CPE Site Setup

6

This chapter details how to install and commission the CPE site. Before beginning the process, review the information in “Preinstallation”, page 3-1.

Chapter Topics

Unpacking and Inventory

- Unpack the Fiberless 320 CPE and CPE ODU on a flat, clean surface at the installation site.
- Check the items received against the packing list and a copy of the purchase order to ensure that you have received your complete order.
- Check that the CPE ODU has the frequency band that was ordered. This information is on the manufacturer label and should match the network plan.
- Inspect all components to be sure they are not damaged. If a component appears to be damaged or is missing, contact your shipper and Ensemble Customer Service immediately.
- Save all packing materials.

Note *Ensemble Customer Support is available at 888-710-8910.*

Indoor Equipment Components

- Fiberless 320 indoor unit with pre-installed subscriber interface cards (SICs). Cards may be of the following types:
  - 4-port T1
  - 6-port 10/100BaseT

Note *Subscriber interface cards are specified at the time of ordering and are factory-installed.*

Note *Release 1.0 does not support V.35 SICs.*

- Power cord for AC-powered model

ODU Components

- Fiberless CPE ODU with frequency band as specified at time of ordering. See page A-1 for specifications.

Note *CPE ODU frequency is specified at the time of ordering and is factory-configured.*

- ODU wall mount or pole mount kit

Note *Mount type is specified at the time of ordering.*

- Ground strap

Installation Materials

- 3M type 33 electrical tape
- 3M electrical coating (PN 054007-1483)
- RG-6 Belden 9248 75 Ohm coaxial cable for outdoor use

- RG-6 Belden 82248 for indoor plenum use
- Ratchet wrench
- 7/16-inch socket
- 1/2-inch socket
- TNC crimp connectors
- Black nylon wire ties for outdoor use

Note *For a complete list of recommended ancillary equipment, see Table 3-3, "Ancillary Equipment Requirements," on page 10.*

Sighting Tools

The following equipment is recommended to assist in antenna alignment:

- Binoculars to locate the base station ODU
- Reflection mirror

Test Equipment

- Digital voltmeter (DVM)
- BNC (cable-male connector) test cable for meter
- Banana plug with female BNC connector
- Laptop computer

ODU Installation

Note *Installers are responsible for supplying mounting bolts.*

Ground Mast

All steel mounting structures attached to the building and the antenna mast must be connected to the building grounding system. If no grounding system or ring is available, ground the antenna mounting structures to the nearest structural beam. The grounding conductor should be set at least a # 2 (AWG) solid tinned copper wire. Use exothermic welds (Cad Welds) when possible to connect to the mounting structure and the building grounding system.

Antenna Mounting

1. Attach the ODU mounting bracket to a mast between 2- and 4-inches in diameter (1 in Figure 6-1).
2. Remove the nuts and washers (2 in Figure 6-1) from one side of each of the two mounting clamps (3) and slide the mounting clamps off the bolts. Set them aside in a safe place.
3. Slip the mounting rack (4 in Figure 6-1) around the mast.
4. Reattach each of the two mounting clamps with the flat washer, lock washer, and nut.
5. Tighten with a 1/2-inch socket wrench until secure.

