Chapter 4

RPC INSTALLATION PROCEDURES

Section I. GENERAL

4.1 Scope

This Chapter provides instructions for the installation of the RPC, and of the associated antennas, if used. The information appearing in this Chapter includes:

- Unpacking.
- Preparation for installation.
- Required equipment, tools, and materials.
- Mounting options.
- Mounting procedures for towers and masts.
- Installation and connection procedures, including application of power.

4.2 Unpacking

Before unpacking, make a preliminary inspection of the shipping containers, preferably in the presence of a carrier representative. Evidence of damage should be noted and immediately reported to the carrier, and to the nearest InnoWave's representative.

- Carefully open the top side of the packing container and take out the RPC, antennas (when supplied), and accessories, and place equipment on a clean, flat surface.
- Check the received items against the packing slip, and compare with your order. Immediately report any missing items or discrepancies found.
- Inspect the equipment carefully for any signs of damage. In case damage is found, contact the manufacturer for repair information, and report the damage to the freight carrier for insurance claims.
- Search the container for any additional small items that may be present.
- Check that the RPC and antennas (if used) comply with the frequency band, in accordance with your order and installation plan.

Keep the shipping carton and packaging materials for reuse.

4.3 Preparation for Installation

4.3.1 Power Considerations

The RPC is remotely fed from the RPCU, or from the MCX-R Remote Unit via the DSL lines. The feed voltage is ±80 to ±90 VDC.

4.3.2 Safety Considerations

WARNING - HIGH VOLTAGE

Dangerously high voltages, that may cause injury or death on contact, are present in this equipment and on the lines connected to the RPCU or to the MCX-R unit. In addition, personnel must be aware that under certain external fault conditions, dangerous voltages may appear on the cables connected to the RPC and antennas.

WARNING - RF RADIATION

Microwave radiation is emitted by the RPC and antennas (if used) during operation.

For your protection and to prevent possible damage to equipment when a fault condition, e.g., lightning strike or contact with high-voltage power lines, occurs on the antennas or on the lines connected to the equipment, the RPC's, the antennas, if used, and the lightning rod must be properly earthed at any time. Any interruption of the protective (earthing) connection inside or outside the units or the disconnection of the protective grounding strap, or disconnection or removal of the lightning rod during equipment operation, can make that equipment dangerous. Intentional interruption is prohibited.

WARNING

Before powering this equipment, the grounding strap, must be connected to a protective earth, in accordance with the procedure given in the ***Grounding and Lightning Protection*** section (para. 2.3).

4.4 Required Equipment, Tools and Accessories

4.4.1 RPC and Antenna

The RPC and antenna kits contain the following components:

- RPC unit.
- RPC mounting kit.
- Antenna support and antenna mounting kit (if applicable).
- Coaxial cables with lightning protectors.

4.4.2 Installation and Tools Accessories

The following tools and accessories are required for the installation of RPC and antennas, if used.

- H-support antenna support.
- Mounting accessories for the antenna support.
- Set of metric sockets (must include a 17 mm socket).
- Flat blade screwdrivers (one with narrow blade and another with normal blade).
- Wire cutter.
- Black plastic attachment straps.
- Tape and RTV for insulating the RPC and antenna connectors.
- Two twisted-pair cables for connection of DSL lines. Use pairs with characteristics suitable for outdoor installation, in accordance with the climatical conditions at the installation site and the applicable local regulations. The pair insulation must have a minimum breakdown voltage of 500V. Use shielded pairs to improve EMI protection.
- Grounding straps and/or cables, as required.
- Safety belts and other applicable protective equipment for climbing and working on towers and masts.

Section II. OUTLINE OF RPC INSTALLATION PROCEDURES

4.5 Scope

This Section comprises the following information:

- Safety warnings.
- General requirements (para. 4.6) - contains general mounting considerations, and information concerning site preparation for the installation of RPC stations.
- RPC station options (para. 4.7) - contains information concerning the installation options and a description of the equipment and accessories required for each installation option.
- Mounting methods (para. 4.8) - contains a description of the supports required for the various mounting options.

WARNING

Never work on roofs, poles, or masts, nor handle telephone lines or outdoor antennas during rain and/or lightning storms.

WARNING

When working on building roofs, poles, or masts, strictly observe the applicable local safety regulations. Use safety belt and other applicable personal protection devices when climbing and working on poles, masts or towers.

WARNING - HIGH VOLTAGE

Dangerously high voltages are present on the lines connected to the RPC. Before connecting the DSL lines, the remote power feed must be deactivated at the RPCU site, in accordance with the installation instructions, and a warning placed on the RPCU to prevent unauthorized application of power.

Dangerous voltages may also appear on the lines connected to the RPC as a result of external fault conditions, e.g., accidental contact with high-voltage lines, etc.. Take the appropriate precautions to avoid accidents.

4.6 General Requirements

4.6.1 General

RPC stations are usually mounted on poles, masts or towers. To minimize signal losses, the two RPC's included in a dual-RPC station shall be located as close as possible, taking in consideration the minimum antenna spacing requirements specified in para. 2.2. The same minimum spacing requirements apply to a single RPC station with an external antenna.

4.6.2 Site Preparation

Refer to the installation planning guidelines presented in Chapter 2, review the information concerning the RPC and antenna versions presented in Chapter 1, and then prepare an installation plan for the intended RPC station(s) in accordance with the station installation options and mounting methods described in para. 3-8 and 4.7 through 4.13.

Ensure that an appropriate pole, mast or tower with a lightning protection system and grounding conductors that meet the requirements of para. 2.3 is available for the mounting of the RPC station(s).

4.6.3 Cabling Requirements

4.6.3.1 RPC Cabling Requirements

The following connections need to be made at certain stages, as defined in the installation procedures:

- Connection of DSL lines coming from the RPCU or the MCX-R unit, as applicable, using two twisted pairs. The lines enter the RPC through a grommet on the lower cover of the RPC. The connection is made by means of the DSL connector (terminal strip) provided with the installation kit.
- Connection of antenna cables, made to two RF connectors located on the top of the RPC, depending on the RPC station options described in para. 4.7.
- Connection of grounding plate to the mast or tower protective cable, made by means of a grounding strap.

4.6.3.2 Antenna Cabling Requirements

When external antennas are used, the following connections shall be made at certain stages, as defined in the installation procedures:

- Connection of antenna cable to the antenna RF connector.
- Connection of antenna to protective ground through the RPC grounding plate.

4.7 RPC Station Options

The following RPC station options can be used for mounting on pole or on tower:

- Dual-RPC radio base station - para. 4.7.1.
- Single-RPC radio base station including one RPC and one external sectorized antenna - para. 4.7.2.
- Single-RPC radio base station including one RPC and two external antennas - para. 4.7.3.

4.7.1 Dual-RPC Radio Base Station

Every installation including multiple radio base stations heading in the same direction, includes pairs of RPC's mounted on poles or on towers. The RPC's are interconnected as shown in Figure 4-1.

> ☞ **NOTE**
>
> RPC space - diversity performance, refer to para. 1.3.3.2 and 1.3.3.3.

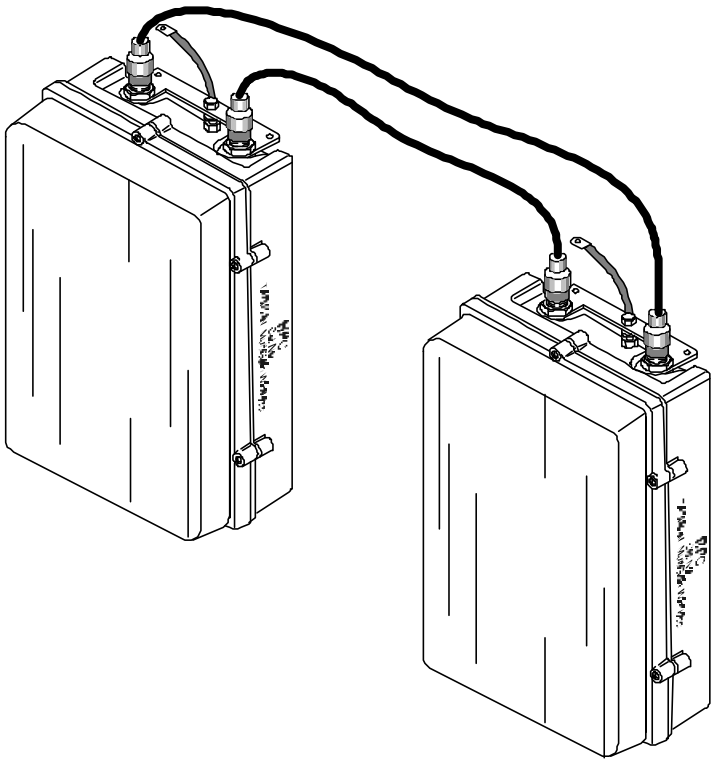

Figure 4-1. Dual RPC Configuration, RF Cable Connections

4.7.2 Single Radio Base Station with One External Antenna

A single radio base station with space diversity comprises an RPC and a sectorized antenna connected as shown in Figure 4-2.

4.7.3 Single-RPC Base Station with Two External Antennas

The RPC also enables the connection of two external antennas, i.e., omnidirectional or wider beamwidth antennas, whenever needed.

RPC internal connections must be changed to enable connection of two external antennas, as explained in the mounting procedures.

The RF cables from the two antennas are connected to the two RF connectors on the top of the RPC.

