5.8 GHz 15/28/50 MB
PDH DIGITAL MICROWAVE RADIO SYSTEM
NLite L
(PDH 1+0/1+1 SYSTEM)

SECTION III INSTALLATION AND INITIAL LINE UP

CONTENTS

TITLE PAGE

1. GENERAL

This section provides installation and initial line up information on the 5.8 GHz 15/28/50 MB microwave radio system.

This manual is described for the firmware version of as follows.

SW UNIT: 1.0.1
MD UNIT: 1.0.2

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2. INSTALLATION

The standard installation is summarized in this section. Included herein are information on typical installation work flow and guides for MDP installation, TRP installation, Antenna (ANT) installation, waveguide connection and cable connections. The installation flow diagram is shown below.

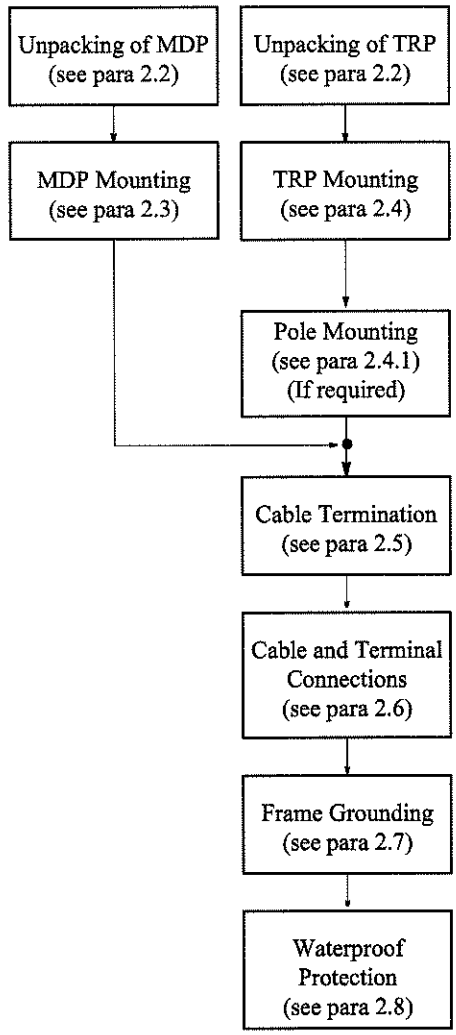


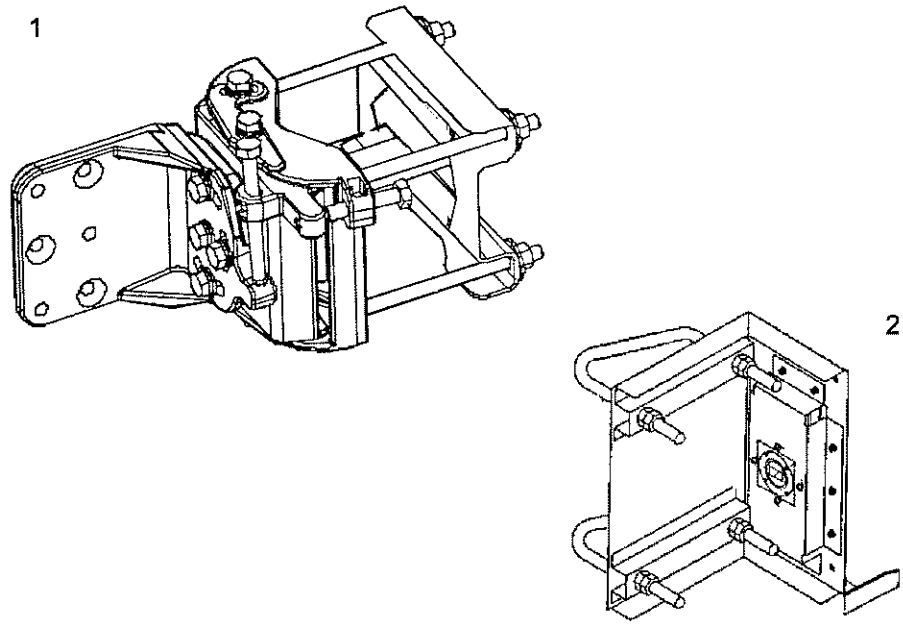
Fig. 2-1 Typical Installation Flow Diagram

2.1 Packing List

Each unpacked component of the [ ] GHz [ ] MB digital radio system must be checked as shown below.

PACKING LIST	DRAWING NO.
Mounting Bracket	Fig. 2-2 *
TRP and MDP	Fig. 2-3
Installation Kit	Fig. 2-4 *

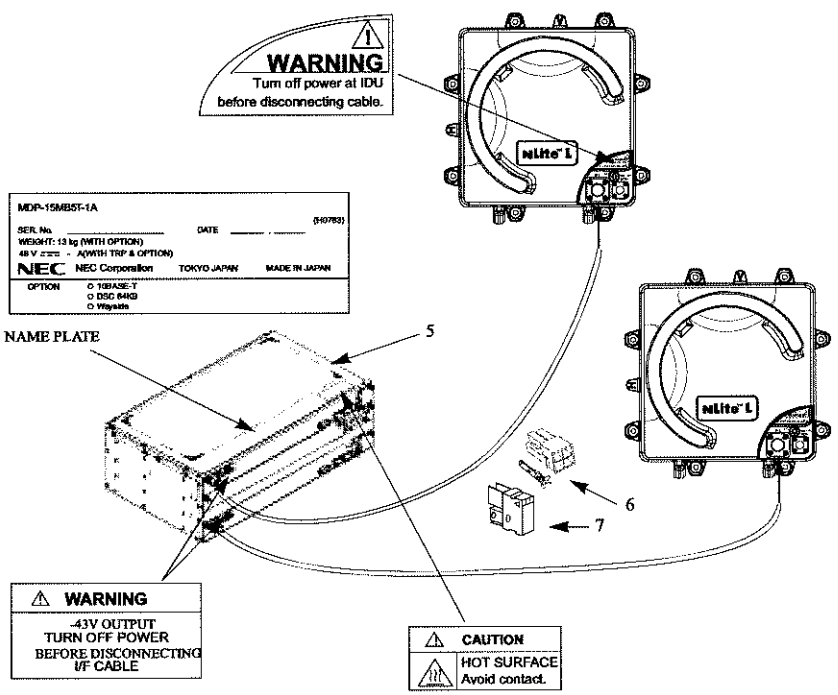
*Note: * These are standard packing boxes.*

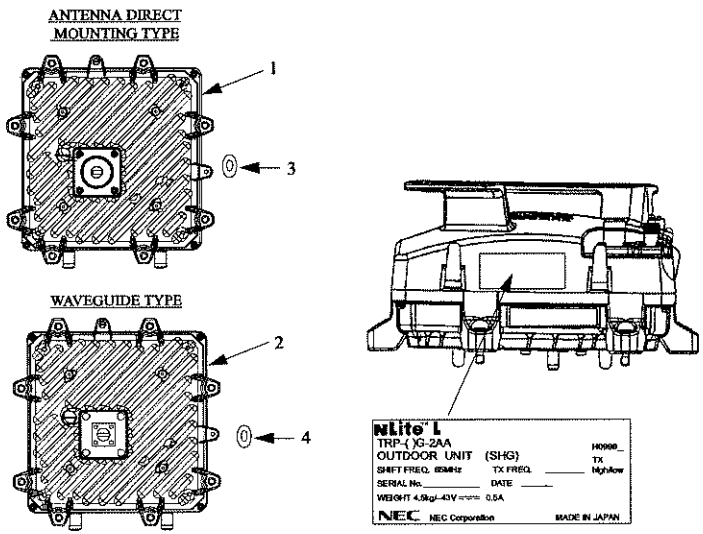


Note: The pole mounting bracket type varies depending to the antenna type and system configuration.

No.	DESCRIPTION
1	Pole Mounting Bracket for the TRP (Antenna Direct Mounting)
2	Pole Mounting Bracket for the TRP (WG Connection)

Fig. 2-2 Packing List of Mounting Bracket



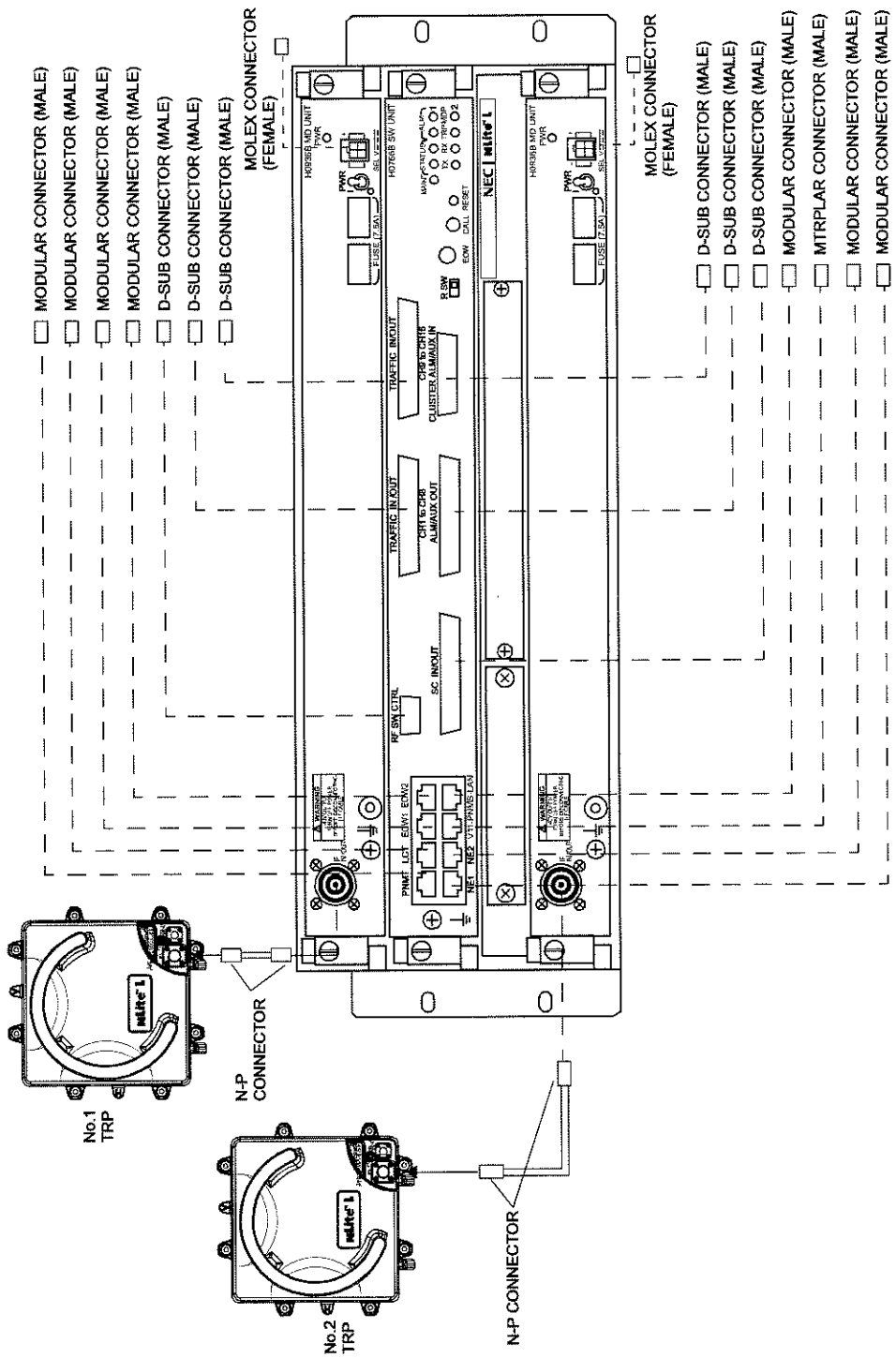


No.	DESCRIPTION
1	TRP-( )G-2AA (TRP) (Antenna direct mounting type)
2	TRP-( )G-2AA (TRP) (Waveguide type)
3	O-Ring (Attached to the antenna direct mounting type TRP)
4	O-Ring (Attached to the waveguide type TRP)
5	MDP-15MB5T-1A / MDP-28MB7T-1A
6	Power Connector (Molex Housing M5557-4R (×1ea)
	Cable Terminal (Molex 5556T) (×4ea)
7	7.5 A Fuse (SMP75) (× 2ea)

Note: Other cables and connectors except those described in the table must be provided by the customer.

We recommended that use IF line cable which is conformed with the UL standard.

Fig. 2-3 Packing List for the TRP and MDP



For 8/16 × 1.5 MB System

Fig. 2-4 Packing List for Installation Kit of MDP and TRP

2.2 Unpacking of MDP and TRP

The procedures to unpack the MDP and TRP are shown in following chart.

- For MDP : Chart 2-1
- For TRP : Chart 2-2

Note: When conveying the MDP or TRP to another place, the original packing should be made to avoid damage.

Chart 2-1 Unpacking Methods of MDP

Step	Procedure
1	Cut p.p. tape at top of the carton (1 to 3). Then open the carton.

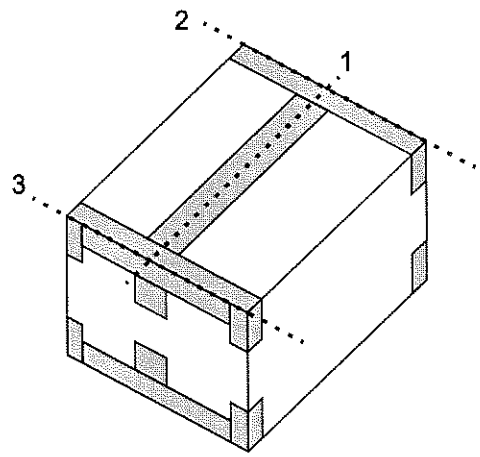


Chart 2-1 Unpacking Methods of MDP (Cont'd)	
Step	**Procedure**
2	Take out the accessories, carton and cushioning materials.

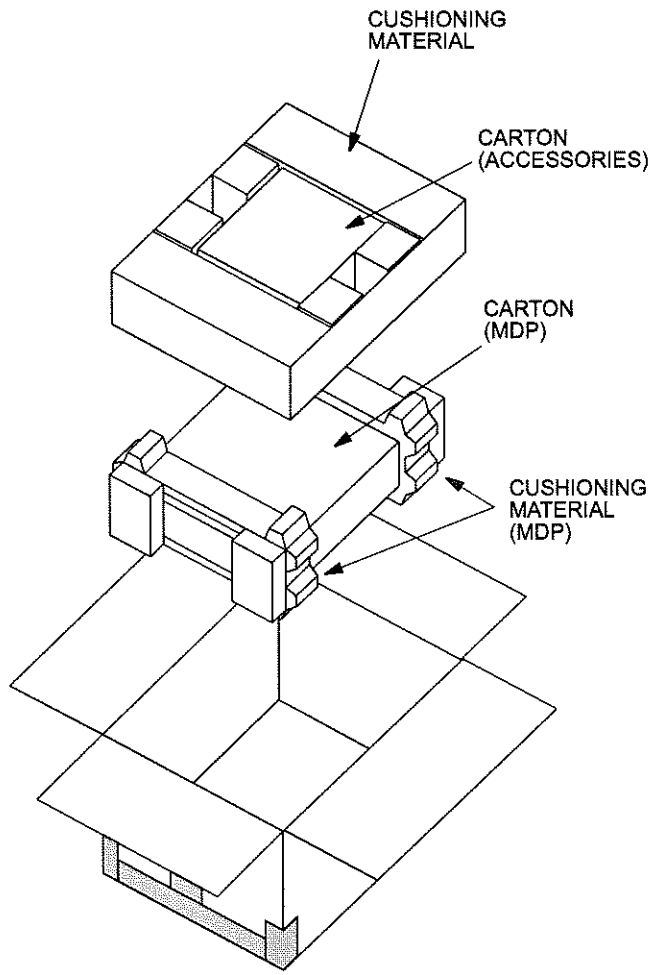
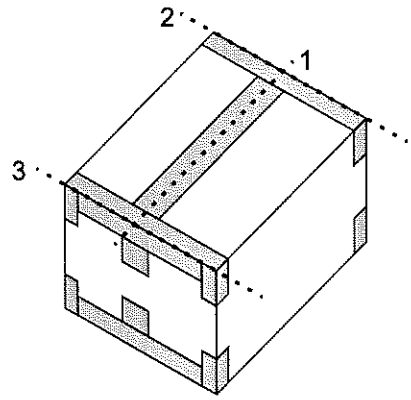
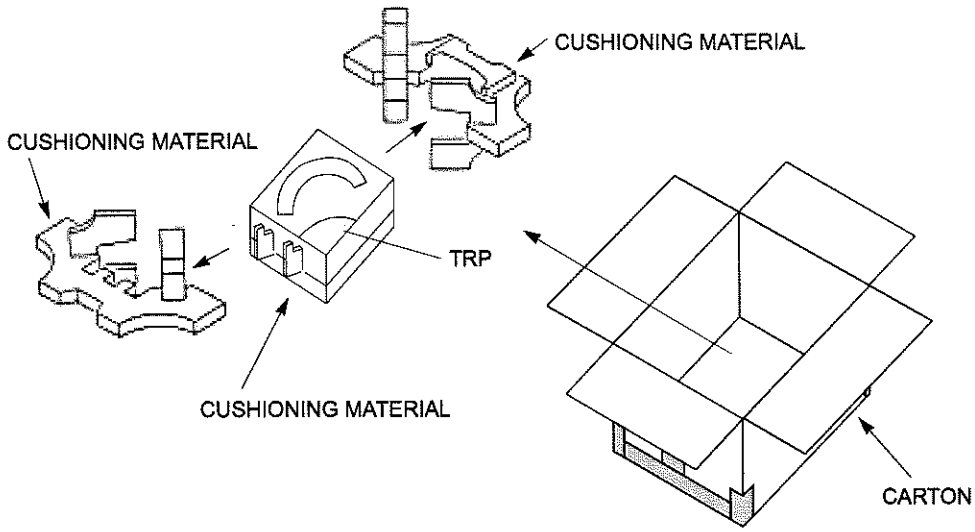


Chart 2-2 Unpacking Methods of TRP

Step	Procedure
1	Cut the p.p. tape at top of the carton (1 to 3). Then open the carton.



2	Take out the TRP with cushioning materials from the carton.



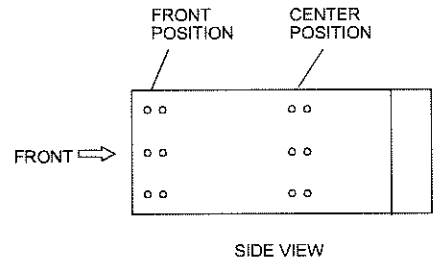
3	Remove the cushioning materials from the TRP.
4	Take out the TRP from the antistatic bag.
5	Inspect the TRP.

2.3 MDP Mounting

The installation procedure for MDP is shown in Chart 2-3. The MDP should be installed in the radio station indoor.

Chart 2-3 Mounting Methods of MDP

Step	Procedure
1	Change the two brackets to desired position on the MDP, if necessary.



2	Align the MDP to the mounting position on the 19-inch rack.

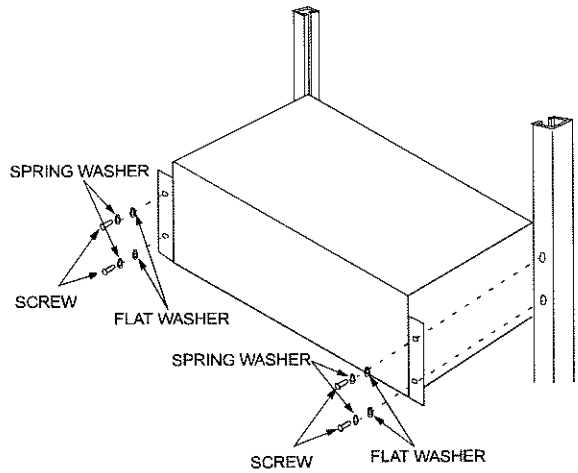
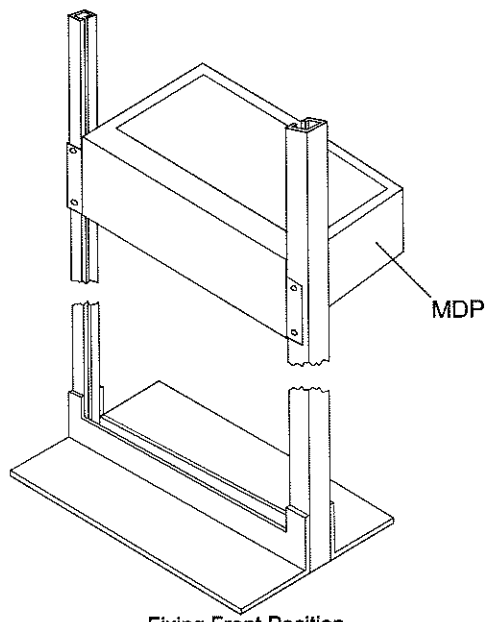


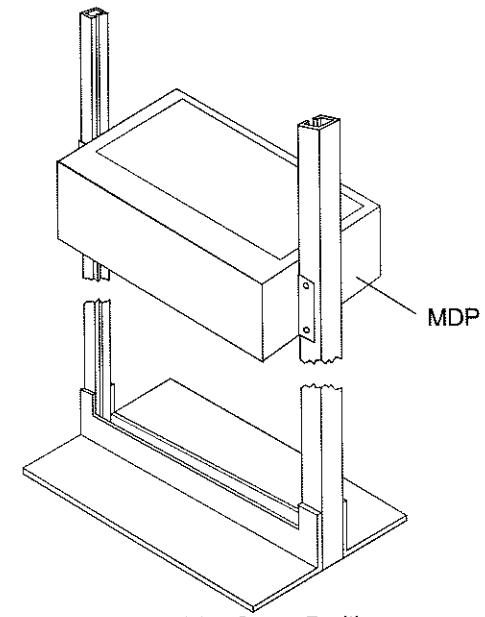
Chart 2-3 Mounting Methods of MDP (Cont'd)

Step	Procedure

3 Fix each side of the MDP to the 19-inch rack with the two screws.

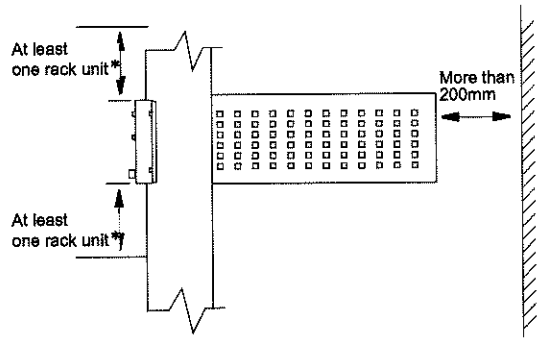


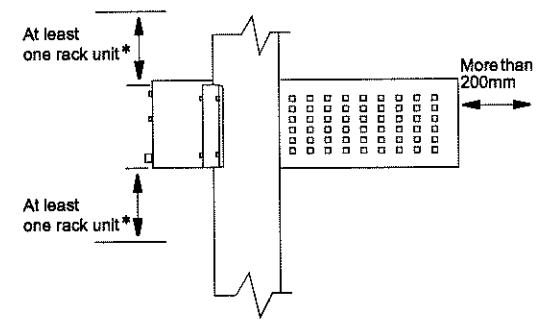
Fixing Front Position



Fixing Center Position

4 To mount the MDP in a 19-inch rack, leave space for one unit at the top and bottom to allow heat from the MDP to radiate.





