DOCUMENT 500-0563, 6.3 M Antenna Installation Manual

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

Document No.	Description
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
C4 Systems

INSTALLATION MANUAL

For

VertexRSI Model 6.3-meter KPK/KPC
Satellite Earth Station Antenna

500-0563

Revision D
October 29, 2002

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REV	DESCRIPTION	DATE	WRITER	CHECK	APPR.
D	EC # 03-0033	10/29/02	JRF	JRS	SPK
C	EC # 00-0381	02/25/00	CLW	JDH	CLS
B	EC # 00-0061	10/28/99	CLW	DLD	CLS
A	Original Release	10/11/99	TLF	CLW	CLS

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 for 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!

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1.0 SCOPE

The VertexRSI Model 6.3-meter bolt-together antenna delivers exceptional performance for receive only and transmit-receive worldwide applications. The Model 6.3M KPK/KPC antenna offers a deep-dish reflector that incorporates precision-formed panels, radials, and hub assembly with matched tooling for ease of assembly without complex field alignment. The antenna features an innovative compact Cassegrain subreflector and unique feed design that results 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. The pedestal is designed for ±60° Azimuth (AZ) travel coverage and is adaptable to ground or rooftop installations.

It is very important to understand the entire installation procedure to avoid any mistakes that could result in permanent damage to the antenna. Therefore, VertexRSI strongly suggests the antenna installer read this manual thoroughly before starting the installation and follow the steps precisely. VertexRSI 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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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 VertexRSI Model 6.3-meter bolt-together antenna is packaged in several cartons. VertexRSI has labeled each carton with model number and contents for easy identification. Once received, the antenna shipping cartons should be inspected and verified for proper antenna model number. If discrepancies are found, please contact VertexRSI for correction. If exterior packing label is unavailable, open the carton 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. 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 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 VertexRSI 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 2-1. Crane (Lifting Device)

Task	6.3 Meter	
	Size (minimum)	**Boom**
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)

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

Table 2-2. Weight Summary

Component	Unit Weight
Reflector assembly	1,350 lbs. (612 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)	400 lbs. (181 kg)
Shipping weight (typical)	4,980 lbs. (2259 kg)

2.1.5 Tools for Installation. This VertexRSI Model 6.3-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 2-3. Tool List

#	Description	Model	Qty.
1	3/8" Cordless Drill w \Chuck	29435A13	1 ea.
2	Battery Screw Driver	7183A51	1ea.
3	Battery Charger for Screw Driver	7183A53	1ea.
4	Spare Battery for Screw Driver	7183A55	1ea.
5	Battery Charger for Drill	4048A12	1ea.
6	Spare Batteries for above Drill	3972A22	1ea.
7	1/4" Flexible Ext. 4" to 6" Lg.	5521A23	1ea.
8	1/4" Adapter for Cordless Drill	5521A31	1ea.
9	1/4" Adapter for Elect. Screw Driver	5716A12	1ea.
10	1/4" Drive Deep Sckt. 5/16"		2ea.
11	1/4" Drive Deep Sckt. 3/8"		2ea.
12	1/4" Drive Deep Sckt. 7/16"		2ea.
13	1/4" Drive Sckt. Std. 5/16"		2ea.
14	1/4" Drive Sckt. Std. 3/8"		2ea.
15	1/4" Drive Sckt. Std. 7/16"		2ea.
16	1/4" Drive Ratchet	5540A36	2ea.
17	1/2" Drive Ratchet	7308A56	1ea.
18	1/2" Drive Sckt. 9/16"		1ea.
19	1/2" Drive Sckt. 3/4"		1ea.

20	1/2" Drive Sckt. 15/16"		1ea.
21	1/2" Drive Sckt. 1/2"		1ea.
22	Phillips Screw Driver #2	5682A28	2ea.
23	Slotted Screw Driver	5682A19	2ea.
24	Open Box Wrench 5/16"		2ea.
25	Open Box Wrench 3/8"		2ea.
26	Open Box Wrench 7/16"		2ea.
27	Open Box Wrench 1/2"		2ea.
28	Open Box Wrench 9/16"		2ea.
29	Open Box Wrench 3/4"		2ea.
30	Open Box Wrench 15/16"		2ea.
31	Putty Knifes	3668A2	2ea.
32	24" Crescent Wrench	5385A18	1ea.
33	2 lb. Machinist's Hammer	5882A1	1ea.
34	Claw Hammer	6062A2	1ea.
35	Wrecking Bar	5992A2	1ea.
36	Tin Snips	3585A12	1ea.
37	Snap Ring Plier Set	5667A46	1ea.
38	Machinist's Flat File	4219A35	1ea.
39	Rat Tail File	4233A27	1ea.
40	Panel Align. Tool Punch Point w \Handle	3603A2	2ea.
41	Spring Clamps	5167A8	4ea.
42	(Bolt Bags)Work Apron	6777A11	2ea.
43	Roll Emery Cloth 150 Grit	4684A021	1ea.
44	Allen Key Hex Sets	7162A13	1ea.
45	25' Tape Measure	6802A16	1ea.
46	Tool Box	6379A11	1ea.
47	Nylon Straps 2" X 10'	3383T466	2ea.
48	3 Ton Shackles	3558T51	2ea.

2.1.6 **Applicable Documents.** Assembly drawings are required for operation and maintenance of the 6.3-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 VertexRSI 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.

