

**DOCUMENT 500-0643, 7.3 M Antenna Installation, Operation and Maintenance Manual**

**Important:** In addition to this manual, the following manuals must be provided to ensure adequate information:

<u>Document No.</u>	<u>Description</u>
300-2436	High Strength Grout Specification and Grouting Process Procedure
500-0231	Alignment Procedure for Antenna Position Transducer

**PLEASE DISCARD THIS PAGE BEFORE BINDING MANUAL**

**GENERAL DYNAMICS**  
SATCOM Technologies

**INSTALLATION, OPERATION AND  
MAINTENANCE MANUAL**

**FOR**

**MODEL 7.3-METER  
SATELLITE EARTH STATION ANTENNA  
(120° AND 200° AZIMUTH TRAVEL)**

**500-0643**

**Revision B  
May 8, 2008**

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**GENERAL DYNAMICS**  
SATCOM Technologies

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## Use of **WARNINGS, CAUTIONS, etc.**

Warnings, Cautions and other notes are included throughout this document to provide necessary information. **IGNORING WARNINGS, CAUTIONS AND OTHER NOTES MAY RESULT IN DAMAGE TO THE PRODUCT, INJURY, OR IN EXTREME CASES, DEATH.** You should know the use of Warnings, Cautions and other markings.

Definitions are:

**WARNING!** **HIGHLIGHTS AN INSTALLATION, OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION, STATEMENT, ETC., WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN INJURY TO OR DEATH OF PERSONNEL.**

**CAUTION!** **HIGHLIGHTS AN INSTALLATION, OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION, STATEMENT, ETC., WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN DAMAGE TO OR DESTRUCTION OF EQUIPMENT OR THE LOSS OF MISSION EFFECTIVENESS OR LONG TERM HEALTH HAZARDS TO PERSONNEL.**

**Important:** **Highlights an essential installation, operating or maintenance procedure, practice, condition or statement, which, if heeded, will ensure efficiency and/or safety of said procedures.**

*Note:* *Highlights an installation, operating or maintenance procedure, practice, condition or statement, which, if heeded, could enhance efficiency and/or safety of said procedures.*

**ESD:** **The Electrostatic Sensitive Device (ESD) appears at the beginning of any procedure or procedural step that includes the handling of equipment sensitive to damage from electrostatic discharge.**

General Warnings and Cautions are also provided at the front of the document. These Warnings and Cautions should be read by anyone who is involved with installation, has access to the equipment or is assigned to perform maintenance on the equipment.

## CAUTIONARY NOTICE

Although SATCOM Technologies has attempted to detail in this document all areas of possible danger to personnel in connection with the use of this equipment, personnel should use caution when installing, operating and servicing this equipment. Care should be taken to avoid electrical shock, whether the hazard is caused by design or malfunction. SATCOM Technologies is specifically not liable for any damage or injury arising from a technician's failure to follow the instructions contained in this document or his failure to exercise due care and caution in the installation, operation and service of this equipment. SATCOM Technologies shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

This document is intended as a general guide for trained and qualified personnel who are aware of the dangers of handling potentially hazardous electrical and electronic circuits. This document is not intended to contain a complete statement of all safety precautions that should be observed by personnel in using this or other electronic equipment.

## ELECTRICAL HAZARDS

The antenna and feed system supplied by SATCOM Technologies is designed to be integrated with various types of electronic equipment. This system, if integrated with high power amplifiers or traveling wave tubes, will be capable of transmitting microwave energy at varying power levels. If transmitting microwave power, SATCOM Technologies cautions the end-user to review all applicable local, federal and international regulations and to comply with all such regulations in the operation and maintenance of the integrated system.

The electrical currents and voltages associated with this equipment, whether supplied by SATCOM Technologies or others, are dangerous. Personnel must at all times observe safety regulations.

- It is recommended that a lockout/tagout process be utilized while servicing the antenna system. In the United States, see OSHA 1910.147.
- Always disconnect power before opening covers, doors, enclosures, gates, panels or shields.
- Always use grounding sticks and short out high voltage points before servicing.
- Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields.
- Keep away from live circuits.
- Know your equipment and do not take risks.
- Always remove all power to the system prior to working on the antenna, the reflector assembly, the reflector backup assembly or the feed assembly.
- Always tag all circuits noting that the power is OFF, the date and your name, prior to commencing any work on that system.

**In case of emergency, be sure that power is disconnected.**

### **POTENTIAL DAMAGE TO ANTENNA**

The antenna limit switches and resolvers have been pre-set to allow maximum antenna performance. Any subsequent adjustment may jeopardize antenna performance and/or result in damage to the antenna.

### **SAFETY NOTICE**

The following safety procedures are listed to remind those performing any work on the antenna system that safety rules must be observed. Failure to observe safety rules may result in serious injury or death. Always work safely and in accordance with established procedures.

- It is recommended that a lockout/tagout process be utilized while servicing the antenna system. In the United States, see OSHA 1910.147.
- Care shall be taken in all operations to safeguard other people as well as property and to comply with all local safety procedures as established by the customer's site representative, as well as local building codes and fire protection standards.
- All persons performing work on the antenna system shall also comply with the Occupational Safety and Health Act (OSHA) standards and all other federal state and local laws, ordinances, regulations and codes relating to designated work.
- Unless the customer's representative on site specifically designates an individual responsible for site safety, the SATCOM Technologies Site Supervisor shall be responsible for and establish a site safety program for the SATCOM Technologies installation work. The site safety program shall incorporate all SATCOM Technologies safety procedures and requirements
- Never make internal adjustments or perform maintenance or service when alone or fatigued.

### **ELECTROMAGNETIC RADIATION**

- It is recommended that a lockout/tagout process be utilized while servicing the antenna system. In the United States, see OSHA 1910.147.
- Do not stand in the direct path of the feed system when the system is transmitting!
- Do not work on the feed system when the system is on!

**ALWAYS WORK SAFELY!**

## TABLE OF CONTENTS

<b>1.0</b>	<b>SCOPE .....</b>	<b>1</b>
<b>2.0</b>	<b>INSTALLATION.....</b>	<b>2</b>
2.1	Before You Begin.....	2
<b>3.0</b>	<b>INSTALLATION PROCEDURE.....</b>	<b>7</b>
3.1	Pedestal Installation.....	8
3.2	Azimuth Drive Installation .....	8
3.3	Pedestal Rough Alignment .....	9
3.4	Elevation Drive Installation.....	9
3.5	Main Reflector Assembly .....	10
3.6	Apex/Quad Leg/Subreflector Installation .....	16
3.7	Reflector-to-Pedestal Installation .....	19
3.8	Feed Installation.....	20
3.9	Subreflector Alignment.....	21
3.10	Final Alignment of Pedestal .....	21
3.11	Limit Switch Installation .....	21
3.12	Positioning Transducers – Installation and Alignment.....	22
3.13	Antenna Utility Electrical Installation.....	22
<b>4.0</b>	<b>ANTENNA COMPONENTS AND CHARACTERISTICS .....</b>	<b>23</b>
4.1	Pedestal Assembly .....	23
4.2	Reflector Assembly.....	23
4.3	Azimuth and Elevation Drive Assemblies .....	23
4.4	Limit Switches (Optional) .....	23
4.5	Angular Position Transducer (Optional).....	23
4.6	Reflector Backup Structure .....	23
4.7	Reflector Panels.....	24
4.8	Anti-Icing (Optional) .....	24
4.9	Material Finishes.....	24
<b>5.0</b>	<b>MAINTENANCE .....</b>	<b>25</b>
5.1	Pedestal/Reflector Assembly Protective Finish .....	25
5.2	Assembly Hardware.....	26
5.3	Lubrication Schedule .....	26
5.4	Rod End Anti-Rotation Screw Adjustment .....	30
5.5	Lightning Protection (Optional) .....	30
<b>6.0</b>	<b>OPERATING INSTRUCTIONS.....</b>	<b>31</b>
6.1	Azimuth Drive Repositioning (if applicable) .....	31
6.2	Tools Required.....	31
6.3	Procedure .....	31
<b>7.0</b>	<b>ELECTRICAL COMPONENT WIRING (OPTIONAL) .....</b>	<b>34</b>
7.1	Hub .....	34
7.2	Pedestal Wiring.....	34
7.3	Azimuth Drive Motor .....	34
7.4	Connection Diagrams .....	34
<b>8.0</b>	<b>WARRANTY .....</b>	<b>35</b>
<b>9.0</b>	<b>VENDOR INFORMATION .....</b>	<b>36</b>

<b>APPENDIX A. REPORTING LOSS OR VISIBLE DAMAGE .....</b>	<b>A-1</b>
<b>APPENDIX B. SUMMARY OF “TURN-OF-THE-NUT” PROCEDURE FOR TIGHTENING FASTENERS .....</b>	<b>B-1</b>

### LIST OF FIGURES

Figure 1. SATCOM Technologies Model 7.3M Antenna.....	7
Figure 2. LP Feed Interface Installation .....	11
Figure 3. Secured Hub.....	12
Figure 4. Radial Beam Installation .....	13
Figure 5. Reflector Lacing Assembly .....	14
Figure 6. Subreflector/Apex Assembly.....	17
Figure 7. Quad Leg Installation.....	18
Figure 8. Rigging for Reflector Lift .....	19
Figure 9. Clevis with Spacer Washer(s).....	20
Figure 10. Antenna Lubrication Points (Typical).....	29
Figure 11. Anti-Rotation Setscrew and Grease Sert Location (Typical) .....	30
Figure 12. Azimuth Jack Drive Assembly Repositioning.....	33

### LIST OF TABLES

Table 1. Crane (Lifting Device) .....	3
Table 2. Weight Summary .....	3
Table 3. Tool List .....	4
Table 4. Lubrication Schedule .....	28
Table 5. Jack Grease Chart.....	29



## 1.0 SCOPE

The SATCOM Technologies Model 7.3-meter bolt-together antenna delivers exceptional performance for receive only and transmit-receive worldwide applications. The Model 7.3M antenna offers a deep-dish reflector that incorporates precision-formed panels and precision machined and tooled radials and hub assembly for ease of assembly without complex field alignment. The antenna features an innovative compact Cassegrain subreflector and unique feed design that result in high gain, low noise temperature, high antenna efficiency and excellent rejection of noise and microwave interference. A large center hub provides spacious accommodation for equipment mounting. A steel elevation/azimuth kingpost pedestal providing stiffness and pointing accuracy supports the reflector.

It is very important to understand the entire installation procedure to avoid any mistakes that could result in permanent damage to the antenna. Therefore, SATCOM Technologies strongly suggests the antenna installer read this manual thoroughly before starting the installation and follow the steps precisely. SATCOM Technologies disclaims any liability or responsibility for the results of improper or unsafe installation, operation, and maintenance practices. Should any installation questions arise that are not answered within this document, please contact:

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2600 N. Longview Street  
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Telephone: (903) 984-0555  
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## **2.0 INSTALLATION**

### **2.1 Before You Begin**

#### **2.1.1 Antenna Foundation**

Prior to installation of the antenna, the antenna foundation must be complete. The specific foundation structure drawing is presented in the installation drawing print package.

#### **2.1.2 Shipment Inspection**

The SATCOM Technologies Model 7.3-meter bolt-together antenna is packaged in several cartons and crates. SATCOM Technologies has labeled each carton/crate with model number and contents for easy identification. Once received, the antenna shipping cartons/crates should be inspected and verified for proper antenna model number. If discrepancies are found, please contact SATCOM Technologies for correction. If exterior packing label is unavailable, open the carton/crate for inspection.

Prior to the installation process, it is recommended that components and hardware received be compared to the packing list included inside each carton/crate. Should any part be missing or if damage is apparent, please refer to Appendix A, "Reporting Loss or Visible Damage."

#### **2.1.3 Unpacking Instructions**

Care should be exercised when uncrating and unpacking the equipment. Each container should be inspected as it is opened. The contents of each container should be checked against the work order packing list inside each carton/crate to verify correct part numbers and quantities. While parts inventory is taking place, organize the antenna installation processes. Make sure perishable items and small items are adequately stored to prevent loss and/or weather damage.