*Note: * When free space is closed within one rack unit, check the environment temperature is lower than +40°C.*

2.4 TRP Mounting

The procedures for mounting and demounting the outdoor type TRP onto the pole are described here. The tools for installation are listed in Table 2-1.

Table 2-1 Tools

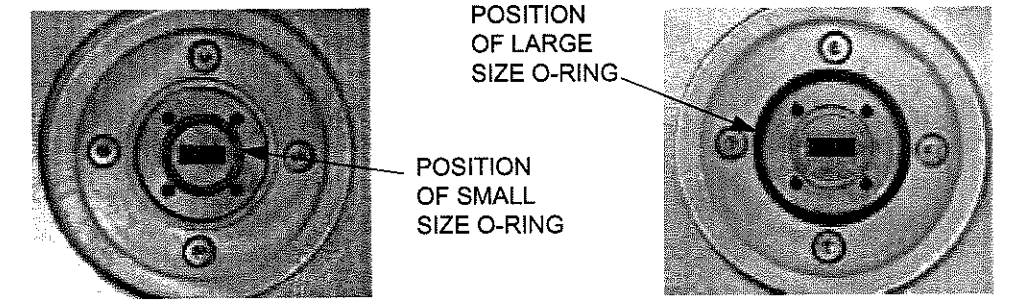
TOOLS
Torque Wrench, Monkey Wrench
Screwdriver

Caution 1. ***How to use small and large O-rings are shown in following table. Two types (small and large) O-ring are attached in Andrew/RFS direct mount antenna. If the small O-ring is used for TRP direct mount installation, a gap may occur between TRP and antenna for RF interface. Therefore it can not be used as watertight connection and may happen transmit or receive level down.***

Caution 2. ***Do not apply silicon grease at O-ring.***

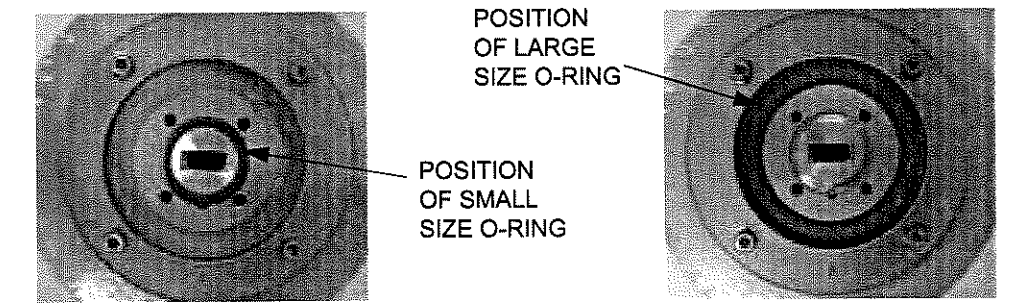
ATTACHENENT POSITION OF O-RING (BETWEEN:)	O-RING		REMARKS
	SMALL SIZE	LARGE SIZE	
ANT — HYB	Not used	Used	Antenna direct mounting
ANT — WG/HYB	Used	Not used	Waveguide connection

Note: 10.5 GHz antenna for direct mount is not possible connection with the ordinary waveguide flanges. NEC original flange is applied.



FOR WAVEGUIDE CONNECTION FOR ANTENNA DIRECT MOUNTING

ANDREW ANTENNA

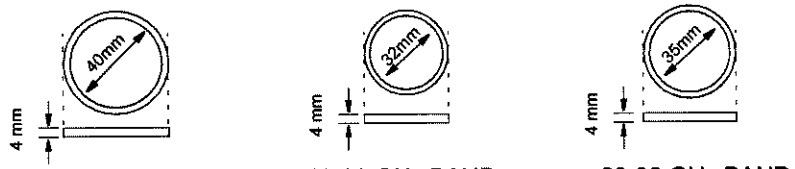


FOR WAVEGUIDE CONNECTION FOR ANTENNA DIRECT MOUNTING

RFS ANTENNA

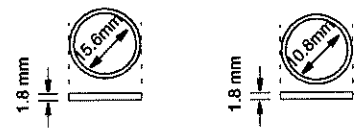
Notes: 1. Do not use both small O-ring and large O-ring simultaneously.

2. O-ring size is different with frequency band as follows:



10/11 GHz BAND 13-23 GHz BAND 26-38 GHz BAND

LARGE SIZE O-RING FOR ANTENNA DIRECT MOUNTING



18/23 GHz BAND 38 GHz BAND

SMALL SIZE O-RING FOR WAVEGUIDE CONNECTION

2.4.1 Pole Mounting

The method of TRP mounting is listed in Table 2-2.

Table 2-2 Pole Mounting

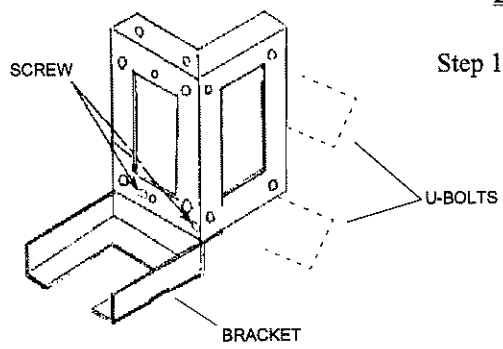
Antenna Direct Mounting Type TRP		
Antenna Direct Mounting Connection		Waveguide Connection
Using NEC HYB	Using Quasar HYB	
10-38 GHz Band	10-38 GHz Band	10-38 GHz Band
Chart 2-9	Chart 2-10	Chart 2-11

Note: When the TRP is mounted on the opposite side of the pole, reassemble the TRP to the right position by the procedure described in Chart 2-4.

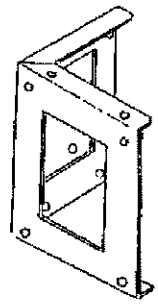
Chart 2-4 Pole Mounting Bracket, Assembly

When the TRP is mounted on the opposite side of the pole, reassemble the TRP to the right position by the following procedure.

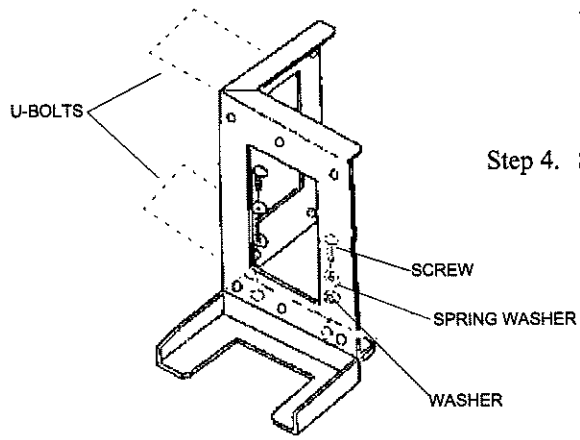
BRACKET ASSEMBLING



Step 1. Loosen two screws, remove the bracket from pole mounting type bracket,



Step 2. Turn the pole mounting bracket as shown at left,

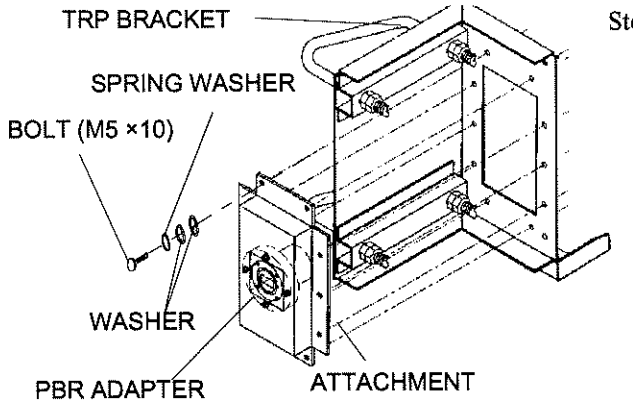


Step 3. The bracket removed in step 1 is mounted onto the pole mounting type bracket with two screws as shown at left.

Step 4. Secure two screws.

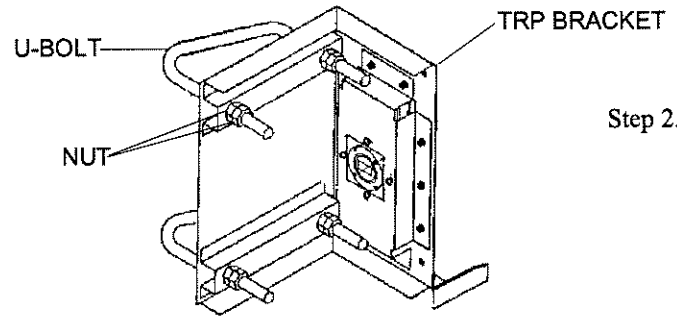
Fig. 2-5 Pole Mounting Bracket, Reassembling

Chart 2-4 Pole Mounting Bracket, Assembly (Cont'd)



Step 1. Mount the attachment with adapter to the TRP bracket using ten bolts,

Note: Color of adapter is white.



Step 2. Loosen eight nuts and remove the two U-bolts from the TRP bracket,

Step 3. Mount the TRP bracket to the pole with two U-bolts,

Note: The diameter of pole is from 48.5 to 114.5 millimetres.

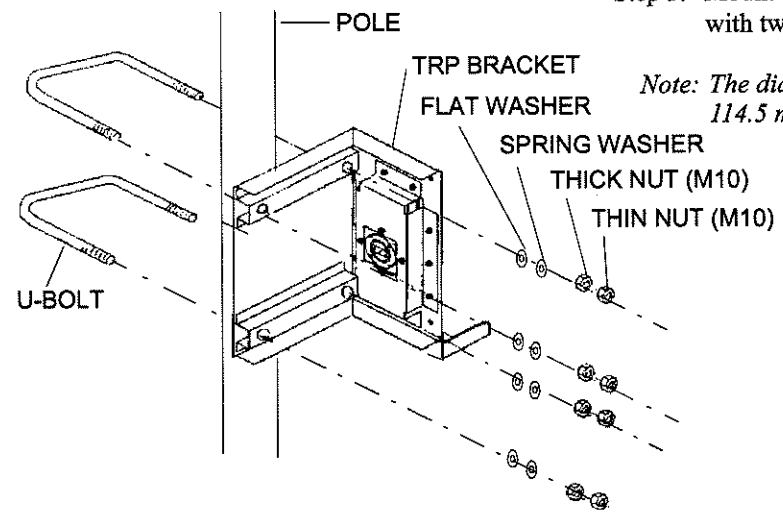


Fig. 2-6 Pole Mounting Bracket for Waveguide Connection, Assembling

Chart 2-5 Antenna Polarization Change

Step	Procedure

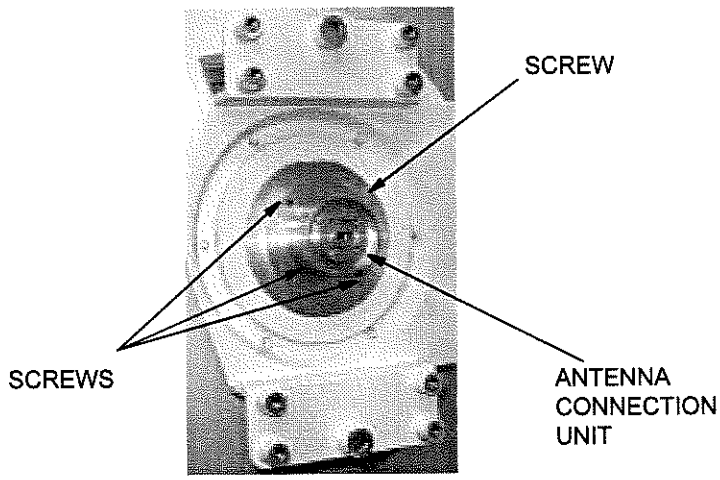
CHANGE OF POLARIZATION

Note: The details are referred to the installation manual which is attached to the antenna.

ANTENNA DIRECT MOUNTING TYPE

Note: The antenna is set to V-polarization when shipped from the factory.

1 If you change to H polarization, loosen the four screws with the Allen key wrench and then rotate the antenna connection unit, keeping the antenna stand horizontal.



V POLARIZATION

Note: A large and a small gasket are included in the antenna package. Please use the large one (The small gasket is not used in antenna mount).

Fig. 2-7 Antenna Polarization Change for Direct Mounting (1/2)

Chart 2-5 Antenna Polarization Change (Cont'd)

Step	Procedure
2	Check that the aperture part of the connection unit is rotated by 90 degrees, then fix it with the screws that were loosened in step 1.

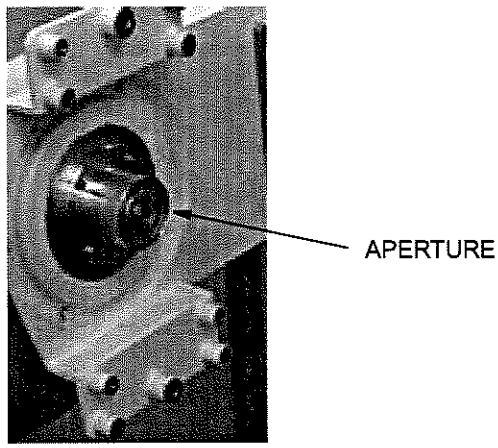


Fig. 2-7 Antenna Polarization Change for Direct Mounting (2/2)

Chart 2-6 HYB Polarization Change

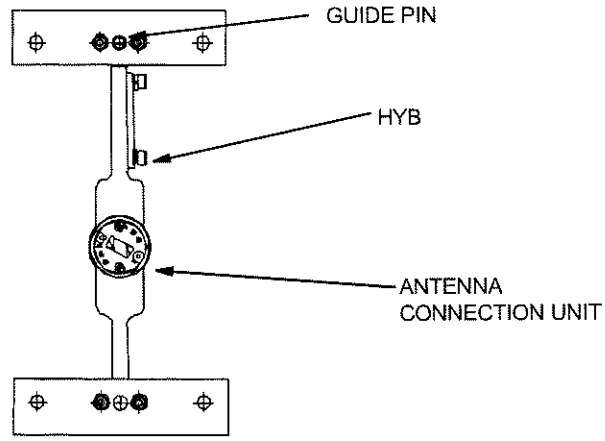
Step	Procedure

CHANGING POLARIZATION OF THE HYB

NEC HYBRID

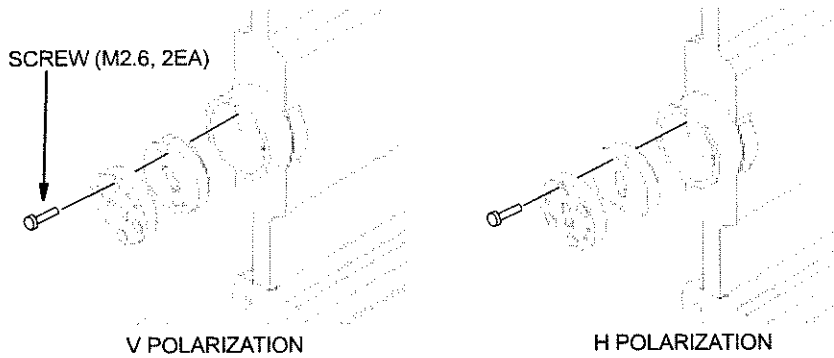
Note: The hybrid is set to V-polarization when shipped from the factory.

1 If you change to H polarization, loosen two screws, rotate the antenna connection unit and put the HYB horizontally.



V POLARIZATION

2 Check that aperture of the connection unit is rotated as shown below, then fix it with the two screws that were loosened in step 1.



V POLARIZATION H POLARIZATION

Fig. 2-8 HYBRID Polarization Change (1/2)

Chart 2-6 HYB Polarization Change (Cont'd)

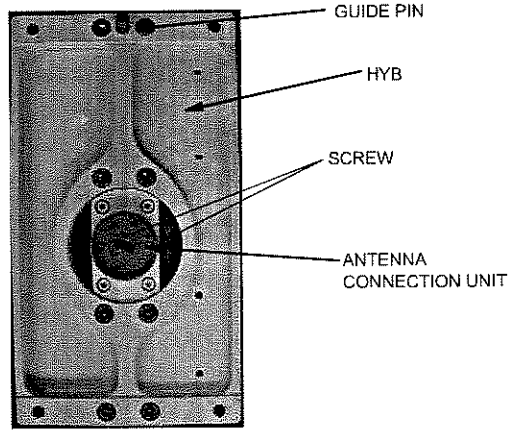
Step	Procedure

Quasar HYBRID

Note: The hybrid is set to V-polarization when shipped from the factory.

1 If you change to H polarization, loosen two screws, rotate the antenna connection unit and put the HYB horizontally.

Quasar HYB



2 Check that the aperture of the connection unit is rotated as shown below, then fix it with the two screws that were loosened in step 3.

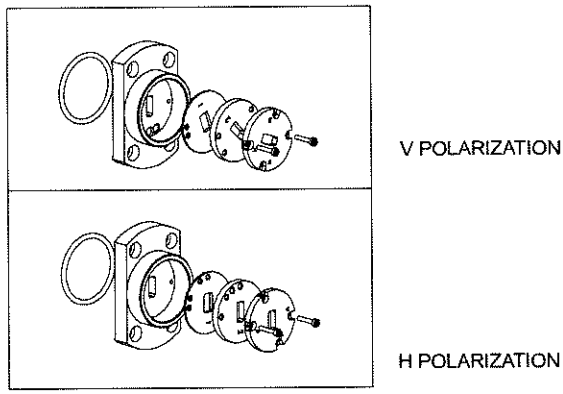
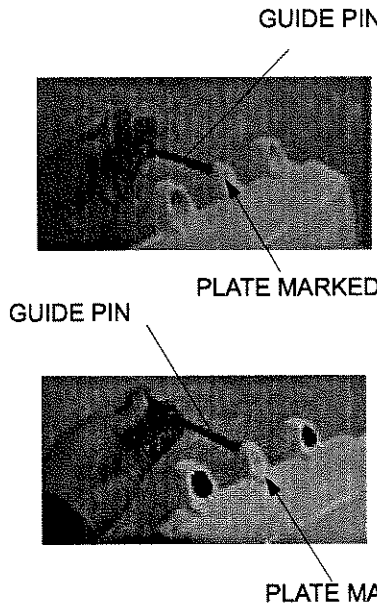


Fig. 2-8 HYBRID Polarization Change (2/2)

Chart 2-7 TRP Polarization Change



CHANGING POLARIZATION

TRP

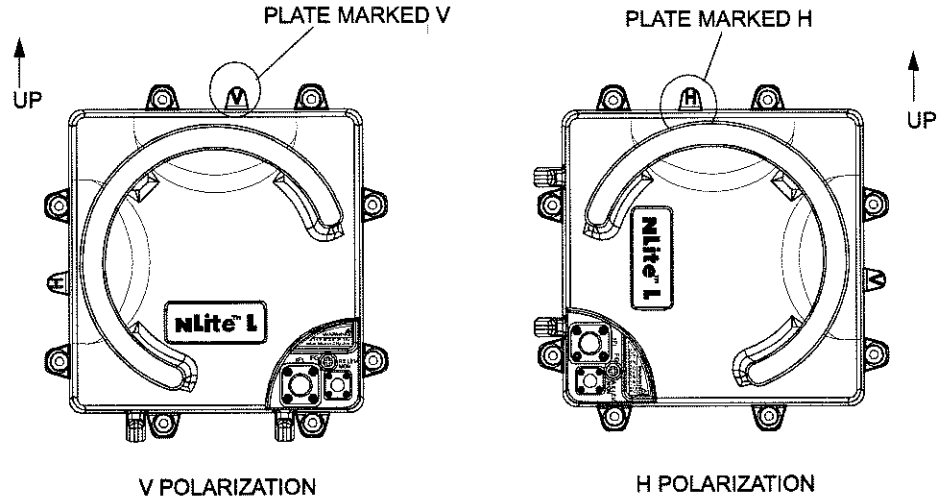
Step 1. When vertical polarization is required, rotate the TRP so as to go up the plate marked V,

Step 2. When horizontal polarization is required, remove the guide pin fixed on the plate marked V,

Step 3. Screw in the guide pin removed in step 2 to the screw hole of the plate marked H,

Step 4. Rotate the TRP so as to go up the plate marked H,

Note: When the TRP is mounted on to the HYB, the TRP is mounted with the plate marked V turns to UP. Change the connection unit for the antenna port of the HYB, when H polarization is applied.

