Series 8345
Prime-Focus Manual Antenna

Installation Manual

Manual 33N074M
July 2008

Notice

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SAFETY SUMMARY

These are general safety precautions that are not related to any specific procedure. These are recommended precautions that personnel must understand and apply.

WARNING

Use care when using metal tools that circuits are not shorted. Some circuits have high current capacity which, when shorted, will flash and may cause burns and/or eye injury.

Remove all jewelry and exposed objects from body and clothing before performing maintenance, adjustments, and/or troubleshooting. Before working inside equipment, remove all power, unless power is required to be on to perform procedures. Do NOT replace parts or modules with power ON.

Servicing this equipment requires working with the equipment while AC power is applied. Extreme caution must be exercised during these procedures.

RESUSCITATION

Personnel working with or near hazardous chemicals or voltages should be familiar with modern methods of resuscitation.

USE SAFETY-APPROVED EQUIPMENT

When cleaners are being applied, approved explosion-proof lights, blowers, and other equipment shall be used. Ensure that firefighting equipment is readily available and in working order. Keep cleaners in special polyethylene bottles or in safety cans and in minimum quantities. Discard soiled cloths into safety cans.

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Chapter 1

General Information and Safety

1.1 Introduction

This manual describes the proper installation of the Series 8345 earth station antenna. The manual is divided into three chapters. Chapter 1 provides the safety precautions involved with the installation of the antenna, an overview of the antenna, its applications, features, specifications, physical and functional descriptions of its components, and available options. Chapter 2 provides information for selecting and evaluating an antenna site. Chapter 3 provides unpacking and installation information, including tools and equipment required, recommended installation sequence, and step-by-step installation procedures.

Important information concerning personal injury, damage to equipment, and increased efficiency or convenience is included as WARNINGS, CAUTIONS, and NOTES, respectively. Therefore, particular attention should be given to this information.

1.2 Safety Precautions

To ensure that installation is trouble-free, to minimize risks to installation personnel, and to prevent damage to equipment, it is necessary to observe the safety precautions provided below. Such information may be found throughout the manual in the form of a WARNING, CAUTION, or NOTE where:

WARNING

designates information concerning the possibility of bodily injury,

CAUTION

designates information concerning the possibility of damage to the equipment or other property, and

NOTE

designates information which may aid the efficiency and convenience of installation.

Carefully read and understand the following safety precautions before attempting to install the equipment:

- Read all instructions carefully before installing the antenna.
- Adhere to all warnings and cautions contained in the installation instructions.
- Make sure that at least two people are present at all times during installation.

WARNING

Do not attempt to assemble the antenna in winds exceeding 20 miles per hour.

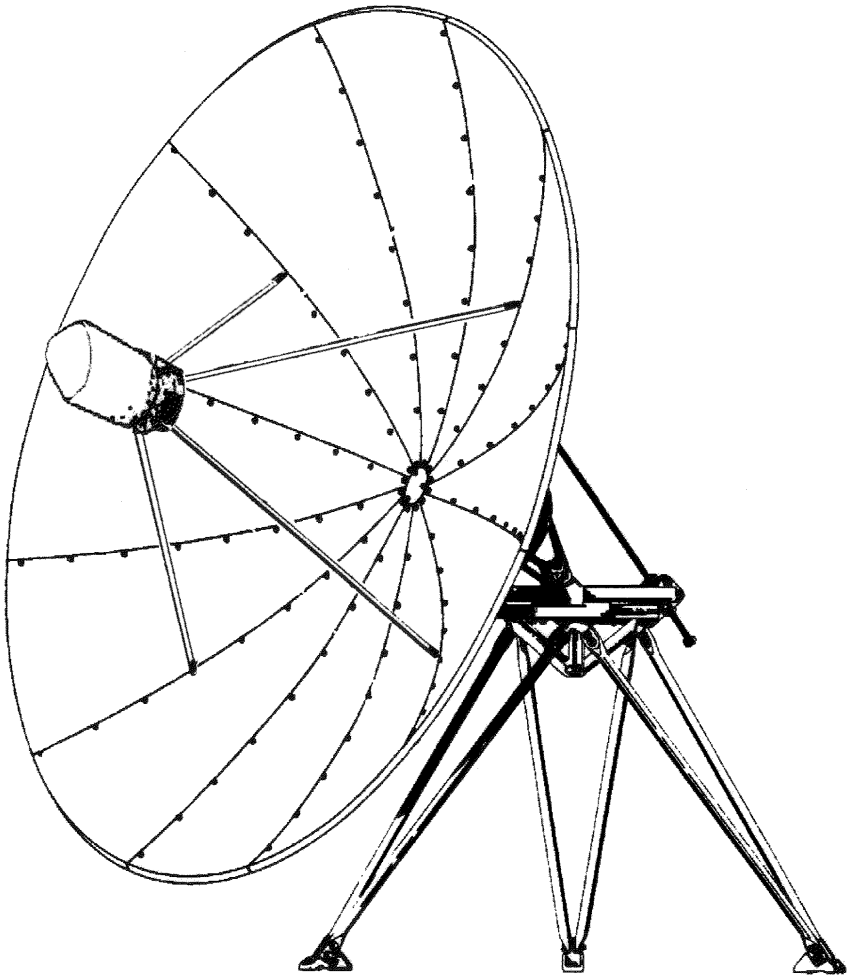
The antenna system should not be located near, and its movement should not make contact with, power or other electrical circuits.

During installation, extreme care should be taken to keep from touching any power lines or other electrical circuits.

