

Type ES24SNG-LTE-()

2.4-Meter SNG



2.4-Meter SNG Earth Station Antenna

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Introduction

Purpose

The purpose of this manual is to provide installation and preventive maintenance required to support the 2.4M SNG Antenna Assembly and Motor Drive System. This manual is subdivided into six sections to provide convenient reference for operator/service personnel requiring technical information on general system and equipment.

A separate user's manual is provided with each RCI 3000 or 3050 control system.

Proprietary Data

The technical data contained herein is proprietary to Andrew Corporation. It is intended for use in operation and maintenance of Andrew supplied equipment. This data shall not be disclosed or duplicated in whole or in part without express written consent of Andrew Corporation.

Information and Assistance

Andrew Corporation provides a world-wide technical support network. Refer to the technical assistance portion of this manual for the contact numbers appropriate to your location.

Notice

The installation, maintenance, or removal of antenna systems requires qualified, experienced personnel. Andrew installation instructions have been written for such personnel. Antenna systems should be inspected by qualified personnel to verify proper installation, maintenance and condition of equipment.

Andrew Corporation disclaims any liability or responsibility for the results of improper or unsafe installation and maintenance practices.

All designs, specifications, and availabilities of products and services presented in this manual are subject to change without notice.

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Technical Assistance

24-hour Technical Assistance

For technical assistance, call the following numbers at anytime.

Call From	Call To	Telephone	Fax
North America (toll free)	U. S. A.	1-(800)-255-1479	(800)-349-5444
Any Location (International)	U. S. A.	(708)-349-3300	(708)-349-5410

Customer Service Center

The Andrew Customer Service Center gives you direct access to the information and personnel service you need, such as the following:

- Place or change orders
- Check price and delivery information
- Request technical literature

You can call from any of the following:

Call From	Telephone	Fax
North America	1-800-255-1479 (toll free)	1-(800)-349-5444 (toll free)
United Kingdom	00-800-0-255-1479 (toll free)	00-800-0-349-5444 (toll free)
Australia	0011-800-0-255-1479 (toll free)	0011-800-0-349-5444 (toll free)
China	00-800-0-255-1479 (toll free)	00-800-0-349-5444 (toll free)
New Zealand	00-800-0-255-1479 (toll free)	00-800-0-349-5444 (toll free)
Hong Kong	001-800-0-255-1479 (toll free)	001-800-0-349-5444 (toll free)

Safety Summary

The following general safety precautions are not related to any specific procedures and, therefore, do not appear elsewhere in this publication. Personnel must understand and apply these precautions during all phases of operation and maintenance.

Keep Away From Live Circuits

Personnel must observe all applicable safety regulations at all times. Ensure power is removed from unit before replacing components. Potential hazards may exist even though the power control is in the off position. Capacitors retain charges. Always remove power and use test equipment to confirm that a circuit is at ground potential before touching it. Never reach into or enter an enclosure to service or adjust the equipment until the absence of power has been confirmed.

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

Resuscitation

Personnel working with or near high voltage should be familiar with modern methods of resuscitation. Such information may be obtained from local medical personnel.

ESD Precaution

This equipment contains electrostatic discharge (ESD) sensitive devices. Equipment handling methods and materials must be used to prevent equipment damage.

Description

Antenna

The 2.4-meter transportable SNG antenna from Andrew has been designed to be more compact and lighter. This new design results in an antenna whose total assembly weight has decreased by 33%.

This antenna design reduces overall windloading, is easier to install and is less costly to ship. The stow height is at 24" for more overall clearance for the truck.

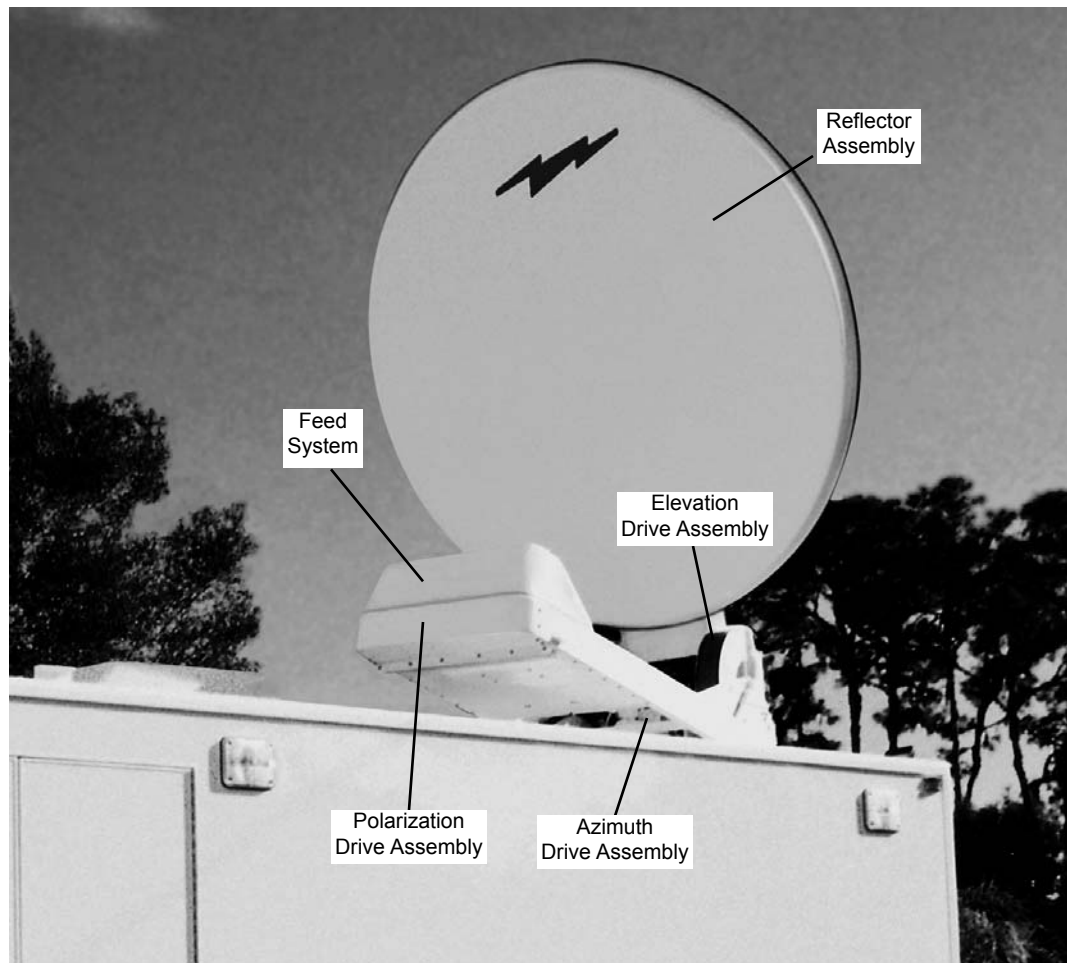
The vehicle mountable 2.4-meter prime focus offset fed antenna from Andrew incorporates performance and optional characteristics particularly suited for television broadcast industry satellite news gathering applications.

