



**JUPITER**<sup>TM</sup>

# **0.98 m Antenna Installation Guide *Model AN9-098-G***

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# Understanding safety alert messages

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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 possible 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.

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

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

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## Messages concerning property damage

A NOTICE concerns property damage only.



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

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## 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 message that concerns a potential electric shock hazard.



Indicates a safety message that concerns a potentially hazardous situation in which you could fall.



Indicates a safety message that concerns radio frequency (RF) energy.

# Antenna installation safety

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



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.
- Ensure that the antenna assembly and installation surface are structurally sound so that they can support all loads (equipment weight, ice, and wind).
- Use safety equipment (e.g., 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.



- To avoid electric shock, stay at least 20 ft away from power lines when there is a chance that you or the equipment you are using could come into contact with the power lines. Always look up and check for overhead lines before moving a ladder.
- 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.* If the antenna reflector contacts electric power lines, you may be killed or seriously injured.
- For pole mount installations, be sure to obtain information regarding underground utilities in the proposed location before digging.
- Call a local company that marks underground utility lines before digging to avoid striking underground cables, pipes, or electric lines. Call 811 from anywhere in the United States to contact a local company that does this. You can also visit <http://call811.com/>.
- Striking or cutting underground cables, pipes, or electric lines can cause personal injury or property damage.



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

## **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.
- 

## **WARNING**

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

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## **CAUTION**



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

- All antennas must carry an industry-standard and government-approved Radiation Hazard Caution label on the feed support arm.
  - 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 the continental United States, Puerto Rico, or a site with an elevation angle that is 30° or greater must be installed such that the lower lip of the reflector is at least 4 ft 5 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.
  - Antennas mounted in Canada, Alaska, Hawaii, or with a less than 30° elevation must be installed such that the lower lip of the 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.
  - 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 that projects outward from the antenna reflector toward the satellite and has the same diameter as the reflector. For example, the antenna may not be installed in a place where the path of the cylindrical space passes immediately above a deck on a nearby property. This reduces the likelihood of a person being exposed to RF radiation because they stood inside of or next to that cylindrical space.
  - 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 on a roof.
  - Fenced installations 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.
- Fenced or roof installations in commercial, industrial, or institutional environments 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.
- Once the transmitter becomes operational, maintain a safe distance; at least 3 ft.

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

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

- Do not remove the yellow caution label on the antenna system. 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.

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

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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 to you and the customer. The installer and the dealer assume full responsibility that the installation is structurally sound to support all loads (weight, wind, and ice) and is properly sealed against leaks.

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**Note:** Some installations may require additional precautions. See the appropriate site preparation and mount installation guide for more information.



# Chapter 1

## Overview

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This installation guide explains how to assemble and install the Hughes AN9-098-G 0.98 m antenna. It is written for qualified installers who are familiar with satellite antenna installation practices and are capable of properly applying the information presented.

This chapter presents an overview of the AN9-098-G antenna, a summary of the steps used to assemble and install the antenna, and supplemental information on tasks related to antenna installation.



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

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### Model AN9-098-G antenna description

The Hughes model AN9-098-G antenna is designed for Ka-band applications. Each JUPITER antenna station consists of an antenna assembly and a satellite modem. The satellite modem communicates with both the *JUPITER satellite and the Network Operations Center (NOC)* using the antenna and radio assembly.

The antenna is connected to the satellite modem using a single-cable intra-facility link (IFL) cable that carries both the transmit and receive signals.

[Figure 1](#) on page 12 shows the AN9-098-G antenna—with radio assembly—assembled and installed on a trimast mount.



Figure 1: Hughes model AN9-098-G 0.98 m satellite antenna

## Antenna installation summary

**Table 1** lists the basic steps and related tasks for assembling and installing the antenna. Perform the procedures in the order listed. For detailed information on each task, refer to the sections and/or other documents listed.

Table 1: Satellite antenna installation summary

	Task	For details, see...
1	Explain the installation process to the customer.	
2	Conduct a site survey with the customer to identify a suitable location for the antenna.	<a href="#">Select the installation site</a> on page 24  Appropriate site preparation and mount installation guide
3	Use Onsite Accelerated Service Installation System (OASIS) app on your smart device to determine your best line of sight (LOS) before installing your antenna, then take the required pictures.  Once you have selected the best possible location, download your GPS coordinates within 15 m of the selected site to get the exact settings for the pointing values (azimuth, elevation, and tilt).	<b><i>JUPITER Antenna Pointing Guide</i></b> (1039429 0001)  <b><i>OASIS User Guide</i></b> (1040630-0001)
4	Install and apply power to the satellite modem.  <b>Note:</b> You must install the satellite modem before installing the antenna to determine the proper antenna pointing values (azimuth, elevation, and tilt).	Appropriate satellite modem installation guide
5	Proceed with the activation and commissioning process in OASIS (use your smart device to connect to the satellite modem via the wireless router). Request site latitude and longitude.  If you do not have a smart device, connect your laptop to the satellite modem and enter the coordinates from your GPS device when prompted. Your GPS device must display coordinates in a degrees/minutes/seconds format, which is commonly found on devices manufactured by Garmin, Magellan, etc. Some phone or tablet GPS apps do not offer seconds measurements.	<b><i>JUPITER Antenna Pointing Guide</i></b> (1039429 0001)  <b><i>OASIS User Guide</i></b> (1040630-0001)
6	Determine the most suitable method for mounting the antenna, then install the antenna mast.  <b>Note:</b> The antenna mast <b>must</b> be plumb. The antenna cannot be adjusted to correct for a mast that is not plumb.	<a href="#">Install the satellite modem</a> on page 25  Appropriate site preparation and mount installation guide

	Task	For details, see...
7	Assemble the antenna (Az/EI mount, feed support arm, reflector, and other parts).	Chapter 3 – <i>Installing the antenna and radio</i>
8	Install the radio assembly	<a href="#">Installing the radio assembly</a> on page 34
9	Install the antenna assembly on the mast.	<a href="#">Installing the antenna assembly onto the mast</a> on page 38
10	Install the IFL cable between the satellite modem and the antenna.	Chapter 4 – <i>Cabling and connections</i>
11	Ground the antenna assembly.	<a href="#">Ground connections</a> on page 43
12	Point the antenna.	<p>Mechanical adjustments for pointing: Chapter 5 – <i>Adjusting antenna azimuth and elevation</i></p> <p>Pointing procedure: <b>JUPITER Antenna Pointing Guide</b> (1039429-0001)</p> <p><b>OASIS User Guide</b> (1040630-0001)</p>

When the antenna is properly pointed, you can commission the satellite modem as instructed in the appropriate IDU installation guide.

## Approved cables

For a list of approved coaxial cable types for the IFL between the antenna and the satellite modem, see the Hughes FSB, ***IFL Cable, Approved List (with lengths) for JUPITER/HTXXXX Domestic Installations*** (FSB 120909\_01).

The FSB lists the maximum cable length for each approved cable type.

Because the requirements and conditions for each installation site may vary, you must use your own judgment and best practices to determine how to route and connect the IFL cable.

## Antenna parts and recommended tools

This chapter identifies the main components and parts provided with the AN9-098-G Ka-band antenna kit. It also provides a list of required tools you will need to successfully perform the installation.



Figure 2: Antenna parts

## Antenna kit components

**Note:** The radio assembly is shipped separately from the rest of the antenna and may not arrive at the same time.

When you receive the antenna equipment, unpack and inspect the components and hardware to ensure that all parts have been received in good condition.



Metal components may contain sharp edges. Use care when unpacking and handling antenna parts.

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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.

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

The main components of the antenna kit are:

- Az/EI mount assembly
- Reflector bracket and polarization plate
- Antenna reflector
- Feed support arm and feed tube adapter
- Side support rods
- Radio assembly (shipped separately) with feed horn attached

The following sections describe and illustrate each component of the antenna kit.



### ***Az/El mount assembly***

The Az/El mount assembly, shown in [Figure 3](#), includes components that allow you to adjust the antenna elevation and azimuth—the Az/El canister, the elevation scale, and the azimuth and elevation adjustment tools. It also includes a grounding screw, used to ground the assembly to the grounding block.

The Az/El canister supports the antenna and secures it to the mast. The elevation scale is used to measure the angle of antenna elevation. The azimuth and elevation adjustment tools are used to finely adjust the azimuth and elevation of the reflector during antenna pointing. See the ***JUPITER Antenna Pointing Guide*** (1039429-0001) for detailed instructions.

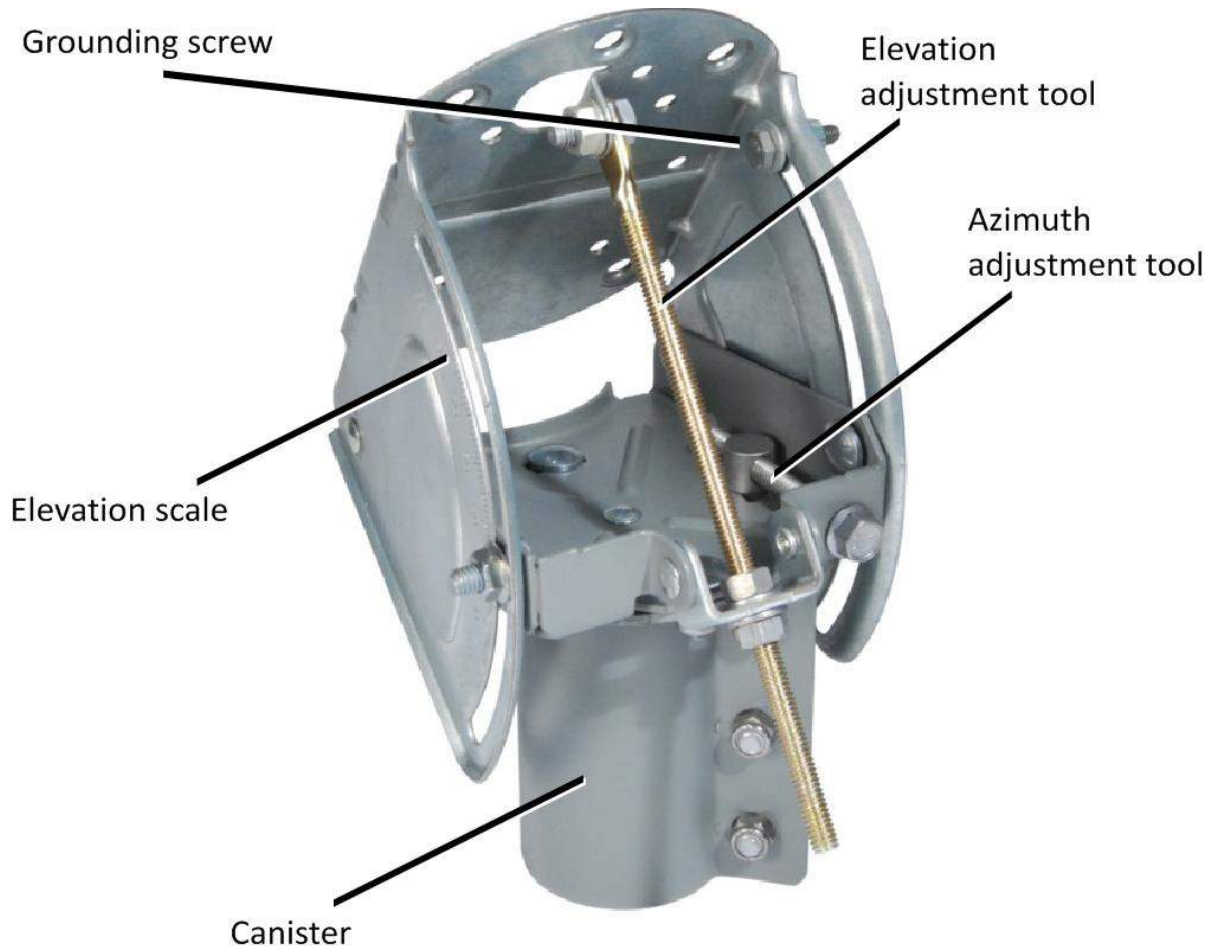


Figure 3: Az/El mount assembly

### ***Reflector bracket and polarization plate***

The reflector bracket shown in [Figure 4](#) attaches to the Az/EI mount and supports the antenna reflector. The tilt plate allows the reflector to rotate so that it can be adjusted for proper tilt. (See also [Figure 9](#) on page 27.)

