



**.98m Ka-Band Antenna
Installation Guide**

Model: AN8-098P

1037750-0001
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Understanding safety alert messages

Safety alert messages call attention to potential safety hazards and tell you how to avoid them. These messages are identified by the signal words DANGER, WARNING, CAUTION, or NOTICE, as illustrated below. To avoid possible property damage, personal injury, or in some cases death, read and comply with all safety alert messages.

Messages concerning personal injury

The signal words DANGER, WARNING, and CAUTION indicate hazards that could result in personal injury or in some cases death, as explained below. Each of these signal words indicates the severity of the potential hazard.



DANGER indicates a potentially hazardous situation which, if not avoided, *will* result in death or serious injury.



WARNING indicates a potentially hazardous situation which, if not avoided, *could* result in death or serious injury.



CAUTION indicates a potentially hazardous situation which, if not avoided, could result in *minor or moderate* injury.

Messages concerning property damage

A NOTICE concerns property damage only.

A blue rectangular box containing the word "NOTICE" in white capital letters.

NOTICE

NOTICE is used for advisory messages concerning possible property damage, product damage or malfunction, data loss, or other unwanted results—but *not* personal injury.

Safety symbols

The generic safety alert symbol



calls attention to a potential personal injury hazard. It appears next to the DANGER, WARNING, and CAUTION signal words as part of the signal word label. Other symbols may appear next to DANGER, WARNING, or CAUTION to indicate a specific type of hazard (for example, fire or electric shock). If other hazard symbols are used in this document they are identified in this section.

Additional symbols This document uses the following hazard symbols:



Indicates a safety alert message that concerns a potential electric shock hazard.



Indicates a safety alert message concerning a potentially hazardous situation in which you could fall.



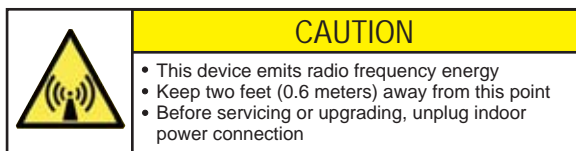
Indicates a safety alert message concerning a potentially hazardous situation in which you could be exposed to radio frequency energy.

Product warning labels

The following safety alert labels are affixed to the antenna feed support arm, radio transmitter, and antenna reflector, respectively.



Feed support arm



Transmitter



Reflector (back side)

Safety alert labels on the antenna assembly

These labels advise that the antenna emits radio frequency (RF) energy. Because of this potential safety hazard, observe all cautions on these labels and in the next section, *Antenna installation safety*.

Antenna installation safety

Observe the following precautions when installing the satellite antenna. This manual also includes other safety alerts where appropriate concerning specific installation procedures.

WARNING

Only Hughes-certified installers may install or service Hughes antennas and their components. Installers must expressly acknowledge the Hughes requirements for Hughes installations.

DANGER



If you work on a roof, tower, or other high structure or use a ladder or scaffold to access the work site, follow these precautions to prevent personal injury or death:

- Walk only on sound roof structures.
 - Make sure the antenna assembly and installation surface are structurally sound so that they can support all loads (equipment weight, ice, and wind).
 - Use safety equipment (for example, a lifeline) appropriate for the work location.
 - Follow all manufacturer safety precautions for all safety and other equipment used.
 - Perform as many procedures as possible on the ground.
-

DANGER



- To avoid electric shock, stay at least 20 ft from power lines.
 - If any part of the antenna or mount assembly comes in contact with a power line, call the local power company to remove it. *Do not try to remove it yourself.*
 - For pole mount installations, be sure to obtain information regarding underground utilities in the proposed location before digging.
-

WARNING

Properly ground the antenna assembly in accordance with all local and national electrical codes.

 **WARNING**

- Do not work in high wind or rain; or if a storm, lightning, or other adverse weather conditions are either present or approaching.
 - Do not attempt to assemble, move, or mount the antenna on a windy day. Even a slight wind can unexpectedly create sudden strong forces on the antenna surface.
-

 **CAUTION**

If the antenna or mount assembly begins to fall during the installation, do *not* attempt to catch it. Move away and let it fall.

 **WARNING**

Antennas that have been improperly installed or attached to an unstable structure are susceptible to wind damage, which can be very serious or even life threatening. The product owner and installer assume full responsibility that the installation is structurally sound to support all loads (weight, wind, and ice) and is properly sealed against leaks.



Observe these precautions to avoid exposure to RF radiation, a potential safety hazard:

- The antenna must be installed in a location not readily accessible to children and in a manner that prevents human exposure to potentially harmful levels of radiation.
- Antennas mounted in Puerto Rico, the continental United States, or at any site with a greater than 30° elevation angle must be installed such that the lower lip of the antenna reflector is at least 5 ft above any surface upon which a person might be expected to stand, and 3 ft 3 inches from any opening (such as a door or window) in a building or adjacent structure.
- Antennas mounted in Canada, Alaska, Hawaii, or any site with a less than 30° elevation must be installed such that the lower lip of the antenna reflector is at least 5 ft 9 inches above any surface upon which a person might be expected to stand, and 3 ft 3 inches from any opening (such as a door or window) in a building or adjacent structure.
- The antenna must be mounted such that no object that could reasonably be expected to support a person is within 6 ft 7 inches of the edges of a cylindrical space projecting outward from the antenna reflector toward the satellite.
- If the above distance requirements cannot be met, the antenna must be mounted in a controlled area inaccessible to the general public, such as a fenced enclosure or a roof.
- A fenced installation must have a locked entry, and the fenced area must be large enough to protect the general public from exposure to potentially harmful levels of radiation.
- Access to a roof installation in a commercial, industrial, or institutional environment must be limited by a door or a permanently fastened ladder that is locked to deny access to the general public.
- Once the transmitter becomes operational, maintain a safe distance; at least 3 feet.

Failure to observe these cautions could result in injury to eyes or other personal injury.



Observe these precautions to avoid exposure to RF radiation, a potential safety hazard:

- All antennas of any type or size must carry an industry standard and government approved *Radiation Hazard Caution* label on the feed support arm.
- A fenced or roof installation in a commercial, industrial, or institutional environment must carry a *Radiation Hazard Caution* sign on the access door, gate, or permanently mounted access ladder within plain sight of anyone approaching the antenna from the front or sides of the reflector.

Failure to observe these cautions could result in injury to eyes or other personal injury.



Note: Some installations may require additional precautions. See the HughesNet System *Antenna Site Preparation and Mount Installation Guide* (1035678-0001) for more information.

Chapter 1

Overview

This Installation Guide explains how to assemble and install the Hughes AN8-098P .98m Ka-band antenna. It is written for qualified installers who are familiar with satellite antenna installation practices, and are capable of properly applying the information presented herein.

This chapter presents an overview of the AN8-098P antenna, a summary of the steps used to assemble and install the antenna, and supplemental information on tasks related to antenna installation. These topics are included in the following sections:

- *The model AN8-098P antenna* on page 1
- *Antenna installation summary* on page 2
- *Tasks related to antenna installation* on page 4

The model AN8-098P antenna

The Hughes model AN8-098P antenna is designed for Ka-band applications. Each HughesNet antenna station consists of an antenna assembly and an indoor unit (IDU), which can be either a satellite modem or a satellite router. The IDU communicates with both the HughesNet satellite and the Network Operations Control Center (NOCC) via the antenna and radio assembly.

The antenna is connected to the IDU by an intra-facility link (IFL) consisting of two cables: a transmit cable and a receive cable.



Figure 1: The Hughes model AN8-098P .98 m satellite antenna

Antenna installation summary

This section lists the basic steps and related tasks used to assemble and install the antenna. These procedures are listed in the order in which they are to be performed. For more detailed information on each task, refer to the chapters and documents listed.

1. Explain the installation process to the customer.
2. Conduct a site survey with the customer to identify a suitable location for the antenna. See the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001) for details.
3. Install and apply power to the IDU, following the instructions in the installation guide for the specific IDU you are installing.



Note: You *must* install the IDU before installing the antenna, to determine the proper pointing values (azimuth and elevation).

4. Connect your laptop computer to the IDU and enter the installation parameters from the installation reference sheet. See the HughesNet ***Ka-Band Antenna Pointing Guide*** (1037663-0001) for detailed instructions.
5. Determine the most suitable method for mounting the antenna, and install the antenna mount and mast. See the HughesNet ***Antenna Site Preparation and Mount Installation Guide*** for details.



Note: It is critical that the antenna mast is plumb. It is impossible to adjust the antenna to correct for a mast that is not plumb.

6. Attach the reflector bracket to the Az/El mount. See Chapter 3 – *Installing the antenna and radio assembly*.
7. Attach the adapter block to the reflector bracket. See Chapter 3 – *Installing the antenna and radio assembly*.
8. Attach the antenna reflector. See Chapter 3 – *Installing the antenna and radio assembly*.
9. Install the feed support arm and support rods. See Chapter 3 – *Installing the antenna and radio assembly*.
10. Install the radio assembly. See Chapter 3 – *Installing the antenna and radio assembly*.
11. Install the feed horn. See Chapter 3 – *Installing the antenna and radio assembly*.
12. Attach the Az/El mount and antenna assembly to the antenna mast pipe. See Chapter 3 – *Installing the antenna and radio assembly*.
13. Install the IFL transmit and receive cables between the IDU and the antenna. See Chapter 4 – *Cabling and connections*.
14. Ground the antenna assembly. See *Tasks related to antenna installation* on page 4.
15. Determine the proper azimuth and elevation. See Chapter 3 – *Installing the antenna and radio assembly*.
16. Point the antenna in accordance with the instructions in the HughesNet ***Ka-Band Antenna Pointing Guide*** (1037663-0001).
17. Commission the IDU. For instructions, see the installation guide for the specific IDU you are installing.

Tasks related to antenna installation

This section discusses tasks related to antenna installation and explains where to find additional information.

Selecting the installation site

Before selecting an installation site, check the installation reference sheet to see if a customer-specific site has been pre-determined and specified. Also, refer to the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001), which discusses the factors that you should consider when selecting an antenna installation site.

The first and most important consideration when choosing a prospective antenna site is whether the area can provide an acceptable line of sight (LOS) to the satellite. A site with a clear, unobstructed view of the southern sky is necessary. Also, consider obstructions that may occur in the future, such as the growth of trees. Select your antenna site before performing the installation, so that the antenna will be able to receive the strongest signal available.

As with any type of construction, a local building permit may be required before installing the antenna. It is the property owner's responsibility to obtain all permits. If necessary, modify the installation instructions in this manual in accordance with local building codes.

Installing the antenna mount

Before installing the antenna itself, you must first install a suitable antenna mount. If the system requires a pole mount installation, be sure to obtain information about the underground utilities in the proposed location. Have the appropriate utility company mark the location of any underground telephone wires, storm drains, etc. Also, because soils vary widely in composition and load capacity, it may be necessary to consult a local professional engineer to determine the appropriate foundation design.

For pole mounts that require a concrete base, you must allow at least 24 hr for the concrete to cure before installing the antenna. Be sure to plan and schedule the installation accordingly.