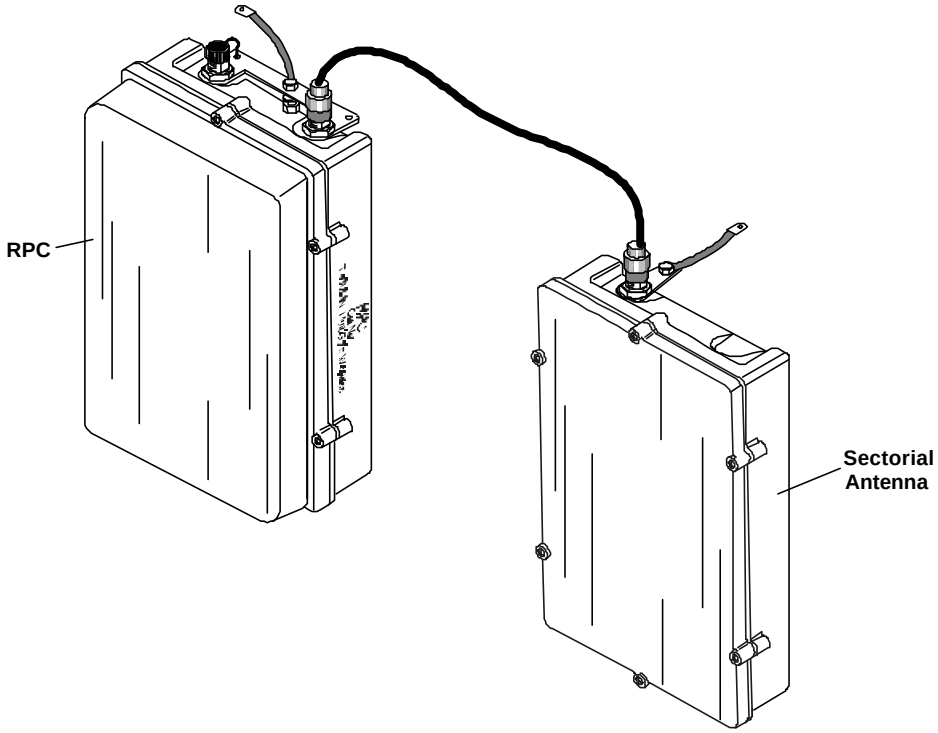

Figure 4-2. Single RPC Radio Station, RF Cables Connections

4.8 Mounting Methods

This section provides an overview of recommended RPC mounting methods for a variety of situations, and describes the recommended installation accessories that have especially designed by InnoWave for mounting RPU/RPC stations.

When properly applied and installed, these installation accessories ensure compliance with the recommendations of para. 2.2.3 and 2.2.4, while simplifying the installation procedures.

4.8.1 RPC and Sectorized Antennas for Pole and Tower Mounting

InnoWave recommends to use H-supports for pole and tower mounting, described in para. 3.8.2.1 through 3.8.2.3. One H-support can be used to mount the following combinations of RPC radio stations:

- One or two pairs of RPC's connected according to Figure 4-1. In this configuration, four RPC's can be attached to the H-support by means of special tilt assemblies, which enable to direct the main beam of the internal antennas in horizontal direction and below the horizontal, up to -18.5°.

> ☞ **NOTE**
>
> For multiple RPC station installation and for achieving 360° coverage, the recommendations of para. 2.2.2 and 2.2.3, respectively, shall be observed.

- One pair of RPC's connected according to Figure 4-1 and a single-RPC radio station (including an RPC and an external sectorized antenna) connected according to Figure 4-2. In this configuration, the RPC's and the external antenna can be attached to the H-support by means of special tilt assemblies, which enable to direct the main beam of the internal and external antennas in horizontal direction and below the horizontal up to -18.5°, as described in Table above.
- One pair of RPC's connected according to Figure 4-1 and a single-RPC radio station, including an RPC connected to two external sectorized antennas. In this configuration, the RPC is attached to the RPU attachment plate by means of a fastener and the external antennas are attached by means of tilt assemblies.
- One or two single-RPC radio base stations, with each RPC connected to two sectorized antennas according to Figure 3-23.

4.8.2 RPC Station with Omnidirectional Antennas

For this option, it is recommended to mount the RPC on a pole or mast by means of a dedicated fastener, and to mount the antennas by means of a dual-antenna support.

Section III. MOUNTING INSTRUCTIONS

WARNING

Before starting the mounting procedure, check the surroundings of the intended RPC location. Avoid possible accidental contact of antennas, mounting support, lightning rod and/or the RPC supporting mast with power lines or transmitting antennas during the mounting process.

Do not install equipment during lightning storms.

4.9 Scope

In most locations, it is necessary to perform the installation procedure in three main stages:

1. Assembly of station equipment on the selected mounting support.
2. Connection of DSL lines to the equipment.
3. Installation of the assembly in its final position on the tower or pole.

Stage 1 is usually performed on the ground, but the order of execution of stages 2 and 3 must be determined by the installation team, in accordance with the specific conditions at each station site:

- When it is possible to work safely on the tower, first install the station assembly in its final position on the tower or pole, and then connect the DSL lines.
- Alternately, connect the DSL lines on the ground, and then mount the whole station assembly, with cables already attached, in its final position on the tower or pole.

This Section contains the following information:

- General instructions for mounting the lightning rod - para. 4.10.
- Instructions for preparation and mounting on pole or tower of RPC stations in dual-RPC configuration - para. 4.11.
- Instructions for preparation and mounting on pole or tower of RPC stations in single-RPC configuration - para. 4.12.
- Instructions for mounting RPC stations with omnidirectional antennas - para. 4.13.
- Instructions for mounting on pole RPC stations with sectorized antennas - para. 4.11.
- Instructions for mounting on tower RPC stations with sectorized antennas - para. 4.12.

Each paragraph listed above contains the list of equipment and accessories required for the corresponding installation option, and provides specific instructions for equipment preparation and mounting.

Section IV provides instructions for completing the installation procedure, mainly the connection of DSL lines and final inspection instructions.

4.10 General instructions for Lightning Rod Mounting

> ☞ **NOTE**
>
> If a lightning rod is already installed at the top of the pole or mast, skip this section and continue to para. 4.11, 4.12, or 4.13, as applicable.

The mounting of a lightning rod is performed in accordance with para. 3.10.2.2. The procedure given in para. 3.10.2.2 is applicable to all the installations.

4.11 Dual-RPC Radio Base Station

This paragraph presents instructions for mounting of two RPC's on a pole by means of the H-support described in para. 3.8.2.1. Each RPC is attached to the H-support by means of a tilt assembly.

4.11.1 Mounting Instructions

The instructions for mounting of two RPC stations including four RPC's, by means of a H-support comprises the following steps:

- Site preparation - para. 4.11.1.1.
- Equipment unpacking and preparation - para. 4.11.1.2.
- Mounting of lightning rod - para. 4.11.1.3.
- Preparation and mounting of RPC on H-support - para. 4.11.1.4.
- Connection of grounding strap and RF cables - para. 4.11.1.5.
- RF connector sealing - para. 4.11.1.6.
- Preliminary inspection - para. 4.11.1.7.
- Mounting on pole - para. 4.11.1.8.
- Mounting on tower - para. 4.11.1.9.

4.11.1.1 Site Preparation

Prepare the site(s) intended for the installation of the RPC station(s) on pole or tower in accordance with the requirements of para. 4.6.2.

4.11.1.2 Equipment Unpacking and Preparation

One. Open the packing containers and take out the equipment and the materials.

Two. Inspect the equipment for any signs of damage.

Three. Refer to the installation plan. Check the received items against the requirements of your installation plan.

4.11.1.3 Lightning Rod Mounting Instructions

A suitably located lightning rod must be present, to protect the station being installed now.

The lightning rod may have already been installed at the top of the pole or tower that will support the antennas, or on another H-support mounted above the station being installed now. In this case, skip to para. 4.11.1.4.

If no lightning rod is installed, use the procedure of para. 3.11.2.3 to install a lightning rod on the H-support being installed.

4.11.1.4 Preparation and Mounting of RPC on H-Support

The following RPC types are offered:

- RPC with external reflectors for operation in the 1.5 GHz frequency band.

- RPC without external reflectors, for use in the 1.9, 2.4 and 3.5 GHz frequency bands.

Refer to Figure 1-5 and Figure 4-3 through Figure 4-6. Numbers in brackets indicate numbers of items in Figure 4-3 through Figure 4-6. Perform the following procedure:

One. Attach a grounding strap to the RPC grounding plate.

Two. Connect the DSL lines in accordance with para. 4.15.