The exclusively designed prime focus, beam-shaping feed configuration, together with the precision hydroformed aluminum reflector assembly, produces extremely high gain, superior efficiency and closely controlled pattern characteristics.

A motorized cable drive system provides a reliable, precise and smooth running system. The SNG antenna options are the RCI 3000 and 3050 control systems.

Antenna travel is stow to +65° (optional 90°) in elevation and $\pm 175^\circ$ in azimuth.

Each SNG antenna is fully-integrated and pretested before leaving the factory to reduce vehicle installation time and costs.



Maintenance

General

The antenna and feed boom/reflector assembly incorporates self lubricating bearing assemblies throughout its construction, eliminating the need for any additional lubrication for the life of the antenna.

The feed system is factory precision aligned for optimum performance, moving or repositioning feed system will only reduce performance capabilities. Do not move the feed system.

The polarization drive system does not require any periodic maintenance; however replacement of the polarization drive chain may be necessary after extended use (usually several years).

Introduction

Periodic maintenance of the Roto-Lok[®] drive normally requires only visual inspection for misalignment or damaged cables. In the event that a cable(s) may require replacement, the drive design incorporates sufficient clearance between the capstan and drum, allowing removal and installation of individual cables. In the event the drive has become disabled due to broken/tangled cables and cannot be driven safely to a stow/repair position, the margin of safety in the drive design, will allow for a cable(s) to be removed to enable the drive to be rotated to a safe stow/repair position for cable replacement. Operation with less than the total number of cables is not recommended as normal operational mode, however the drive will function with reduced stiffness temporarily while awaiting replacement cable installation.

Antenna Drive System Cable Inspection

Drive cables should be periodically checked for cable misalignment or visible damage that might lead to broken wires and or tangled cables. Look for frayed/broken cable wires that might occur due to normal wear after extended lifetime, or through contact with foreign objects, such as hand tools during servicing of the antenna. In the event of frayed/broken wires are discovered, they should be replaced as soon as possible to prevent damage to neighboring cable assemblies.

Check cables every four weeks for the first six months of operation (cable tension, frayed/broken wires). Thereafter, monitor cables biannually. For continuous use of antenna drive system, shorten the above recommended periodic interval by one half.

The rated capacity/stiffness of the Roto-Lok[®] drive system is directly related to tension within the cables configuring the azimuth and elevation drive system. Proper cable tension is essential for the antenna drive system to perform as specified. How to verify and maintain proper cable tension is considered in the following discussion.

CAUTION!

Do Not Over Tension the Cable When Tightening the Cable Tension Adjusting Nuts. It is Possible to Break a Cable With the Mechanical Advantage of the Threaded End!

Cable Replacement

Azimuth Rotational Limits

The two adjustment locations for the five azimuth cables are 224° apart on the azimuth ring. To reach these adjustment locations the antenna must be rotated so the azimuth cable access port is over the adjustment location. Rotation to the counter-clockwise (CCW) adjustment location may be hindered by hardware and software limits.

This document primarily addresses azimuth cable tension requirements and also includes elevation cable tension requirements for completeness.

Cable replacement is beyond the scope of normal maintenance, please consult Andrew Corporation for assistance.

Depending on how the azimuth hard limits are currently configured, a hard limit override may need to be made to allow sufficient rotation of the antenna for azimuth cable tension adjustment to be made. The "hard limits" are small, limit switch, trip blocks located inside the azimuth ring. The azimuth hard limits may be configured for $\pm 175^\circ$, $\pm 135^\circ$ or $\pm 90^\circ$ of travel by simply changing the hard limits actuation blocks installed position (one hard limit for clockwise and one hard limit for counterclockwise rotation). The azimuth hard limits are factory configured for $\pm 175^\circ$ of travel in both clockwise and counter-clockwise directions.

During the installation of the antenna onto the truck, the azimuth hard limits may have been changed by the integrator to less than $\pm 175^\circ$ of rotation. If the azimuth hard limits are at $\pm 175^\circ$ the following procedure WILL NOT be necessary. Skip down the following Procedure and start at section marked CABLE TENSION ADJUSTMENT, AZIMUTH DRIVE. If the azimuth hard limits are configured for $\pm 135^\circ$, or $\pm 90^\circ$ the following provisions will need to be made prior to starting azimuth cable tensioning procedure.

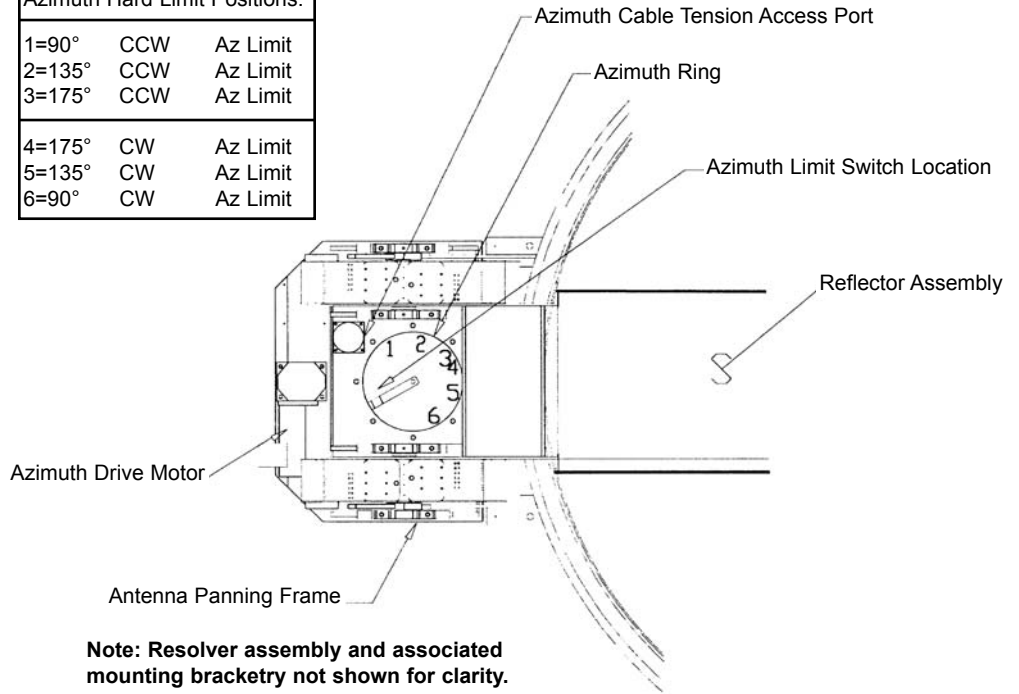
The counter-clockwise hard limit must be set to the 175° CCW position during the cable tension adjustment procedure, then later re-configured. The clockwise hard limit will not need to be removed/changed from any position of operation during the azimuth cable tensioning procedure, only the CCW hard limit.

