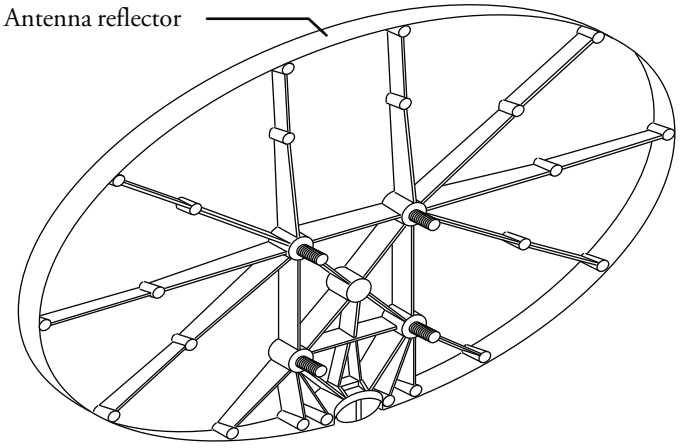
ANTENNA INSTALLATION GUIDE

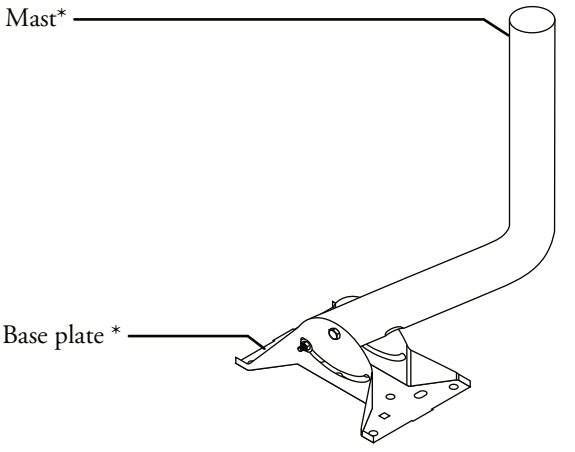
(FOR POLE MOUNT)

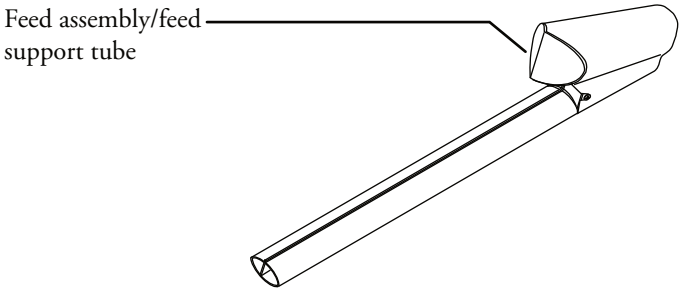
DirecPC™

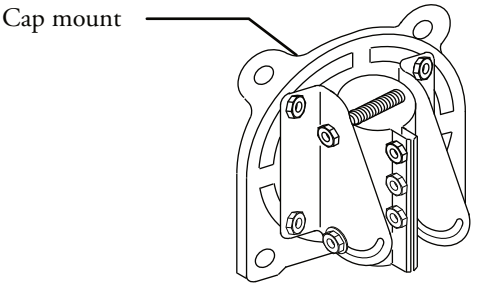
A START HERE

YOUR ANTENNA KIT CONTAINS THE FOLLOWING COMPONENTS:

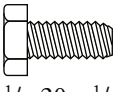


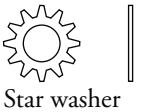


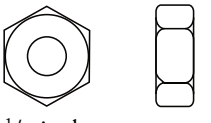


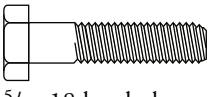



$^{5}/_{16}$-18 wedge nut (Qty: 1)

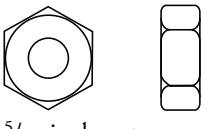

$^{1}/_{4}$-20 x $^{1}/_{2}$-inch bolt (Qty: 1) *


Star washer (Qty: 1) *


$^{1}/_{4}$-inch nut (Qty: 1) *

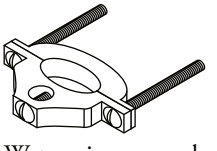

$^{5}/_{16}$-18 hex bolt (Qty: 1)

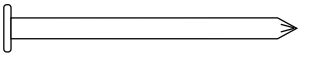

$^{3}/_{8}$-inch flat washer (Qty: 8) *


$^{5}/_{16}$-inch nut (Qty: 4)

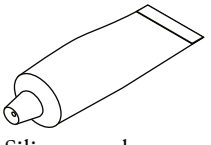

$^{5}/_{16}$-inch lock washer (Qty: 5)

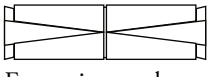

$^{5}/_{16}$-inch flat washer (Qty: 1)

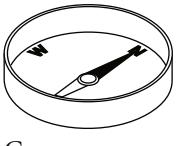

Water pipe ground clamp (Qty: 1)

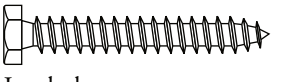

Cement-coated nail, 16d (Qty: 12) *

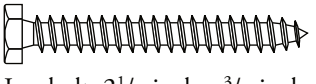

Cable clips for RG6 coaxial cable (Qty: 10)

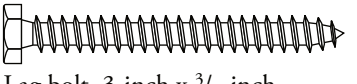

Silicone sealant, 1-ounce container (Qty: 1)

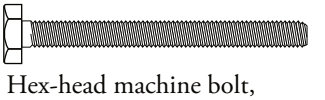

Expansion anchor (Qty: 5) *


Compass (Qty: 1)


Lag bolt, 2-inch x $^{3}/_{8}$-inch (Qty: 6) *


Lag bolt, $2^{1}/_{2}$-inch x $^{3}/_{8}$-inch (Qty: 8) *

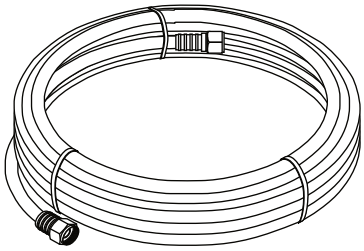

Lag bolt, 3-inch x $^{3}/_{8}$-inch (Qty: 2) *


Hex-head machine bolt, $2^{1}/_{4}$-inch x $^{3}/_{8}$-inch (Qty: 5) *

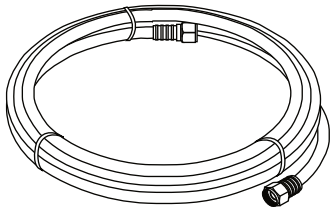
* These items are not needed for the pole mount installation, but you should store them just in case you decide later to move the antenna to a new location.