Failure to observe these warnings may result in severe injury or death.

1.3 Equipment Description

The Series 8345 earth station antenna (Figure 1-1) is designed for quick and easy installation without special tools or hoisting equipment.



A concrete pier foundation kit is available as an economical alternative to a concrete slab foundation. The pier foundation is designed for steady 110 mph windloads. It consists of three cast pier inserts. A steel framework bolts the inserts into a triangle, which is lowered into three augered holes containing prepared re-bar cages; the holes are then filled with concrete. Installing the pier foundation is less time-consuming and less expensive than pouring a concrete slab foundation.

A standard elevation-over-azimuth mount is provided with the 4.5-meter antenna for both ease of operation and pointing accuracy. This mount provides continuous satellite arc coverage from any location in the contiguous United States. Pointing of the antenna is rapid and accurate. A 5° to 90° elevation range is provided for maximum pointing capability. Complete 360° azimuth coverage eliminates the need to align the

foundation to a specific heading, thereby also eliminating the possibility of installation errors associated with foundation centerlines.

The paraboloidal reflector consists of twelve precision, stretch-stamped steel panels for consistent surface accuracy. The twelve panels are uniform and completely interchangeable for handling convenience, lower shipping costs, and easy installation. After a foundation has been prepared, two people can install the antenna in one day. No special tools are required and no single part weighs more than 140 pounds (45 kg).

Each of the optional feeds offered with the 4.5-meter earth station antenna provides consistent high quality and unusual economy in a mid-sized antenna system. The Ku-band Feed provides dual-polarization, receive-only capability in the 10.9 to 12.75 GHz range. The C-band Feed provides dual-polarization, receive-only capability in the 3.7 to 4.2 GHz range.

1.4 Equipment Application

The 4.5-meter earth station antenna is designed for a wide range of applications and is especially well-suited for CATV operations receiving video programming from domestic satellites. Feeds are available for 3.7 to 4.2 GHz receive-only applications, 10.9 to 12.75 GHz receive-only applications.

1.5 Standard Features

The Series 8345 earth station antenna provides cost-effective high performance for a wide range of applications and includes the following features:

- Ease of installation
- Minimum maintenance
- Minimum shipping and installation costs
- Minimum site preparation requirements
- Full satellite arc coverage from any location in the contiguous United States (5° to 90° continuous elevation; 360° continuous azimuth)
- Elevation-Over-Azimuth Mount for ease of operation
- Interchangeable, stamped reflector panels for consistent surface accuracy (no panel adjustment or testing required)
- Protected environment for LNAs/LNBs
- Ku-band compatible

1.6 Options

For added ease of installation and a wider range of applications, the following options are available:

- Pier Foundation Kit (a low-cost alternative to the concrete slab foundation)
- C/Ku-band Feed (for receive-only applications in the 10.9 to 12.75 GHz range)
- Multi-beam Feed (for receiving up to 5 satellite beams – from satellites spaced 2° to 8° apart --with one dish)

1.7 Specifications

The Series 8345 earth station antenna has been designed and tested to meet the specifications listed in Table 1-1.

Table 1-1. Series 8345 Antenna Specifications[1]

Characteristic	Specification
ELECTRICAL	
Operating frequency	C-band 3.7 to 4.2 GHz Ku-band 10.9 to 12.75 GHz
Feed types	Ku-band, dual polarization C-band, dual polarization C-band dual-beam
Antenna gain	43.6 dBi at 4 GHz 53.1 dBi at 12 GHz
VSWR (Referenced at output of OMT)	1.3:1 maximum
Polarization	Dual linear
Polarization adjustment	360° continuous
Axial ratio	35 dB minimum on axis
Isolation between ports	35 dB minimum for dual linear operation
Half-power beam width (-3dB reference)	C-band 1.1° nominal @ 4 GHz Ku-band 0.4° nominal @ 12 GHz
First sidelobe	C-band -22.5 dB @ 4 GHz Ku-band -20 dB @ 12 GHz
Antenna noise temperature	C-band 24K at 30° elevation Ku-band 28K at 30° elevation

Table 1-1. Series 8345 Antenna Specifications[1]

Characteristic	Specification
Radiation pattern	C-band main beam <= theta <7.0 <29.0 - 25.0 (log (theta)) dbi Ku-band 1.0 <= theta < 7.0: <29.0 – 25.0 (log (theta)) dbi C- & Ku-band 7.0 <= theta < 9.2: < +8.0 dBi 9.2 <= theta < 48.0: <32.0 – 25.0 (log (theta)) dBi 48.0 <= theta < 180.0: < -10.0 dBi
Feed interface	CPR-229 flange (C-band) WR-75 flange (Ku-band)
GENERAL	
Antenna type	Prime-focus, paraboloidal
Antenna diameter	4.5-meter (14.83 ft)
Reflector construction	Stretch-stamped, 12-panel, 4.5-meter diameter
Mount configuration	Elevation-over-azimuth
Azimuth coverage	360° continuous
Elevation range	5° to 90° continuous
Satellite coverage	Any satellite in the visible geosynchronous arc, from any location in the contiguous U.S.
ENVIRONMENTAL	
Pointing accuracy	.054° rms in 30 mph winds gusting to 45 mph @ 59° F
Temperature range (operational)	-40°C to 65°C (-40° F to +149° F)
Survival[2]	Antenna designed to withstand steady winds up to 110 mph @ 59° F, 107 mph @ 32°F no ice, 99 mph @ -40° F no ice, 67 mph @ 32° F with 2-inch radial ice. (Ref. American National Standard Building Code Requirements, ANSI A58.1, with an effective velocity pressure of 30.9 psf.) Winds gusting to 125mph may cause some localized yielding.
Solar radiation	1. 1 mW/mm^2
Atmospheric conditions	Salt, pollutants and corrosive contaminants as encountered in tropical temperature, marine, and moderate industrial areas.