If a claim for shipping damages is to be made, save the packing material, the container and the accompanying paperwork to substantiate the claim with the carrier. Notify SATCOM Technologies as soon as possible. Do not return any unit, subassembly or assembly until authorization and shipping instructions are received from the factory.

#### 2.1.4 Support Equipment Description and Weight

This paragraph defines the specific machinery and instruments necessary to accomplish the field installation of the antenna.

**Table 1. Crane (Lifting Device)**

<b>Task</b>	<b>Size (minimum)</b>	<b>Boom</b>
Lift and position pedestal	10 ton (9100 kg)	45 feet (14 m)
Lift and position reflector assembly	12 ton (11000 kg)	70 feet (21 m)
Lift and position feed	7 ton (6500 kg)	45 feet (14 m)

*Note: The above table assumes unrestricted access to foundation on flat compacted surface. Any other condition will require on-site crane sizing.*

**Table 2. Weight Summary**

<b>Component</b>	<b>Unit Weight</b>
Reflector assembly	2,000 lbs. (907 kg)
Pedestal assembly	1,700 lbs. (771 kg)
Az jack drive assembly (less motor drive)	600 lbs. (272 kg)
El jack drive assembly (less motor drive)	600 lbs. (272 kg)
Shipping weight (typical)	5,830 lbs. (2,644 kg)

### 2.1.5 Tools for Installation

This SATCOM Technologies Model 7.3-meter antenna is designed for assembly by a crew of three with limited special heavy equipment or tooling. The following are tools and items needed for installation:

**Table 3. Tool List**

#	Description	Qty.
1	3/8" Cordless Drill w \Chuck	1 ea.
2	Battery Screw Driver	1 ea.
3	Battery Charger for Screw Driver	1 ea.
4	Spare Battery for Screw Driver	1 ea.
5	Battery Charger for Drill	1 ea.
6	Spare Batteries for above Drill	1 ea.
7	1/4" Flexible Ext. 4" to 6" Lg.	1 ea.
8	1/4" Adapter for Cordless Drill	1 ea.
9	1/4" Adapter for Elect. Screw Driver	1 ea.
10	1/4" Drive Deep Sckt. 5/16"	2 ea.
11	1/4" Drive Deep Sckt. 3/8"	2 ea.
12	1/4" Drive Deep Sckt. 7/16"	2 ea.
13	1/4" Drive Sckt. Std. 5/16"	2 ea.
14	1/4" Drive Sckt. Std. 3/8"	2 ea.
15	1/4" Drive Sckt. Std. 7/16"	2 ea.
16	1/4" Drive Ratchet	2 ea.
17	1/2" Drive Ratchet	1 ea.
18	1/2" Drive Sckt. 9/16"	1 ea.
19	1/2" Drive Sckt. 3/4"	1 ea.
20	1/2" Drive Sckt. 15/16"	1 ea.
21	1/2" Drive Sckt. 1/2"	1 ea.
22	Phillips Screw Driver #2	2 ea.
23	Slotted Screw Driver	2 ea.
24	Open Box Wrench 5/16"	2 ea.
25	Open Box Wrench 3/8"	2 ea.

26	Open Box Wrench 7/16"	2 ea.
27	Open Box Wrench 1/2"	2 ea.
28	Open Box Wrench 9/16"	2 ea.
29	Open Box Wrench 3/4"	2 ea.
30	Open Box Wrench 15/16"	2 ea.
31	Putty Knifes	2 ea.
32	24" Crescent Wrench	1 ea.
33	2 lb. Machinist's Hammer	1 ea.
34	Claw Hammer	1 ea.
35	Wrecking Bar	1 ea.
36	Tin Snips	1 ea.
37	Snap Ring Plier Set	1 ea.
38	Machinist's Flat File	1 ea.
39	Rat Tail File	1 ea.
40	Panel Alignment Tool Punch Point with Handle	2 ea.
41	Spring Clamps	4 ea.
42	(Bolt Bags)Work Apron	2 ea.
43	Roll Emery Cloth 150 Grit	1 ea.
44	Allen Key Hex Sets	1 ea.
45	25' Tape Measure	1 ea.
46	Tool Box	1 ea.
47	Nylon Straps 2" X 10'	2 ea.
48	3 Ton Shackles	2 ea.

## 2.1.6 Applicable Documents

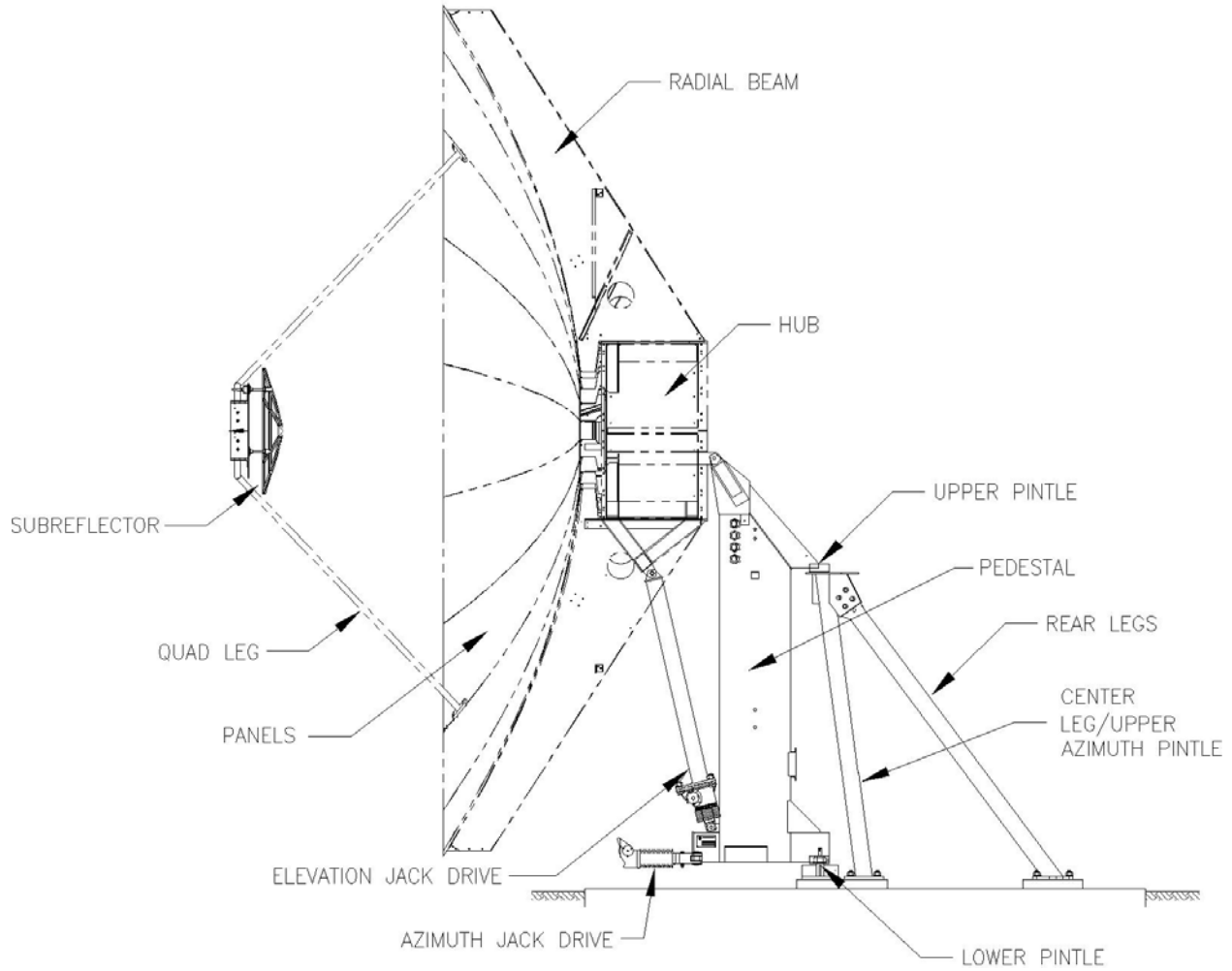
Assembly drawings are required for operation and maintenance of the 7.3-meter KPK/KPC antenna. Necessary drawings are part of the print package provided with the antenna and should be retained with this manual for reference in the future. Contact SATCOM Technologies for current revisions. A complete set of applicable drawings will be found in the print package shipped with the antenna.

The following documents should accompany this manual. In the event of a conflict between a referenced document, this manual shall govern.

<u>Doc. #</u>	<u>Description</u>
300-2436	High Strength Grout Specification and Grouting Process Procedure
500-0231	Alignment Procedure for Antenna Position Transducer

### 3.0 INSTALLATION PROCEDURE

*Note: Refer to Figure 1 during installation. This figure is an overall view of the assembled antenna and can assist the installer with locating parts and understanding the relationship between the components.*



**Figure 1. SATCOM Technologies Model 7.3M Antenna**

### 3.1 Pedestal Installation

*Note: Verify actual anchor bolt layout to the foundation layout drawing.*

*Note: Refer to drawing in the print package during installation of pedestal and jack drive assemblies.*

- Step 1.** Install the center leg/upper azimuth pintle assembly to foundation. Use the leveling bolts on the base plates with thrust plates to maintain a nominal 3" grout gap between the foundation surface and the bottom of the foot. Bolts shall be tightened to a "Snug Tight."

*Note: "Snug Tight" is defined as the condition of securing until connection plies are in firm contact.*

- Step 2.** Install the other two legs on the inside of the center leg/upper azimuth pintle assembly and the foundation. Use the leveling bolts on the base plates with thrust plates to maintain a nominal 3" grout gap between the foundation surface and the bottom of the foot. Tighten the bolts securing the legs to the azimuth pintle assembly per "Turn-of-the-Nut" procedure unless otherwise specified on installation drawing in print package.

*Note: "Turn-of-the-Nut" procedure for tightening fasteners is described in Appendix B of this document.*

*Note: Lubricate the bearings with Mobilith SHC PM or equivalent before executing the next step.*

- Step 3.** Install the pedestal to the upper pintle assembly and foundation using a crane. The pedestal should be lifted by placing a minimum of two nylon slings (2-Ton rating each) around the upper pedestal. A come-along or adjustable strap may be necessary to level the pedestal during the lift. Care should be taken to protect the finish of the pedestal. Use the leveling bolts on the base plates with thrust plates to maintain a nominal 3" grout gap between the foundation surface and the bottom of the foot. Ensure the lower pintle is level and then snug tighten the bolts, securing the lower pintle per "Turn-of-the-Nut" procedure unless otherwise specified on installation drawing in print package.

### 3.2 Azimuth Drive Installation

Install the azimuth trunnion/manual drive assembly per installation drawing in print package. Use the leveling bolts on the base plates with thrust plates to maintain a nominal 3" grout gap between the foundation surface and the bottom of the foot.



### 3.3 Pedestal Rough Alignment

*Note: AZ jack should be disconnected for ease of rotating kingpost. Re-level AZ jack **after** verticality is complete.*

**Step 1.** Place a level on pintle to ensure pintle is level and adjust nuts on anchor bolts to level pintle as required.

**CAUTION! ONLY ROTATE PEDESTAL POSITION IN LIGHT WIND CONDITIONS (LESS THAN 20 MPH WINDS).**

**Step 2.** Rotate pedestal by pushing it until the pedestal is at one of the azimuth limits.

**Step 3.** Place a level vertically on the front centerline of the pedestal tube and adjust the leveling bolts on foundation anchor bolts on the rear legs until the pedestal is level. Continue by placing a level vertically on the side centerline of the pedestal tube and adjust the nuts on foundation anchor bolts on all legs until the pedestal is level. Repeat as necessary.

*Note: To ensure accuracy of level, rotate the level 180° to verify calibration. The level should read the same in either position.*

**Step 4.** Rotate the pedestal to the opposite azimuth limit and repeat previous leveling process.

**Step 5.** Rotate the pedestal to a center position between the two rear legs. Place a level vertically on the centerline of the pedestal and adjust the nuts on foundation anchor bolts on the center leg until the pedestal is level.

**Important: Observe the gap between the top of the middle leg and upper azimuth pintle bearings. This gap must be between 3/8" and 5/8".**

**Step 6.** Repeat Steps 1 through 5 until all positions are level.

**Step 7.** Level and connect AZ jack.

**Step 8.** Grout lower pintle, legs, and azimuth jack base. See SATCOM Technologies Document 300-2436.

**Step 9.** Secure the azimuth jack, with trunnion attached, to pedestal using pins and hardware pre-installed in drive assembly.