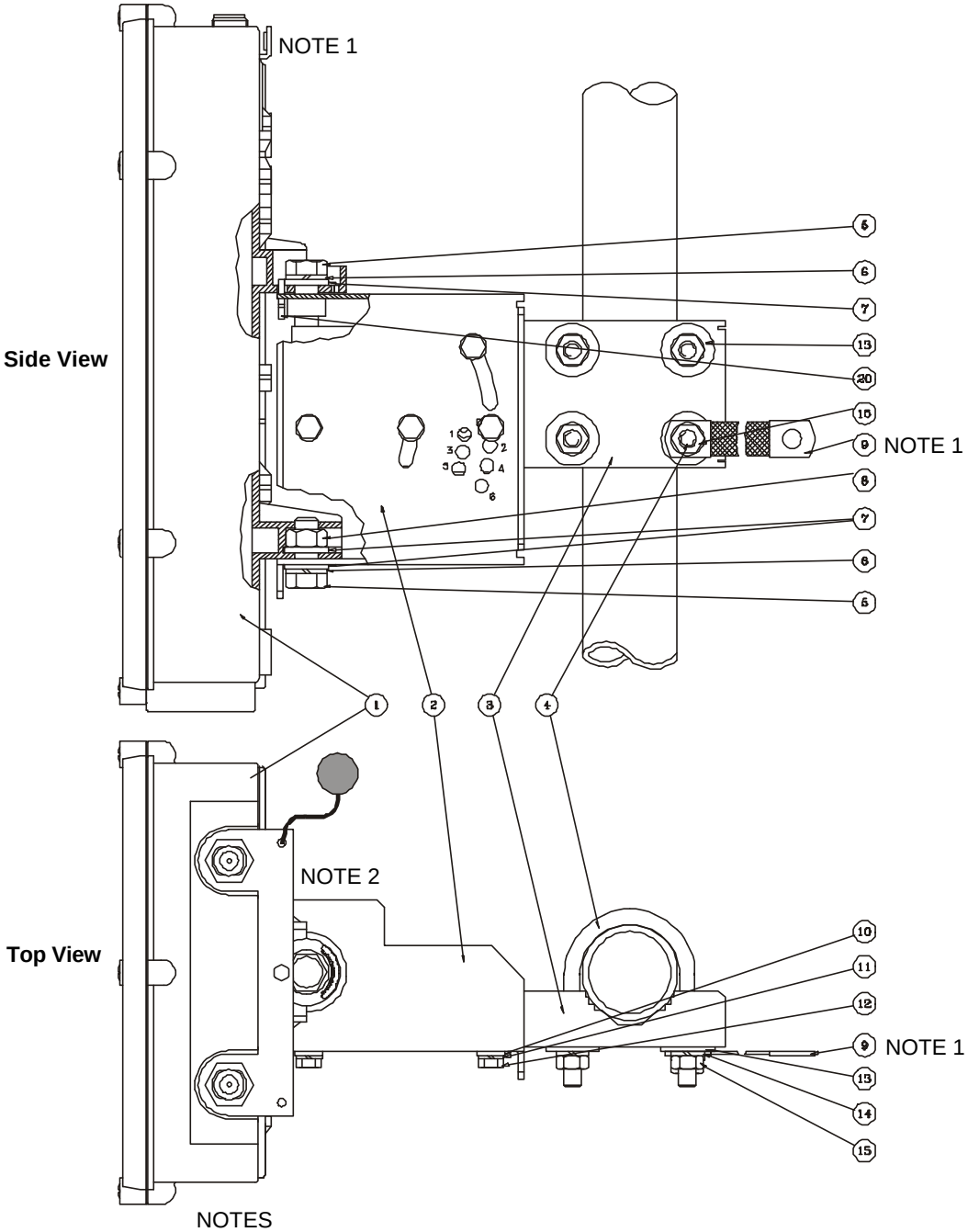

Figure 4-3. RPC and Tilt Accessories

Three. Skip this paragraph for RPC without external reflector. For reflector attachment perform the following procedure:

(1) Prepare seven screws with flat and spring washers (17, 18, 19).

(2) Position the reflector on a clean surface with the flat section upwards.

(3) Position the RPC under the reflector with the RPC cover face down. Orient the RPC with its upper attachment ear and RF connectors near the reflector grounding screw hole.

(4) Lift the RPC, push it into position so as to insert the attachment ears through the reflector holes.

(5) Insert the attachment and grounding screws (17, 18, 19) provided with washers and tighten the seven screws by hand.

(6) Use a flat screwdriver to tighten completely the screws. Tighten the screws alternately, starting with the screws at the opposite ends of a diagonal, then those at the ends of the other diagonal. Do not tighten one screw completely and then the others: take up one turn at a time from each screw sequentially in the order described.

(7) Connect the protective ground TBD.

(8) Continue to para. d. below.

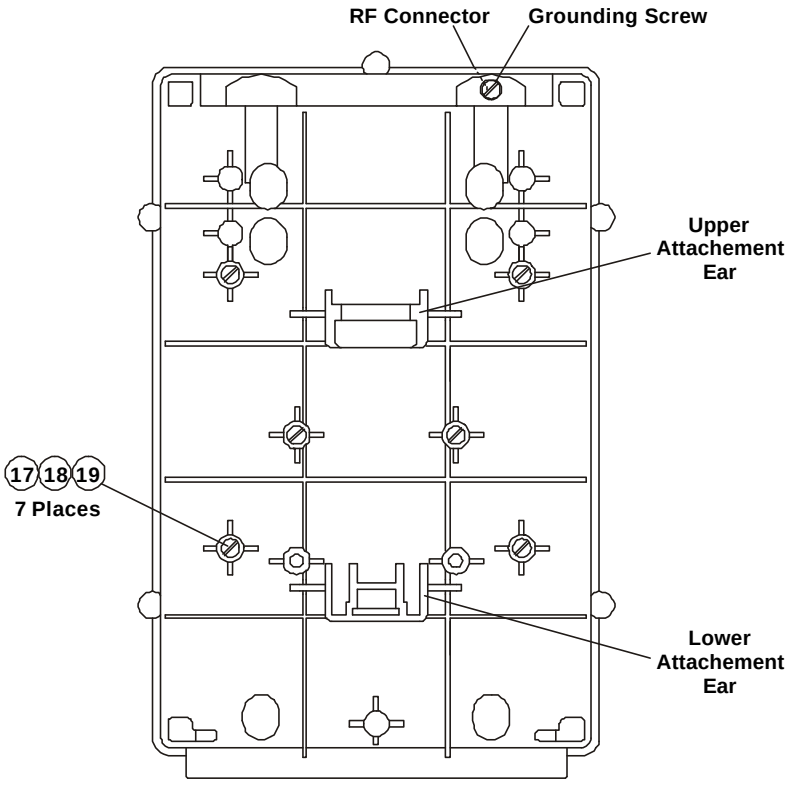

Figure 4-4. Attachment of Reflector

d. Tilt Accessories Attachment. Refer to Figure 4-3 through Figure 4-6.

Figure 4-5 shows an upper view of a tilt holder attached to a RPC with external reflector (16).

Attach the grounding strap and the tilt accessories as follows:

(1) Skip this step for RPC without external reflector: place the tilt holder (2) on the rear side of the reflector as shown in Figure 4-4 and fasten it to the reflector by means of four screws and shims (17, 18, 19).

(2) Skip this step for RPC with external reflector: place the tilt holder on the rear side of the RPC as shown in Figure 4-5.

(3) Insert a screw and spring and flat washers (5, 6, 7) through the upper RPC attachment ear (as shown in Figure 4-3) and screw it by hand in the thread of the tilt holder (2).

(4) Insert a screw and spring and flat washers (5, 6, 7) through the lower RPC attachment ear. Insert a flat washer and a nut (8), and then screw the nut by hand, clockwise, on the screw that fastens the lower attachment ear.

(5) Position the tilt bracket (3) in the inner side of the tilt holder (2), fasten it to the tilt holder using the tilt axle screw (12) and spring and flat washers (10, 11). Tighten the screw by hand.

(6) Insert the split pin (20) in the dedicated holes through the upper ear and the tilt holder and secure it by bending its ends.

(7) Tighten the upper and the lower screws (5) and nut (8).

(8) Position the tilt bracket to zero tilt. Insert the three tilt adjustment screws and washers and tighten them so that the tilt holder will stay in the horizontal position (i.e., zero tilt).

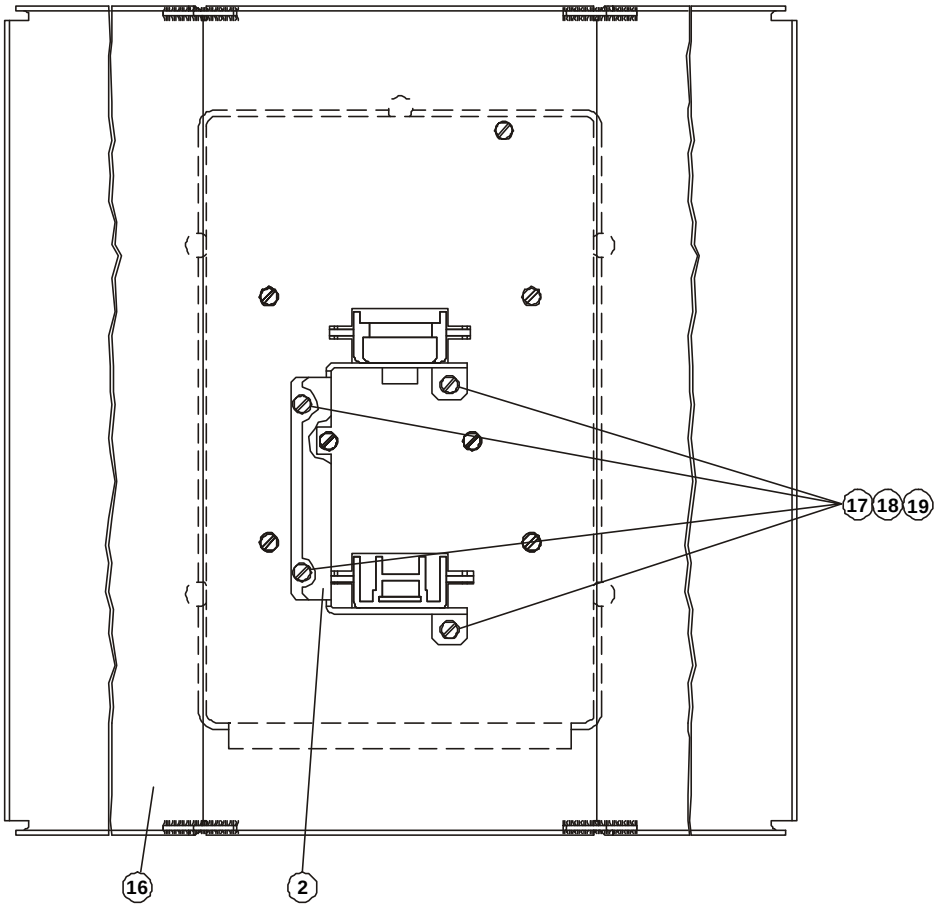

Figure 4-5. Tilt Holder Attachment

(9) Refer to Figure 4-6 and to para 4.4.2. The tilt assembly enables to direct the main beam of the RPC in the horizontal direction and below the horizontal up to -18.5°, as specified in Table 4-1. Adjust the RPC to the desired tilt position. Place the tilt adjustment screw in the appropriate position in accordance with the desired tilt angle and tighten the tilt axle and the tilt adjustment screws. Do not exert excessive force.

(10) Skip this step for RPC with external reflector, attach a grounding strap (9) to the RPC grounding plate by means of a screw (21), flat washer (22), spring washer (14), and nut (15), as shown in Figure 4-3.

Table 4-1. RPC Tilt Adjustment

Hole Number	Tilt
0	0°
1	-2.5°
2	-5.7°
3	-8.9°

4	-12.1°
5	-15.3°
6	-18.5°

Four. RPC Attachment. Attach the RPC to the H-support as follows:

(1) Refer to Figure 4-7. Determine the place of the RPC on the H-support in accordance with the requirements of para. 2.2.2.