Review the overhead view of the antenna to determine the location of the CCW azimuth hard limit and re-position the hard limit actuation block to the 175° CCW location (position #3). Each actuation block is held in place by two #4-40 UNC x 1/2, SST, Flat Head Screws. The retaining screws are installed with Loctite®, persistence may be required to remove them. Careful inspection of the interior of the azimuth ring will reveal marked, steel stamped degree and orientation information on the surface of the ring (i.e. 135° CCW, 90° CCW, 175° CW etc.) use these marked locations to confirm correct position of the azimuth hard limits.

After the counter-clockwise hard limit has been relocated to 175° CCW position, a second level of protection for azimuth rotation will need to be addressed.

Azimuth Hard Limit Positions:

1=90°	CCW	Az Limit
2=135°	CCW	Az Limit
3=175°	CCW	Az Limit
4=175°	CW	Az Limit
5=135°	CW	Az Limit
6=90°	CW	Az Limit



Overhead View of Antenna

Note

AZ East = AZ Counter-clockwise (as viewed from above)

AZ West = AZ Clockwise (as viewed from above)

Azimuth Drive Cable Tension Adjustment

Step 1

Check cables around drum for proper alignment. Cables should be evenly spaced from one another as they wrap around the drum (height/centering). Rotate drum if necessary to align cables.

Step 2

Remove the rear rain shield, which covers the azimuth axis opening.

Step 3

Remove cable tension access port cover, located near azimuth drive gear reducer.

Step 4

Starting from the stowed position, deploy antenna and rotate in azimuth approximately 80° clockwise to align access port on panning frame with spring end of cables, until directly under access port (Figure 1).

CAUTION!

Before/during the initial azimuth rotation of the re-calibrated antenna, verify by inspection that there are no pinch points with any antenna accessories (example: waveguide, cables, etc.) passing through the center of the antenna mount.

With the Software and hardware limits reset for to 175° azimuth counter-clockwise rotation the following azimuth cable tension adjustment will now be possible.

Required Tools

- Precision 1/8-inch key stock, at least 6 inches long (supplied with antenna)
- ¼-inch drive ratchet with 7/16 standard or thin walled socket (not supplied with antenna)

CAUTION!

Be sure no interference is present in and around the azimuth axis opening during antenna rotation.

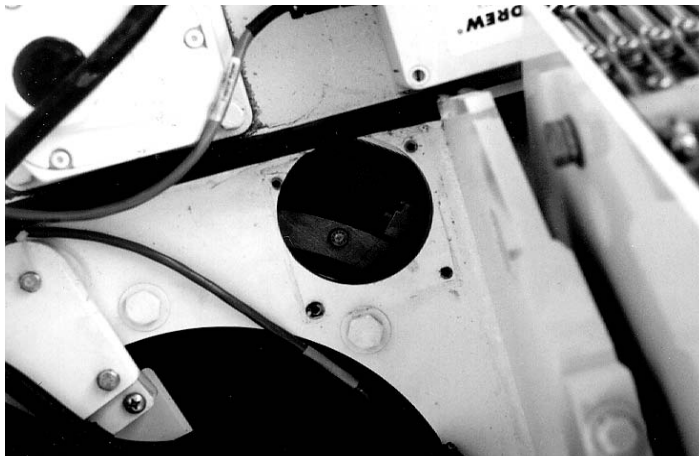


Figure 1. Azimuth Access Port Positioned Over Cable Adjusting Nuts

Note

To ensure that the cables are not tensioned beyond the design value, the precision key stock must be used to detect when the cable tension adjusting nut has been tightened so that the "Thrust Sleeve" is 0.005 to 0.010 inches from contacting the spring housing. This will ensure the nominal spring compression and cable tension.

Step 5

Insert the precision key stock into the vertical slot in the azimuth spring housing, see Figure 2 (the key stock acts as a thickness (feeler) gauge) then starting with the lowest cable tension adjusting nut, (nearest the bottom of the antenna mount) tighten each cable until the key stock is just snug but can be slid up and down.

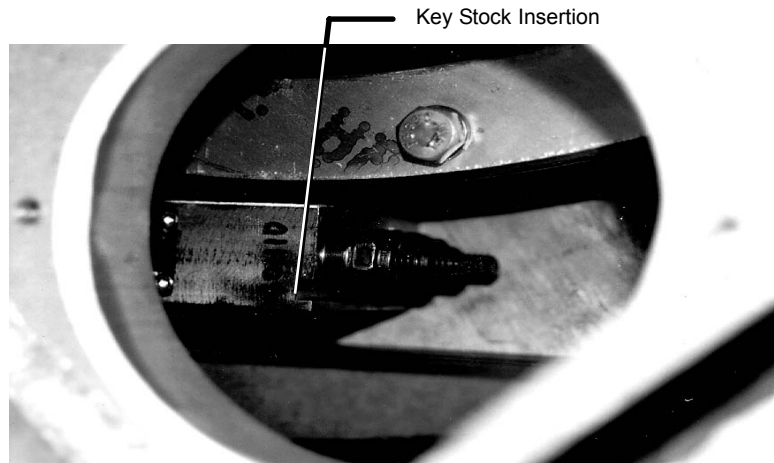


Figure 2. Detail View of Access Port Showing Location of Precision Key Stock Insertion Point

Step 6

Loosen the adjusting nut just slightly so that the key stock will move freely up and down and allow setting clearance on subsequently adjusted cables (Figure 3).



Figure 3. Adjusting Azimuth Cable Tension

Step 7

Repeat step #5 for the next cable adjusting nut(s).

Step 8

Return antenna to azimuth stowing position while maintaining current antenna elevation.

Step 9

From the stow position, begin counter-clockwise rotation approximately 150°. The access port on the panning frame should now be positioned over the opposite end of the unadjusted cable assemblies. Repeat steps 5 and 6 for the cable tension adjusting nuts now accessible.

CAUTION!

Be sure no interference is present in and around the azimuth axis opening during antenna rotation.

- Step 10** After tensioning both ends of azimuth cable assembly, rotate azimuth to limits of travel (clockwise and counterclockwise) several times to distribute cable tension evenly.
- Step 11** Recheck/verify cable tension at both ends of azimuth cable(s) in accordance with the above recommended procedure. Repeat above cable tensioning procedure if necessary.
- Step 12** If changed earlier, reset the software limits and reconfigure the hardware limits for counter-clockwise azimuth rotation to their previous value/location. Return antenna to stow position before relocating any hard limit actuation blocks (see section titled Azimuth Rotational Limits for more detail).
- Step 13** Verify proper software and hardware limit switch operation.
- Step 14** Replace cable tension access port cover and rear rain shield.

Elevation Drive Cable Tension Adjustment

Adjustment of the elevation cable tension does not require a unique elevation angle, only an elevation angle that allows convenient access to cable tension adjusting nuts (Figure 4).