For complete information regarding antenna mount installation, including various mounting methods, refer to the following two documents in the order listed:

- The customer-specific installation reference sheet
- The HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001).

Refer to the installation reference sheet for any customer-specific guidelines concerning the mount installation. Use only the mount installation method described in the reference sheet.

If the installation reference sheet does not specify a method, use only the mount installation methods documented in the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1025678-0001). Most installations in a commercial, industrial, or institutional environment use a non-penetrating roof mount.

Installing the IDU See the installation guide for the specific IDU you are installing.

Grounding The entire antenna assembly must be grounded. For grounding information, refer to your training, best grounding practices, the Hughes Field Service Bulletin (FSB) *HNS Broadband Requirements for RG-6 and RG-11 IFL Cable Connectors, Ground Blocks and Ground Block Location* (FSB 050518_01), and applicable parts of the National Electrical Code (NEC).

Cabling Information For a list of approved cable types for the IFL between the antenna and the IDU, see the Hughes FSB, *IFL Cable, Approved List (with lengths) for SPACEWAY Domestic Installations* (FSB 080202_01). The FSB lists the maximum cable length for each approved cable type for all relevant radios types.

Because it is impossible to predict the requirements specific to each installation site, you must use your own judgement and best practices to determine how to route the IFL transmit and receive cables.

Antenna parts and required tools

This chapter describes the components and parts provided with the AN8-098P Ka-band antenna kit. It also lists the hardware and tools needed to properly assemble and install the antenna. This chapter contains the following sections:

- *Antenna kit components* on page 7
- *Small hardware parts list* on page 14
- *Tools* on page 15

Antenna kit components



Metal components may contain sharp edges. Use care when un-packing and handling antenna parts.

Upon receiving the kit, unpack and inspect the antenna components and hardware to make sure all parts have been received in good condition. If any parts appear to have been damaged in transit, immediately contact the freight carrier. If any parts appear to be missing or damaged, but *not* as a result of handling in transit, contact your dealer or distributor.

The antenna kit is shipped in three containers. Figure 2 identifies the contents of each container.



Note: To avoid potential damage, leave all components in their protective packages until required.

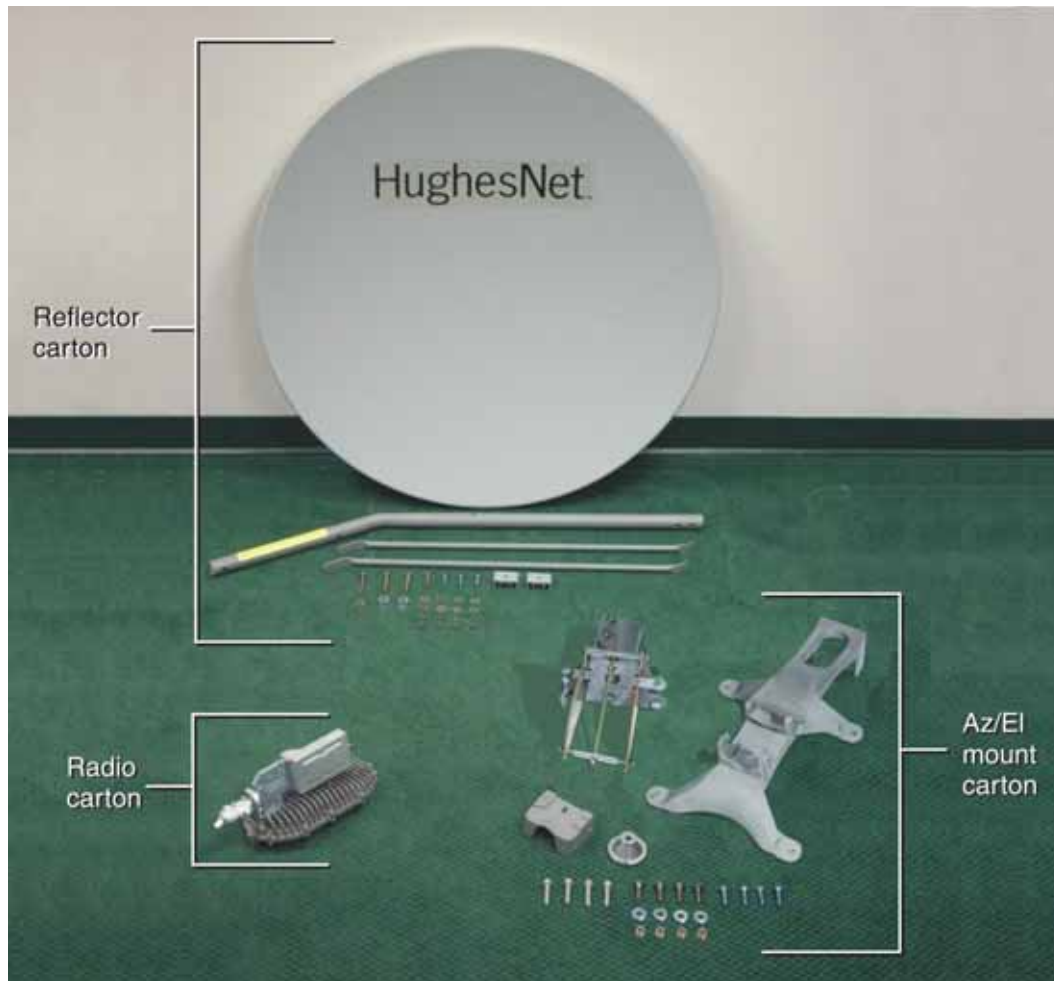


Figure 2: Antenna kit components



Note: The radio assembly is shipped separately and may not arrive at the same time as the other two cartons.

The main components of the antenna kit are:

- Azimuth/Elevation (Az/EI) mount assembly
- Reflector bracket and adapter block
- Antenna reflector
- Feed support arm and support rods
- Radio assembly
- Feed horn and collar

Related components (not shown):

- Tri-mast or other mount

The following sections describe each component of the antenna kit.

Az/EI mount assembly The *Az/EI mount* shown in Figure 4 consists of the Az/EI canister, the elevation scale, and the azimuth and elevation adjustment tools.

The Az/EI canister supports the antenna and secures it to the mast. The elevation scale is used to measure the angle of antenna elevation. The fine azimuth and elevation tools are used to finely adjust the azimuth and elevation of the reflector during antenna pointing. See the HughesNet *Ka-Band Antenna Pointing Guide* (1037663-0001) for detailed instructions.

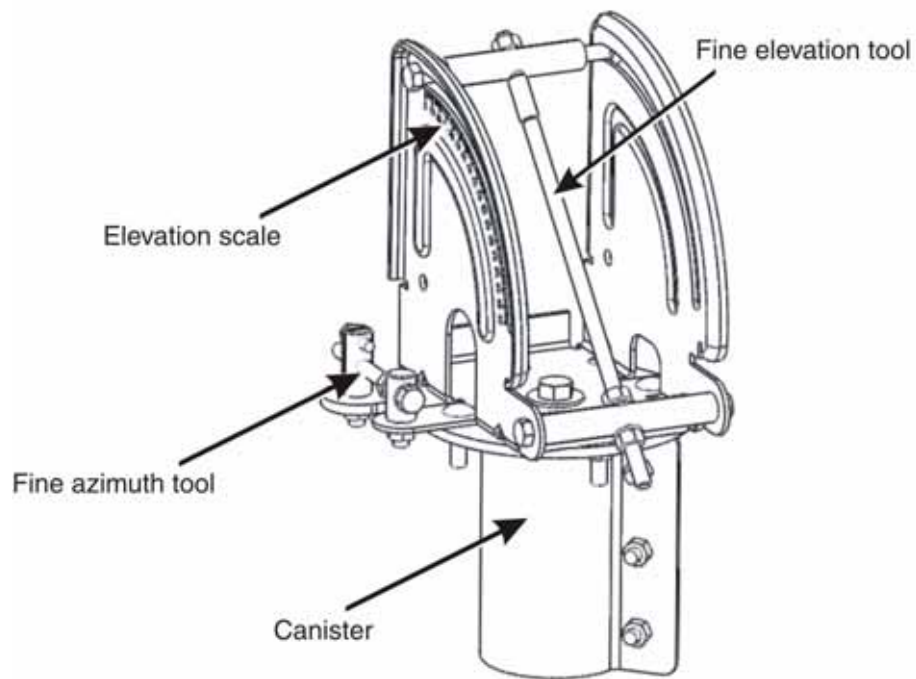


Figure 3: Az/EI mount assembly

Reflector bracket and adapter block

The *reflector bracket* supports the antenna reflector. It attaches to the Az/EI mount assembly. The *adapter block* attaches to the reflector bracket and anchors the feed support arm to the antenna assembly. Figure 4 shows the reflector bracket and adapter block.

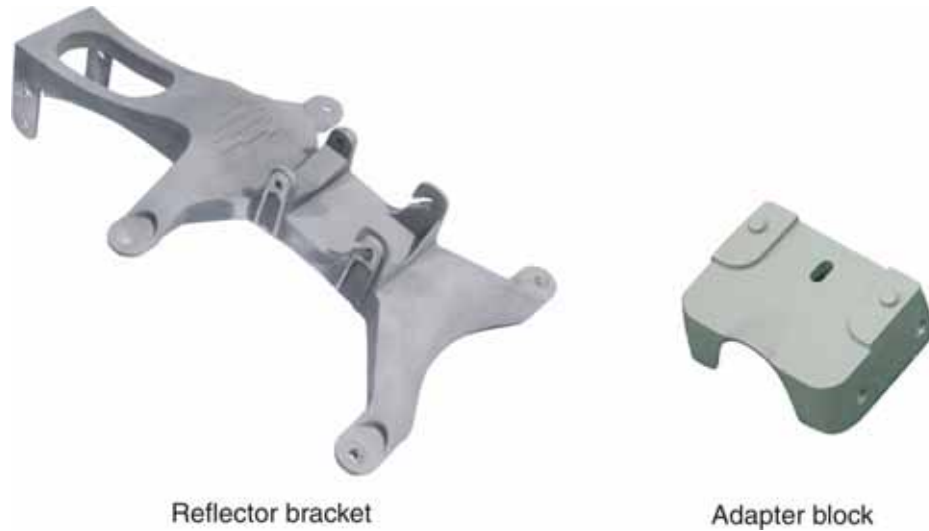


Figure 4: Reflector bracket and adapter block

Antenna reflector

The antenna *reflector* shown in Figure 5 focuses the transmitted and received RF signals. It attaches to the reflector bracket and the adapter block.



Figure 5: Antenna reflector

NOTICE

To avoid damage to the antenna reflector, handle it with care.

Feed support arm and support rods

The antenna kit contains one *feed support arm* and two *support rods*, shown in Figure 6. The feed support arm supports the radio assembly and feed horn. The support rods attach to the reflector to stabilize the arm and provide additional support.



Figure 6: Feed support arm and support rods

Radio assembly

The *radio assembly* shown in Figure 7 consists of the radio transmitter, low noise block converter (LNB), transmit/receive isolation assembly (TRIA), and polarizer waveguide.