Document No.	Description
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 3-1 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.*

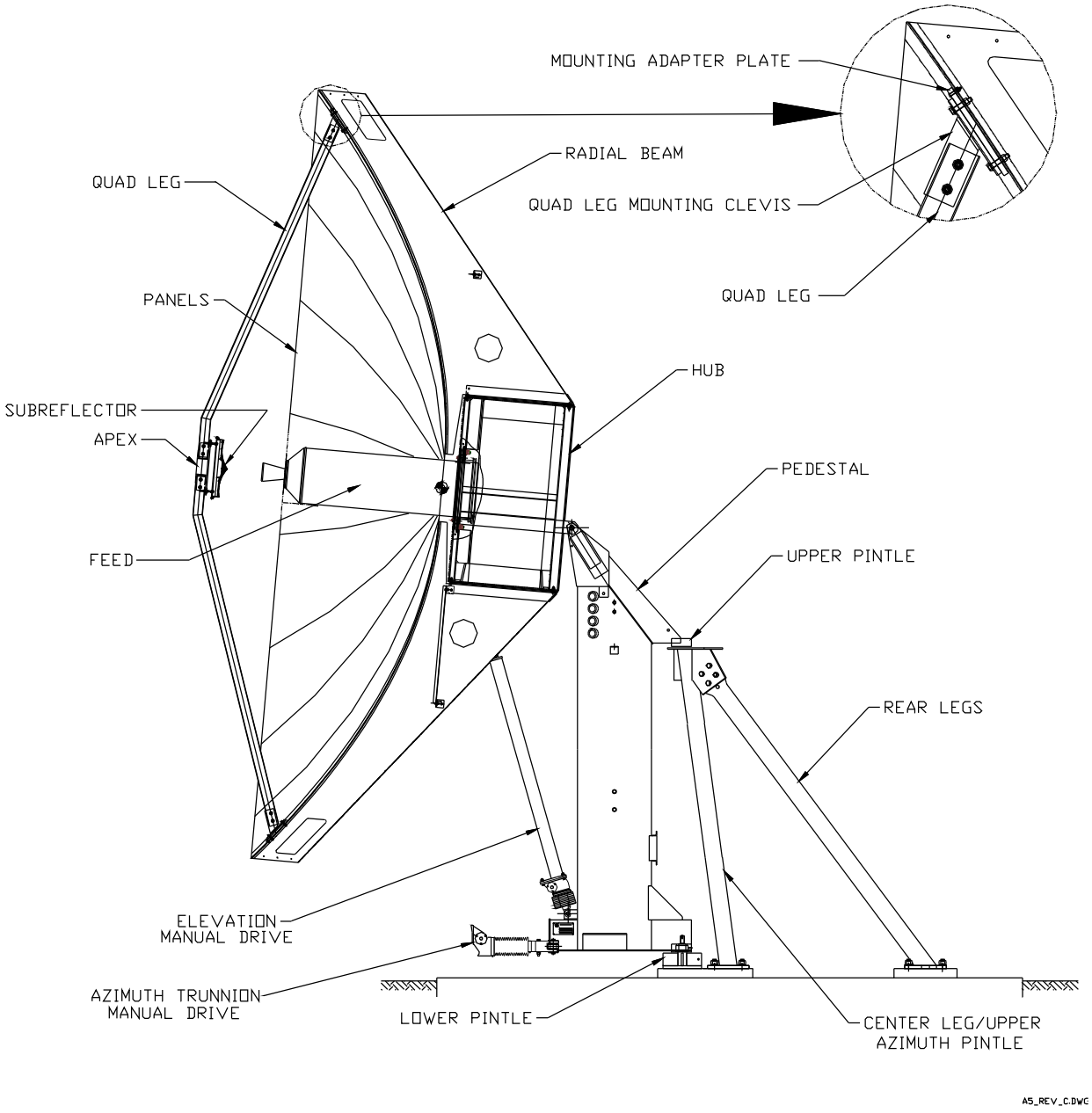

Figure 3-1. Fully Assembled VertexRSI Model 6.3M Antenna

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.*

1. Install the center leg/upper azimuth pintle assembly to foundation. Use the nuts on anchor bolts 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.*

2. Install the other two legs on the inside of the center leg/upper azimuth pintle assembly and the foundation. Use the nuts on anchor bolts 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 Almagard or equivalent before executing the next 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 nuts on the anchor bolts with thrust plates to maintain a nominal 3" grout gap between the foundation surface and the bottom of the foot. Ensure lower pintle is level and 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 nuts on the anchor bolts 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.*

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).*

2. Rotate pedestal by pushing it until the pedestal is at one of the azimuth limits.
3. Place a level vertically on the front centerline of the pedestal tube and adjust the nuts 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.*

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

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".*

6. Repeat Steps 1 through 5 until all positions are level.
7. Level and connect AZ jack.
8. Grout lower pintle, legs, and azimuth jack base. See VertexRSI Document 300-2436.
9. Secure the azimuth jack, with trunnion attached, to pedestal using pins and hardware pre-installed in drive assembly.
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

1. Install the elevation manual drive assembly to the pedestal using the pre-installed pin.
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 3-2 of this document and Drawing 630024 in the print pack.*

1. Position the two concentric V-rollers on the hub. (Concentric rollers have a ∅=0.75" stud.)
2. Position the LP feed drive tube, chain guide inside the hub, in the grooves of the two concentric V-rollers.
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 ∅=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.*

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.
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.
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. Refer to Drawing 630024 in the print pack.*

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.
8. Install and fully tighten the mounting hardware.

