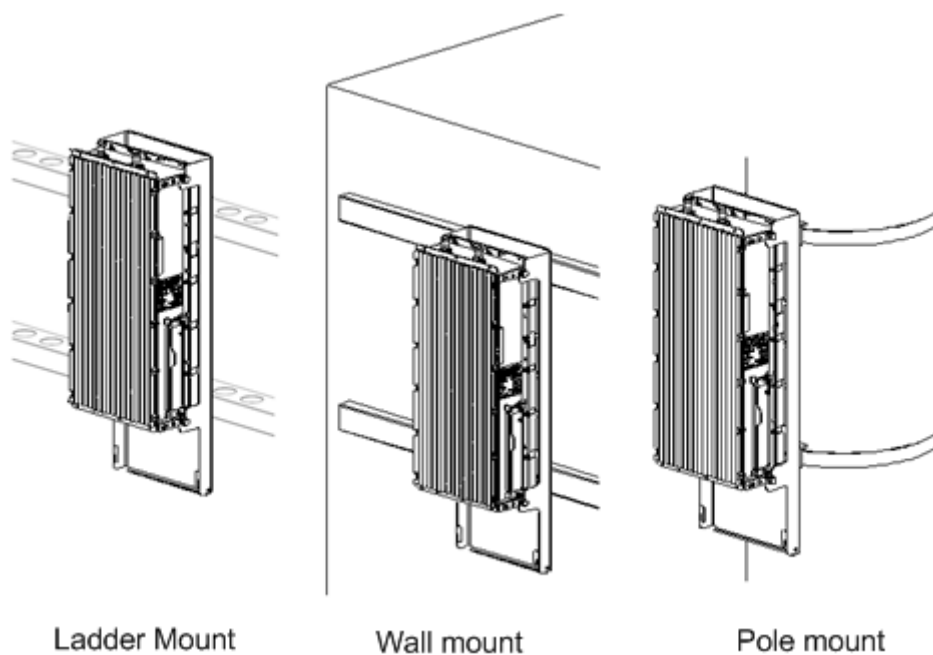


Figure 13 Installation Images Part 1

2 Cross Arm Mount/ Suspension Mount

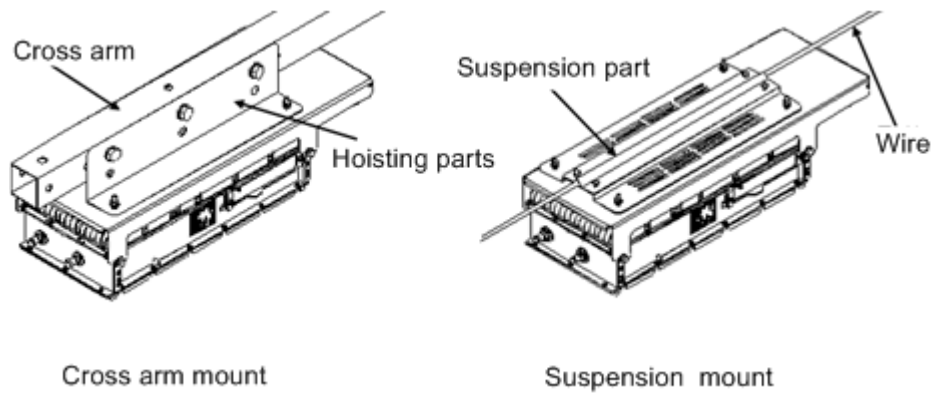


Figure 14 Installation Images Part 2

- i** When setting up the equipment horizontally, set it so that the mounting hardware is on the top face.

5.3 Ladder/ Wall/ Pole/ Cross Arm/ Suspension Installation

5.3.1 Dedicated Mounting Hardware for Installation

All-in-one Type eNB (ladder/ wall/ pole/ cross arm/ suspension mount) is installed using the dedicated mounting hardware which is the standard installation method. For details on the dedicated mounting hardware, refer to the following figure.

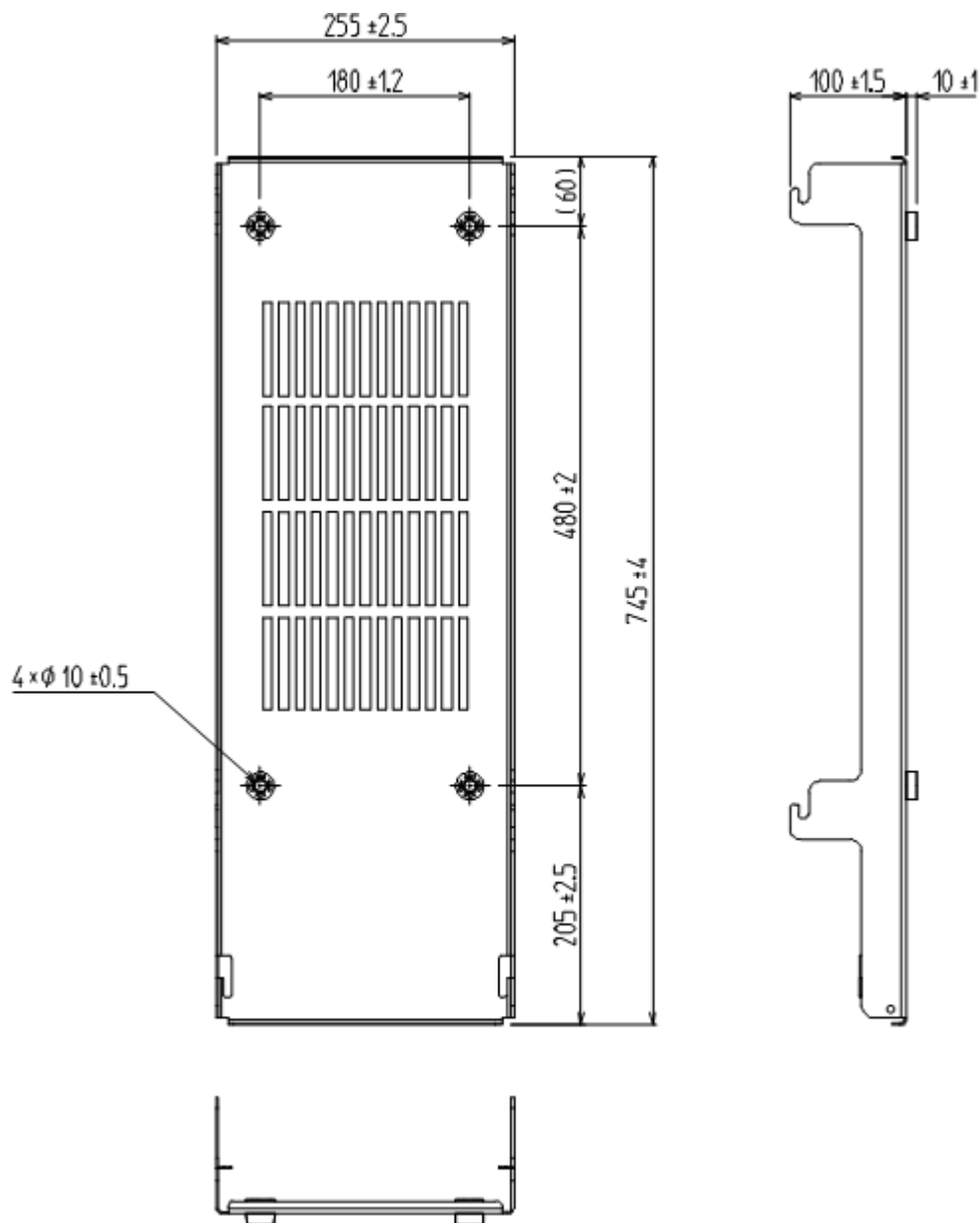


Figure 15 Dedicated Mounting Hardware

5.3.2 Installation Method

The following shows the method to install All-in-one Type eNB (ladder/ wall/ pole/ cross arm/ suspension mount).

The following shows the image to mount the dedicated mounting hardware on the installation surface.

1 Wall/ Ladder Mount

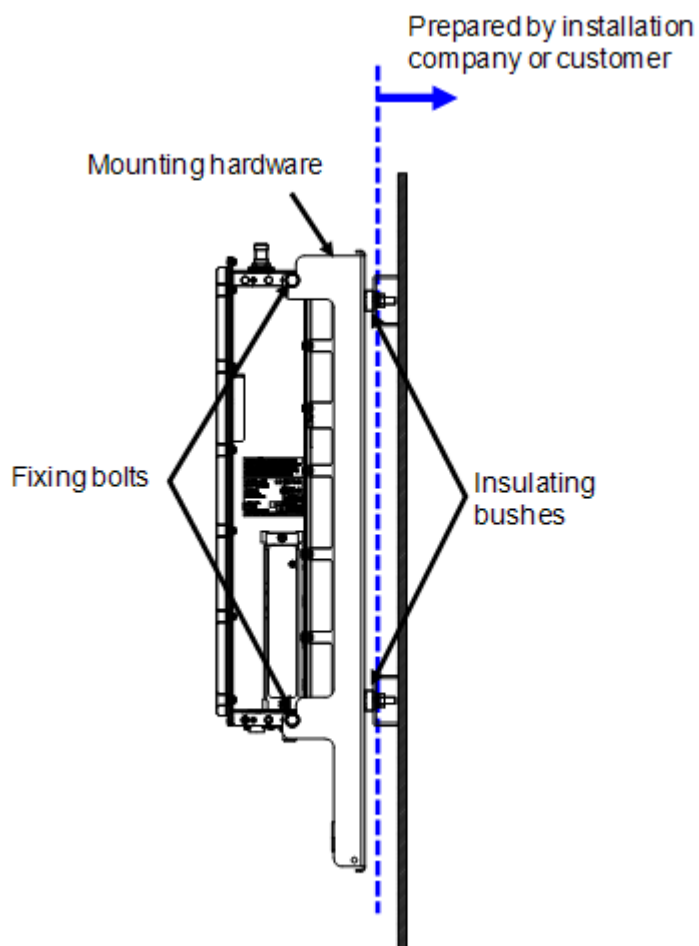


Figure 16 Wall/ Ladder Mount Installation Image

2 Pole Mount

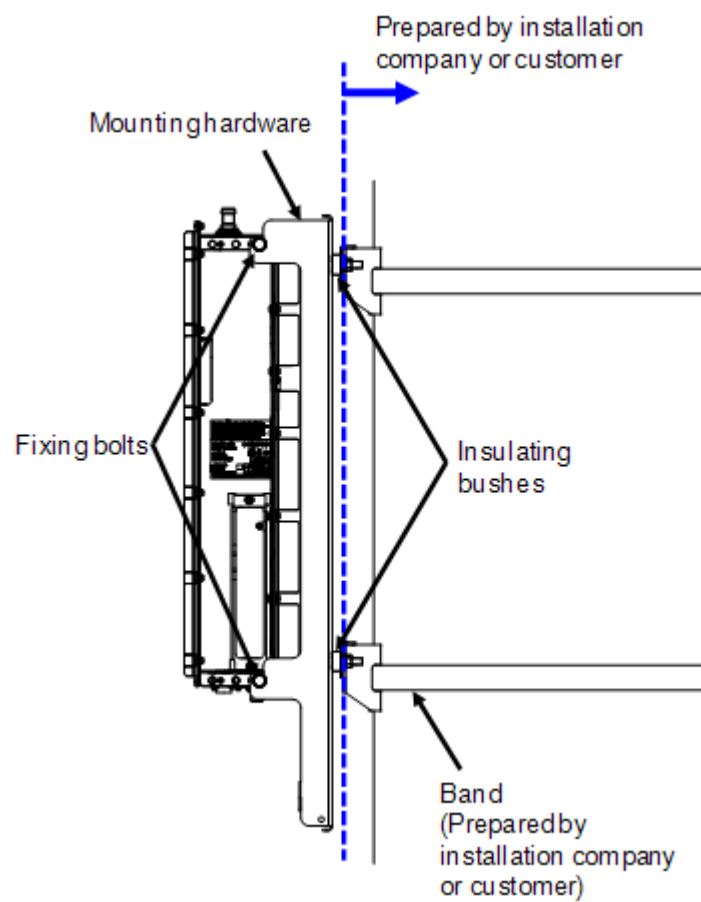


Figure 17 Pole Mount Installation Image

- i** The bands and any ledge to put on the mounting hardware must be prepared by the installation company or the customer.