[1]Specifications subject to change without notice.

[2]All conditions assume proper installation and adjustable components securely clamped.

Chapter 2

Antenna Site Selection

2.1 Criteria For Antenna Site Selection

One of the most important factors to be considered for trouble-free, high-quality signal reception from desired satellites is the location of the antenna (the antenna site). For best signal reception, the antenna site selected should provide the following:

a. **Operational Clearance**. The site must allow clearance for antenna movement (in both elevation and azimuth) necessary for aiming and maintenance purposes.

b. **Clear Line-of-Sight**. The site must allow the antenna to be aimed at desired satellite(s) with no obstructions between any portion of the reflector and the satellite(s).

c. **Absence of Signal Interference**. The site must be free of strong microwave and other signal interference.

However, in order to evaluate the selected site against the above criteria, the antenna pointing position (aiming coordinates) for the desired satellite(s) must be determined. The methods of determining aiming coordinates for desired satellite(s) and for ensuring that the above criteria are met are described below.

2.2 Determining Aiming Coordinates

To receive signals from a desired satellite, an antenna must be positioned properly using the correct elevation and azimuth angles. The following procedure describes the method for determining the aiming coordinates for a given satellite at a specific site. This procedure should be used to evaluate the selected antenna site before the antenna is installed. The same procedure is also used following antenna installation to accurately aim the antenna.

1. Determine the latitude and longitude of your selected antenna site. For our example, Atlanta Georgia is 33.7° N latitude and 84.4° W longitude.

2. Obtain the longitude of the satellite from which you desire to receive signals. For our example, the satellite longitude is 131° W.

3. Calculate the local pointing angles using method A or B.

   - Method A.

   Use the site angle calculator available on the internet at url:
   http://www.satsig.net/ssazel.htm

   - Method B.

   Use the following formulas.

   Local Azimuth = ATAN(TAN((S1–S2)*0.017453)/SIN(S2*0.017453))*57.29578+180

   Local Elevation = ATAN(((COS((S1-S2)*0.017453))*(COS(S2*0.017453))-0.151263)/SQRT(1-((COS((S1-S2)*0.017453))^2)*((COS(S2*0.017453))^2)))*57.29578

   Where

   S1 = Satellite Latitude in decimal degrees. Enter West as positive numbers and East as negative numbers.

   S2 = Site Longitude in decimal degrees. Enter values as true angles (verses uncompensated magnetic compass readings) Enter North as positive numbers and South as negative numbers.

   S3 = Satellite Latitude in decimal degrees. Enter West as positive numbers and East as negative numbers.

2.3 Verifying Operational Clearance

After the antenna aiming coordinates have been determined, verify operational clearance (Figure 2-1). This ensures that antenna movement is unrestricted for both aiming and maintenance purposes.