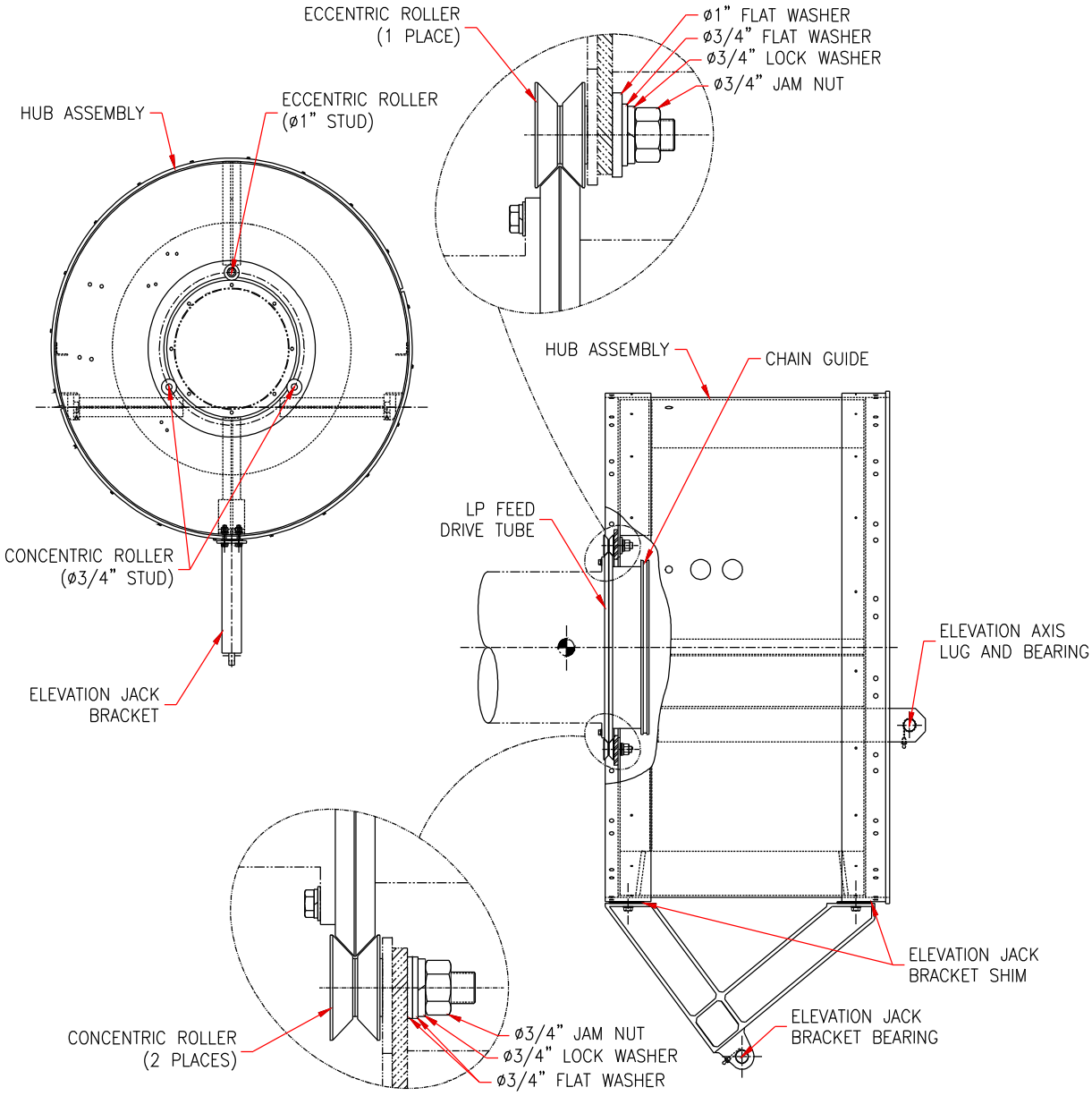

Figure 3-2. LP Feed Interface Installation

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!*

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 3-3.)