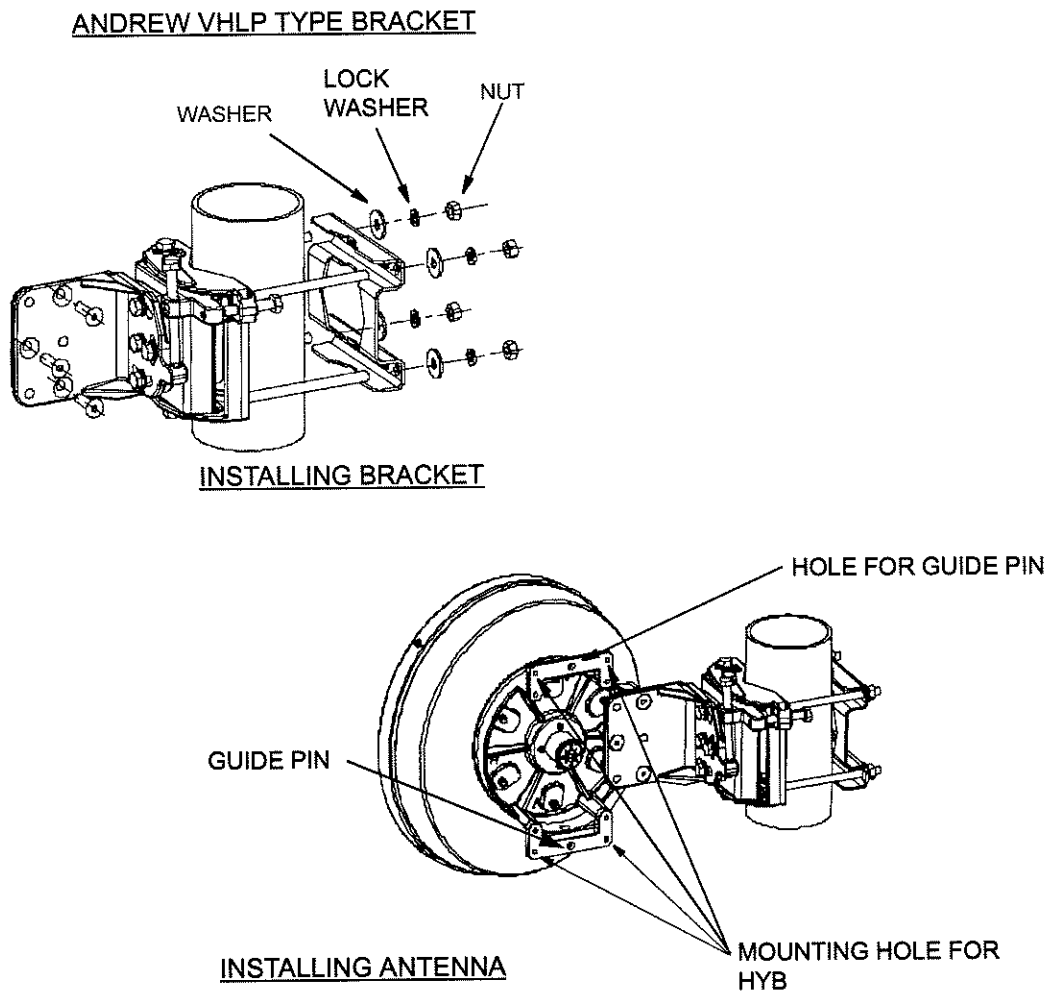


V/H Polarization Conversion for antenna direct mounting without HYB

Fig. 2-9 Changing V/H Polarization for Antenna/HYB Direct Mounting TRP

Chart 2-8 TRP Antenna Direct Mounting

Step	Procedure
	MOUNTING
1	Tighten the M10 hex bolts to fix the clamp using a wrench.

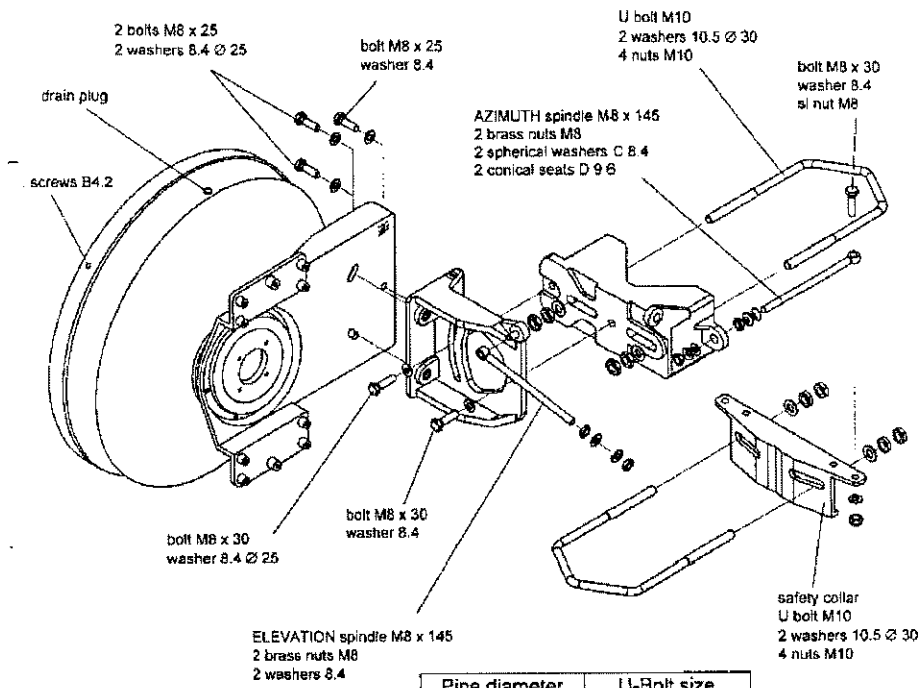


Note: The tightening torque is from 5.0 to 6.0 N·m.
Be careful not to damage the O-ring (Antenna).

Fig. 2-10 TRP Antenna Direct Mounting (1/5)

Chart 2-8 TRP Antenna Direct Mounting (Cont'd))

Step	Procedure



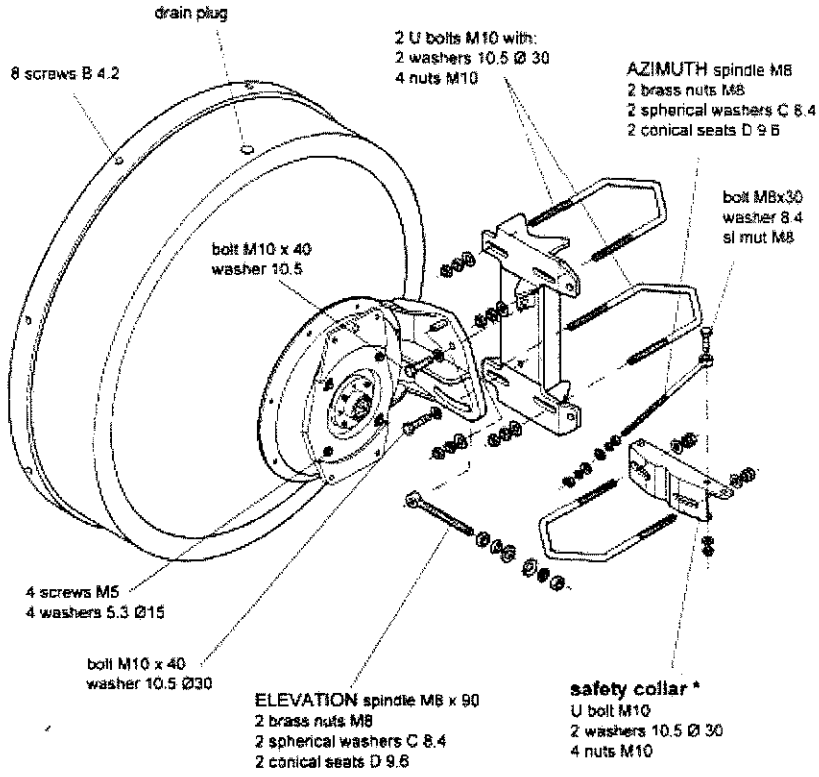
RFS SB1 TYPE BRACKET

Pipe diameter [mm]	U-Bolt size [mm]
51 - 89	89
90 - 115	115

Fig. 2-10 TRP Antenna Direct Mounting (2/5)

Chart 2-8 TRP Antenna Direct Mounting (Cont'd))

Step	Procedure



* safety collar (on request)

Pipe diameter [mm]	Bolt size [mm]
48 – 51	51 (optional)
52 – 89	89
90 - 115	115 (standard)

RFS SB2 TYPE BRACKET

Fig. 2-10 TRP Antenna Direct Mounting (3/5)

Chart 2-8 TRP Antenna Direct Mounting (Cont'd))

2 Fix the TRP to the bracket by tightening the M6 screws (four locations),

Notes: 1. Figure shows V polarization.
2. Be careful not to damage the O-ring (Antenna).
3. The tightening torque is 4.0 N·m ± 10%.

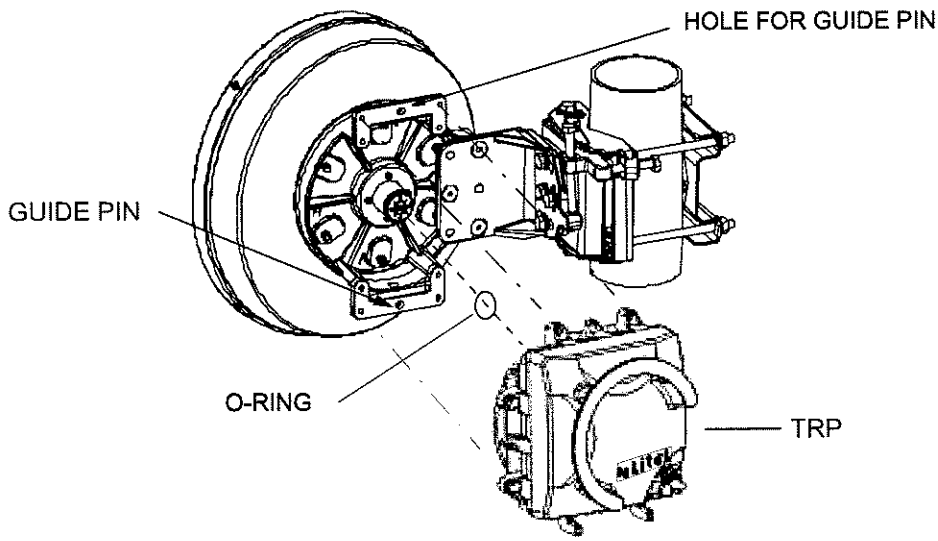
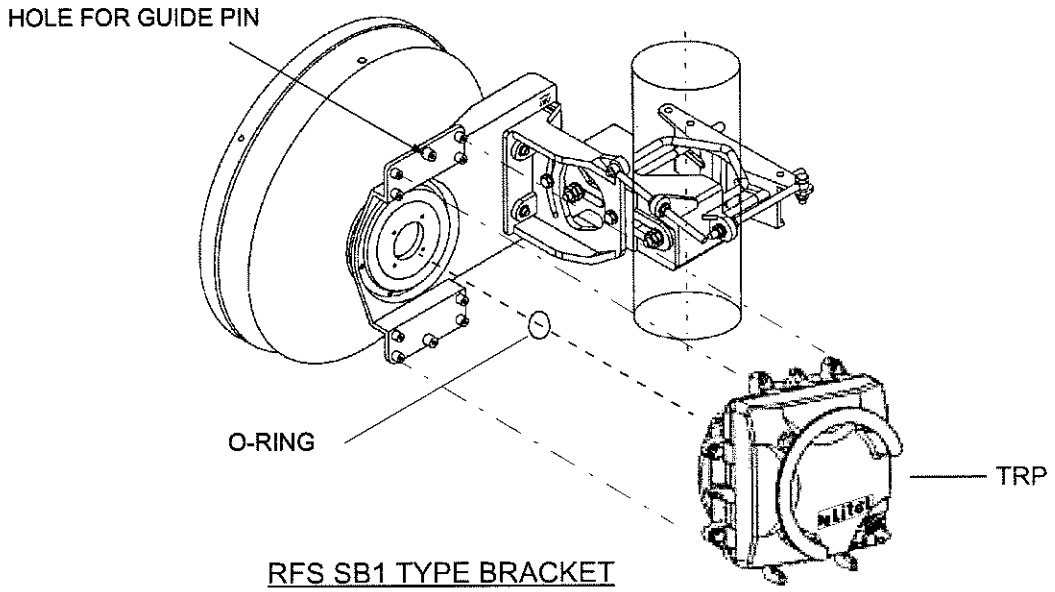


Fig. 2-10 TRP Antenna Direct Mounting (4/5)

Chart 2-8 TRP Antenna Direct Mounting (Cont'd))

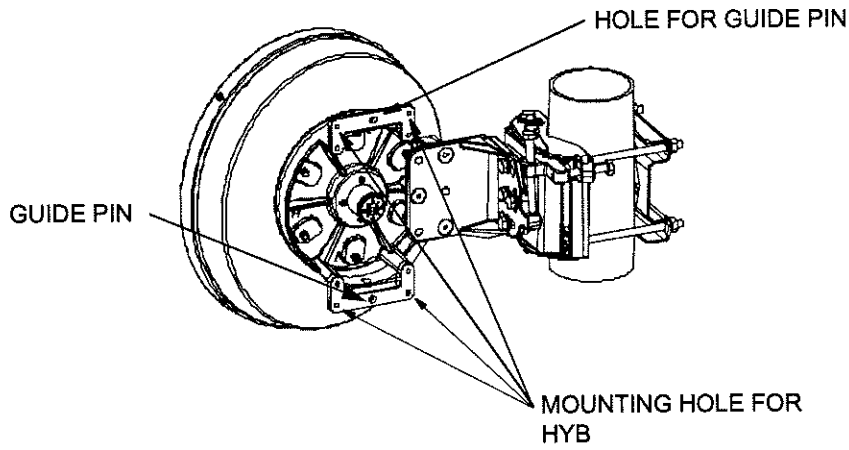


Notes: 1. Figure shows V polarization.
2. Be careful not to damage the O-ring (Antenna).
3. The tightening torque is 4.0 N·m ± 10%.

Fig. 2-10 TRP Antenna Direct Mounting (5/5)

Chart 2-9 TRP Antenna Direct Mounting Using NEC Hybrid

Step	Procedure
1	Fix the HYB to the antenna by tightening them with the M6 screws (four locations).



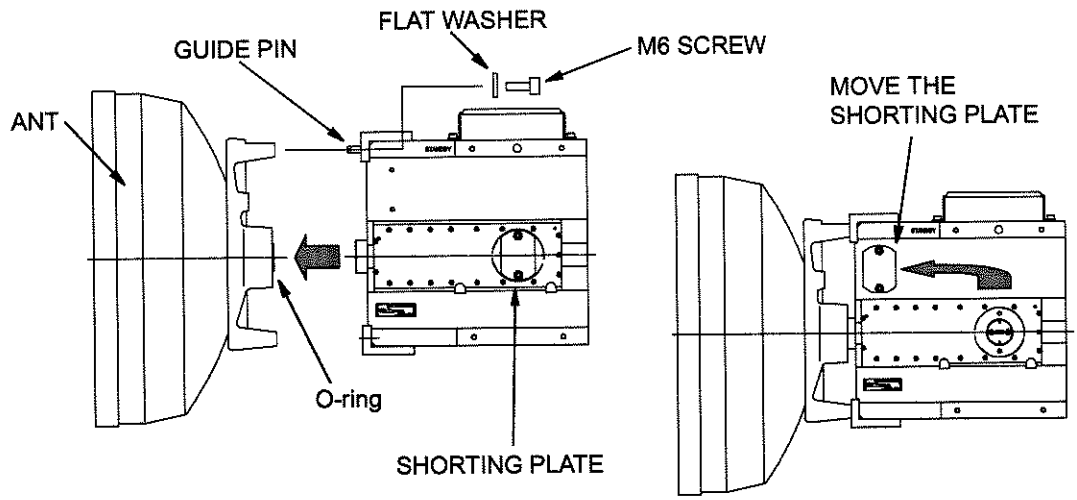


Chart 2-9 TRP Antenna Direct Mounting Using NEC Hybrid (Cont'd)

Step	Procedure
2	Insert the O-rings to the two TRP ports of the HYB.
3	Fix the two TRPs respectively with hex screws (four locations) using the allen key wrench.

Note: Be careful not to damage the O-rings (Hybrid).

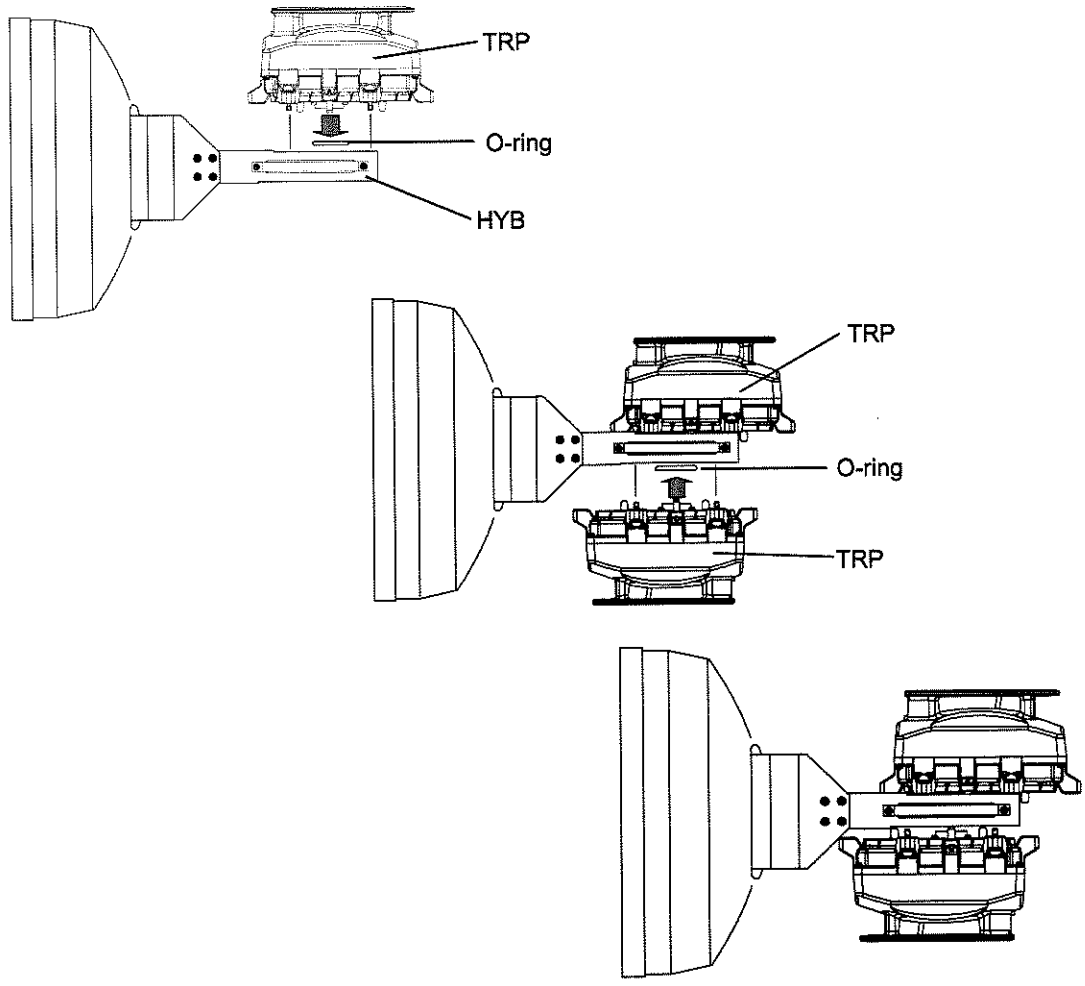
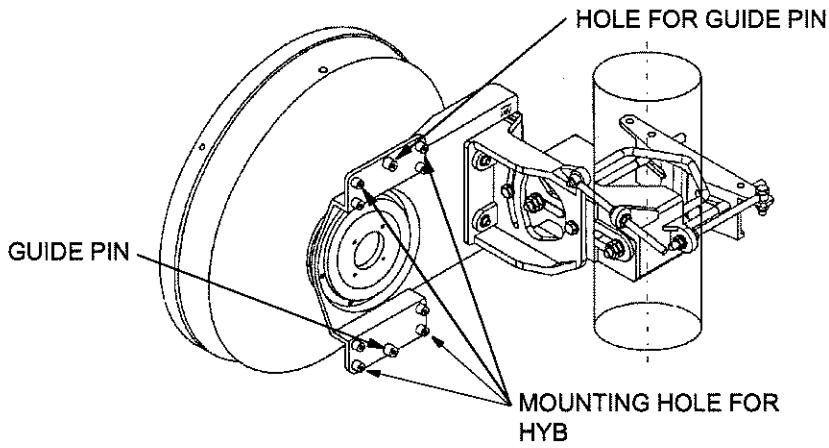


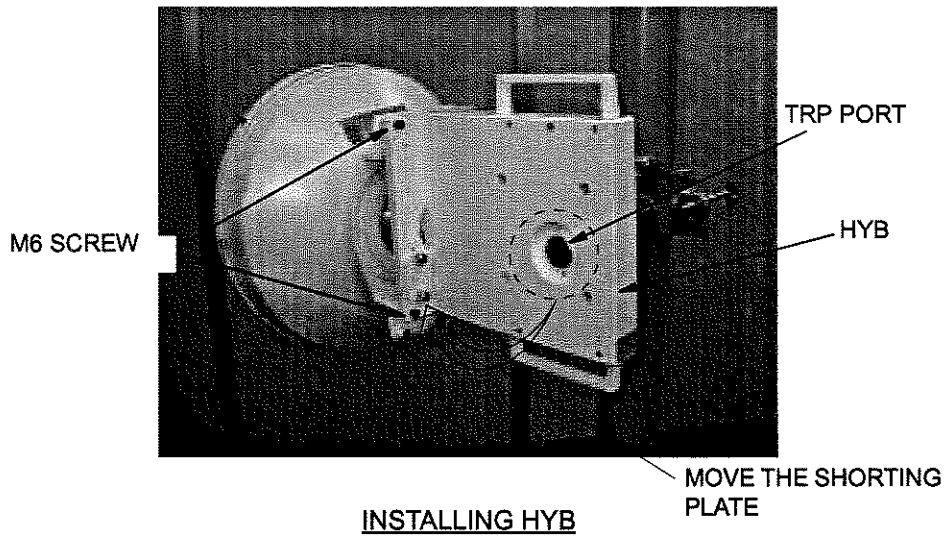
Chart 2-10 TRP Antenna Direct Mounting Using Quasar Hybrid

Step	Procedure
1	Fix the HYB to the antenna by tightening them with the M6 screws (four locations).