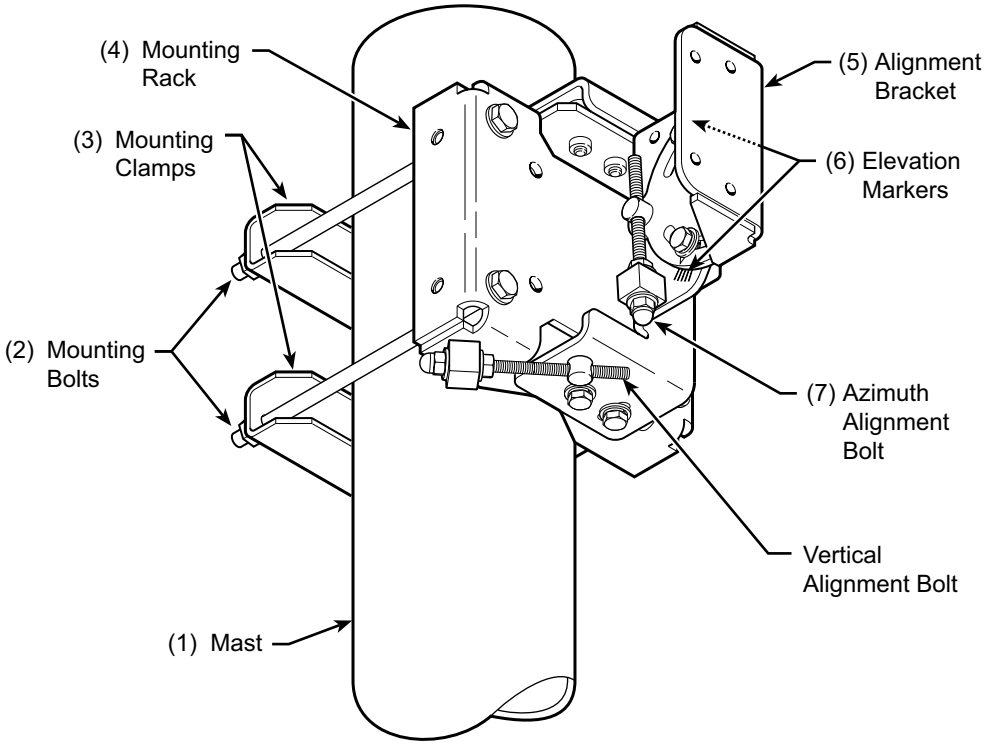

Figure 6-1. CPE Pole Mount Assembly

6. Attach the antenna to the mounting plate, orienting it for proper polarization (see the next sections) and LOS alignment with the base stations.
7. After aligning the antenna, tighten the mounting clamps.

Lightning Suppressor Installation

Note *A lightning suppressor is not shipped with the ODU. See page 3-10 for the Ensemble-recommended lightning suppressor.*

WARNING

It is not possible to guarantee that lightning protection will be 100 percent effective against a direct lightning strike.

Install one suppressor as close as possible to the point at which the cable enters the building. Another suppressor should be installed as close as possible to the ODU. See Figure 6-2 and Figure 6-3 for illustrations of the suppressor installation.

Note *Connect the supplied ground strap from the ODU housing to the pole mount (antenna ground points), ensuring there is contact on the pole.*