GO TO B

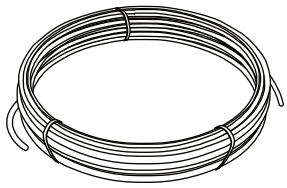
B MAJOR SYSTEM COMPONENTS (continued)



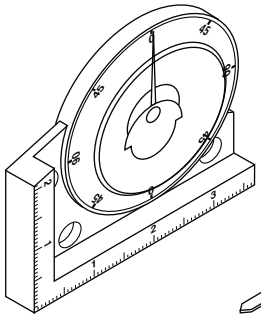
100 feet weatherproof RG6 coaxial cable with F-type connectors (Qty: 1)



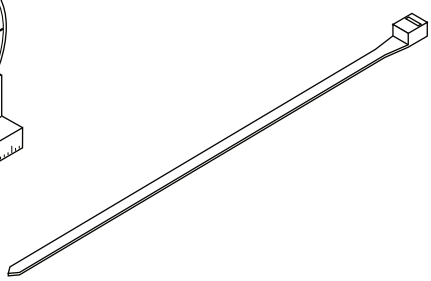
25 feet weatherproof RG6 coaxial cable with F-type connectors (Qty: 1)



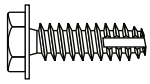
50 feet #8 aluminum grounding wire (Qty: 1)



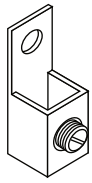
Angle finder (Qty: 1)



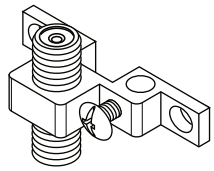
$11^{1}/_{2}$-inch cable tie (Qty: 4)



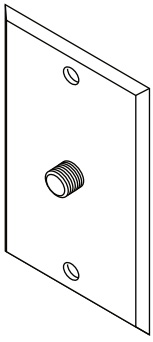
M6 hex head self-tapping screw (Qty: 1)



Grounding lug (Qty: 1)



Coaxial ground block with mounting hardware (Qty: 1)



Wall plate with mounting hardware (Qty: 1)

C CONVENTIONS USED IN THIS GUIDE

Notes, cautions, and warnings, defined as follows, are used throughout this guide to help you become familiar with possible safety or equipment hazards.

DANGER

Indicates an imminent shock hazard that, if not avoided, will result in severe personal injury or death caused by electric shock.

WARNING

Indicates a shock hazard or unsafe practice that, if not avoided, could result in severe personal injury or death caused by electric shock.

WARNING

Indicates a hazard or unsafe practice that, if not avoided, could result in severe personal injury or death.

CAUTION

Indicates a hazard or unsafe practice that could result in minor or moderate personal injury or product or property damage.

Note: *A note presents additional information or interesting sidelights.*

GO TO D

D SAFETY INFORMATION

DANGER

You can be seriously injured or *killed* if the antenna comes into contact with electric power lines. Verify that there are none nearby before performing procedures in this guide. Watch out for overhead power lines. Check the distance to the power lines before starting installation. We recommend that you stay a minimum of 20 feet (6 meters) from all power lines.

If any part of the antenna or mast assembly comes into contact with a power line, call your local power company. *Do not try to remove it yourself!* They will remove it safely.

WARNING

Before you dig any holes or trenches, call your local utility companies so they can help you locate underground power, telephone, cable, gas, water, and sewer lines in the area.

WARNING

Local electrical codes and the National Electrical Code require the antenna to be connected to a grounding electrode. Even if you will be installing the antenna onto a pole inserted into the ground, a grounding electrode still must be connected to the antenna.

WARNING

For your own safety, follow these important safety rules:

- **Perform as many functions as possible on the ground.**
- **If you start to drop the antenna or mast assembly, get away from it and let it fall.**

WARNING

Assembling the dish antenna on a windy day can be dangerous. Because of the antenna surface, even slight winds create strong forces. For example, a 1.0-meter antenna facing a wind of 20 MPH (32km/h) can undergo forces of 60 lbs. (269N). Be prepared to safely handle these forces at unexpected moments.

Do not attempt to assemble, move, or mount a dish on windy days or serious, even fatal, accidents can occur. Hughes Network Systems, Inc., is not responsible or liable for damage or injury resulting from antenna installations.

WARNING

Antennas improperly installed or installed onto an inadequate structure are extremely susceptible to wind damage. This damage can be very serious or even life threatening. The owner and installer assume full responsibility for ensuring that the installation is structurally sound to support all loads (weight, wind, and ice) and properly sealed against leaks.

Hughes Network Systems, Inc., will not accept liability for any damage caused by a satellite system due to the many unknown variable applications. Hughes Network Systems, Inc. also recommends that you consult your local building safety code before installation.

E INTRODUCTION

The *DirecPC Antenna Installation Guide* provides information required to install your antenna on a pole mount.

Note: *Before installing the antenna, check local zoning codes, covenants, and other restrictions. Some communities prohibit installing satellite antennas or place limits on the mounting height of the antenna.*

This guide is intended for an installer experienced in performing the various tasks described in this guide. Depending on how you will install the antenna, you may be required to:

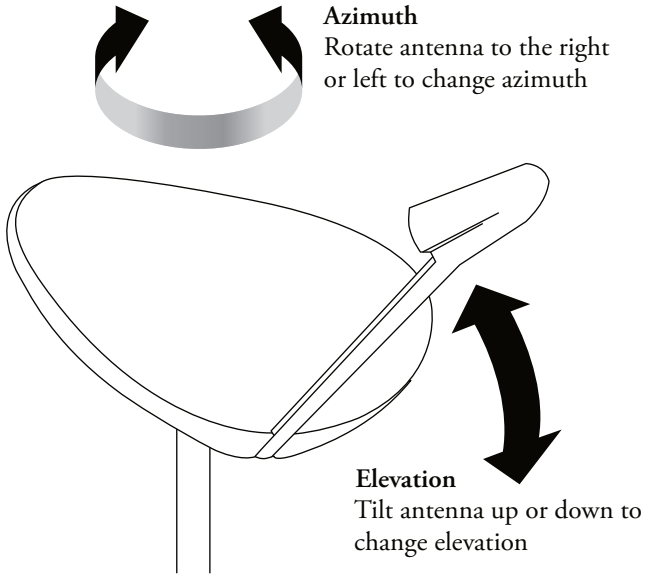
- Use a power drill to drill holes into your house.
- Determine whether there are water pipes, electrical wiring, or gas lines hidden in the walls near where you will be drilling.
- Route coaxial cable through the foundation wall, under floors, and through interior walls.
- Ground the antenna and coaxial cable as recommended in the National Electrical Code (published by the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269).

If you do not feel comfortable about performing these tasks or complying with installation requirements, contact your DirecPC dealer for information on having your system installed by an authorized professional installer.

GO TO F

F LOCATING THE SATELLITE

The satellite is located approximately 22,300 miles (35,900 kilometers) in orbit above the equator. The orbit is referred to as being *Geostationary* because the satellite travels above Earth's equator from west to east at a speed matching that of Earth's rotation, thus remaining stationary in relation to Earth. To aim the antenna at the satellite you need to know the azimuth and elevation angles. As shown in the diagram at right, you set the antenna to the correct azimuth angle by turning it from side to side. You set the elevation by tilting the antenna up or down.



Before you install the antenna, make sure:

- The DirecPC adapter has been installed. (If not, refer to chapter 2, "Installing the DirecPC adapter" in *Getting Started*.)
- The DirecPC software has already been installed. (If not, see chapter 3, "Installing the DirecPC Navigator" in *Getting Started*.)
- You have run the *Auto Setup* program and reached the *Antenna Pointing* section. (If not, refer to chapter 4, "Configuring the DirecPC software and DirecPC adapter" in *Getting Started*.)