(2) Secure the tilt bracket (3) to the H-support by means of two tilt clamps (5), washers (13, 14) and nuts (15).

(3) If the RPC has an external reflector, insert a grounding strap (9) between the flat and the spring washer on the lower tilt clamp, as shown in Figure 4-3.

(4) Adjust the RPC heading by rotating the tilt bracket around the pipe of the H-support until the desired RPC heading is reached.

(5) Tighten the four nuts (15) that secure the tilt bracket (3) to the H-support.

Five. Perform the procedure of para. a. (if applicable), b., c. and d. for the other RPC's to be mounted.

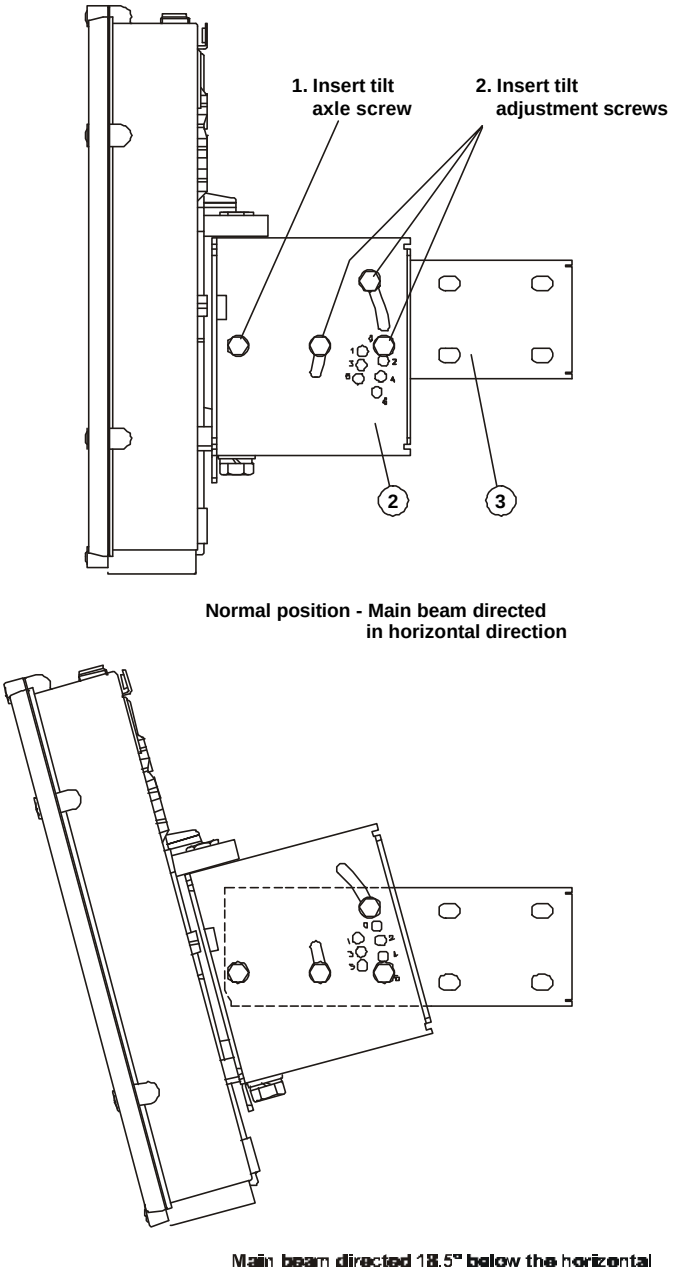

Figure 4-6. RPC Tilt Adjustment

4.11.1.5 Connection of Grounding Straps and RF Cables

Figure 4-7 shows four RPC's attached to a H-support.

One. Connect RF cables of each RPC and its associated RPC as shown in Figure 4-7.

Two. Attach the grounding straps to the H-support in the places shown in Figure 4-7, by means of screws, spring and flat washers, and nuts.

Three. Attach the RF cables to the H-support by means of plastic straps. Secure the RF cable surplus to the H-support, behind the RPC units.

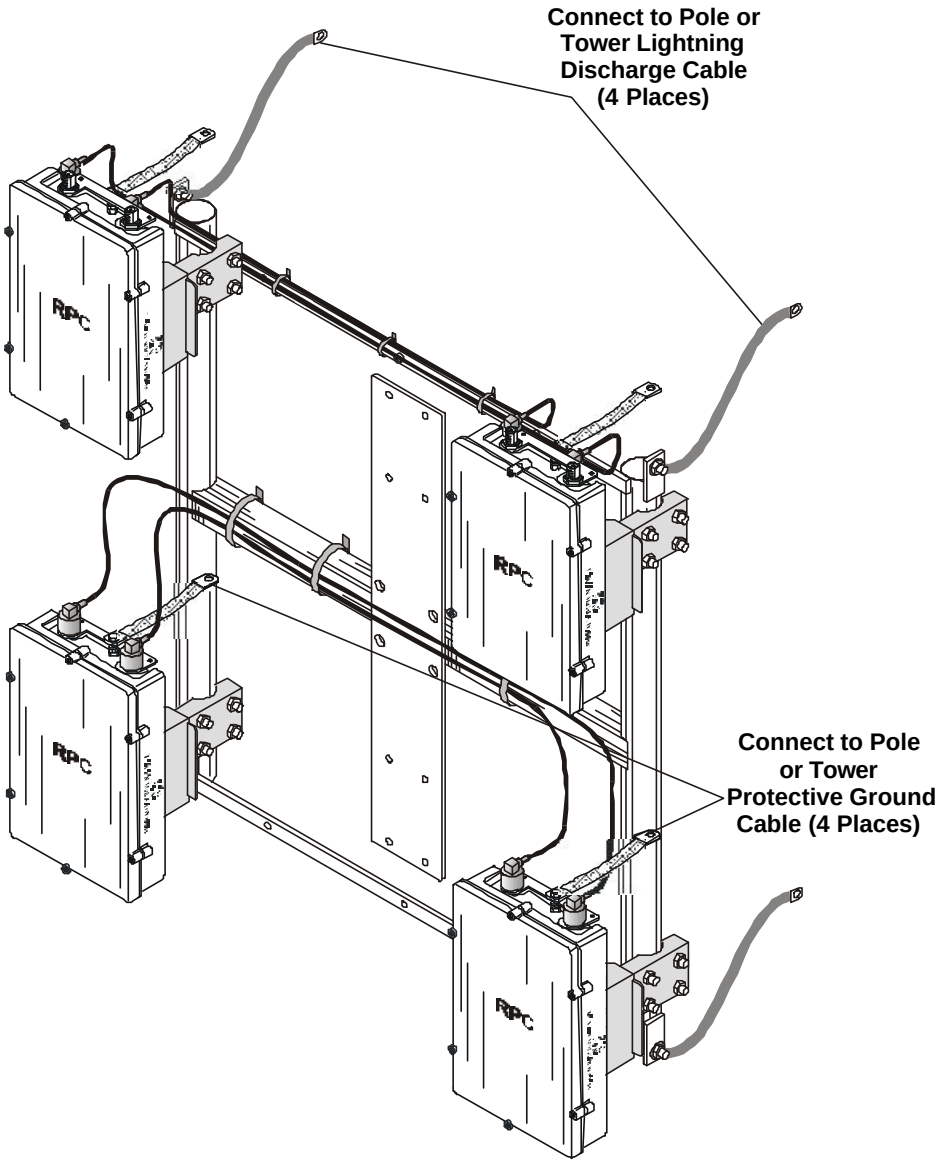

Figure 4-7. Four RPC's Mounted on H-Support

> ☞ **NOTE**
>
> For RPC spacing refer to para. 2.2.2.

4.11.1.6 Antenna Connector Sealing

Seal the connection of the RF cables to the RPC RF connectors in accordance with para. 4.15.

4.11.1.7 Preliminary Inspection

Before mounting the assembly on the pole, perform the inspection procedure given in para. 4.16.

> ☞ **NOTE**
>
> Perform the procedure of para. 4.11.1.8 or 4.11.1.9, as applicable.

4.11.1.8 Mounting on Pole

Refer to Figure 3-2, Figure 4-7 and Figure 3-25. Numbers in brackets indicate numbers of items in Figure 3-2 and Figure 3-25.

One. Ensure that the procedures of para. 4.11.1.3 (if applicable) and 4.11.1.4 through 4.11.1.7 have already been performed.

Two. Make sure that the DSL cables are secured to the support.

Three. Carefully lift the H-support to its intended place on the pole.

Four. Orient the antenna support toward the center of the 60° sector to be covered.

Five. Attach the H-support by means of two U-bolts (15), flat and spring shims and nuts as shown in Figure 3-2 and Figure 3-19.

Six. Connect the H-support to the pole electrical discharge cable by means of grounding straps, bolts, flat and spring shims and nuts as shown in Figure 3-25.

Seven. Connect the antennas to the pole grounding bar by means of grounding straps, bolts, flat and spring shims and nuts.

4.11.1.9 Mounting on Tower

One. Ensure that the procedures of para. 4.11.1.3 (if applicable), and 4.11.1.4 through 4.11.1.7 have already been performed for all the RPC units mounted on the support.

Two. Make sure that the DSL cables are secured to the support.

Three. Attach the tower mounting support to the H-support as shown in Figure 3-4 or Figure 3-5, or Figure 3-3 and Figure 3-8 through Figure 3-12, as applicable. Note that the H-support can be deflected by ±20° in the vertical plane by using the right or the left attachment section of the tower mounting support, and that each narrow H-support can be vertically deflected by ±30° using the right or the left attachment section of the tower mounting support.

Four. Carefully lift the H-support to its intended place on the tower.

Five. Orient the antenna support in the center of the 60° sector to be covered.