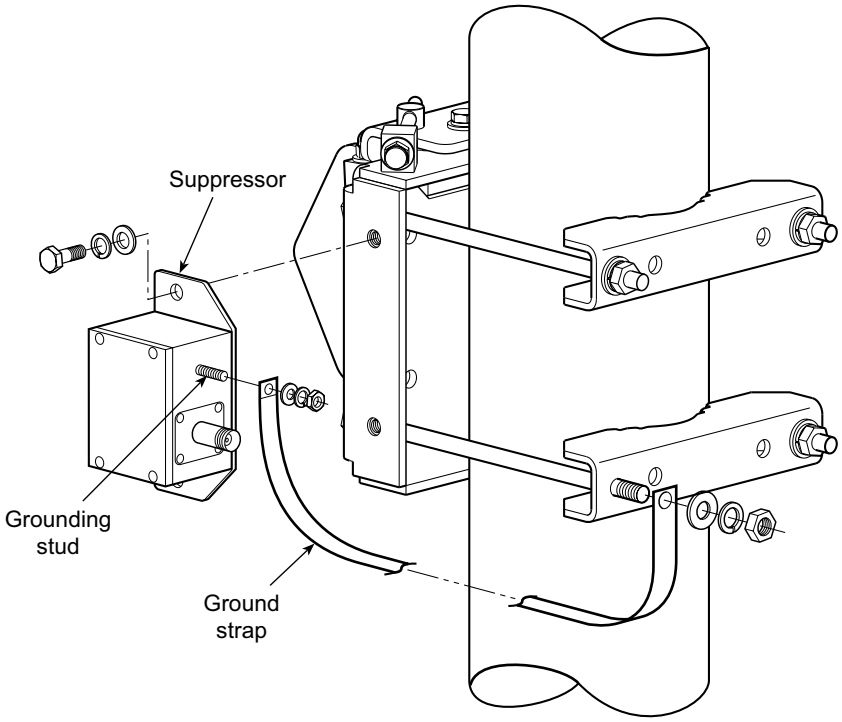

Figure 6-2. Lightning Suppressor Assembly

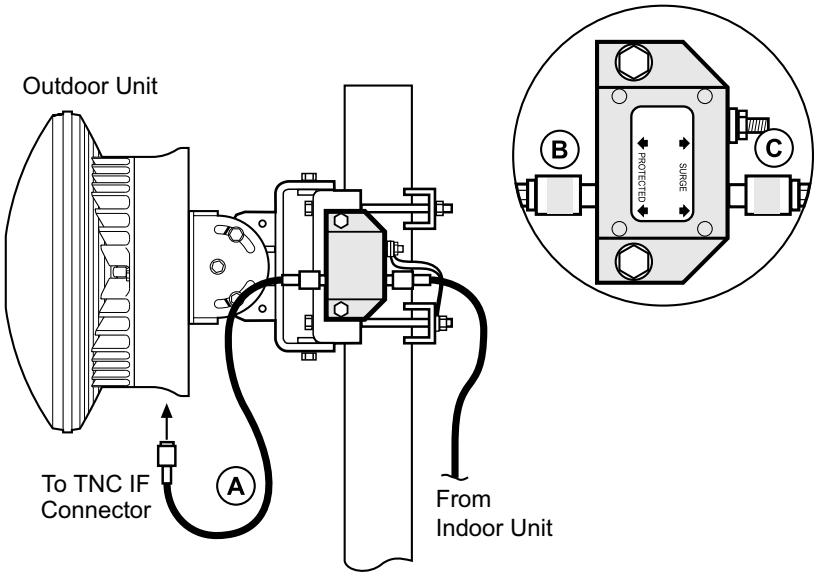

Figure 6-3. Lightning Suppressor Assembly Closeup

Vertical Antenna Polarization

- For a vertical polarized antenna, mount the unit with its two cable connectors facing down and the "V" is up as shown in Figure 6-4.
- Line up the bolts in the antenna with the four holes in the mounting bracket as shown in Figure 6-4.

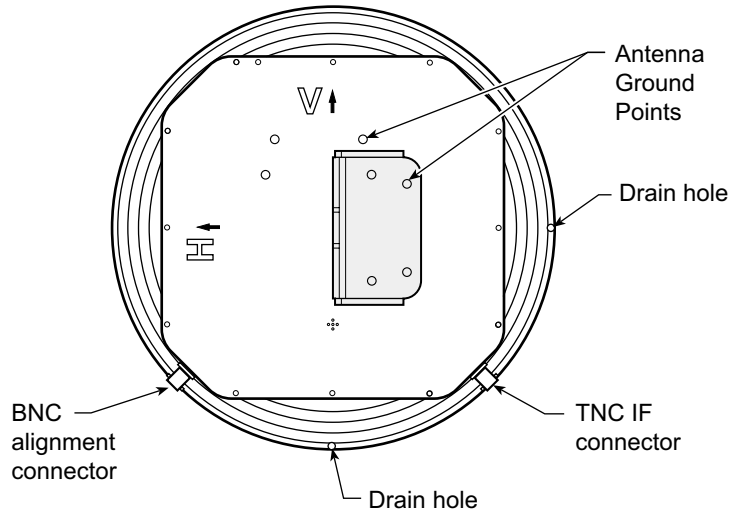

Figure 6-4. Mounting Vertically Polarized ODU

Horizontal Antenna Polarization

- For a horizontally polarized antenna, mount the unit with its two cable connectors facing sideways, so that the TNC connector points downward and the "H" is up as shown in Figure 6-5.
- Line up the bolts in the antenna with the four holes in the mounting bracket as shown in Figure 6-5.