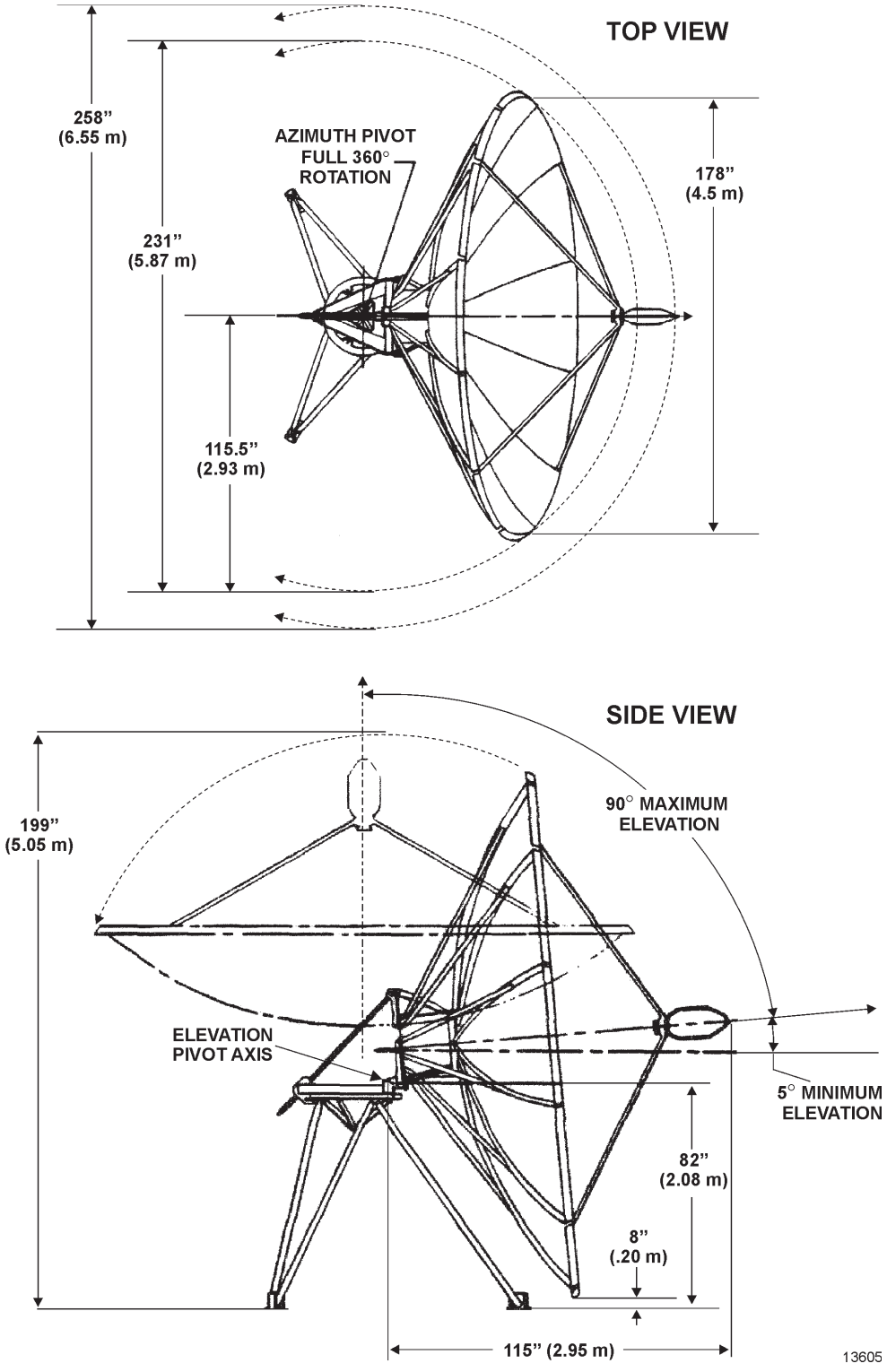


Figure 2-1. Clearance Requirements for 4.5-Meter Antenna

2.4 Verifying Clear Line-of-sight

After operational clearance has been verified, verify a clear line-of-sight. This ensures that the antenna may be aimed at the desired satellite(s) without obstruction between any portion of the reflector and the satellite(s). Using the satellite aiming coordinates for a particular site, be sure that there are no trees, buildings, powerlines, etc. between the dish location and the satellite. It is important that this clearance includes the total dish surface area and that nothing blocks any portion of the dish surface.

2.5 Verifying Absence of Signal Interference

For best signal reception, it is important that the selected antenna site be free of strong microwave or other signal interference. Microwave systems near a selected antenna site can cause interference. If a known source of interference (a microwave tower, for example) is close by, it may be necessary to have a site survey performed to determine the site's suitability.

CAUTION

No buildings, walls, fences, or other permanent fixtures should be planned for installation any closer than two meters from the antenna and foundation envelope without consultation with the factory.

Chapter 3

Antenna Installation

3.1 Unpacking and Inspection

NOTE

Do not empty packages containing parts. Remove parts from packages only as needed during installation. Because the part numbers are provided only on the packages, if the parts are emptied from the packages, identifying parts would be difficult. This could result in improper installation.

Upon receipt of the shipping carton, carefully compare the bill of lading with the equipment actually received, checking for equipment damaged during shipment. Sift through all packing materials before declaring missing equipment.

NOTE

To declare equipment as damaged or lost, it is important to save the shipping carton. The inspector must examine the carton prior to completing the inspection report.

3.1.1 Equipment Damage or Loss During Shipment

When equipment is damaged or lost in transit, the carrier (delivering transportation company) is required by law to make note of damage or loss on the freight bill. The carrier, not the shipper, is responsible for all damage or loss. In the event of equipment damage or loss during shipment, the carrier of the equipment should be contacted immediately.

3.1.2 Equipment Return Procedure

SSE's Satellite Ground Systems division makes every reasonable effort to ensure that all items arrive safely and in working order. When equipment is received, which is not in working order, return the equipment to the factory for repair or replacement. Return the equipment according to the following procedure. This procedure will apply whenever equipment is returned for warranty or other services.

a) Notify SSE of the problem and request a Return Material Authorization (RMA) number and shipping instructions.

For a current list of telephone and email contact information please refer to the SSE internet site (www.superiorsatelliteusa.com).

b) Tag or identify defective equipment and note defect and circumstances, if any. If known, reference sales order, purchase order, and date equipment was received.

c) Reship equipment in original shipping container or use a strong shipping container to protect equipment during shipment.

d) Package equipment using shock-absorbing material around all sides of equipment.

e) Seal container securely and mark outside of container FRAGILE.

3.2 Recommended Tools And Equipment

Installation of the Series 8345 Earth Station Antenna is quick and easy. Although no special tools or hoisting equipment are required, Table 3-1 lists the tools and equipment needed for efficient and convenient installation.

Table 3.1. Tools and Equipment Required for Installation

Size	Description
1-1/8"	Combination Wrench and Socket (1/2" Drive)
15/16"	Combination Wrench and Socket (1/2" Drive)
3/4"	Combination Wrench and Socket (1/2" Drive)
9/16"	Combination Wrench and Socket (1/2" Drive)
1/2"	Combination Wrench and Socket (3/8" Drive, 3/8" Ratchet)
3/8"	Combination Wrench and Socket (3/8" Drive, 3/8" Ratchet)
1/4"	Combination Wrench and Socket (3/8" Drive, 3/8" Ratchet)
7/16"	Combination Wrench
6"	Slip-joint Pliers
	Alignment tool (drift pin)
15”	Large Adjustable Wrench (1-7/8" opening)
	7 to 9 ft-lb Torque Wrench
	15-20 ft-lb Torque Wrench (1/4" to 3/8" Drive)
	150 ft-lbs Torque Wrench (1/2" Drive)
	Slotted Screwdriver
	Phillips-head Screwdriver
5/32"	Allen Wrench
	Carpenter's Level