**Step 10.** Extend the lead screw to its fully extended length and verify proper travel.

**CAUTION! TO PREVENT DAMAGE TO THE JACK OR INJURY TO OPERATOR, CARE SHOULD BE TAKEN TO DRIVE JACK SLOWLY AS IT APPROACHES STOP COLLAR AT THE LIMITS OF ELEVATION TRAVEL.**

### 3.4 Elevation Drive Installation

**Step 1.** Install the elevation manual drive assembly to the pedestal using the pre-installed pin.

**Step 2.** Install the motorized drive assembly (if applicable) to the azimuth drive.

*Note: Do not install EL motor drive at this time.*

### 3.5 Main Reflector Assembly

*Note: The reflector will be assembled on the ground prior to installation on the pedestal. Sufficient space should be available to install the radials and panels and for lifting the assembled reflector to the pedestal.*

*Note: "Turn-of-the-Nut" procedure should be used to tighten all reflector fasteners. For the reflector fasteners, "Snug Tight" is defined as the condition existing when the plies of the connection are in firm contact. Reflector fasteners shall be tightened 1/3 turn past the "Snug Tight" condition.*

#### 3.5.1 Feed Interface Installation

**CAUTION! THE FEED INTERFACE MUST BE INSTALLED ON THE HUB PRIOR TO INSTALLING RADIALS AND PANELS!**

*Note: Use the following procedure for a linearly polarized (LP) feed installation. Refer to Figure 2.*

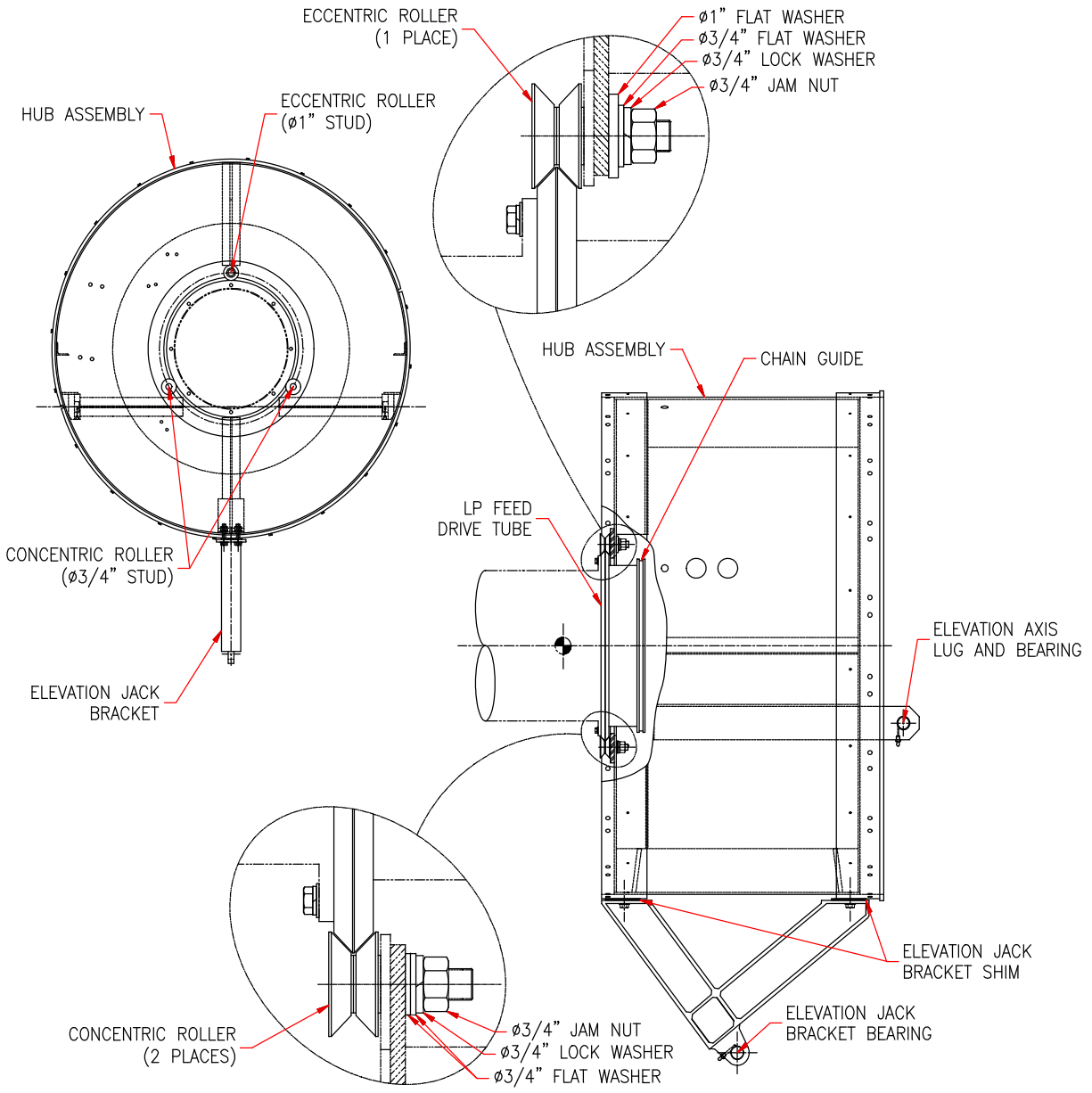
- Step 1.** Position the two concentric V-rollers on the hub. (Concentric rollers have a  $\varnothing=0.75$ " stud.)
- Step 2.** Position the LP feed drive tube, chain guide inside the hub, in the grooves of the two concentric V-rollers.
- Step 3.** While the drive tube remains in contact with the two concentric rollers, tilt the drive tube away from the top of the hub. Position the eccentric V-roller such that as the tube is lowered toward the hub, the eccentric V-roller will seat in its mounting hole, capturing the drive tube in the three rollers. (The eccentric roller has a  $\varnothing=1.00$ " stud.)

*Note: The rotating axis of the roller of the eccentric roller assembly is slightly offset from the centerline of the stud. This provides a cam-like capability that is used to adjust the rolling pressure between the rollers and feed drive tube. The adjustment is made by turning the mounting stud in its mounting hole in the top of the hub using a hex wrench.*

- Step 4.** Use hex wrench to rotate and adjust the eccentric roller such that the drive tube is firmly held in place by the rollers but rolls smoothly.
- Step 5.** Install flat washers, lock washers, and hex nuts on all three rollers and fully tighten. Hold the stud stationary using a hex wrench while tightening the hex nut on each roller assembly.
- Step 6.** Check that the drive tube rolls smoothly. If not, loosen hardware on eccentric roller, readjust, and retighten.

*Note: Use the following procedure for a circularly polarized (CP) feed installation.*

- Step 7.** Position the CP feed adapter plate on the top of the hub. The 1-1/4" diameter hole in the adapter plate should be aligned with the 1" diameter hole in the top of the hub. The machined lip of the adapter plate should fit into the machined I.D. of the hub top plate for centering.
- Step 8.** Install and fully tighten the mounting hardware.

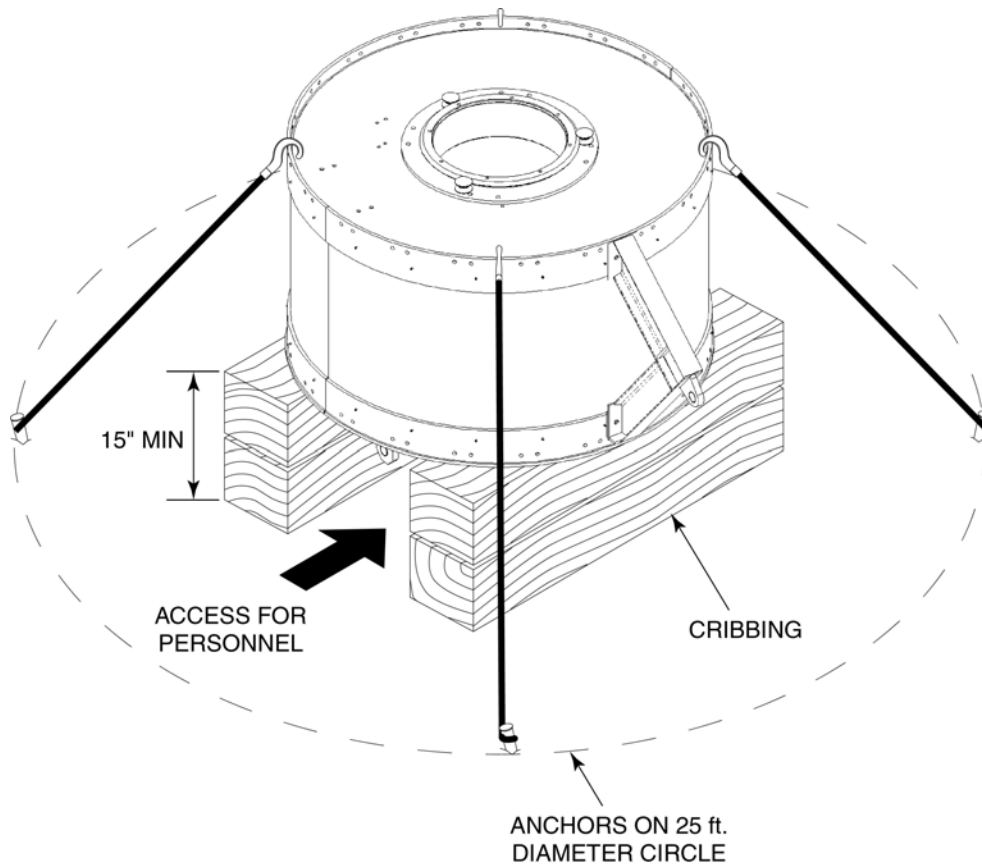


**Figure 2. LP Feed Interface Installation**

### 3.5.2 Radial Beam Installation

**CAUTION! THE FEED INTERFACE, EITHER CP OR LP, MUST BE INSTALLED ON THE HUB PRIOR TO INSTALLING RADIALS AND PANELS!**

- Step 1.** Position the hub assembly on cribbing 15" high minimum. Cribbing should provide a stable platform for building the reflector. If stacked smaller boards are used, they should be secured to each other using wood screws or nails (see Figure 3).



**Figure 3. Secured Hub**

- Step 2.** Secure the hub to the ground using straps and ground anchors as a precaution against the reflector being overturned by wind during assembly. Hooks may be placed over the upper lip of the hub as shown in Figure 3. Straps should be placed in locations on the hub so as not to interfere with radial beam installation.