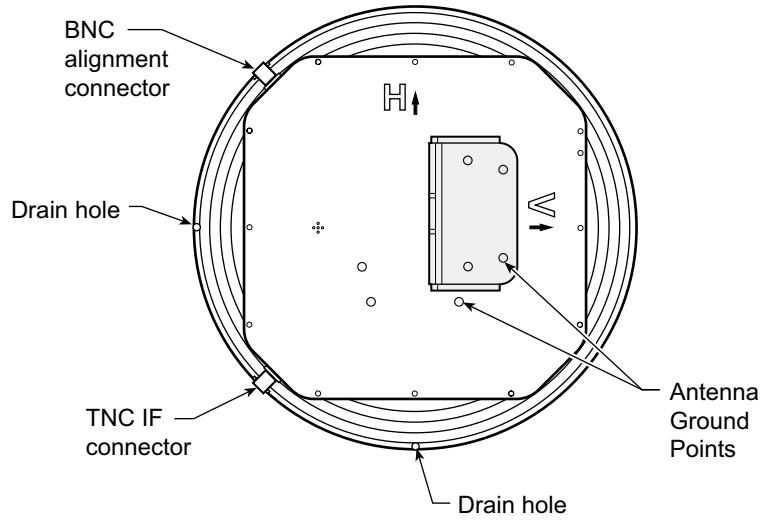

Figure 6-5. Mounting Horizontally Polarized ODU

IF Cable Installation

⚠ WARNING

The RG-6 cable may have -48 VDC across the connector when it is connected to the CPE. So if for some reason the CPE has been powered up, power it off before connecting or disconnecting the RG-6 cable at either end.

Note *Belden 9248 (for outdoor) or Belden 82248 (for plenum indoor) are the only approved RG-6 cable types.*

1. Run RG-6 coaxial cable between the CPE and the CPE ODU. The maximum permissible individual cable run length is 1,000 feet (300 meters). Ensure there is an 18-inch (45 cm) service loop at each end of the cable.

   When required, encase cables in plastic or metal conduit or cable duct, maintaining a minimum bend radius of two inches (5 cm).

Note *Depending on local codes and the HVAC design of a particular building, plenum-rated cable may be required.*

   Normally, cables between the ODU and the CPE indoor equipment should not be spliced. However, if a cable splice cannot be avoided, use only approved connectors.

2. Label each end of the cable individually with numbers or colors using cable labeling tape. 3M makes a product that is ideally suited for this application.

Cable Terminations

The RG-6-type coaxial cable uses a male TNC connector to connect to the ODU. Follow the instructions from the connector manufacturer to prepare the cable. Install the connector only with the recommended crimping tool. (See page 3-10 for recommended tool.)

1. Install TNC connector on the IF cable.
2. Connect the cable to the lightning suppressor.
3. Make an 18-inch (45 cm) IF jumper cable with a TNC connector on each end.
4. Install the 18-inch IF jumper cable between the ODU and the lightning suppressor.

5. Waterproof the connector using a sealing type of heat shrinkable tubing, cold shrink tubing, or 3M type 66 vinyl tape with a coating of 3M electrical coating.

Note *Waterproofing is not required for connectors that terminate inside.*

6. At the CPE indoor equipment, install a TNC connector on each IF cable.
7. Following the system design plan, connect the cable from each antenna unit to a specific ODU connector on the CPE.

CPE Indoor Installation

Indoor Equipment Placement

The Fiberless 320 CPE can be located in a wiring closet with other communications equipment or in a customer suite. Its compact low-profile package, rubber feet, and optional mounting brackets make it easy to mount it in either a standard 19-inch (47 cm) or 23-inch (57 cm) cabinet or stack on a shelf using the included rack-mounted ears (see Figure 6-6).

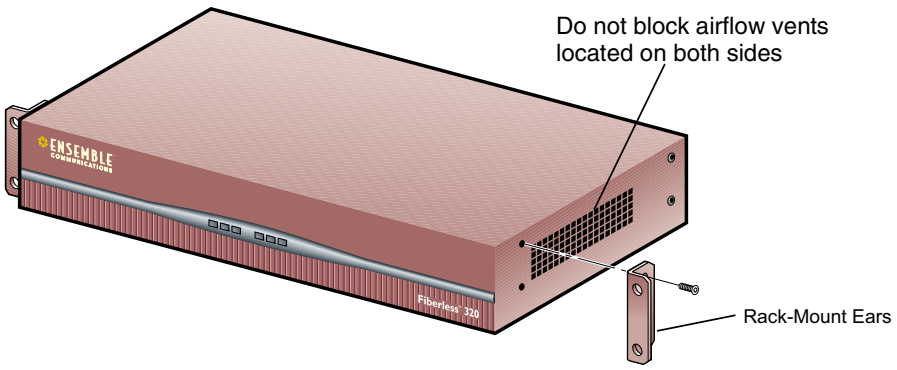

Figure 6-6. CPE Showing Airflow Vents and Rack-mounted Ears

Caution

When placing the CPE, do not block the airflow vents that are located on both sides of the unit.