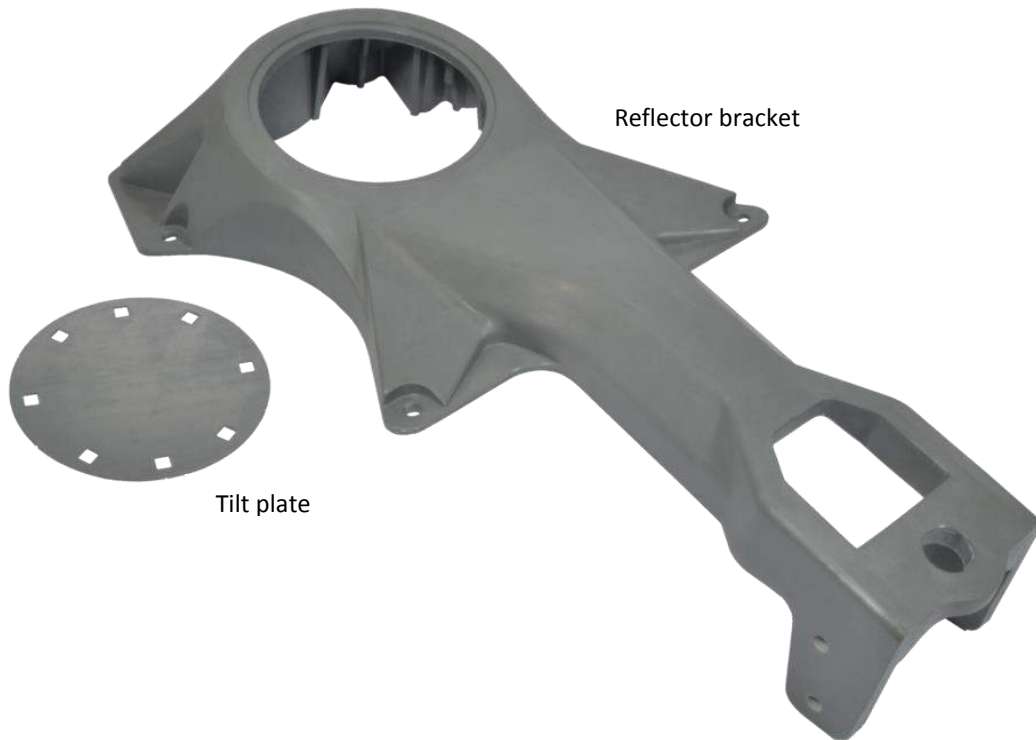


Figure 4: Reflector bracket and tilt plate

### ***Antenna reflector***

The antenna reflector shown in [Figure 5](#) focuses the transmitted and received RF signals. It attaches to the reflector bracket.



Figure 5: Antenna reflector

#### ***NOTICE***

Handle the antenna reflector with care to avoid bending it or causing other damage.

---

### **Feed support arm**

Figure 6 shows the feed support arm, which supports the radio assembly and feed horn.

Radiation exposure label



Figure 6: Feed support arm

### **Radio assembly**

The radio assembly shown in Figure 7 consists of the radio transmitter/receiver, polarizer waveguide, and feed horn.



Figure 7: Radio assembly

## Small hardware parts list

**Table 2** lists the small hardware parts included with the antenna kit and radio assembly.

Table 2: Small hardware parts

Hardware parts	Quantity	Listed parts are used to attach...	Illustration showing where parts are used
$\frac{5}{16}$ inch $\times$ $\frac{3}{4}$ inch carriage bolts	5	Reflector bracket and polarization plate to Az/El mount assembly	<a href="#">Figure 9</a> on page 27
$\frac{5}{16}$ inch hex nuts	5		
Thread cutting screws	6	Antenna reflector to reflector bracket	<a href="#">Figure 11</a> on page 29
$\frac{1}{4}$ inch $\times$ 2.0-inch carriage bolts	2	Assembling the feed support arm	<a href="#">Figure 12</a> on page 30
$\frac{1}{4}$ inch flat washers	2		
$\frac{1}{4}$ inch lock washers	2		
$\frac{1}{4}$ inch hex nuts	2		
$\frac{1}{4}$ inch $\times$ 1.5-inch carriage bolts	1		
$\frac{1}{4}$ inch $\times$ 1.0-inch carriage bolts	2	Side support rod installation	<a href="#">Figure 13</a> on page 31
$\frac{1}{4}$ inch flat washers	2		
$\frac{1}{4}$ inch lock washers	2		
$\frac{1}{4}$ inch hex nuts	2		
$\frac{1}{4}$ inch $\times$ 2.0-inch hex bolts	1	Attaching the support arm to the reflector	<a href="#">Figure 14</a> on page 32
$\frac{1}{4}$ inch flat washers	3		
$\frac{1}{4}$ inch lock washers	2		
$\frac{1}{4}$ inch hex nuts	2		
$\frac{5}{16}$ inch $\times$ 1.00-inch hex bolt	4	Securing the feed tube adapter	<a href="#">Figure 15</a> on page 33
$\frac{5}{16}$ inch flat washers	4		
$\frac{5}{16}$ inch lock washers	4		
M4-0.7 x 10 pan head screw	1	Securing the radio	<a href="#">Figure 18</a> on page 36

## Tools

Table 3 lists the tools recommended for assembling and installing the antenna.

Table 3: Required tools

Tools	Details
Socket wrench, $\frac{1}{2}$ inch (with 3 inch extension)	For $\frac{5}{16}$ inch bolts.
Open-end wrench, $\frac{1}{2}$ inch	For $\frac{5}{16}$ inch bolts. Two of the Az/El 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, $\frac{7}{16}$ inch	For $\frac{1}{4}$ inch bolts. Some nuts and bolts require a second wrench to prevent turning.
Torque wrench, foot-pounds	With $\frac{1}{2}$ inch and $\frac{7}{16}$ inch sockets, capable of measuring torque to 8 ft-lb.
Torque wrench, open-end, inch-pounds	$\frac{7}{16}$ inch, capable of tightening to 20 inch-lb, such as the Ripley model TW 207-AH-B torque wrench, which is present to 20 inch-lb. Used to connect IFL to the radio assembly or ground block.
3 mm ball-end hex wrench	For Allen screws on polarizer assembly (for adjusting circular polarization only).
Phillips-head screwdriver, $\frac{1}{4}$ inch	For screw used to secure antenna reflector to reflector bracket.
Bubble level	Used to ensure that the mast is plumb.
Compass	Used in determining proper antenna azimuth.
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 satellite modem and antenna.
UV-rated cable ties	Used to secure slack in cables to antenna mast.

# Installing the antenna and radio

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This chapter explains how to assemble and install the antenna, radio assembly, and associated hardware.



Before you install the antenna, read all safety information in [Understanding safety alert messages](#) on page 5.

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## General instructions for assembling the antenna



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.
  - Ensure that the antenna assembly and installation surface are structurally sound so they can support all loads (equipment weight, ice, and wind).
  - Use safety equipment (e.g., 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.
- 



- To avoid electric shock, stay at least 20 ft away from power lines when there is a chance that you or the equipment you are using could accidentally come into contact with the power lines. Always look up and check for overhead lines before moving a ladder.
  - 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.* If the antenna reflector contacts electric power lines, you may be killed or seriously injured.
  - For pole mount installations, be sure to obtain information regarding underground utilities in the proposed location before digging.
  - Call a local company that marks underground utility lines before digging to avoid striking underground cables, pipes, or electric lines. Call 811 from anywhere in the United States to contact a local company that does this. You can also visit <http://call811.com/>.
-

Before you assemble the antenna, read these important instructions:

- 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 instructed to do so.* See [Table 4](#) for torque specifications.
- Torque – To ensure successful installation of the antenna, it is critical that you tighten all nuts and socket-head screws to the torque values shown in [Table 4](#).

Table 4: Torque specifications

Fastener or connector	Proper torque value
$\frac{5}{16}$ inch	15 ft-lb
$\frac{1}{4}$ inch	3 ft-lb
$\frac{11}{32}$ inch thread cutter	10 ft-lb
M4 wrench	19 in-lb

## Select the installation site

Before selecting an antenna installation site, check OASIS or the installation reference sheet to see if there is a customer preference for the installation site. Work with the customer to see if a line of sight (LOS) is available at their preferred site. Refer to the appropriate antenna site preparation and mount installation guide that discusses the factors you should consider when selecting an installation site.

The first and most important consideration when choosing a prospective site is whether the site can provide an acceptable line of sight (LOS) to the satellite. Choose a site where the antenna will be able to receive the strongest signal available. A clear, unobstructed view of the southern sky is necessary for proper transmission. Consider obstructions that may occur in the future, such as construction in the area, or the growth of trees.

Also, consider potential grounding sources when choosing a location. For guidance on grounding, see the documents listed in [Ground connections](#) on page 43.

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 necessary permits and comply with local building codes.



## Install the satellite modem

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

For installation instructions, refer to the appropriate installation guide for the satellite modem you are installing.

## Determining the pointing values and polarization setting

### ***Pointing values***

Once the satellite modem is fully powered up, connect your smart device through a wireless router and, using OASIS, set the pointing parameters for the antenna by following the instructions OASIS gives. If you need further guidance, consult the ***OASIS User Guide*** (1040630-0001).

Alternatively, connect it to your laptop either wirelessly or by using an Ethernet cable, and then use your GPS receiver to calculate the exact latitude and longitude of the antenna site. Follow the instructions in the ***JUPITER Antenna Pointing Guide*** (1039429-0001) to enter the latitude and longitude information to determine the initial antenna azimuth, elevation, and tilt values. Record these values and keep them handy for reference as you install and point the antenna.

### ***Polarization setting***

At the satellite modem System Control Center, enter the installation parameters as presented in OASIS, or, if you are using a laptop, as presented in the satellite modem software, to obtain the required polarization setting (either left-hand circular polarization [LHCP] or right-hand circular polarization [RHCP]). Make a note of the required setting for reference when you install the radio. See the ***JUPITER Antenna Pointing Guide*** (1039429-0001) and the ***OASIS User Guide*** (1040630-0001) for more information.