Six. Attach the tower mounting support to the tower by means of appropriate U-bolts, flat and spring shims and nuts as shown in Figure 2-2 or Figure 2-3, and Figure 3-5 or Figure 3-7, or by means of Z-adapter(s), flat and spring shims and nuts as shown in Figure 3-3 and Figure 3-10 through Figure 3-12 (as applicable). The H-support shown in Figure 3-5 and Figure 3-6 can be attached to the tower by using appropriate U-bolts, in accordance with the dimensions of the tower section.

Seven. Connect the H-support to the tower or to the grounding bar (as applicable), by means of grounding cables, as shown in Figure 3-25 and Figure 4-7.

4.12 Single-RPC Radio Base Station

The instructions for mounting of single-RPC radio base stations including one RPC and one or two sectorized antennas on a pole or on a tower, by means of a H-support, comprises the following steps:

- Site preparation - para. 4.12.1.
- Equipment unpacking and preparation - para. 4.12.2.
- Mounting of lightning rod - para. 4.12.3.
- Preparation and mounting on H-support and connections of one RPC and a single external antenna - para. 4.12.4.
- Preparation and mounting on H-support and connections of one RPC and two external antennas - para. 4.12.5.
- RF connector sealing - para. 4.12.6.
- Preliminary inspection - para. 4.12.7.
- Mounting on pole or tower - para. 4.12.8.

4.12.1 Site Preparation

Prepare the site(s) intended for the installation of the RPC station(s) on pole or tower in accordance with the requirements of para. 4.6.2.

4.12.2 Equipment Unpacking and Preparation

One. Open the packing containers and take out the equipment and the materials.

Two. Inspect the equipment for any signs of damage.

Three. Refer to the installation plan. Check the received items against the requirements of your installation plan.

4.12.3 Lightning Rod Mounting Instructions

Refer to para. 4.11.1.3 for instructions.

4.12.4 Preparation, Mounting on H-Support and Connections of RPC Station with a Single External Antenna

4.12.4.1 RPC Preparation and Mounting

One. Cover the RF connector with the cover as shown in Figure 4-8.

⚠ CAUTION

Failure to cover the connector may result in damage to equipment.

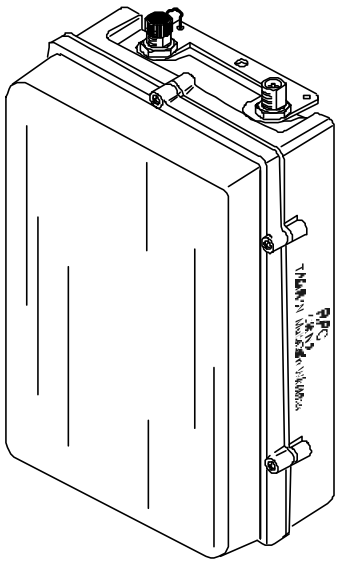

Figure 4-8. RPC with RF Connector Covered

Two. Perform the procedure of para. 4.11.1.4.

Three. To identify the location of RPC and antenna on H-support, refer to para. 2.2.2 and Figure 4-9 and Figure 4-10, respectively.

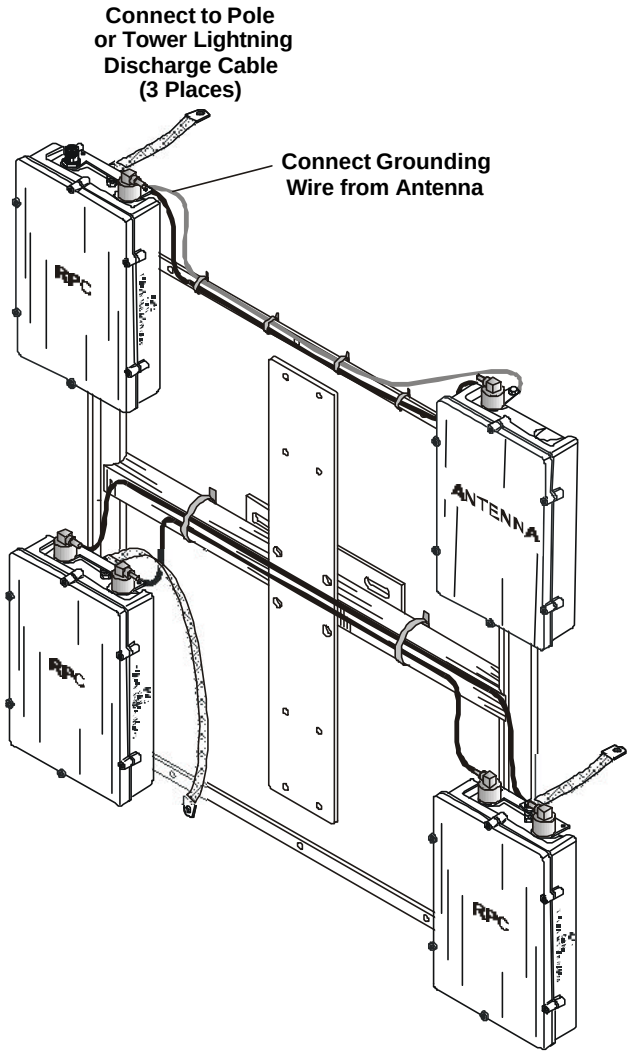

Figure 4-9. Two Dual-RPC and One Single-RPC Stations without Reflectors Mounted on H-Support

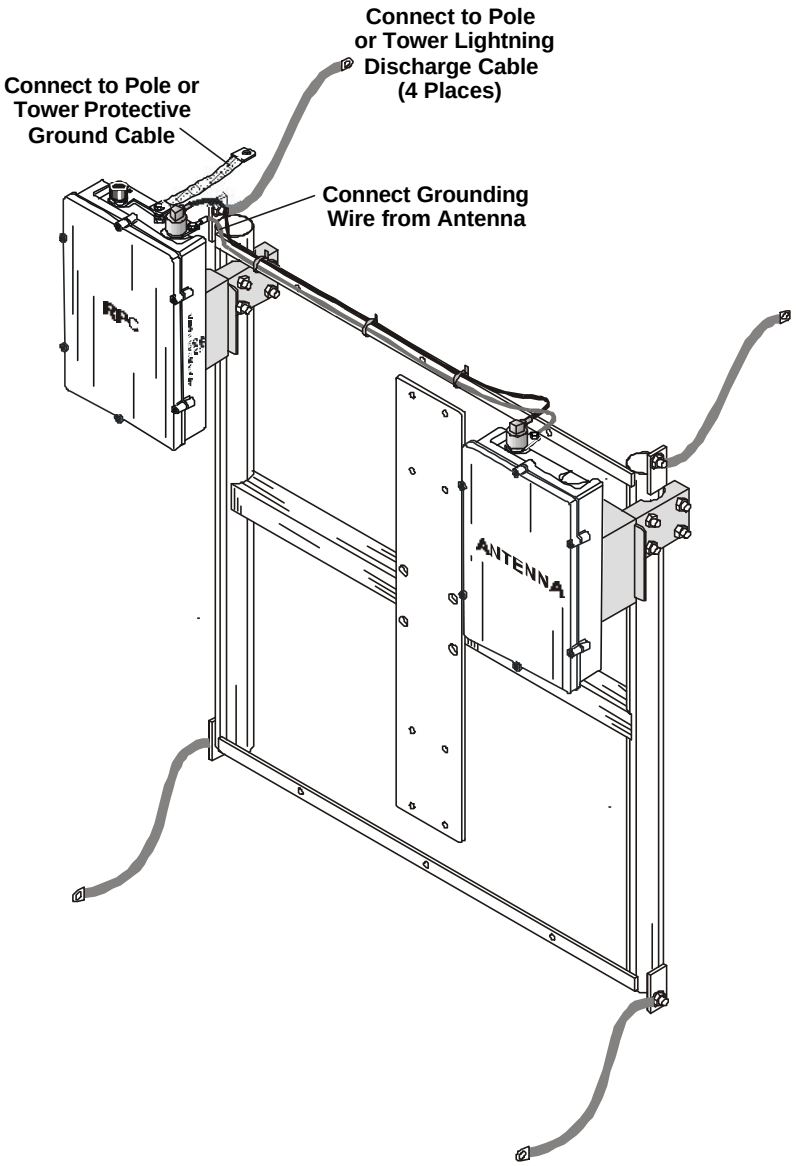

Figure 4-10. Single-RPC Station with One External Antenna Reflector Mounted on H-Support

4.12.4.2 Preparation and Mounting of External Sectorized Antennas

One. For antenna locations on the support, refer to para. 2.2.3 and Figure 4-9.

Two. For attachment of sectorized antennas to H-support by means of a tilt assembly, perform the procedure of para. 3.11.2.5, but refer to Figure 4-9 and Figure 4-10, instead of Figure 3-18.

4.12.4.3 Grounding Straps and RF Cables Connection

One. Attach the grounding straps to the RPC units in the places shown in Figure 4-9, by means of screws, spring and flat washers, and nuts.

Two. Attach the grounding straps to the H-support in the places shown in Figure 4-9, by means of screws, spring and flat washers, and nuts.

Three. Connect an RF cable between the RPC and its associated antenna.

Four. Fasten the RF cables and the antenna grounding wire to the H-support by means of plastic straps.

Five. Continue to para. 4.12.6.

4.12.5 Preparation, Mounting and Connections of RPC Station with Two External Sectorized Antennas

4.12.5.1 Configuration of RPC for Operation with Two External Antennas

This procedures is used to prepare the RPC for connection to two external antennas.

One. Loosen the six captive screws that fasten the cover to the RPC housing and remove the cover. Figure 4-11 shows an internal view of an RPC configured for dual-RPC operation, or for single RPC operation with one external antenna.