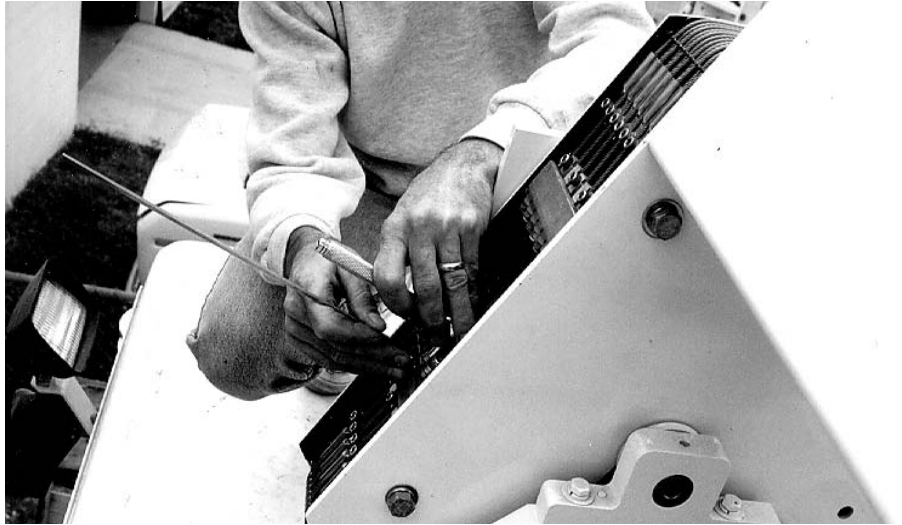


Figure 4. Elevation Cable Tension Adjustment

Cable tension adjustment for the elevation drive is similar to the azimuth drive, except there are individual slots for the precision key stock at each cable location in the elevation spring housing, (Figure 5).

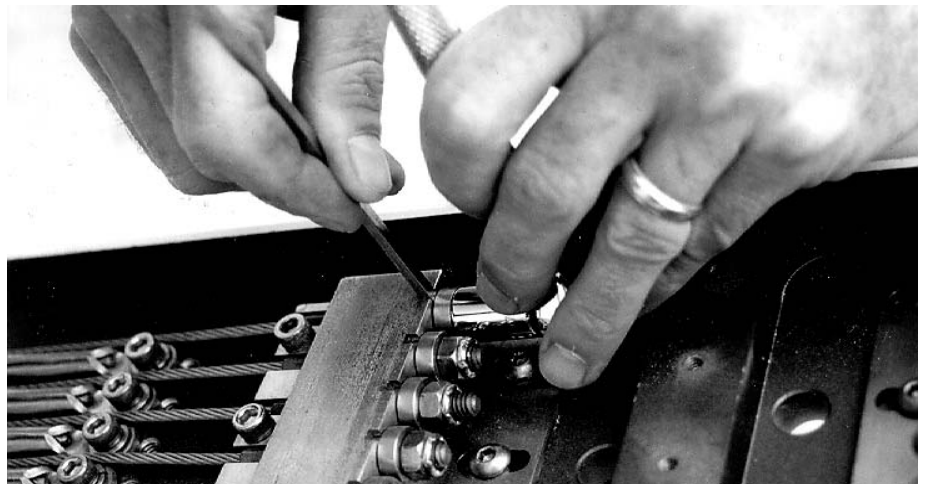


Figure 5. Individual Slots for Precision for Precision Key Stock

- Step 1** After verifying/performing elevation cable tension procedure on both ends of each cable and each elevation drum cable assembly, the following steps two through four will complete this procedure.
- Step 2** Run elevation drive system through entire range of movement (0° to 66° elevation) several times to distribute cable tension evenly along the length of each cable.
- Step 3** Recheck/verify cable tension at both ends of each of the elevation cable(s) in accordance with the above recommended procedure.
- Step 4** Repeat above elevation cable tensioning procedure if necessary.

Emergency Procedures

Controls and Power Failure

In the event of power loss or controller failure with antenna deployed, the following procedure will allow the antenna to be returned manually to stow position.

Notice!

Stowing antenna without power requires two personnel to safely return antenna to stowed position. Failure to follow this requirement may cause personal injury and/or damage to antenna.

Azimuth Drive Step 1

To return azimuth to a stow heading, first determine direction of rotation to return antenna to stow position.

Step 2

Locating the brake cover, on the azimuth drive motor, located on the free hanging end of the drive motor assembly (Figure 6) is the brake cover. Carefully remove the brake cover attached with two wing nuts, being careful to retain the nylon washers under the wing nuts (required for watertight seal).

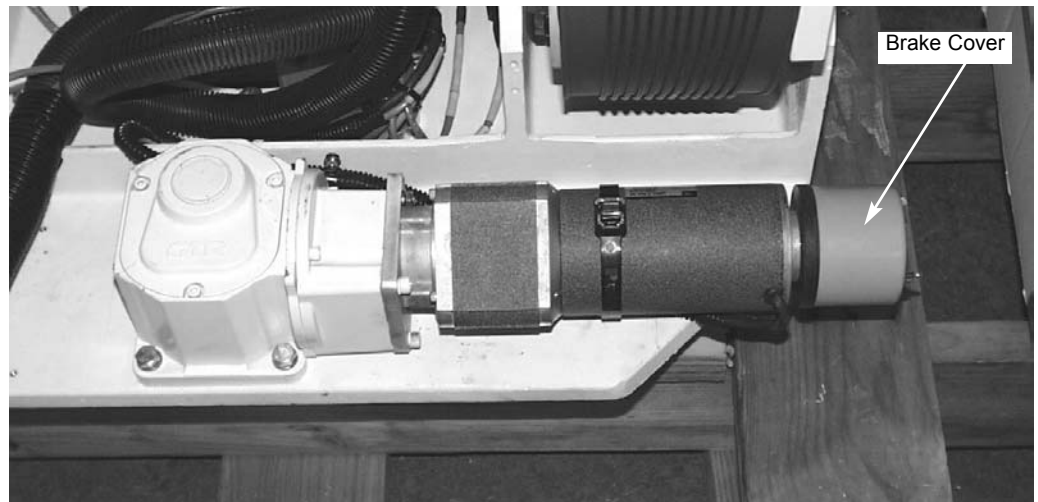


Figure 6. Location of Azimuth Brake Assembly

Step 3

With the brake assembly exposed, locate the manual release screws (2) on the brake assembly. The brake can be released by turning the manual release screws counter-clockwise, allowing the motor to free-wheel.

Step 4 Using a 5/32" Allen wrench, turn the two manual release screws counter-clockwise until the brake releases (Figure 7).