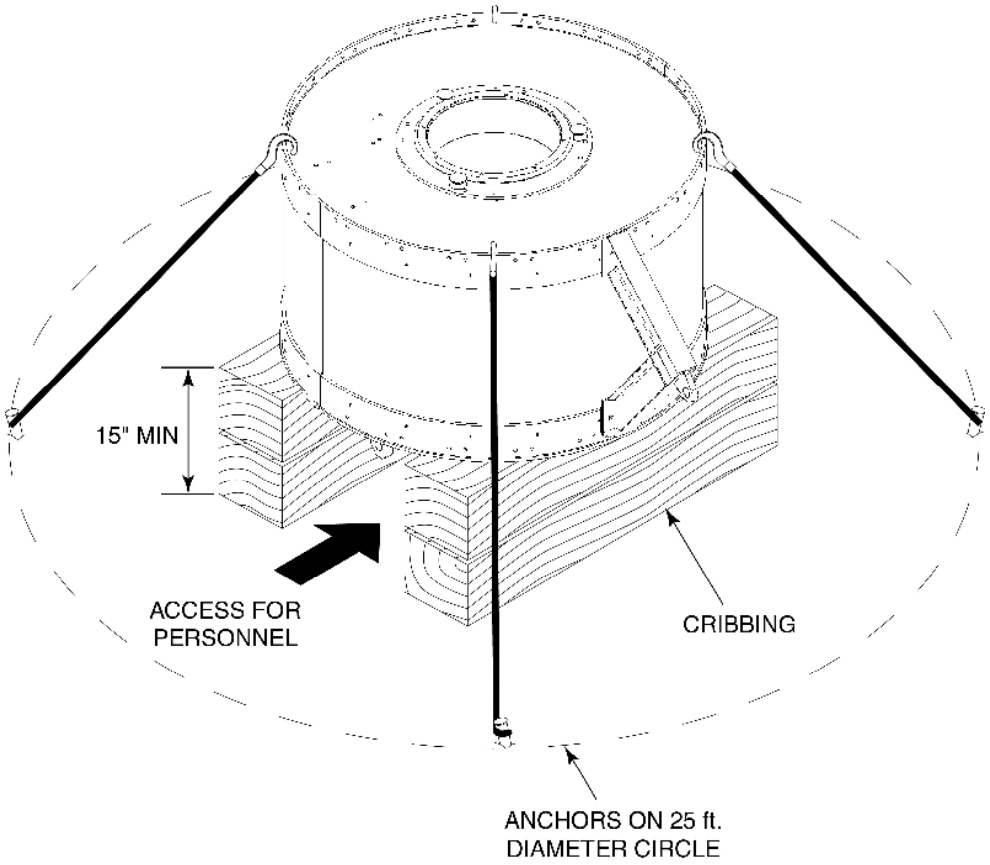

Figure 3-3. Secured Hub

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 3-3. Straps should be place 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.*

3. Install the elevation jack bracket to the hub (if not factory installed.) Completely tighten the mounting hardware. (See Figure 3-2 and Drawing 630021).
4. 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.
5. Attach each radial beam, one at a time, to the hub with the ½" 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 3-4).
6. 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 3.5.7 in this document.*

3.5.3 Outer Lacing Installation

Install the 20 contoured outer lacing members using the ¼" diameter hardware provided. (See Figure 3-5 and Drawing 630001). Finger-tighten hardware.

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.*

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.
2. Maneuver a panel so that it lies on top of two adjacent radials and the outer lacing member in a reflector bay. Temporarily hang the panel from the heads of the outer lacing mounting bolts. (See Figure 3-5).
3. Place the outer lacing shim between the panel and outer lacing member, aligning the holes in all three parts. (See Figure 3-5 and Drawing 630001).

Figure 3-4. Radial Beam Installation

4. Install machine screws (head on the panel side) through the panel and outer lacing members.

5. Install machine screws (head on the panel side) through the panel and radials working from the outboard edge of the panel toward the hub.

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.
7. Repeat Steps 1 through 6 for each reflector bay. Progressively work from one bay to the adjacent bay without skipping.
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

1. Completely tighten all panel-to-outer lacing screws for all bays.
2. 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.
3. Completely tighten the outer lacing-to-radial bolts for all bays.

3.5.6 Structural Lacing Installation

1. Install the 2-1/2" X 2-1/2" angle clips for mounting the torsional and ring lacing. Finger-tighten the hardware. (See Figure 3-5 and Drawing 630001).