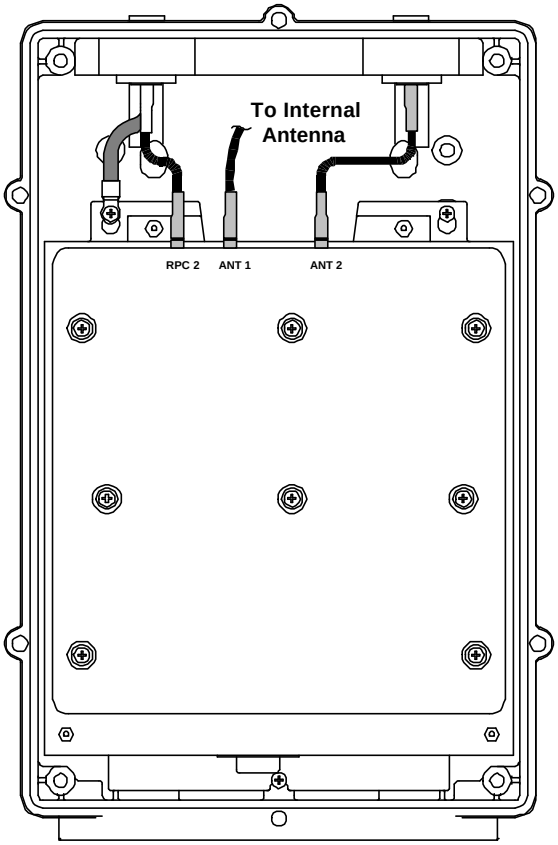

Figure 4-11. RPC Internal View

Two. Refer to Figures 4-11 and 4-12 and perform the following procedure:

(1) Disconnect the internal antenna cable from the ANT1 connector.

(2) Disconnect the internal cable from the RPC2 connector and connect it to the ANT1 connector.

(3) Position the cover over the RPC housing and tighten its screws by hand.

(4) Tighten the captive screws alternately. Take one turn at a time from each screw cyclically, until the cover is fastened. Do not use excessive force.

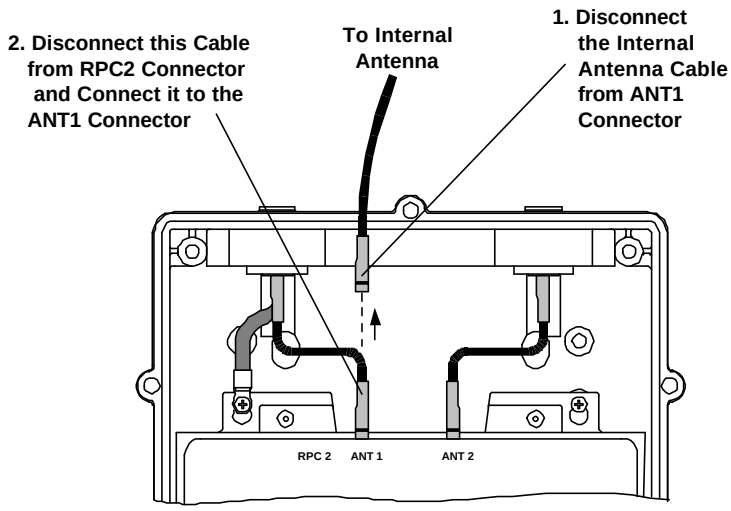

Figure 4-12. RPC Internal Connections for Operation with Two External Antennas

4.12.5.2 Mounting of RPC on H-Support

Perform the procedure of para. 3.11.2.4.

4.12.5.3 Preparation and Mounting of Sectorized Antennas on H-Support

One. For antenna locations on the support, refer to para. 2.2.2 and Figure 4-9 or Figure 4-10, respectively.

Two. For attachment of sectorized antennas to H-support by means of a tilt assembly, perform the procedure of para. 3.11.2.5, but now refer to Figures 4-9 and 4-10, instead of Figure 3-12.

4.12.5.4 Connection of Grounding and RF Cables

Use the procedure of para. 3.11.2.6.

4.12.6 RF Cable Connectors Sealing

Seal the connections of the RF cables to the RPC and antenna connectors according to the procedure of para. 4.15.

4.12.7 Preliminary Inspection

Before mounting the H-support on a pole or tower, perform the procedure given in para. 4.16.

4.12.8 Mounting on Pole or Tower

One. Ensure that the procedures of para. 4.12.3 (if applicable), 4.12.4 or 4.12.5 (as applicable), 4.12.6 and 4.12.7 have already been performed.

Two. For mounting on pole, use the procedure of para. 4.11.1.8.b. through g.

Three. For mounting on tower, use the procedure of para. 4.11.1.9.b. through g.

4.13 RPC Station with Two Omnidirectional Antennas

4.13.1 General

An RPC station with two omnidirectional antennas is similar to the RPU station with two omnidirectional antennas and lightning rod mounted on a pole, shown in Figure 3-14.

The RPC is attached to the mast by means of a fastener. The antennas are attached to the mast by means of a dual-antenna support. The antenna support is attached to the pole by means of clamps.

4.13.2 Mounting of RPC Station with Two Omnidirectional Antennas

The mounting procedure for a RPC station with two omnidirectional antennas and a lightning rod comprises the following steps:

- Mounting of lightning rod - para. 4.13.2.1.
- Configuration of RPC for operation with two external antennas - para. 4.13.2.2.
- Mounting of RPC on mast - para. 4.13.2.3.
- Mounting of antenna on dual-antenna support - para. 4.13.2.4.
- Antenna connector sealing - para. 4.13.2.5.
- Preliminary inspection - para. 4.13.2.6.
- Mounting of dual-antenna support - para. 4.13.2.7.

4.13.2.1 Lightning Rod Mounting Instructions

Refer to para. 4.11.1.3 for instructions.

4.13.2.2 Configuration of RPC for Operation with Two External Antennas

Perform the procedure of para. 4.12.5.1.

4.13.2.3 Mounting of RPC on Mast

Figure 4-13 shows the RPC attached to a pole by means of a fastener. Numbers in brackets indicate item numbers in Figure 4-13.

One. Attach a grounding strap to the RPC grounding plate as shown in Figure 2-6.

Two. Connect the DSL lines in accordance with the procedure of para. 4.15.

Three. Attach the fastener (2) to the RPC (1) by means of screws (3) spring washers (4), flat washers (5) and nuts (6) as shown in Figure 4-13. Note that two flat washers are used around the lower screw.

4.13.2.4 Mounting of Antenna on Antenna Support

One. Attach the two omnidirectional antennas to the dual antenna support by means of clamps, bolts, nuts and washers.

Two. Connect the RF cable connectors to the RF connectors on the two antennas.

Three. Attach the RF cables to the dual antenna support using plastic straps, as shown in Figure 4-13.

4.13.2.5 Antenna Connector Sealing

Seal the connections of the antenna cables to the antenna RF connectors in accordance with para. 4.16.

4.13.2.6 Preliminary Inspection

Before lifting the dual antenna support, perform the procedure of para. 4.17.

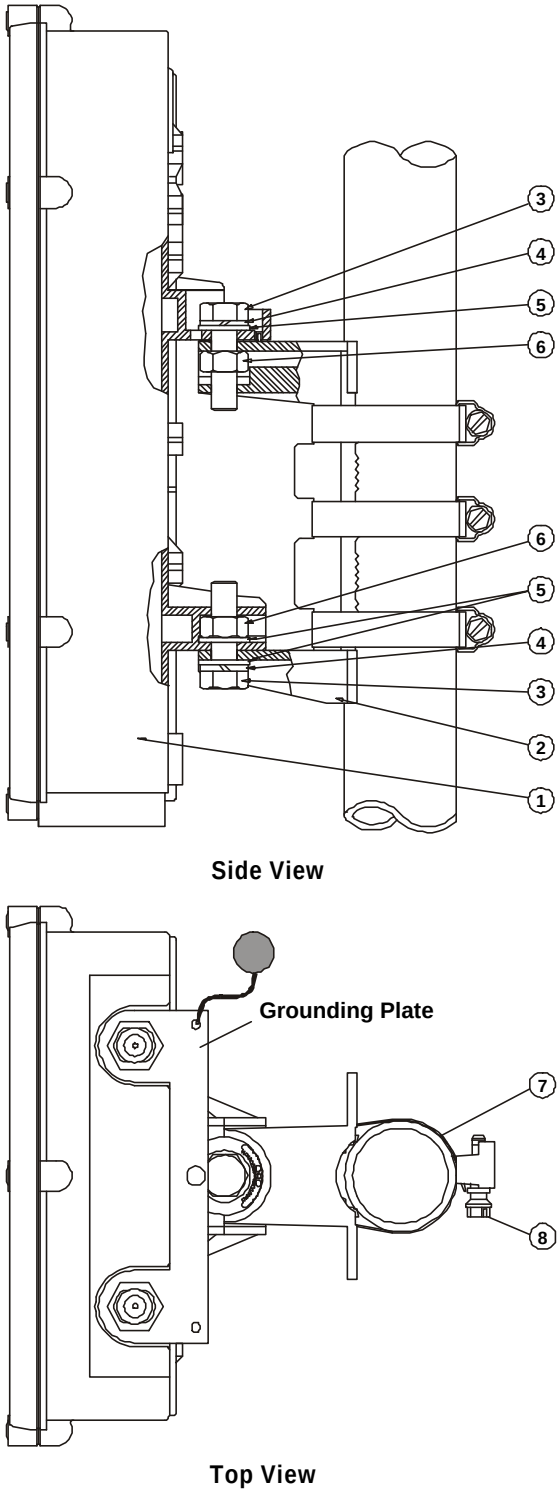

Figure 4-13. RPC Mounted on Mast

4.13.2.7 Mounting of Dual-Antenna Support

One. Ensure that the procedures of para. 3.10.2.1, 3.10.2.2 (if applicable), 3.10.2.3, 4.15 and 4.16 have been already performed.

Two. Make sure that the DSL cable is secured to the support.

Three. Carefully lift the dual-antenna support with the mounted equipment to the intended location on the mast.

Four. Attach the dual-antenna support to the mast by means of clamps, bolts and washers.

Section IV. RPC INSTALLATION AND CONNECTION INSTRUCTIONS

WARNING - HIGH VOLTAGE

Dangerously high voltages, that may cause injury or death on contact, are present in this equipment and on the lines connected to the RPCU or to the MCX-R unit. In addition, personnel must be aware that under certain external fault conditions, dangerous voltages may appear on the cables connected to the RPC.