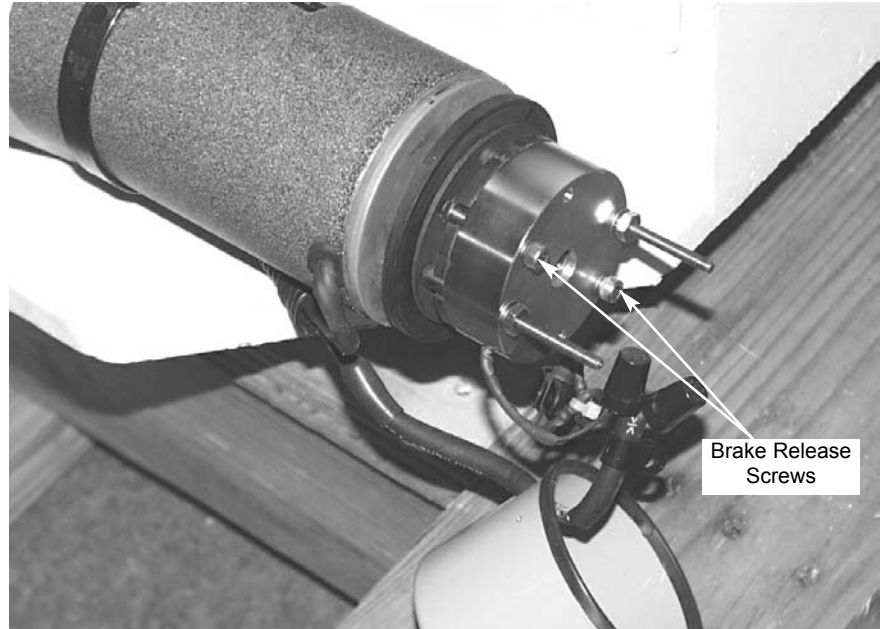


Figure 7. Brake Release Procedure.
(azimuth gear motor shown, elevation gear motor similar)

Step 5 When the brake is released, a black/red disk assembly (brake/clutch mechanism) will begin to rotate as the motor free-wheels. This may be used as a visual sign that brake disengagement has been achieved.

Step 6 Release the brake and rotate in azimuth to achieve azimuth stowing position. The end of the feed boom may be used as a push point for azimuth rotation (only during power loss).

Step 7 Install the brake cover with the nylon washers and wing nuts.

Elevation Drive

Step 1

With the azimuth orientation of the antenna correctly oriented for stowing, locate the brake cover on the elevation drive motor, (the same size and type of motor is used for both elevation and azimuth drives) and follow the same procedure required for azimuth brake release.

CAUTION!

When Elevation Brake is Released, Feed Boom/Reflector Will Be Unrestricted. At Extremely High Look Angles the Feed Boom/Reflector May Need to be Guided in the Pproper Direction by a Second Person. As the Feed Boom Approaches a Horizontal Position Care Must be Taken During Manual Brake Release as the Stowing Boom Will Pass Through the Access Area to the Brake. Coordinating With a Second Person Assisting/Guiding Reflector to Stow Position, Brake Release Operator Will Need to Work Carefully Around Closing Reflector Assembly, Avoiding Scissor Action of Closing Assembly.

Step 2

Release the brake and carefully lower the reflector/boom assembly into stowed position.

Step 3

Install brake cover with nylon washers and wing nuts (orientation of drain/weep hole in brake cover should be near the 6 o'clock position).

Component Replacement

Azimuth Brake Replacement

Purpose

Provide instruction to remove and replace the azimuth and/or elevation brake assembly used on the ESA24SNG-LTE-XX Series 2.4M SNG Antenna.

Required Tools (Customer-Supplied)

- No. 2 Phillips Screwdriver (Must have good tip that fits screw head well)
- Small propane torch (or equivalent).
- Small (4-8 inch) Adjustable Wrench.
- Single edge razor blade or sharp knife.
- 2 X 4 Lumber 5-foot long.
- 5/32" Allen Wrench

Caution

This Procedure Should Only Be Performed In Non-Windy Conditions (Winds Under 15 mph). When the Brake Is Removed the Antenna Will Be Allowed to "Freewheel". Two Persons Are Required To Safely Remove and Reinstall the Brake Assembly. One Person To Perform the Replacement and the Other To Hold the Antenna In Position.

Turn Off Main Power Source To the Controller System Prior To Proceeding!

Step 1

Locate the azimuth brake at the rear of the azimuth panning frame. Refer to Figure 1.

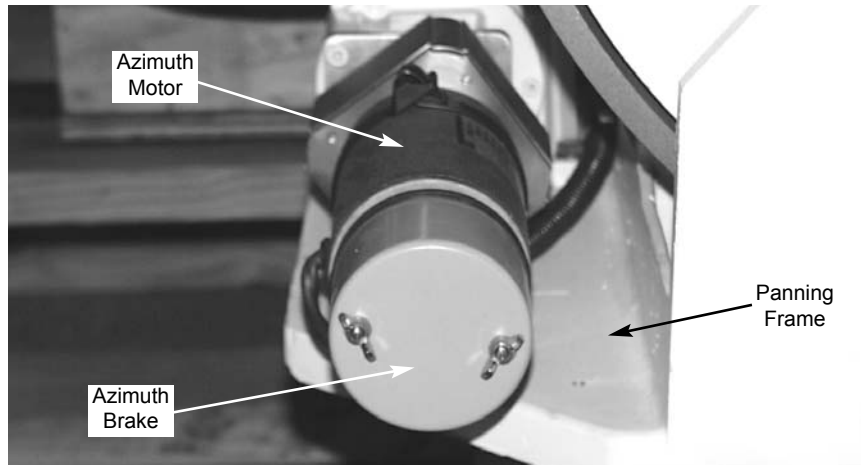


Figure 1

Step 2

Remove the two wingnuts and two nylon washers attaching the brake cover. Refer to Figure 2. Retain removed hardware for later use.

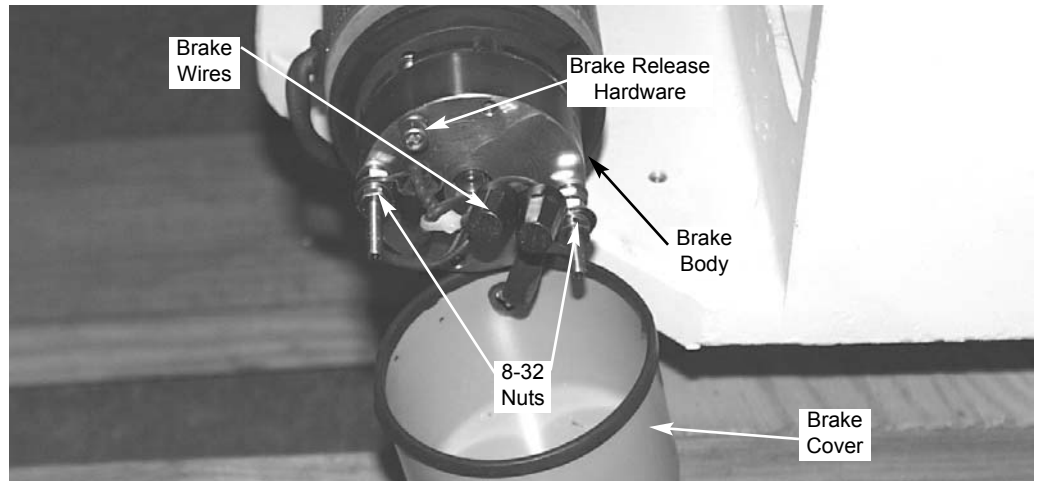


Figure 2

Step 3

Remove the two 8-32 nuts securing the brake body to the brake base. Once the brake body is removed a large nut attached to the motor shaft and the motor shaft will be revealed. The nut/shaft will be allowed to move freely. If wind or gravity force is present on the antenna the nut/shaft may start to turn. If it turns, the second person should steady the antenna movement until the new brake is installed. Lay aside the brake body, brake cover, and connecting wire until later instructions. Refer to Figure 3. Retain removed hardware for later use.