CPE Indoor Access Requirement

Allow enough room to accommodate the size of the unit (1.5 U [2.6 inches/6.6 cm) by 9.5 inches (25 cm) deep) with enough clearance to accommodate termination of up to 16 data cables or 12 T1 cables, two cables to the ODU, and a power cord.

CPE Indoor Temperature

The location should meet these temperature allowances, including enough ventilation to dissipate heat loads of 150 Watts:

50° to 86° F (10° to 40° C)

CPE Indoor Power

The CPE indoor unit is normally shipped for use with 120/220 VAC power. When possible, it should be plugged into a dedicated 15 Amp circuit. You may install a small PC-style UPS if desired.

CPE Indoor Grounding

For AC systems, ground the indoor unit by connecting its conductor to a grounded power outlet. The ground conductor on the power plug must be connected to the building's electrical ground.

WARNING

Do not power up the indoor unit until you are instructed to do so during the initial procedure.

CPE Indoor Procedure

- Select an environment that is dirt and dust free for the CPE.
- Situate the CPE box in a rack, shelf mount or on a table top. Connect the power cable to the power connector on the back of the CPE indoor equipment.

> ***WARNING***
>
> **The cable may have -48 VDC across the connector when connected to the CPE. Therefore, DO NOT apply power to the CPE before connecting or disconnecting the RG-6 cable at either end.**

Note *The CPE requires a nominal of 110/220 VAC, 10 Amps. Each CPE requires a separate circuit breaker. UPS is optional.*

- Connect the RG-6 cable to the CPE ODU1 port connector (see Figure 6-7).
- Plug the CPE power cord into either a 110/220 VAC power outlet (Figure 6-7 shows a typical 110 VAC outlet).
- Turn on breaker to the CPE and verify that the fan is operating.

Note *The CPE has a field-replaceable 3-Amp fuse located behind the switch housing. Remove the housing to replace this fuse.*

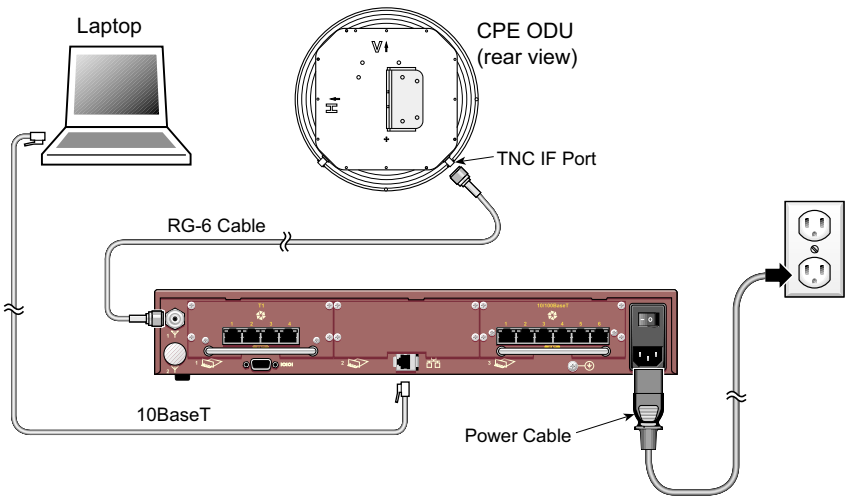

Figure 6-7. Power Cable Installation

> ⚠ ***Caution***
>
> *If you power off the CPE, wait five seconds before turning on the power again.*

Antenna Alignment

The following sections describe how to align the antenna. Figure 6-8 illustrates the assembly and its alignment rods.