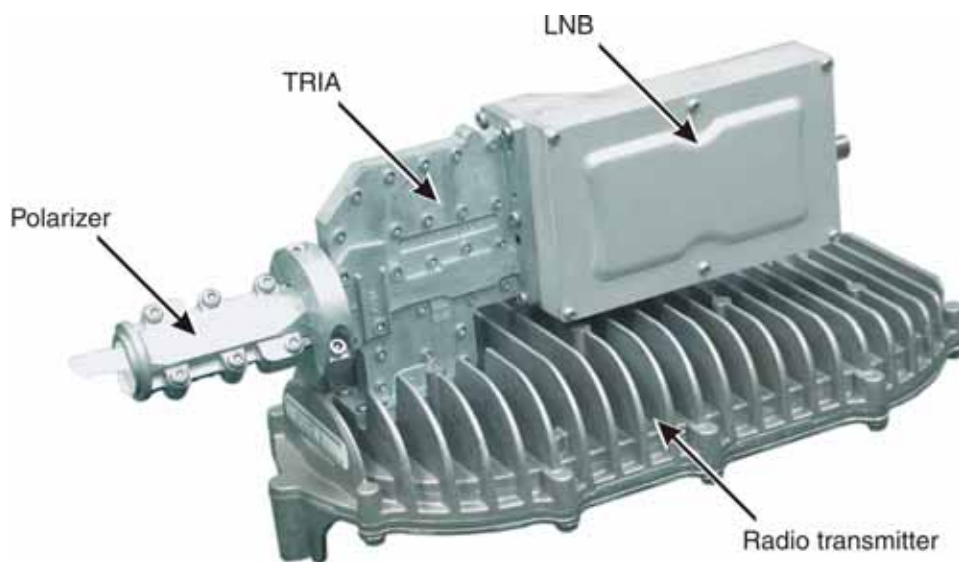


Figure 7: Radio assembly

Feed horn and collar The *feed horn*, shown in Figure 8, attaches to the polarizer waveguide on the radio assembly by way of the two-piece *collar*. The feed horn gathers the reflected signal from the antenna reflector and channels it toward the LNB.



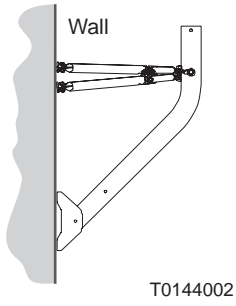
Figure 8: Feed horn and collar

NOTICE

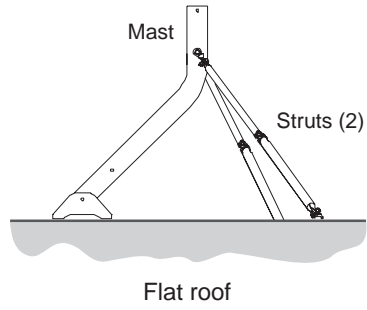
- Do not remove the protective packing material from the feed horn window until installation of the radio assembly is complete.
- Do not attempt to remove the feed horn window at any time.
- Be careful not to damage the feed horn window. Do not touch the plastic film.

Related Components

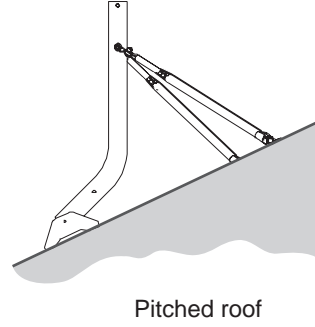
Tri-mast (or other antenna mount) Although the tri-mast is not part of the antenna kit, it is described here because it is the most commonly used mounting option for the AN8-098P Ka-band antenna. As shown in Figure 9, the tri-mast can be positioned in a number of configurations to adapt it for mounting onto surfaces of various angles. For other suitable antenna mounting options, see the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001).



T0144002



Flat roof



Pitched roof

Figure 9: Tri-mast in various configurations

Small hardware parts list

Table 1 lists the small hardware parts included in the antenna kit.

Table 1: Small hardware parts

Part	Quantity	Listed parts are used to attach...	Illustration showing where parts are used
5/16 × 3/4-inch carriage bolt	4	Reflector bracket to Az/EI mount assembly	Figure 10 on page 19
1/2-inch hex head serrated flange nut	4		
1/2 × 1-inch hex head bolts	4	Adapter block to reflector bracket	Figure 12 on page 20
1/2-inch flat washers	4		
1/2 × 1-3/8-inch thread-cutting bolts	4	Antenna reflector to reflector bracket	Figure 14 on page 22
7/16 × 2.5-inch hex head bolt	1	Feed support arm to adapter block	Figure 15 on page 23
7/16-inch flat washer	1		
7/16-inch lock washer	1		
7/16 × 1-inch hex head bolts	2	Support rods to reflector	Figure 16 on page 24
7/16-inch lock washers	2		
7/16-inch serrated flange hex nuts	2		
7/16 × 2-inch hex head bolt	1	Support rods to feed support arm	Figure 17 on page 24
7/16-inch flat washer	1		
7/16-inch lock washer	1		
7/16-inch serrated flange hex nut	1		
1/2 × 2-inch hex head bolts	2	Radio assembly (transmitter) and adapter brackets (2) to feed support arm	Figures 18 on pages 25
1/2-inch flat washers	2		
0.9-inch inside diameter O-ring	1	Feed horn and collar to radio assembly	Figure 24 on page 30
#6-32 hexagonal socket head (Allen) screw	2		

Tools

Table 2 lists the tools required to assemble and install the antenna.

Table 2: Tools required to assemble and install the antenna

Tool	Details
Socket wrench, ½-inch (with 3-inch extension)	For 5/16-inch bolts.
Open-end wrench, ½-inch	For 5/16-inch bolts. Two of the Az/EI canister nuts are not accessible by socket wrench. Some nuts and bolts require a second wrench to prevent turning.
2 open-end or socket wrenches, 7/16-inch	For 1/4-inch bolts. Some nuts and bolts require a second wrench to prevent turning.
Torque wrench	With ½-inch and 7/16-inch sockets capable of torquing to 8 ft-lb.
Long-shaft hexagonal ball driver (7/64-inch)	For #6-32 Allen screws. Driver shaft should be at least 5 inches long.
Torque wrench for hexagonal socket	Must fit a 3-mm hexagonal socket and be capable of torquing to 15 in-lb.
Bubble level	Used to make sure that the mast is plumb.
Compass	Used in determining antenna azimuth.
Pencil	Carpenter's pencil.
Dielectric grease	Used to prevent moisture contamination from occurring on coaxial cable connections.
Weatherproofing tape	Used to keep moisture away from cable connections
Approved RG6 cable	Used for IFL between IDU and antenna.
UV-rated cable ties	Used to secure slack in cables to antenna mast.

Chapter 3

Installing the antenna and radio assembly

This chapter explains how to assemble and install the antenna, radio assembly, and associated hardware. Topics in this chapter include:

- *Determining the pointing values* on page 17
- *General instructions for assembling the antenna* on page 18
- *Installing the reflector bracket* on page 19
- *Installing the antenna reflector* on page 21
- *Installing the feed support arm and support rods* on page 23
- *Installing the radio assembly* on page 25
- *Installing the feed horn* on page 28
- *Installing the antenna assembly onto the mast pipe* on page 31

CAUTION

Before you install the antenna, read all safety information in *Understanding safety alert messages* on page ix.

Determining the pointing values

Before installing the antenna, you must install and power up the IDU. Refer to the appropriate IDU installation guide for instructions.

Once the IDU is powered up, connect it to your laptop using an Ethernet cable, then use your global positioning system (GPS) receiver to calculate the exact latitude and longitude of the antenna site. Following the instructions in the HughesNet *Ka-Band Antenna Pointing Guide* (1037663-0001) to enter the latitude and longitude information into the IDU to determine the initial antenna azimuth and elevation values. Record these values and keep them handy for reference as you install and point the antenna.

General instructions for assembling the antenna

Before you assemble the antenna, read these important instructions:

- Mast – *The antenna mast must be installed before you can install the antenna.* For information on installing the mast, see the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001).



Note: The mast diameter must be 2.5-inch nominal pipe size (2.88-inch outside diameter).

- Sequence of steps – When you assemble the antenna, *be sure to follow the instructions in this chapter in the order they are presented.*

WARNING

For rooftop installations, assemble the antenna on the ground and then carry the fully assembled antenna up to the roof.

- Tightening hardware – *Do not tighten any nuts or other hardware until you are instructed to do so.* (See also the next item, *Torque.*)
- Torque – To ensure successful installation of the antenna, it is critical that you tighten all nuts and socket-head screws to the maximum torque values shown in Table 3.

Table 3: Torque specifications

Fastener	Maximum torque
5/16-inch bolts	8 ft-lb.
¼-inch bolts	5 ft-lb.
M4 hexagonal socket head screws	15 in-lb.

Installing the reflector bracket

Begin the antenna assembly by attaching the reflector bracket to the Az/EI mount assembly:

1. Loosen the two screws on either side of the Az/EI mount elevation linkage.
2. Clip the hooks near the top of the reflector bracket over the elevation linkage as shown in Figure 10.

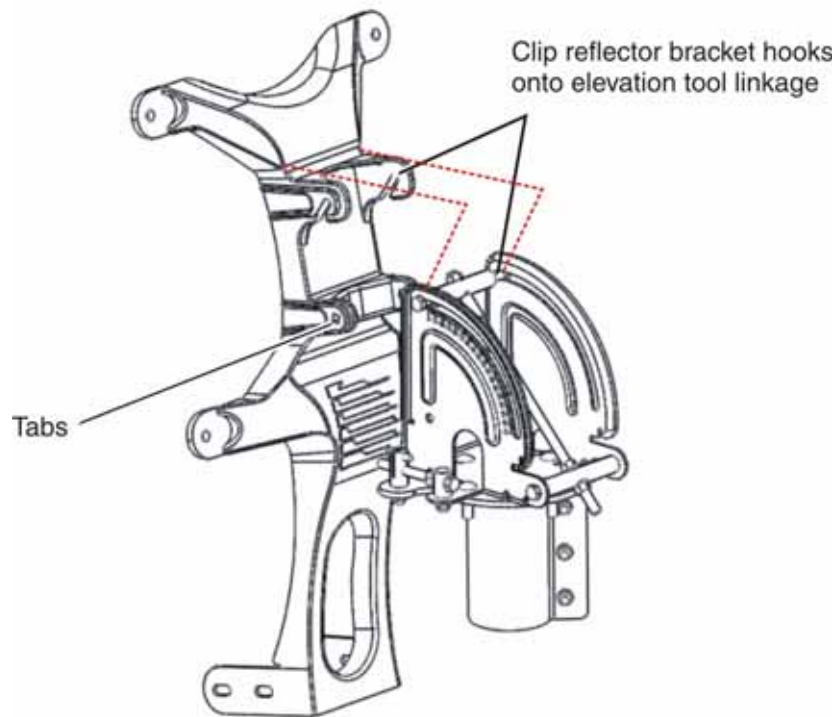


Figure 10: Attaching the reflector bracket to the Az/EI mount

3. Align the tabs on the reflector bracket with the two pivot holes in the sides of the Az/EI mount as shown in Figure 11, and insert two carriage bolts from the inside, out through the holes.
4. Secure the reflector bracket to the Az/EI mount from the outside with two ½-inch nuts.