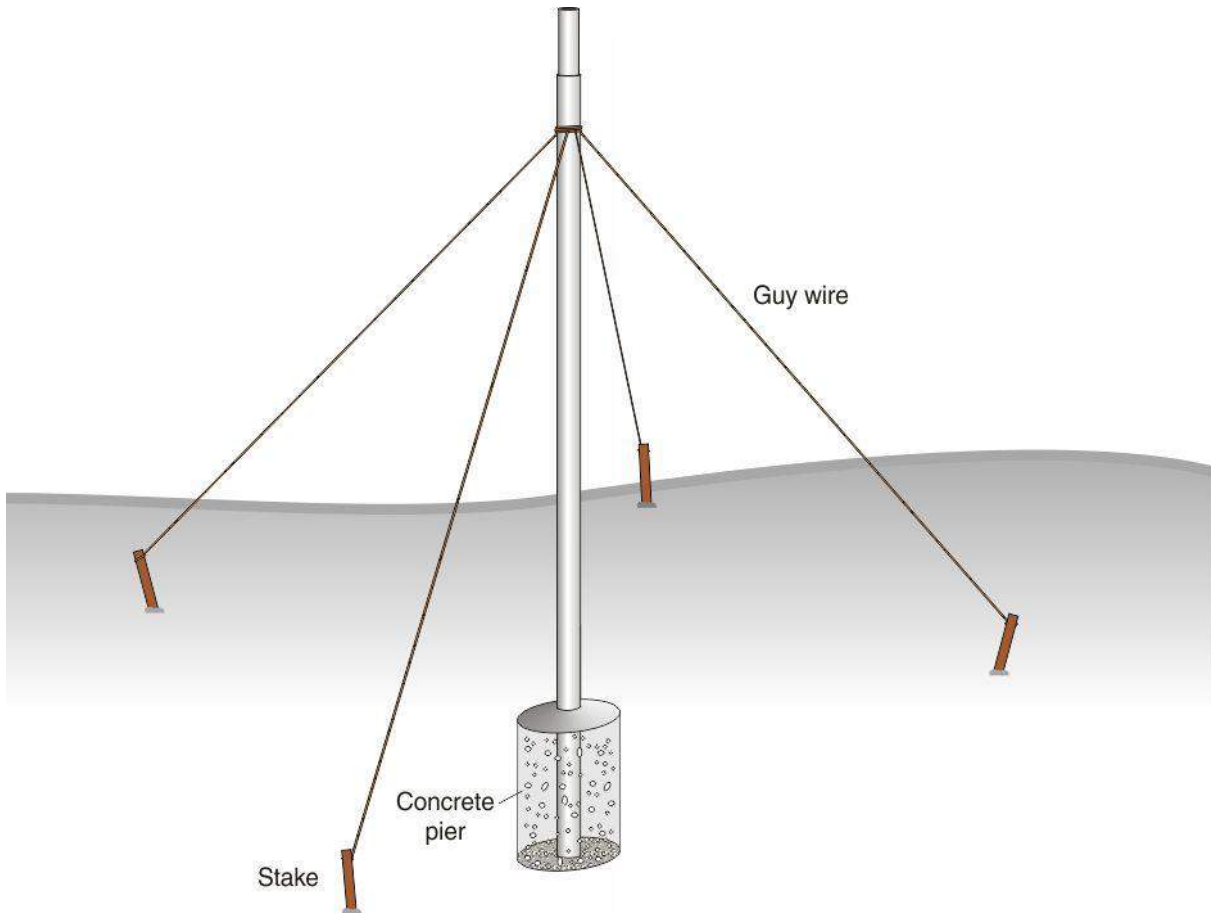
## Install the antenna mount

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

If you are using QUIKRETE fast-setting concrete mixture to set the pole mount, it will take about 4 hours for the concrete to cure to the point where you can safely install the antenna. See the appropriate antenna site preparation and mount installation guide for more information about using QUIKRETE.

Mounts installed with a standard concrete mix need at least 24 hours to cure before you can install an antenna on the mount. Be sure to plan and schedule the installation accordingly.

**Note:** Ensure the pole remains plumb as the concrete cures. You can accomplish this by bracing the pole. Figure 8 shows an example of how to do this.



T0139928

Figure 8: Pole mount kept plumb with guy wires

**Note:** The antenna mast *must* have an outside diameter of  $2\frac{3}{8}$  inches.

For complete information regarding antenna mount installation, including various mounting methods, refer to the appropriate antenna site preparation and mount installation guide.

Refer to the installation reference sheet for any customer requested guidelines concerning the mount installation. When you arrive at the site, use the installation method/location requested in the work order only if it will provide a good line of sight (LOS) to the satellite.

If the installation reference sheet does not specify a method, use one of the methods documented in the appropriate antenna site preparation and mount installation guide. Most installations in commercial, industrial, or institutional environments use a non-penetrating roof mount.

## Installing the reflector bracket and tilt plate

Attach the tilt plate and reflector bracket to the Az/EI mount as shown in [Figure 9](#) on page 27.

1. Place the reflector bracket against the face of the Az/EI mount. Make sure that the Az/EI mount fits inside the lip of the reflector support. Then place the polarization plate over the round opening in the reflector bracket.
2. Rotate the polarization plate so that the five holes line up with the corresponding holes in the Az/EI mount.

**Note:** The polarization plate contains additional holes that will not line up with holes in the Az/EI mount.

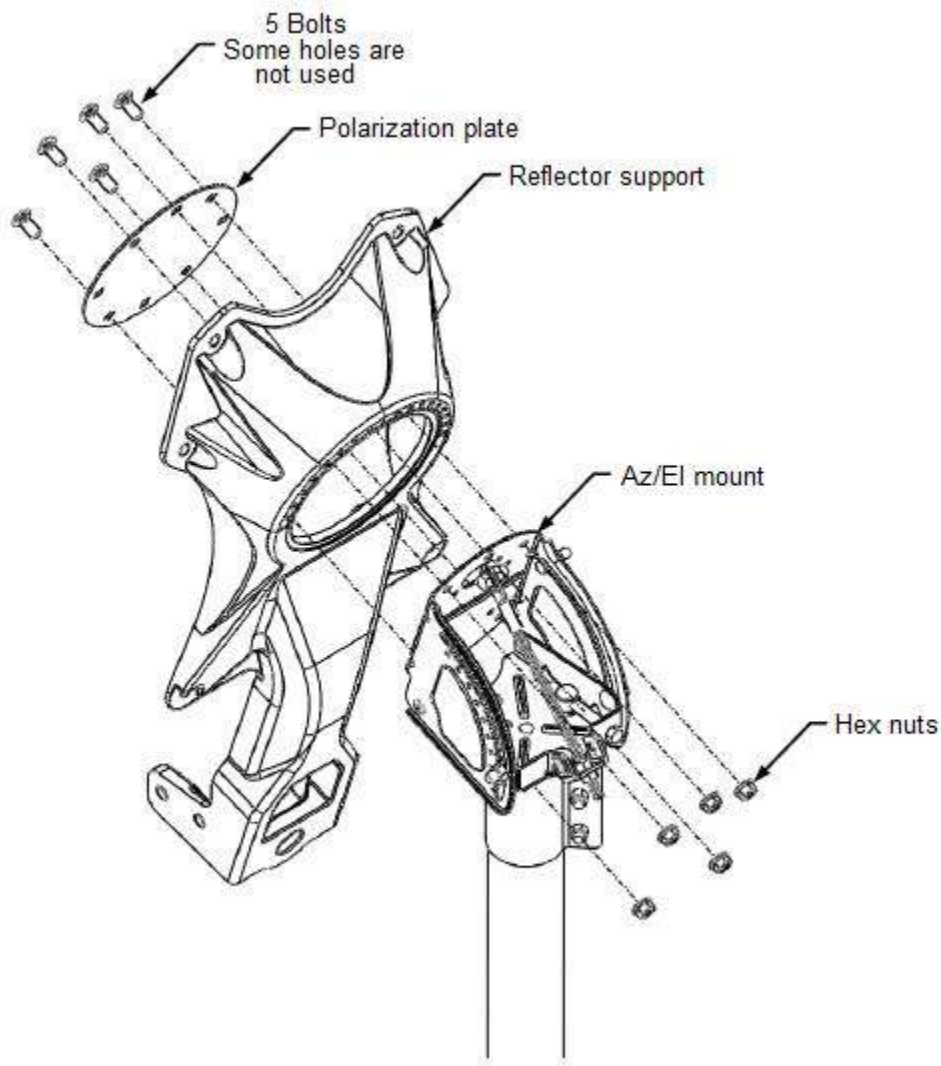


Figure 9: Attaching the reflector bracket and polarization plate

3. Insert five carriage bolts through the polarization plate and into the corresponding holes in the Az/EI mount.

4. From the opposite side of the reflector bracket, place a hex flange nut on each bolt and tighten the nuts lightly, only until snug. The reflector bracket should rotate freely between the Az/EI mount and the polarization plate.

When the reflector bracket is correctly attached to the Az/EI mount, you can see the tilt scale numbers above the tilt pointer, as shown in [Figure 10](#) on page 28. In the figure, the tilt is set to **0**.

The Az/EI tilt scale can place the tilt or rotation of the antenna to either a positive or negative position, based on coordinates, and must be set on each installation according to specifications.

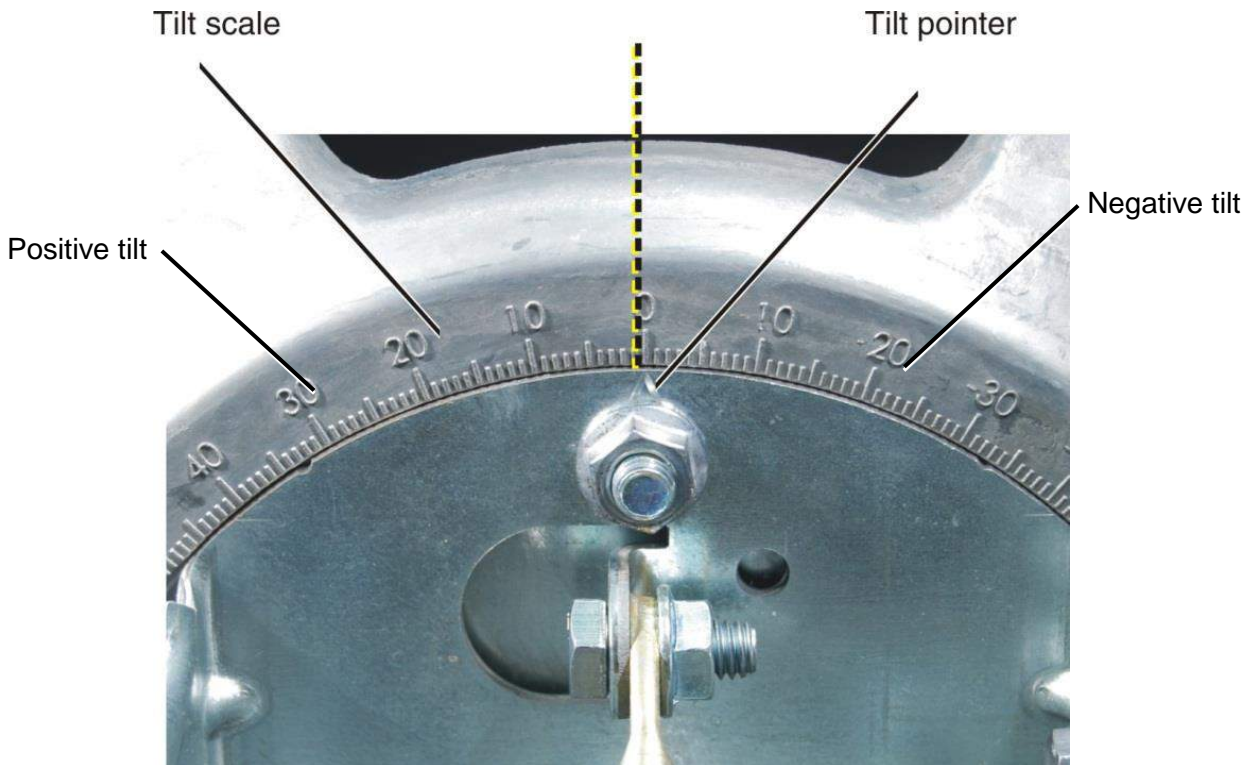


Figure 10: Tilt scale and pointer

5. If you need to set the tilt to anything other than zero, set the scale to the proper reading and lock down the five bolts; otherwise, leave the tilt set to **0** and lock down the five bolts. Using the tilt value you obtained from the satellite modem as described in [Determining the pointing values and polarization setting](#) on page 25, set the scale to the proper reading and lock down the five bolts.