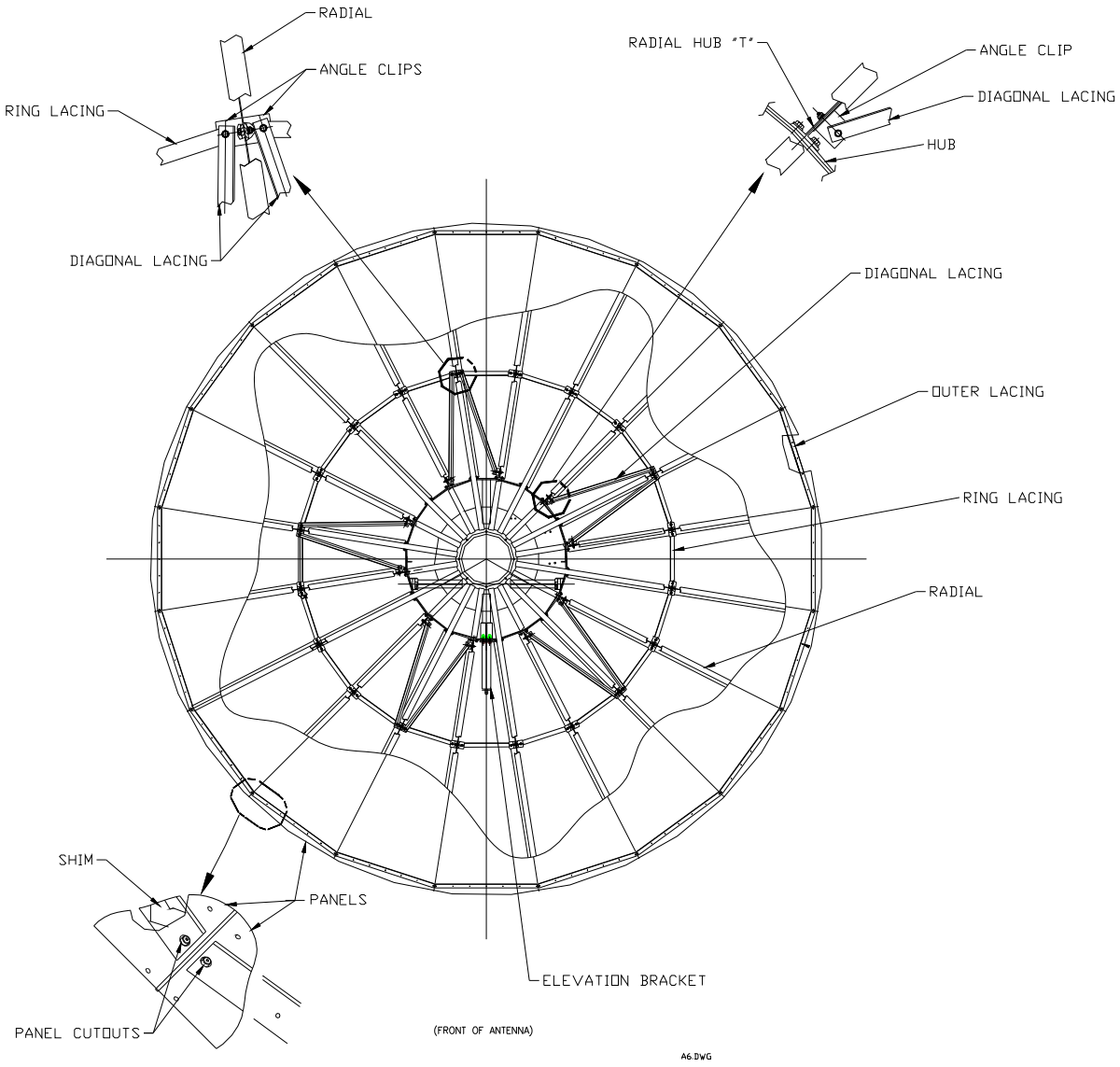

Figure 3-5. Reflector Lacing Assembly

2. Install the torsional and diagonal lacing members. Installation must be simultaneous as these members share fasteners in some locations. Finger-tighten the hardware.
3. Position the horizontal surface of each structural lacing angle clip such that it is level. Fully tighten the mounting hardware for the clips.
4. Fully tighten the mounting hardware for all ring and torsional lacing.

3.5.7 Main Reflector Assembly in Windy Conditions

Note: *When assembling the reflector in windy conditions, special care must be taken to avoid damaging reflector components during assembly. Windy 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 outer lacing members and ring and torsional lacing members. This procedure limits the movement caused by wind and minimizes the chances of damage occurring.*

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.
2. Mount the next radial adjacent to the first. Fully tighten hardware. Install outer lacing member between the two radials. Install structural lacing angle clips, diagonal, and torsional lacing using the procedures described above. Lacing hardware should be finger tight
3. Continue installing radials to the hub, one at a time. Install lacing members after each radial is installed. Add more nylon ropes as needed to prevent excessive movement of the structure.
4. It is not recommended that panels be installed in windy conditions. If the radial and lacing structure is to be left overnight, snug all bolts. Be certain to loosen all lacing hardware prior to beginning panel installation described in Section 3.5.4.

3.5.8 Apex/Quad Leg Mounting Clevises Installation

At each of the four clocking positions indicated in Figure 3-6, install the quad leg mounting clevises and adapter plates (beveled side toward reflector surface) to the reflector using the 3/8” diameter hardware provided. Fully tighten hardware.

Caution! *The quad legs and therefore the quad leg mounting clevises must be installed at the clocking positions shown in Figure 6 for the antenna to perform as designed. Should the quad legs be installed in any other clocking position, unpredictable performance will result.*

3.6 Reflector-to-Pedestal Installation

1. Clean and lubricate the bearings on the elevation axis lugs and elevation jack bracket on the hub. (See Figure 3-2).
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.