*Note: Leave access for personnel to enter the hub/reflector from underneath.*

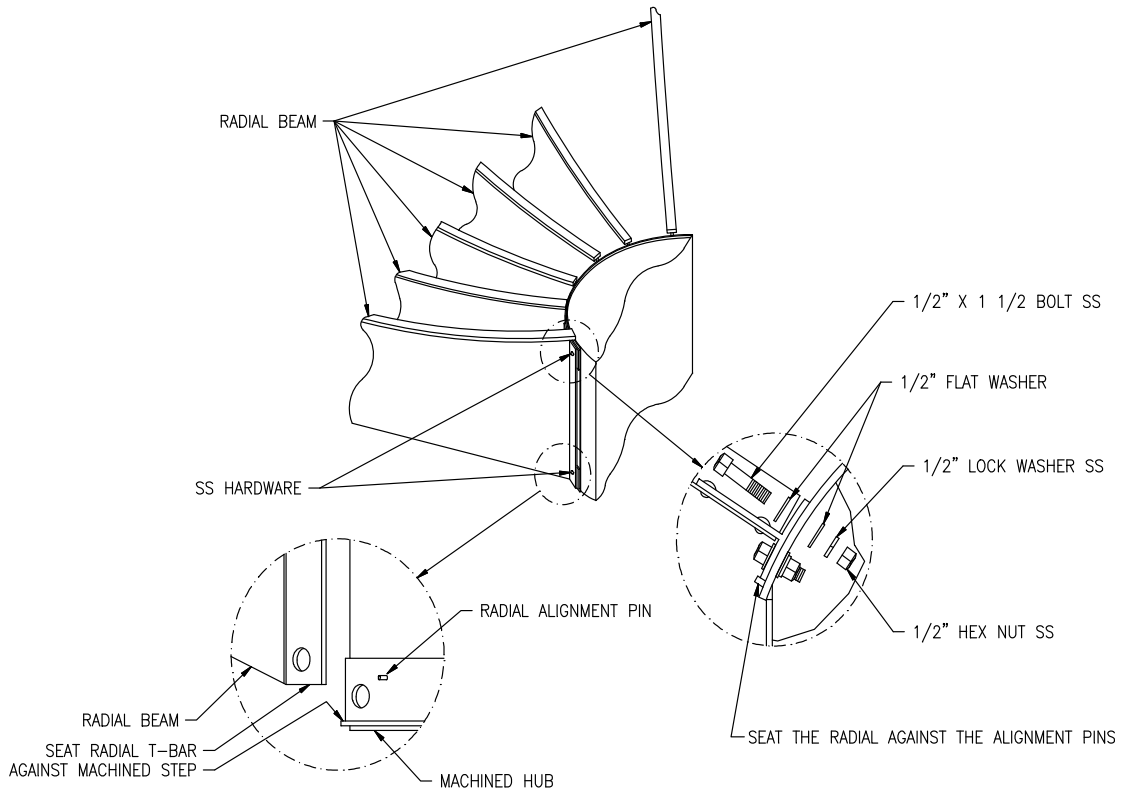
*Note: Ground anchors should be chosen based upon local soil conditions at the time of installation.*

- Step 3.** Wipe down machined bands on the outside of the hub with a clean, dry cloth. Mating surfaces on the hub and radials should be free of debris.

**Step 4.** Attach each radial beam, one at a time, to the hub with the 1/2" diameter hardware provided. Each radial must be seated on the machined step at the bottom of the hub with the edge of the hub tee making contact with both alignment pins in the hub wall (see Figure 4).

**Step 5.** Fully tighten the radial mounting hardware. After tightening hardware, check to ensure that the radial hub tee has remained in contact with the machined step and with the alignment pins. If not, loosen the hardware, adjust, and retighten.

*Note: For windy conditions, lacing members should be installed as radials are installed. Refer to Section 3.5.6 in this document.*



504524.DWG

**Figure 4. Radial Beam Installation**

### 3.5.3 Lacing Installation

- Step 1.** Install the 20 contour lacing members using the ¼" diameter hardware provided (see Figure 5 and drawing in print package). Leave hardware less than finger tight to allow movement.
- Step 2.** Install the 2-1/2" X 2-1/2" angle clips for mounting the torsional, inner ring and outer ring lacing. Leave hardware less than finger tight to allow movement. (see Figure 5 and drawing in print package).
- Step 3.** Install the outer ring lacing members.
- Step 4.** Install the torsional and inner ring lacing members. Installation must be simultaneous as these members share fasteners in some locations. Leave hardware less than finger tight to allow movement.
- Step 5.** Position the horizontal surface of each structural lacing angle clip such that it is level. Fully tighten the mounting hardware for the clips.
- Step 6.** Fully tighten the mounting hardware for all ring and torsional lacing, starting with the entire outboard ring and then moving to the inner ring.

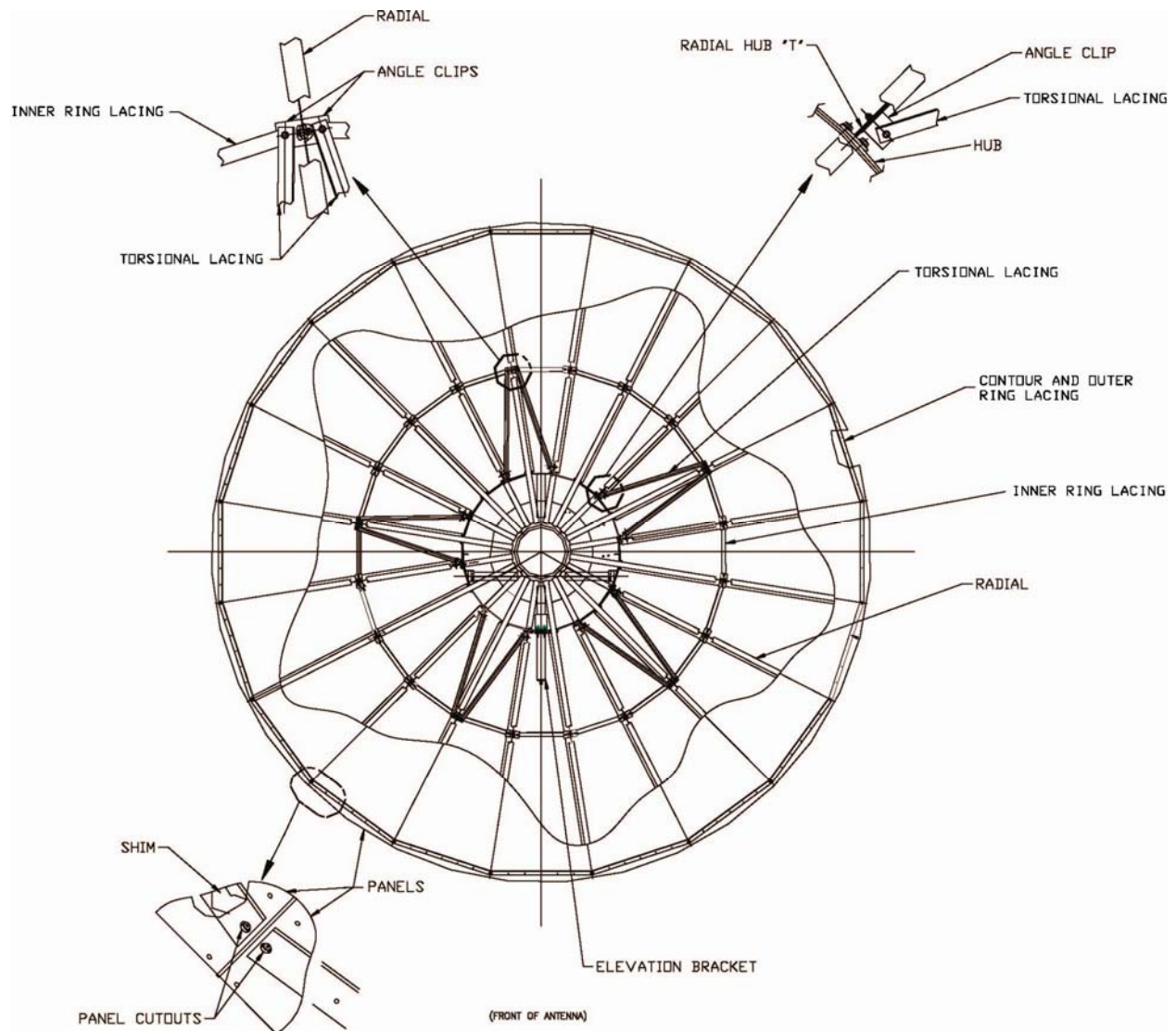


Figure 5. Reflector Lacing Assembly

### 3.5.4 Reflector Panel Installation

**CAUTION! DO NOT STAND IN THE MIDDLE OF THE PANELS DURING THE INSTALLATION PROCESS. IF, FOR ANY REASON, PERSONNEL MUST STAND IN THE REFLECTOR, THEY SHOULD ALWAYS STAND SUCH THAT THEIR WEIGHT IS SUPPORTED BY THE RADIAL BEAMS.**

- Step 1.** The mating surfaces of the panels and radials must be free of debris. Wipe down the top of the radials and the backside edges of the panels with a clean, dry cloth prior to panel installation.
- Step 2.** Maneuver a panel so that it lies on top of two adjacent radials and the contour lacing member in a reflector bay. Temporarily hang the panel from the heads of the contour lacing mounting bolts (see Figure 5).
- Step 3.** Install machine screws (head on the panel side) through the panel and radials working from the hub toward the outboard edge of the panel.
- Step 4.** Place the contour lacing shim between the panel and contour lacing member, aligning the holes in all three parts (see Figure 5 and drawing in print package).
- Step 5.** Install machine screws (head on the panel side) through the panel and contour lacing members.
- Step 6.** Install one flanged lock nut on each machine screw. The nuts should be less than finger tight to allow movement of the structure until the last panel is installed.
- Step 7.** Repeat Steps 1 through 6 for each reflector bay. Progressively work from one bay to the adjacent bay without skipping.
- Step 8.** Mounting hardware for the last panel must be installed from inside the reflector. The installer should stand where the radial is supporting his/her weight. Do not stand in the middle of panels!

### 3.5.5 Reflector Hardware Tightening Sequence

- Step 1.** Completely tighten the panel-to-radial screws for each bay starting at the inboard edge of the panel working toward the outboard edge, alternating from side to side.
- Step 2.** Completely tighten all panel-to-contour lacing screws for all bays, alternating from side to side.

### 3.5.6 Main Reflector Assembly in Windy Conditions

*Note: When assembling the reflector in windy conditions, care must be taken to avoid damaging reflector components during assembly. Conditions for this discussion are defined as steady winds exceeding 15 mph (24 km/hr) or gusts up to 20 mph (32 km/hr). As each radial is installed to the hub, it should be connected with previously installed radials by installing the lacing members. This procedure limits the movement caused by wind and minimizes the chances of damage occurring.*

- Step 1.** Mount the first radial to the hub following the procedures in Section 3.5.2. Fully tighten hardware. Immediately tie the radial to the ground using nylon rope and wood or steel stakes or weights.
- Step 2.** Mount the next radial adjacent to the first. Fully tighten hardware. Install contour lacing member between the two radials. Install structural lacing angle clips and ring and torsional lacing using the procedures described above. Lacing hardware should be finger tight

**Step 3.** Continue installing radials to the hub, one at a time. Install lacing members after each radial is installed. Fully tighten all lacing hardware after all radials and lacing have been installed. Add more nylon ropes as needed to prevent excessive movement of the structure.

**Step 4.** It is not recommended that panels be installed in windy conditions.

### **3.6 Apex/Quad Leg/Subreflector Installation**

**CAUTION! THE QUAD LEGS MUST BE INSTALLED AT THE CLOCKING POSITIONS SHOWN IN FIGURE 7 FOR THE ANTENNA TO PERFORM AS DESIGNED. SHOULD THE QUAD LEGS BE INSTALLED IN ANY OTHER CLOCKING POSITION, UNPREDICTABLE PERFORMANCE WILL RESULT.**

*Note: Refer to drawing in print package and Figure 6 of this document for the following steps.*

**Step 1.** Working on the ground, attach the legs to the apex using the 3/8" hardware provided. Snug the bolts; do not fully torque.