In the space provided below, write the azimuth and elevation angles displayed on the *Antenna Pointing* screen:

Azimuth:

Elevation:

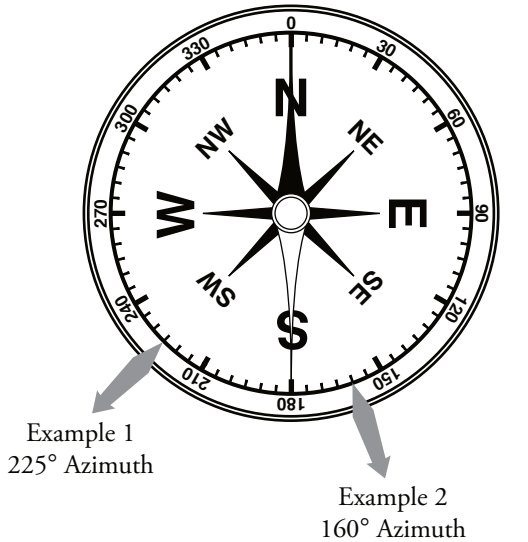
G CHOOSING THE ANTENNA INSTALLATION SITE

Perform the following steps to select the best site to install the antenna:

1. Go to the location where you plan to install the antenna.
2. Using a compass like that shown at right, hold the compass level so the needle can rotate freely. When the needle stops rotating, it will be pointing to north. Doing so carefully so as not to disturb the needle, rotate the body of the compass so that the *0°* or *N* marks printed on the compass align with the painted end of the needle. The compass is now aligned with magnetic North.

Note: *Large metal structures near the compass may reduce its accuracy. If you are near such structures, move several feet away and repeat the measurement to verify the readings.*

3. Draw an imaginary line from the center of the compass to the azimuth value you recorded above. This is the direction for pointing the antenna toward the satellite. Use a rock or some other object to mark the location where you are standing; then pick a landmark in the distance that aligns with the magnetic azimuth bearing, or mark the azimuth direction in some way.



GO TO H

H CHOOSING THE ANTENNA INSTALLATION SITE (continued)

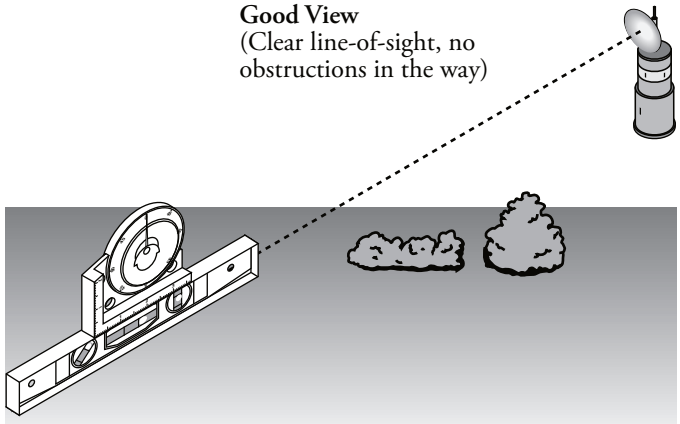
4. Using the angle finder and a carpenter's level or straight edge, verify that there is an unobstructed line-of-sight toward the satellite as shown in the diagram below. To do this, align the level along the azimuth bearing. Then, using the angle finder, lift the front of the straight edge to the elevation value indicated on the antenna pointing calculations window. Sight along the straight edge to verify that there are no obstructions (such as buildings or trees) blocking the view. Also, avoid installing the antenna next to electrical equipment such as air-conditioning units, because they can cause signal interference.

CAUTION

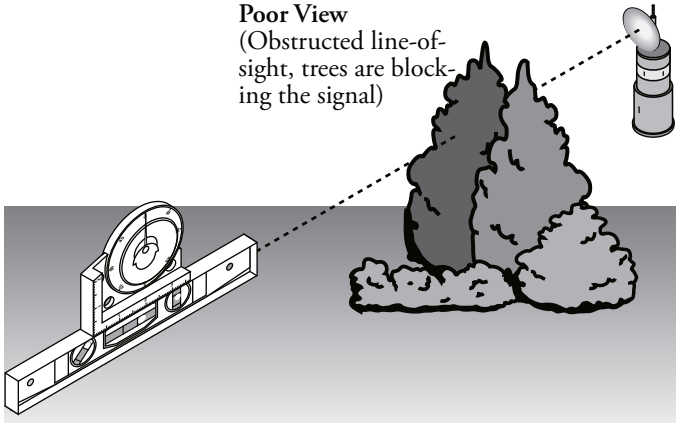
To avoid possible injury, do not select a site where the antenna could be bumped into or tripped over by people.

Note: When you check for obstructions, avoid sites where future tree growth could block the line-of-sight.

Good View
(Clear line-of-sight, no obstructions in the way)

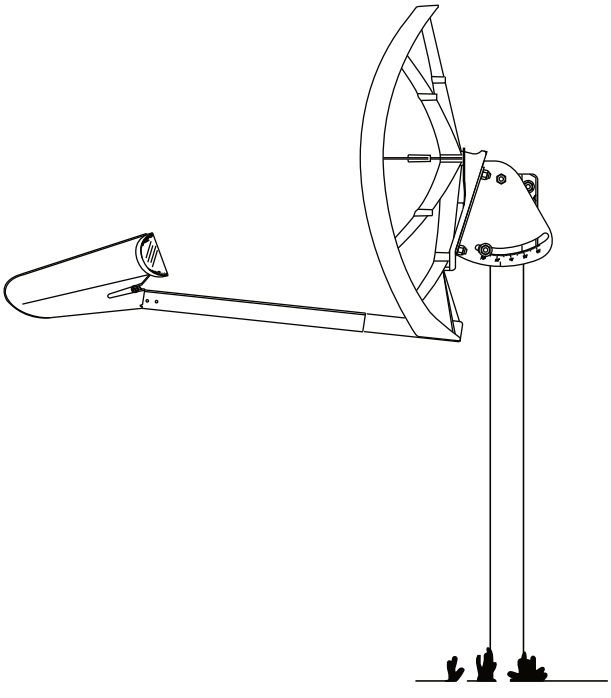


Poor View
(Obstructed line-of-sight, trees are blocking the signal)



I INSTALLING THE POLE-MOUNTED ANTENNA

This guide describes installing the antenna assembly onto a ground-mounted pole (shown below). Read this guide thoroughly before beginning system assembly. For best results, perform each step in the same sequence as listed in this guide.



DANGER

You can be seriously injured or *killed* if the antenna comes into contact with electric power lines. Verify that there are none nearby before performing the following procedure.

WARNING

To avoid injury, before you dig, call your local utility companies so they can help you locate underground power, telephone, cable, gas, water, and sewer lines in the area.

CAUTION

If you will be using a pole other than the one recommended as an optional purchase for the DirecPC pole mount system, make sure it meets the following specifications. (Using a pole that does not meet the recommendations may result in a pole mount that is not sturdy enough to support the weight of the antenna or able to withstand the wind velocities that the antenna was designed to withstand).