Note: Ensure that the carriage bolts are firmly seated before tightening the nuts.

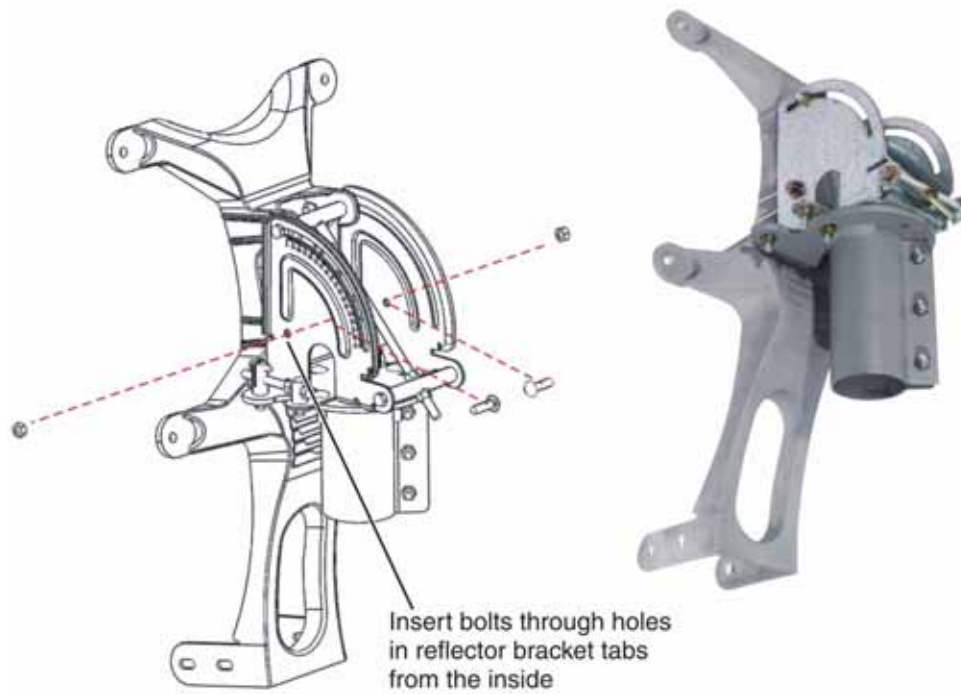


Figure 11: Securing the reflector bracket

5. Fit the adapter block between the extensions on either side of the reflector bracket arm in the position shown in Figure 12.

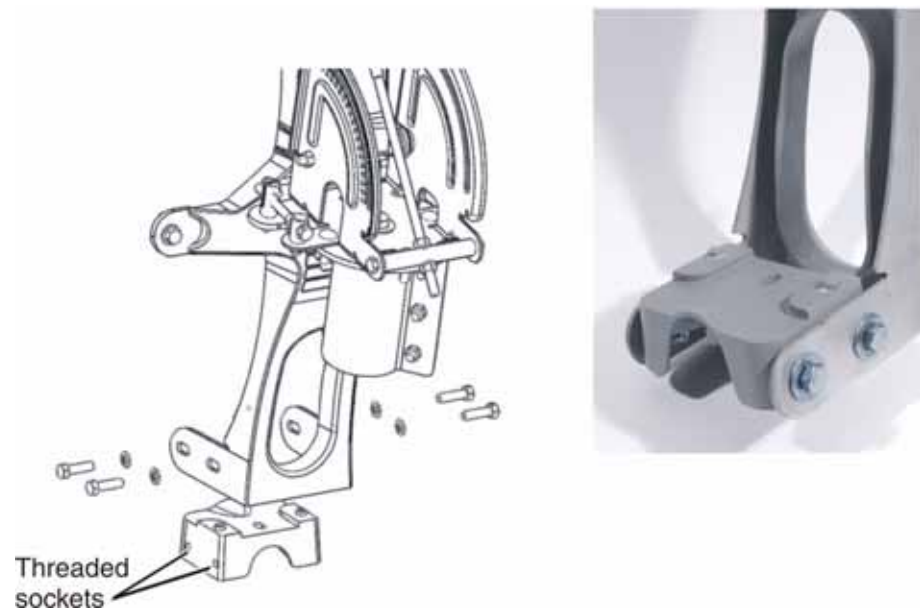


Figure 12: Attaching the adapter block to the reflector bracket

6. Secure the adapter block in place by inserting four $\frac{1}{2} \times 1$ -inch hex head bolts, with washers, through the holes in the reflector bracket arm, and into the threaded sockets on the adapter block (two on each side). *Do not tighten the bolts at this time.*

Installing the antenna reflector

To attach the antenna reflector to the reflector bracket:

1. Place the reflector in position on the reflector bracket so that the two keys on the bottom of the reflector fit into the corresponding notches on the adapter block as shown in Figure 13.

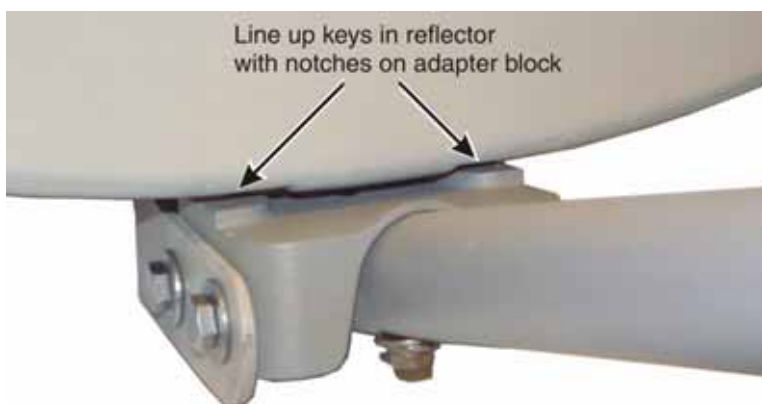


Figure 13: Aligning the reflector with the adapter block

2. Align the mounting holes in the reflector with the holes in the reflector bracket as shown in Figure 14.

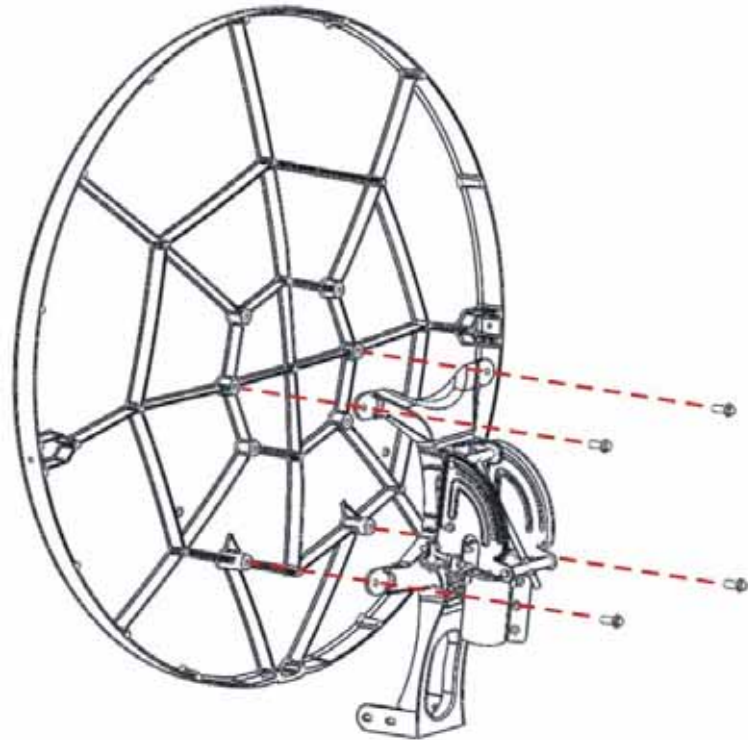


Figure 14: Attaching the antenna reflector

3. Insert four thread-cutting bolts ($\frac{1}{2}$ -inch \times $\frac{3}{4}$ -inch) into the holes in the reflector bracket from the back, and through the corresponding holes in rear of the reflector.
4. Once the reflector is in place, tighten the nuts lightly, only until snug, then tighten the four bolts that secure the adapter block to the reflector bracket.

Installing the feed support arm and support rods

To attach the feed support arm and support rods:

1. Position the feed support arm underneath the adapter block as shown in Figure 15.
2. Insert a single 7/16-inch \times 1 $\frac{3}{4}$ -inch bolt with lock washer and flat washer, up through the feed support arm from below and into the threaded socket of the adapter block.



Note: There are two holes near the end of the feed support arm. Be sure to insert the bolt through the hole that is furthest from the end, as shown in Figure 15.

3. Tighten until secure.

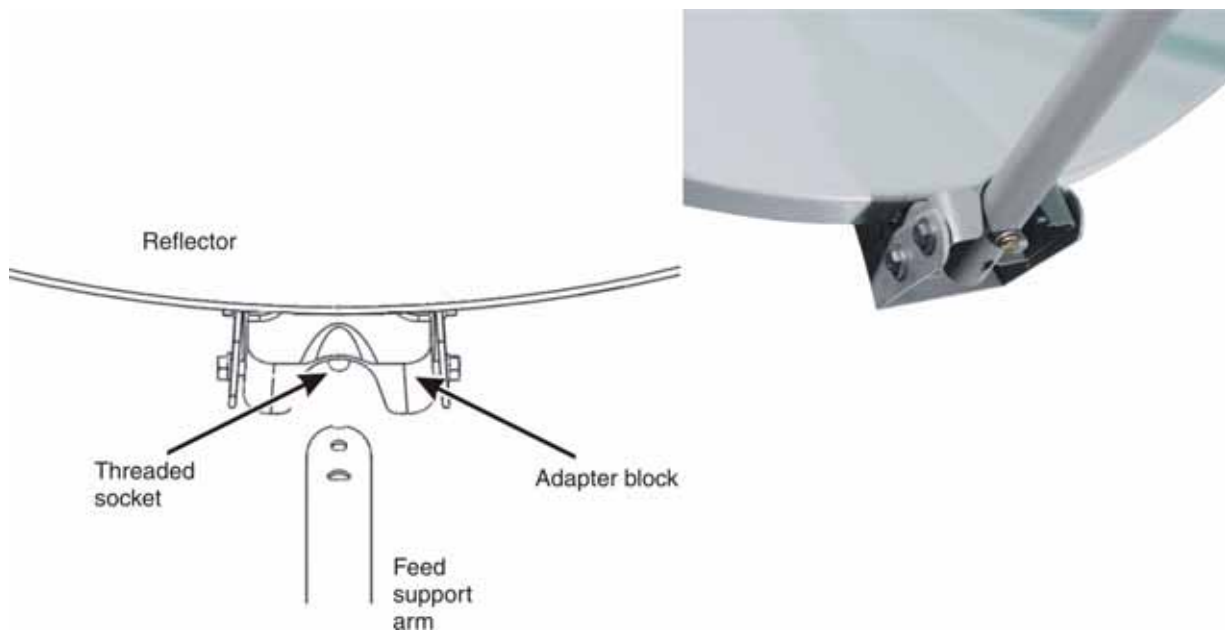


Figure 15: Attaching the feed support arm to the adapter block

4. Attach the two support rods to the reflector rim on opposite sides, using one 7/16 x 1-inch hex head bolt for each rod, as shown in Figure 16. As shown in the figure, the two tips at the opposite ends of the support rods are not the same. Be sure to attach the longer-tipped ends to the reflector, as illustrated in Figure 16. Do *not* tighten.