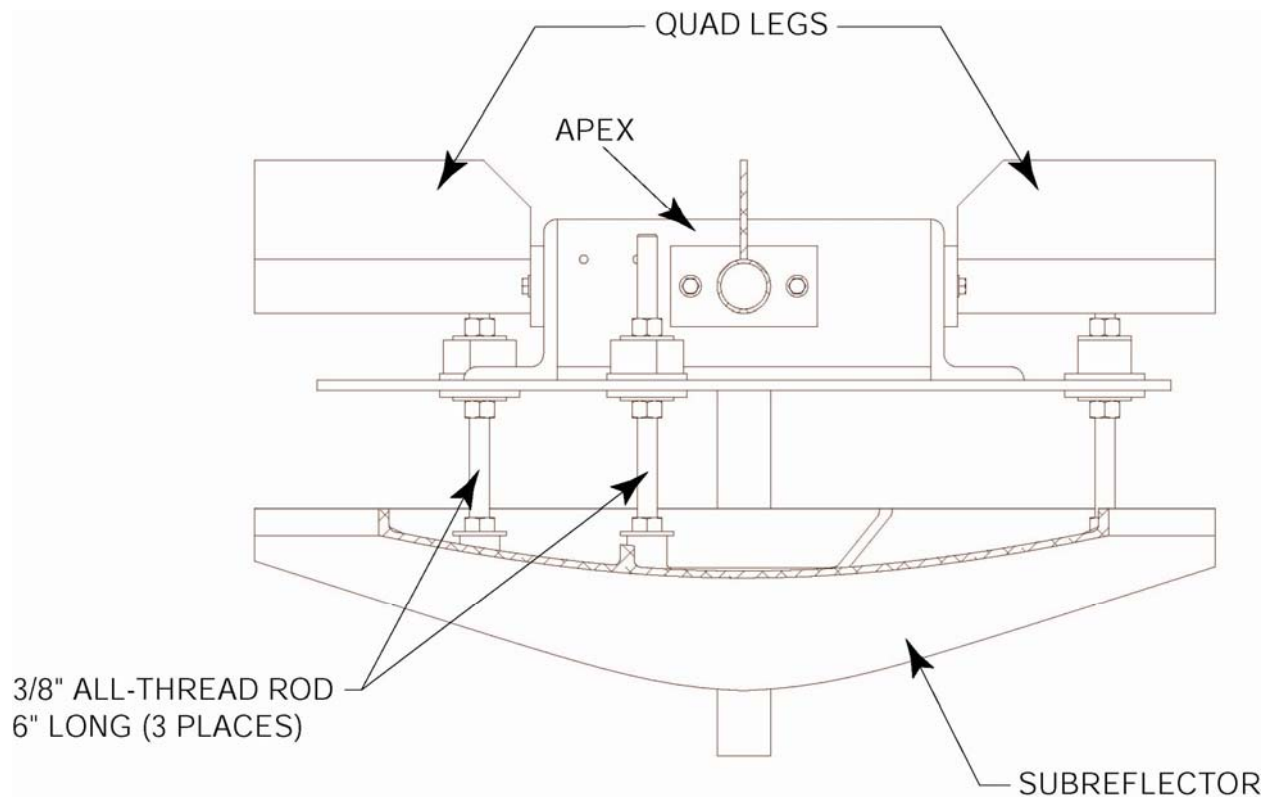
**Step 2.** Secure the 6" long all-thread rods to the subreflector and lock in place with hex nut.

**Step 3.** On each of the three mounting studs on the subreflector assembly, install one nut, one flat washer, and one plate washer, in sequential order.

**Step 4.** Position the subreflector assembly between the feed horn and the apex such that the three studs are aligned with the 1-1/8" diameter holes in the apex.

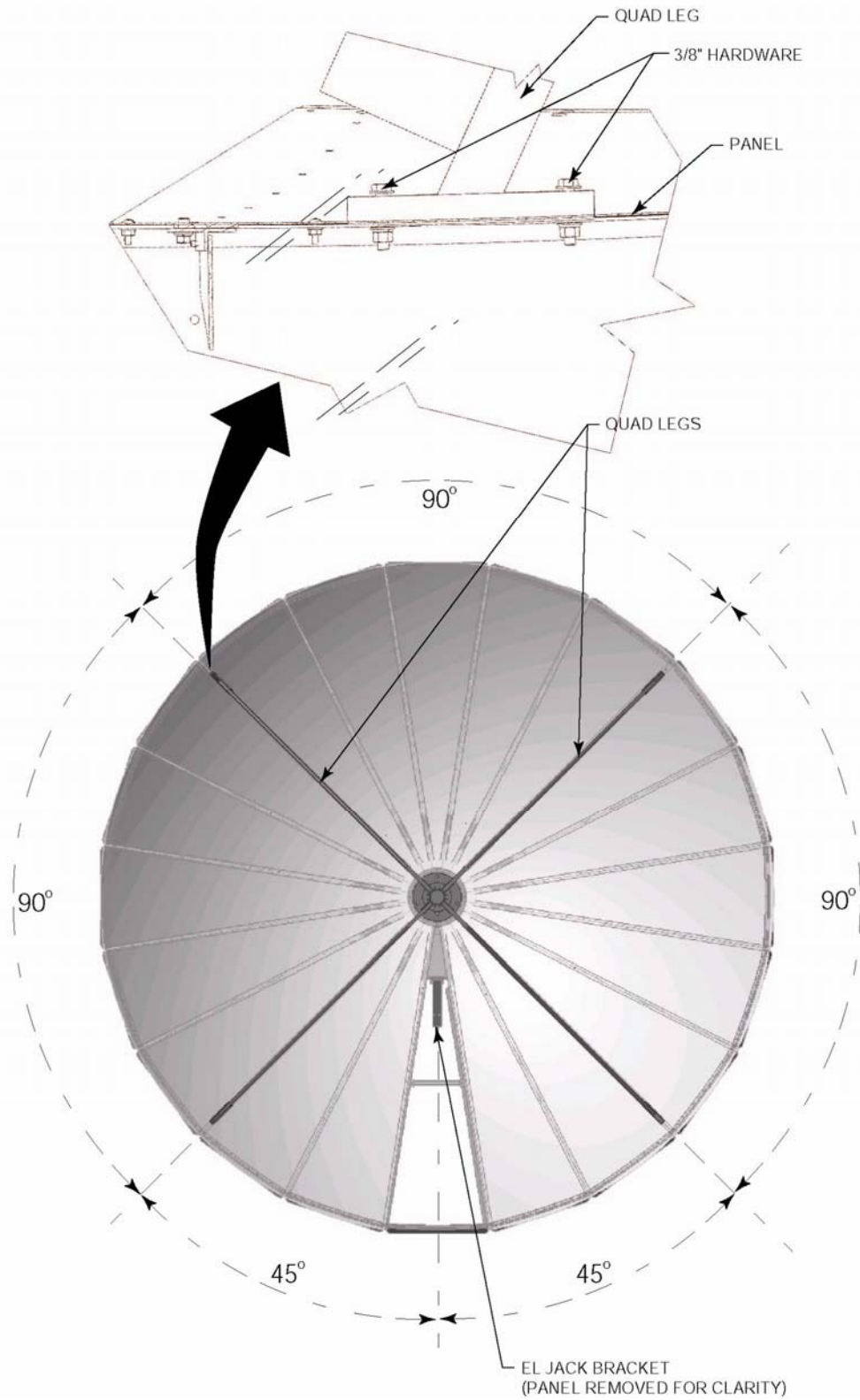
**Step 5.** Lift the subreflector toward the apex. The studs should protrude through the apex. Install one plate washer, one flat washer, and one nut, in sequential order, on the end of the stud protruding through the apex. Hand-tighten the nut on the backside of the apex such that the apex supports the subreflector assembly.





**Figure 6. Subreflector/Apex Assembly**

- Step 6.** Lift the Apex/Quad Leg assembly with the lifting device and position such that the legs may be fitted into the radials. Attach the legs to the radials using the 3/8" hardware provided. Snug the bolts; do not fully torque.
- Step 7.** Verify that the apex is level. The end of the leg that attaches to the apex should be parallel to the apex plate. Fully tighten the leg attachment bolts at the apex and at the quad leg clevises.



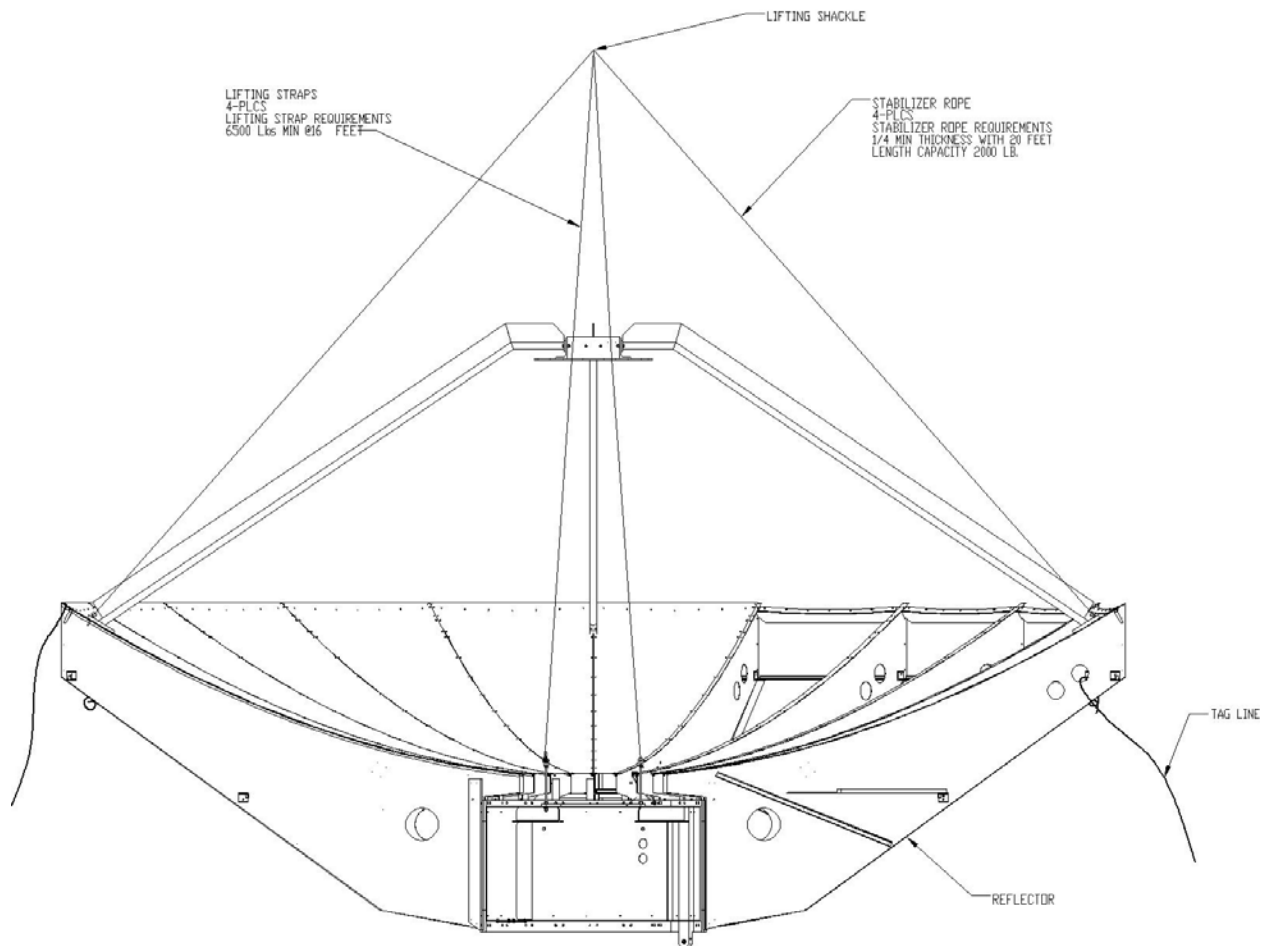
**Figure 7. Quad Leg Installation**

### 3.7 Reflector-to-Pedestal Installation

- Step 1.** Clean and lubricate the bearings on the elevation axis lugs and elevation jack bracket on the hub (see Figure 2).
- Step 2.** Check the fit of the elevation axis pins in the elevation axis bearings on the hub. Also check the fit of the elevation jack pins. Use emery cloth or a file to remove any burrs, if necessary.

*Note: Figure 8 shows the reflector fully rigged for lift to the pedestal.*

- Step 3.** Install the four longer eye bolts to the hub, 90° apart.
- Step 4.** Install shackle in lug of eye bolts (see Figure 8).
- Step 5.** Attach choker to shackle.