- **The pole must have a $2^{3}/_{8}$-inch outside diameter (OD). Pole and pipe sizes are measured by inside diameter (ID) and wall thickness. To obtain a pole with the correct OD, look for a pole with a 2-inch ID and a Schedule-40 wall thickness.**
- **The pole must be at least 6 feet long.**

GO TO J

HAVE AVAILABLE THE FOLLOWING TOOLS AND MATERIALS:

- Hole digging tools
- Hammer or driver for grounding rod
- Wheelbarrow or concrete mixing box
- Bubble level
- Assorted open-end wrenches
- Torque wrench (to 18 ft. pounds)
- Phillips screwdriver
- Ratchet wrench, 3/8-inch drive
- 10-mm socket, 3/8-inch drive (for M6 bolts)
- 13-mm socket, 3/8-inch drive (for M8 bolts)
- 10-mm nut driver
- 13-mm nut driver
- 1/2-inch drill bit
- 3/8-inch electric drill (for coax cable routing)
- 3 40-lb, bags of quick-setting concrete
- 1 1/2-inch ground clamp (if not using recommended pole)
- RG-6 coaxial cable with F-type connectors, impedance: 75 ohms, shielding: minimum double shield (requires a minimum 100% foil shield covered with a 40% woven braid), outer cover: PVC (must be suitable for both indoor and outdoor use, length as required)
- Coaxial cable sealant (COAX-SEAL or equivalent) to prevent moisture from seeping into the LNB from the coaxial connector
- A grounding rod and clamp (as required by the National Electrical Code and applicable local codes)

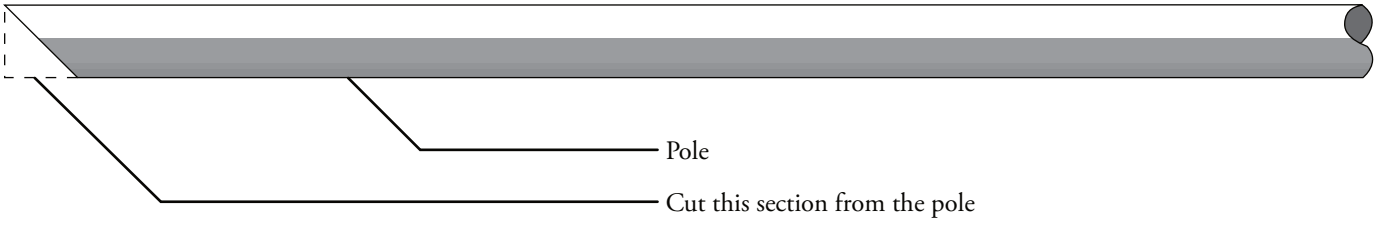
INSTALLING THE POLE MOUNT

Perform the following steps to install the pole mount.

Note: *10-mm tools fit M6 hardware and 13-mm tools fit M8 hardware.*

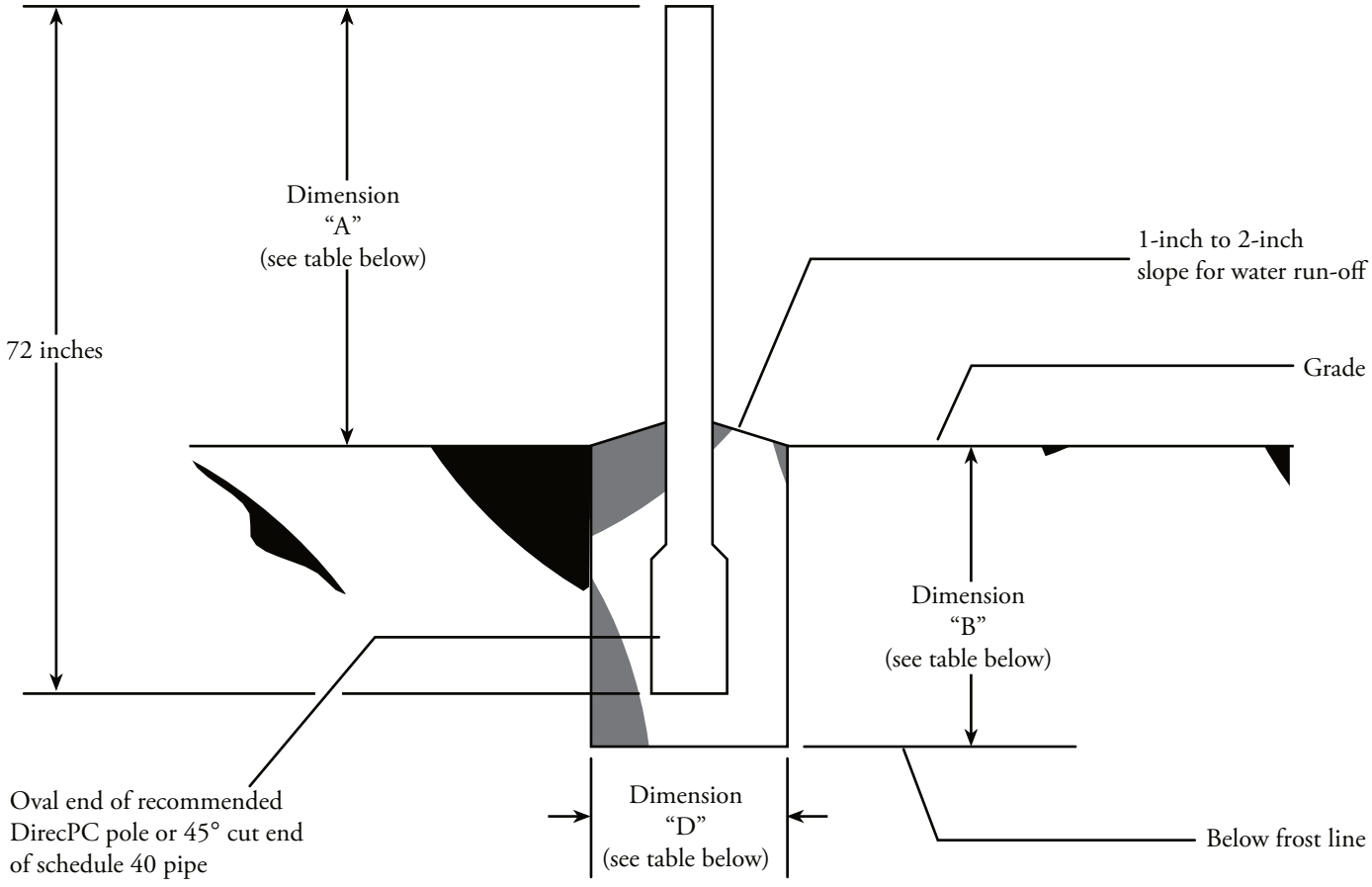
1. If you are using the recommended DirecPC pole, go to step 2. Otherwise, use a hacksaw to cut the bottom edge of the pole at a 45° angle, as shown below. This prevents the pole from rotating in the concrete over time.

Note: *If you live in an area where the frost line is never deeper than 36 inches below grade, refer to the figure and table in section* ***K*** *for specifications as you perform the following steps to install the pole. Otherwise, refer to the figure and table in section* ***L*** *for specifications that describe installing the pole in soil where the frost line extends 36 inches or deeper below grade.*



GO TO K

2. If you live in an area where the frost line is never deeper than 36 inches below grade, refer to the table below to determine how deep and wide the pole mount hole should be. Otherwise, because you live in an area where the frost line extends 36 inches or deeper below grade, refer to the table in section **L** to determine how deep and wide the pole mount hole should be. Dig the hole to the specified dimensions.



Wind Velocity	Exposure B Dimensions A	B	D	Concrete Volume	Exposure C Dimensions A	B	D	Concrete Volume
80 MPH	37 in.	36 in.	7 in.	0.9 feet^3	37 in.	36 in.	7 in.	0.9 feet^3
90 MPH	37 in.	36 in.	7 in.	0.9 feet^3	37 in.	36 in.	7 in.	0.9 feet^3
100 MPH	37 in.	36 in.	7 in.	0.9 feet^3	37 in.	36 in.	7 in.	0.9 feet^3
110 MPH*	37 in.	36 in.	7 in.	0.9 feet^3	34 in.	39 in.	7 in.	0.95 feet^3
120 MPH*	34 in.	36 in.	9 in.	1.25 feet^3	34 in.	39 in.	8 in.	1.25 feet^3

* $2^3/_8$ O.D. X 14 GA wall ground pole (#9007869-0005) is rated at 110 MPH at heights shown.