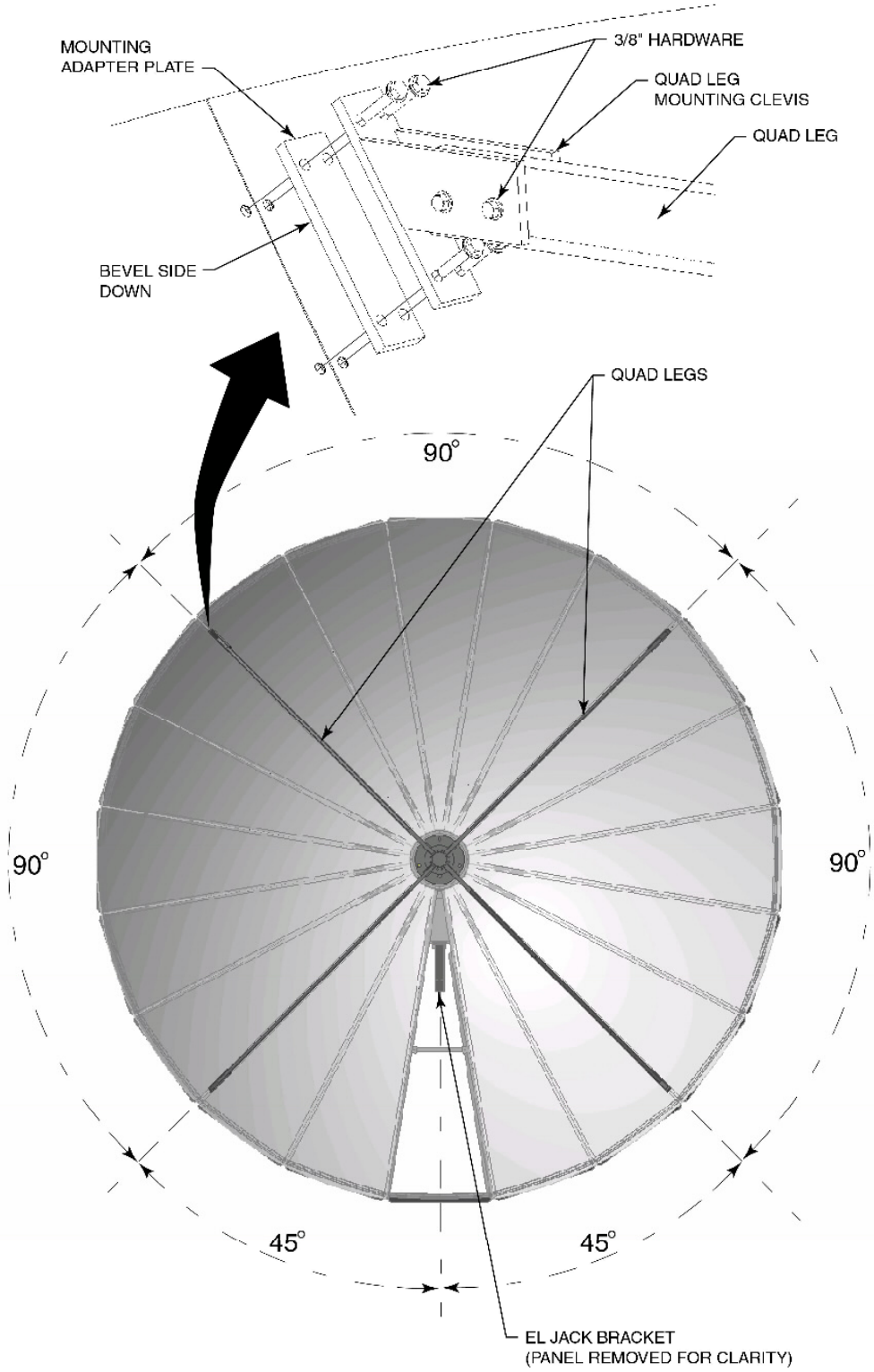

Figure 3-6. Quad Leg Installation

Note: *Figure 3-7 shows the reflector fully rigged for lift to the pedestal.*

3. Install reflector lifting tool per Drawing 029448 provided in the print pack.
4. Install shackle in lug of eye bolts. (See Figure 3-7)
5. Attach choker to shackle.