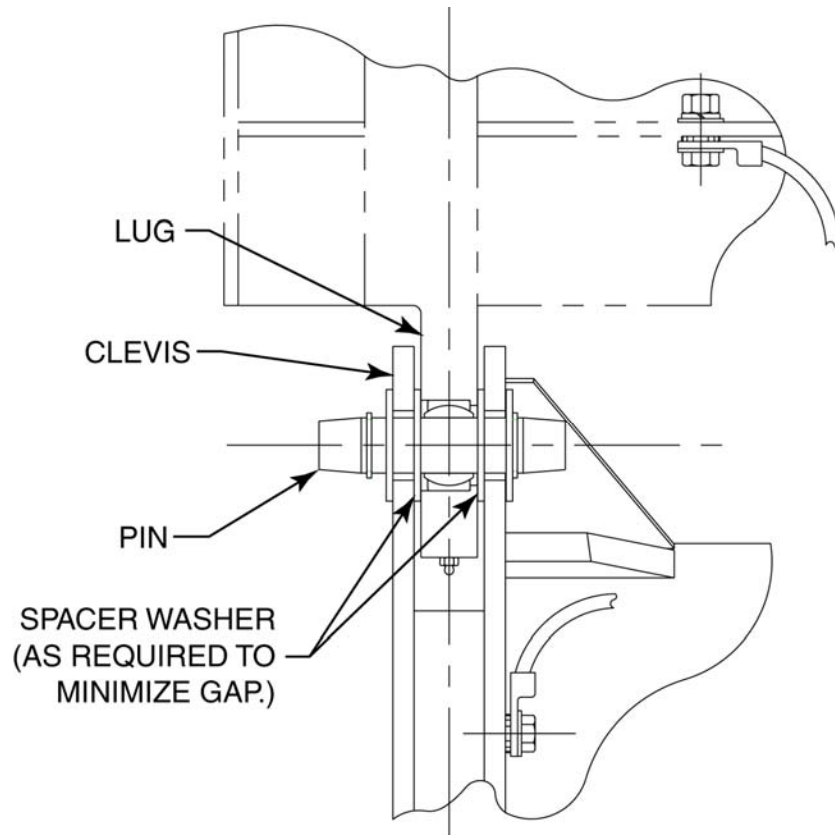


**Figure 8. Rigging for Reflector Lift**

- Step 6.** Attach lifting straps to shackles.
- Step 7.** Install one shorter eye bolt in each quad leg interface.
- Step 8.** Loosely tie nylon rope from each quad leg eye bolt to the lifting line (see Figure 8).
- Step 9.** Use crane to pull slack from choker by picking up approximately 1,000 lbs.
- Step 10.** Tighten the nylon ropes.
- Step 11.** Attach tag lines to the outer ring lacing members.

**Step 12.** Lift the reflector and connect the elevation axis lugs to the pedestal per the assembly drawing in the print pack. Position spacer washers between hub mounting lugs and pedestal clevis as required by mounting configuration as permitted by spacing. To connect the axis, insert a drift pin through the axis lug on one side and install the axis pin through the other side. After one side is completely secured, remove the drift pin and insert the other axis pin completing the elevation axis joint.

*Note: The area between mounting lugs and pedestal clevis varies according to tolerances. Install spacer washers to accommodate gap on either and/or both sides of lugs to eliminate remaining space as shown in Figure 9.*



**Figure 9. Clevis with Spacer Washer(s)**

**Step 13.** Pin the elevation jack to the elevation jack bracket previously installed on the hub.

**Step 14.** After the reflector has been secured to the pedestal assembly, remove the lifting equipment from the reflector. Walk only on the radial beams.

### 3.8 Feed Installation

Install the feed assembly per drawing in print package. Use crane and choker to lift feed into position.

### 3.9 Subreflector Alignment

*Note: Refer to drawing in print package and Figure 6 for the following steps.*

- Step 1.** Level and set the height of the subreflector assembly. Using a tape measure, measure from the back of the subreflector to the main reflector at a minimum of three locations, 120 degrees apart along a line parallel to the RF axis of the reflector. Adjust the nuts until the same height is measured at each of the locations and the height matches the dimension given on drawing in print package.
- Step 2.** Center the subreflector in the main reflector. Using a tape measure, measure from the edge of the subreflector to the outboard edge of the main reflector at a minimum of three locations, 120 degrees apart, and reposition the subreflector assembly until it is centered. Fully tighten the subreflector assembly mounting nuts.

*Note: Attach the tape measure to the outer edge of the panel near a radial beam for this measurement. If the tape measure is not attached near a radial beam, the outer edge of the panel may deflect and provide erroneous measurement data.*

- Step 3.** Check the level, height, and centering position of the subreflector assembly after tightening the nuts to verify correctness. Loosen the nuts and repeat Steps 6 and 7 to adjust the level, height and centering position, if necessary.

### 3.10 Final Alignment of Pedestal

*Note: For specific applications involving high-frequency operation, in-orbit control, or TT&C, more precise pedestal alignment may be required. Refer to SATCOM Technologies document 400-0429, General Procedure-Kingpost Pedestal Final Alignment.*

*Note: For specific applications involving FCC requirements, balance and focus of the subreflector may be required after final pedestal alignment. Refer to SATCOM Technologies document 400-2681, Subreflector Balancing and Focusing Procedure.*

- Step 1.** Move reflector to 45° elevation.
- Step 2.** Repeat the alignment steps described in Section 3.3. Adjustments may be required to compensate for the added weight of the reflector assembly.
- Step 3.** Install EL motor drive (if applicable).
- Step 4.** Re-check AZ jack for level, adjust as necessary.
- Step 5.** Ensure gap between top of leg and bottom of bearing housing is nominally from 3/8" to 1/2".
- Step 6.** Grout AZ trunnion and rear legs. See SATCOM Technologies Document 300-2436.

### 3.11 Limit Switch Installation

- Step 1.** Verify that limit switch installation, in the azimuth axis, is in accordance with the drawing provided in the print package.
- Step 2.** Adjust travel limit stops as required to trip limit switch within mechanical travel.
- Step 3.** Verify that limit switch installation, in the elevation axis, is in accordance with the drawing provided in the print package.
- Step 4.** Adjust travel limit stop sleeves as required to trip limit switch within mechanical travel.
- Step 5.** Install the polarization limit switch stop in accordance with the drawing provided in the print package.

**Step 6.** Adjust position of stops to trip polarization limit switch travel at +/- 50°.

### **3.12 Positioning Transducers – Installation and Alignment**

**Step 1.** Install the positioning transducers and azimuth resolver (if applicable) per installation drawing in print package.

**Step 2.** Perform alignment of antenna position transducer in accordance with alignment procedure 500-0231.

### **3.13 Antenna Utility Electrical Installation**

**CAUTION! REMOVE ALL POWER TO THE ANTENNA PRIOR TO ELECTRICAL INSTALLATION.**

Install the antenna control cabling and electrical kits in accordance with the wiring schematics provided in the print package.

## **4.0 ANTENNA COMPONENTS AND CHARACTERISTICS**

This section lists a brief general description of the antenna system. More detailed operation and maintenance instructions are covered in subsequent sections. All pertinent antenna system drawings are provided in the print pack supplied at time of shipment.

### **4.1 Pedestal Assembly**

A two-axis elevation-over-azimuth kingpost pedestal is used to accurately position the RF axis of the antenna.

### **4.2 Reflector Assembly**

A modified paraboloid reflector constructed from high accuracy panels is combined with a high performance feed system to give maximum efficiency with low sidelobes.

### **4.3 Azimuth and Elevation Drive Assemblies**

Basic components of the drive assemblies are as follows:

- a. Worm gear screw jack; see shipping list or nameplate on unit for specific information.
- b. Gearmotor (Optional-Motorized); see shipping list or nameplate on unit for specific information.

### **4.4 Limit Switches (Optional)**

Mechanical limit switches are provided on the elevation and azimuth axes to prevent structural and/or electrical damage due to excessive rotation of the system. Limit switches are activated by tripping the lever arm against an adjustable stop angle. The lever arms and the stops are adjustable to the travel range.

*Note: Every 2 months or after heavy snow or sand storm, inspect and clean all debris, snow, or sand from limit switches and lever arms.*

### **4.5 Angular Position Transducer (Optional)**

Angular position indication is given by three position transducers, one each mounted on the azimuth and elevation axes plus one mounted on the optional feed polarization drive. Their electrical outputs are monitored as digital readouts integral with the antenna position controller.

*Note: Every 2 months or after heavy snow or sand storm, inspect and clean all debris, snow, or sand from angular position transducers, shafts, and couplings.*

### **4.6 Reflector Backup Structure**

The reflector backup structure is comprised of radial ribs emanating from a center hub structure. Interconnecting hoop members are provided to furnish the structure with maximum stiffness capability. The truss work on the rear of the reflector is provided to eliminate surface distortion which may result from dead weight deflections of the supporting members causing rotations at the panel supports.

#### 4.7 Reflector Panels

Aluminum reflector panels are provided for each reflector assembly. The panels are designed to meet the stiffness and load requirements for the overall specification. The panels will support, without permanent deformation of surface accuracy, a 300-pound soft-bottom shoe load.

#### 4.8 Anti-Icing (Optional)

Accumulation of ice on optical surfaces is prevented by the automatic anti-icing system. This system consists of closeout covers and an environmentally control heat source (typically electric).

#### 4.9 Material Finishes

##### 4.9.1 Aluminum Structure

The aluminum reflector structure portion of the SATCOM Technologies antenna may include the following components:

- a. Panels
- b. Radial trusses
- c. Hub
- d. Lacing
- f. Subreflector apex mount and legs

The panels top surface have been cleaned, corrosion treated and painted. Paint is diffusive thermally deflective flat white. The radials and hub have been cleaned and brightened. As an option, any of these components may be provided with a paint finish.

***WARNING! HIGH OR SEMI-GLOSS PAINT SHOULD NEVER BE USED ON THE REFLECTOR PANEL FACES OR ON THE SUBREFLECTOR SURFACE.***

##### 4.9.2 Steel Structure

The steel structure of the SATCOM Technologies kingpost pedestal antenna may include the following:

- a. Kingpost pedestal
- b. Support legs
- c. Jack drive assemblies
- d. Pivot bearing blocks
- e. Jack pivot bearing blocks
- f. Ladders and platforms (Optional)
- g. Radial Trusses
- h. Hub
- i. Lacing

With the exception of the jack assemblies, each of these structural components is normally hot-dip galvanized. As an option, any of these components may be provided with paint over hot-dip galvanized finish.



## **5.0 MAINTENANCE**

### **5.1 Pedestal/Reflector Assembly Protective Finish**

The pedestal/reflector assembly should be inspected on a regular basis and should be maintained as follows:

- a. Accumulations of dirt and/or grease shall be removed using a solution of hot water and detergent. Following cleaning, rinse with clear water.
- b. Damaged or deteriorated surface finishes shall be repaired as follows:

#### **5.1.1 Reflector Surface Panels (Painted Aluminum)**

- a. Lightly sand damaged area with 180 grit sanding pad to feather edges.
- b. Clean sanded area to remove any particles left by sanding.
- c. Apply one coat of primer.
- d. Allow primer to air dry.
- e. Apply the first coat of flat white paint.
- f. Allow first coat of paint to dry thoroughly.
- g. Apply second coat of flat white paint.

#### **5.1.2 Unpainted Aluminum**

- a. Wire brush to remove oxides.
- b. Clean thoroughly using a solvent for greasy areas; hot water and detergent for dirt accumulations.

#### **5.1.3 Painted Aluminum**

- a. Repeat of steps a, and b, of unpainted aluminum.
- b. Wipe down using clean rag.
- c. Select applicable primer.
- d. Mix according to manufacture's instruction.
- e. Apply one coat of primer.
- f. Allow primer to air dry.
- g. Apply one coat of gloss white paint.

#### **5.1.4 Galvanized Steel Components**

- a. Remove dirt, grease and/or rust.
- b. Apply one coat of Zinc rich(cold galvanizing type)paint.

#### **5.1.5 Miscellaneous Painted Steel Components**

- a. Remove dirt, grease, and/or rust.
- b. Apply one coat if primer.
- c. Allow primer to air dry.
- d. Apply the first coat of paint.
- e. Allow first coat of paint to dry thoroughly.
- f. Apply second coat of paint as required to cover.

## 5.2 Assembly Hardware

Annually, assembly hardware shall be visually inspected. Any hardware which appears to be loose shall be tightened in accordance with AISC specification for structural joints.

Damaged fasteners shall be replaced with an identical fastener. For high strength fasteners, the turn-of-nut method is recommended as the means for providing the proper fastener tension as specified by the American Institute of Steel Construction (AISC), in the Specification for Structural Joints Using ASTM A325 or A490 Bolts taken from the ninth edition of the **Manual of Steel Construction, Allowable Stress Design**.

Fasteners meeting the American Society for Testing and Materials (ASTM) A325 Specification or the Federal Specification, FF-S-85C, for grade 5 steel, are considered to be high strength fasteners.