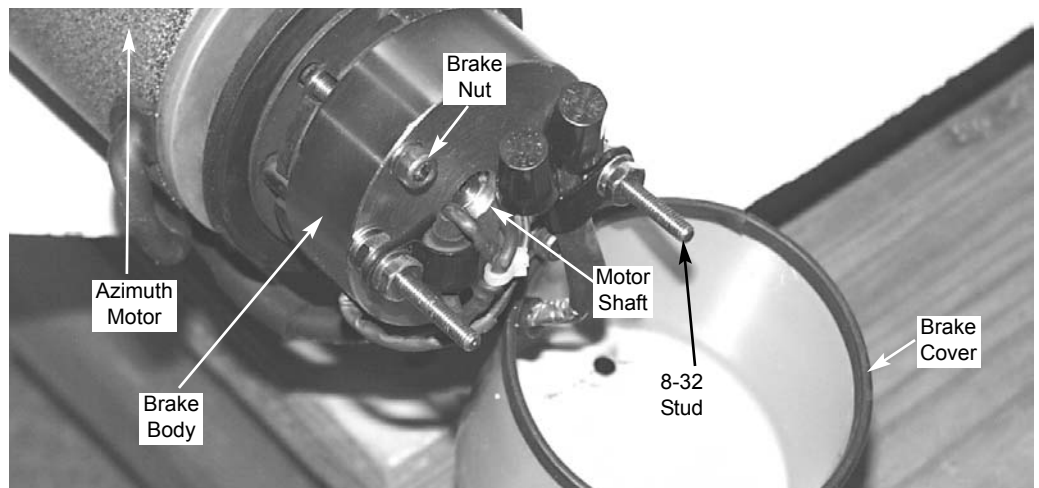


Figure 3

Caution

New Threadlocker Must Be Applied To the Brake Nut Setscrews To Prevent Premature Brake Failure!

Step 4

Install new brake body on 8-32 studs until seated on brake nut and flush as detailed in Figure 4. After disc is centered brake nut may be rotated slowly to allow brake nut to line up with brake disc. Install 8-32 nuts and tighten - threadlocker is **not** required on these nuts.

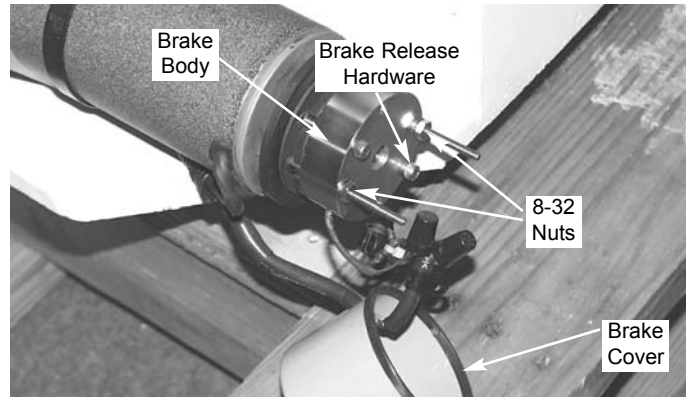


Figure 4

Step 5

Remove the two black wires from the old brake body from their wirenuts (attached to the red and black wires). Install the new brake body wires in the same manner as the old ones were removed. Either black brake wire may be connected to either the red or black wires - polarity is not important. Be sure not to reverse the wiring of the diode. (POLARITY DOES MATTER ON THE DIODE). Be sure wire nut setscrews are secure. Refer to Figure 5 for details of this step.

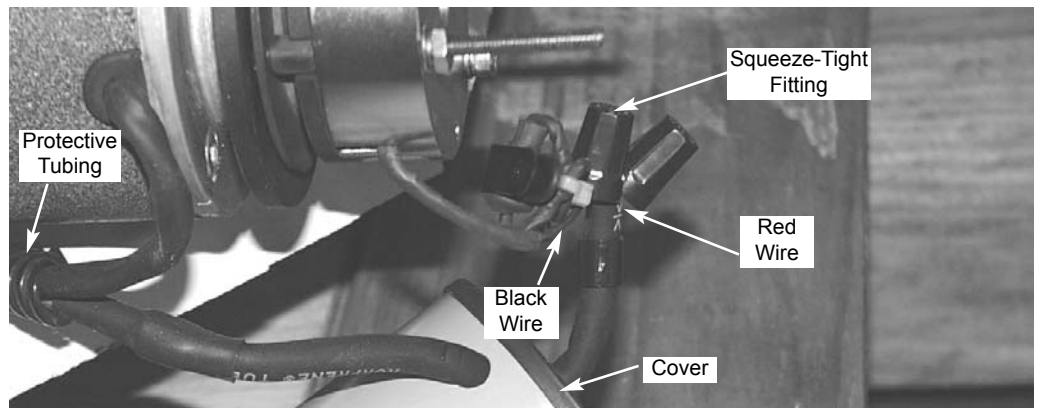


Figure 5

Step 6

Locate the small weep hole in the brake cover near the hole for the protective tubing. It may be painted closed and easier to locate from inside the cover. Use the 1/16 inch drill bit to drill a 1/16 inch hole enlarging and cleaning out this existing hole. This weep hole is essential to allow equalization of pressure inside the brake. After drilling, wipe inside of cover removing any shavings or debris. Refer to Figure 6.

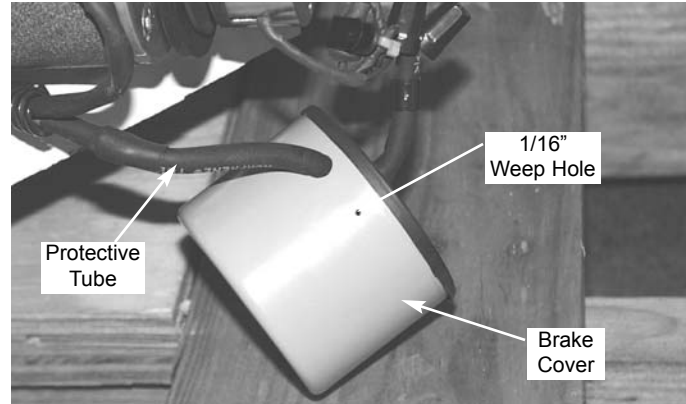


Figure 6

Step 7

There are two ways the cover may be installed. Install the brake cover with the weep hole facing down. Use the nylon washers under the wing nuts to provide a water-tight seal as detailed in Figure 7.