Notes: 1. Be careful not to damage the O-ring (Antenna).
2. The tightening torque is 4.0 N·m ± 10%.

INSTALLING ANTENNA



INSTALLING HYB

Chart 2-10 TRP Antenna Direct Mounting Using Quasar Hybrid (Cont'd)

Step	Procedure
2	Insert the O-rings to the TRP ports of the HYB.
3	Fix the two TRPs with hex screws (four locations) using the allen key wrench.

Note: Be careful not to damage the O-rings (Hybrid).

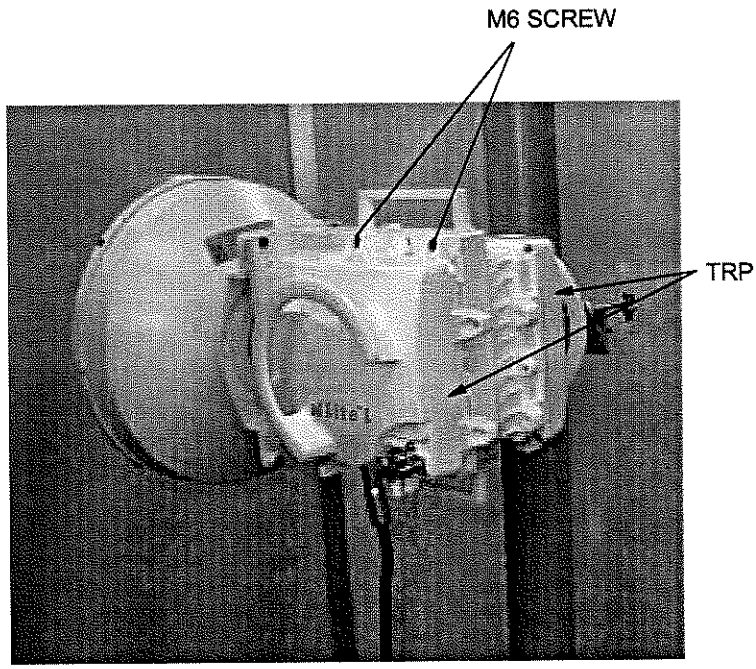


Chart 2-11 TRP Waveguide Connection

Step	Procedure
1	Connect the waveguide to the TRP and fix the waveguide to the TRP with four bolts.

Note: Be careful not to damage the O-ring.

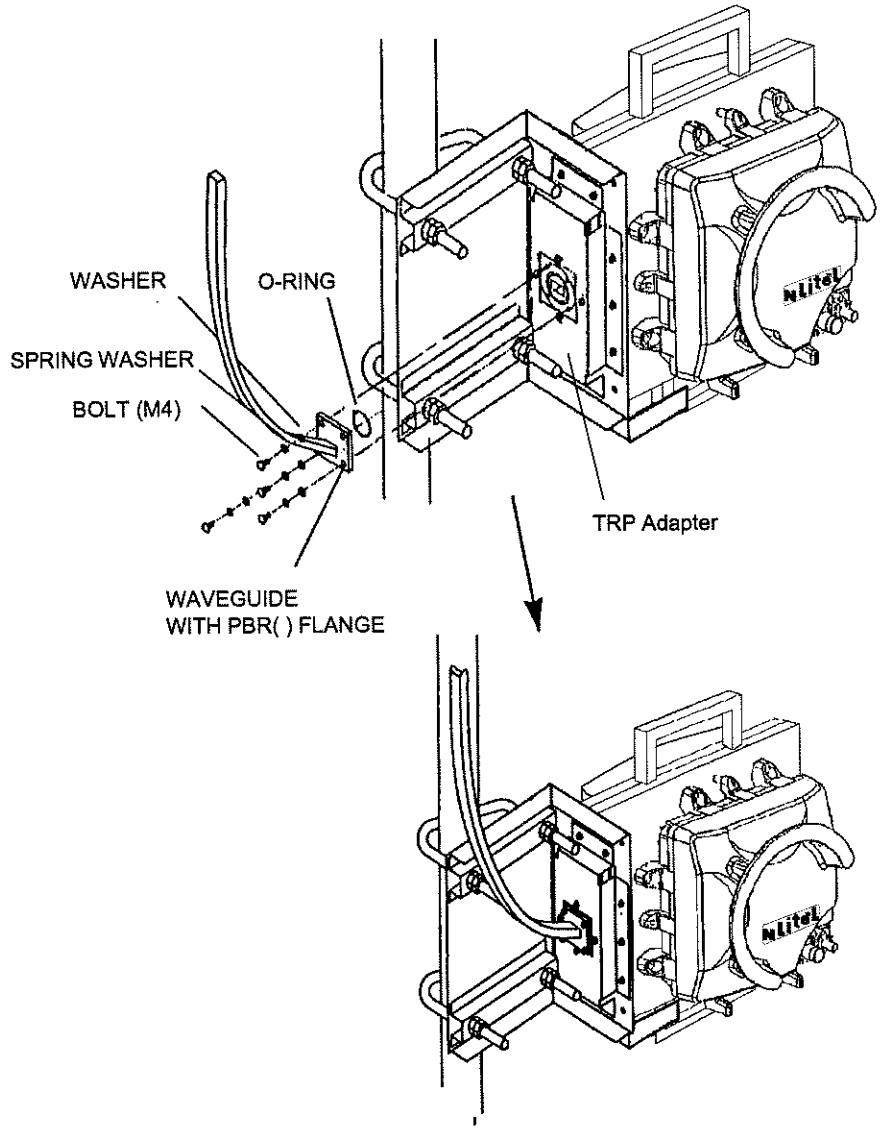
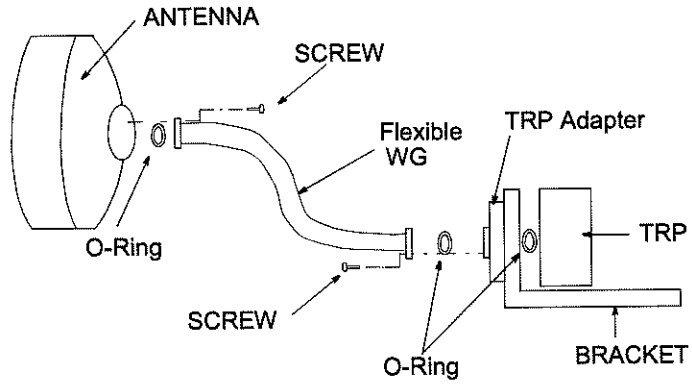


Chart 2-11 TRP Waveguide Connection (Cont'd)

Step	Procedure
2	Connect the waveguide to the antenna and fix the waveguide, to the antenna with screws.



Notes: The flange type between Antenna and flexible waveguide must be matched. If necessary, a suitable waveguide flange transition must be adapted.

Flange type of the TRP is peculiar to NEC.

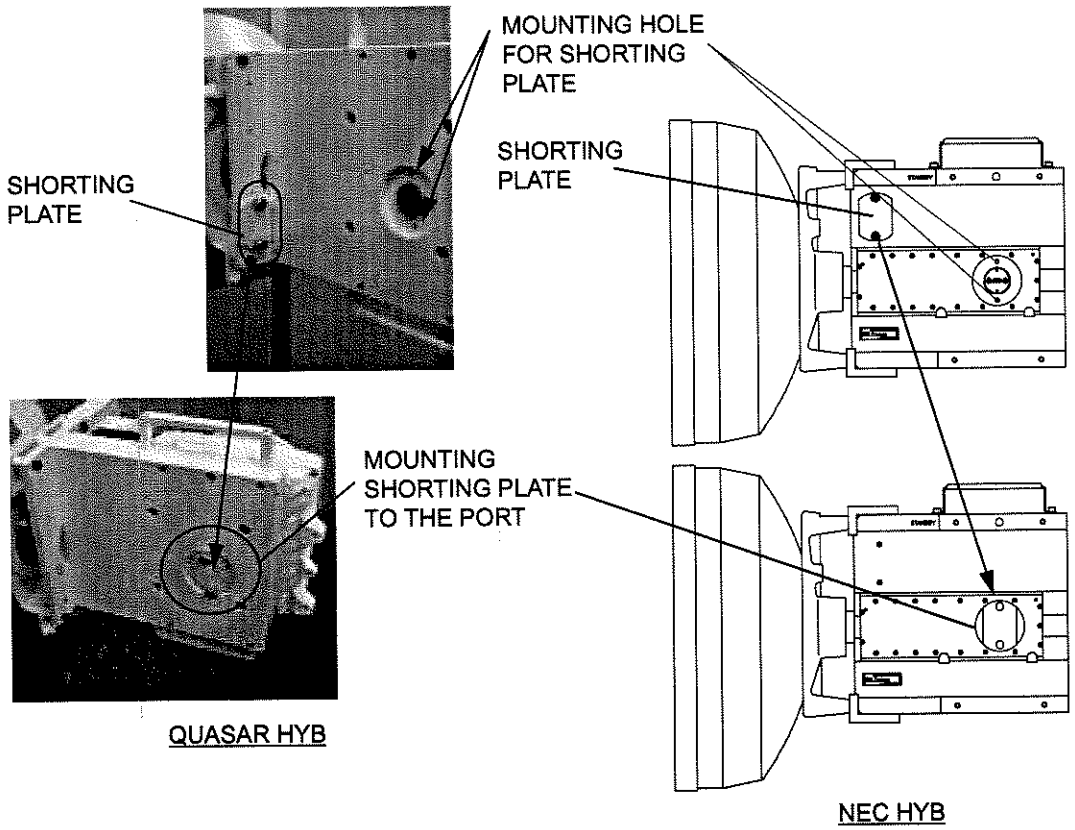
2.4.2 Demounting

For demounting the TRP (if necessary), use the following procedure.

Chart 2-12 TRP Demounting

Step	Procedure
1	Remove the four (or six) fixed bolts from the TRP.
2	Then demount the TRP.

Note: When demounting the TRP from the HYB, mount the attached shorting plate to the demounted port of the hybrid to avoid RF power leaking from the hybrid and for waterproofing.

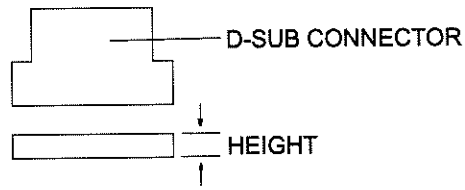


2.5 Cable Termination

In this section, the list of tools and material and the method for cable termination are described. The following cables are described for reference.

- D-sub connector (refer to Chart 2-13)*
- N-P connector of the L angle type (refer to Chart 2-14)**
- N-P connector of the straight type (refer to Chart 2-15)**
- Molex 5557-04R connector (refer to Chart 2-16)

*Notes: 1. * Use D-sub connectors of less than 16 mm on height as illustrated below.*



*2. ** The IF line cable length difference between the No.1 CH and the No.2 CH must not exceed 100 m (differential absolute delay time: within 500 ns) in 1+1 system.*

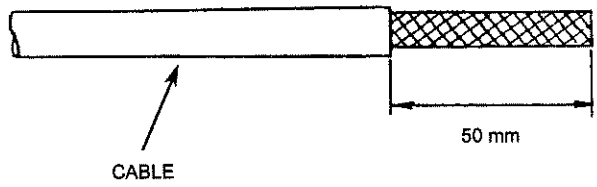
The necessary tools and materials are summarized in Table 2-3.

Table 2-3 Tools and Material List

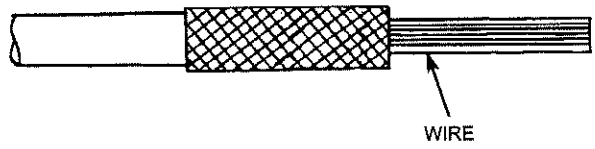
No.	NAME		REMARKS
1	Soldering Iron		
2	Solder		
3	Knife		
4	Measure		
5	Wire Stripper		
6	Adjustable Wrench		
7	Hand Crimping Tool	CL250-0012-2/ CL250-0013-5	For D-Sub connector
		57026-5000/ 57027-5000	For Molex connector

Chart 2-13 Terminating Supervisory Cables with D-Sub Connector

Step	Procedure
1	Strip back the cable sheath, taking care not to damage the braided shield.



2	Fold back the braided shield (do not separate the strands) and trim it as shown.



3	Remove the insulation over a length of 4 mm from the end of the wire. CONFORMABLE WIRE SOCKET CONTACT AWG#20-24 :CD-PC-111 AWG#24-28 :CD-PC-121

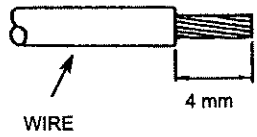
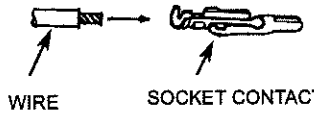


Chart 2-13 Terminating Supervisory Cables with D-Sub Connector (Cont'd)

Step	Procedure
4	Insert the cable into the socket contact.



5	The cable should be fitted so that insulation and bare wire are arranged as shown.

6	Insert the socket contact into the hand crimping tool. CONFORMING WIRE SOCKET CONTACT AWG#20-24 :TC-CD-111 AWG#24-28 :TC-CD-121

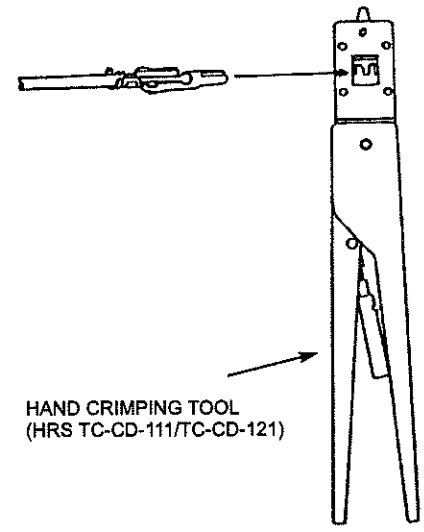
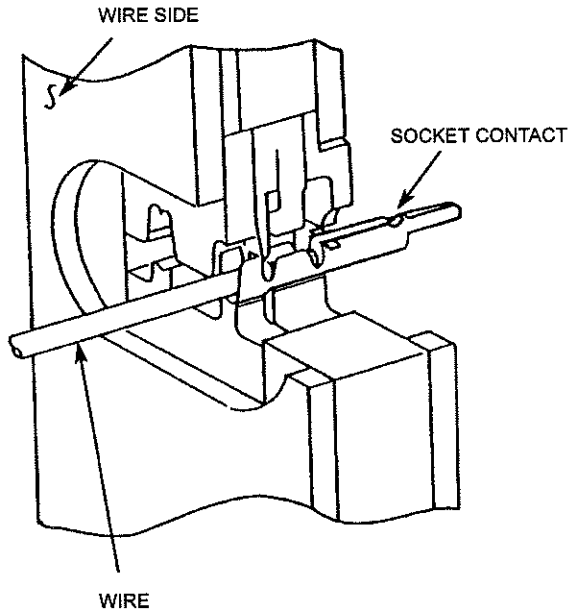


Chart 2-13 Terminating Supervisory Cables with D-Sub Connector (Cont'd)

Step	Procedure
7	Recheck that the wire position is as shown in step 5 before crimping the socket contact (see illustration at below).



8	Wind the metallic shield tape on the braided shield.

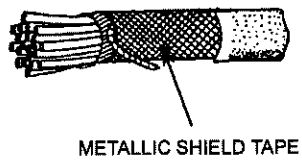


Chart 2-13 Terminating Supervisory Cables with D-Sub Connector (Cont'd)

Step	Procedure
9	Set the cable into the plug case as shown in figure. Then, fit the cable using the cable clamper and two screws.

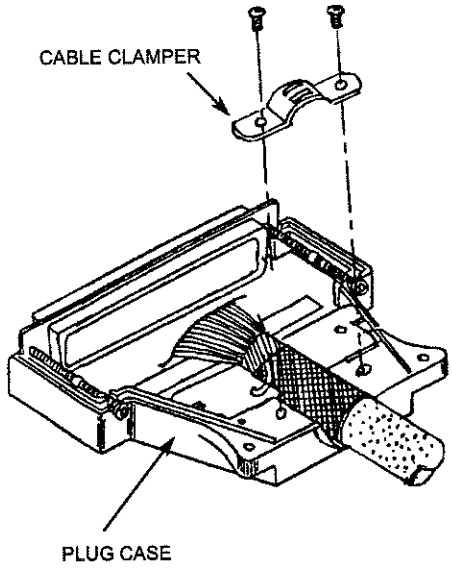


Chart 2-13 Terminating Supervisory Cables with D-Sub Connector (Cont'd)

Step	Procedure
10	Referring to circle A, fix the drain wire with screw.
11	Referring to circle B, insert each wire to the specified position of corresponding interface terminal. Insert the socket contacts into the upper and lower row positions while taking care that the socket contacts are inserted the right way round.

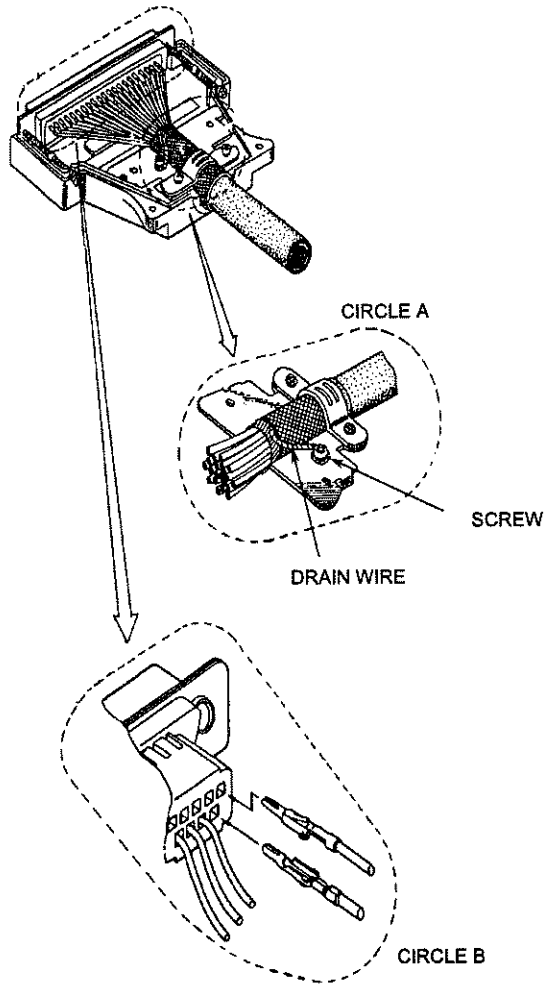


Chart 2-13 Terminating Supervisory Cables with D-Sub Connector (Cont'd)

Step	Procedure
12	Fix the plug case with two screws, as shown in the figure.

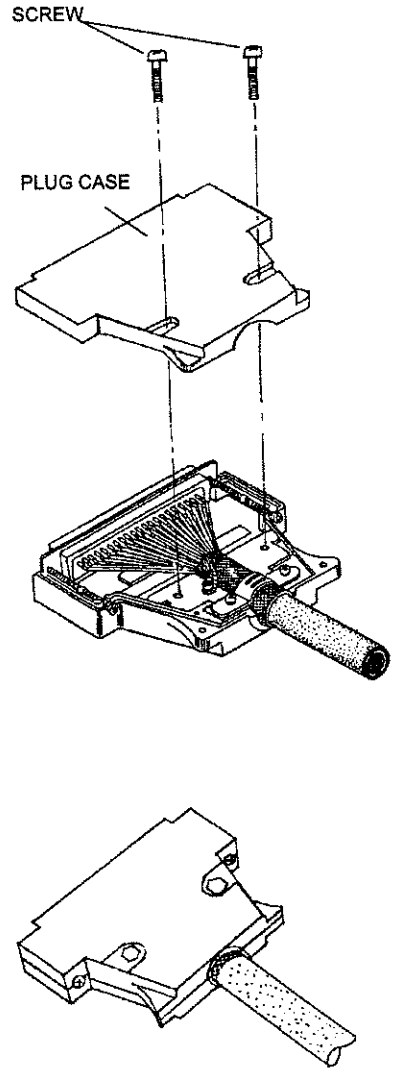
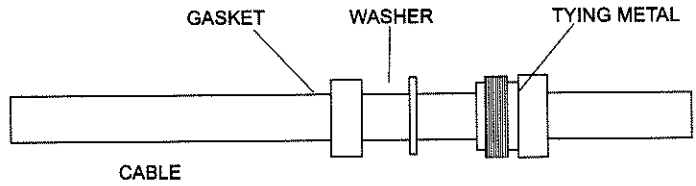
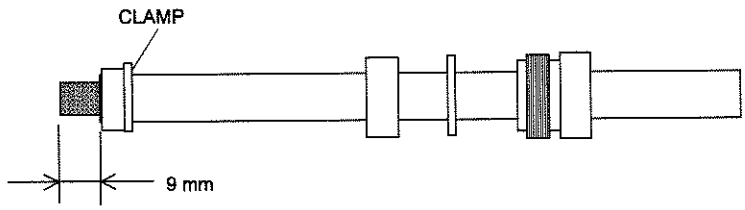


Chart 2-14 Terminating Coaxial (IF Signal) with N-P Connector (L Angle Type)

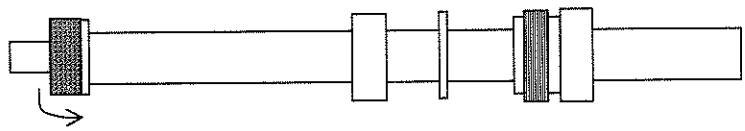
Step	Procedure
1	First fit the tying metal, washer and gasket on the cable.