3 Cross Arm/ Suspension Mount

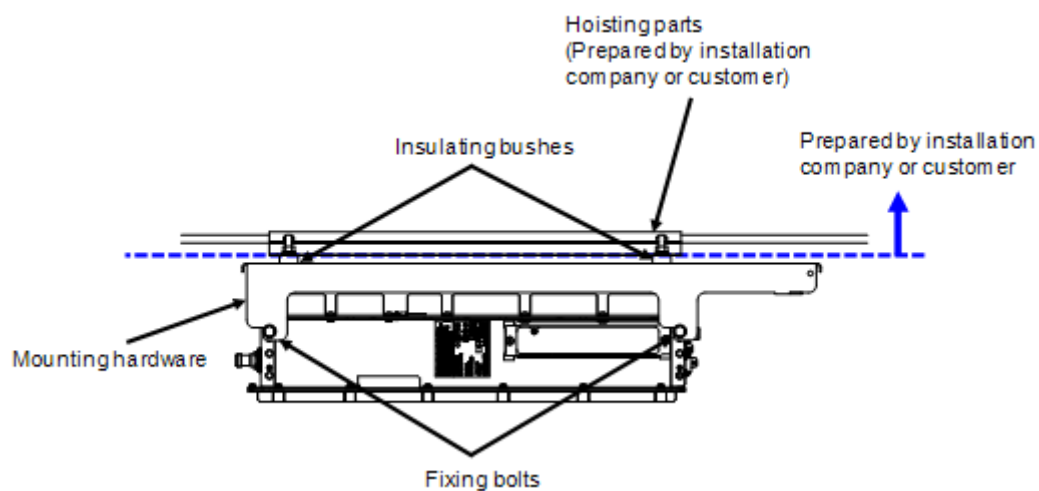


Figure 18 Cross Arm/ Suspension Mount Installation Image

- i** Cross Arms, suspension parts and cross arm fixing bolts on the power source column, etc., suspension part mounting bolts, wires between poles must be prepared by the installation company or the customer.

5.3.3 Installation Procedure

The following shows the procedure to install All-in-one Type eNB (ladder/ wall/ pole/ cross arm/ suspension mount).

Installing the dedicated mounting hardware (ladder/ wall/ pole/ cross arm/ suspension)

i This equipment requires electrical insulation with the installed surface, so when fixing by M8 bolts, insulating bushes are used.

1 Refer to [Figure 19](#), and fix using M8 bolt with the bushes in the correct order.

If there is no male screw, fix with M8 nut, etc.

2 Finally, tighten the bolts again, and mark the bolts. (M8: torque $17 \pm 1 \text{ N}\cdot\text{m}$)

i If there is no hole to install the equipment on the installed surface (ladder/ wall/ pole/ electrical pole/ suspension parts), perform drilling referring to the dedicated mounting hardware installation hole dimensions ([Figure 15](#)).

Be careful not to deform the mounting hardware when fixing the equipment.

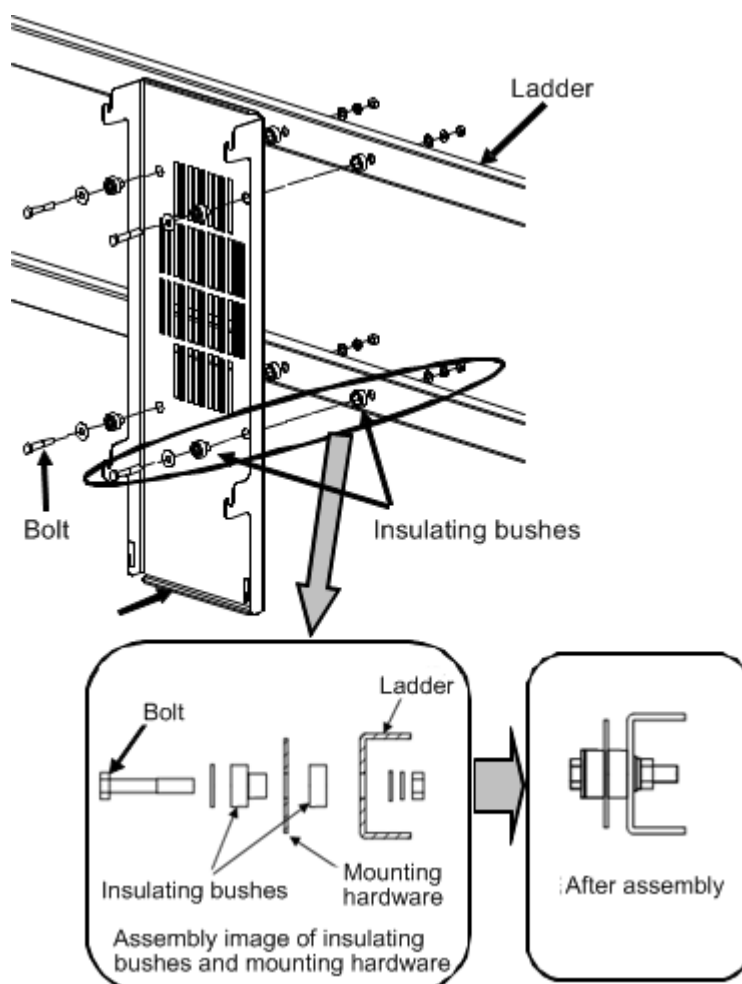


Figure 19 Dedicated Mounting Hardware Installation

Installing the Equipment to Dedicated Mounting Hardware

- 1 Insert the 4 fixing bolts into the screw holes on the top, bottom, left and right side of equipment (the back side hole out of the 3 screw holes in a row) for about the half of their length and temporarily fix them. Refer to [Figure 20](#) for installation of fixing bolts

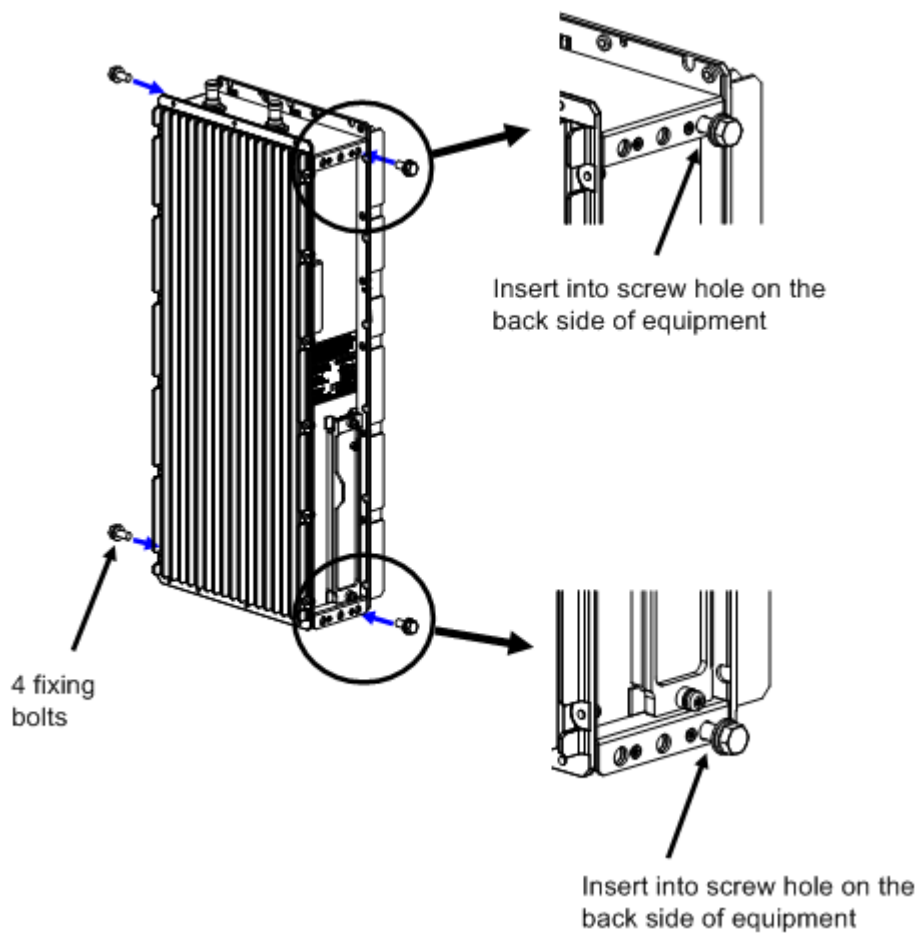


Figure 20 Fixing Bolts Installation

- 2 Hang the equipment by the four M8 bolts (attached to equipment) temporarily fixed in step (1) onto the chases on top/ bottom/ left and right of the dedicated mounting hardware. Refer to [Figure 20](#) for installation onto the mounting hardware.

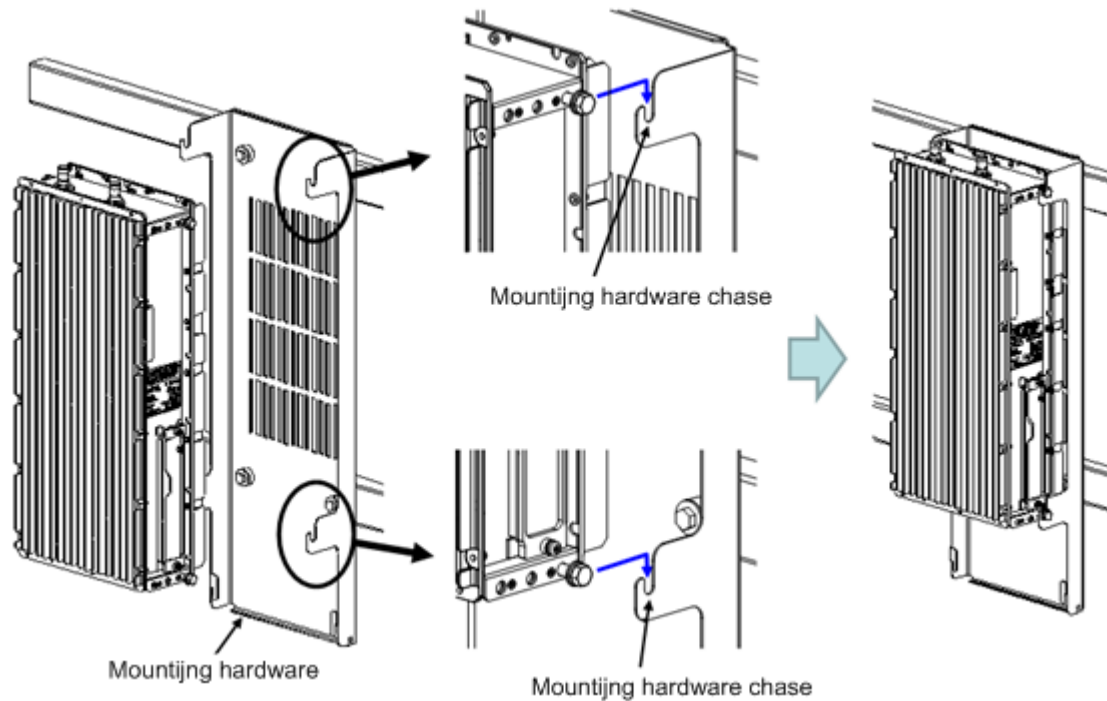


Figure 21 Installing the Equipment onto the Mounting Hardware

- 3** Tighten the four M8 bolts temporarily fixed in step (1). Lastly, tighten the bolts further and mark the bolts, and the installation is complete (torque value M8: $17 \pm 1 \text{ N} \cdot \text{m}$).

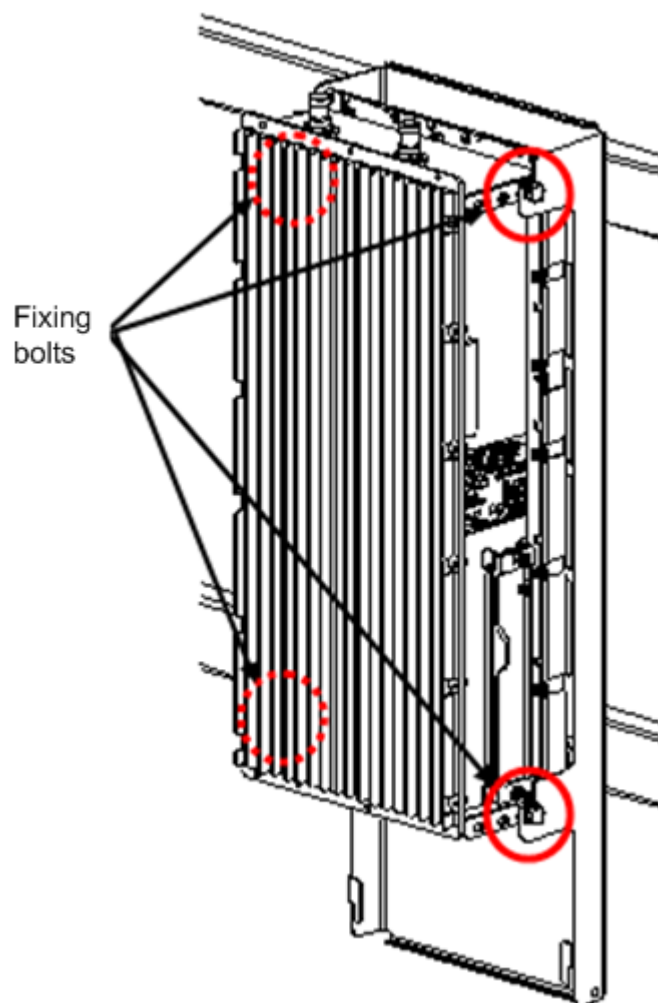


Figure 22 Tightening the Fixing Bolts

5.3.4 C-COVER (Connector Cover) Installation Procedure

i C-COVER is an optional part.