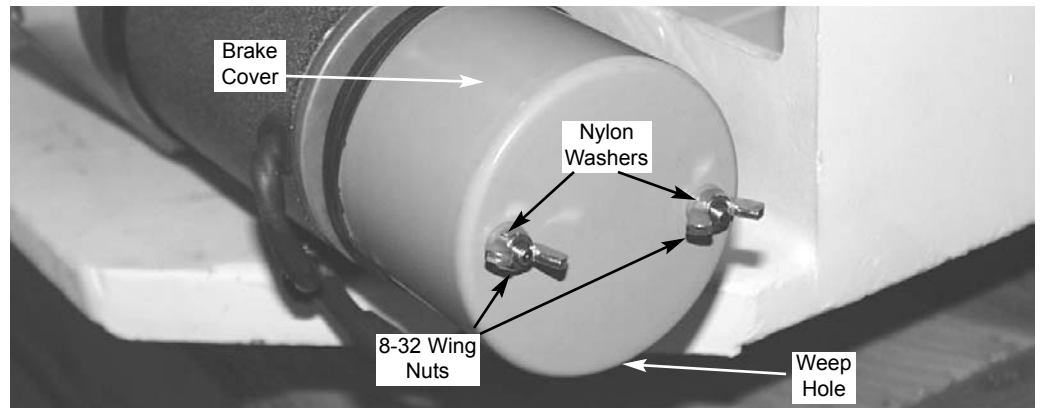


Figure 7

This completes the replacement of the azimuth brake assembly. The antenna control power should now be turned back on and the azimuth axis rotated to verify proper brake release and operation.

Elevation Brake Replacement

The elevation brake replacement procedure is identical to the azimuth brake replacement. Refer to the previous azimuth procedure for details.

Caution

This Procedure Should Only Be Performed In Non-Windy Conditions (Winds Under 15 mph). When the Brake Is Removed the Antenna Will Be Allowed to "Freewheel". Two Persons Are Required To Safely Remove and Reinstall the Brake Assembly. One Person To Perform the Replacement and the Other To Hold the Antenna In Position.

Step 1

Locate the elevation brake at the front of the azimuth panning frame. Refer to Figure 8.



Figure 8

Step 2

Due to the weight of the boom the elevation boom and reflector must be supported during the elevation brake replacement process. The antenna elevation axis should be driven to an angle high enough to provide clearance to work under the boom on the brake assembly. A 2 X 4 inch piece of lumber (or equivalent) should be used to support the boom and reflector as detailed in Figure 9. The elevation axis should be driven down until the boom and reflector are resting on the 2 X 4.

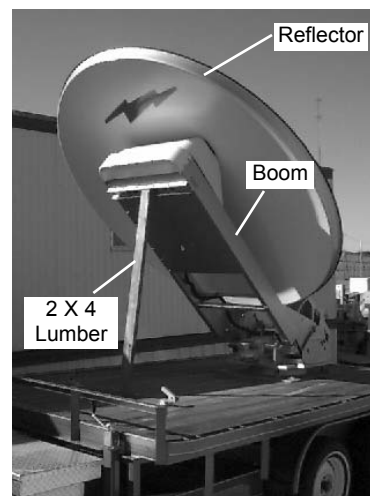


Figure 9

Specifications

Antenna Electrical

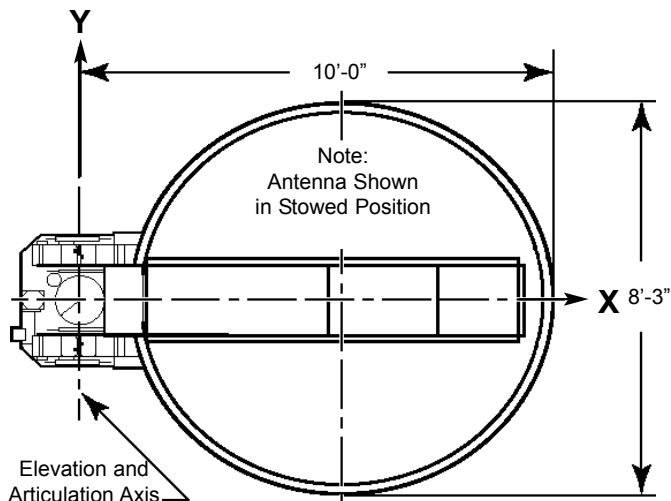
Operating Frequency Band			Ku-Band Transmit	
Ku-Band Receive			14.0-14.5 GHz	
10.95-12.75 GHz				
Gain at circular waveguide flange of feed				
		2-Port		
Rx Frequency	Rx Gain		Tx Frequency	Tx Gain
11.950 GHz	47.7		14.25 GHz	49.2
		4-Port		
Rx Frequency	Rx Gain		Tx Frequency	Tx Gain
11.950 GHz	47.4		14.25 GHz	48.9
Polarization			Linear	
Polarization Discrimination, on axis across 1dB contour			>35 dB 27 dB	
Beamwidth, at Midband			Ku-Band	
3 dB Receive (Transmit)			0.72° (0.61°)	
15 dB Receive (Transmit)			1.42° (1.33°)	
Antenna Noise Temperature under clear sky conditions, at 68° F (20° C), at the circular waveguide flange of the feed.				
Elevation	Ku-Band (2-Port)		Ku-Band (4-Port)	
10°	44°		72°	
30°	33°		61°	
Antenna VSWR, Transmit and Receive			<1.3:1	
Radiation Pattern Performance			PE's #4471 and #4472	
Tx Power Handling Capability				
2-Port Network, maximum, W			2000	
4-Port Network, maximum, W			600	
Feed Interface Flanges, Receive/Transmit			WR75	
Isolation, minimum, Tx into Rx, dB			40 (2-Port)	85 (4-Port)
Power Density Data				
Projected Width of Reflector			96 in	
Area of Feed Horn Aperture			10.65 in ²	
Focal Length			60 in	
Optional Cross Axis Kit, loss, 1 dB		1XAK-LTE (1 run)	2XAK-LTE (2 runs)	

All designs, specifications and availabilities of products and services presented in this Bulletin are subject to change without notice.