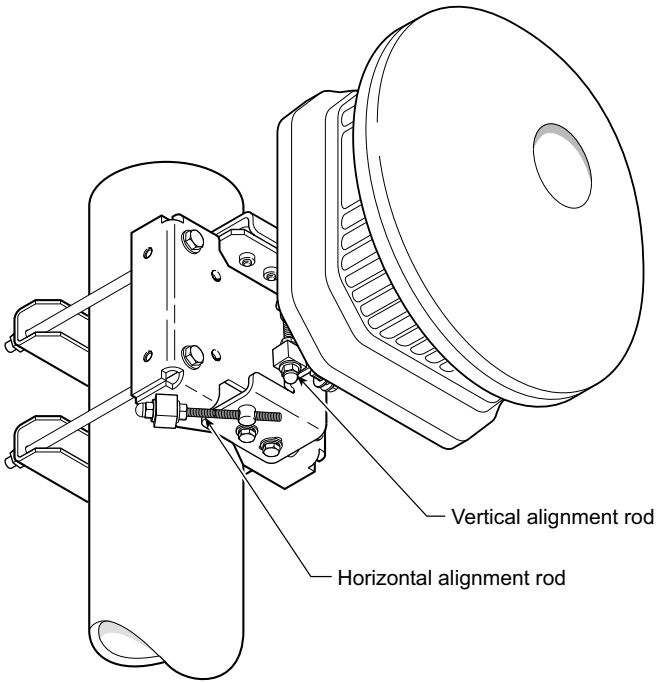

Figure 6-8. Antenna Adjustments

DC Voltage Measurement

- Connect a BNC cable to the ODU alignment port (BNC connector) as shown in Figure 6-9.
- Connect the other end of the BNC cable to the banana plug.
- Turn on the DVM and set it to measure DC voltage. Make note of the voltage reading on the DVM.
- Connect the banana plug to the digital voltage multimeter (DVM).

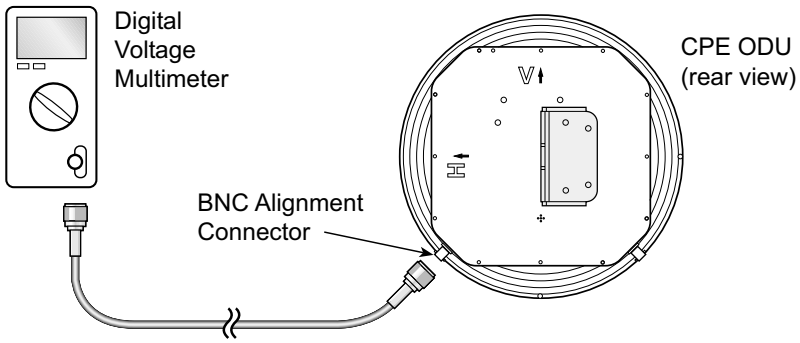

Figure 6-9. Digital Voltage Multimeter (DVM) Connection

Note *The alignment port is factory configured to provide a voltage of 0 - 5 VDC. Any received signal level (RSL) of less than 0.5 VDC is translated as 0 and the readout displays a blinking 0.*

Receive Signal Levels for Various Voltages

Table 6-1: RSL and Voltages

Rx pwr (dBm)	RSL (V)
-75	1.08
-70	1.39
-65	1.71
-60	2.04
-55	2.35
-50	2.69
-45	3.00
-40	3.33
-35	3.65
-30	3.96
-25	4.29
-20	4.61

Note *These values are a guide. They will be affected by rain fading, antenna alignment accuracy, and antenna tilt angle.*

Voltage Readings

1. Using the 7/16-inch socket wrench set, start sweeping the antenna slowly to one direction. Pause every two turns, waiting for the readout to stabilize before preceding.

2. Note the peak voltage variances, and sweep the antenna in the other direction.

Main Lobe Location

3. Move the antenna to the strongest signal reference of the two.
4. Repeat steps 1-3 for the vertical alignment.

Antenna Alignment Completion

5. When alignment is completed, disconnect the BNC cable at both the ODU BNC connector and the DVM.
6. Recap the ODU BNC connector and stow all tools.

CPE Software Configuration

See page 7-65.

CPE Subscriber Interface Cards (SICs)

Customer equipment is connected to the SIC ports at the rear of the CPE. Slot 1 may be the four-port T1, and slot 3 may be the six-port 10/100BaseT.

Note *Release 1.0 does not support slot 2.*

Connect CPE SIC ports to the customer equipment.

CPE LEDs

Within 45 seconds of successful registration, the CPE establishes an active data connection.

The CPE Status, ODU, and Sync LEDs, as shown in Figure 9-1, will display solid green if the CPE is functioning properly.

Note *At power up, Status, ODU, and Sync LEDs are red.*

See "Troubleshooting" on page 9-1 for the LED descriptions.