2 Strip back the cable sheath, taking care not to damage the braided shield, and fit the clamp.



3 Fold back the braided shield (separating the strands of the braid) and trim it.



Note: Pay attention not to damage the plait.

4 Insert the ferrule.

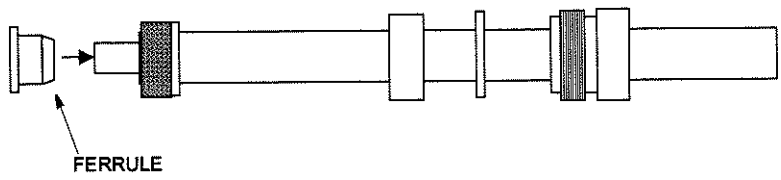
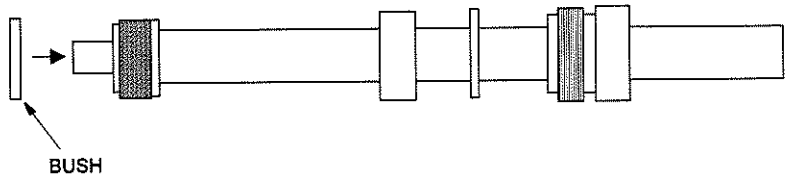


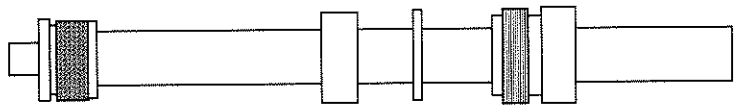
Chart 2-14 Terminating Coaxial (IF Signal) with N-P Connector (L Angle Type) (Cont'd)

Step	Procedure

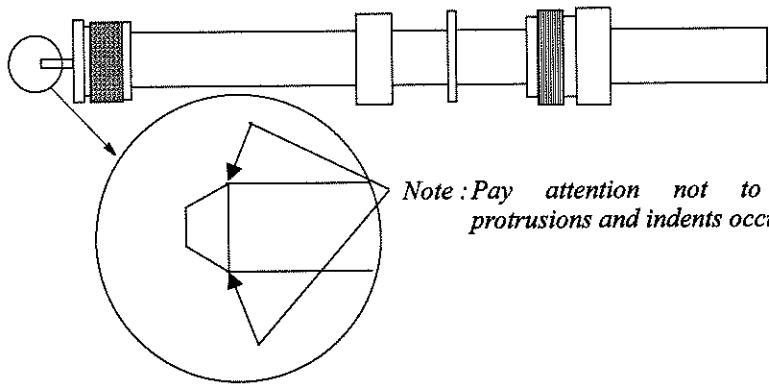
5 Fit the bush.



6 Cut the aluminium foil and inner insulator away along the bush and retain the inner conductor.



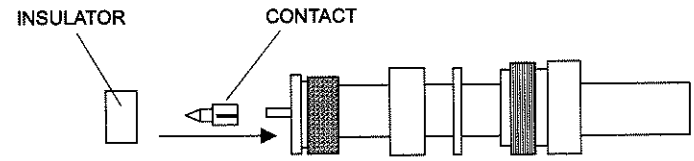
7 Taper the edge of the center conductor using a file as shown in the enlarged view below.



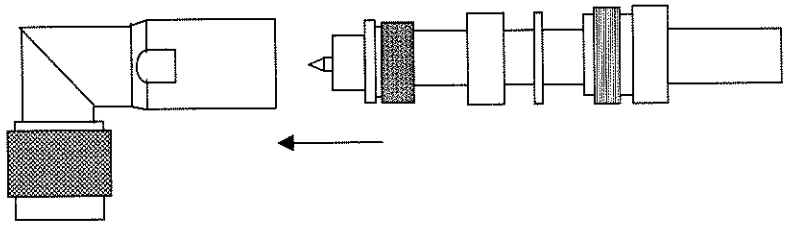
Note : Pay attention not to let protrusions and indents occur.

Chart 2-14 Terminating Coaxial (IF Signal) with N-P Connector (L Angle Type) (Cont'd)

Step	Procedure
8	Mount the contact onto the center conductor and mount the insulator onto the contact.



9	Insert the cable into the shell.



10	Tighten the tying metal with wrench point by wrench (Tighten with torque 4 to 10 N·m)

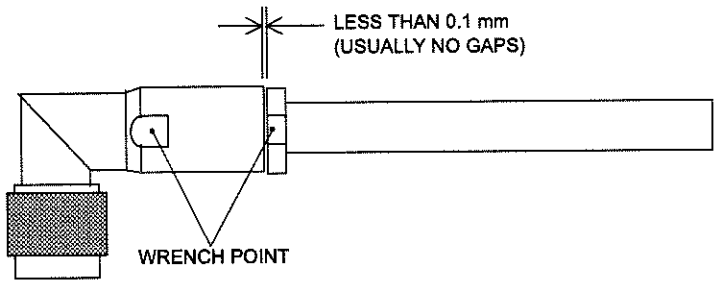
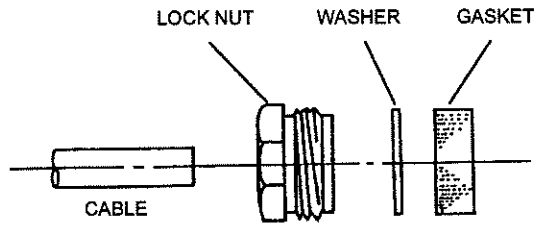


Chart 2-15 Terminating Coaxial (IF Signal) Cables with N-P Connector (Straight Type)

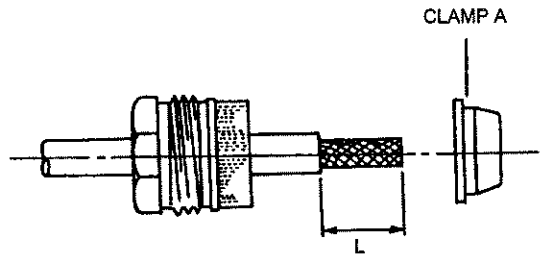
In case of marking "NDK" on connector, please ask NEC for cable process.

Step	Procedure

1 First fit the lock nut, washer and gasket on the cable as shown.



2 Strip back the cable sheath, taking care not to damage the braided shield, and fit clamp A.

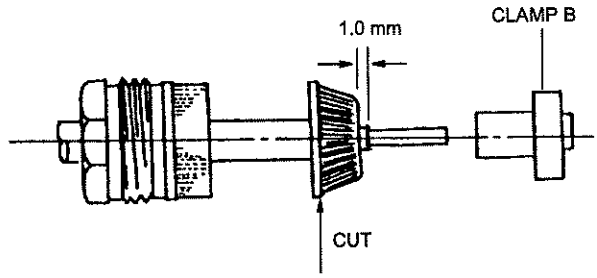


CONNECTOR	CABLE	L
N260	5D-FB	25 mm
N227	8D-FB	25 mm
N228	10D-FB	27 mm
N229	12D-FB	27 mm

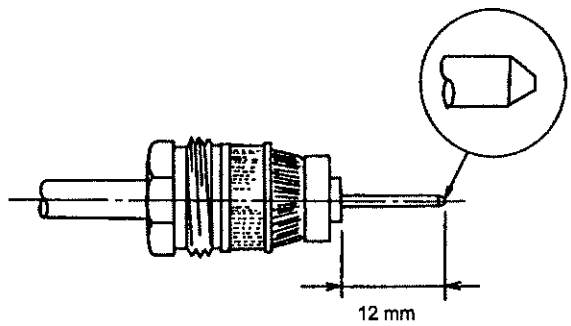
3 Fold back the braided shield (separating the strands of the braid) and trim it.

Chart 2-15 Terminating Coaxial (IF Signal) Cables with N-P Connector (Straight Type) (Cont'd)

Step	Procedure
4	Cut away the insulation from the center conductor and fit clamp B. Be sure not to cut or scratch the conductor while stripping the insulation.



5	Cut the center conductor. Taper the end of the center conductor using a file as shown in the enlarged view below.



6	Mount the center contact onto the center conductor as shown.

Note: Insert the center contact into insulator (1.5 mm).

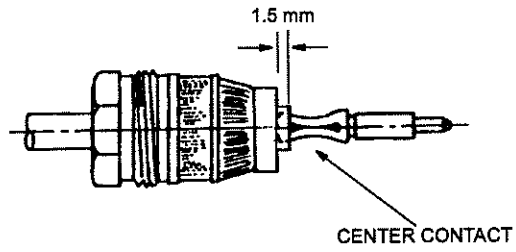
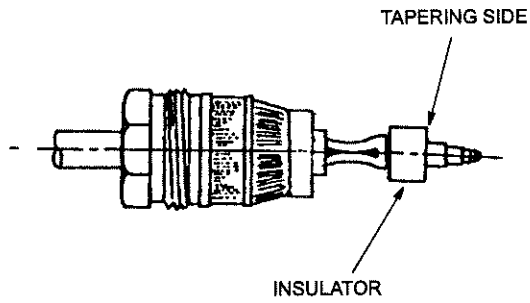
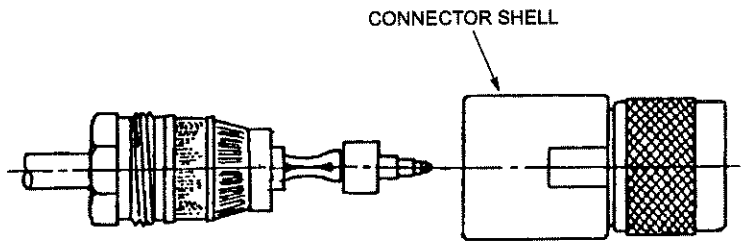


Chart 2-15 Terminating Coaxial (IF Signal) Cables with N-P Connector (Straight Type) (Cont'd)

Step	Procedure
7	Mount the insulator onto the center contact.



8 Insert the cable into the connector shell.



9 Tighten the lock nut.

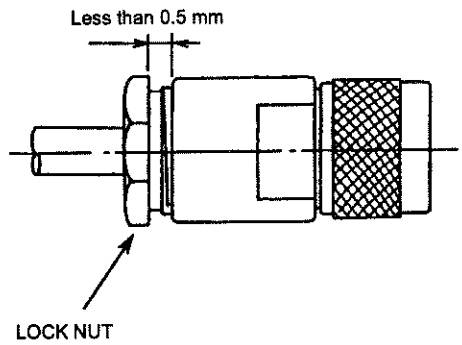
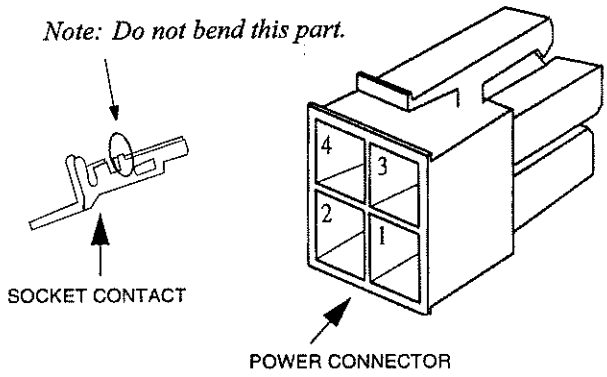


Chart 2-16 Terminating Power Supply Cables with Molex Connector

Step	Procedure



1 Remove 3.0 to 3.5 mm of insulation.

CABLE

AWG#16

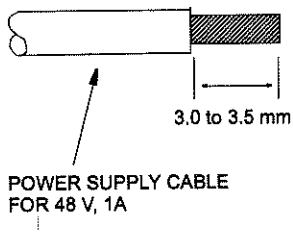
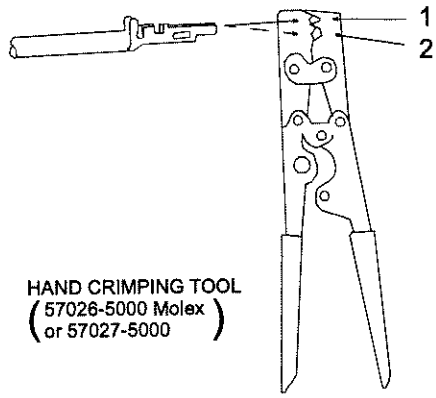


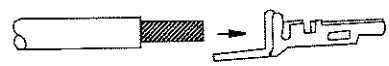
Chart 2-16 Terminating Power Supply Cables with Molex Connector (Cont'd)

Step	Procedure
2	Set the socket contact to position 1 or 2 of the hand crimping tool.



HAND CRIMPING TOOL TYPE	OUTSIDE DIAMETER OF CABLE	SET POSITION
57026-5000	ϕ 1.5 to 1.8	1
	ϕ 1.8 to 2.2	2
57027-5000	ϕ 2.3 to 2.6	1
	ϕ 2.6 to 3.1	2

3 Squeeze the handle of the hand crimping tool, insert cable into socket contact.



4 The cable should fit, so that insulation and bare wire are arranged as shown.

5 Squeeze the handle of the hand crimping tool until the ratchet is released.

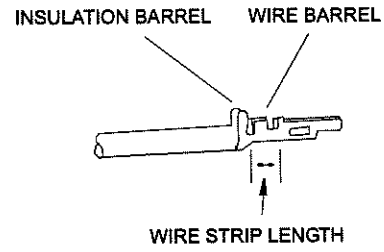
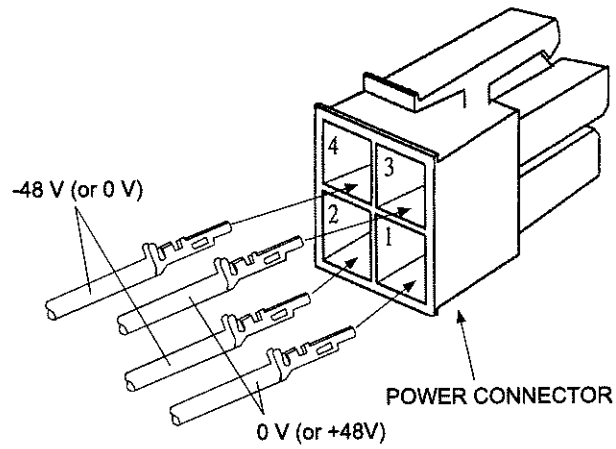


Chart 2-16 Terminating Power Supply Cables with Molex Connector (Cont'd)

Step	Procedure
6	Insert the socket contacts into the power connector till they lock.



2.6 Cable and Terminal Connections

Set up as in Fig. 2-11 referring to the following connecting method.

(a) IF signal cable

Connect the connector correctly and tighten it by turning the tightening ring clockwise.

Note: The difference of IF line cable length between the No.1 channel IF cable length and the No.2 channel IF cable length should be within 100m (differential absolute delay time: within 500 ns).

(b) Data signal cable and supervisory cable

Connect the D-sub connector correctly and fix it with two screws (#4-40).

(c) Modular cable

Insert the Modular connector correctly.

(d) Baseband signal cable

Align the BNC connector guide groove to the other connector guide ridge and turn the connector cap clockwise fully until it is locked firmly.

(e) Power supply cable

Insert the Molex connector correctly.

Table 2-2 and Table 2-3 in Section II OPERATION show pin assignment in the MDP and TRP.

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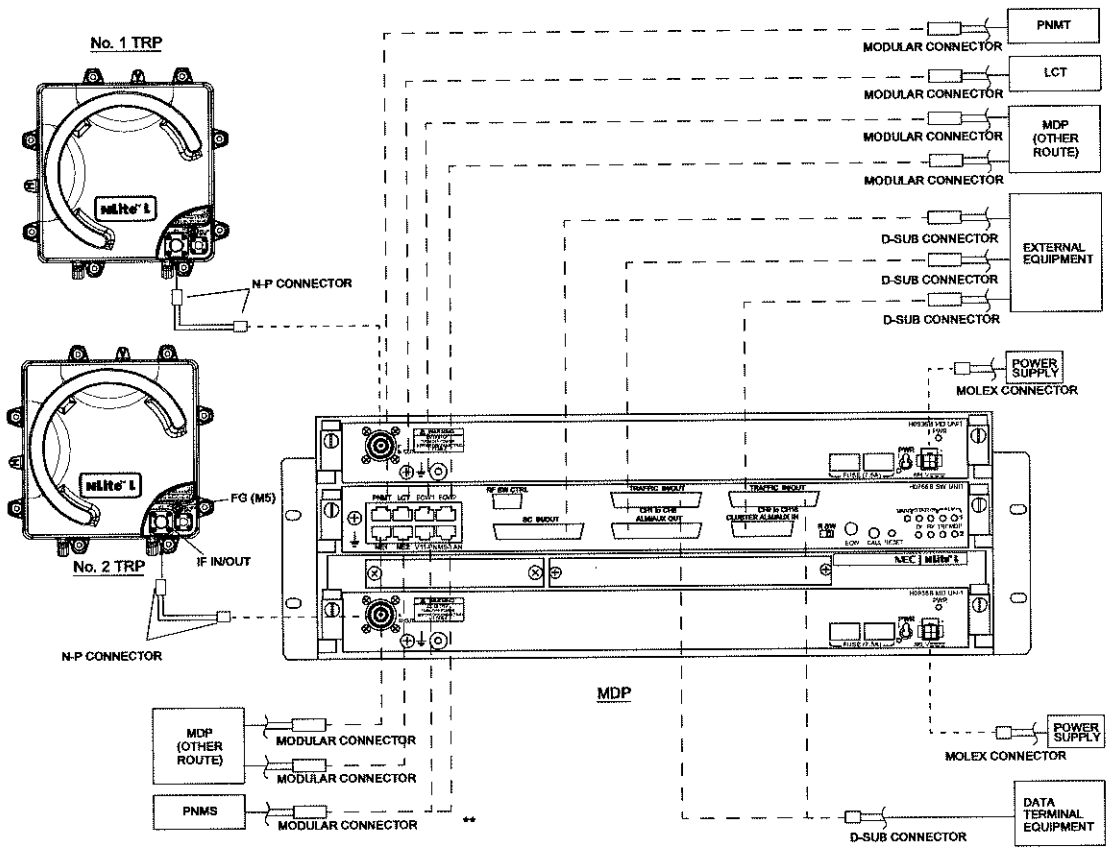


*Notes: 1. ** Either (V.11 or 10 Base-T) can be selected.*
2. The difference of IF line cable length between the No.1 CH and the No.2 CH must not exceed 100m (differential absolute delay time: within 500 ns).

For 8/16 × 1.5 MB System

Fig. 2-11 Cable and Terminal Connections of MDP and TRP

2.7 Frame Grounding

In mounting the MDP and TRP, perform frame grounding. The location of the frame grounding in each MDP and TRP is shown in Fig. 2-12, and the connection for frame grounding is shown in Fig. 2-13.

Note: Connect the Frame Ground (FG) terminal on the MDP to the mounting rack with the earth cable. In addition, connect the mounting rack to the indoor earth terminal with the earth cable and connect the FG terminal on the TRP to the ground (refer to Fig. 2-13).