$2^3/_8$ O.D. X Schedule 40 (0.154 wall) ground pole is rated at 120 MPH at heights shown.

Note 1: *Pole and foundation design is based on the following criteria:*

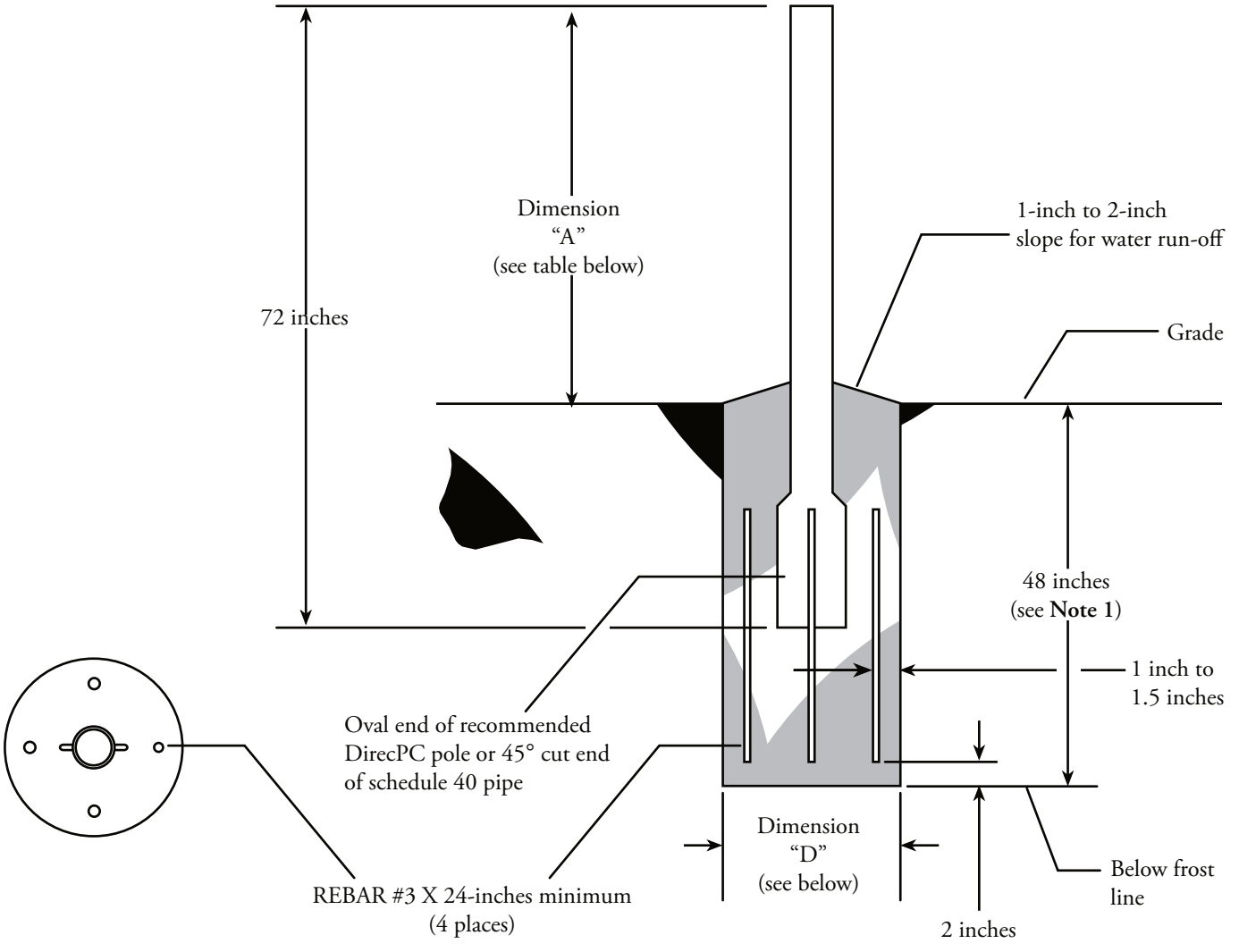
- *Uniform Building Code Exposure B or C and 1.5 stability factor.*
- *Vertical soil pressure of 2,000 pounds per square foot.*
- *Lateral soil pressure of 400 pounds per square foot.*
- *Concrete compressive strength of 2,500 pounds per square inch in 28 days.*

Note 2: *The foundation design shown in the figure above is intended as a guide only, it does not represent a specific site plan. Because soil condition vary and may not meet design criteria listed in Note 1, you should consult a local professional engineer to determine your soil conditions and appropriate foundation.*

Note 3: *Exposure B indicates the terrain of urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions. The obstructions extend at least 1500 feet in all directions from the antenna installation.*

Note 4: *Exposure C indicates a flat terrain which is generally open; including obstructions less than 30 feet high, and extending one-half mile or more from the site in all directions from the antenna installation.*

GO TO L



	Exposure B			Exposure C		
Wind Velocity	Dimensions A	D	Concrete Volume	Dimensions A	D	Concrete Volume
80 to 125 MPH	37 in.	7 in.	1.2 feet^3	37 in.	7 in.	1.2 feet^3
110 MPH*	37 in.	7 in.	1.2 feet^3	34 in.	7 in.	1.2 feet^3
120 MPH*	34 in.	7 in.	1.2 feet^3	34 in.	7 in.	1.2 feet^3

* $2^3/_8$ O.D. X 14 GA wall ground pole (#9007869-0005) is rated at 110 MPH at heights shown.

$2^3/_8$ O.D. X Schedule 40 (0.154 wall) ground pole is rated at 120 MPH at heights shown.

Note 1: *The 48-inch hole depth may be increased as necessary for your particular site. If you do make the hole deeper, also increase the concrete, and extend the length of the rebar accordingly.*

Note 2: *Pole and foundation design is based on the following criteria:*

- *Uniform Building Code Exposure B or C and 1.5 stability factor.*
- *Vertical soil pressure of 2,000 pounds per square foot.*
- *Lateral soil pressure of 400 pounds per square foot.*
- *Concrete compressive strength of 2,500 pounds per square inch in 28 days.*

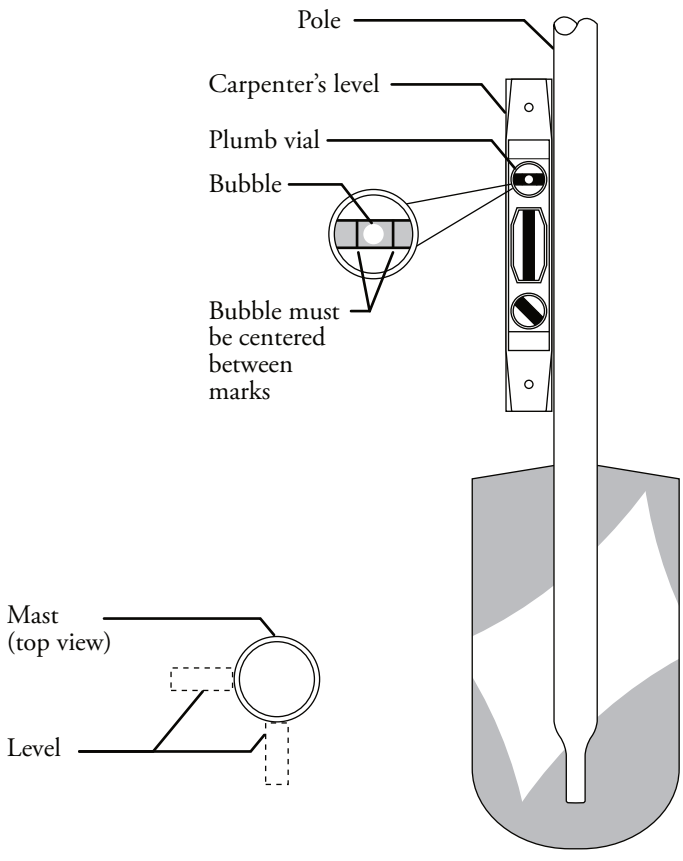
Note 3: *The foundation design shown in the figure above is intended as a guide only, it does not represent a specific site plan. Because soil conditions vary and may not meet design criteria listed in Note 2, you should consult a local professional engineer to determine your soil conditions and appropriate foundation.*