- 1 Check the screw holes (the center of the 3 screw holes) on the left and right sides of eNB equipment.

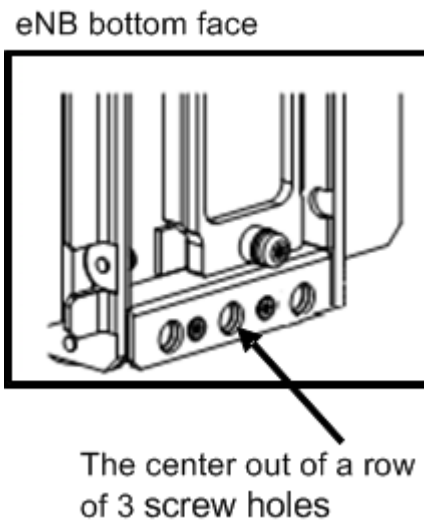


Figure 23 Right Side Fixing Bolt Installation Location (Reference)

- 2 Insert the two fixing bolts into the screw holes on the left and right sides of the equipment bottom part (the center of the 3 screw holes) for half of its length and fix temporarily.

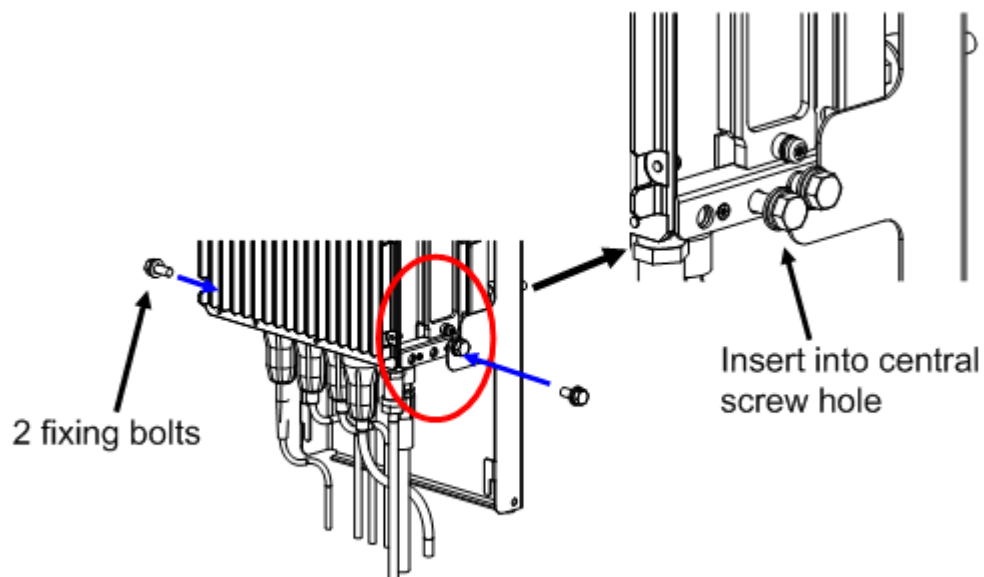


Figure 24 Installing Fixing Bolts

- 3** Set a RAC-NUT into the round hole on the mounting hardware, with the screw side facing inward.

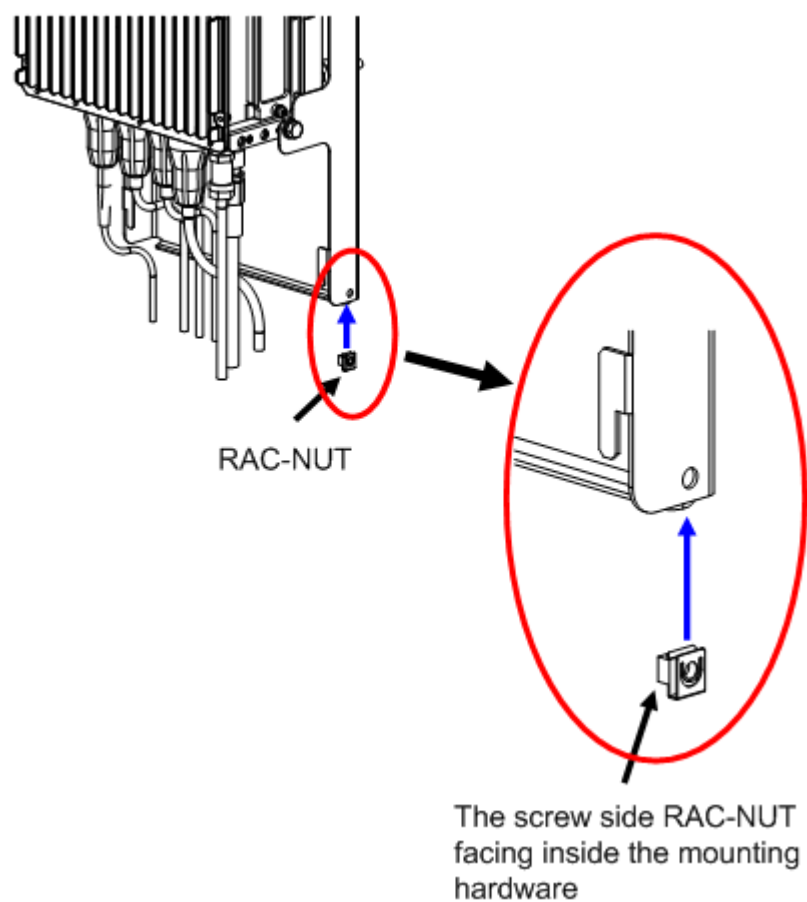


Figure 25 Installing RAC-NUT

- 4 Set the C-COVER chase to the protruding parts on the left and right of dedicated mounting hardware, and pull the C-COVER a little downwards to hang the C-COVER on the mounting hardware.

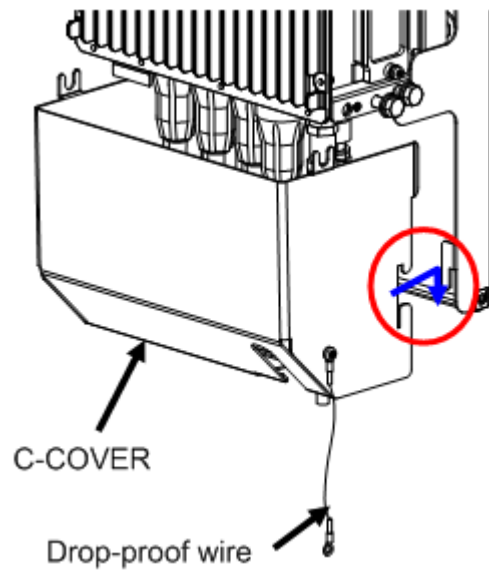


Figure 26 Temporarily Installing the C-COVER

- 5 Fix the drop-proof wire of the C-COVER using a TORX screw (M5) onto the dedicated mounting hardware (torque value M5: $4 \pm 0.5 \text{ N}\cdot\text{m}$).

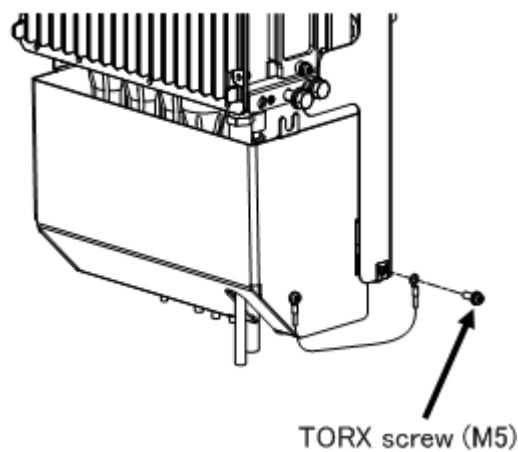


Figure 27 Installing the Drop-Proof Wire

- i** Pulling the drop-proof wire of the C-COVER strongly may cut it off. If the wire is cut, there is a risk of the C-COVER dropping when trying to remove it.

- 6 Lift the C-COVER upwards (in direction indicated by the blue arrow), and insert (red arrow) the C-COVER nails into the gaps of two fixing bolts of the left and right side, which were temporarily fixed in step (2).

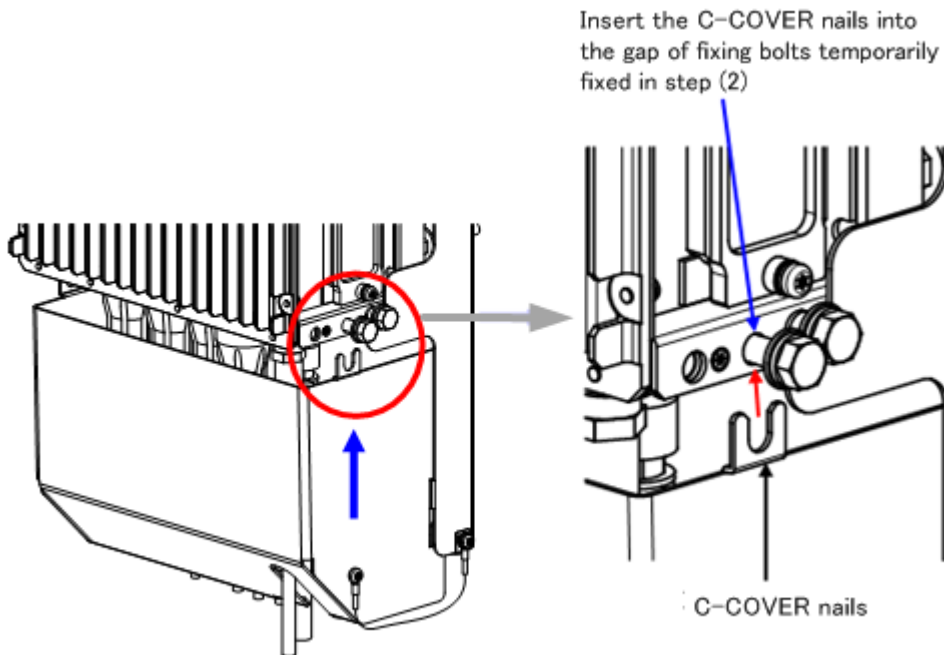


Figure 28 Temporarily Installing the C-COVER

- 7 Tighten the fixing bolts which were temporarily fixed in step (2). Finally, tighten the bolts again and mark the bolts, and the installation procedure is complete (torque value M8: $17 \pm 1 \text{ N}\cdot\text{m}$).

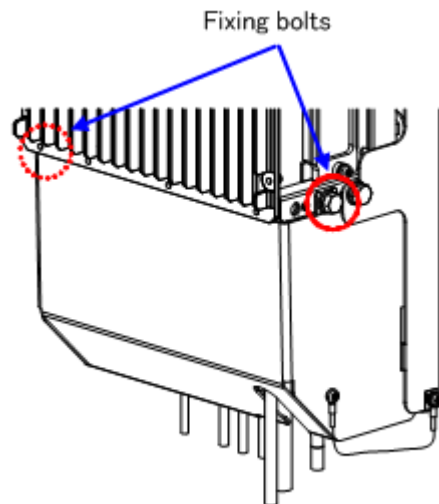


Figure 29 Tightening the Fixing Bolts

5.3.5 F-COVER (Front Cover) Installation Procedure

i F-COVER is an optional part.

- 1 Check the screw holes (front side hole out of the three screw holes) on the top, bottom, left and right to set the fixing bolts.