## Installing the antenna reflector

Follow the steps below to attach the antenna reflector to the reflector bracket.

### NOTICE

While attaching the reflector bracket, do not place the reflector face down on a hard surface. The weight of the reflector bracket and any additional pressure during assembly could bend the reflector.

1. Line up the holes on the reflector with the holes on the reflector support, as shown in Figure 11.
2. Insert six thread cutting screws ( $11/32$ -14  $\times$  1.13 inch) into the holes in the reflector bracket and through the corresponding holes in the reflector, as shown in Figure 11.

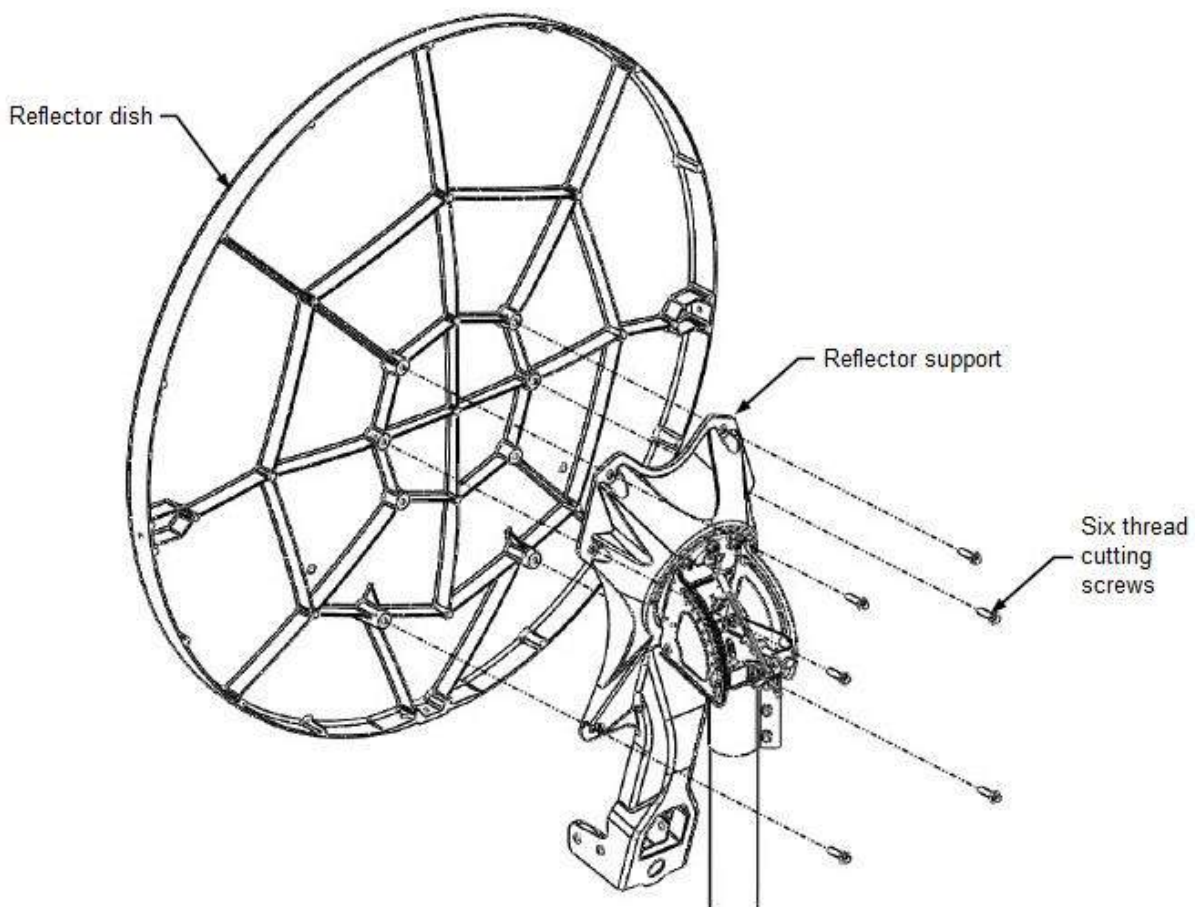


Figure 11: Attaching the antenna reflector

3. Tighten the screws using a  $5/16$  inch wrench.

## Installing the feed support arm

To assemble the feed support arm:

1. Insert a  $\frac{1}{4}$ -20 x 1.5 inch carriage bolt into the pocket of the feed tube adapter.

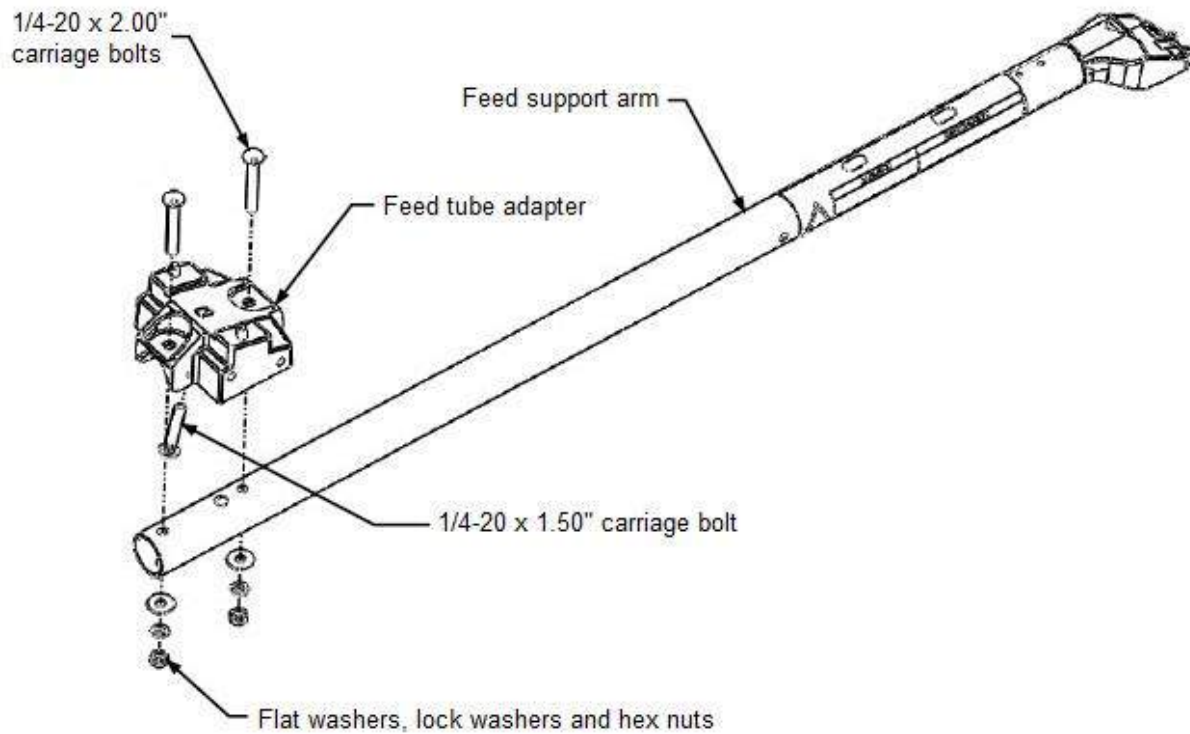


Figure 12: Assembling the feed support arm

2. Place the feed tube adapter onto the feed support arm and secure it in place with two  $\frac{1}{4}$ -20 x 2 inch carriage bolts.
3. Fasten each of the two carriage bolts in place with a  $\frac{1}{4}$  inch flat washer, a lock washer, and a hex nut. Fasten snugly.

To install the feed support arm:

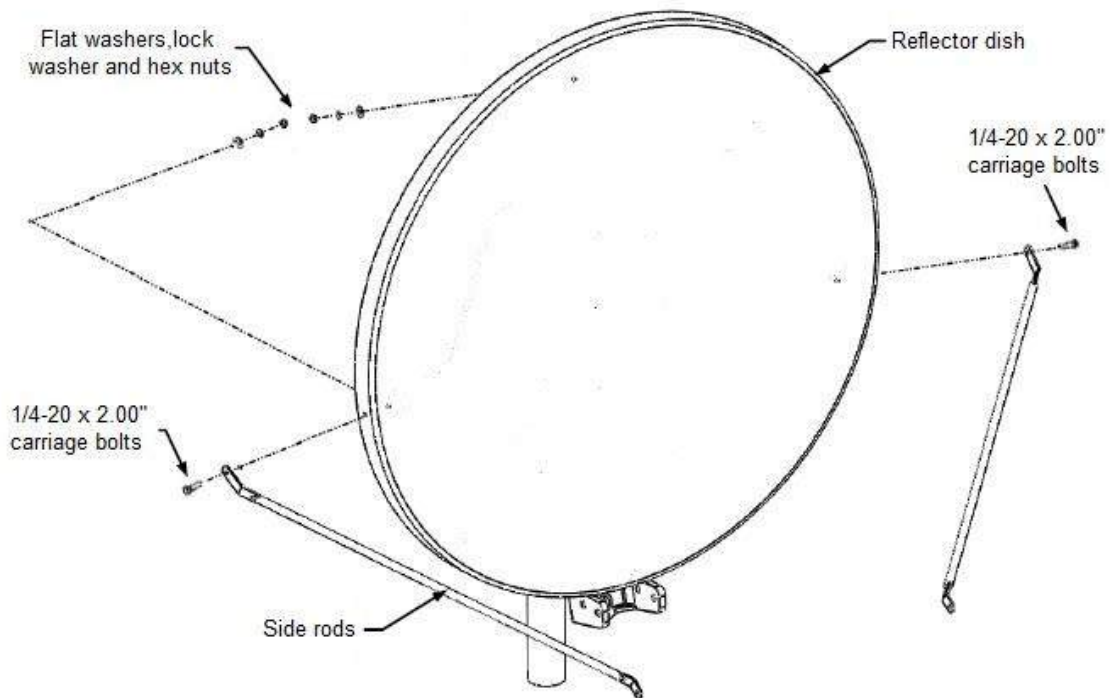


Figure 13: Side support rod installation

1. Attach the side rods to the reflector dish using two  $\frac{1}{4}$ -20 x 1 inch carriage bolts. Loosely secure both bolts with a  $\frac{1}{4}$  inch flat washer, a lock washer, and a hex nut. You should still be able to rotate the side rods.