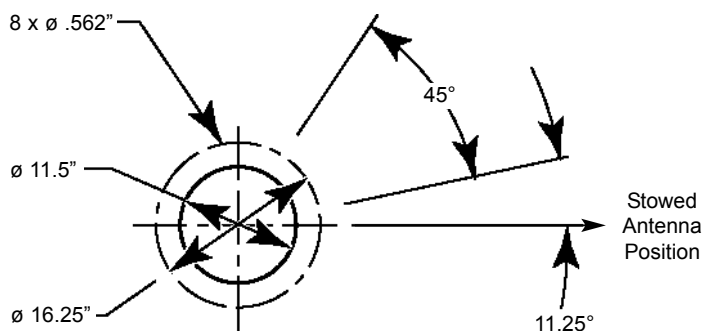
Antenna Mechanical

Configuration	ESA24SNG-LTE
Feed Type	Prime Focus, Offset
Reflector Material	Precision-Formed Aluminum
Reflector Segments	1
Mount Type	EI over Az, Pedestal
Material/Finish	
Reflector	Aluminum
Feed	Brass
Positioner	Aluminum
Feed Arm	
Capacity	180 lbs
Area	29.5" x 36.5" x 12" High (8.3 ft ³)
Antenna Pointing Range, Continuous	
Elevation	65° (optional 90°)
Azimuth	180°, 270°, 350°
Polarization	±90°
Wind Loading, Survival	
65 mph (105 km/h) in any position of operation	
Wind Loading, Operational (motor drives)	
45 mph (72 km/h), gusting to 65 mph (105 km/h)	
Temperature, Operational	-40° to 125° F (-40° to 52° C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft ² (1135 Watts/m ²)
Relative Humidity	100%
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.
Positioner Travel Rates, degrees per second	
Elevation	0.25° to 1.0°/second
Azimuth	0.25° to 1.0°/second
Polarization	0.5° to 2.0°/second
Weight, Net	690 lbs
Electrical Requirements	
Local Unit	Clean/Conditioned
Voltage	190-250 Vac, 1Ø, 50/60 Hz
Power	1.5 kVa, total
Remote Unit	Clean/Conditioned
Voltage	100-240 Vac, 1Ø, 50/60 Hz
Power	1.3 A, maximum
Maximum Branch-Circuit, Short-Circuit and Ground-Fault Protection Device: 1Ø Input	20 A inverse time breaker

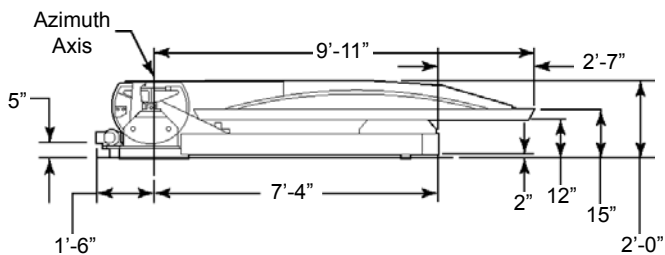
Antenna Dimensions



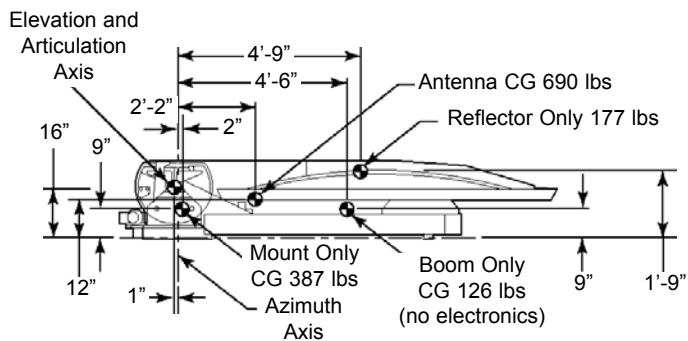
Antenna Overall Dimensions - Top View



Mounting Pattern on Truck

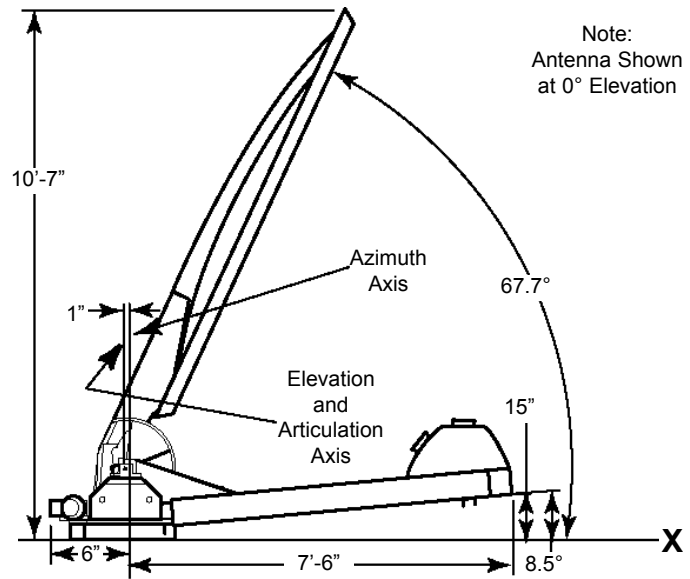


Antenna Overall Dimensions - Side View



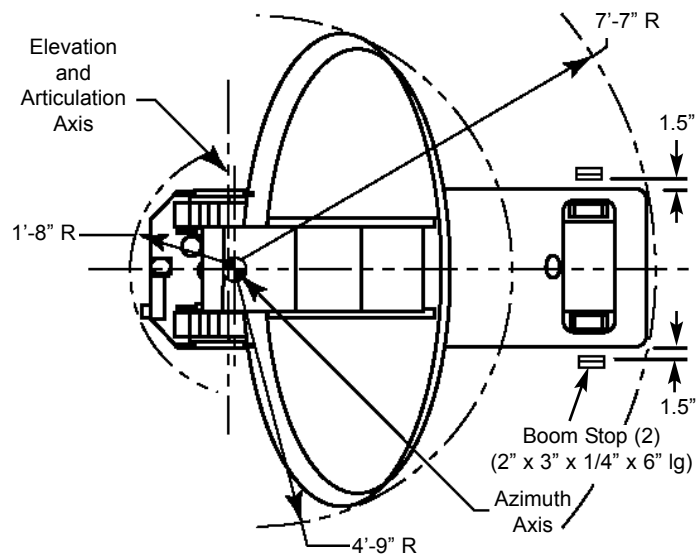
Approximate Antenna Weight Distribution

Antenna Dimensions

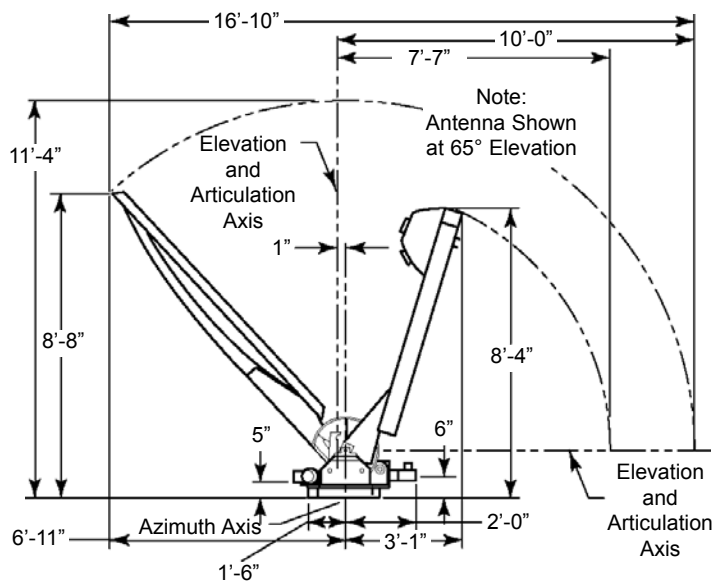


Note:
Antenna Shown
at 0° Elevation

Antenna Clearance Envelope - Side View



Antenna Clearance Envelope - Top View



Note:
Antenna Shown
at 65° Elevation

Antenna Clearance Envelope and Center of Gravity - Side View