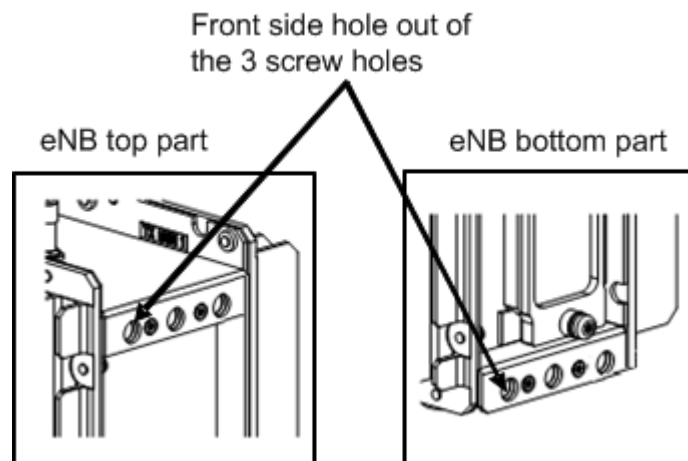


Figure 30 Installation Location of Fixing Bolts on the Right Side Top and Bottom (Reference)

- 2 Insert the four fixing bolts (attached parts) into the screw holes (front side hole out of the three screw holes) on the top, bottom, left and right of equipment for half of their length and fix temporarily.

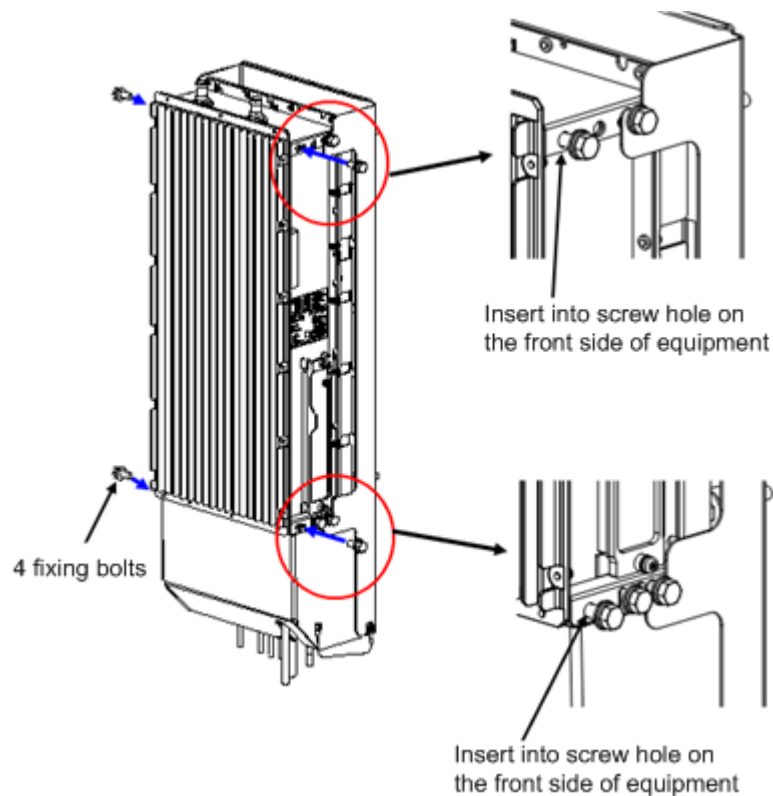


Figure 31 Installing Fixing Bolts

- 3 Insert the F-COVER chase into the gap of fixing bolts temporarily fixed in step (2).

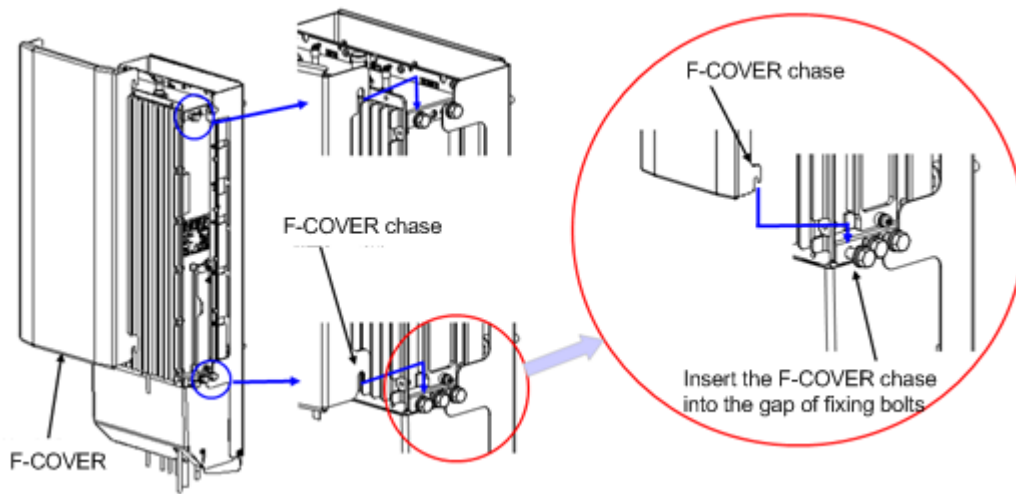


Figure 32 Installing the F-COVER

- 4 Tighten the four fixing bolts on top, bottom, left and right which were temporarily fixed in step (2). Finally, tighten the bolts again and mark the bolts, and the installation procedure is complete (torque value M8: $17 \pm 1 \text{ N}\cdot\text{m}$).

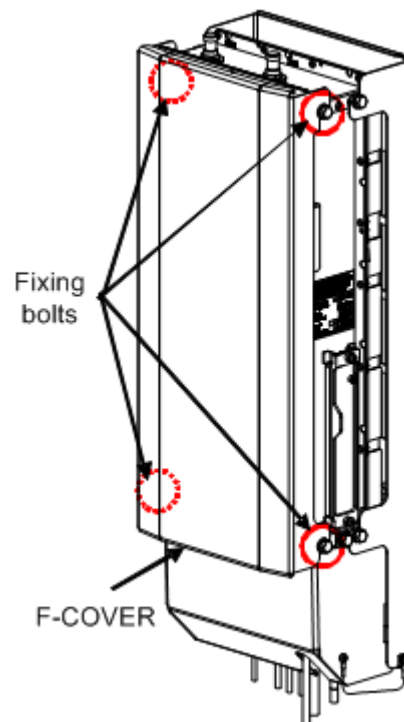


Figure 33 Tightening the Fixing Bolts

5.4 List of Attachments and Tools

The following lists the attachments and tools required for equipment installation.

Table 7 Attachment List

Item Name	Quantity	Note
For FG (M6 + pan head screw)	1	Mount on equipment
Connector caps	1 set	Mount on equipment
Dedicated mounting hardware	1 set	Including installation parts
F-COVER	1 set	Optional, including installation parts
C-COVER	1 set	Optional, including installation parts

Table 8 Tool List

Item Name	Used for	Note
M6 + Standard driver	FG	
TORX T25 size screw driver	C-COVER drop-proof wire fixing screw and maintenance window	With tamper-resistant pin
Hexagonal spanner (For M8)	Dedicated mounting hardware, C-COVER and F-COVER	

6 Cable Work

6.1 List of Used Cables and Connectors

[Table 9](#) shows the cables and connectors used for this equipment.

Table 9 Used Cables and Connectors

External Interface/ Name	Connectors on Equipment		Connectors on Cable	
	Connector type	1st line: Vender name 2nd line: Vender model name	Connector type	1st line: Vender name 2nd line: Vender model name
Power source input interface -48V DC	Square bipolar	TE FOAC FullAXS BULKHEAD HOUSING + square bipolar	FullAXS	TE FullAXS POWER FLOATING or FullAXS POWER FIXED
GPS interface / GPS	N type waterproof (J)	DDK N-SR-J-1.5D	N type waterproof	General-purpose connector. No vender/ model name specified.
External alarm interface / EXT ALM	RJ-45	TE FOAC FullAXS BULKHEAD HOUSING + RJ45	RJ-45	TE FullAXS SIGNAL FLOATING
Optical BH interface / BH(O)	LC 2-core (MMF core radius 50 μm)	TE FOAC FullAXS BULKHEAD HOUSING + LC 2-core	LC 2-core	TE FOMM50 LEAD4.8mm FullAXS LC/DPX- LC/DPX
	LC 2-core (MMF core radius 62.5 μm)	TE FOAC FullAXS BULKHEAD HOUSING + LC 2-core	LC 2-core	TE FOMM62.5 LEAD4.8mm FullAXS LC/DPX- LC/DPX (Model name not fixed: in discussion with TE)
	LC 2-core (SMF)	TE FOAC FullAXS BULKHEAD HOUSING + LC 2-core	LC 2-core	TE FOSM LEAD4.8mm FullAXS LC/DPX- LC/DPX
Metal BH interface / BH(E)	RJ-45	TE FOAC FullAXS BULKHEAD HOUSING + RJ45	RJ-45	TE FullAXS SIGNAL FLOATING
Antenna tilt control input interface / RET	Round waterproof (J) IEC60130-9	Amphenol AISG-RECE-CONNE- SOCKET-TYPE01	Round waterproof (P) IEC60130-9	AISG general-purpose

Table 9 Used Cables and Connectors

External Interface/ Name	Connectors on Equipment		Connectors on Cable	
	Connector type	1st line: Vender name 2nd line: Vender model name	Connector type	1st line: Vender name 2nd line: Vender model name
RF antenna interface / ANT0, ANT1	N type waterproof (J)	N(F)4H BULKHEEAD 18.0-7.0	N type waterproof (P)	General-purpose connector. No vender/ model name specified.

6.2 Power Cable Connection (-48V DC)

[Figure 34](#) shows the position of the connector used to connect the power cable.

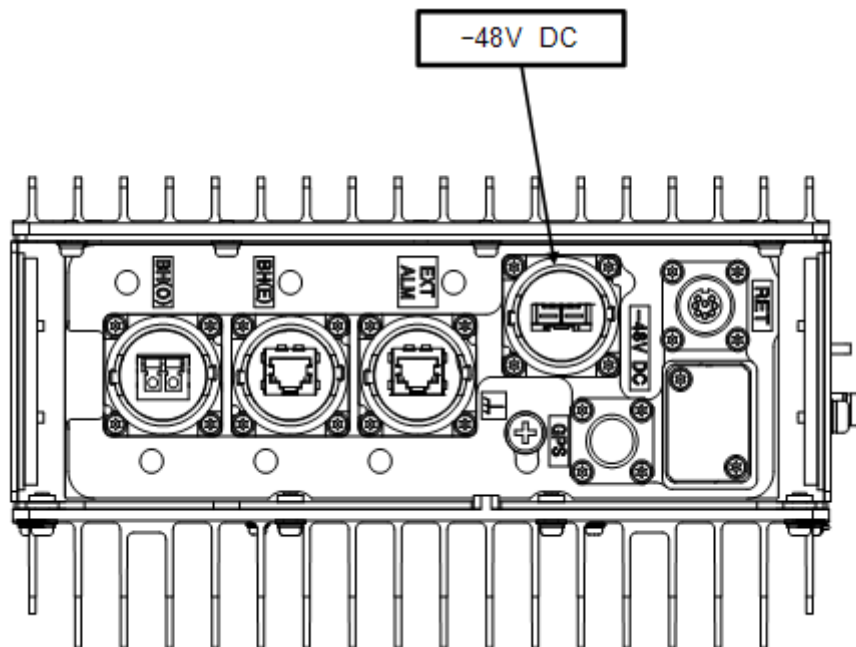


Figure 34 Bottom Face Cable Connection Position (Power Connector)

6.2.1 Power Cable Connection Composition

The following shows the connection composition of the power cable. There are two types of power cable: the Floating type and the Fixed type.

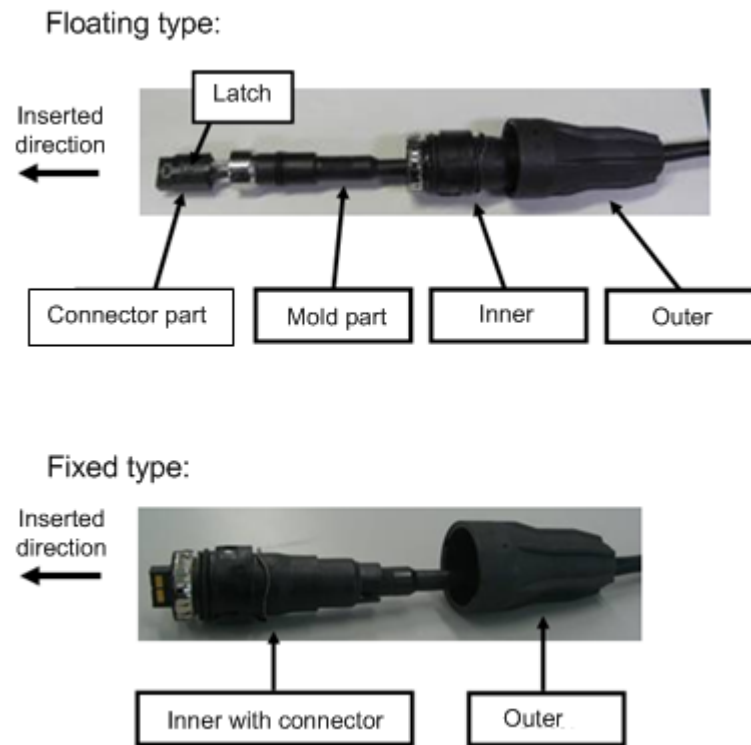


Figure 35 Power Connection Cable Composition

6.2.2 Power Cable Connection Procedure

The following shows the procedure to connect the power cable.