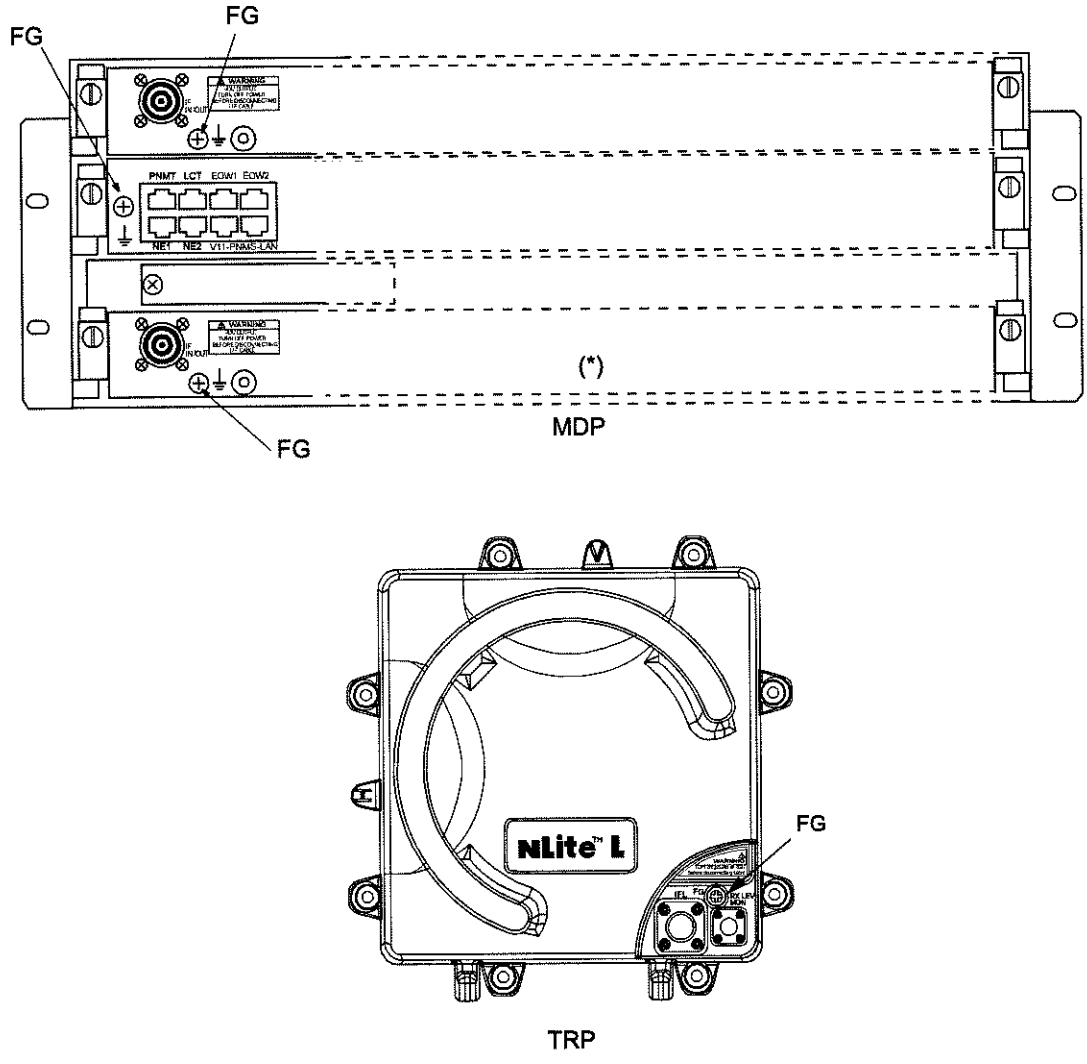
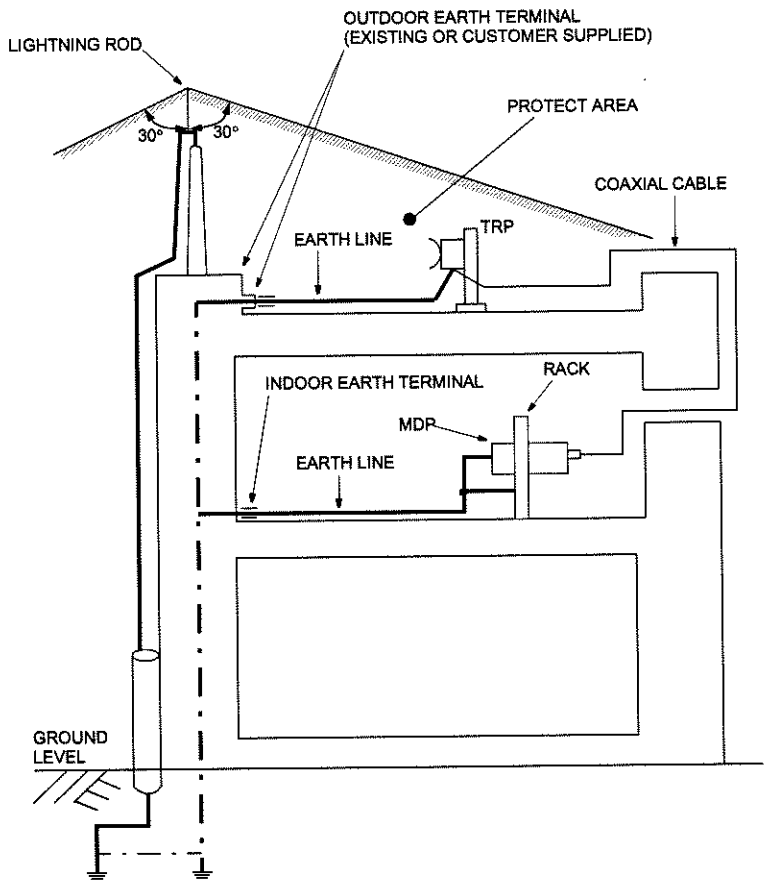


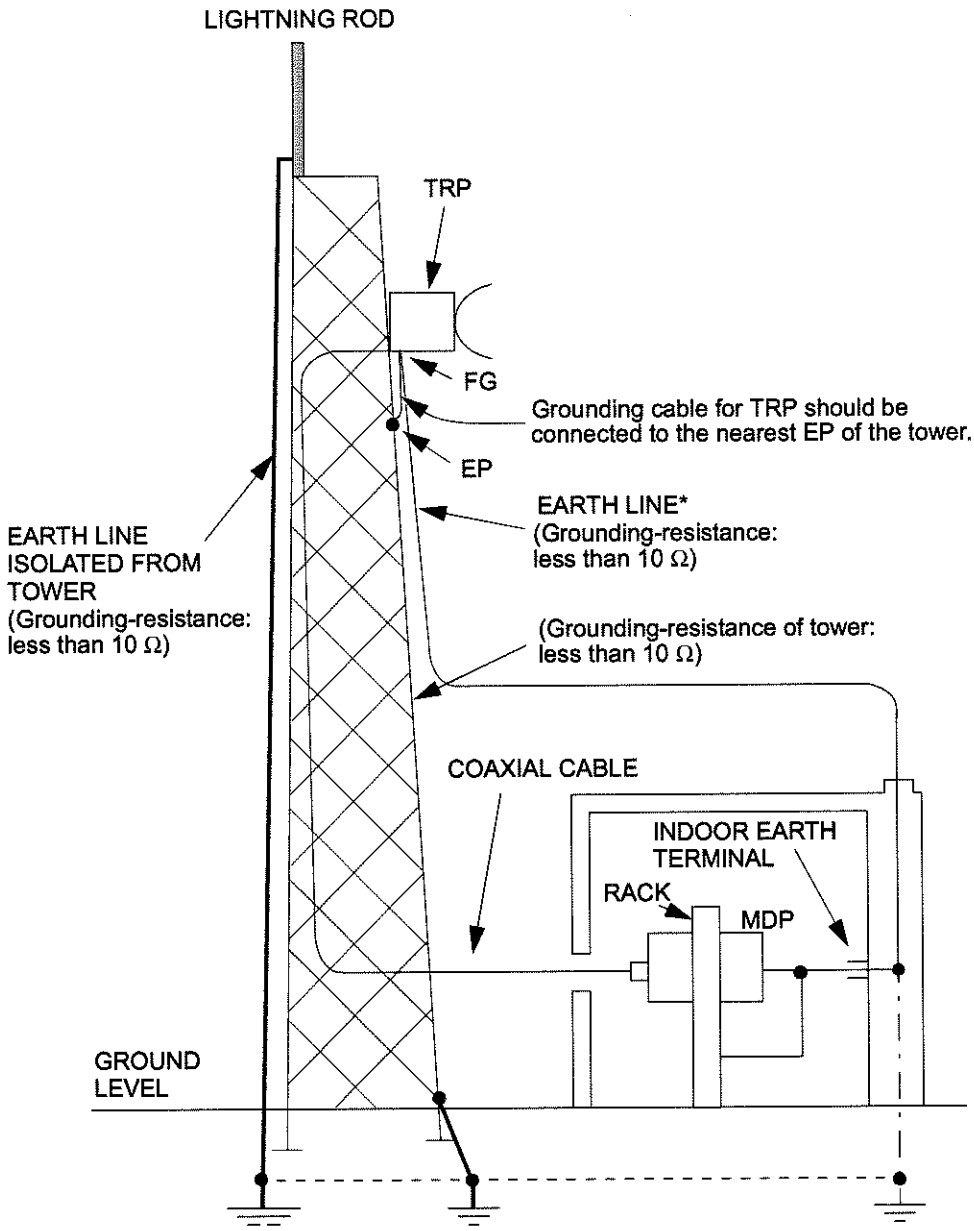
Fig. 2-12 Location of Frame Ground



Cautions: *1. Install the TRP within the area protected by lightning rod.*

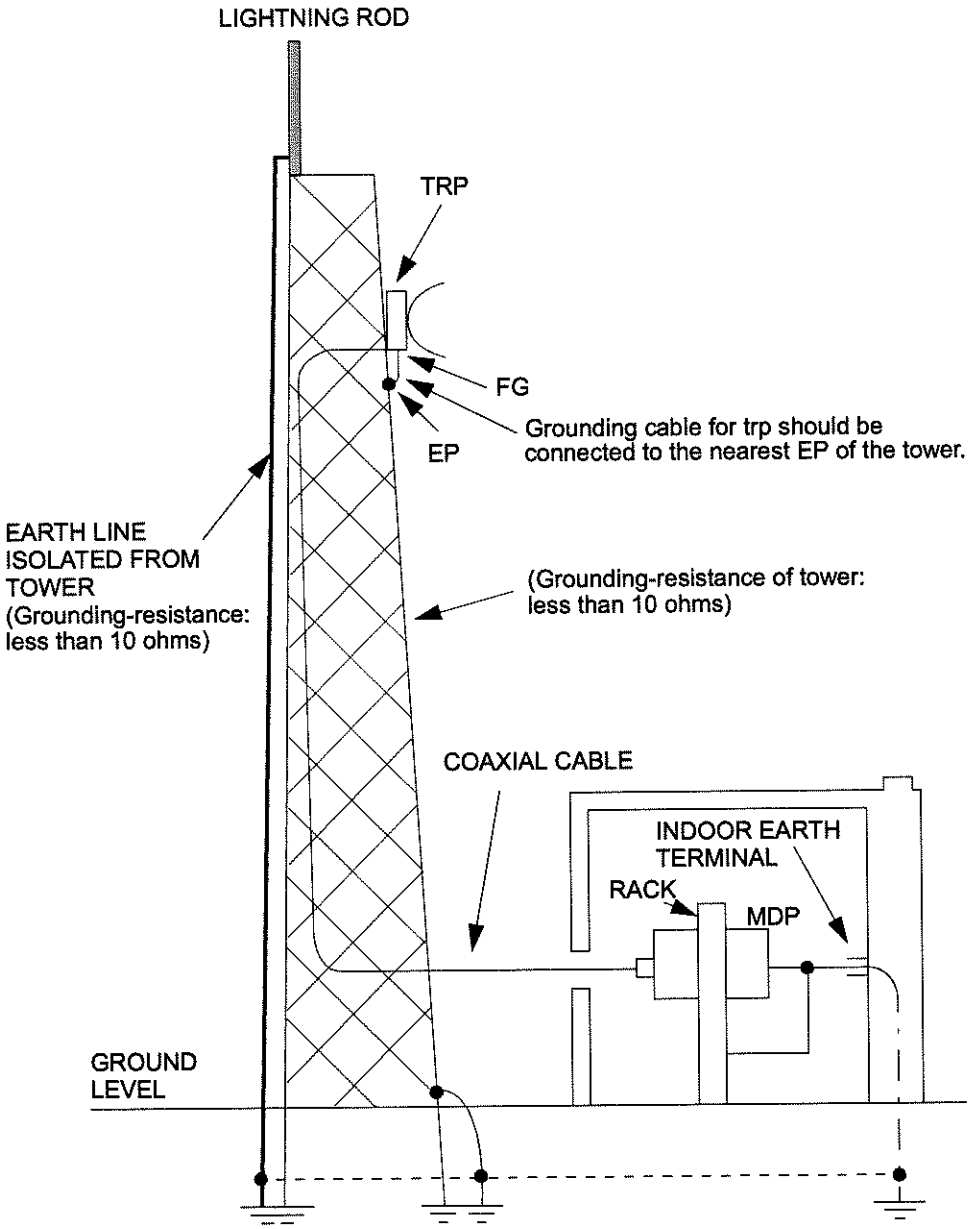
2. To avoid surge currents caused by lightning circulating in the equipment earth system, connect the equipment earth system (frame ground) to ground of the lightning rod at ground level.

Fig. 2-13 Connection for Frame Grounding (1/4)



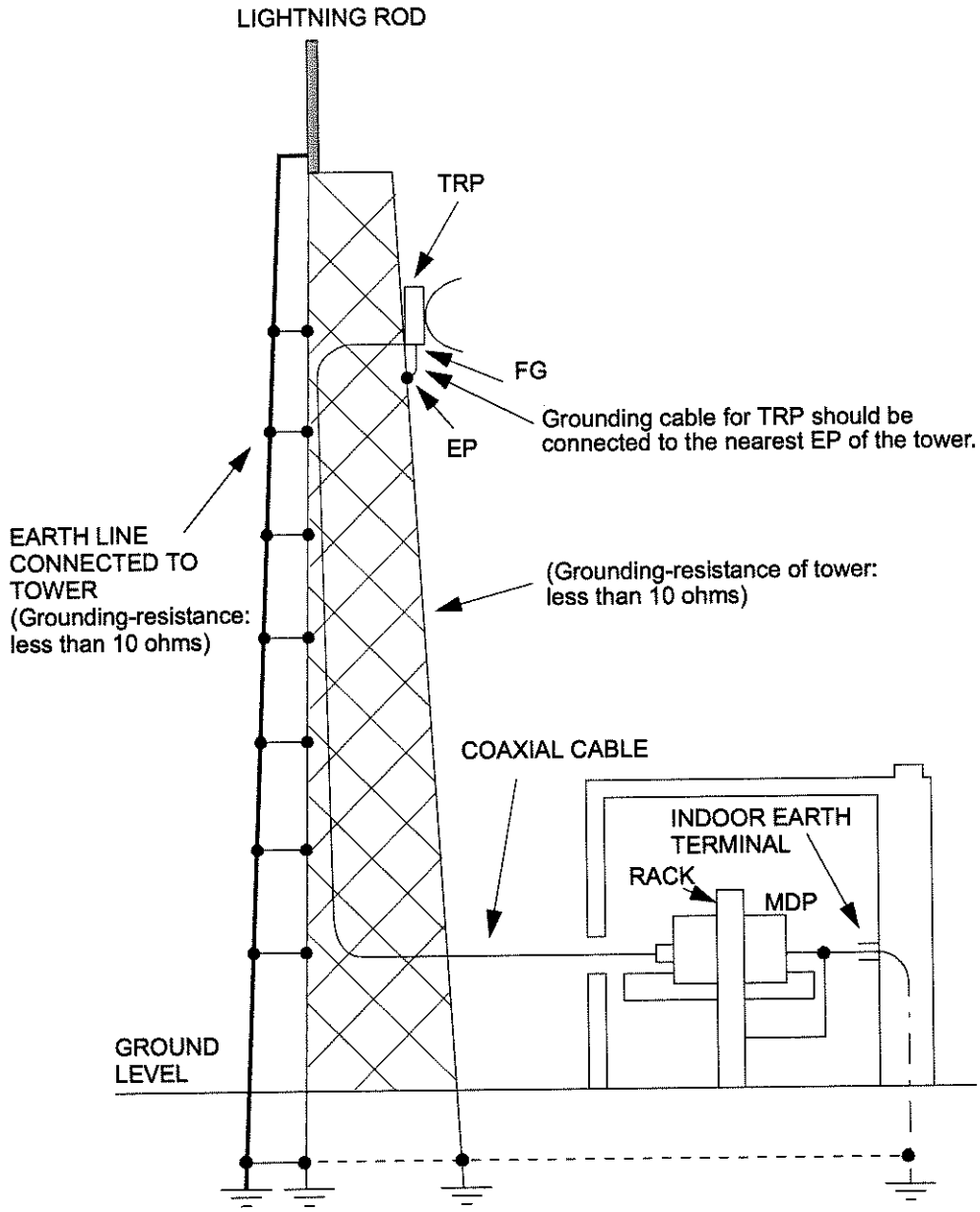
Note: ** NEC recommends that the earth line should be connected to the frame ground of TRP and installed as shown above.*
EP : Earthing Point of tower
FG : Frame Ground terminal

Fig. 2-13 Connection for Frame Grounding (2/4)



EP : Earthing Point of tower
FG : Frame Ground terminal
This connection is an example.

Fig. 2-13 Connection for Frame Grounding (3/4)

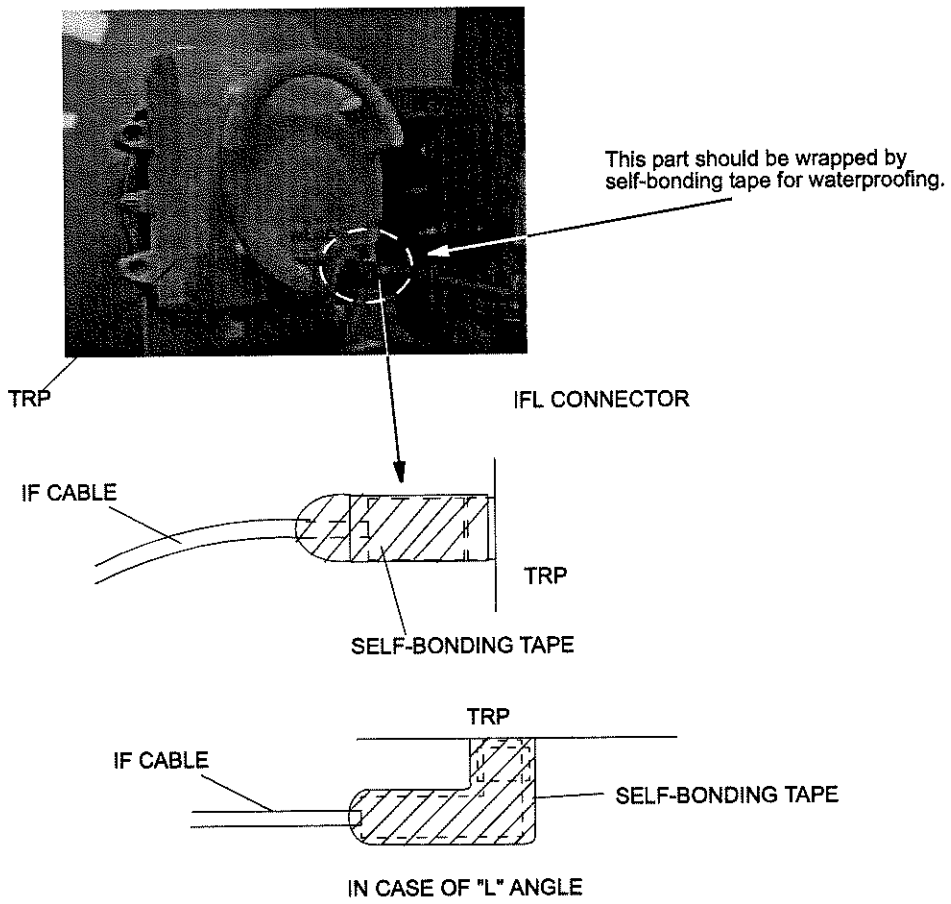


EP : Earthing Point of tower
FG : Frame Ground terminal
This connection is an example.

Fig. 2-13 Connection for Frame Grounding (4/4)

2.8 Waterproof Protection

After cable connection, the following part should be wrapped by self-bonding tape for waterproof (see Fig. 2-14).



Note: The self-bonding tape should be prepared by the customer.

Fig. 2-14 Location of Connector for Waterproof

3. INITIAL LINE UP

This chapter provides instructions for the initial lineup of the equipment. Included is information on start-up, shut-down, MDP and TRP equipment setting, antenna orientation and lineup test for the equipment.

If orderwire communication is required, connect the X0818A OW/RX LEV Monitor unit to the TRP. The OW/RX LEV Monitor unit operates on a dry battery (6F22/9V).

Notes: *1. Insert the battery with correct polarity.*

2. When the OW/RX LEV Monitor will not being used for long periods of time, remove the battery to avoid damage from battery leakage and corrosion.

3. Set the OW switch to ON when the orderwire is used. If the OW indicator is not lit even after the OW switch is set to ON, replace the battery.

3.1 Start-up

Referring Chart 3-1 Check the polarity and voltage of the power supply cable before connecting the cable to the MDP.

Warning: ***1. The –43 V DC power is superimposed on the center conductor of the IF coaxial cable between the MDP and the TRP. Connecting test equipment directly to this terminal may damage it and touching the coaxial cable core may cause electrical shock.***

2. Persons performing servicing must take necessary steps to avoid electro-static discharge which may damage the modules on the MDP or cause error. Wear a conductive wrist strap connected to the grounded (FG) jack on the front of the equipment shelf. This will minimize static build-up during servicing.

3. Do not disconnect the IF cable between the MDP and the TRP in operating condition, to avoid damaging the MDP and TRP. Do not remove/connect the IF cable with the MDP power ON, turn the MDP power OFF before connecting/disconnecting the IF cable.

4. After turning ON the equipment, wait at least 1 minute before turning it OFF again. Repeatedly turning the power ON and OFF within a short interval may cause the MDP to fail.

5. Contact NEC before program download on the LCT is performed. Equipment may not function correctly with improper operation.

Caution: ***1. Be careful that top surface of the MDP is considerably hot.***

Chart 3-1 Power Turn ON

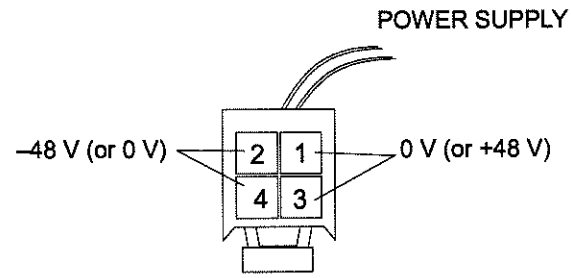
Caution: Do not apply a voltage to the equipment that varies sharply. The equipment may operate improperly.

Apparatus:
Suitable Screwdriver
Digital Multimeter

Step	Procedure

Note: The TRP power is also supplied through the MDP power switch.