Table 3.1. Tools and Equipment Required for Installation

Size	Description
	Angle Finder or Inclinometer
6'	Stepladder
	Hammer

3.3 Recommended Installation Sequence

In order to ensure proper and trouble-free installation of the antenna after a site has been selected (See Chapter 2 for antenna site selection), the following installation sequence is recommended:

a. Installation of foundation and feet
b. Assembly of mount
c. Assembly of reflector
d. Installation of feed
e. Satellite pointing procedure
f. Feed polarization

3.4 Installation of Foundation and Feet

The Series 8345 Earth Station Antenna (Figure 3.1) does not require critical foundation alignment because the antenna can be rotated through an azimuth range of 360 degrees. This feature greatly simplifies construction of the foundation and consequently results in reduced costs.

SSE does not represent or warrant that any particular design or size of foundation is appropriate for any particular locality or installation. However, this manual includes wind-loading information, typical foundation designs, and other information that may be used as a guide when considering professional design of an antenna foundation.

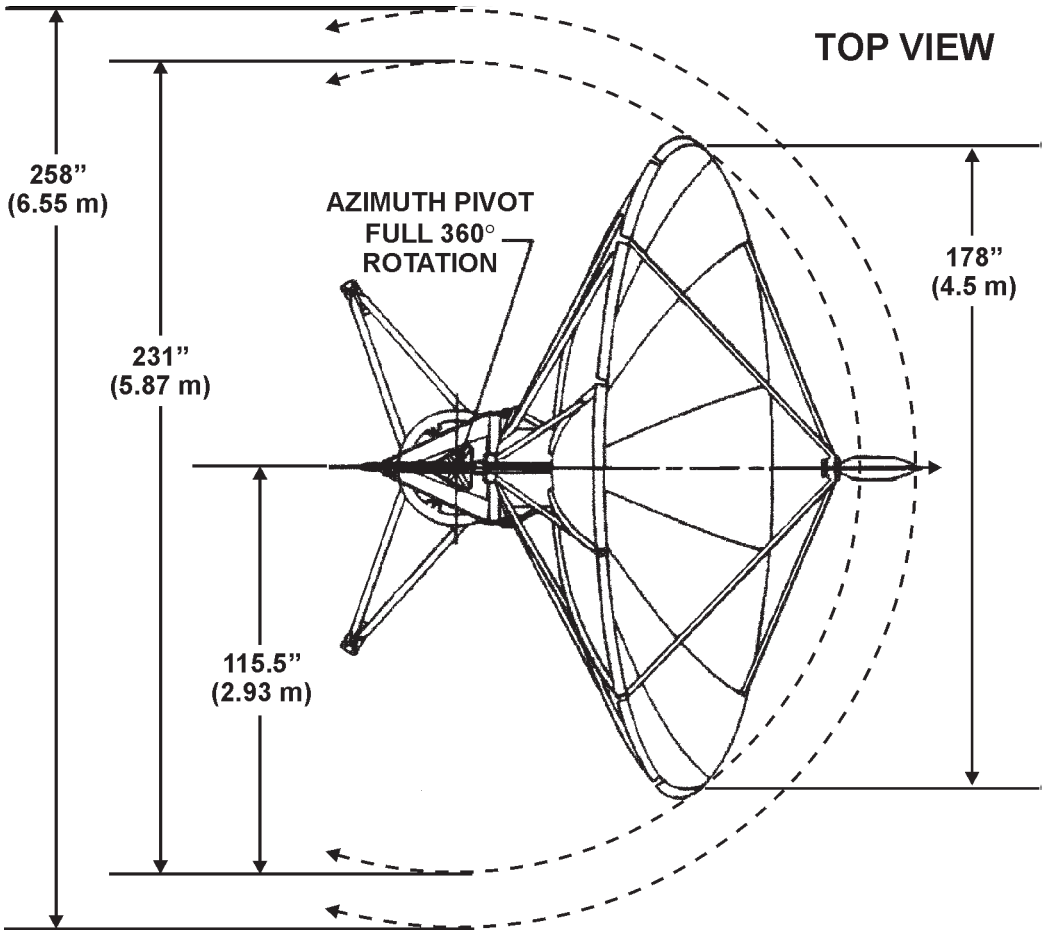


Figure 3.1. outline Dimensions of 4.5-meter Antenna

3.4.1 Wind-loading Information

The Series 8345 Antenna is designed to survive a 110 mph wind. Figure 3-2 shows the forces encountered at the foundation by either in-ground feet or surface feet for 110 mph wind.