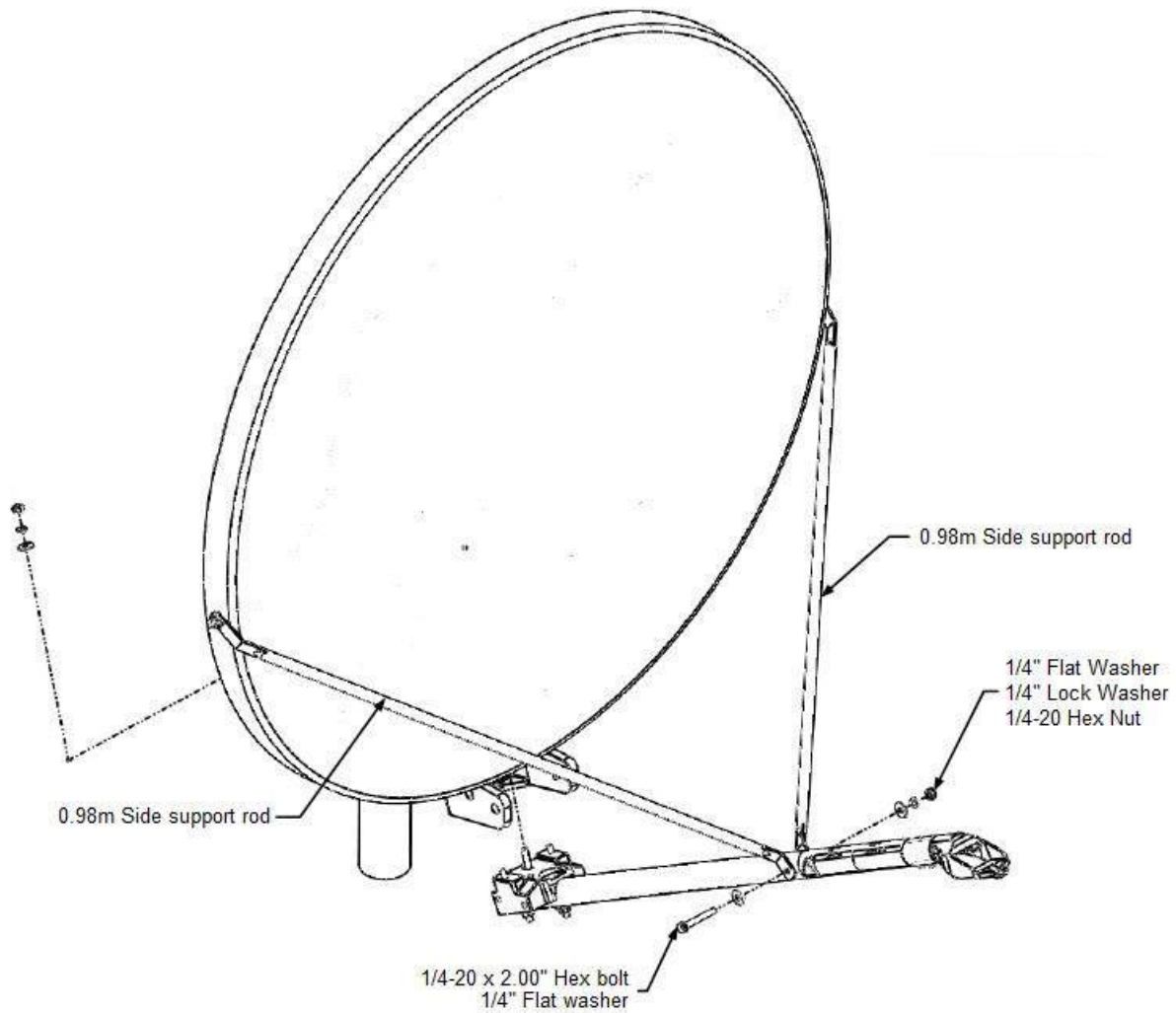


Figure 14: Attaching the support arm to the dish

2. Loosely attach the feed support arm to the side rods using a single  $\frac{1}{4}$  x 2 inch hex bolt and two  $\frac{1}{4}$  inch flat washers, a  $\frac{1}{4}$  inch lock washer, and a  $\frac{1}{4}$ -20 hex nut. The washers must be placed on both sides of the feed support arm, as shown in [Figure 14](#).
3. Swing the feed support assembly upward and use a  $\frac{1}{4}$  inch flat washer,  $\frac{1}{4}$  inch lock washer and  $\frac{1}{4}$ -20 hex nut to secure it to the reflector.



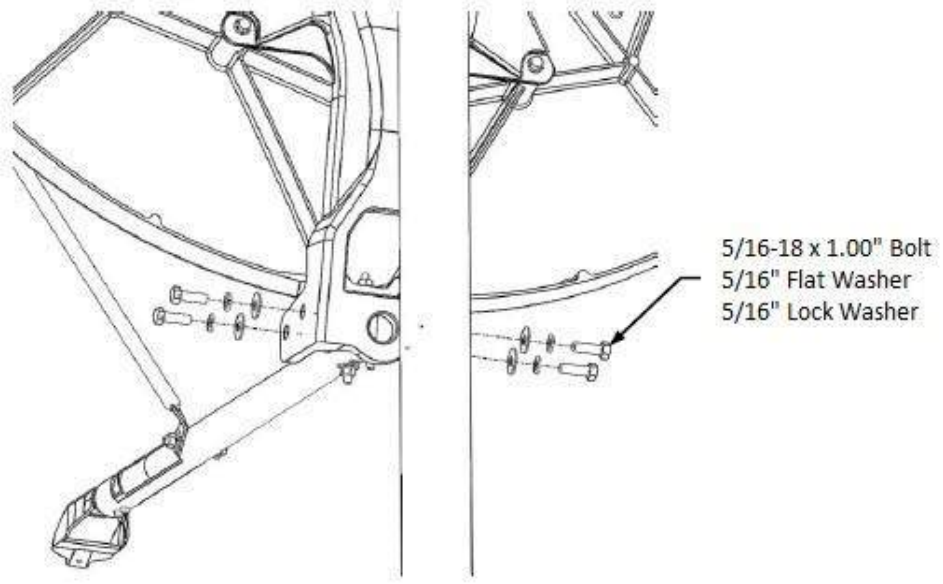


Figure 15: Securing the feed tube adapter

4. Attach the reflector support to the feed tube adapter using four  $\frac{5}{16}$ -18 x 1 inch screws, four  $\frac{5}{16}$  inch flat washers, and four  $\frac{5}{16}$  inch lock washers.
5. Tighten all screws on the assembly until snug.

## Installing the radio assembly

To mount the radio assembly on the feed support arm:

1. Position the radio assembly above the feed support arm so that the feed horn faces the reflector, as shown in [Figure 16](#).

**Note:** Never mark the radio housing or feed horn. Marks cannot be removed and will result in the unit being scrapped if it is returned to Hughes.



Figure 16: Radio position on antenna assembly

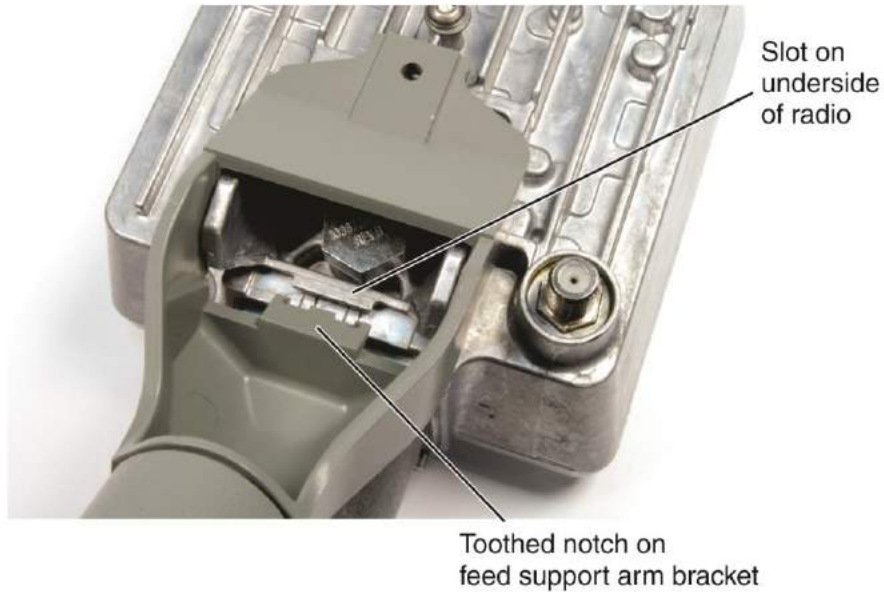
2. Guide the two tabs on the underside of the radio assembly into the bracket on the end of the feed support arm so that they fit into the guides on the inside of the bracket.

Be sure that the toothed key on the bracket fits into the slot on the underside of the radio, as shown in [Figure 17](#) on page 35.

**Note:** The support arm bracket key must fit into the radio slot. If it does not, the radio will be unable to transmit to the satellite correctly.

**Note:** If you lose a screw that holds the radio on the feed arm, *do not* drill an additional hole into the radio to fit a screw of a different size. Use a replacement screw of the same size. Radios with additional holes in the mounting tabs must be scrapped if returned to Hughes. Have spare nuts, bolts, or screws on hand in case you lose those provided in the kit.

### Separated



### Connected

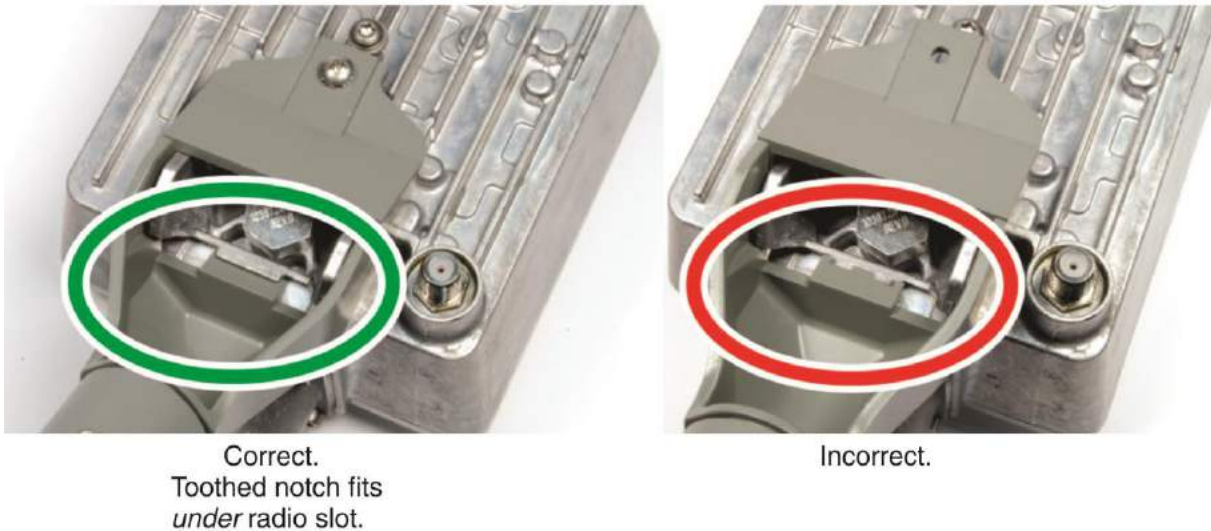


Figure 17: Proper alignment of radio to feed support arm

3. Insert the M4 Phillips head screw up through the feed support arm bracket from underneath and into the threaded socket on the bottom of the radio, as shown in [Figure 18](#).
4. Tighten until snug.