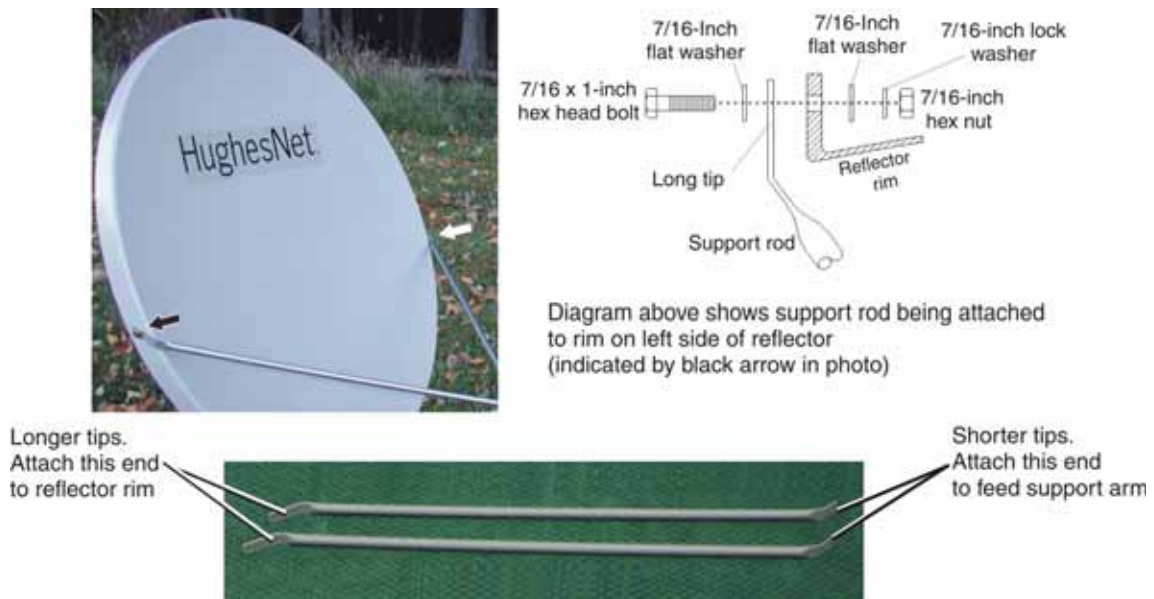


Figure 16: Attaching the support rods to the reflector (right rod shown)

5. Attach the free ends of the support rods to the feed support arm as shown in Figure 17, using a single 7/16 x 1.25-inch bolt, lock washer, and flat washer.

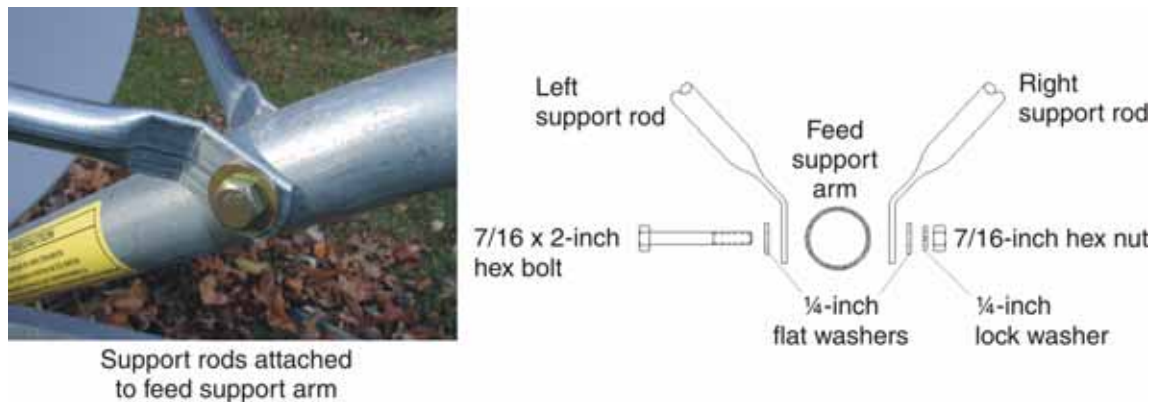


Figure 17: Attaching the support rods to the feed support arm

6. Secure the bolt with a 7/16-inch nut and tighten.
7. Tighten the two bolts securing the rods to the reflector.

Installing the radio assembly

To mount the radio assembly to the feed support arm:

1. Place the two adapter brackets on the feed support arm as shown in Figure 18.

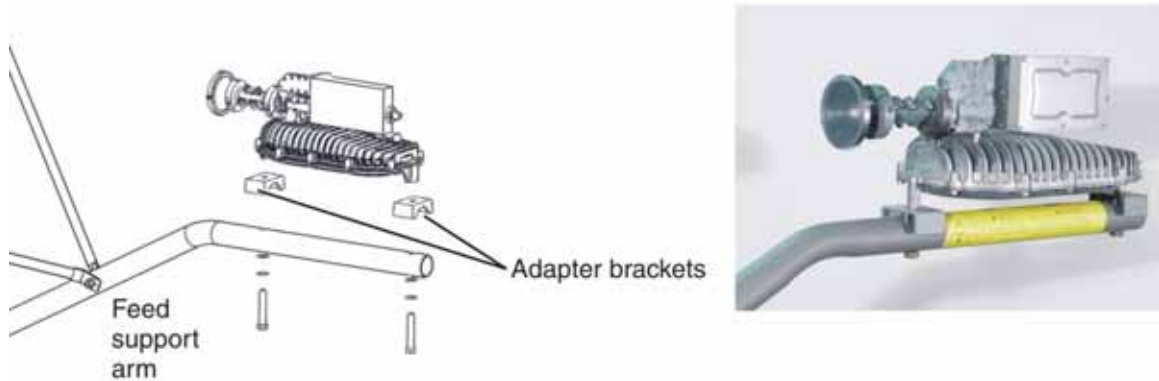


Figure 18: Attaching the radio assembly

2. As shown in the figure, position the radio assembly above the adapter brackets so that the waveguide end of the radio is nearest to the reflector.
3. Lower the radio onto the adapter brackets and insert one $\frac{1}{2}$ -inch \times 1.75-inch bolt, with $\frac{5}{16}$ -inch flat washer and lock washer up through the feed support arm and adapter bracket, into each of the two threaded sockets in the radio transmitter.
4. Tighten both bolts to secure the radio to the feed support arm.

Adjusting circular polarization

It may be necessary for you to reposition the polarizer waveguide on the radio assembly to set the proper polarization between the radio transmitter and the antenna reflector. Before proceeding, check the installation reference sheet to determine whether the installation calls for left-hand circular polarization (LHCP) or right-hand circular polarization (RHCP).

Once you determine which polarization setting is required, check the position of the polarizer waveguide on the radio to determine whether an adjustment is necessary. From the rear of the radio, looking toward the reflector, you can easily determine whether the polarizer is currently set for LHCP or RHCP by the way it leans. (See Figure 19.)



Note: There is no default factory setting for transmit polarization. Radios can be shipped with either setting.

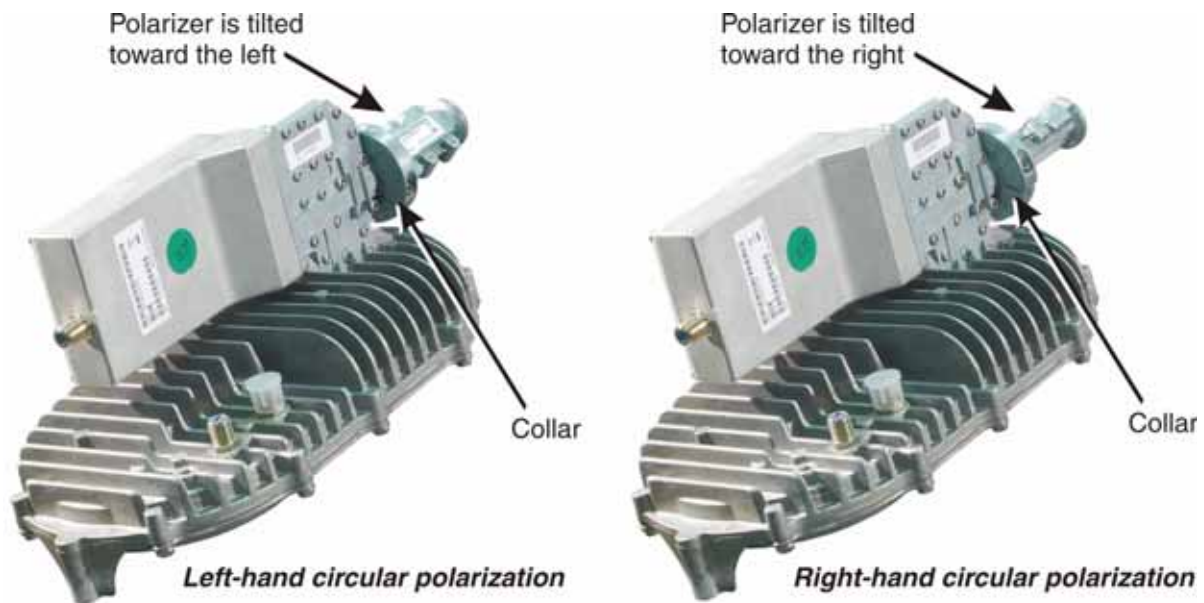


Figure 19: Determining the polarization setting

To reposition the polarizer:

1. Remove the two-piece polarizer collar by loosening and removing the two Allen screws that hold it together.
2. Separate the polarizer from the TRIA and rotate it one quarter turn (clockwise for LHCP or counter-clockwise for RHCP), until the appropriate notch lines up with the key on the end of the TRIA. As shown in Figure 20, the LHCP notch is adjacent to the L on the polarizer and the RHCP notch is adjacent to the R on the polarizer).