GO TO M

M INSTALLING THE POLE-MOUNTED ANTENNA (continued)

3. Place the pole into the hole, and place rocks (for example) around the pole to stabilize it in a vertical position.
4. Using a bubble level, plumb the pole in at least two different locations on the side of the pole, as shown at right. These two measurements should be at right angles to each other. When the pole is plumb, secure it with the rocks, or attach guy wires to hold it upright.
5. Fill the hole with prepared quick-drying cement. Shape the top of the concrete with a slope to improve drainage as shown in figures in sections **K** and **L**.
6. Let the cement dry for at least 24 hours before you mount the antenna assembly onto the pole.

Note: *To enable the concrete to cure uniformly, keep it moist or cover it with a Visqueen plastic tarp (or equivalent) to keep moisture from escaping until it has cured.*



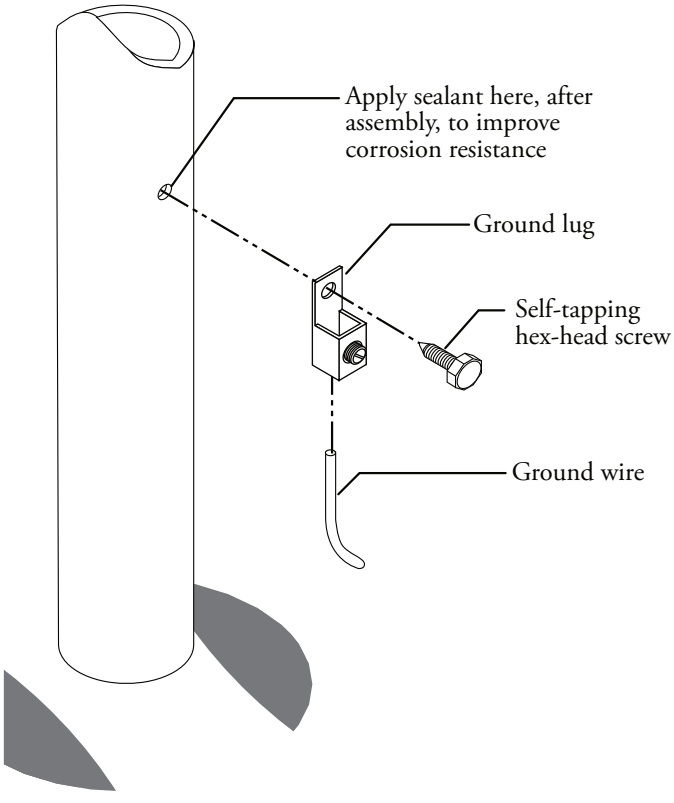
N GROUNDING THE POLE MOUNT

Perform the following steps to ground the pole mount.

WARNING

To avoid injury from electrical shock, local electrical codes and the National Electrical Code require that the antenna be connected to a grounding electrode. Even though you will be installing the antenna onto a pole inserted into the ground, a grounding electrode must be connected to the antenna.

1. Insert one end of the ground wire through the ground lug (see diagram at right). If the ground wire is to be routed under ground, use a copper ground wire.
2. Tighten the ground lug clamp screw until the ground wire is secured.
3. Install the ground lug onto the pole mount using the self-tapping hex-head screw as shown at right.
4. Refer to the National Electrical Code (NEC) Section 810 and local electric codes for the specific instructions on grounding the remaining end of the ground wire.

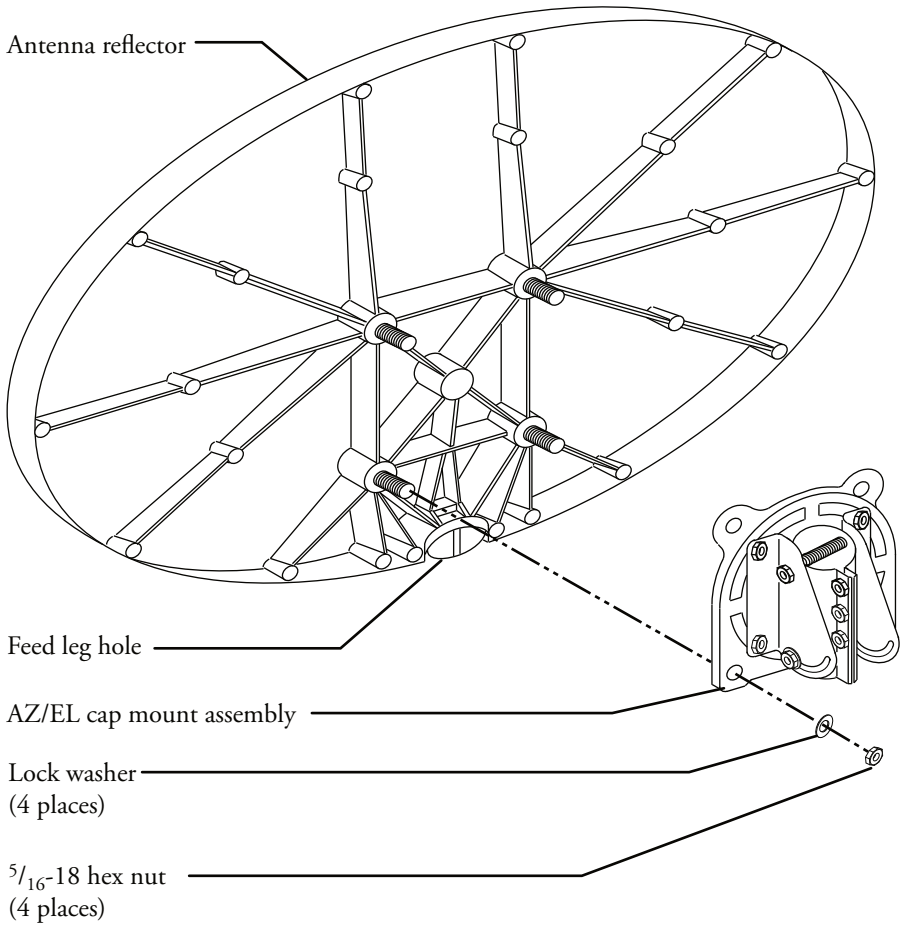


GO TO O

O ASSEMBLING ANTENNA REFLECTOR TO AZ/EL CAP MOUNT

Perform the following steps to assemble the antenna reflector onto the azimuth/elevation (AZ/EL) cap mount.

1. Insert the four threaded studs on back Of antenna reflector through corresponding holes on AZ/EL cap mount assembly (see diagram at right).
2. Install four lock washers and $^{5}/_{16}$-inch hex nuts onto threaded studs. Tighten and torque hex nuts to 18 ft.-lbs. (24N-m).