Figure 18: Securing the radio

### ***Changing transmit circular polarization (if needed)***

The radio may be shipped with the polarizer set for left-hand circular polarization (LHCP) or right-hand circular polarization (RHCP). There is no default setting. If the radio polarization setting does not match the polarization required for the antenna location, you will have to change the setting.

#### **Determining the polarization setting**

1. At the satellite modem System Control Center, enter the installation parameters as described in the ***JUPITER Antenna Pointing Guide*** (1039429-0001) to obtain the required polarization setting.
2. Refer to [Figure 19](#) on page 37 and check the position of the polarizer on the radio.
  - If the marker on the feed horn base aligns with **L**, the polarizer is set for LHCP.
  - If the marker aligns with **R**, the polarizer is set for RHCP. For example, the radio shown in [Figure 19](#) is set for LHCP, with the feed horn marker pointing to the L.

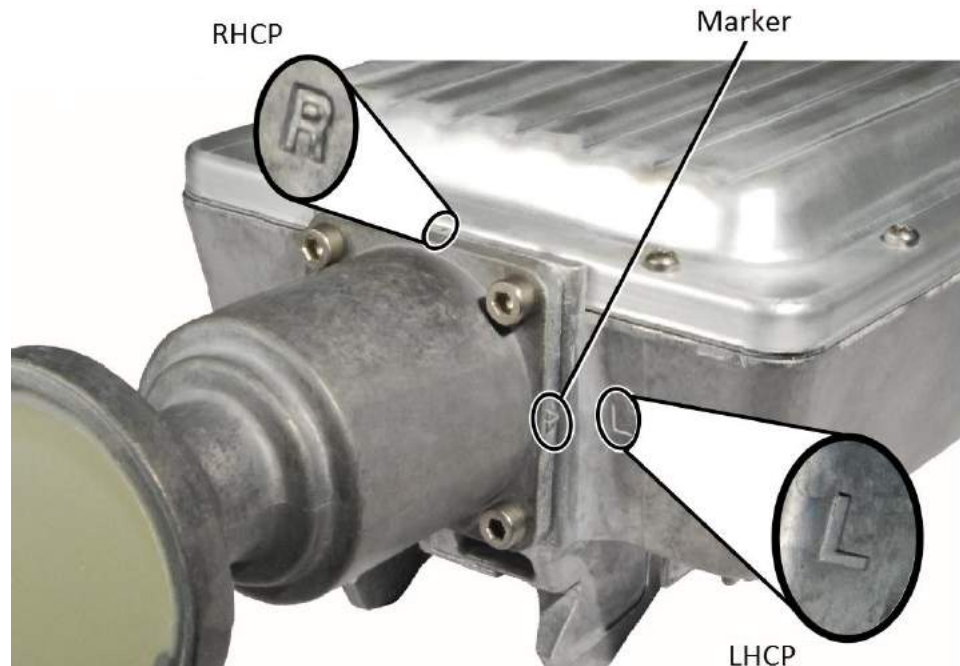


Figure 19: Determining the polarization setting of the radio

3. Compare the existing setting with the required setting you obtained in [Determining the pointing values and polarization setting](#) on page 25. If the polarizer is already set to the proper setting, skip the rest of this section and proceed to [Installing the antenna assembly onto the mast](#) on page 38.
4. If the polarizer is not set to the required polarization, follow the steps in [Changing polarization](#).

### Changing polarization

**Note:** Follow the instructions in this section only if you need to change the transmit circular polarization setting.

To change the polarization, reposition the polarizer as follows:

1. Using a 3 mm ball-end hex wrench, remove the four screws that secure the feed horn to the radio.
2. Separate the feed horn assembly from the radio and reposition it so that the marker on the base aligns with **L** label on the radio for LHCP, or **R** for RHCP.

#### NOTICE

If the O-ring comes out of the feed horn groove, make sure it is properly resealed and that the blue mark is visible, as shown in [Figure 20](#) on page 38 before reinstalling the feed horn assembly on the radio.

The O-ring prevents moisture from accessing the waveguide and the radio. *It must be properly seated.*

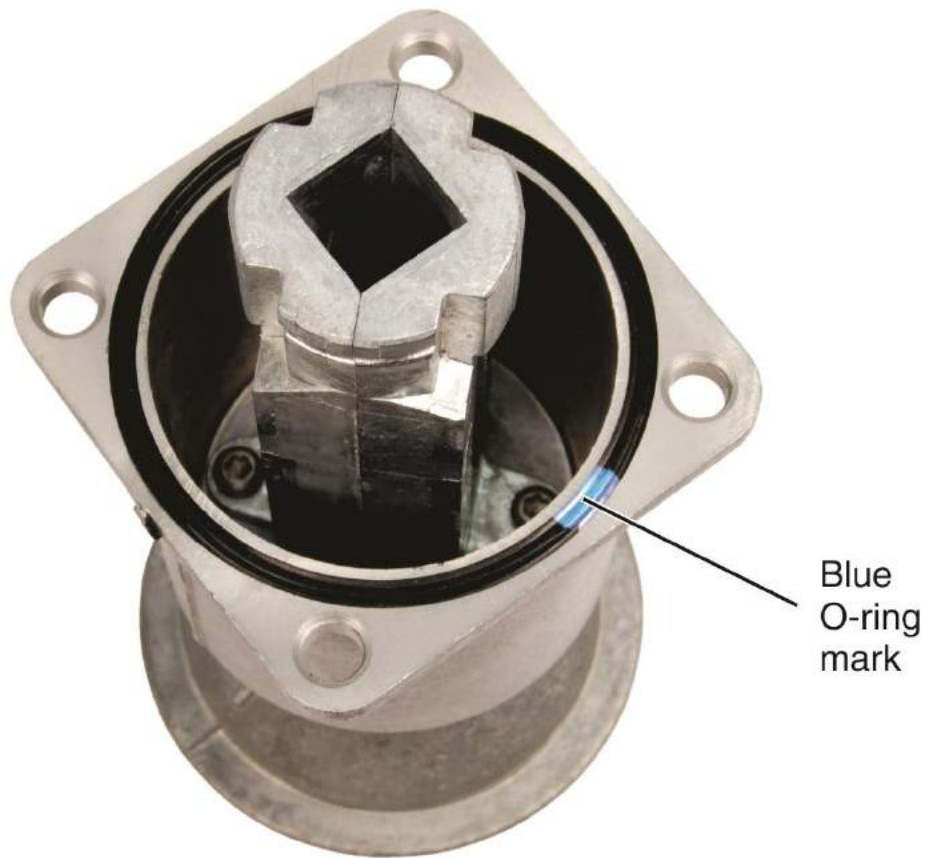


Figure 20: Feed horn O-ring properly seated

3. Reattach the feed horn assembly by replacing and tightening the four screws to 13 inch-lb  $\pm$  2 inch-lb. Ensure that the feed horn face is flush to the housing on all sides.

#### NOTICE

Attach the feed horn assembly exactly as described in this section. Failure to do so could allow moisture to accumulate inside the radio and/or feed horn, causing damage to the equipment.

## Installing the antenna assembly onto the mast

Follow these steps to install the assembled antenna assembly onto the mast pipe:

1. Before you install the antenna onto the mast pipe, use a bubble level to ensure that the mast is plumb.

Check the mast at two perpendicular locations. See [Figure 21](#) on page 39.

**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.



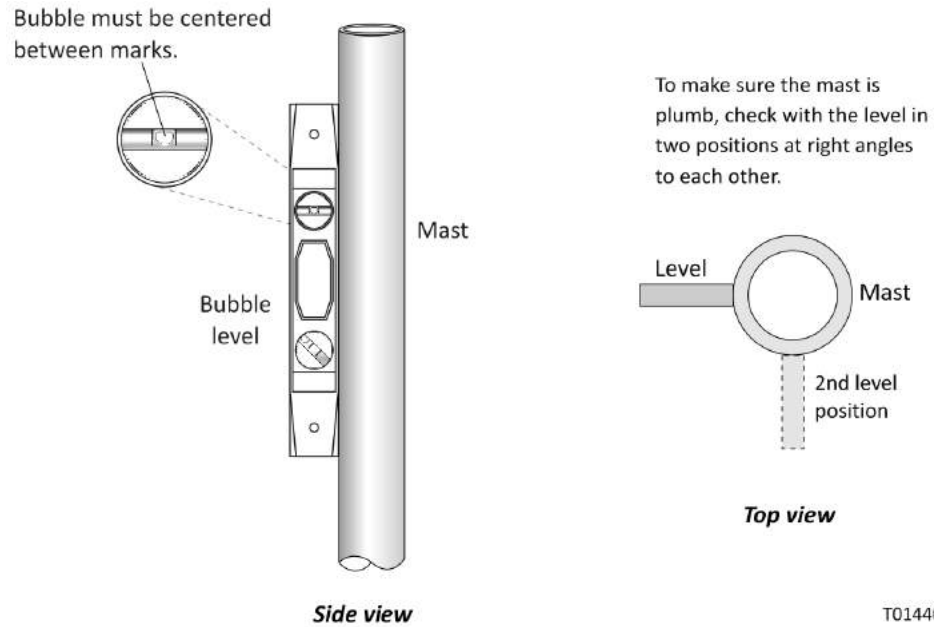


Figure 21: Making sure the mast is plumb

2. Slide the antenna assembly down onto the mast so the Az/EI mount fits onto the mast as shown in [Figure 22](#) on page 39.