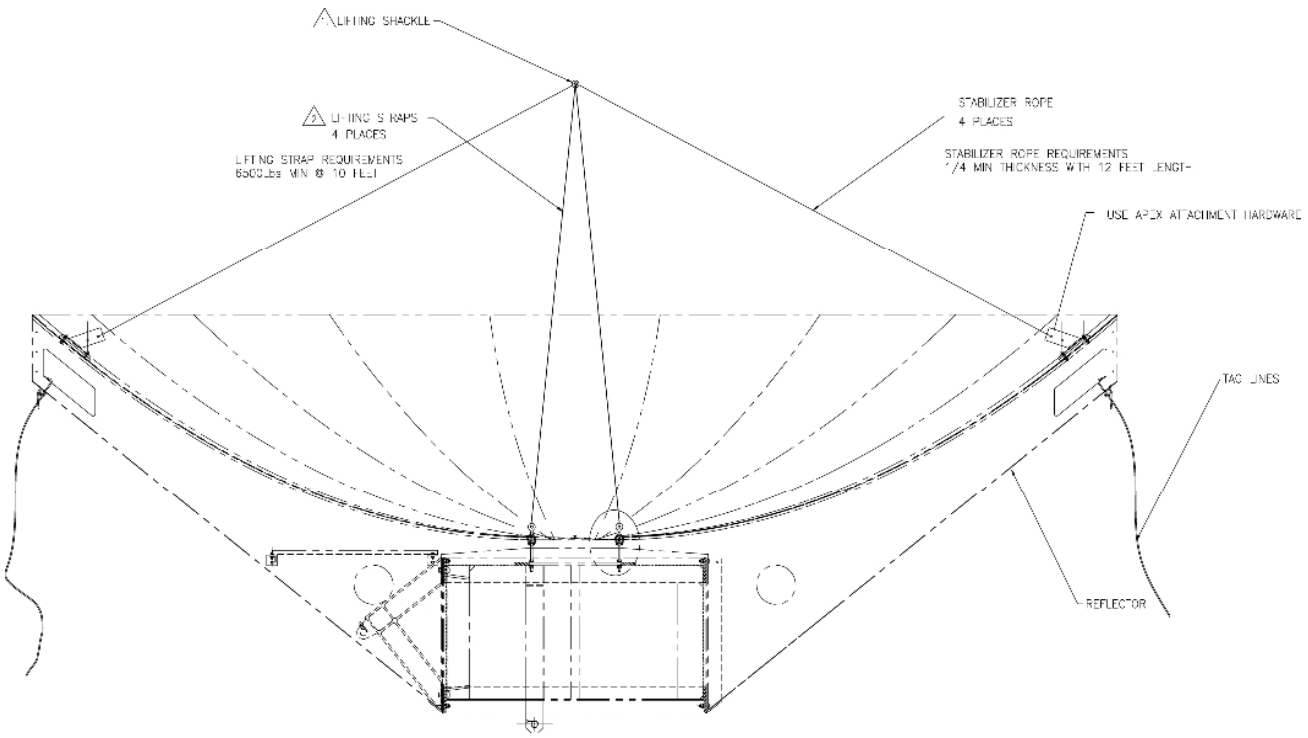

Figure 3-7. Rigging for Reflector Lift

6. Attach lifting straps to shackles.
7. Install one bolt in each quad leg clevis.
8. Loosely tie nylon rope from each quad leg mounting clevis to the lifting line. (See Figure 3-8).
9. Use crane to pull slack from choker by picking up approximately 1,000 lbs.
10. Tighten the nylon ropes.
11. Attach tag lines to the reflector ring lacing members.

Figure 3-8. Reflector Rigging at Quad Leg Clevis

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 Antenna Installation Drawing and Figure 3-9.*

13. Pin the elevation jack to the elevation jack bracket previously installed on the hub.
14. After the reflector has been secured to the pedestal assembly, remove the lifting equipment from the reflector. Walk only on the radial beams.

3.7 Feed Installation

Install the feed assembly per Drawing 630024. Use crane and choker to lift feed into position.

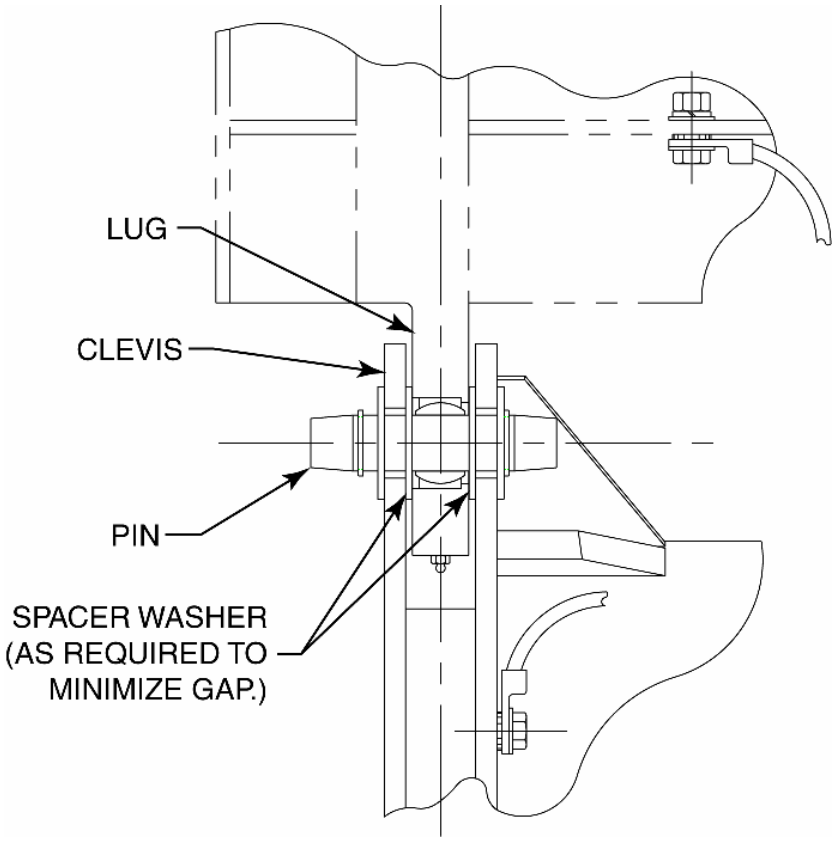

Figure 3-9. Clevis with Spacer Washer(s)

3.8 Apex/Quad Leg Installation

Note: *Refer to Drawing 630001 and Figure 3-1 of this document for the following steps.*

Note: *Use the following steps if a lifting device is available.*

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

Note: *The subreflector assembly may be attached to the apex prior to lifting the apex/quad leg assembly. (See Section 3.9).*

2. Lift the Apex/Quad Leg assembly with the lifting device and position such that the legs may be fitted into the reflector-mounted clevises. Attach the legs to the clevises using the 3/8" hardware provided. Snug the bolts; do not fully torque.
3. 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. Use the shims provided as required to obtain a tight joint between the quad leg and apex.

Note: *Use the following procedure if a crane is not available.*

4. Place the apex, quad legs, and hardware in the reflector with the reflector in the stow position.
5. While one installer holds the apex in position above the feed horn, another installer should attach the legs, one at a time, to both the apex and reflector-mounted clevises using the 3/8" hardware provided. Snug the bolts; do not fully torque.

6. 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. Use the shims provided as required to obtain a tight joint between the quad leg and apex.

3.9 Subreflector Installation and Alignment

Note: *Refer to Drawing 630001, Figure 3-1 and Figure 3-9 of this document for the following steps.*

1. Secure the 6” long all-thread rods to the subreflector and lock in place with hex nut.
2. On each of the three mounting studs on the subreflector assembly, install one nut, one flat washer, and one plate washer, in sequential order.
3. 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.
4. 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.
5. 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 630001.
6. 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.*

7. 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.