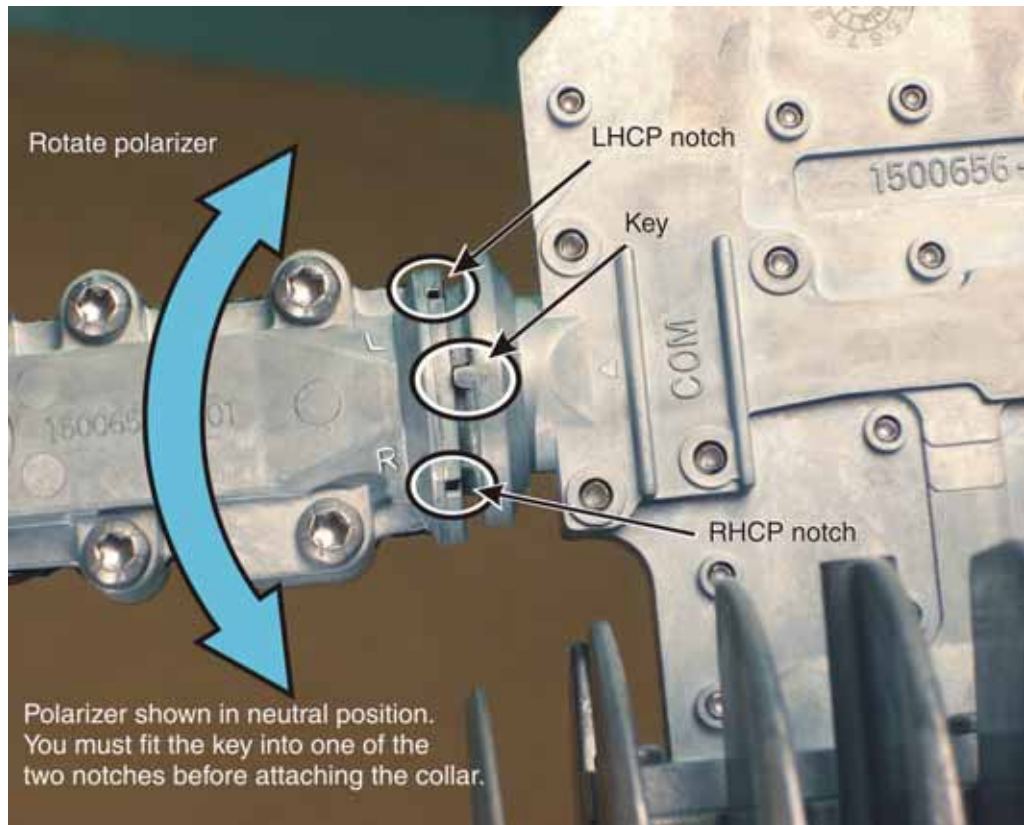


Figure 20: Adjusting circular polarization (collar removed)

3. After making the adjustment, reseat the waveguide with the TRIA and reassemble the collar as follows:
Fit the two halves of the collar around the waveguide as shown in Figure 21 so that the notches in the collar come together around the ridge formed at the waveguide seam. When properly aligned, the seam formed by the two halves of the collar will line up with the seam on the waveguide.
4. Reinsert the two Allen screws into the collar and tighten to secure the polarizer in place. *Be sure to tighten the collar completely.*

NOTICE

You *must* assemble the collar exactly as described above and as shown in Figure 21. Failure to do so could allow moisture to accumulate inside the TRIA, causing damage to the radio.

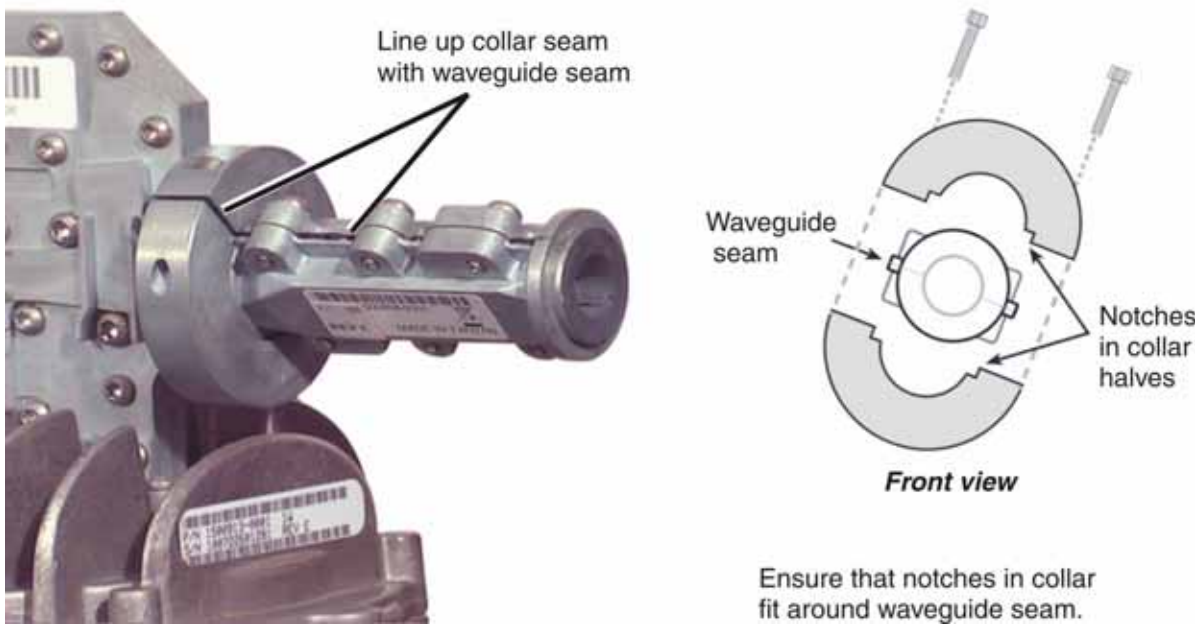


Figure 21: Securing the waveguide collar

Installing the feed horn

NOTICE

- Do not remove the protective packing material from the feed horn window until installation of the radio assembly is complete.
- Do not attempt to remove the feed horn window at any time.
- Be careful not to damage the feed horn window. Do not touch the plastic film that covers the window.

To attach the feed horn to the radio assembly:

1. Remove and discard the protective seal from the polarizer on the radio assembly (shown in Figure 22).

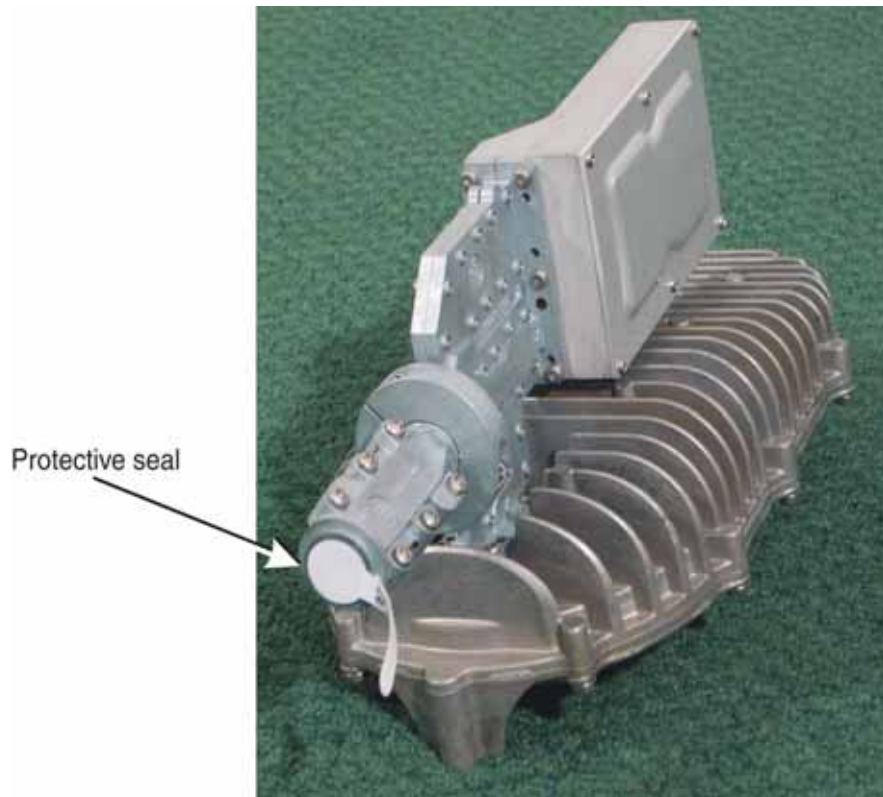


Figure 22: Remove the protective seal from the polarizer

2. Remove the dust cap from the stem of the feed horn and insert the O-ring into the groove inside the stem as shown in Figure 23.



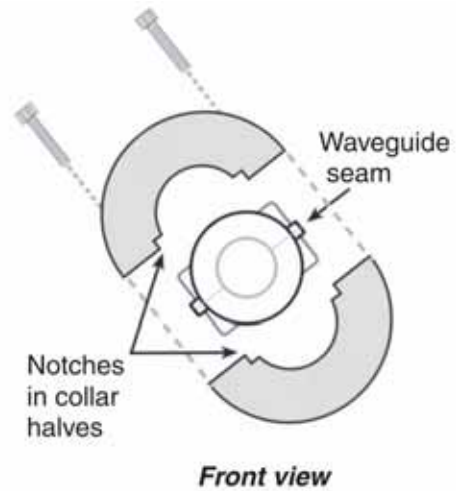
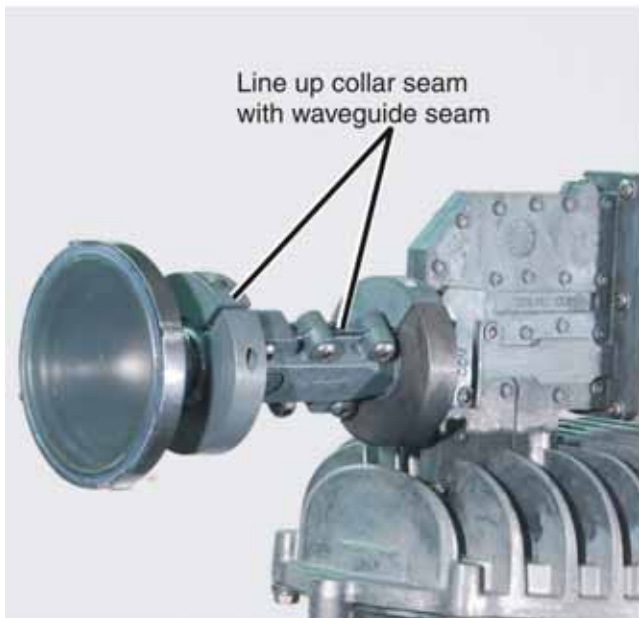
Figure 23: Insert O-ring into groove at mouth of feed horn

3. Position the feed horn against the waveguide as shown in Figure 24.



Figure 24: Feed horn position

4. Fit the two halves of the feed horn collar around the ridge at the point where the feed horn meets the waveguide, as shown in Figure 25. When properly aligned, the seam formed by the two halves of the collar will line up with the seam on the waveguide as shown in the figure.



Ensure that notches in collar fit around waveguide seam.

Figure 25: Attaching the feed horn collar

NOTICE

You *must* assemble the collar exactly as described above and as shown in Figure 25 before fully assembling the collar. Failure to do so will result in damage to the polarizer waveguide.

5. Insert two Allen screws into the collar and tighten to secure the feed horn in place.
6. At this point, fully tighten any hardware that is not tight—however, leave nuts that are used for pointing adjustments slightly loose or just snug.

Installing the antenna assembly onto the mast pipe

Follow these steps to mount the antenna assembly onto the mast:

1. Before you install the antenna assembly onto the mast pipe, use a bubble level to make sure that the mast is plumb. Check the mast at two perpendicular locations, as shown in Figure 26.



Note: It is critical that the antenna mast is plumb. It is impossible to adjust the antenna to correct for a mast that is not plumb.