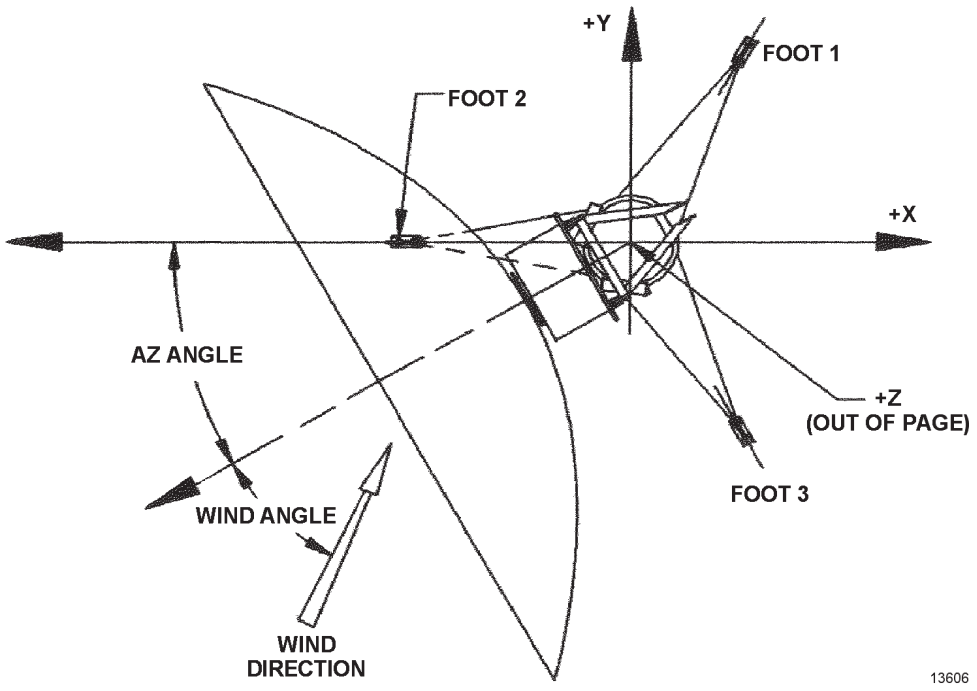


Figure 3.2. Foundation Loading: Sign Conventions

NOTE

Tables 3-2 and 3-3 list forces which are the loads applied to the foundation by the antenna. The 31.0 psf (110 mph) load cases include the corresponding Antenna Weight Only loads. Forces are in lbs; moments are in lb-ft.

Table 3.2. Loads at Individual Antenna Feet

Load Case	Ant AZ	Wind Dir	EL Angl	Foot 1			Foot 2			Foot 3		
				F_x	F_y	F_z	F_x	F_y	F_z	F_x	F_y	F_z
WEIGHT ONLY	0	0	0	374	-39	-211	-746	-1	-1147	372	39	-213
WEIGHT ONLY	0	0	60	265	149	-381	-530	-1	-807	264	-148	-382
WEIGHT ONLY	0	0	90	189	281	-502	-377	-0	-567	188	-281	-502
31.0 psf	0	0	0	1421	2772	-4466	5178	4	7354	1428	-2776	-4458
31.0 psf	0	0	60	2215	2097	-4095	-585	-2	-1030	2212	-2096	-4099
31.0 psf	0	0	90	-166	1439	-1756	1275	2	1935	-163	-1441	-1751
31.0 psf	0	60	0	833	2968	-4281	5562	-524	7907	2155	-2944	-5197
31.0 psf F	0	120	0	1474	-222	-782	-1481	862	-2207	-992	554	1419
31.0 psf	0	180	0	-380	-2062	2854	-5012	-4	-7269	-388	2067	2844
31.0 psf	0	180	60	571	-1370	1369	-2671	-4	-4034	565	1374	1361
31.0 psf	0	180	90	544	-877	752	-2029	-2	-3069	539	879	747
WEIGIIT ONLY	36	0	0	138	-89	50	-671	228	-1027	533	-139	-594
WEIGHT ONLY	36	0	60	158	126	-263	-496	104	-753	338	-230	-555
WEIGHT ONLY	36	0	90	172	277	-485	-372	16	-558	200	-293	-528
31.0 psf	36	0	0	2635	4716	-7719	4126	-102	5846	-267	105	303
31.0 psf	36	0	60	2144	2886	-4937	-884	584	-1419	1849	-1211	-2868
31.0 psf	36	0	90	554	1788	-2784	967	-571	1464	-756	-662	-252
31.0 psf	36	60	0	2209	5198	-8006	4656	-656	6601	346	79	-165
31.0 psf	36	120	0	892	-890	499	-1788	1145	-2623	-614	125	553
31.0 psf	36	180	0	-1660	-3548	5645	-4126	466	-5976	1109	-315	-1239
31.0 psf	36	180	60	-451	-1910	2866	-2220	785	-3342	1429	223	-827
31.0 psf	36	180	90	-210	-1234	1814	-1711	603	-2580	1156	75	-803
WEIGHT ONLY	60	0	0	-19	-39	103	-550	339	-833	568	-300	-840
WEIGHT ONLY	60	0	60	87	148	-240	-441	155	-664	354	-302	-667
WEIGHT ONLY	60	0	90	162	280	-482	-364	24	-545	203	-304	-544
31.0 psf	60	0	0	2940	5099	-8393	2419	-156	3408	-1345	2009	3415
31.0 psf	60	0	60	1857	3203	-5116	-1368	865	-2048	1432	-741	-2060

Table 3.2. Loads at Individual Antenna Feet

Load Case	Ant AZ	Wind Dir	EL Angl	Foot 1			Foot 2			Foot 3		
				F_x	F_y	F_z	F_x	F_y	F_z	F_x	F_y	F_z
31.0 psf	60	0	90	976	1709	-2994	465	-850	702	-969	-41	721
31.0 psf	60	60	0	2613	5734	-8946	2934	-729	4138	-840	2150	3237
31.0 psf	60	120	0	509	-1196	1160	-1687	1300	-2452	-357	-372	-279
31.0 psf	60	180	0	-2149	-3739	6221	-2688	696	-3887	1946	-1963	-3904
31.0 psf	60	180	60	-1036	-1817	3171	-1486	1168	-2225	1754	-680	-2249
31.0 psf	60	180	90	-653	-1150	2031	-1194	897	-1791	1374	-567	-1810