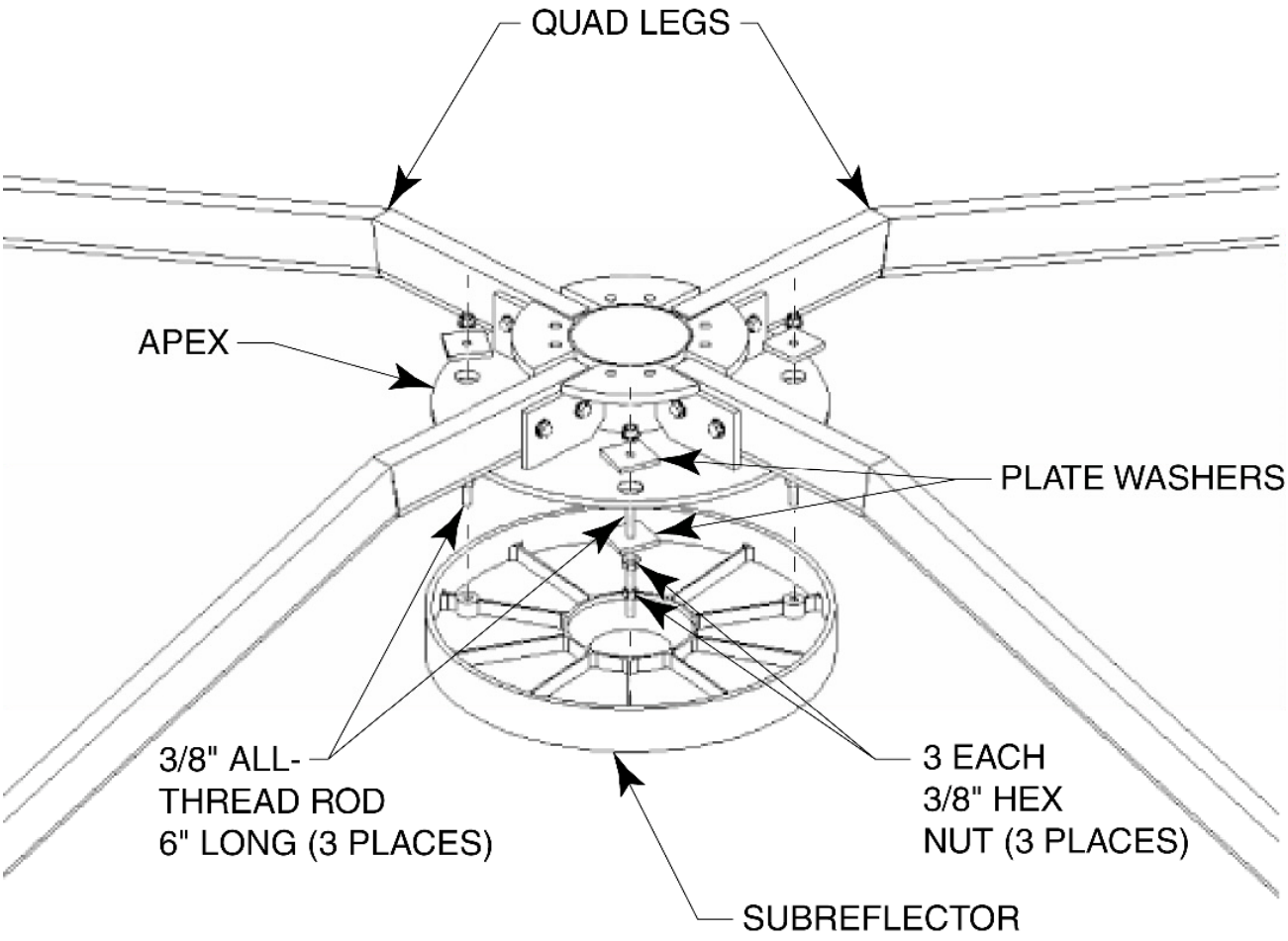

Figure 3-10. Subreflector/Apex Assembly

3.10 Final Alignment of Pedestal

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

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

3.11 Limit Switch Installation

1. Verify that limit switch installation, in the azimuth axis, is in accordance with the drawing provided in the print package.
2. Adjust travel limit stops as required to trip limit switch within mechanical travel.
3. Verify that limit switch installation, in the elevation axis, is in accordance with the drawing provided in the print package.
4. Adjust travel limit stop sleeves as required to trip limit switch within mechanical travel.
5. Install the polarization limit switch stop in accordance with the drawing provide in the print package.
6. Adjust position of stops to trip polarization limit switch travel at +/- 90°.

3.12 Positioning Transducers – Installation and Alignment

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

A complete list of drawings for this antenna is included in the print package.

Reflector Installation
Pedestal Installation
Azimuth Drive Installation
Azimuth Drive Assembly
Motorization Kit
Azimuth / Elevation Transducer Installation
Azimuth / Elevation Limit Switch Installation

4.0 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).

6.0 VENDOR INFORMATION

Contact VertexRSI antenna Products Division sales department for information regarding the purchase, replacement, and/or special servicing of OEM components.

VertexRSI Antenna Products Division
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 VertexRSI immediately by contacting Project Managing Department.

Returning

Thorough consideration has been taken by VertexRSI 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, VertexRSI will determine disposition as to return, repair and/or replacement. The return process can be expedited by following this procedure:

a. Notify VertexRSI 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 VertexRSI.

c. When returning items to VertexRSI, 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 VertexRSI 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.

	Number of Turns Past "Snug Tight"*		
Bolt length	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

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