*Note: Galvanized ASTM A325 high strength structural bolts should not be reused. Retightening previously tightened bolts which have been loosened by tightening adjacent bolts is not considered to be a reuse.*

## 5.3 Lubrication Schedule

Table 4 identifies the items on the antenna which require lubrication. Figure 10 shows typical locations of grease fittings.

### 5.3.1 Bearing Lubrication

The following paragraphs describe the function, location, and lubrication of the remaining moving mechanisms of the antenna system, which require lubrication.

The bearings used on the pedestal assembly are the elevation axis bearing (2), the azimuth axis bearing (2), and the elevation and azimuth drive jack rod end bushing (1 each).

Every six months, bearings should be lubricated. Clean all dirt off the grease fittings prior to lubricating bearings. Inject grease using a conventional pump type grease gun. See lubrication schedule for proper lubricant.

#### **Elevation Axis Bearings**

The reflector is attached to the pedestal at the elevation axis through two self-aligning spherical bushings. The elevation axis grease fittings are located on the elevation lugs protruding from the hub.

#### **Azimuth Axis Bearings**

The azimuth axis of the antenna is defined by two each self-aligning spherical bushings located in a vertical line at the upper and lower pintles on the front side of the pedestal. Grease fittings for these bearings are located in bearing block housings.

#### **Drive Assembly Bearings**

A spherical bushing is used at the end of the jack screw drive assembly to provide pivoting action at this point. The azimuth and elevation jackscrew assembly bearing grease fitting is located at the jackscrew rod end.

### 5.3.2 Jacks and Gearmotors

Every three months the gearing in the machine screw jacks must be lubricated with grease for normal operation. Under severe use, (i.e. steptrack operation on one satellite or many changeovers between satellites daily) jacks should be greased monthly. There are grease fitting locations on the worm shaft housing, and on the screw housing.

***WARNING! DO NOT MIX GREASES.***

Every three months, remove the boot. The exposed jack screw should be cleaned and coated with a thin coating of grease. The grease should be painted on with a paint brush so that a thick film remains on all exposed surfaces of the jack screw and the boot replaced.

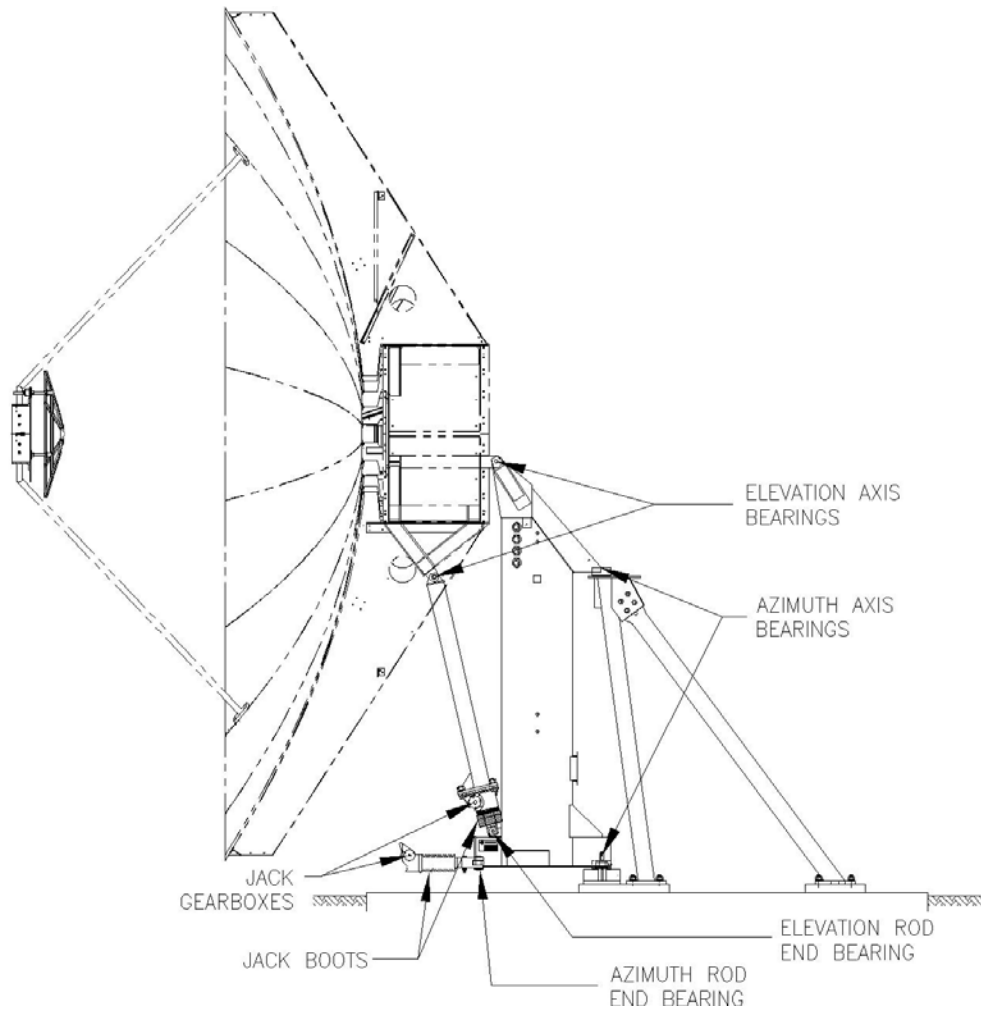
Every six months the boot should be removed and the jack screw extended to the limit before cleaning and coating. In this case, the housing lubrication should be delayed until after the boot is replaced and the jack screw retracted to the operating point in order to insure maximum grease retention. Improved boot life can be obtained by coating the boot with a silicone type vinyl protectant every two months.

The gearmotors can be considered low maintenance; however, they should be checked at least every three months for signs of oil leakage. Unless an oil leak is detected, it is not necessary to change or add oil to the reducer for the life of the antenna. See Table 4.

**Table 4. Lubrication Schedule**

<b>ITEM</b>	<b>FREQUENCY</b>	<b>LUBRICANT</b>	<b>REMARKS</b>
1. Screw Jack Housing	Normal Operation Every 3 Months, Severe Operation Monthly	Mobilith SHC PM grease or equal	Grease fitting on head of jack, two places and one place under boot.
2. Elevation Axis Bearings	Every 6 Months	Mobilith SHC PM grease or equal	Grease fitting on hub elevation lug, one place each side.
3. Azimuth Axis Bearings	Every 6 Months	Mobilith SHC PM grease or equal	Grease fitting on azimuth axis bearing housings, one each per upper and lower bearing.
4. Azimuth Rod End Bearing	Every 6 Months	Mobilith SHC PM grease or equal	Grease fitting on end of rod end.
5. Elevation Rod End Bearing	Every 6 Months	Mobilith SHC PM grease or equal	Grease fitting in hub jack lug
6. Jack Screws	Every 3 Months	Mobilith SHC PM grease or equal	During periodic maintenance, jack screw boots are to be removed and the screws extended and lubricated.
7. AZ/EL Jack Gear Reducers	Every 3 Months	Mobile SHC 629 oil	No oil change required. Inspect and maintain level above center of output shaft.

*Note: Mobilith SHC PM is standard grease. Extreme low temperature systems use Mobilith SHC RR221. Consult project engineer for additional grease options and specifics.*



**Figure 10. Antenna Lubrication Points (Typical)**

**Table 5. Jack Grease Chart**

JACK SIZE	GREASE CAPACITY		*RELUBRICATION AMOUNT	
	SHOTS	WEIGHT	SHOTS	WEIGHT
25 TON	140 SHOTS	70 Oz.	10 SHOTS	5 Oz.

\* Each grease fitting

#### 5.4 Rod End Anti-Rotation Screw Adjustment

Every six months, the anti-rotation setscrews in the jack rod ends of the antenna should be checked and adjusted during routine maintenance when necessary. Each rod end has three tapped holes in a circular pattern around the pin connecting the jack to the pedestal or reflector. Each hole contains a setscrew which is adjusted to minimize the tendency of the jack screw to rotate when the jack is extended or retracted. Figure 11 shows a typical anti-rotation setscrew location.

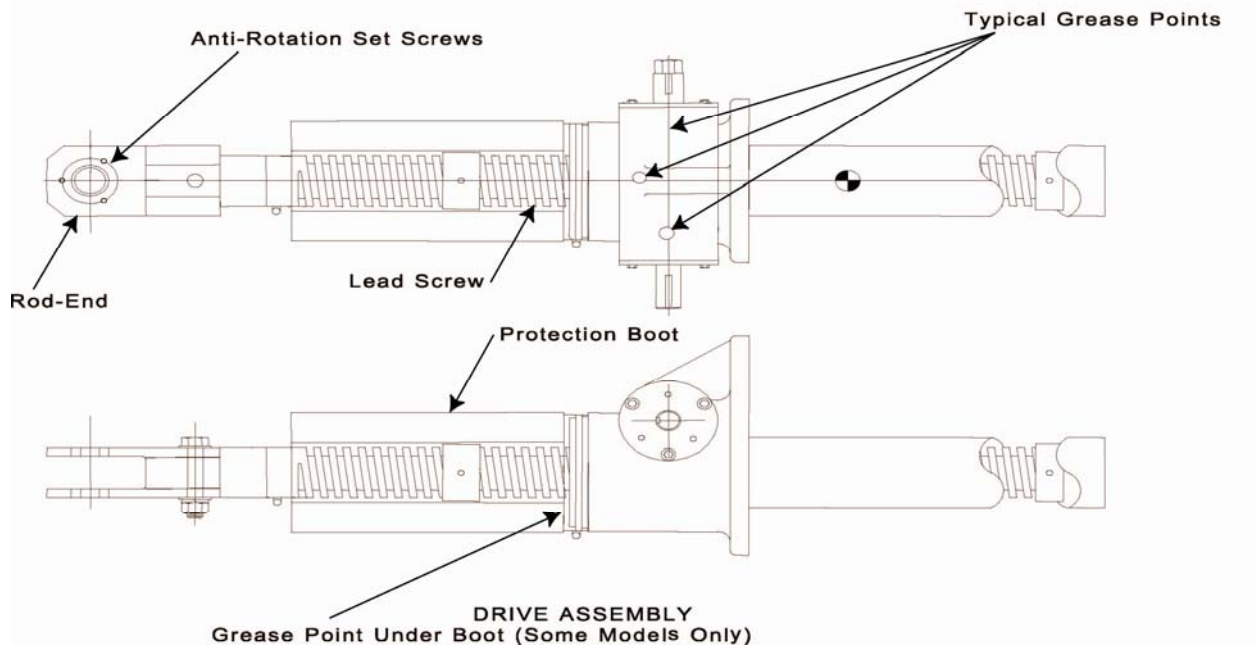


Figure 11. Anti-Rotation Setscrew and Grease Sert Location (Typical)

#### 5.5 Lightning Protection (Optional)

The lightning rods and ground cables must be checked periodically to insure continuity of conductance (good metal to metal contact).

## 6.0 OPERATING INSTRUCTIONS

### 6.1 Azimuth Drive Repositioning (if applicable)

Follow these instructions to move the azimuth drive assembly for extended travel.

### 6.2 Tools Required

The following tools and equipment are required for repositioning the azimuth drive assembly, in addition to hand tools, wrenches, drift pins, etc., used during installation.