1 Check that the No.1 CH SEL V in voltage is between –36 to –60 V (or +36 to +60 V) with the digital multimeter, before connecting the power cable as shown below to the No.1 CH MDP,



2 Check that the IF line cable between the MDP and the TRP is connected,

3 Turn on the No.1 PWR switch on the MDP (see Fig. 3-1),

4 Confirm that No.1 PWR indicator on the MDP is lighted.

5 Repeat steps 1 to 4 for No.2 channel in 1+1 system,

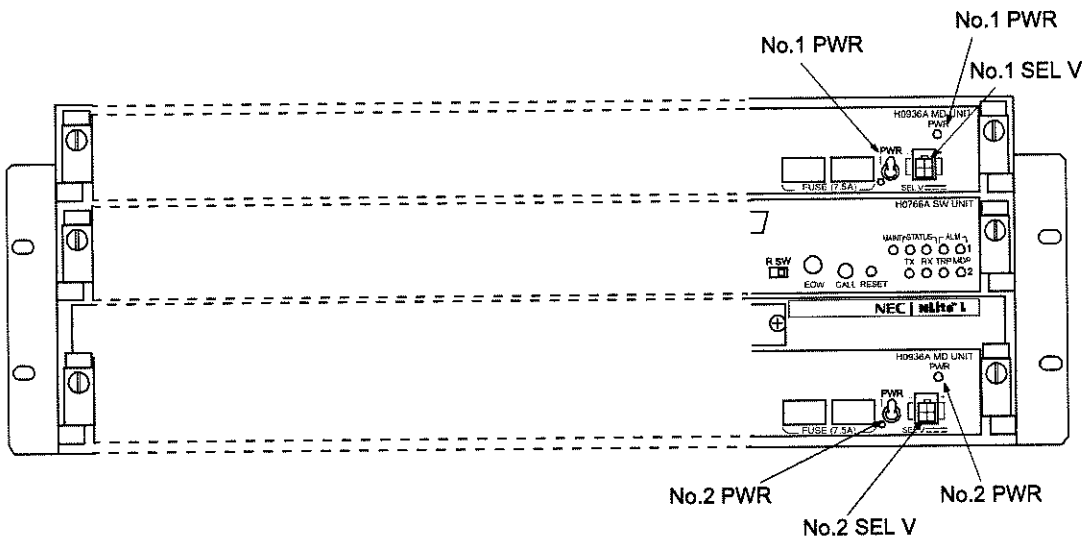


Fig. 3-1 Connector, Power Switch and Indicator Location

3.2 Shut-down

The shut-down procedure for the equipment is shown in Chart 3-2.

Warning: After turning ON the equipment, wait at least 1 minute before turning it OFF again. Repeatedly turning the power ON and OFF with in a short interval may cause the MDP to fail.

Chart 3-2 Shut-down

Step	Procedure
1	Turn off the No.1 (or No.2 CH PWR in 1+1 system) switch on the MDP (see Fig. 3-1).

3.3 Initial Setting

The initial setting of the MDP/TRP is performed by the LCT according to Table 3-1.

Table 3-1 Initial Setting Items

	Item	Remarks
1.	System Configuration Setting	Chart 5-1 in Section II
2.	Date and Time Setting	Chart 5-2 in Section II
3.	Provisioning Setting	Chart 5-3 in Section II
4.	Relay/House Keeping Setting	Chart 5-4 in Section II

The details of the setting with LCT, refer to chapter 5 in Section II.

3.4 Antenna Orientation

After the initial setting has been compelted, an antenna orientation is performed between two stations according to the procedures in Chart 3-3.

Chart 3-3 Antenna Orientation

Apparatus :

HP 3466A Digital Multimeter (or equivalent) with test leads or X0818A OW/RX LEV Monitor unit

Wrench

Step	Procedure
1	Connect the RS-232C cable between the LCT and MDP (see Fig. 2-2 in Chart 2-1 in Section IV MAINTENANCE),
2	Open the Terminal software (e.g; HyperTerminal),
3	Enter Login name "Admin" and press the "Enter" key, enter the password "12345678" and press the "Enter" key, At each station, when the TX power control is operated in ATPC, change the setting from "ATPC" to "MTPC" on the TX Power Control item of System Configuration using the LCT. *Note: In Antenna Alignment Mode, since ATPC control stops, it should be set to MTPC mode and TX power is fixed.*
4	Press the "3" key and "Enter" key to display provisioning data,

```
— NEC PDH RADIO  VER. X.XX.XX —
0. Logout
1. Alarm / Status
2. Performance Monitor
3. Provisioning Data
4. System Configuration
5. Inventory Data
6. Relay / House Keeping
7. Maintenance
Enter Selection :
```

At each station, TX power is set to the value calculated by the system design, but while antenna orientation, TX power should be set to 0 dB in MTPC TX PWR mode so that TX power becomes the maximum (TX power setting can be performed by MTPC TX PWR item of "Provisioning Data" using LCT).

Note: The MTPC TX PWR is the item which sets up the quantity of attenuation of transmitter power, and adjusts transmitter power with the quantity of this attenuation.

Chart 3-3 Antenna Orientation (Cont'd)

Step	Procedure

```
--- Provisioning Data ---
 1. Display Current Data
 2. Set Provisioning Data
Enter Selection : 2

--- Set Provisioning Data ---
 1. Main / LAN Signal configuration
 2. BER Threshold
 4. SC Assignment
 5. MTPC TX PWR  ..... *1
 6. ATPC Range ..... *2
 8. RX Threshold
 9. Additional ATT
10. TRP ALM Mode
13. Channel Usage Error
16. AIS Activation Condition
17. AIS Activation Delay Time
18. AIS Generated Report
19. AIS Received Report
Enter Selection :
```

*Note: *1 MTPC TX PWR is indicated when the "Manual" is selected in ATPC Manual Control item by the LCT.*

**2 ATPC is indicated when the "Auto" is selected in ATPC Manual Control item by the LCT.*

5 Press the "ESC" key to go back to the following main menu,

```
--- NEC PDH RADIO  VER. X.XX.XX ---
 0. Logout
 1. Alarm / Status
 2. Performance Monitor
 3. Provisioning Data
 4. System Configuration
 5. Inventory Data
 6. Relay / House Keeping
 7. Maintenance
Enter Selection :
```

6 Press the "7" key for Maintenance and press the "Enter" key,

Chart 3-3 Antenna Orientation (Cont'd)

Step	Procedure

7 Press the "1" key to select MAINT mode and press the "Enter" key,

```
--- Maintenance ---
 1. MAINT Mode (OFF)
 2. Control
 3. Reset CPU
 4. Set Calendar
 5. Password Setting
 6. Program Download
Enter Selection :
```

8 Press the "1" key and press the "Enter" key to set the MAINT Mode to On. The maintenance screen is re-displayed,

Note: Control items can be performed only when the equipment is MAINT mode "ON".

```
--- MAINT Mode ---
 1. On
 2. Off
Enter Selection : 1
```

9 Press the "2" key to select control and press the "Enter" key,

```
--- Maintenance ---
 1. MAINT Mode (ON)
 2. Control
 3. Reset CPU
 4. Set Calendar
 5. Password Setting
 6. Program Download
Enter Selection :
```

Chart 3-3 Antenna Orientation (Cont'd)

Step	Procedure
10	At each station, press the "1" key twice for setting item 11 "Antenna Alignment Mode" of "Control" and press the "Enter" key,

Note: The "Antenna Alignment Mode" is used for extending the dynamic range of the RX LEVEL MONITOR (TRP). In this mode, since control of TX power stops, the normal operation can not be performed.

```
— Control —
 1. RF Frequency
 2. ATPC Manual Control
 3. TX SW Manual Control
 4. TX Mute
 5. RX SW Manual Control
 6. CW
 7. IF Loopback
 8. Main Signal Loopback (Near End)
 9. Main Signal Loopback (Far End)
10. Linealzer Control
11. Antenna Alignment Mode
16. LAN Device Reset
Enter Selection :
```

Note: Item 2 is displayed when ATPC mode is selected in system configuration setting.

Item 3 and 5 are displayed only in the 1+1 system.

11 At each station, remove the cap from the RX LEV MON connector on the TRP (see Fig. 3-2),

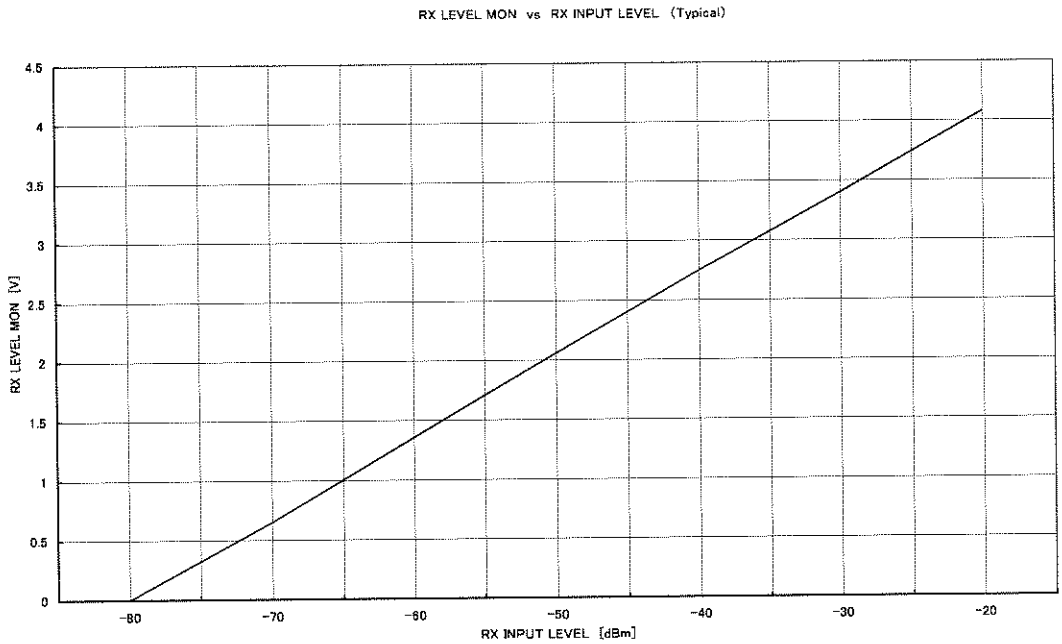
12 At each station, set up as in Fig. 3-2 (Connect cables between RX LEV/OW IN and RX LEV MON connectors using F-type plug),

13 At each station, adjust the azimuth and elevation angle of the antenna alternately so that the measured voltage becomes maximum,

Note: The relation of the RX INPUT LEVEL and RX LEVEL MON is shown below.

Chart 3-3 Antenna Orientation (Cont'd)

Step	Procedure



A. USING ANDREW VHLP TYPE BRACKET

AZIMUTH ANGLE ADJUSTMENT

13-1 Loosen bolts (1 in Fig. 3-3 (1/3)),

13-2 Adjust the azimuth angle by bolt (2 in Fig. 3-3 (1/3)),

13-3 Secure bolts loosened in step 13-1,

ELEVATION ANGLE ADJUSTMENT

13-4 Loosen bolts (3 in Fig. 3-3 (1/3)),

13-5 Adjust the elevation angle by bolt (4 in Fig. 3-3 (1/3)),

13-6 Secure bolts loosened in step 13-4,

Chart 3-3 Antenna Orientation (Cont'd)

Step	Procedure
	C. USING RFS SB1 TYPE BRACKET
	AZIMUTH ANGLE ADJUSTMENT
13-15	Loosen nuts of the U-bolt (3 in Fig. 3-3 (2/3)),
13-16	Loosen nuts (4 in Fig. 3-3 (2/3)),
13-17	Adjust the azimuth angle by nuts (5 in Fig. 3-3 (2/3)),
13-18	Secure nuts loosened in step 13-15 and 16,
	ELEVATION ANGLE ADJUSTMENT
13-19	Loosen bolts (1 in Fig. 3-3 (2/3)),
13-20	Adjust the elevation angle by nuts (2 in Fig. 3-3 (2/3)),
13-21	Secure bolts loosened in step 13-19,
	D. USING RFS SB2 TYPE BRACKET
	AZIMUTH ANGLE ADJUSTMENT
13-22	Loosen nuts (4 in Fig. 3-3 (3/3)),
13-23	Adjust azimuth angle by adjusting nuts (3 in Fig. 3-3 (3/3)),
13-24	Secure nuts loosened in step 13-22,
	ELEVATION ANGLE ADJUSTMENT
13-25	Loosen bolts (1 in Fig. 3-3 (3/3)),
13-26	Adjust elevation angle by adjusting nut (2 in Fig. 3-3 (3/3)),
13-27	Secure bolts loosened in step 13-25,
14	At each station, disconnect digital multimeter or OW/RX LEV MONITOR from RX LEV MON jacks,
15	At each station, reconnect the cap removed in step 9.
16	Reset the Antenna Alignment Mode control to OFF,
17	Reset the control from MTPC to ATPC,
18	Reset the mainte mode to OFF referring to steps 6 and 7 and press the "Enter" key,
19	Continue to Chart 3-4,

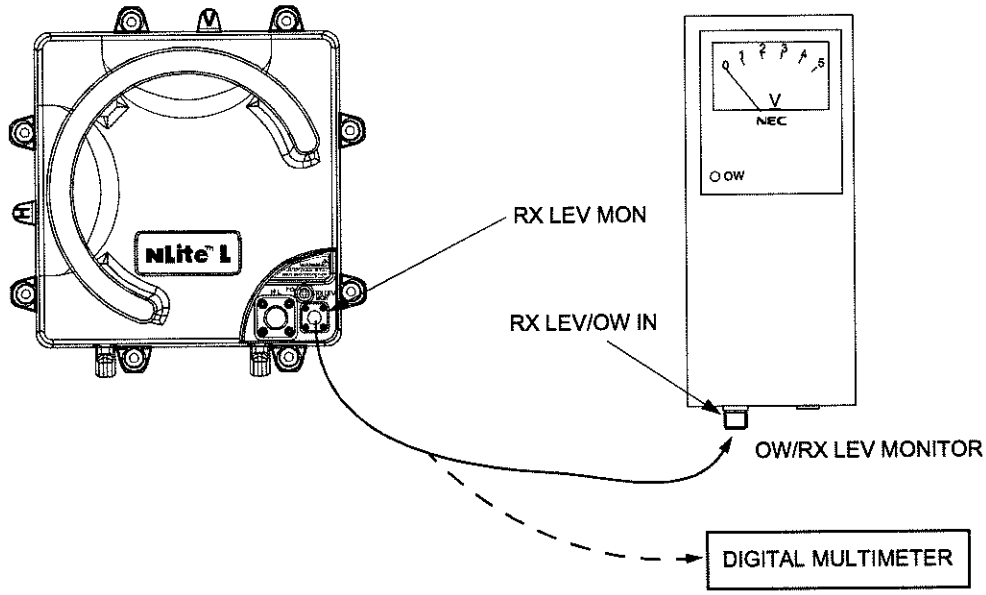
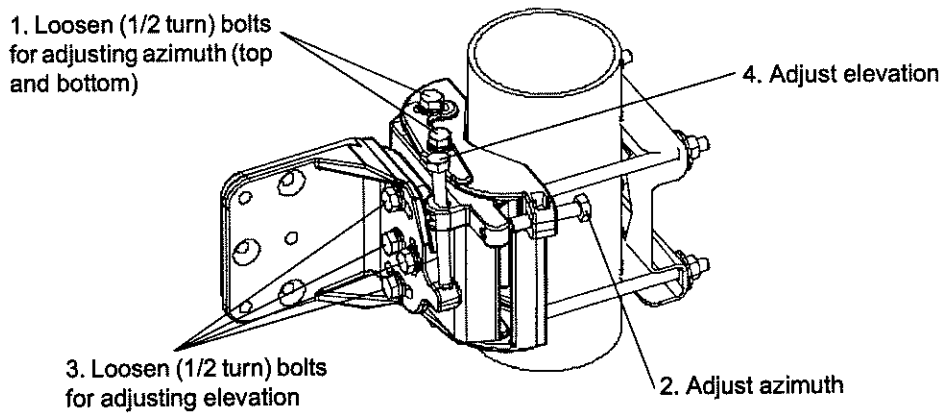
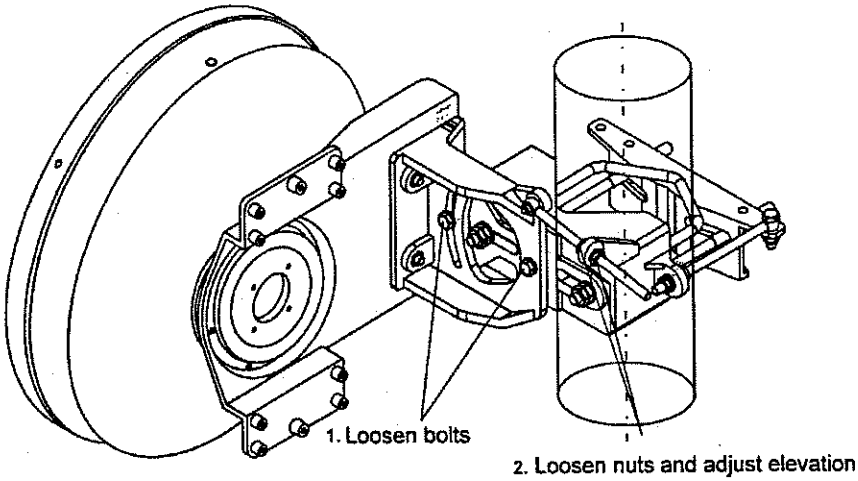


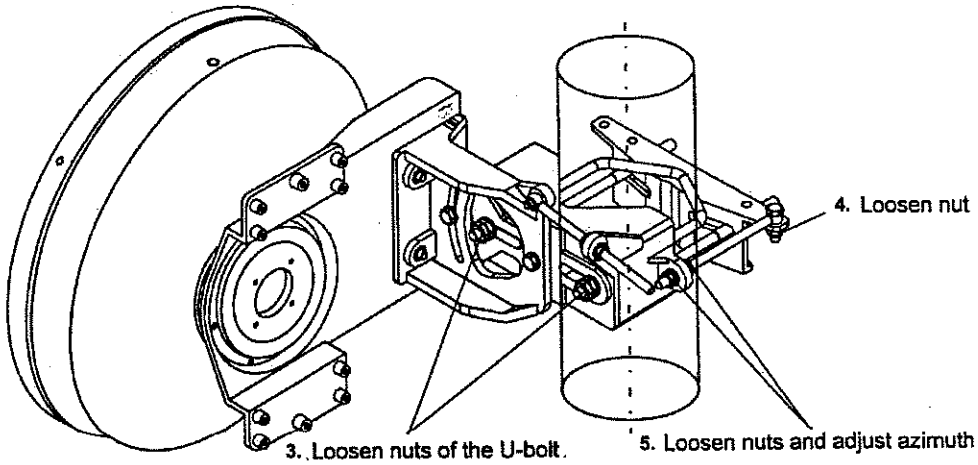
Fig. 3-2 Antenna Orientation Test Setup



ANDREW VHLP TYPE BRACKET

Fig. 3-3 Location of Adjusting Nuts (1/3)

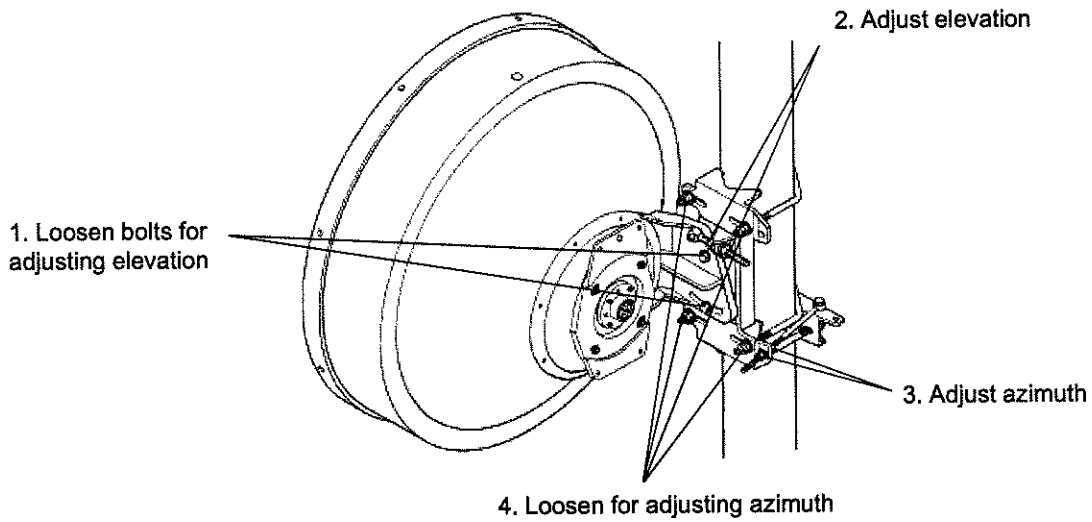




0.3 ϕ m Antenna

C. RFS SB1 TYPE BRACKET

Fig. 3-3 Location of Adjusting Nuts (2/3)



0.6 ϕ m Antenna

D. RFS SB2 TYPE BRACKET

Fig. 3-3 Location of Adjusting Nuts (3/3)

3.5 Lineup Test

Procedure for line up test between two stations are listed in Table 3-2.