Table 3.3. Total Loads on Foundation

Load Case	Ant AZ	Wind Dir	El Angl	FOUNDATION FORCE AND MOMENT SUMMATION F_x	F_y	F_z	M_x	M_y	M_z
WEIGHT ONLY	0	0	0	-0	-0	-1571	-0	-4654	-0
WEIGHT ONLY	0	0	60	-0	-0	-1571	-0	-2113	-0
WEIGHT ONLY	0	0	90	0	0	-1571	-0	-317	-0
31.0 psf	0	0	0	8027	-0	-1570	-0	54317	-0
31.0 psf	0	0	60	3842	-0	-9224	-0	13151	-0
31.0 psf	0	0	90	946	0	-1571	-0	17846	0
31.0 psf	0	60	0	8550	-500	-1571	3672	58152	8807
31.0 psf	0	120	0	-999	1195	-1571	-8780	-11992	-14836
31.0 psf	0	180	0	-5781	0	-1571	-0	-47121	-0
31.0 psf	0	180	60	-1535	0	-1303	-0	-25999	-0
31.0 psf	0	180	90	-946	-0	-1570	-0	-18479	-0
WEIGHT ONLY	36	0	0	-0	0	-1571	2736	-3765	-0
WEIGHT ONLY	36	0	60	-0	0	-1571	1242	-1709	-0
WEIGHT ONLY	36	0	90	-0	0	-1571	186	-256	0
31.0 psf	36	0	0	6494	4718	-1570	-31927	43943	0
31.0 psf	36	0	60	3108	2258	-9224	-7730	10640	0
31.0 psf	36	0	90	765	*556*	-1571	-10490	14438	0
31.0 psf	36	60	0	7211	4621	-1571	-31210	49205	8807
31.0 psf	36	120	0	*-1511*	380	-1571	-54	-14862	-14836
31.0 psf	36	180	0	-4677	-3398	-1571	27697	-38121	-0
31.0 psf	36	180	60	-1241	-902	-1303	15282	-21034	-0
31.0 psf	36	180	90	-765	*-556*	-1570	10862	-14950	-0
WEIGHT ONLY	60	0	0	-0	-0	-1571	4031	-2327	-0
WEIGHT ONLY	60	0	60	-0	-0	-1571	1830	*-1056*	-0
WEIGHT ONLY	60	0	90	-0	0	-1571	274	-158	0
31.0 psf	60	0	0	4014	6952	-1570	-47040	27158	-0
31.0 psf	60	0	60	1921	3327	-9224	-11390	6576	-0

Table 3.3. Total Loads on Foundation

Load Case	Ant AZ	Wind Dir	El Angl	FOUNDATION FORCE AND MOMENT SUMMATION F_x	F_y	F_z	M_x	M_y	M_z
31.0 psf	60	0	90	473	819	-1571	*-15455*	8923	0
31.0 psf	60	60	0	4708	7154	-1571	-48525	32256	8807
31.0 psf	60	120	0	-1534	-268	-1571	5996	-13599	-14836
31.0 psf	60	180	0	-2890	*-5006*	-1571	40808	-23560	0
31.0 psf	60	180	60	-767	-1329	-1303	22516	-12999	-0
31.0 psf	60	180	90	-473	-819	-1570	16003	-9240	-0

3.5 Installation of Typical Foundations

Typical foundation designs for in-ground and surface-mounted feet are provided in Figures 3-3 and 3-4. Foundations are designed for 110 mph wind loads.

Because soil conditions, building codes, and other factors vary with location, persons installing antenna foundations should obtain professional engineering services for the design and construction supervision.

The following notes apply to the typical foundation designs and corresponding instructions:

NOTES

All reinforcing bars should conform with ASTM A-615-68, Grade 40 or Grade 60.

All concrete should conform to building code standards and have a minimum compressive strength of 3000 psi at 28 days.

The antenna should be properly grounded to meet applicable local codes. The ground cable from an antenna foot should be attached to either a buried grid or a suitable stake, depending on local soil conditions.

The typical foundations used in these instructions are provided for illustration only. SSE does not represent or warrant that these illustrative designs are suitable for any particular location. Consultation with a professional engineer may be necessary to determine a suitable foundation design for each site.

3.5.1 Installing a Pier Foundation (In-ground Mount)

STEP 1. As shown in Figure 3-3, attach pier spacers between pier feet using 1/2-inch bolt, washer, and nut, twelve places.

STEP 2. Set piers 12" into pier holes. Level the entire foundation frame by placing support blocks under the pier spacers

WARNING

No attempt should be made to erect the antenna without allowing proper cure time for the concrete.

NOTE

Remove support blocks after concrete has been poured and set

3.5.2 Installing a Pad Foundation (Surface Mount)

The surface foot is secured to the foundation with two 3/4”-diameter anchor bolts (three places). These bolts are 3/4-10 UNC, made of ASTM A36 hot-rolled steel. Position the bolts as shown in Figure 3-3. SSE has an optional anchor bolt kit which contains three surface feet, six anchor bolts, and a template for installing the bolts.

WARNING

Allow proper concrete cure time before full torque (100 ft-lbf) is applied to anchor bolts.

WARNING

No attempt should be made to erect the antenna without allowing proper cure time for the concrete.