- 1 Check that the corresponding breaker is OFF when mating the power connector.
- 2 Move the Inner and Outer straight to the insertion direction. Inserting them at an angle or twisting them may damage the connector.
- 3 Perform the connection while holding the cables close to the equipment, so that the connectors do not drop out by the cable weight, etc.
- 4 The Outer, Inner and the connectors are made out of plastic. Stepping on them or banging them may damage them, so handle them with care.
- 5 Even if the Outer is fixed, twisting the cable may place load to the internal connector and damage it. When laying cables, be careful not to twist them.



- 6 After mating, discard the waterproof cap attached to the cable. The wind, etc. may break the cord, and the cap may drop.
- 7 When disconnecting the power cable, turn the power off from the power source.
- 8 When laying cables, always keep the bend radius to 66 mm or more.

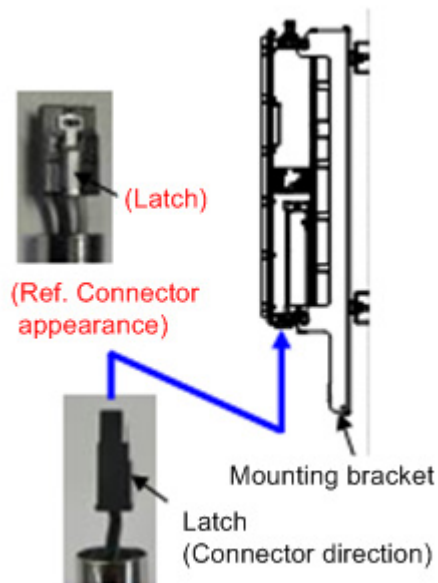
6.2.2.1 Floating Type Cable Connection Procedure

The following shows the procedure to connect the Floating type cable.

- 1 Insert the connector part of the power cable to the equipment side connector.



- (1) Connect the connector latch of the power cable towards the mounting hardware side of eNB equipment.



- (2) Push in the connector of the power cable in until the latch mates.



- i** Pushing in by force holding the mold part may damage the connector part. Make sure to hold the connector part when connecting.



- 2** Insert the power cable Inner straight into the connector on the equipment.



- i** When inserting the power cable Inner, there would be friction between the inner cable and the Inner, so hold the cable with your hand while inserting.

After inserting the power cable Inner, pull the cable while still holding the cable with your hand, to closely fit the mold part and the Inner.



- 3** Rotate the power cable Outer clockwise to fix it in place.

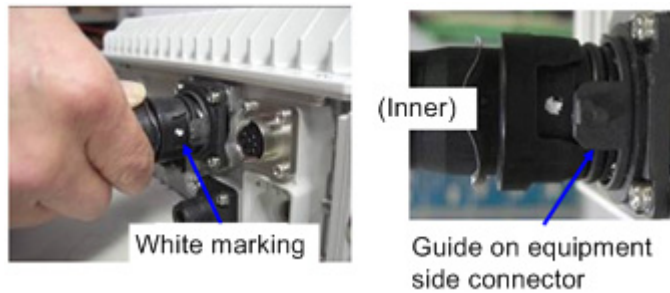


6.2.2.2 Fixed Type Cable Connection Procedure

The following shows the procedure to connect the Fixed type cable.

i Inserting the power cable by force at a wrong connector position or with the connector facing upside down may damage the connector and the printed circuit board inside the equipment. Do not insert the cable by force, and check the direction of the power cable connector again.

- 1 Positioning with the white marking, insert the power cable into the equipment connector until the Inner is beside the guide on the equipment side connector.



- 2 Pushing the power cable Outer, rotate it clockwise to fix it.



6.3 Backhaul Cable Connection

6.3.1 Metal Type Backhaul Cable Connection (BH(E))

[Figure 36](#) shows the location of the connector to connect the backhaul (Electrical) cable.

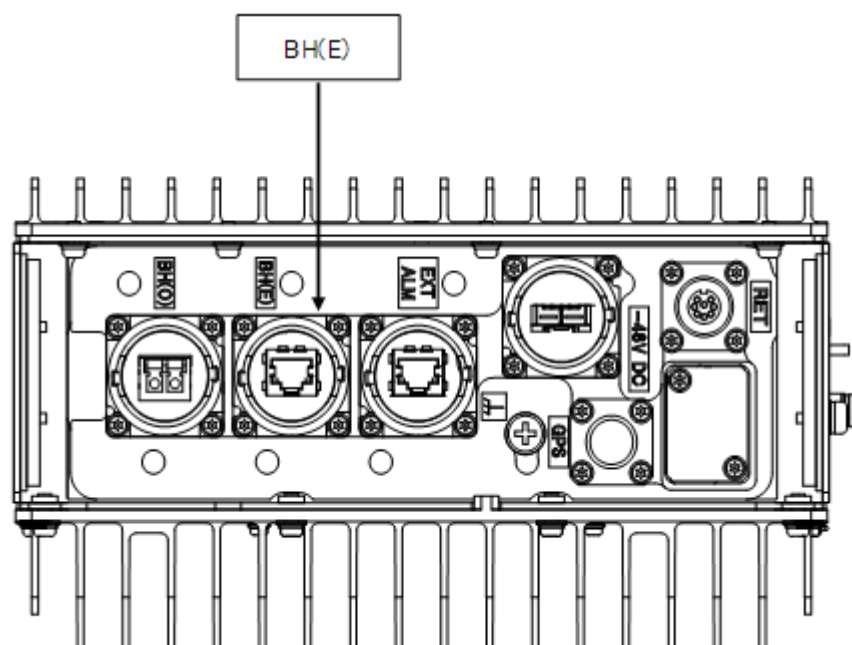


Figure 36 eNB Bottom Face Cable Connection Position (Backhaul interface (Electrical))

The following shows the composition of the backhaul connection cable (Electrical).

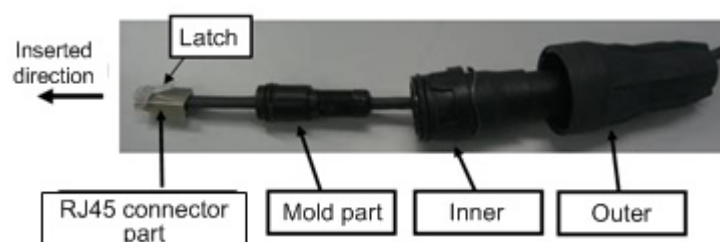


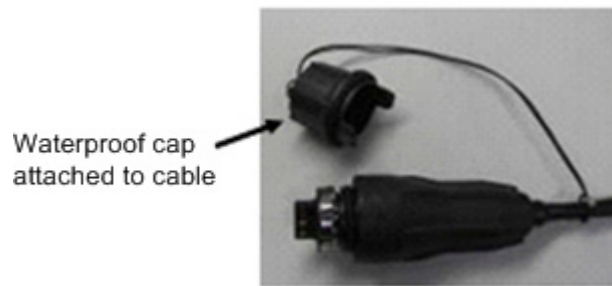
Figure 37 Backhaul Connection Cable (Electrical) Composition

6.3.1.1 Backhaul Cable Connection Procedure (Electrical)

The following shows the procedure to connect the backhaul cable (Electrical).



- 1 Move the Inner and Outer straight to the insertion direction. Inserting them at an angle or twisting them may damage the connector.
- 2 Perform the connection while holding the cables close to the equipment, so that the connectors do not drop out by the cable weight, etc.
- 3 The Outer, Inner and the connectors are made out of plastic. Stepping on them or banging them may damage them, so handle them with care.
- 4 Even if the Outer is fixed, twisting the cable may place load to the internal connector and damage it. When laying cables, be careful not to twist them.
- 5 After mating, discard the waterproof cap attached to the cable. The wind, etc. may break the cord, and the cap may drop.



- 6 When laying cables, always keep the bend radius to 22 mm or more.

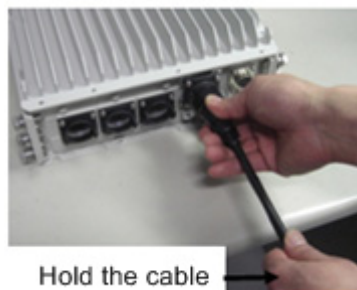
- 1 Insert the RJ45 connector part to the equipment connector, until the latch mates.



- 2** Insert the Inner straight into the equipment connector.



- i** When inserting the Inner, there would be friction between the inner cable and the Inner, so hold the cable with your hand while inserting.



- 3** Rotate the Outer clockwise to fix it in place.



6.3.2 Optical Type Backhaul Cable Connection (BH(O))

[Figure 38](#) shows the position of the connector to connect the backhaul (Optical) cable.

- I** For notes on handling the optical cable, refer to section [6.3.3](#).

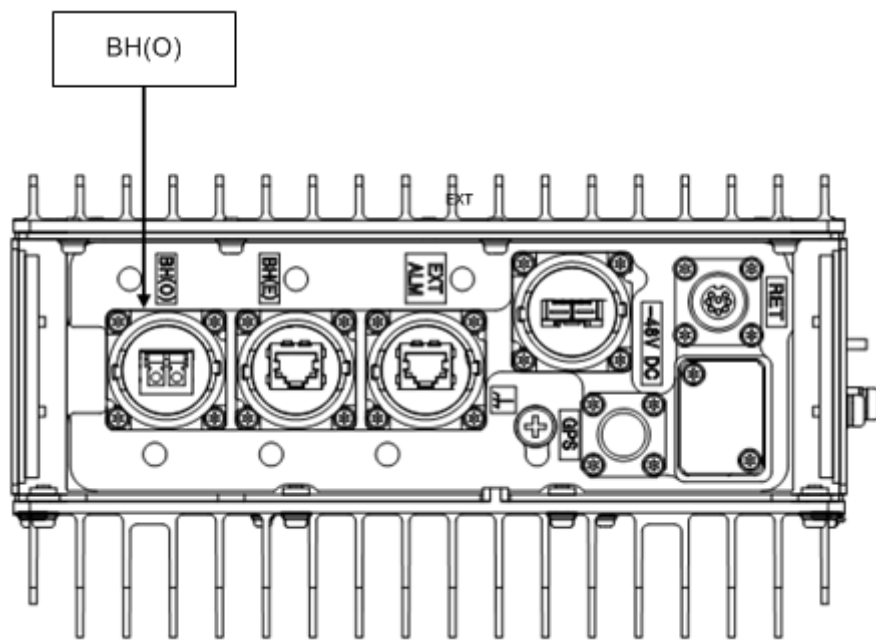


Figure 38 eNB Bottom Face Cable Connection Position (Backhaul Interface (Optical))

The following shows the backhaul connection cable (Optical) composition.

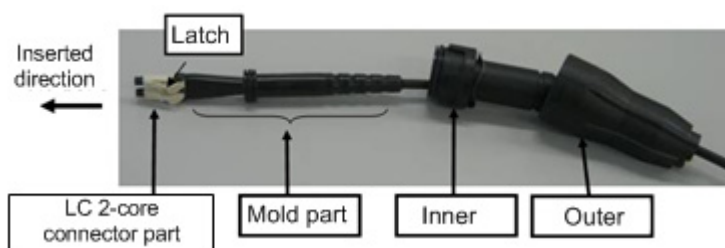


Figure 39 Backhaul Connection Cable (Optical) Composition

6.3.2.1 Backhaul Cable Connection Procedure (Optical)

The following shows the procedure to connect the backhaul cable (Optical).



- 1 When connecting cable to BH(O), remove the waterproof cap on BH(O) and put it on BH(E).
- 2 Move the Inner and Outer straight to the insertion direction. Inserting them at an angle or twisting them may damage the connector.
- 3 Perform the connection while holding the cables close to the equipment, so that the connectors do not drop out by the cable weight, etc.
- 4 The Outer, Inner and the connectors are made out of plastic. Stepping on them or banging them may damage them, so handle them with care.
- 5 Even if the Outer is fixed, twisting the cable may place load to the internal connector and damage it. When laying cables, be careful not to twist them.
- 6 After mating, discard the waterproof cap attached to the cable. The wind, etc. may break the cord, and the cap may drop.



- 7 When laying cables, always keep the bend radius to 30 mm or more.