**Note:** The mast must have an outside diameter of  $2\frac{3}{8}$  inches.

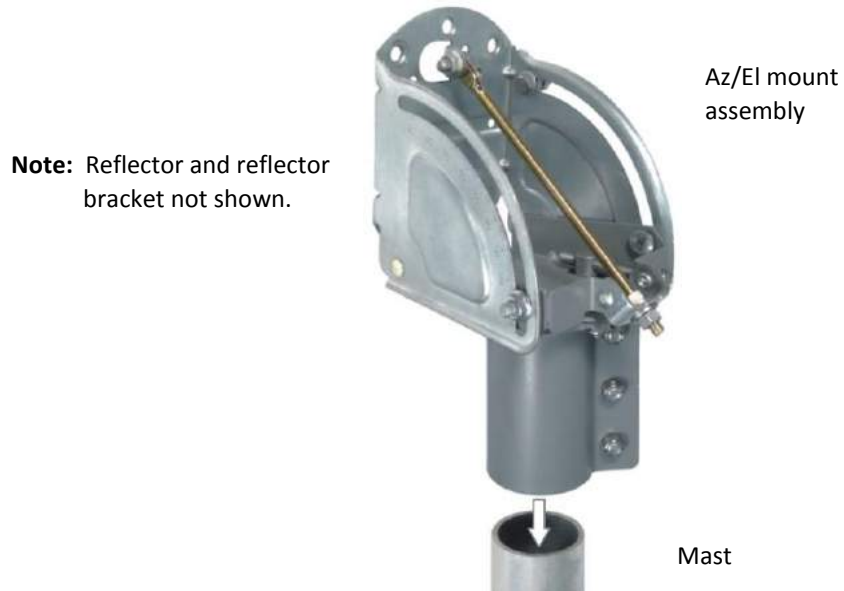


Figure 22: Installing the Az/EI mount assembly

This completes assembly of the antenna. Depending on the antenna orientation and mount, the antenna should look similar to the one shown in [Figure 1](#) on page 12.

Next you must route the IFL between the antenna and the satellite modem. See Chapter 4 – *Cabling and connections*.

# Cabling, connections, and grounding

---

This chapter illustrates where the antenna IFL connector is located, describes how to route the IFL cable at the antenna, and explains how to connect the IFL cable to the radio assembly. You must connect this cable before you can point the antenna at the JUPITER satellite.

## Cabling requirements

For a list of approved coaxial cable types for the IFL cable that runs between the antenna and the satellite modem, see the Hughes FSB, ***IFL Cable, Approved List (with lengths) for Jupiter/HTXXXX Domestic Installations*** (FSB\_120909\_01). The FSB lists the maximum cable length for each approved cable type for all relevant radio types.

### 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 and ground block requirements, see the Hughes FSB, ***HNS Broadband Requirements for RG-6 and RG-11 IFL Cable Connectors, Ground Blocks and Ground Block Location*** (FSB 50518\_01).



## Routing the IFL cable at the antenna

1. Insert one end of the IFL cable into the feed support arm and thread it through the feed support arm until it comes out the opposite end, as shown in [Figure 23](#).



Figure 23: IFL cable configuration

2. Leave an adequate coiled service loop (6 ft to 10 ft) and use UV-resistant cable ties to secure it to the mast, boom arm bracket, or Az/EI mount, providing a minimum cable length of 25 ft between the radio and the satellite modem.

**Note:**

- Do not leave the service loop lying on roof or other mounting surface.
- Do not block access to the azimuth and elevation adjustment nuts on the Az/EI mount assembly.
- Be sure to run a grounding wire from the Az/EI plate to the ground block.

3. Coil any additional cable and secure with UV-resistant cable ties, which are black in color.

### NOTICE

Where the IFL cable connects to the radio or to a ground block, tighten the cable connector to 20 inch-lb. *Overtightening the radio connector can result in damage to the radio assembly.*

---

## Connecting the IFL cable

This section explains how to connect the IFL cable to the radio assembly at the antenna.

### NOTICE

All outdoor F-connector threads must be coated with dielectric grease before connecting them to the radio or ground block. See Hughes FSB **HNS Broadband Requirements for RG-6 and RG-11 IFL Cable Connectors, Ground Blocks and Ground Block Location** (FSB 050518\_01).

Connect the IFL cable to the radio as follows:

1. Ensure that the satellite modem is powered off and its power cord is unplugged from the outlet.
2. Apply a small amount of dielectric grease to the inside of the IFL cable connector.
3. Connect the IFL cable to the connector on the radio, as shown in [Figure 24](#).
4. Tighten the cable connector to 20 in-lb.
5. When the IFL cable is properly connected to both the radio and the satellite modem, reapply power to the satellite modem as instructed in the satellite modem installation guide.

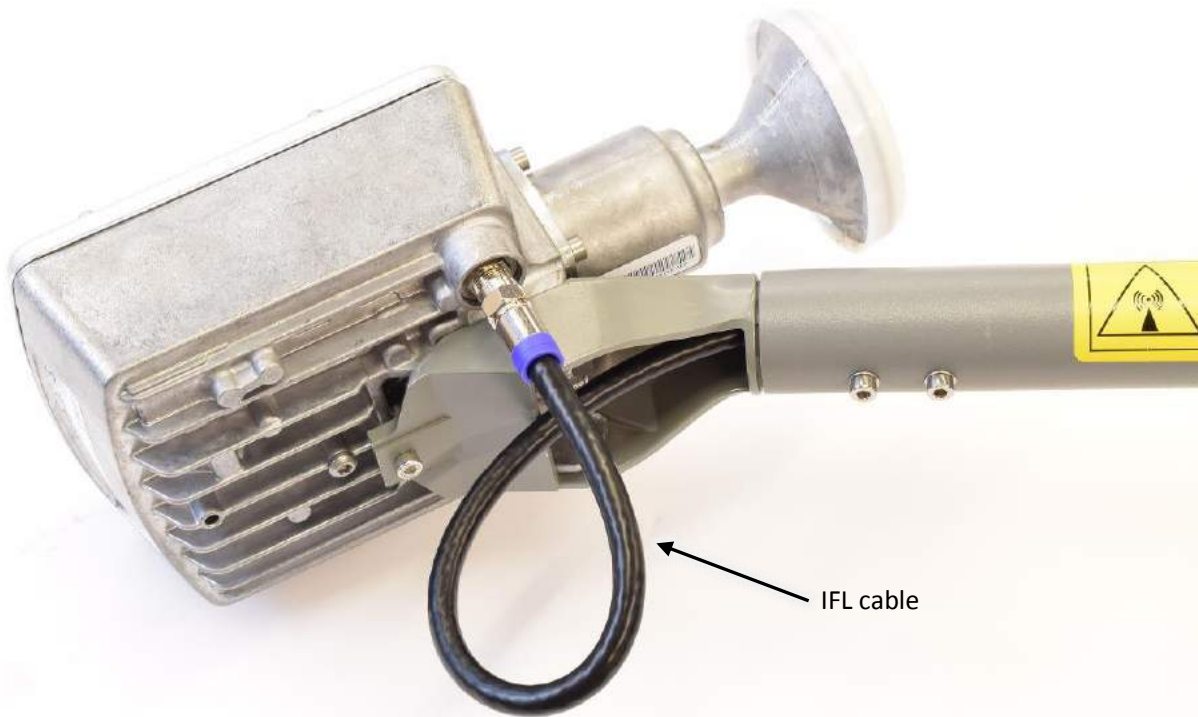


Figure 24: Hughes-approved IFL cable connector

## NOTICE

Hughes connectors, in conjunction with the dielectric grease on the F-connector threads, provide weatherproofing for outdoor connections. These connectors should be used in new installations, upgrades, and any repairs.

Outdoor connectors on radios and ground blocks that are in areas with corrosive environments (e.g. salt air) may need additional weatherproofing, such as weatherproofing tape or a weather boot filled with dielectric grease. For additional information on weatherproofing the connection, see [Adjusting elevation](#) on page 48.

---

## Ground connections



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

---

The antenna assembly must be grounded. For grounding information, refer to your training, best grounding practices, 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).

### **Antenna mast**

Ground the antenna mast at the Az/El mount. For specific grounding procedures, refer to the documents listed above.

### **Radio**

Although the radio contains a ground screw on its underside, use of this ground screw is optional. The radio is grounded through the shield in the coaxial cable and the ground block, and no additional grounding is necessary. For additional grounding procedures, see the documents referenced above.

## Pointing

This completes the installation. You must now point the antenna. See *the JUPITER Antenna Pointing Guide* (1039429-0001) for details. For mechanical adjustments specific to this antenna, see Chapter 5 – *Adjusting antenna azimuth and elevation*.



## Chapter 5

# Adjusting antenna azimuth and elevation

This chapter explains how to adjust the antenna azimuth and elevation for optimum transmission and reception. It explains mechanical adjustments only. For explanation of the pointing process for this antenna, see the **JUPITER Antenna Pointing Guide** (1039429-0001). To successfully point the antenna, you must follow the procedures as described in the pointing guide.

**Note:** When acquiring a signal, start with the azimuth and maximize the signal, then make minor adjustments to the elevation.

### NOTICE

Do not pull on the antenna reflector or feed support arm to make pointing adjustments. Doing so could cause permanent damage to the antenna. Instead, use the adjustment mechanisms and procedures described in this chapter.

## Adjusting azimuth

Figure 25 illustrates how you adjust antenna azimuth by moving the antenna horizontally, from side to side.