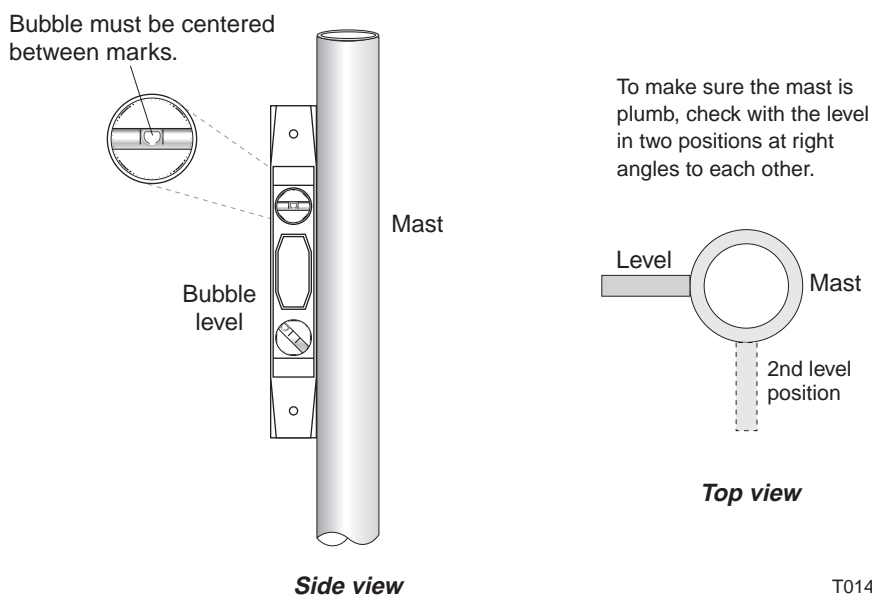


Figure 26: Making sure the mast is plumb

2. Slide the Az/EI canister down onto the mast as shown in Figure 27.
3. Tighten.



Note: The mast diameter must be 2.5-inch nominal pipe size (2.88-inch outside diameter).

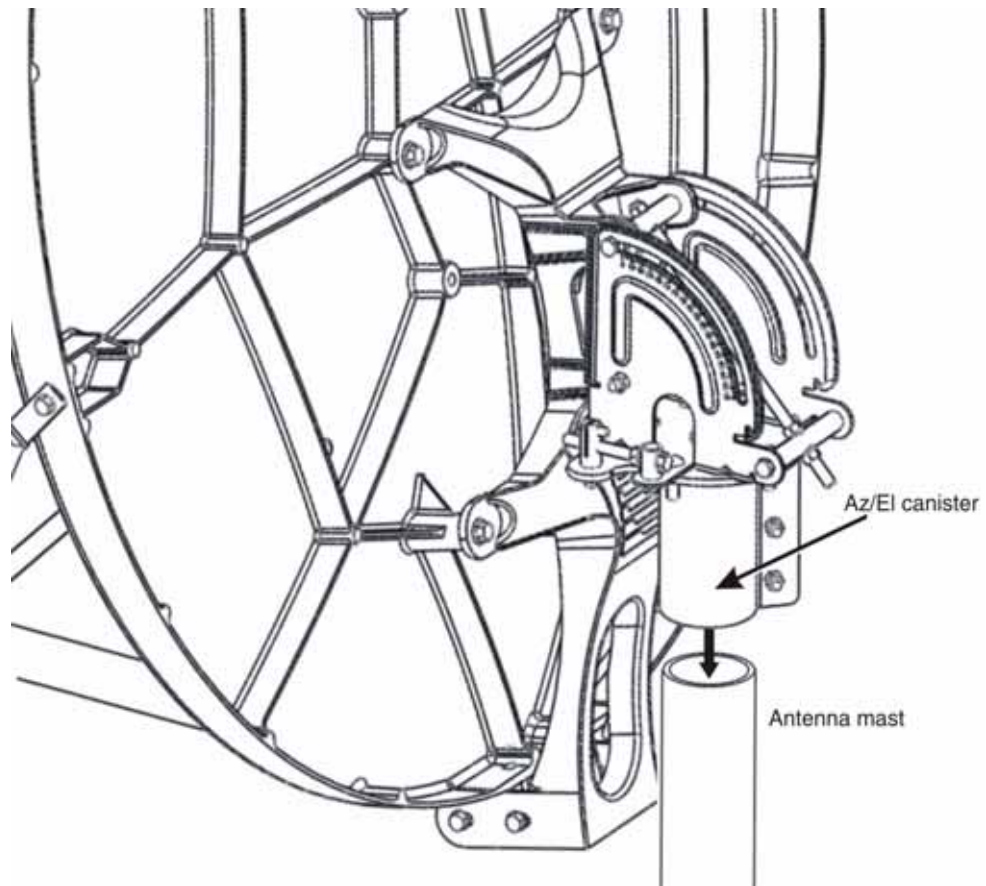


Figure 27: Installing the antenna onto the mast pipe

This completes the assembly phase of the antenna installation process. Depending on its orientation, the antenna should look similar to the one shown in Figure 28.



Figure 28: Assembled antenna

To proceed with the installation, you must route the IFL transmit and receive cables between the antenna and the IDU. See Chapter 4 – *Cabling and connections*.

Cabling and connections

This chapter illustrates where the antenna transmit, receive, and ground connectors are located; demonstrates how to route the transmit and receive cables at the antenna; and explains how to connect the transmit and receive cables to the radio assembly. You must connect all of these cables before you can point the antenna toward the HughesNet system satellite.

Topics in this chapter include:

- *Cabling requirements* on page 35
- *Routing the cables at the antenna* on page 36
- *Connecting the transmit and receive cables* on page 38
- *Ground connection* on page 41

Cabling requirements

For a list of approved coaxial cable types for the IFL between the antenna and the IDU, see the Hughes FSB, *IFL Cable, Approved List (with lengths) for SPACEWAY Domestic Installations*, (FSB 080202-01). The FSB lists the maximum cable length for each approved cable type, for all applicable radio types.

Because it is impossible to predict the requirements specific to each installation site, you must use your own judgement and best practices to determine how to route the IFL cables.

NOTICE

Coaxial cables and connectors can corrode if exposed to moisture. Use *only* compression type connectors, and weatherproof them with dielectric grease and weatherproofing tape.



Note: For connector requirements, see the Hughes FSB, *HN Broadband Requirements for RG-6 and RG-11 IFL Cable Connectors, Ground Blocks and Ground Block Location* (FSB 50518_01).

Routing the cables at the antenna

Route the coaxial transmit (Tx) and receive (Rx) cables at the antenna as follows:

1. Route the Tx cable (marked with blue electrical tape) over the Az/EI mount assembly, down behind the reflector, and along the feed support arm to the rear of the transmitter, in a configuration similar to that shown in Figure 29.



Note: Do *not* exceed the minimum bending radius specified by the cable manufacturer.

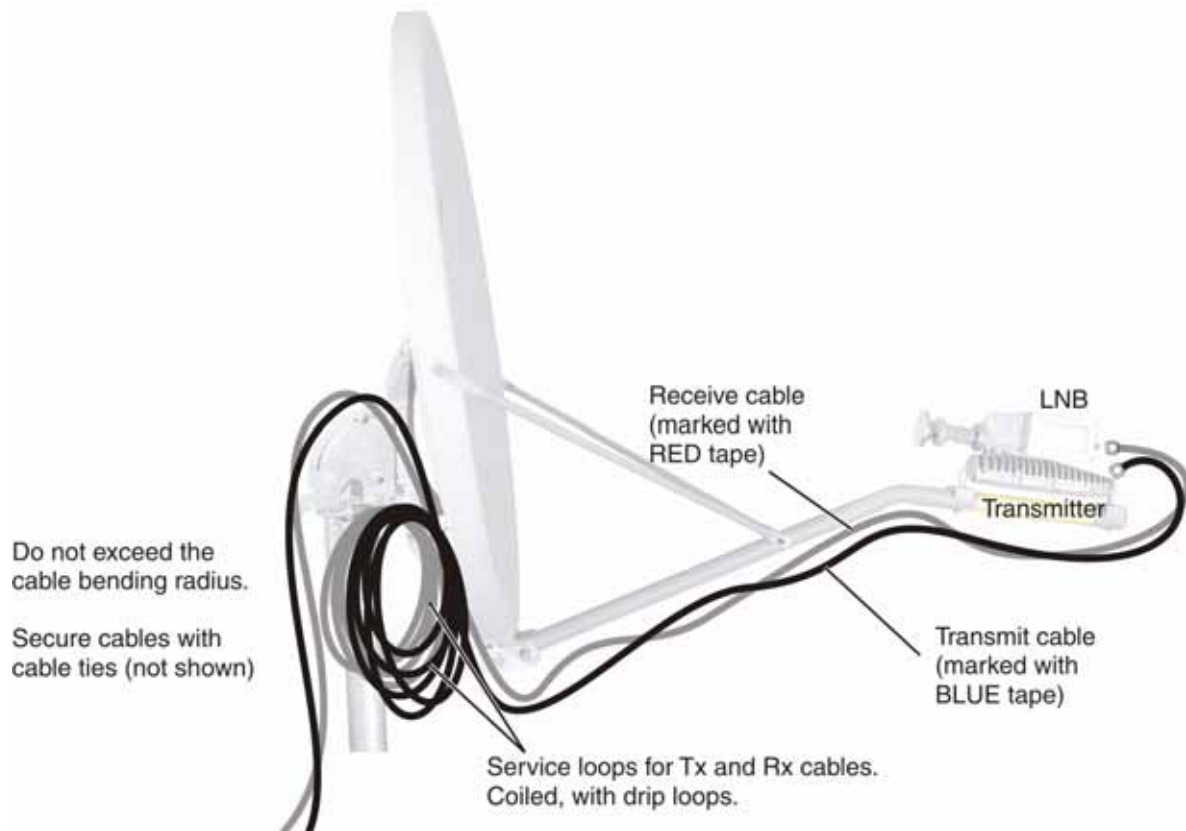


Figure 29: Transmit and receive cable configurations

2. Leave a 10-foot service loop and secure it to either the mast, Az/EI mount, or reflector bracket.



Note:

1. Do *not* leave the service loop lying on the roof or other mounting surface.
2. Do *not* block access to the azimuth and elevation adjustment nuts on the Az/EI mount assembly.

3. Coil the extra cable, leave a drip loop, and secure the Tx cable with cable ties.
4. Route the Rx cable (marked with red electrical tape) over the Az/El mount assembly, down behind the reflector, and along the feed support arm to the LNB, in a configuration similar to that shown in Figure 29 above.



Note: Do *not* exceed the minimum bending radius specified by the cable manufacturer.

5. Leave a 10-foot service loop and secure it to either the mast, Az/El mount assembly, or reflector bracket.



Note:

1. Do *not* leave the service loop lying on the roof or other mounting surface.
2. Do *not* block access to the adjustment nuts on the Az/El mount assembly.

6. Coil the extra cable, leave a drip loop, and secure the Rx cable with cable ties.

Connecting the transmit and receive cables

This section explains how to connect the Tx and Rx cables to the radio assembly at the antenna.