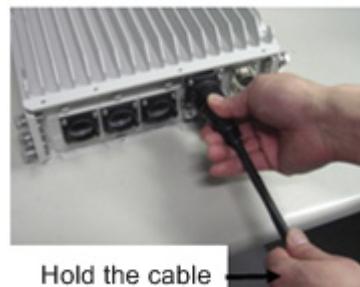
- 1 Insert the LC 2-core connector part into the equipment SFP, until the latch mates.



- 2 Insert the Inner straight into the equipment SFP.



- i** When inserting the Inner, there would be friction between the inner cable and the Inner, so hold the cable with your hand while inserting.



- 3 Rotate the Outer clockwise to fix it in place.



6.3.3 Notes on Handling Optical Cables

The following shows the notes on handling the optical cables.



- 1 When applying surplus treatment to the optical cable connecting the BH(O) connector of this equipment and the termination box, keep the outdoor armored cable bend radius to 120 mm (240 mm in diameter) or more.
- 2 When applying surplus treatment inside the termination box, keep the cable bend radius to 30 mm (60 mm in diameter) or more for the parts without outdoor armored cable.
- 3 Applying too much force on the optical cable may damage it. Connect the optical cable so that it is not twisted.
- 4 When fixing the optical cable, tie the optical cable so that it is not twisted.

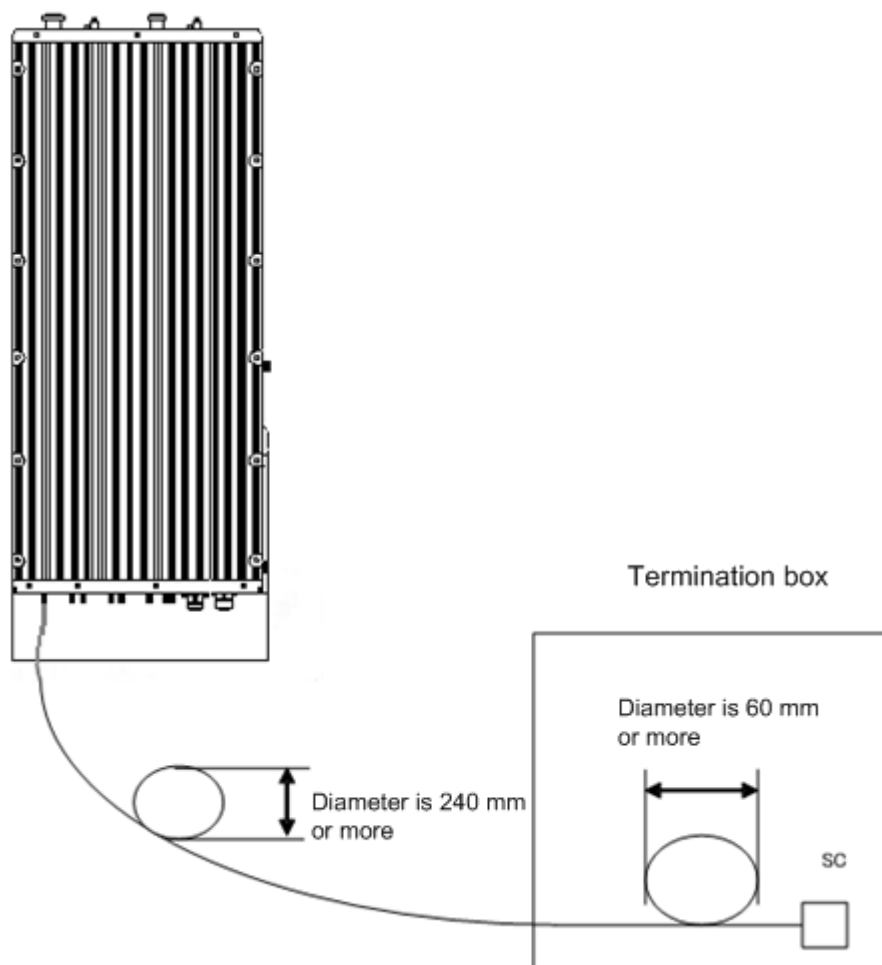


Figure 40 Surplus Treatment of Optical Cable

- Cleaning Equipment SFP and Optical Cable LC Connector
Use the cleaning utensil (stick type) (for $\phi 1.25$) to wash the ferrule (pin-shaped) end-face and side-face of the contact terminal on the SFP and optical cable LC connector mating part. (Alcohol cannot be used together)
- Do not reuse the cleaning utensil already used once. Invisible dust is attached on the used utensil so reusing it may damage or contaminate the optical cable.

6.4 GPS Cable Connection (GPS)

[Figure 41](#) shows the position of the connector to connect the GPS cable.

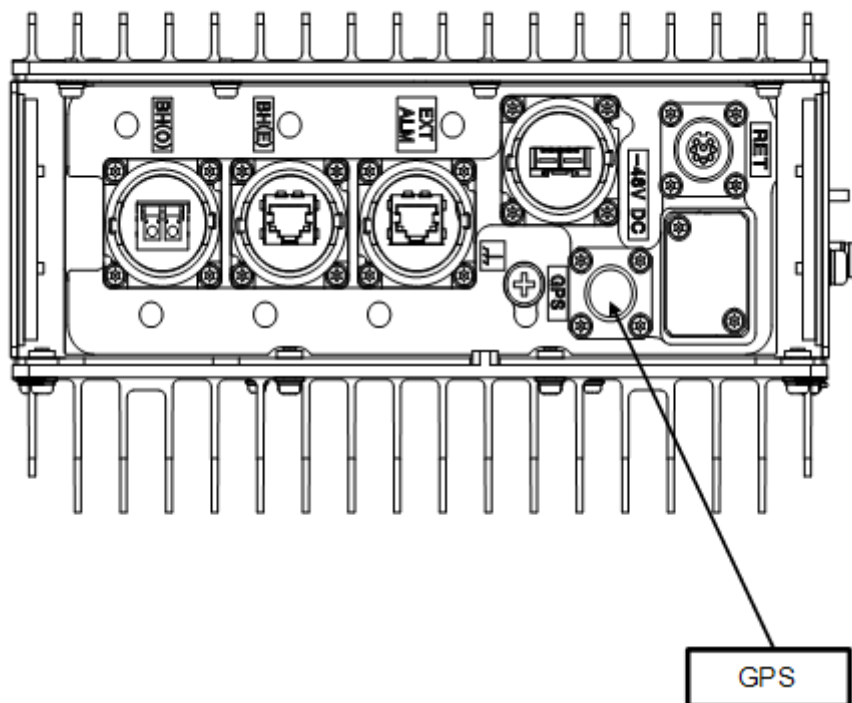


Figure 41 Bottom Face Cable Connection Position (GPS connector)

6.4.1 GPS Cable Connection Procedure

The following shows the procedure to connect the GPS cable.

- 1 Insert the GPS connector into the GPS connector on the eNB equipment.
- 2 After holding the ring on the GPS cable against the GPS connector on the eNB equipment, tighten until the male screw ridges of the GPS connector on the eNB equipment are invisible.

Recommended tightening torque is 0.7 N•m to 1.1 N•m.

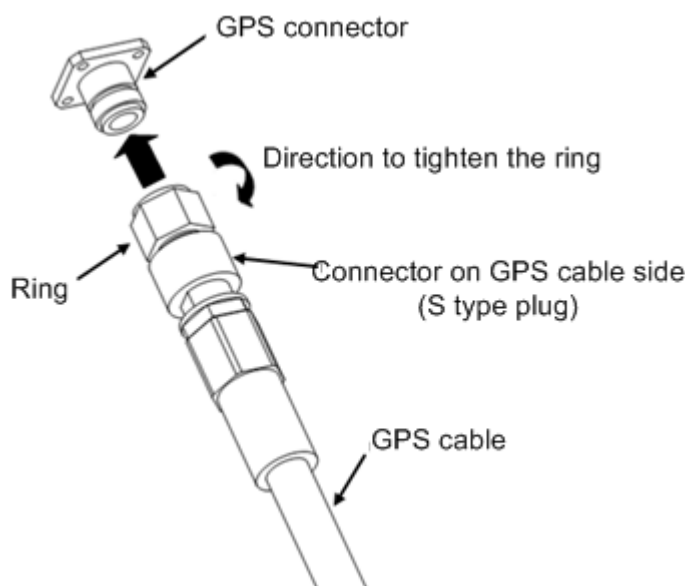


Figure 42 GPS Cable Connection

- 3 To prevent the mating part loosening, it is recommended to protect the connector on the eNB equipment up to the cable (so that the cable side connector is completely covered) with outdoor weather-proof tape.

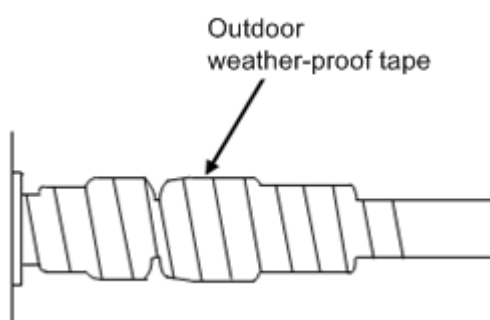


Figure 43 GPS Cable Connector Protection Example

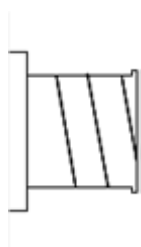


Figure 44 GPS Cable (with Waterproof Cap)

6.5 External Alarm Interface Cable Connection (EXT ALM)

[Figure 45](#) shows the position of the connector to connect the external alarm interface cable.

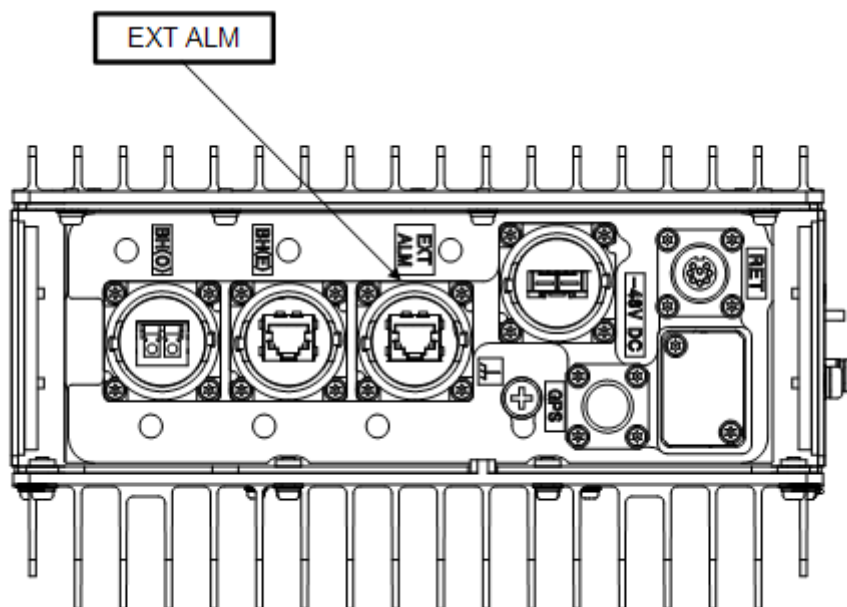


Figure 45 Bottom Face Cable Connection Position (External Alarm Interface (EXT ALM))

The following shows the external alarm interface connection cable composition.

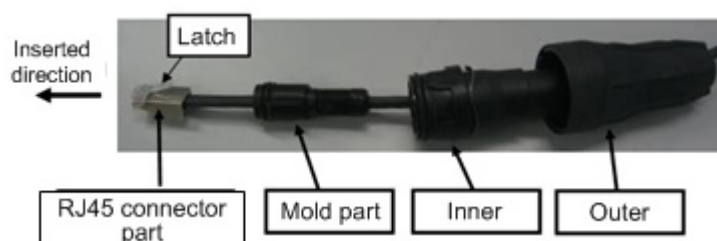


Figure 46 External Alarm Interface Connection Cable Composition

6.5.1 External Alarm Interface Cable Connection Procedure (EXT ALM)

The connection procedure of the external alarm interface cable is the same as that of the metal type backhaul cable, so refer to section [6.3.1](#).

6.6 FG Cable Connection (FG)

[Figure 47](#) shows the position of the Frame Ground (FG) connector screw to connect the FG cable.