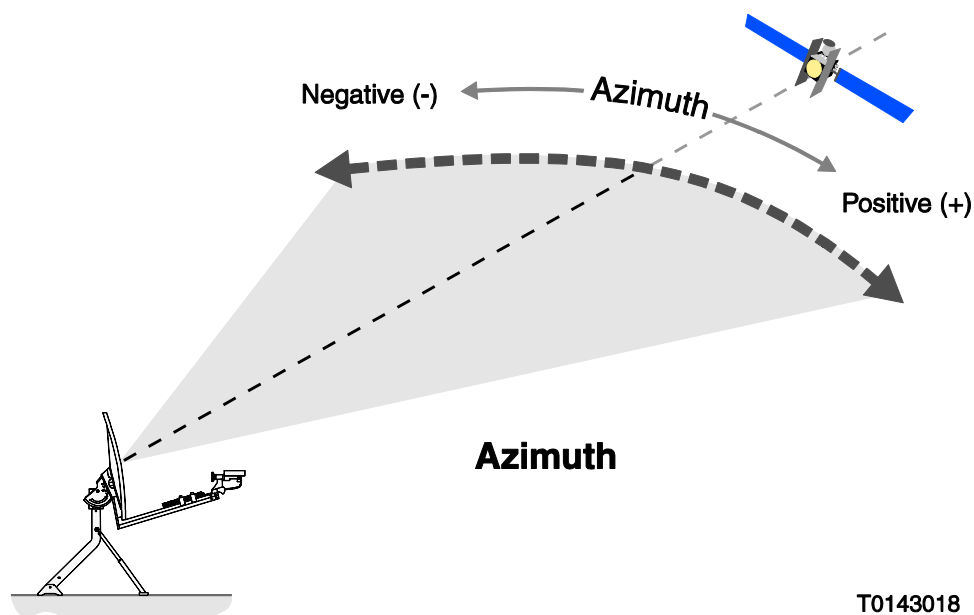


Figure 25: Adjusting antenna azimuth

## Checking the azimuth base starting position

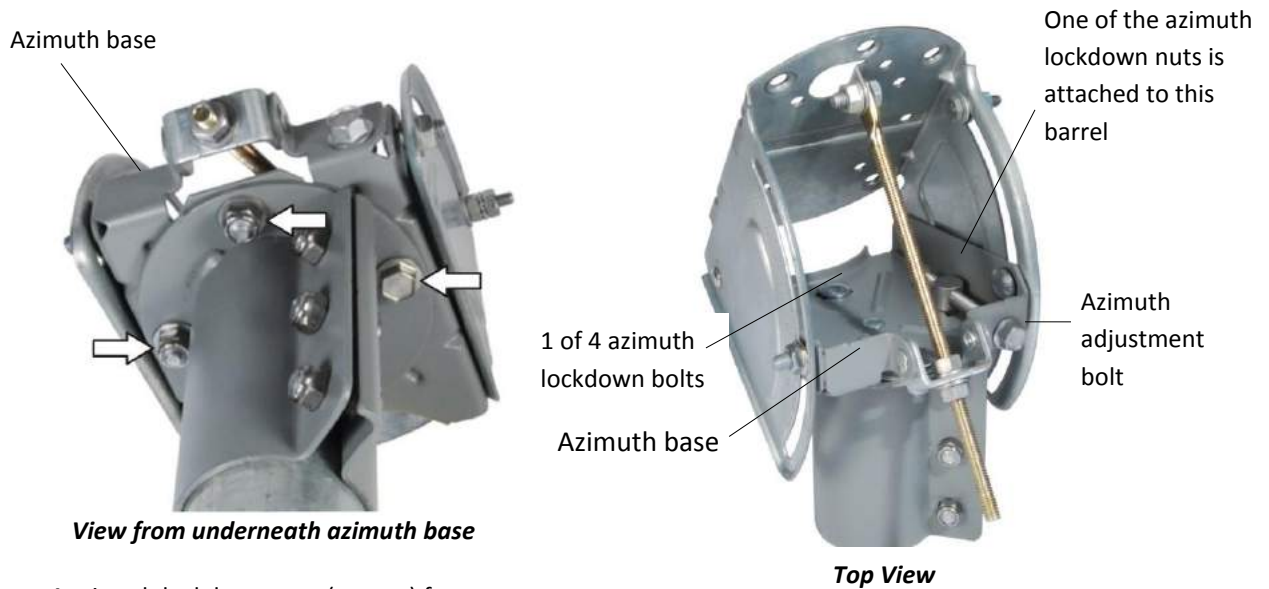
Before making any azimuth adjustments, ensure that the azimuth lockdown bolts are centered in the curved slots in the azimuth base. See [Figure 26](#).

*If the bolts are not centered in the slots:*

1. From underneath the azimuth base, ensure that the four  $\frac{5}{16}$  inch azimuth lockdown nuts are loose.
2. Use a  $\frac{1}{2}$  inch wrench to turn the fine azimuth adjustment bolt until the lockdown bolts are centered in the curved slots.

You should not have to turn the two inner nuts on the adjustment bolt, but if they are loose, tighten them.

Leave the lockdown nuts loose so you can adjust azimuth.



Loosen 4 azimuth lockdown nuts (arrows) from underneath the azimuth base.

**Note:** The fourth lockdown nut is not visible in this view.

Figure 26: Checking the azimuth base starting position

## Coarse azimuth adjustment

Make coarse azimuth adjustment as follows:

1. Loosen the three Az/El canister nuts (arrows in [Figure 27](#)) enough to allow the antenna assembly to rotate freely on the mast.

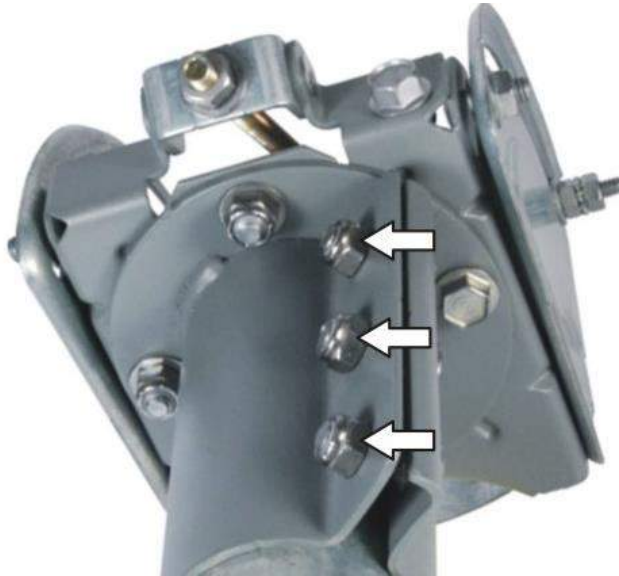


Figure 27: Az/El canister nuts

2. Holding the reflector bracket, point the antenna reflector as accurately as possible in the direction indicated in OASIS or on the installation reference sheet.
3. Lock down the Az/El canister by fully tightening the three canister nuts.

## Fine azimuth adjustment

For fine azimuth adjustment, use the azimuth adjustment bolt:

1. Ensure that the Az/El canister nuts are tight enough to prevent the antenna from rotating on the mast.
2. Using a  $\frac{1}{2}$  inch wrench, rotate the azimuth adjustment bolt shown in [Figure 26](#) on page 46 in either direction to achieve the desired azimuth angle.

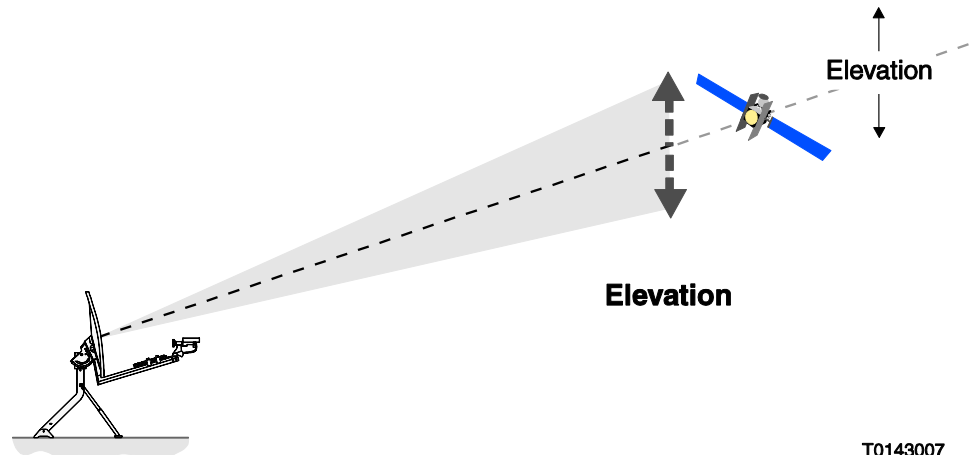
### NOTICE

Do not pull on the antenna reflector or feed support arm to make pointing adjustments. Doing so could cause permanent damage to the antenna. Instead, use the adjustment mechanisms and procedures described in this chapter.

3. When the azimuth is set as desired, tighten the four azimuth lockdown nuts under the azimuth base.

## Adjusting elevation

Figure 28 illustrates how to adjust the antenna elevation by moving the antenna up and down relative to the horizon.



T0143007

Figure 28: Adjusting antenna elevation

To adjust antenna elevation:

1. Loosen the elevation lockdown nuts on each side of the Az/El mount. See Figure 29.

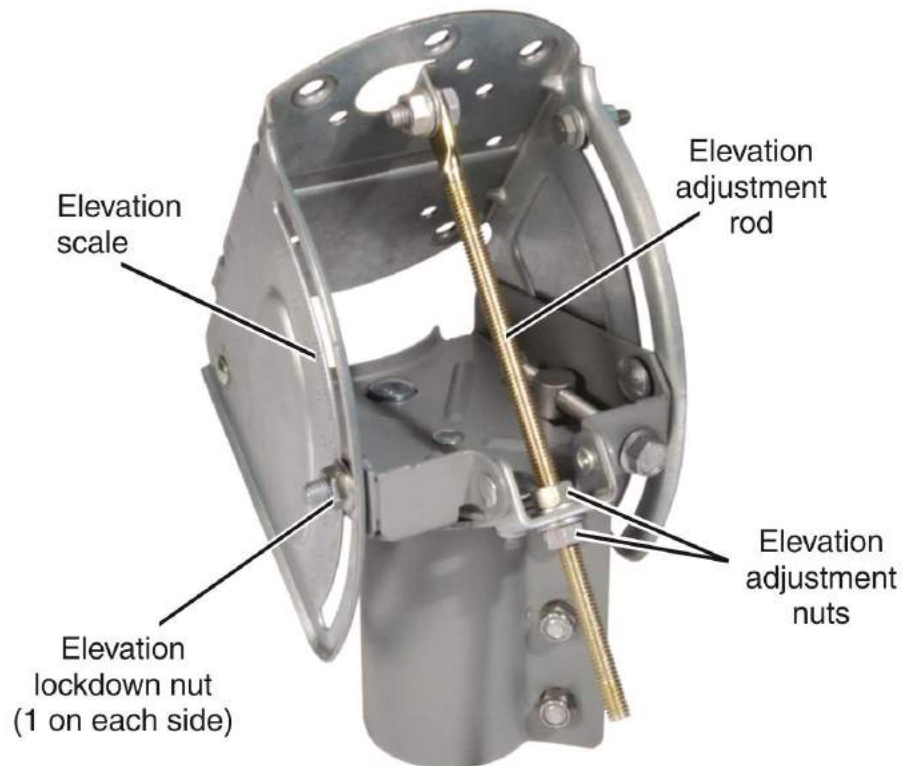


Figure 29: Elevation adjustment components



2. Loosen the top elevation adjustment nut and spin it counter-clockwise until it is an inch or two up the elevation adjustment rod.
3. Use the lower nut to adjust the elevation.

The black line shown in [Figure 30](#) on page 49 points to the elevation value on the elevation scale. For example, the antenna shown in the figure is adjusted to 26°.

Arrow points to the elevation marker (below bolt).

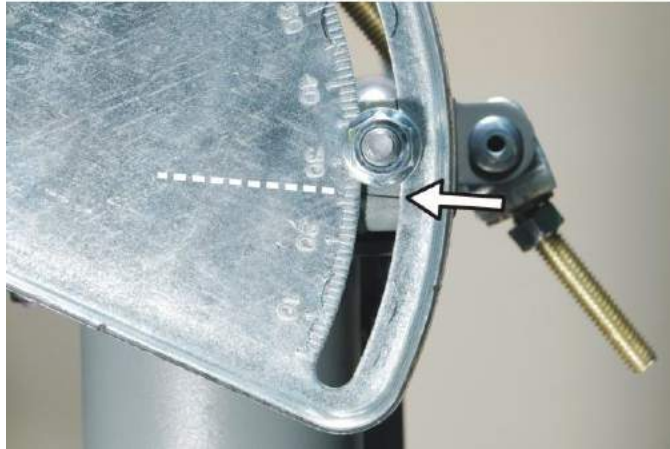


Figure 30: Elevation marker

4. Spin the top elevation adjustment nut clockwise until it is snug against the base plate.
5. Secure the coarse elevation setting by tightening the two elevation lockdown nuts on either side of the Az/EI mount.

## Weatherproof the cable connections

Hughes connectors, in conjunction with the dielectric grease on the F-connector threads, provide weatherproofing for outdoor connections. These connectors should be used in new installations, upgrades, and any repairs.

Outdoor connectors on radios and ground blocks that are in areas with corrosive environments (e.g. salt air) may need additional weatherproofing, such as weatherproofing tape or a weather boot filled with dielectric grease ([Figure 31](#)).

**Note:** If you use any cable ties, they must be resistant to ultraviolet radiation. These are typically black in color.



Figure 31: Hughes-approved IFL cable connector with additional weatherproofing

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