Before connecting the DSL lines, the remote power feed must be deactivated at the RPCU site in accordance with the DSL lines connection procedure.

WARNING - RF RADIATION

Microwave radiation is emitted by the RPC and external antenna (if used) during operation.

4.14 Scope

This Section contains procedures for the connection and installation of the RPC and associated antennas, if used. These procedures shall be performed in conjunction with the mounting instructions given in Section III.

RPC and antenna installation, and the line connections, must be carried out only by qualified personnel in accordance with the following instructions.

The procedures given in para. 4.14 and 4.15 shall generally be performed before lifting the RPC and antennas or the mounting support for mounting on the pole, mast or tower.

The procedure given in para. 4.16 must be performed before lifting the RPC and antennas or the mounting support for mounting on the pole, mast or tower.

The complete installation procedure of an RPC station comprises the preparations and the mounting instructions given in Section III for each mounting option, and the installation, connection and inspection instructions given in Section IV, that are applicable to all the mounting options.

4.15 Connection of DSL Lines

One. Establish communication with the operator of CMAP8000 or SuperOffice MAP management system, and with qualified personnel at the RPCU site.

Two. Ensure that the RPI cards in the RPCU that interface with the RPC's to be installed have been installed, configured, and defined.

Three. Request to define the relevant MDSL as NOT EQUIPPED.

> **WARNING**
>
> Do not change MDSL status, unless specifically instructed to do so.

Four. Refer to Figures 4-14 and Figure 4-15 and perform the following steps:

(1) Unscrew the two screws that fasten the bottom cover of the RPC case.

(2) Insert the DSL cable through the grommet in the RPC cover and connect the DSL lines to the DSL-1 and DSL-2 terminals on the DSL line connector as shown in Figures 4-14 and 4-15. Make sure that each DSL wire pair is separately connected.

> **CAUTION**
>
> The wire pairs must not be interchanged.

(3) Connect the DSL line connector to the RPC line connector.

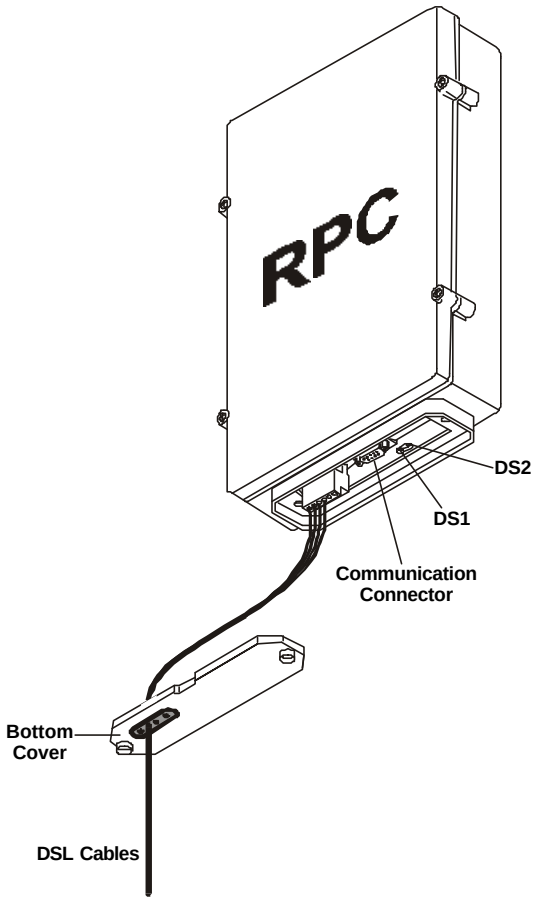

Figure 4-14. Connection of DSL Lines to the RPC

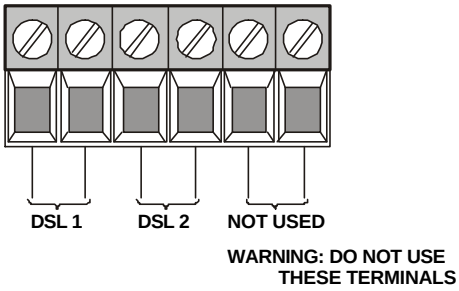

Figure 4-15. Connections to DSL Line Connector

Five. At the RPCU site, connect the DSL cable via the DSL distribution frame to RPCU1 connectors J10, J11 or J12, as applicable (or to the old-generation RPCU connectors J9 or J14, as applicable).

☞ NOTE

The RPC does not have a power switch. Operation starts as soon as power is connected to the unit via the DSL lines (power is connected when the corresponding MDSL is defined as equipped).

WARNING - RF RADIATION

Microwave radiation is emitted by the antennas while the RPC is powered.

Six. Request the CMAP-8000 operator to change in the status of the MDSL connected to the RPC, as EQUIPPED.

Seven. On the RPC, verify that the DS1 and DS2 indicators light on the RPC powering.

Eight. For your safety and to avoid unnecessary exposure to microwave radiation, request the CMAP-8000 operator to redefine the MDSL connected to the RPC being installed as NOT EQUIPPED, until you finish the installation of the RPC (steps i, and j and installation in the final location).

Nine. Close the RPC bottom cover and fasten it with the two captive screws. Tighten the screws. Do not use excessive force.

Ten. Repeat para. c. through i. above for each RPC to be installed on same tower or mast.

Eleven. Continue to the RPC PREPARATION AND MOUNTING section for the applicable mounting option procedure, given in Section III. When done, notify the CMAP-8000 operator that the installation has been completed, and therefore the RPC station can be put into operation by defining the MDSL connected to the RPC as EQUIPPED.

4.16 Sealing of RF Cable Connectors

The connection of the RF cables to the RPC and antenna RF connectors must be sealed by wrapping self-adhesive tape (Cat. No. 254-61956D by ELECTRO SPEED) around the RF connectors.

4.17 Preliminary Inspection

Before mounting the H-support on a pole, mast or tower, perform the following inspection:

- Ensure that the RPC mounting, installation, connections, and the RF cable connectors sealing have already been performed in accordance with the applicable procedures.
- Ensure that all the cables and wires are properly fastened to their supports.
- The following requirement is applicable only to an RPC connected to one external antenna: Ensure that the left-hand RF connector of the RPC is covered by means of the connector cover.

4.18 Final Inspection

- Ensure that the RPC mounting installation connection and RF cable connectors sealing have already been performed in accordance with the applicable procedures.
- Tighten all screws and nuts.
- Ensure that all the cables and wires are properly fastened to the supports, pole, mast or tower.
- Check that the RPC and antenna heading (if used), complies with the installation plan.
- After completing the mounting, installation and connection procedures, configure the parameters of the RPC as described in Chapter 5.

Chapter 5

CONFIGURATION INSTRUCTIONS

5.1 Scope

This Chapter provides instructions for RPU/RPC configuration, first-time operation and post-installation testing instructions, and procedures for correcting the most frequent problems encountered when operating the first time a radio port system.

The information presented in this Chapter is organized as follows:

- RPU/RPC configuration - para. 5.2.
- First-time operation and post-installation testing instructions - para. 5.3.
- Solving power-up problems - para. 5.4.

5.2 RPU/RPC Configuration

5.2.1 General

This paragraph presents instructions for configuring the RPU/RPC from the RPCU site, using the CMAP-8000 Maintenance & Administration Program.

5.2.2 RPU/RPC Parameters

Before starting the configuration process, perform the following activities:

- Perform the mounting, connection, and installation procedures of the RPU/RPC in accordance with the procedures given in Chapter 3 or 4, respectively.
- Power-up the RPCU that controls the operation of the radio port system.
- Configure the RPI card that provides the link to the RPU/RPC, and then turn on the DC supply voltage to the RPU/RPC by means of this RPI card.

Refer to the relevant sections in the "CMAP-8000 Installation and Operation Manual" for information and detailed instructions on RPU configuration.

To configure the RPU, enter the CONFIGURATION section in the main menu bar and select the RPU DETAILS option on the PROVISIONING sub-menu. The following parameters shall be configured:

- RPU Number - para. 5.2.2.1.
- Sector Number - para. 5.2.2.2.
- Phase Number - para. 5.2.2.3.

5.2.2.1 RPU Number

The RPU number is the RPU identification (ID) within a given MGW system. RPU's and RPC's are assigned identification numbers in accordance with the associated MDSL.

The RPU number has two fields: the first field represents the slot number of the related RPI board in the RPCU enclosure, and the second field is always 1.

5.2.2.2 Sector Number

The sector number identifies the radio coverage sector supported by the RPU/RPC. The sector number enables the FAU units to recognize all the RPU's/RPC's situated in the same sector.

5.2.2.3 Phase Number

The phase number indicates the starting frequency (phase) within the frequency hopping sequence for a given RPU/RPC, i.e., the index number of the "first" frequency in the frequency hopping sequence for a specific RPU/RPC.

The allowable range is from 1 up to the number of frequencies in the hopping table.

5.2.2.4 RPU Identifier

After confirming the values entered in the RPU Number, Sector Number and Phase Number windows, the RPU identifier value will be displayed.

The RPU identifier comprises the following information:

- RPCU number, according to the setting of the DIP switch on the RPCU connector panel.
- Sector number.
- Phase number.
- Subscriber number.

The RPU identifier is used as a synchronization code between the FAU and the corresponding RPU/RPC.

5.3 First-Time Operation and Post-Installation Testing Procedure

5.3.1 Operating Instructions

The RPU/RPC does not require operator attendance. Operation starts as soon as power is connected to the unit through the DSL lines. RPU/RPC operation, power, monitoring and configuration is performed from the RPCU site, using a PC running the CMAP-8000 and RMON (if applicable) programs.

5.3.1.1 Power-Up

WARNING - HIGH VOLTAGE

Dangerously high voltages are present on the lines connected to the RPU/RPC. Before connecting or disconnecting the DSL lines, the remote power feed must be deactivated at the RPCU site, in accordance with the installation instructions, and a warning placed on the RPCU and the CMAP-8000 operator must be notified to prevent unauthorized application of power.