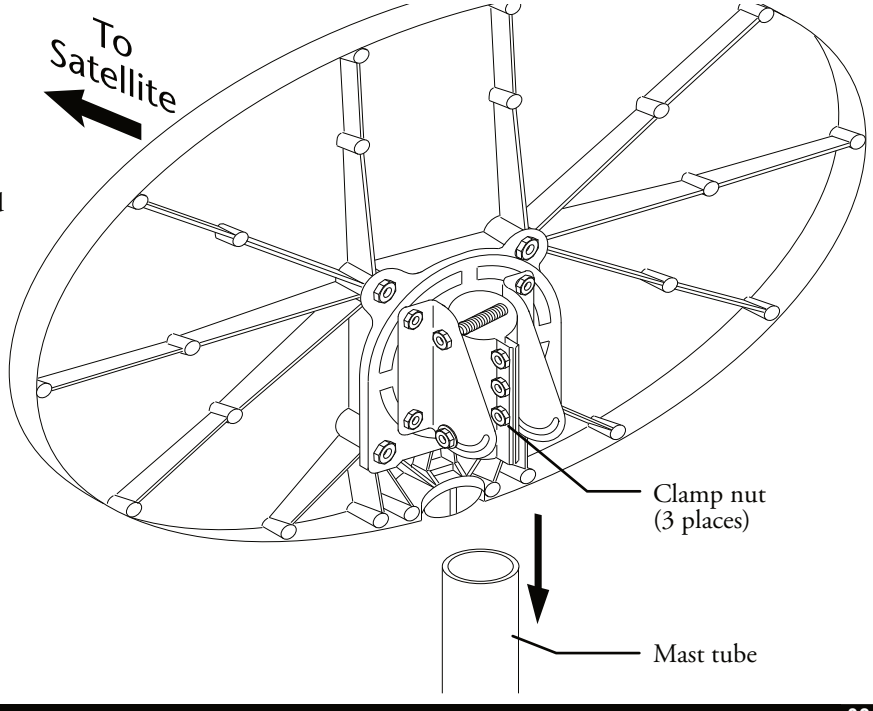


P ASSEMBLING ANTENNA/CAP MOUNT ONTO MAST

Perform the following steps to assemble the antenna/cap mount onto the pole.

Note: *Do not remove the abrasive pad from inside the cap mount assembly; it remains as a part of the assembly.*

1. Lift antenna/cap mount assembly and slide AZ/EL cap mount onto mast tube (see diagram at right).
2. Tighten $^{5}/_{16}$ clamp nuts so that the antenna/cap mount assembly is held stationary on mast but can be swiveled with slight pressure.

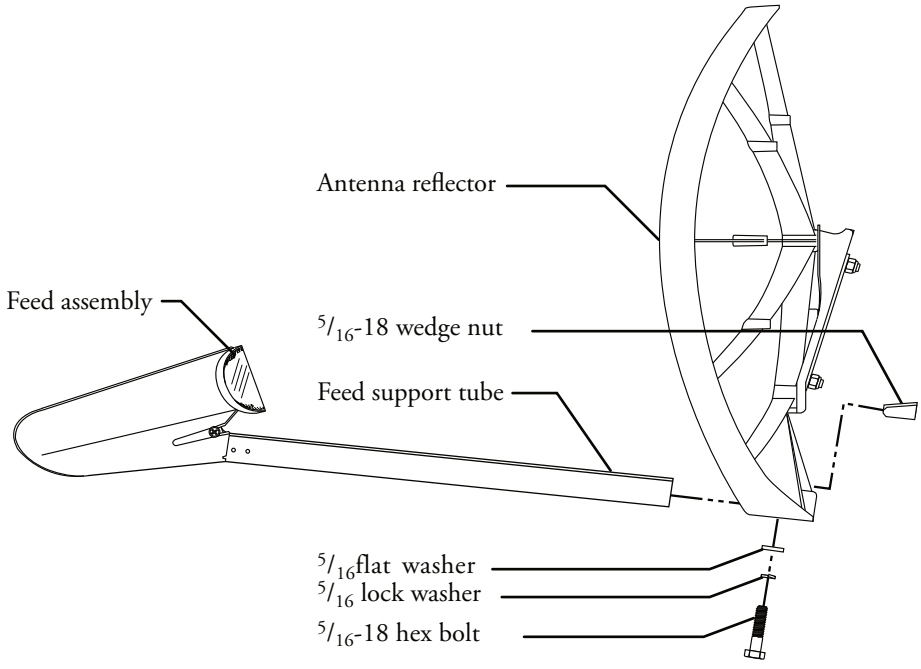


GO TO Q

Q INSTALLING FEED ASSEMBLY AND FEED SUPPORT TUBE ONTO REFLECTOR

Perform the following steps to install the feed assembly and feed support tube onto the antenna reflector. The feed support tube is keyed to assure that it will seat properly in the feed support socket.

1. Insert the $^5/_{16}$-18 wedge nut into the antenna reflector as shown in diagram at right. The wedge nut is keyed so that it will fit properly in its slot in the antenna.
2. Install the feed support tube into the feed support socket on the antenna reflector.
3. Secure the feed support tube with a $^5/_{16}$ flat washer, lock washer, and $^5/_{16}$-18 hex bolt. Use a torque wrench to tighten the hex screw to 8 to 10 ft-lbs.



R INSTALLING AND ROUTING THE LNB COAXIAL CABLE

HAVE AVAILABLE THE FOLLOWING TOOLS AND MATERIALS:

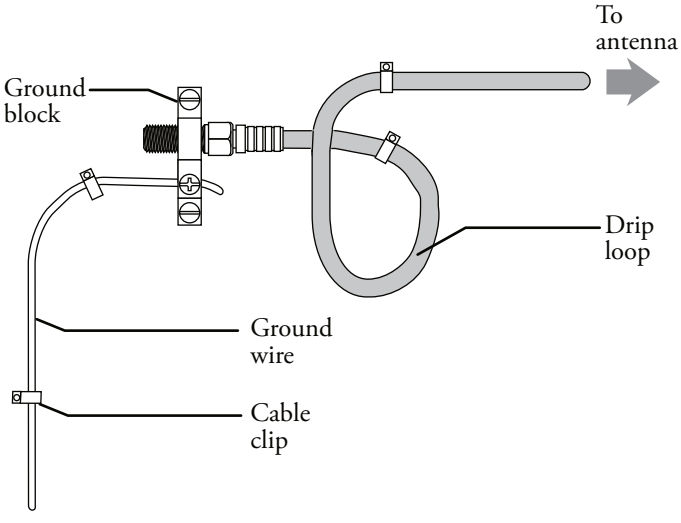
- Flat-blade screwdriver
- Phillips screwdriver
- Hammer

INSTALLATION PROCEDURE

This section describes routing and installing the coaxial cable between the low-noise block (LNB) and the grounding block. Depending on the routing of the coaxial cable, you may choose to use a cable that can be buried. When normal coaxial cable is buried, its outer cover decays in the soil, and the cable's life is shortened. Cables that are suitable for burial use a special outer cover that resists breakdown. Some of these cables also have a special coating on their ground shields. This coating resists corrosion if water gets into the cable. Any time the coaxial cable is buried, use cable that is suitable for burial. Doing so will help prevent problems in the future.

An important goal of your cable installation is to protect the cable from physical damage and moisture penetration. To protect the cable from physical damage, secure it to walls or other stable surfaces with cable clips. This prevents the cable from sagging and being damaged by people stepping on it or running over it with yard equipment. Prevent moisture penetration by using weatherproof connectors, or by sealing any connection that is exposed to the elements. Drip loops provide a connection with additional protection by preventing moisture from traveling down the cable and entering the connection, as shown at right.