Table 3-2 Lineup Test Items

	Item	Remarks
1	Meter Reading	Chart 3-4
2	Orderwire Test	Chart 3-4
3	BER Measurement	Chart 3-5

Chart 3-4 Meter Reading and OW Test

Step	Procedure
1	Connect the RS-232C cable between the LCT and MDP (see Fig. 2-2 in Chart 2-1 in Section IV MAINTENANCE),
2	Open the Terminal software (e.g; HyperTerminal),
3	Enter Login name "Admin" and press the "Enter" key, enter the specified password and press the "Enter" key,

```
Login    : Admin
Password : ********

— NEC PDH RADIO  VER. X.XX.XX —
 0. Logout
 1. Alarm / Status
 2. Performance Monitor
 3. Provisioning Data
 4. System Configuration
 5. Inventory Data
 6. Relay / House Keeping
 7. Maintenance
Enter Selection :
```

4	Press the "2" key for Performance Monitor and press the "Enter" key,

Chart 3-4 Meter Reading and OW Test (Cont'd)

Step	Procedure
5	Press the "1" key for Display Metering /BER and press the "Enter" key. Verify the all items listed in Table 3-2.

```
--- NEC PDH RADIO  VER. X.XX.XX ---
  0. Logout
  1. Alarm / Status
  2. Performance Monitor
  3. Provisioning Data
  4. System Configuration
  5. Inventory Data
  6. Relay / House Keeping
Enter Selection : 2

--- Performance Monitor ---
  1. Display Metering / BER
  2. Display Performance Monitor
  3. Display Threshold Data
  4. Set Threshold Data
  5. RSL Monitor
Enter Selection : 1

--- Display Metering / BER ---
   TX POWER      +10dBm
   RX LEVEL      -60dBm
   TRP PS MON    -43V
   BER           0.0E-10 (Calculating)

--- Performance Monitor ---
  1. Display Metering / BER
  2. Display Performance Monitor
  3. Display Threshold Data
  4. Set Threshold Data
  5. RSL Monitor
Enter Selection :
```

Notes: 1. In the 1+1 system, metering/BER values for No.1 CH is displayed in the left side and for No.2 CH is displayed in the right side.

2. "3.0E-4" indicates the bit error rate of 3 x 10^{-4}.

*3. * BER (BER between radio) is calculated every one minute. "Calculating" is displayed till the value is fixed.*

*4. *If the performance data from the TRP are not received, **dBm and ***V are displayed.*

5. TX POWER/RX LEVEL is indicated in 1 dB step.

Chart 3-4 Meter Reading and OW Test (Cont'd)

Step	Procedure

Table 3-3 Meter Reading

Check Item	Normal Indication		Allowable Range
TX POWER	10.5 GHz	+21 to –7 dBm	Normal Indication ±3 dB (8 x 1.5 MB)
RX LEVEL	–30 dBm*	10.5 GHz	–20 to –93 dBm (8 x 1.5 MB)
TRP PS MON	–43 V**		–32 to –46 V DC

Notes: *1. *Varies in proportion to the receiving RF signal level.*

*2. **Varies with cable length between the MDP and TRP.*

3. Record displayed indication values on the LCT.

6 Press the "ESC" key to go back to Main menu, and press the "Enter",

7 Press the "0" key to Logout,

METER READING OF TRP

8 Remove the cap from the RX LEV MON jack of the TRP (see Fig. 3-5),

9 Connect the digital multimeter or OW/RX LEV MONITOR to RX LEV MON jack. Confirm that the meter indication is as described in Table 3-4,

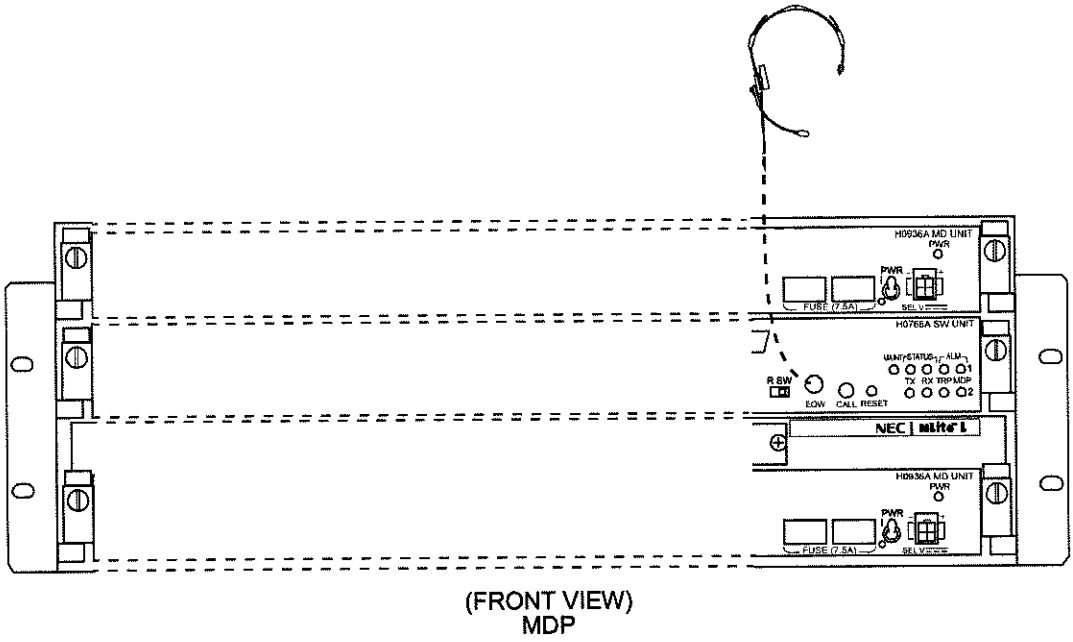
10 Disconnect the digital multimeter or OW/RX LEV MONITOR and reconnect the cap removed in step 7,

Table 3-4 Meter Reading of TRP

CHECK ITEM	ALLOWABLE RANGE
RX level	Depends on received signal level (0.2 to 4.5 V DC)

Chart 3-4 Meter Reading and OW Test (Cont'd)

Step	Procedure
	ORDERWIRE TEST
11	Connect the OW/RX LEV MONITOR unit to the RX LEV MON jack on the TRP,
12	Connect headset(s) to the EOW jack on the front panel of the MDP and/or OW/RX LEV MONITOR unit (see Figs. 3-4 and 3-5),
13	Press the CALL button switch on the front panel of the MDP, Requirement: At opposite station, the buzzer on the MDP is activated,
14	Check that orderwire telephone between stations can be connected by using headsets,
15	Set OW switch on the OW/RX LEV MONITOR unit to ON (OW indicator on the OW/RX LEV MONITOR is turned on),
16	Check that orderwire telephone between MDP and TRP can be connected by using headsets,
17	Disconnect headset(s) from EOW jack on the front panel of the MDP, and/or OW/RX LEV MONITOR unit,
18	Disconnect the OW/RX LEV MONITOR unit from the RX LEV MON jack on the TRP.



(FRONT VIEW)
MDP

Fig. 3-4 Lineup Test Setup for MDP

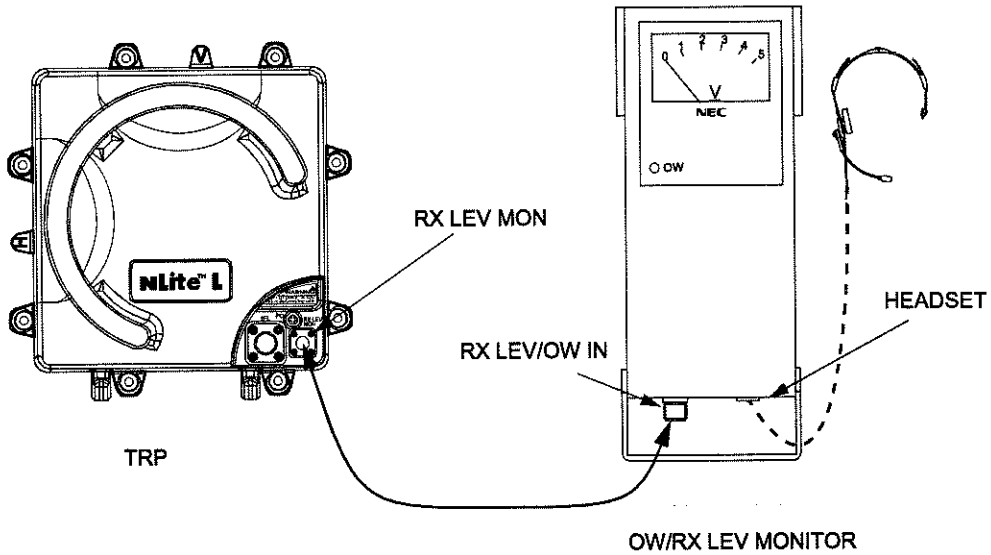


Fig. 3-5 Lineup Test Setup for TRP

Chart 3-5 BER Measurement

BER measurement is performed between terminal stations.

Apparatus :

Digital Multimeter (or equivalent) with test leads
Screwdriver
PDH Analyzer
Headset

Step	Procedure
1	Disconnect the D-sub connectors from the CH01-CH08 IN/OUT on the MDP (see Fig. 3-6),
2	Set the PDH Analyzer at transmit signal and receive signal at STATION A and STATION B as follows: • Bit rate : 1.544 Mbps (ANSI T1.102) • Code format : B8ZS or AMI • Impedance : 100 ohms, balanced
3	Set up as in Fig. 3-6,
4	Measure the BER for each channel,
5	Check that the measured BER is within values of system calculation,
6	Restore all connections used test to normal.

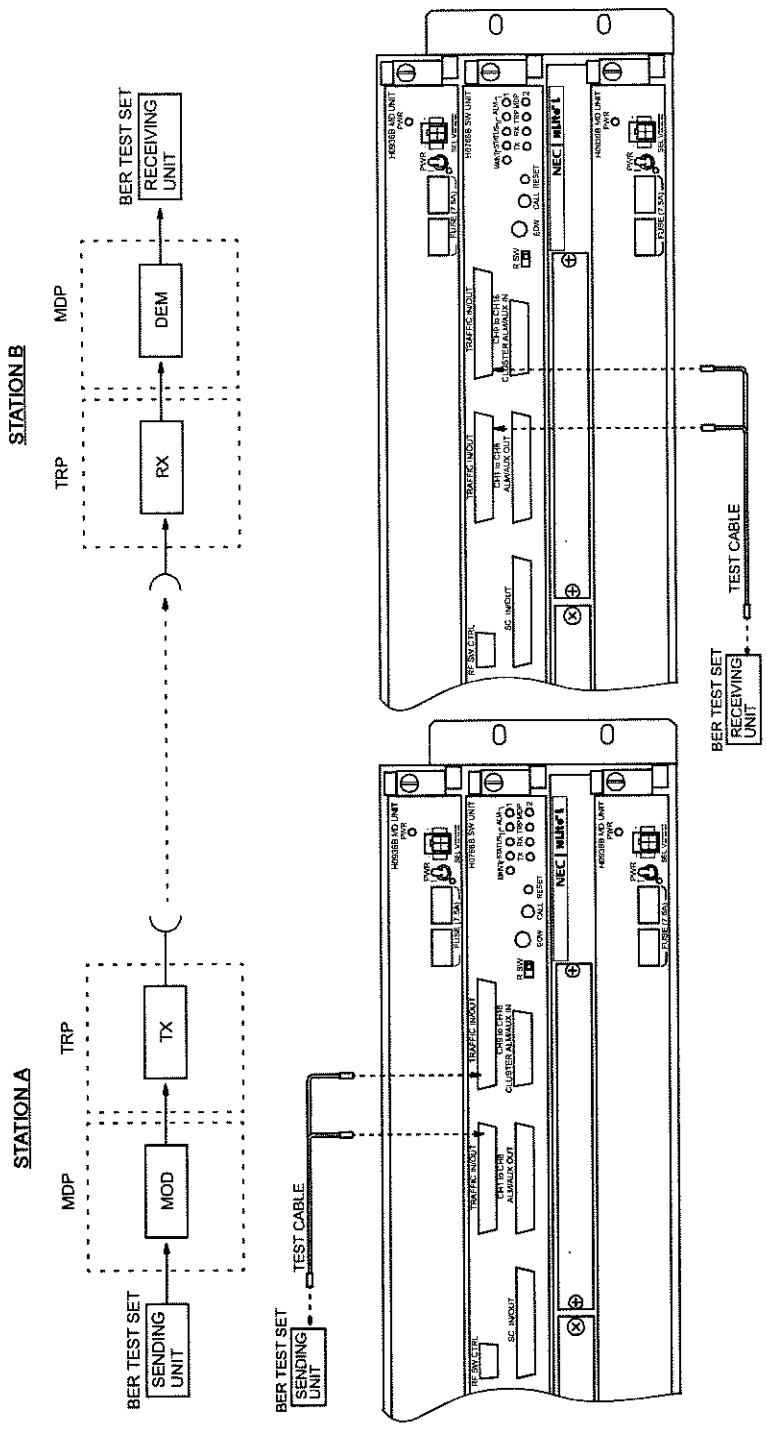


Fig. 3-6 Lineup Test Setup for BER Measurement

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5.8 GHz 15/28/50 MB
PDH DIGITAL MICROWAVE RADIO SYSTEM
NLite L
(PDH 1+0/1+1 SYSTEM)

SECTION IV MAINTENANCE

CONTENTS

TITLE

C L-2

1. GENERAL

This section provides instructions for the maintenance of the 5.8 GHz 15/28/50 MB digital microwave radio system.

This section provides precautions and instructions on preventive maintenance and corrective maintenance.

This manual is described for the firmware version of as follows.

SW UNIT: 1.0.1
MD UNIT: 1.0.2

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2. PRECAUTIONS

The following precautions must be carefully observed during maintenance.

(a) The maintenance personnel should report arrival at and departure from a station to the relevant station. The following are dangers and warnings to the maintenance personnel.

Warning: ***1. The –43 V DC power is superimposed on the center conductor of the I/F cable between the MDP and the TRP. Connecting test equipment directly to this terminal may damage it and touching the coaxial cable core may cause electrical shock.***

2. Persons performing servicing must take necessary steps to avoid electro-static discharge which may damage the modules on the MDP or cause error. Wear a conductive wrist strap connected to the grounded (G) jack on the front of the equipment shelf. This will minimize static build-up during servicing (see Fig. 2-1).

3. Do not disconnect the I/F cable between the MDP and the TRP in operating condition, to avoid damaging the MDP and TRP. Do not remove/connect the I/F cable with the MDP power ON, turn the MDP power OFF before connecting/disconnecting the I/F cable.

4. After turning ON the equipment, wait at least 1 minute before turning it OFF again. Repeatedly turning the power ON and OFF within a short interval may cause the MDP to fail.

5. Contact NEC before program download on the LCT is performed. Equipment may not function correctly with improper operation.

Caution: 1. Be careful that top surface of the MDP is considerably hot.

(b) During maintenance, the MDP should be set to maintenance condition by the local craft terminal (LCT) (see Chart 3-1).

(c) To avoid service interruption under the maintenance, perform manual protection switching in 1+1 system.

Note: When protection switching has been automatically completed during a fault, keep this condition by manual protection switching operation.

(d) First set the MAINT mode to "ON" before selecting the other items on the LCT maintenance menu.

(e) Information on the maintenance and the control such as TX SW, RX SW, Mute, CW, LB, etc. is released if the power is turned off or the RESET switch is pressed.

(f) While the CPU is initialized by pressing the RESET switch, alarm(s) is in normal condition. After initialization, the alarm information is properly provided through relay contacts.

(g) Service will be interrupted instantly by pressing the RESET switch.

(h) When the control such as TX MUTE, CW, LB, etc. is performed, set TX SW and RX SW to the same channel certainly. If it carries out in AUTO condition, it may not operate normally.

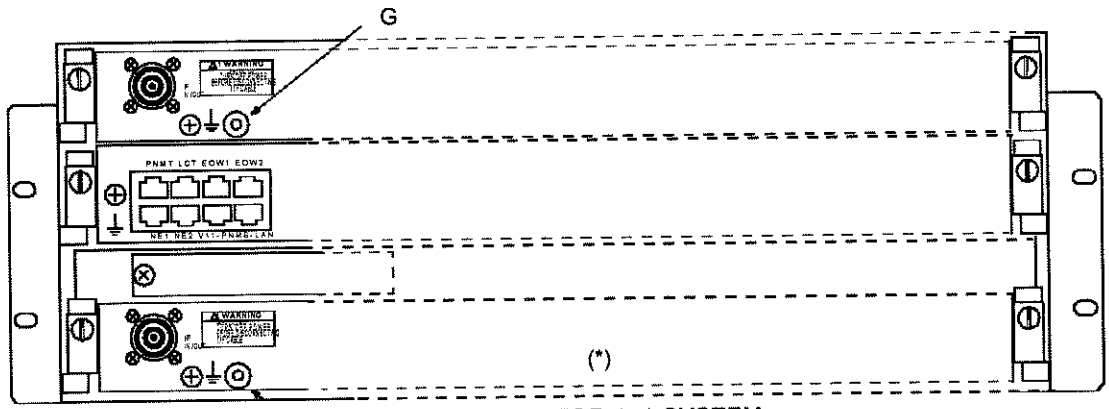
(i) Instantaneous interruption may occur when performing the TX SW manual switching operation.

(j) Before removing or installing the MDP/TRP, turn off the power switch on the MDP.

(k) For procedures to change the password, refer to the Appendix in this section.

(l) After equipment start-up, allow the equipment to warm up at least 30 minutes.

(m) After completing maintenance, restore all connections and manual switch(es) to normal and confirm that all red alarm LEDs are unlit.



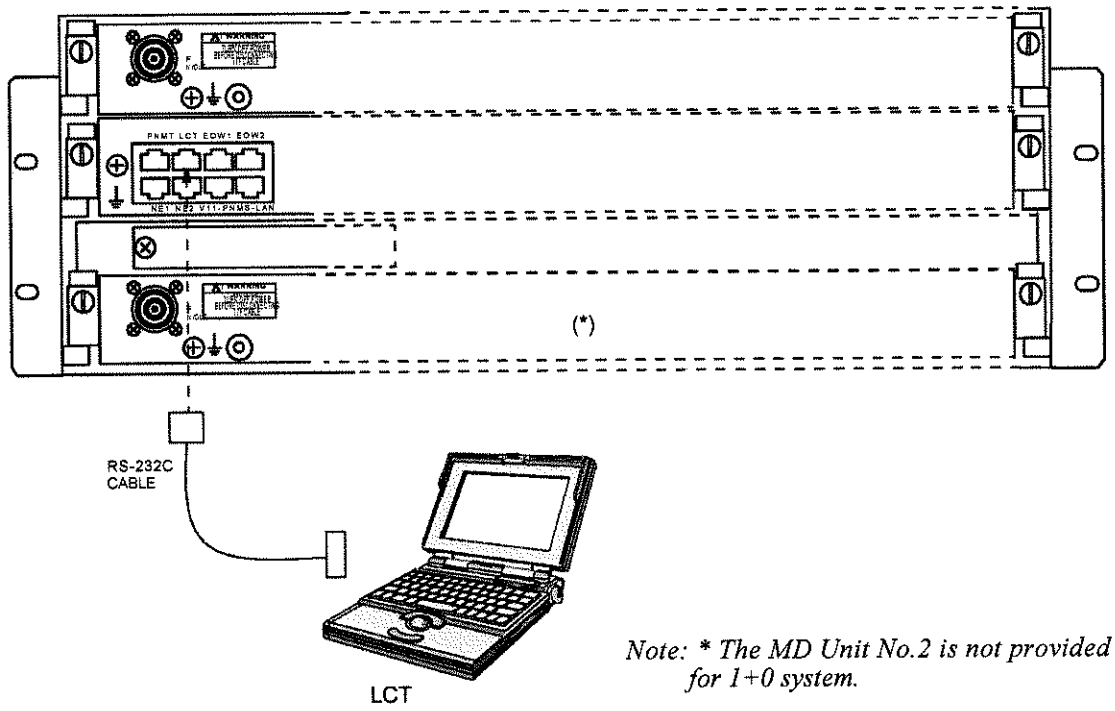
*Note: * The MD Unit No.2 is not provided for 1+0 system.*

MDP

Fig. 2-1 Location of G Terminal

Chart 2-1 Maintenance Mode Setting

Step	Procedure
1	Connect the RS-232C cable between the LCT and the MDP,



*Note: * The MD Unit No.2 is not provided for 1+0 system.*

Fig. 2-2 LCT Setup

2 Open the Terminal software (e.g; HyperTerminal),

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3. PREVENTIVE MAINTENANCE

This chapter provides the routine (annual) maintenance procedures to ensure the satisfactory operation of the equipment. During preventive maintenance, carefully observe the precautions given in chapter 2.

3.1 Test Sets and Accessories

The test sets and special accessories listed in Table 3-1 are required for maintenance. If recommended test sets and accessories are not available, equivalents may be used.

Table 3-1 Test Sets and Accessories

No.	Model Type	Model Number	Manufacture
1	PDH Analyzer	MP1550A	Anritsu
2	Digital Multimeter	HP34401A	HP
3	OW/RX LEV Monitor*	X0818A	NEC
4	Screwdriver	—	—
5	T Type Hexagonal Driver	—	—
6	Torque Wrench	—	—
7	Local Craft Terminal (LCT) with RS-232C Cable	—	—

*Note: 1. * The OW/RX LEV Monitor operates on a dry battery (6F22/ 9V). When the OW/RX LEV Monitor will not be used for a long period, remove the battery to avoid damage from battery leakage and corrosion.*

3.2 LCT Maintenance Mode

Chart 3-1 Maintenance Mode Setting

Step	Procedure

1 Enter Login name "Admin" and the "Enter" key,

```
Login : Admin
Password : ********
--- NEC PDH RADIO VER. X.XX.XX ---
0. Logout
 1. Alarm / Status
 2. Performance Monitor
 3. Provisioning Data
 4. System Configuration
 5. Inventory Data
 6. Relay / House Keeping
7. Maintenance
Enter Selection :
```

2 Enter the valid password and press the "Enter" key,

Maintenance Mode Setting

3 Press the "7" key and press the "Enter" key,

```
Enter Selection : 7
--- Maintenance ---
1. MAINT Mode (OFF)
2. Control
3. Reset CPU
4. Set Calendar
5. Password Setting
6. Program Download
Enter Selection : 1

--- MAINT Mode ---
1. On
2. O f f
Enter Selection : 1
--- Maintenance ---
1. MAINT Mode (ON)
2. Control
3. Reset CPU
4. Set Calendar
5. Password Setting
6. Program Download
Enter Selection :
```

4 Press the "1" key and press the "Enter" key,

5 Press the "1" key and press the "Enter" key for Mainte mode ON,