<u>Tools/Equipment</u>	<u>Quantity</u>
Small, mobile hoist, 4,000 lb capacity	1
Nylon Slings, 4,000 lb capacity, minimum	2
Come-along, 4,000 lb capacity, minimum	2

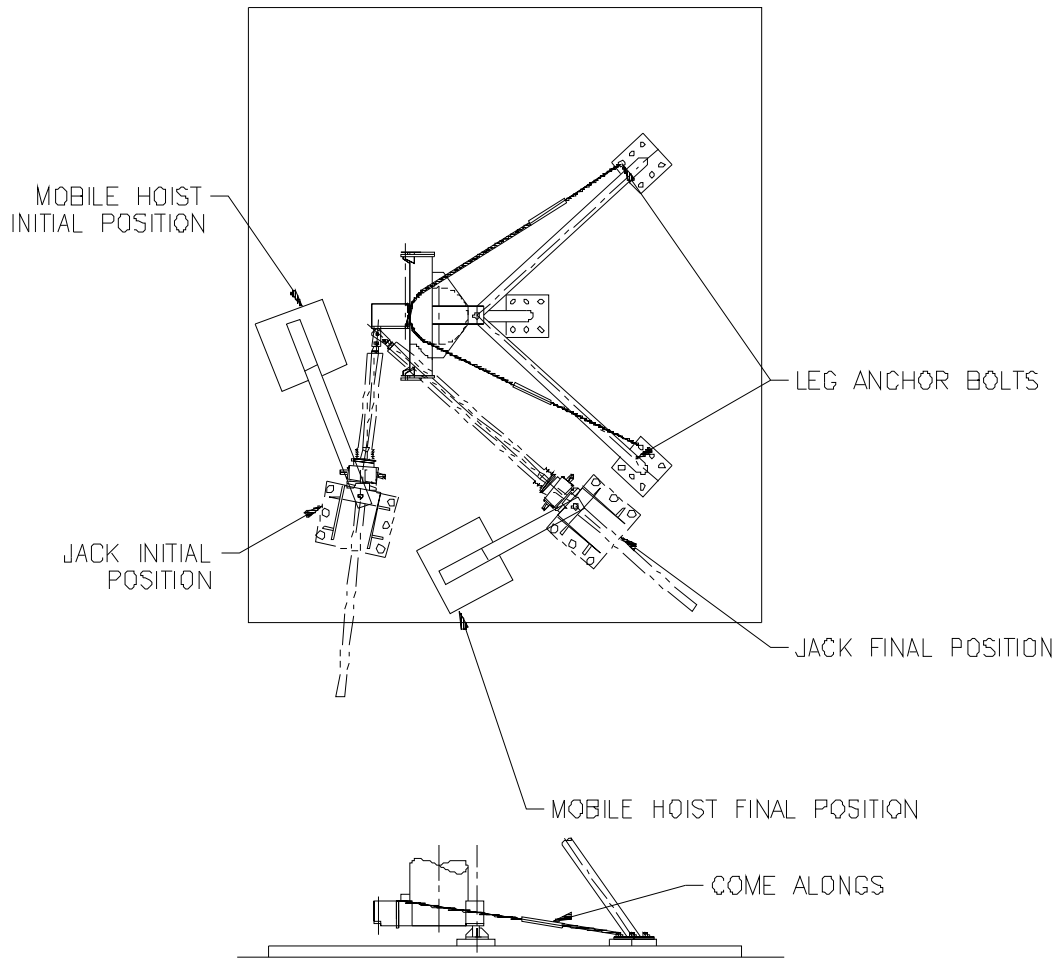
### 6.3 Procedure

- Step 1.** Ensure both drive positions have been grouted prior to repositioning the azimuth drive assembly.
- Step 2.** Raise the reflector assembly (antenna assembly) to the elevation drive assembly high limit, approximately 90°.
- Step 3.** Extend or retract the jack fully so the pedestal moves toward the new azimuth jack position.
- Step 4.** Using two (2) 4,000 lb. capacity come-alongs, tie the pedestal to the two opposing leg anchor bolts to prevent motion when azimuth jack is disconnected. Use the inside anchor on one leg as not to interfere with the mounting of the jack on the back pad.
- Step 5.** Move the mobile hoist to the initial position, as shown in Figure 12.
- Step 6.** Remove the hexagonal nuts and washers from the azimuth jack mount.
- Step 7.** Remove the retaining ring from the bottom of the clevis pin.
- Step 8.** Remove the pin and washers, noting the position of the washers.
- Step 9.** Retract or extend the azimuth jack sufficiently to disengage the clevis from the pedestal.
- Step 10.** Remove electrical power from the antenna system.
- Step 11.** Tag the electrical power disconnect switch.
- Step 12.** Disconnect and tag the electrical connections to the azimuth drive jack assembly.
- Step 13.** Position the slings under and around the azimuth drive jack assembly.
- Step 14.** Attach the slings to the mobile hoist hook.
- Step 15.** Using the mobile hoist, raise the azimuth drive jack assembly clear of its mounting bolts.
- Step 16.** Using the mobile hoist, move and position the azimuth drive jack assembly at its new location.
- Step 17.** Lower the azimuth drive jack assembly carefully on the mounting bolts of the new pad.

**CAUTION! DO NOT DAMAGE BOLTS THREADS WHILE LOWERING AZIMUTH DRIVE JACK ASSEMBLY INTO POSITION.**

- Step 18.** Replace the washers and hexagonal nuts removed in Step 6.
- Step 19.** Tighten the hexagonal nuts.
- Step 20.** Reroute the electrical cables for the azimuth drive jack assembly.
- Step 21.** Connect the electrical connections disconnected in Step 12.
- Step 22.** Extend azimuth drive jack sufficiently to align clevis in pedestal.
- Step 23.** Replace the clevis pin.
- Step 24.** Ensure clevis pin is fully seated. If clevis pin is not fully seated, tap the pin, using a small hammer, until the pin is fully seated.
- Step 25.** Ensure the washers are replaced in the same position as they were when removed in Step 8.
- Step 26.** Replace the retaining ring on the clevis pin.
- Step 27.** Recheck the anchor bolts to ensure the hexagonal nuts are tightened to the specifications.
- Step 28.** Remove the two (2) come-alongs from the pedestal.
- Step 29.** Remove the slings from the azimuth drive jack assembly.
- Step 30.** Remove the mobile hoist from the antenna area.
- Step 31.** Check the antenna area for obstructions and/or hazards for antenna movement.
- Step 32.** Move the antenna on its azimuth axis to ensure it moves according to specifications.
- Step 33.** Extend the azimuth drive jack to its full travel.
- Step 34.** Reset the limit switch for this travel.
- Step 35.** Retract the azimuth drive jack to its minimum.
- Step 36.** Reset the azimuth drive assembly limit for this travel.
- Step 37.** Return the elevation drive assembly to a known look angle.
- Step 38.** Return the azimuth drive jack assembly to a known look angle.
- Step 39.** Resume normal antenna operation.





**Figure 12. Azimuth Jack Drive Assembly Repositioning**

## **7.0 ELECTRICAL COMPONENT WIRING (OPTIONAL)**

Kingpost antennas requiring motorized axis drives are factory pre-wired to a certain extent to provide a smooth and straight forward interface during initial erection, as well as to insure a neat and orderly system to aid in future maintenance. Such systems are pre-wired to interface with any one of a number of control systems which may be used with the antenna to provide varying levels of control, from simple jog, to sophisticated steptrack systems. The following is a description of electrical component and subassembly wiring for the motorized kingpost antenna.

### **7.1 Hub**

Cables from the various peripheral devices about the elevation axis, including elevation synchro and limit switch, polarization drive motor, limit switch, and synchro, are gathered together and carried down to the pedestal via electrical conduit.

### **7.2 Pedestal Wiring**

The various cables exiting the hub in conduits are routed to the top of the pedestal and then through the pedestal to the main conduit fittings, located on the front of the pedestal, approximately four feet above the foundation. All wires and cables are then routed through flexible conduit from the main fittings to the local antenna control unit.

### **7.3 Azimuth Drive Motor**

Wiring for the azimuth drive motor is facilitated by cabling in conduit underground between the outside control unit and drive assembly.

### **7.4 Connection Diagrams**

Connection diagrams for all of the above-mentioned peripheral devices are shown on the electrical installation drawings which are provided as contract requires for the different systems available.

## 8.0 WARRANTY

SATCOM Technologies warrants the items ordered hereunder at the time of shipment to be free from defects in material, workmanship, and to conform to the contract specification. SATCOM Technologies' liability under this Warranty shall terminate one (1) year after date of acceptance or eighteen (18) months from the date of shipment, whichever comes first. Some individual products include extended warranties as stated in brochure(s) and extended warranties may be purchased as requested and quoted. Written notice of any defects shall be given SATCOM Technologies upon discovery and SATCOM Technologies shall promptly correct such defects by repair or replacement, at its option, without charge, either FCA SATCOM Technologies' plant or service in the field.

**IN NO EVENT SHALL SATCOM TECHNOLOGIES' LIABILITY UNDER THIS WARRANTY EXCEED THE COST OF REPAIR OR REPLACEMENT OF SUCH DEFECTIVE ITEM AND UNDER NO CIRCUMSTANCES SHALL SATCOM TECHNOLOGIES BE LIABLE FOR SPECIAL OR CONSEQUENTIAL DAMAGES.**

Specifically excluded from this Warranty are:

- a. Defects or nonconformance caused by and resulting from improper operation, maintenance, or storage of the equipment.
- b. Items of characteristically indeterminate life, such as bulbs, fuses, etc.

**THIS WARRANTY CONSTITUTES SATCOM TECHNOLOGIES' SOLE AND EXCLUSIVE LIABILITY HEREUNDER AND BUYER'S SOLE AND EXCLUSIVE REMEDY FOR DEFECTIVE OR NONCONFORMING ITEMS AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS IMPLIED OR STATUTORY (INCLUDING THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE).**

## 9.0 **VENDOR INFORMATION**

Contact SATCOM Technologies' sales department for information regarding the purchase, replacement, and/or special servicing of OEM components.

SATCOM Technologies  
2600 N. Longview St.  
Kilgore, Texas  
75662-6842  
USA

Telephone: 903-984-0555  
Fax: 903-984-7597

## APPENDIX A. REPORTING LOSS OR VISIBLE DAMAGE

Some damage may occur to the parts during the shipping process. A claim should be filed with the carrier at the time of receiving the equipment or after completion of parts verification. Follow the "Reporting Loss or Visible Damage", "Reporting Concealed Damage", and "Reporting Missing Parts" when filling a claim with the carrier.

### **Reporting Loss or Visible Damage**

Make a note of any loss or damage on the freight bill or receipt signed by the carrier's agent. Failure to adequately claim such loss or damage may result in the carrier refusing to honor a damage claim. The form for such a claim can be acquired from the carrier.

### **Reporting Concealed Damage**

The contents may be damaged in transit due to rough handling that may not show any external damage. For any of the concealed damage discovered after unpacking the unit, make a written request for an inspection by the carrier's agent, and file a claim with the carrier.

### **Reporting Missing Parts**

After opening the shipment, an inventory of the parts should be completed. Check items received in the shipment. If there is any item missing, please notify SATCOM Technologies immediately by contacting Project Managing Department.

### **Returning**

Thorough consideration has been taken by SATCOM Technologies to ensure that all antenna items arrive in safe working order. Occasionally, equipment may be received that is not in working condition due to reasons beyond manufacturer's control. Upon review of the completed claim forms, SATCOM Technologies will determine disposition as to return, repair and/or replacement. The return process can be expedited by following this procedure:

- a. Notify SATCOM Technologies' Project Managing Department by telephone or fax, giving a short description about the missing items or damaged components. (Phone (903) 984-0555, Fax (903) 984-1826).
- b. Tag or identify the defective equipment, noting the defect or circumstance. Pack the equipment in a sturdy shipping container with some protective packing materials, and return it to SATCOM Technologies.
- c. When returning items to SATCOM Technologies, please include all available information regarding sales order number, purchase order number, delivery date and other pertinent information to properly identify the antenna. Also, please include the following information:

Your company name

Your address with city, state and country

Your telephone and fax numbers

The individual's name SATCOM Technologies should contact

**APPENDIX B. SUMMARY OF “TURN-OF-THE-NUT” PROCEDURE FOR TIGHTENING FASTENERS**

All A325 and A490 fasteners shall be tightened per this procedure unless otherwise specified.

All bolts in the connection shall be brought to “Snug Tight” then tightened additionally by the amount listed in the table below, with the tightening progressing from the most rigid part of the connection to its free edge.

“Snug Tight” is defined as the condition of securing until connection plies are in firm contact.

Bolt length	Number of Turns Past “Snug Tight”		
	Faces Normal	One Face Sloped <1:20	Both Faces Sloped <1:20
Up to 4X diameter	1/3 turn	1/2 turn	2/3 turn
>4X to 8X diameter	1/2 turn	2/3 turn	5/6 turn
>8X to 12X diameter	2/3 turn	5/6 turn	1 turn

*Note: Turns defined as nut rotation relative to bolt regardless of which is turned.*