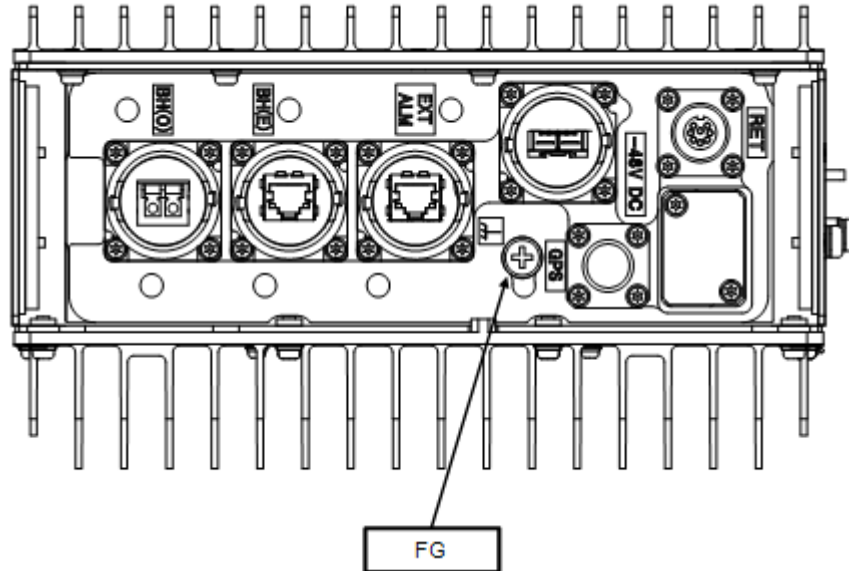


Figure 47 Bottom Face Cable Connection Position (FG)

6.6.1 FG Cable Connection Procedure

The following shows the procedure to connect the FG line.

- 1 Use the M6 + pan head screw installed on the FG terminal to connect the FG cable to the equipment.

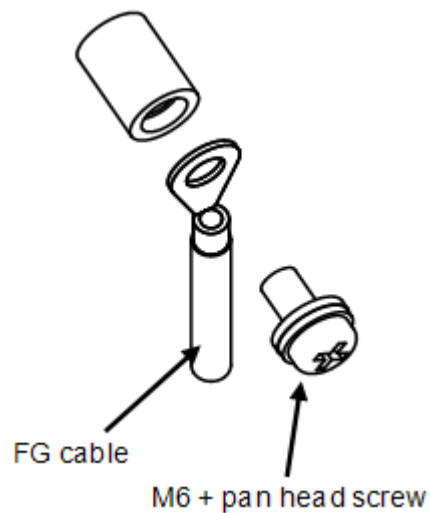


Figure 48 FG Terminal Connection Part



- 1 The recommended tightening torque is 4 N•m.
 - 2 When connecting the FG cable, connect it so that it would take the shortest way to the ground point in the office.
- 2** To prevent loosening, it is recommended to protect the connector on the eNB equipment + pan-head screw to the FG line (so that the FG line side crimping terminal is completely covered) with outdoor weather-proof tape.
-  Apply protection after checking the voltage referring to section [7](#). If protection is applied before checking the voltage, some voltage check procedure cannot be performed.

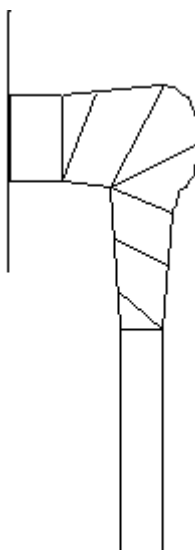


Figure 49 Crimping Terminal Mounting Screw Protection Example

6.7 Antenna Tilt Control Cable Connection (RET)

[Figure 50](#) shows the position of the connector to connect the antenna tilt control cable.

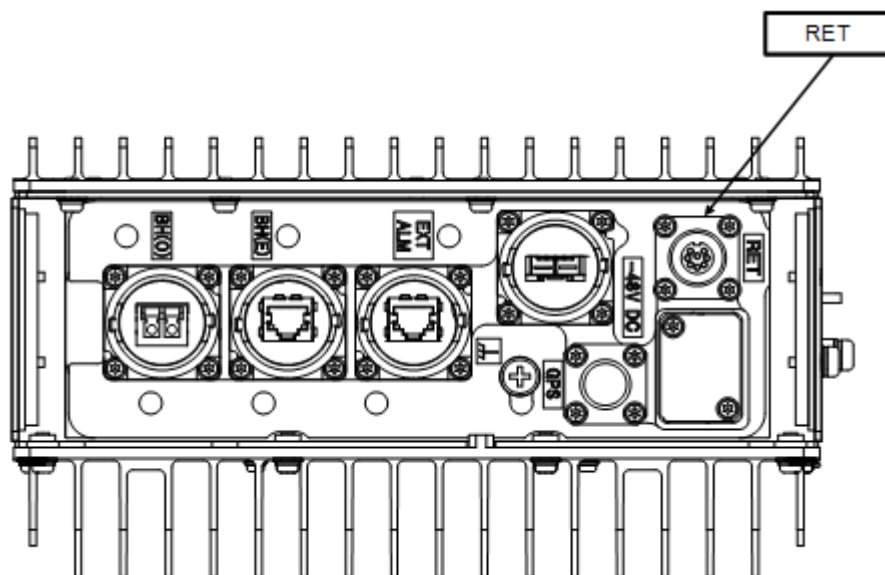


Figure 50 Bottom Face Cable Connection Position (RET)

6.7.1 Antenna Tilt Control (RET) Cable Connection Procedure

The following show the procedure to connect the antenna tilt control (RET) cable.

- 1 Insert the antenna tilt control cable connector into the antenna tilt control connector on the eNB equipment.
- 2 Holding the ring of the antenna tilt control cable against the antenna tilt connector on the eNB equipment, use your hand to tighten the ring on the cable clockwise.

Recommended tightening torque is 1.0 N•m to 1.2 N•m.

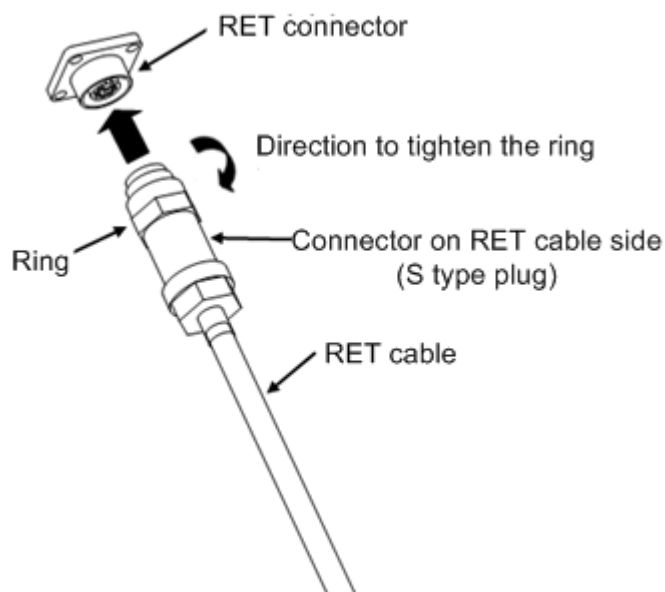


Figure 51 Antenna Tilt Control Connector Connection

- 3 To prevent the mating part loosening, it is recommended to protect the connector on the eNB equipment up to the cable (so that the cable side connector is completely covered) with outdoor weather-proof tape.

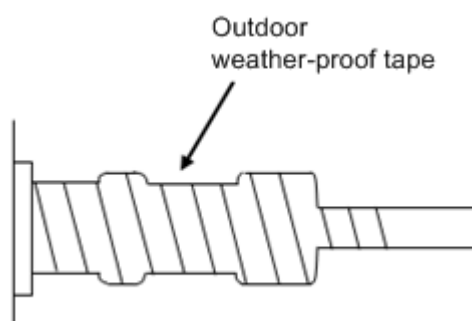


Figure 52 Connector Protection Example (RET)



Figure 53 Waterproof Cap Protection Example

6.8 Antenna Cable Connection (ANT0/ANT1)

[Figure 54](#) shows the positions of the connectors to connect the antenna cable.

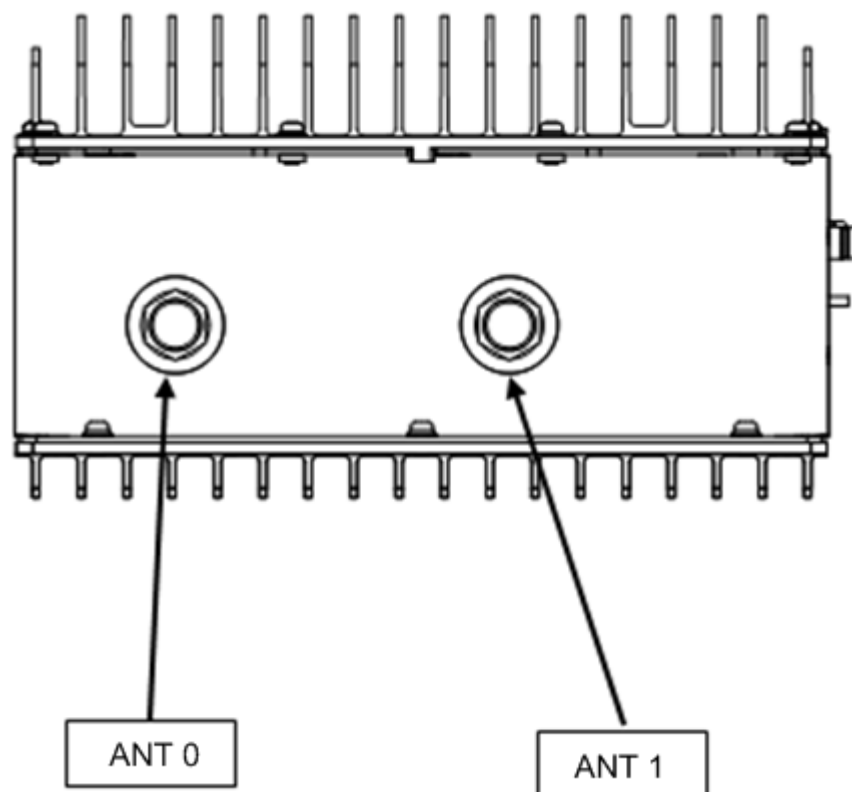


Figure 54 Top Face Cable Connection Position (Antenna Cable)

6.8.1 Antenna Cable Connection Procedure (ANT0/ANT1)

The following shows the procedure to connect the antenna cable.

- 1 Insert the antenna cable connector into the RF connector on the eNB equipment.
- 2 Holding the ring on the antenna cable against the RF connector on the equipment, tighten the ring of the antenna cable until the male screw ridges of the RF connector on the equipment are invisible.

Recommended tightening torque is 0.7 N•m to 1.1 N•m.

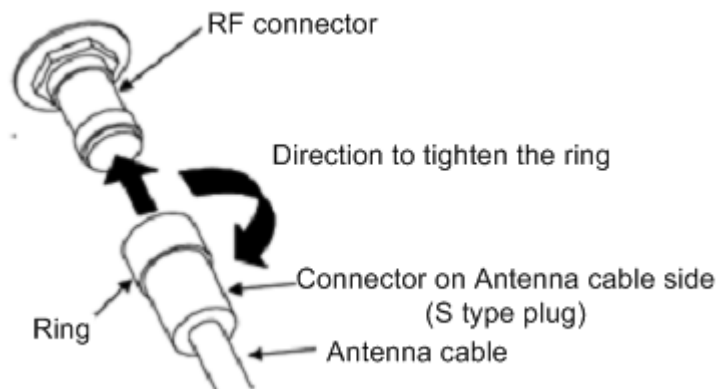


Figure 55 Antenna Cable Connection

- 3 To prevent the mating part loosening, it is recommended to protect the connector on the eNB equipment up to the cable (so that the cable side connector is completely covered) with outdoor weather-proof tape.

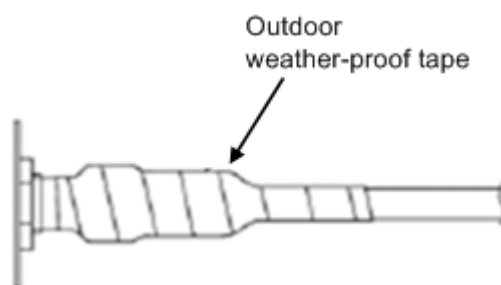


Figure 56 Connector Protection Example (ANT)

6.9 Connector Details

6.9.1 Power Connector Pin Allocation

The following shows the pin allocations on the power connector installed on the eNB equipment.