1. Select the location where you will install the ground block. Choose a site that will be near to the point where the cable enters the building. Also, plan a short and straight path for the ground wire to the grounding rod.



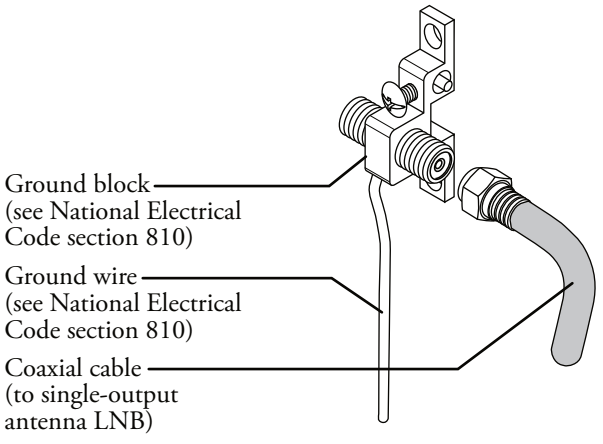
WARNING

To avoid injury, verify before you drill that there are no electrical wires or pipes near where you will be drilling.

GO TO S

S INSTALLING AND ROUTING THE LNB COAXIAL CABLE (continued)

2. Select a length of cable that can be route easily from the LNB to the ground block.
3. Secure the grounding block to a stable mounting surface with two screws, then connect the coaxial cable to the grounding block (see diagram below).

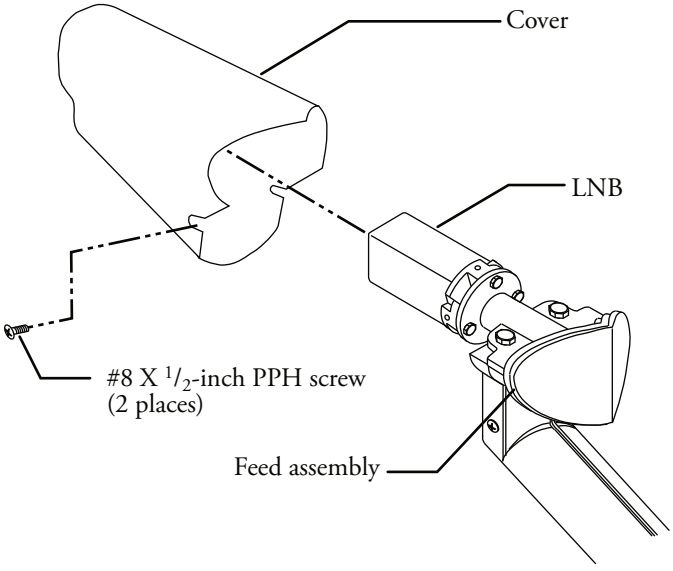


4. Secure the cable with cable clips. Do not forget to form the drip loop and secure it with cable clips.
5. Install the #8 ground wire on the ground terminal of the ground block.
6. Route the ground wire to the ground rod.
7. Connect the ground wire to the ground rod. Secure the wire to a wall or some surface to protect it.

T CONNECTING THE COAXIAL CABLE TO THE LNB

Perform the following steps to install the LNB cable to the LNB.

1. Using a Phillips screwdriver, remove the two#8X$^1/_2$-inch PPH screws from the feed assembly cover (see diagram below).

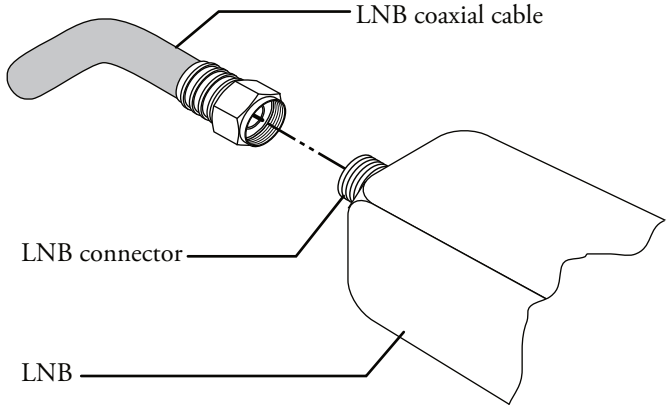


2. Remove the feed assembly cover.
3. Route one end of the RG-6 coaxial cable from the back of the antenna reflector along the feed leg until approximately 12 inches (30.5 cm) of cable extends from the top of the leg. Tie the cable in place.
4. If the cable already has an F-type connector on it, go to step5. Otherwise, follow the instructions that came with the F-type connector you are using to install it onto the end of the cable.

CAUTION

If the F-type connector you are using is not weatherproof, you need to use a coaxial cable sealant (COAX-SEAL or equivalent) to prevent moisture from seeping into the LNB from the coaxial connector. The copper-plated center conductor in the RG-6 cable can experience electrolytic corrosion at the LNB connector. Moisture combined with DC current cause this type of corrosion.

5. Install the coaxial cable onto the LNB connector (see diagram below).



6. Install the feed assembly cover using the two #8 X $^1/_2$-inch PPH screws removed in step1.
7. Verify that the feed cover is positioned with the two drain holes facing the ground.

GO TO U

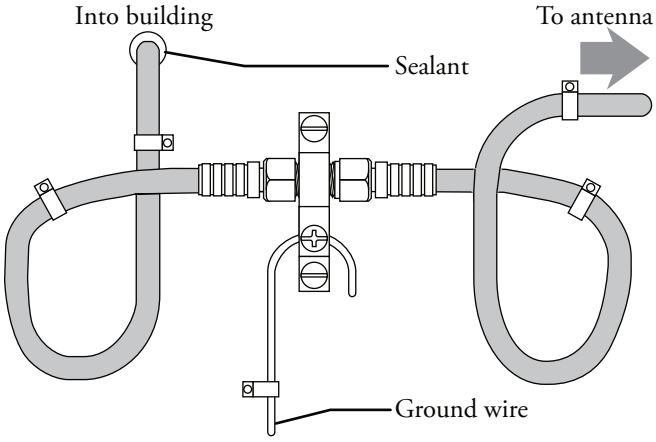
ATTACHING THE LNB CABLE ONTO THE DIRECPC ADAPTER

During this step of the installation, route the LNB cable from the ground block to the DirecPC adapter. In most installations, there is more than one way to get the LNB cable to the adapter from the grounding block. If the adapter is located near an inside wall, use the crawl, basement, or attic spaces. When routing the LNB cable to the adapter, take the shortest possible path and always protect it from physical damage.

WARNING

To avoid injury, verify that there are no electrical wires or pipes in the area of the hole where you plan to drill to enter the building.

1. After verifying that there are no wires or pipes blocking the location where you want to feed the coaxial cable into the building, drill a 1/2-inch hole.
2. Connect one end of the cable to the ground block (see diagram at right).
3. Form a 3-inch to 5-inch drip loop in the cable before inserting it in the access hole.
4. Secure the drip loop and cable to the wall with cable clips.



5. Inside the building, route the cable to the computer. Depending on the installation site, this could be through a floor or wall, directly to the rear of the computer. If the cable goes straight through a wall, you can use a wall plate at the access point.
6. Install the cable onto the adapter cable connector.
7. Seal the access point into the building with silicone sealant.

The antenna and cable are now completely installed. Refer to chapter 5 “Aligning the antenna” in Getting Started.

Notes

FCC ID: K3YHNS9200-1

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

This product is the subject of one or more U.S. or foreign patents pending.

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