Dangerous voltages may also appear on the lines connected to the RPU/RPC as a result of external fault conditions, e.g., accidental contact with high-voltage lines, etc. Take the appropriate precautions to avoid accidents.

WARNING - RF RADIATION

Microwave radiation is emitted by the RPU antennas and by the RPC during operation.

WARNING

Before powering this equipment, its grounding strap must be connected to a protective earth, in accordance with the ***Grounding and Lightning Protection*** section in para. 2.3.

Twelve. The RPU/RPC is turned on when the remote feeding voltage is connected to the RPU line connector via the DSL lines.

Thirteen. If power has been disconnected, observe the safety requirements and reconnect power to the unit in accordance with the DSL line connection procedure given in Chapter 3.

Fourteen. While the RPU/RPC bottom cover is open, verify that the DS1 and DS2 indicators light when the RPU/RPC receives power. If not, refer to para. 5.4 “Solving Power-Up Problems”.

5.3.1.2 Turn-Off

Fifteen. Establish communication with the operator of the CMAP-8000 or SuperOffice MAP management system, and with authorized personnel at the RPCU site.

Sixteen. Request to define the relevant MDSL as NOT EQUIPPED.

WARNING

Do not change MDSL status, unless specifically instructed to do so.

Seventeen. Refer to figures 3-20 and 3-21 and perform the following steps:

(1) Unscrew the two screws that fasten the bottom cover of the RPU/RPC case.

(2) Disconnect the DSL line connector from the RPU line connector.

5.3.2 Post-Installation Testing

RPU/RPC operation can be tested by establishing calls from the exchange with at least eight subscribers, after the RPCU, RPU/RPC and the relevant FAU's have been installed, connected and configured according to the appropriate procedures.

5.4 Solving Power-Up Problems

The following list provides recommended procedures for correcting the most frequent problems encountered after powering-up the RPU/RPC.

Problem	Solution
DS1 and/or DS2 indicators do not light when the RPU/RPC power is applied	1. Check proper connection of the DSL lines to the DSL line connector. 2. Check that the DSL line connector is properly connected to the RPU/RPC line connector. 3. Check with person at RPCU site that the relevant RPI card is installed in the RPCU enclosure, in the appropriate card slot. Reset the RPI card, wait a few minutes and check the indicators on the RPI card and on RPU/RPC. 4. Ensure that the RPCU and RPU/RPC parameters have been properly configured, that the relevant MDSL is defined as EQUIPPED, and that proper MDSL connections have been made at the RPCU site. 5. If the RPU/RPC is connected to an MCX-R unit, ensure that proper connections have been made at the MCX-R unit. 6. Make the following checks in cooperation with the personnel at the MCX-R and MCX-L sites: • Ensure for proper connections between the GTU, and the MCX-R and MCX-L units. • Ensure that an LPF card is installed in the proper slot of the MCX-R enclosure, and check for the corresponding DSL LED indication on the LPF card. • Check that the proper feeding voltage has been selected in the LPF card. • Ensure that the MCX system parameters have been properly configured at the MCX-L site. 7. Request replacement of the relevant RPI card in the RPCU and/or of relevant LPF card in the MCX-R unit (if applicable). Wait a few minutes and check again the DS1 and DS2 indicators. 8. Replace RPU/RPC unit. 9. If problem persists, check continuity of DSL lines.

Chapter 5

CONFIGURATION INSTRUCTIONS

6.1 Scope

This Chapter provides instructions for RPU/RPC configuration, first-time operation and post-installation testing instructions, and procedures for correcting the most frequent problems encountered when operating the first time a radio port system.

The information presented in this Chapter is organized as follows:

- RPU/RPC configuration - para. 5.2.
- First-time operation and post-installation testing instructions - para. 5.3.
- Solving power-up problems - para. 5.4.

6.2 RPU/RPC Configuration

6.2.1 General

This paragraph presents instructions for configuring the RPU/RPC from the RPCU site, using the CMAP-8000 Maintenance & Administration Program.

6.2.2 RPU/RPC Parameters

Before starting the configuration process, perform the following activities:

- Perform the mounting, connection, and installation procedures of the RPU/RPC in accordance with the procedures given in Chapter 3 or 4, respectively.
- Power-up the RPCU that controls the operation of the radio port system.
- Configure the RPI card that provides the link to the RPU/RPC, and then turn on the DC supply voltage to the RPU/RPC by means of this RPI card.

Refer to the relevant sections in the “CMAP-8000 Installation and Operation Manual” for information and detailed instructions on RPU configuration.

To configure the RPU, enter the CONFIGURATION section in the main menu bar and select the RPU DETAILS option on the PROVISIONING sub-menu. The following parameters shall be configured:

- RPU Number - para. 5.2.2.1.
- Sector Number - para. 5.2.2.2.
- Phase Number - para. 5.2.2.3.

6.2.2.1 RPU Number

The RPU number is the RPU identification (ID) within a given MGW system. RPU’s and RPC’s are assigned identification numbers in accordance with the associated MDSL.

The RPU number has two fields: the first field represents the slot number of the related RPI board in the RPCU enclosure, and the second field is always 1.

6.2.2.2 Sector Number

The sector number identifies the radio coverage sector supported by the RPU/RPC. The sector number enables the FAU units to recognize all the RPU’s/RPC’s situated in the same sector.

6.2.2.3 Phase Number

The phase number indicates the starting frequency (phase) within the frequency hopping sequence for a given RPU/RPC, i.e., the index number of the “first” frequency in the frequency hopping sequence for a specific RPU/RPC.

The allowable range is from 1 up to the number of frequencies in the hopping table.

6.2.2.4 RPU Identifier

After confirming the values entered in the RPU Number, Sector Number and Phase Number windows, the RPU identifier value will be displayed.

The RPU identifier comprises the following information:

- RPCU number, according to the setting of the DIP switch on the RPCU connector panel.
- Sector number.
- Phase number.
- Subscriber number.

The RPU identifier is used as a synchronization code between the FAU and the corresponding RPU/RPC.

6.3 First-Time Operation and Post-Installation Testing Procedure

6.3.1 Operating Instructions

The RPU/RPC does not require operator attendance. Operation starts as soon as power is connected to the unit through the DSL lines. RPU/RPC operation, power, monitoring and configuration is performed from the RPCU site, using a PC running the CMAP-8000 and RMON (if applicable) programs.

6.3.1.1 Power-Up

WARNING - HIGH VOLTAGE

Dangerously high voltages are present on the lines connected to the RPU/RPC. Before connecting or disconnecting the DSL lines, the remote power feed must be deactivated at the RPCU site, in accordance with the installation instructions, and a warning placed on the RPCU and the CMAP-8000 operator must be notified to prevent unauthorized application of power.

Dangerous voltages may also appear on the lines connected to the RPU/RPC as a result of external fault conditions, e.g., accidental contact with high-voltage lines, etc. Take the appropriate precautions to avoid accidents.

WARNING - RF RADIATION

Microwave radiation is emitted by the RPU antennas and by the RPC during operation.

WARNING

Before powering this equipment, its grounding strap must be connected to a protective earth, in accordance with the ***Grounding and Lightning Protection*** section in para. 2.3.

Eighteen. The RPU/RPC is turned on when the remote feeding voltage is connected to the RPU line connector via the DSL lines.

Nineteen. If power has been disconnected, observe the safety requirements and reconnect power to the unit in accordance with the DSL line connection procedure given in Chapter 3.

Twenty. While the RPU/RPC bottom cover is open, verify that the DS1 and DS2 indicators light when the RPU/RPC receives power. If not, refer to para. 5.4 “Solving Power-Up Problems”.

6.3.1.2 Turn-Off

Twenty-one. Establish communication with the operator of the CMAP-8000 or SuperOffice MAP management system, and with authorized personnel at the RPCU site.

Twenty-two. Request to define the relevant MDSL as NOT EQUIPPED.

WARNING

Do not change MDSL status, unless specifically instructed to do so.

Twenty-three. Refer to figures 3-20 and 3-21 and perform the following steps:

(3) Unscrew the two screws that fasten the bottom cover of the RPU/RPC case.

(4) Disconnect the DSL line connector from the RPU line connector.

6.3.2 Post-Installation Testing

RPU/RPC operation can be tested by establishing calls from the exchange with at least eight subscribers, after the RPCU, RPU/RPC and the relevant FAU's have been installed, connected and configured according to the appropriate procedures.

6.4 Solving Power-Up Problems

The following list provides recommended procedures for correcting the most frequent problems encountered after powering-up the RPU/RPC.

Problem	Solution
DS1 and/or DS2 indicators do not light when the RPU/RPC power is applied	10. Check proper connection of the DSL lines to the DSL line connector. 11. Check that the DSL line connector is properly connected to the RPU/RPC line connector. 12. Check with person at RPCU site that the relevant RPI card is installed in the RPCU enclosure, in the appropriate card slot. Reset the RPI card, wait a few minutes and check the indicators on the RPI card and on RPU/RPC. 13. Ensure that the RPCU and RPU/RPC parameters have been properly configured, that the relevant MDSL is defined as EQUIPPED, and that proper MDSL connections have been made at the RPCU site. 14. If the RPU/RPC is connected to an MCX-R unit, ensure that proper connections have been made at the MCX-R unit. 15. Make the following checks in cooperation with the personnel at the MCX-R and MCX-L sites: • Ensure for proper connections between the GTU, and the MCX-R and MCX-L units. • Ensure that an LPF card is installed in the proper slot of the MCX-R enclosure, and check for the corresponding DSL LED indication on the LPF card. • Check that the proper feeding voltage has been selected in the LPF card. • Ensure that the MCX system parameters have been properly configured at the MCX-L site. 16. Request replacement of the relevant RPI card in the RPCU and/or of relevant LPF card in the MCX-R unit (if applicable). Wait a few minutes and check again the DS1 and DS2 indicators. 17. Replace RPU/RPC unit. 18. If problem persists, check continuity of DSL lines.