Table 10 Terminal Number and Signal Names

Pin No.	Signal name
1	-48V DC
2	0V

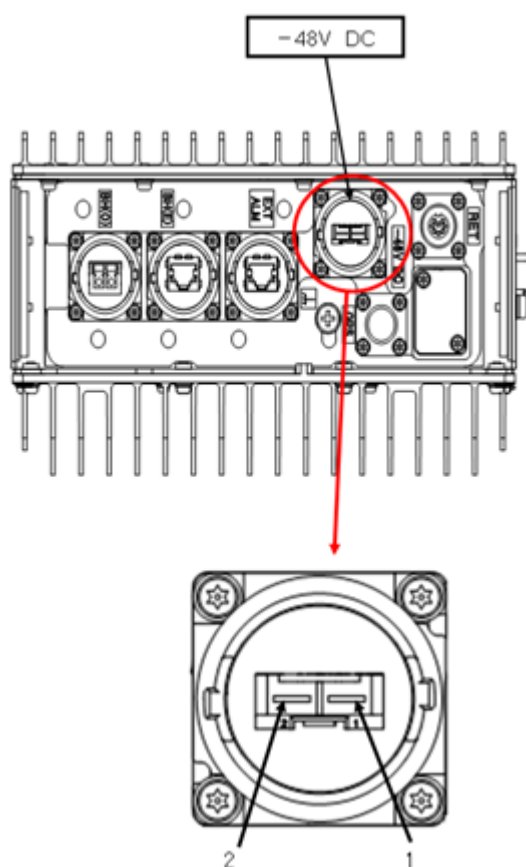


Figure 57 Power Connector Pin Allocations

6.9.2 Antenna Tilt Control Connector (IEC60130-9)

The following shows the pin allocations for the antenna tilt control connector on the eNB equipment.

Table 11 Terminal Number and Signal Names

Pin No.	Signal name	AISG Requirement
1	+12V DC nominal	Not supported
2	-48V DC nominal	Not supported
3	RS485 B	Would be supported
4	RS485 GND	For eNB, it is supported. Whether it is used or not depends on RET support situation.
5	RS485 A	Would be supported
6	10V -30V DC	Would be supported
7	DC return	Would be supported
8	N/C	Reserved for future extension.

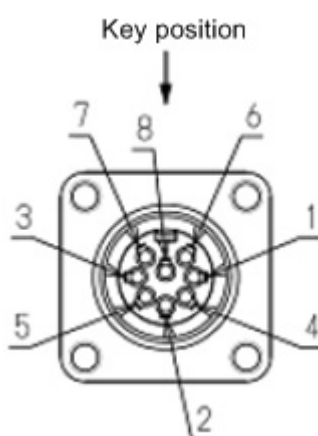


Figure 58 Pin Allocations for Antenna Tilt Control Connector

6.9.3 External Alarm Interface (EXT ALM)

The following shows the pin allocations of the external alarm interface (EXT ALM) on the eNB equipment.

Table 12 Pin Number and Signal Name

Pin No.	Signal name
1	Output 1 (Make)
2	Output 1 (Break)
3	Output 1 (Common)
4	Input 1-G
5	Input 1
6	-
7	Input 2-G
8	Input 2

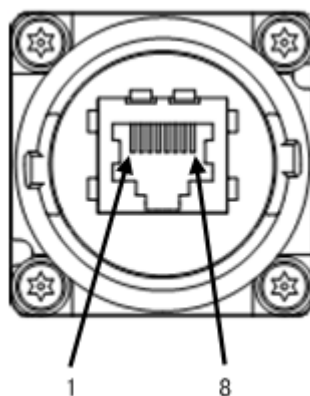


Figure 59 Pin Allocation for External Alarm Interface (EXT ALM) Connector

7 Voltage Check

7.1 Cable Side Power Connector Pin Location Polarity

The following shows the pin location polarity image and details of the cable side power connected to the Power Distribution Board (PDB) side breaker.

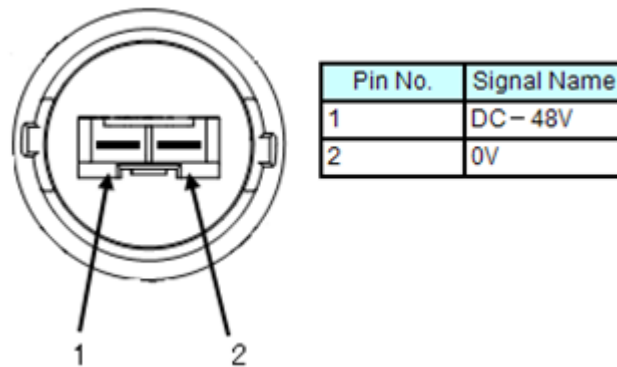


Figure 60 Cable Side Power Connector Pin Location Polarity

7.2 Voltage Check Procedure

The following show the procedure to check the voltage.

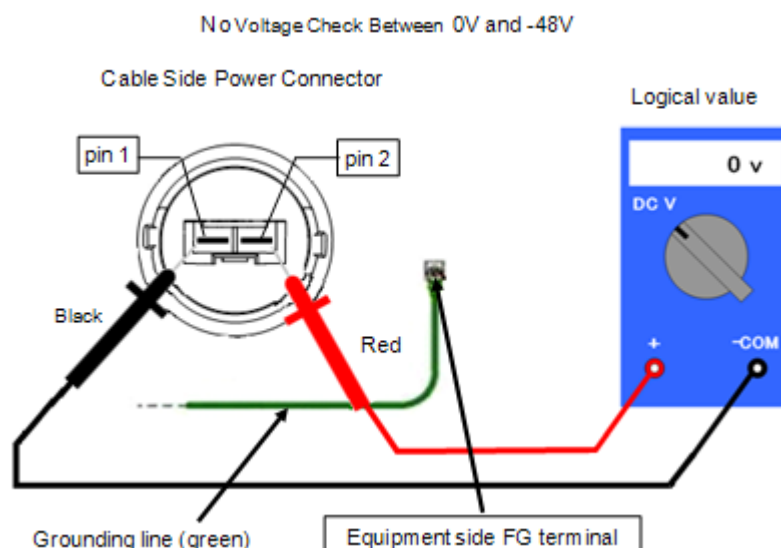
- 1 Prepare the tester in advance. Check that the tester operates normally before starting the test.
- 2 Check the target location by sight and by reading out.
- 3 Insulate and cure the necessary parts of the cable side power connector, DC power distribution board and DC breaker to prevent short-circuit accidents.
- 4 No voltage check of the breaker

Check that the target breaker on the power distribution board side is turned OFF by sight, and perform no voltage check on the power distribution board side using the tester.

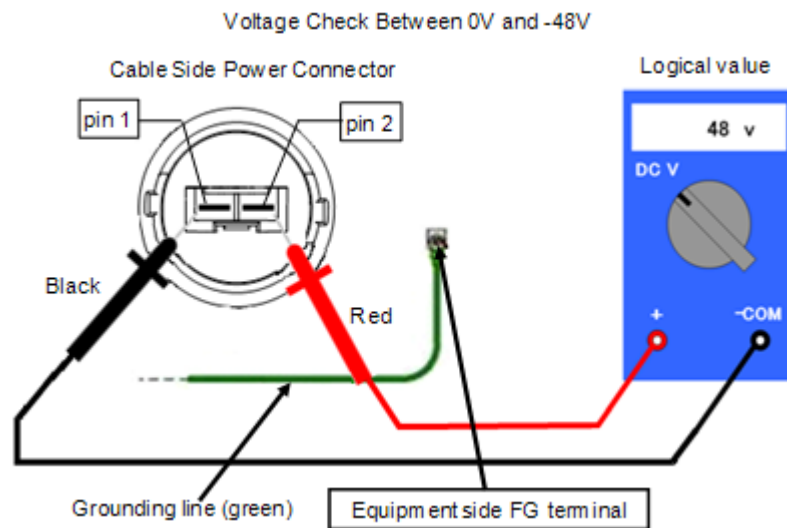
 - 1 Check that the red lead bar is connected to the + on the tester, and black lead bar to the -COM on the tester.
 - 2 Change the tester range to VDC range. For a tester with the Ampere range, check with two people or more that the measurement is not performed in Ampere range and that the test bar insertion positions to the tester are correct.
 - 3 Connect the red lead bar of the tester to the plus (+) pole of the target power distribution board breaker, and the black lead bar to its minus (-) pole.
 - 4 Check that the value displayed on the tester is 0V (no voltage, logical value).
 - 5 Disconnect both the lead bars of the tester from the breaker terminals.
- 5 Cable Side Power Connector Voltage Check

Check that the target power distribution side breaker is turned OFF by sight, and perform no voltage check of the cable side power connector using the tester.

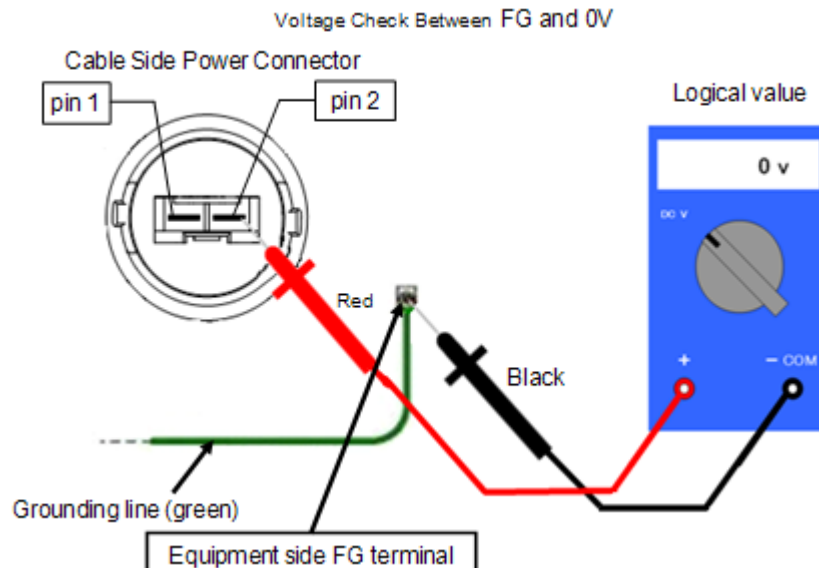
 - 1 Connect the red lead bar of the tester to the 0V terminal (pin 2) on the cable side power connector, and the black lead bar to its -48V terminal (pin 1).
 - 2 Check that the value displayed on the tester is 0V (no voltage, logical value).



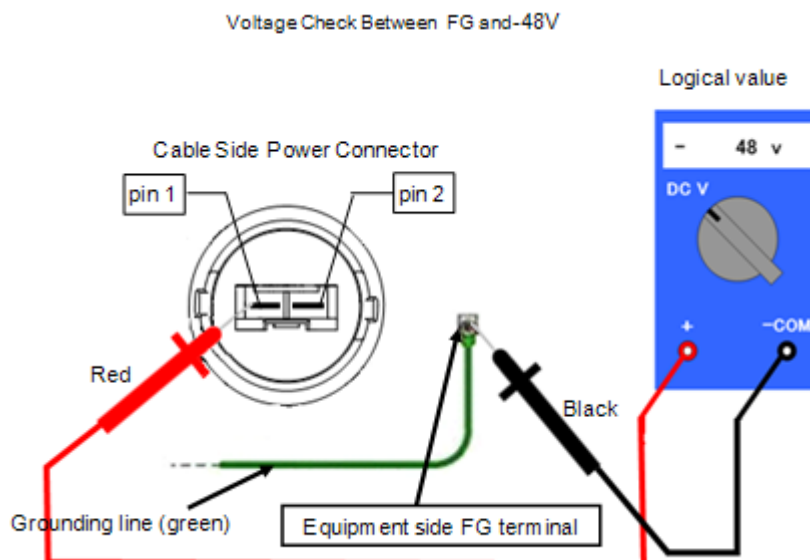
- 6 Keep each lead bar (red and black) of the tester connected as is, and instruct another worker to turn ON the target breaker.
 - i After the worker checks the position of the target breaker by the drawing, the target device name displayed on the power distribution and the destination plate attached to the power cable, the worker turns ON the target breaker. Moreover, the supervisor would always be present and checks on the work.
- 7 Check that the breaker switch is turned ON, and 48V (logical value) is displayed on the tester.



- 8 Keeping the red lead bar connected to the 0V terminal (pin 2) of the cable side power connector, slowly move the black lead bar to the grounding terminal (E or FG) and connect to it. Upon connection, check that the voltage changes from 48V to 0V (logical value).



- 9 Keep the black lead bar connected to the grounding terminal (E or FG), slowly move the red lead bar from the 0V terminal (pin 2) of the cable side connector to the -48V terminal (pin 1), and connect to it. Upon connection, check that the voltage changes from 0V to -48V.



- 10 Check that the polarities of the logical value and the actual measurement value are the same, the voltage value is almost the same as the above logical value, in a range allowed by the device characteristics, or is an appropriate voltage specified by the rectifier.
- 11 When the voltage check is complete, check the target breaker again and turn the breaker OFF (upon turning OFF, check again that the cable side power connector is in 0V (no voltage)).
- 12 Remove the cure materials, and attach the power distribution board breaker terminal protection cover (fix by screws and check the tightening).
- 13 Connect the cable side power connector to the power connector on the equipment side.
- 14 Clean up the site.