Note: You should protect all outdoor cable connections with dielectric grease and weatherproofing tape as shown in Figure 30. However, because the antenna pointing procedure requires that you disconnect the cables, you should wait until the pointing process is complete before weatherproofing the connections.



Figure 30: Weatherproofing the cable connectors

Transmit cable Connect the Tx cable to the radio transmitter as follows:

1. Remove power from the IDU.
2. Fill the Tx cable connector (marked with blue electrical tape) with dielectric grease.
3. Connect the Tx cable to the transmitter connector marked *IFL*, shown in Figure 31.

NOTICE

Coaxial cables and connectors can corrode if exposed to moisture. Use *only* compression type connectors, and weatherproof them with dielectric grease and weatherproofing tape.

4. Tighten the cable connector until it is finger-tight, then tighten an additional 1/4 turn with a 7/16-inch wrench.
5. If necessary, secure the cable with cable ties.



Figure 31: Transmit connector

Receive cable Connect the Rx cable to the LNB as follows:

1. Ensure that power has been removed from the IDU.
2. Fill the Rx cable connector (marked with blue electrical tape) with dielectric grease.
3. Connect the Rx cable to the receive connector on the LNB, shown in Figure 32.

NOTICE

Coaxial cables and connectors can corrode if exposed to moisture. Use *only* compression type connectors, and weatherproof them with dielectric grease and weatherproofing tape.



Figure 32: Receive connector

4. Tighten the cable connector until it is finger-tight, then tighten an additional 1/4 turn with a 7/16-inch wrench.
5. If necessary, secure the cable with cable ties.
6. After both the Tx and Rx cables are connected to the radio and the IDU, reapply power to the IDU in accordance with the instructions in the IDU installation guide.

Ground connection

Ground the antenna mast at the Az/EI mount by attaching the ground wire to the elevation lockdown bolt as shown in Figure 33. For specific grounding procedures, refer to the sources listed in *Grounding* on page 5.



Note: Although the radio transmitter contains a ground screw, a separate ground wire to the radio assembly is not required; the radio assembly is grounded through the metallic shield of the coaxial cable.

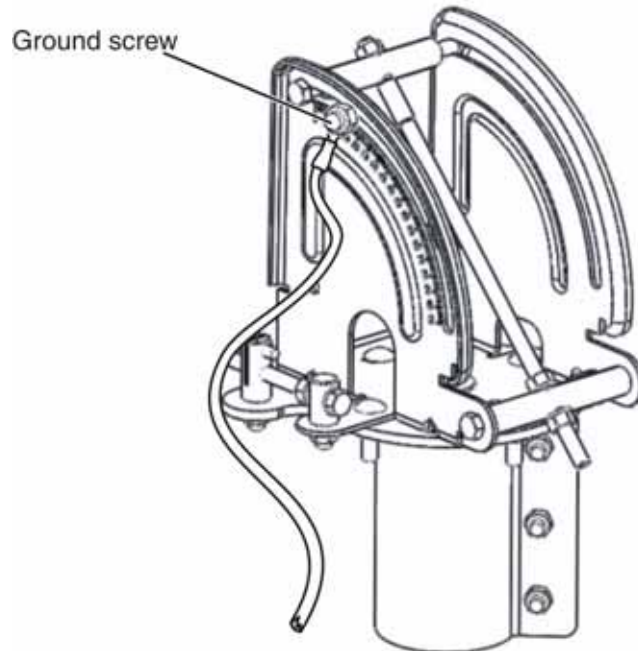


Figure 33: Ground screw on the Az/EI mount

This completes the installation. You must now point the antenna. See the *Ka-Band Antenna Pointing Guide* (1037663-0001) for details.

Adjusting the antenna azimuth and elevation

This chapter describes the process by which to adjust the antenna azimuth and elevation to the correct position for optimum transmission and reception. As the installer, you will perform these procedures during the antenna pointing process. This chapter discusses the mechanical adjustments used to modify the position of the antenna only. It does *not* discuss the pointing process itself. For information on pointing the AN8-098P and all HughesNet Ka-Band antennas, see the HughesNet *Ka-Band Antenna Pointing Guide* (1037663-0001).

This chapter contains the following sections:

- *Adjusting the elevation* on page 44
- *Adjusting the azimuth* on page 46

Adjusting the elevation

To adjust the antenna elevation:

1. Unlock the elevation by loosening the 5/16-inch elevation lockdown nuts on either side of the Az/El mount. Figure 34 shows the location of the nuts (only one nut is shown).

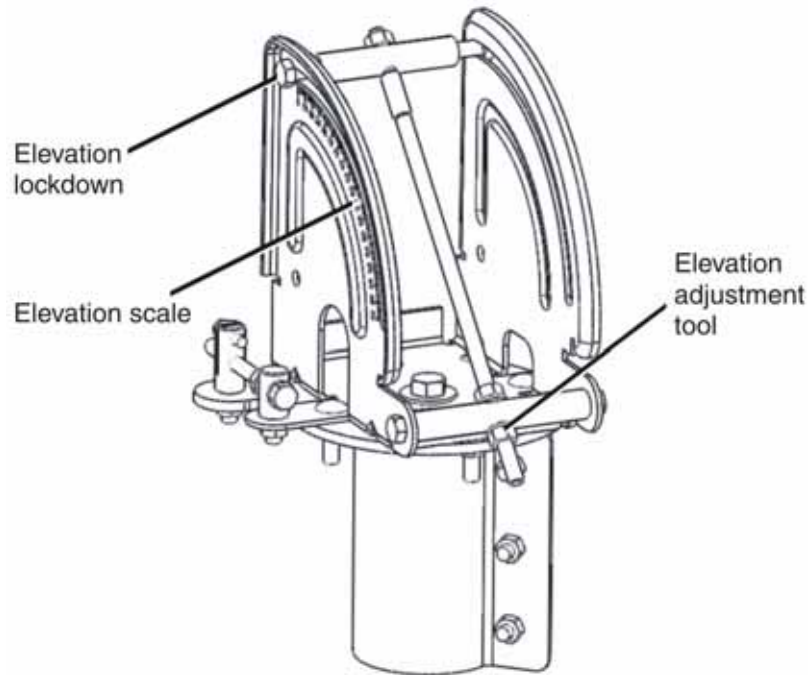


Figure 34: Elevation adjustment components

2. Loosen the top elevation adjustment nut and spin it counter-clockwise until it rides an inch or two up the elevation adjustment rod.
3. Use the lower nut to adjust the elevation.
4. As shown in Figure 35, the black line on the bar behind the lockdown nut acts as a pointer to indicate the value in the elevation scale. For example, the antenna shown in the figure is adjusted to 26°.

Use this line to measure the angle of elevation.

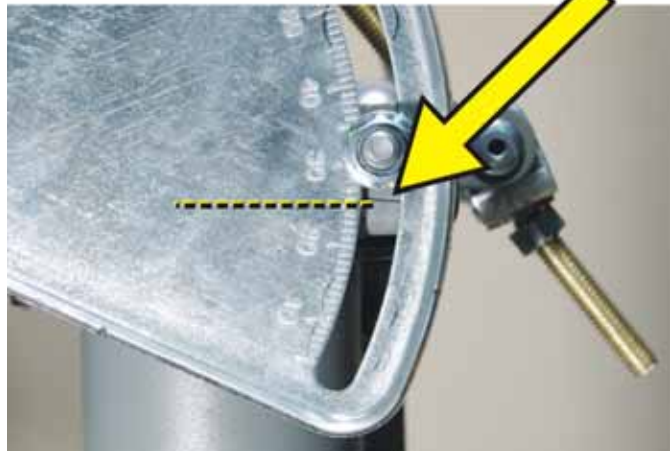


Figure 35: Elevation marker

5. Spin the top elevation adjustment nut clockwise until it is snug against the base plate.
6. Lock down the elevation by tightening the two lockdown nuts on either side of the Az/El mount using a ½-inch socket and torque wrench.

Adjusting the azimuth

To adjust the antenna azimuth:

1. Ensure that the three 5/16-inch azimuth lockdown nuts at the bottom of the Az/El canister (shown in Figure 36) are loose enough that the antenna assembly rotates freely on the mast.

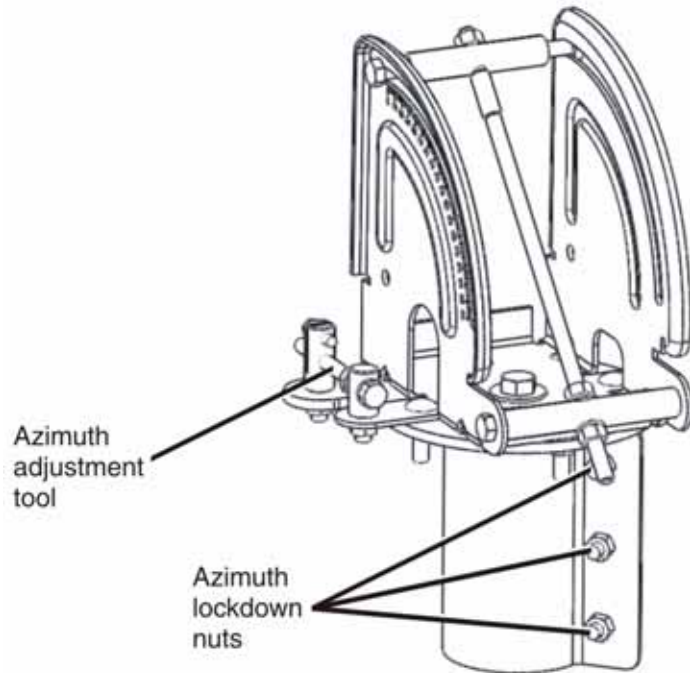


Figure 36: Azimuth adjustment components

2. Manually point the antenna reflector as accurately as possible in the appropriate direction as indicated on the installation reference sheet.

NOTICE

Do *not* attempt to adjust the azimuth manually by pulling on the antenna reflector or feed support arm. Doing so could cause permanent damage to the antenna.

3. Tighten the three lockdown nuts just enough so that the antenna does not rotate freely.

4. Using a 1/2-inch wrench, rotate the azimuth adjustment bolt shown in Figure 36 in either direction to achieve the desired azimuth angle.



Note: Azimuth measurements are calibrated relative to *true* north, not magnetic north.

5. Verify the azimuth with a compass and tighten the three lockdown nuts fully to secure the antenna in position.

Acronyms and abbreviations

A

Az – Azimuth

E

El – Elevation

F

FSB – Field service bulletin

ft – Foot

ft-lb – Foot-pound

G

GPS – Global positioning system

H

hr – Hour

I

IDU – Indoor unit

IFL – Intra-facility link

in-lb – Inch-pound

L

LHCP – Left-hand circular polarization

LNB – Low noise block converter

LOS – Line of sight

M

m – Meter

N

NEC – National Electrical Code

NOCC – Network Operations Control Center

R

RF – Radio frequency

RHCP – Right-hand circular polarization

Rx – Receive

T

TRIA – Transmit/receive isolation assembly

Tx – Transmit

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