NOTE

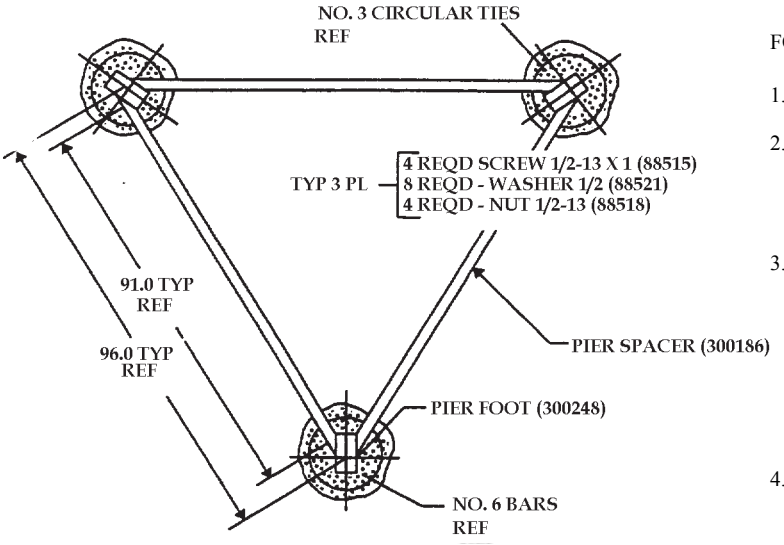
Remove support blocks after concrete has been poured and set.

3.6 Assembly of Mount

The procedure below describes the assembly of the Series 8345 elevation-over-azimuth mount. This procedure includes instructions for assembling the pedestal, attaching the pedestal to the foundation, and assembling the hub. The procedure follows:

NOTE

Before proceeding, be sure that the ground cable has been attached to a foot of the foundation according to local grounding codes. (See notes in Figures 3-3, and 3-4.)



NOTES

1. Maximum dimension between bottom of horizontal flanges and top of concrete is 2 inches.
2. Minimum safe soil bearing capacity is 3000 PSF. If soil is cohesive, the undrained shear strength should be > 1000 PSF. If the soil is cohesionless the angle of internal friction should be ≥ 30°.
3. Footing is designed for 110 MPH survival wind for Model 8345 4.5-meter Antenna attached directly to the piers.
4. Proper electrical grounding shall be provided by the installing contractor to meet applicable local codes. This may take the form of a buried grid or suitable copper stake, depending on local soil conditions. The mount shall be electrically connected to ground. The grounding system should not be connected to the concrete foundation.

FOUNDATION CONSTRUCTION NOTES:

1. The foundation heading is not critical to antenna performance.
2. Pier holes are drilled on 96.0 inch centers at 72 inch minimum depths as shown. Pier is minimum 18 inches diameter. Bottom of pier hole is to be below frost line. Remove any loose soil and tamp bottom of holes.
3. Construct a reinforcing cage for each pier using six No. 6 (3/4" dia.) reinforcing bars to form a 10.5 inch vertical diameter cylinder. The vertical bars should be held in place by wire tying to three circular No. 3 (3/8 dia.) reinforcing bar ties. Lower a cage into each pier hole. Center it in the hole and depress the vertical rebars two to three inches into the ground at the bottom of the hole.
4. Connect spacers between pier inserts and lower inserts into rebar cages. Level the entire foundation frame by placing blocks under the spacers.
5. The top of the cages of the piers should be level with respect with one another within 1/4 inch.
6. When concrete is poured into the holes, care should be taken that the concrete flows fully into the cavities on either side of the pier inserts, and that the cages do not shift. Allow concrete to cure before erecting the antenna.

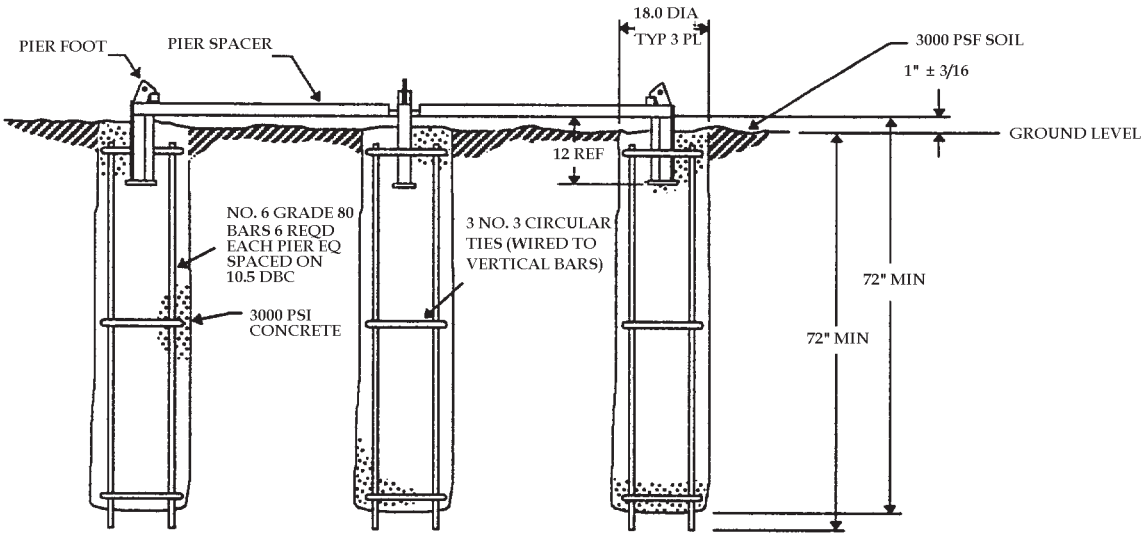
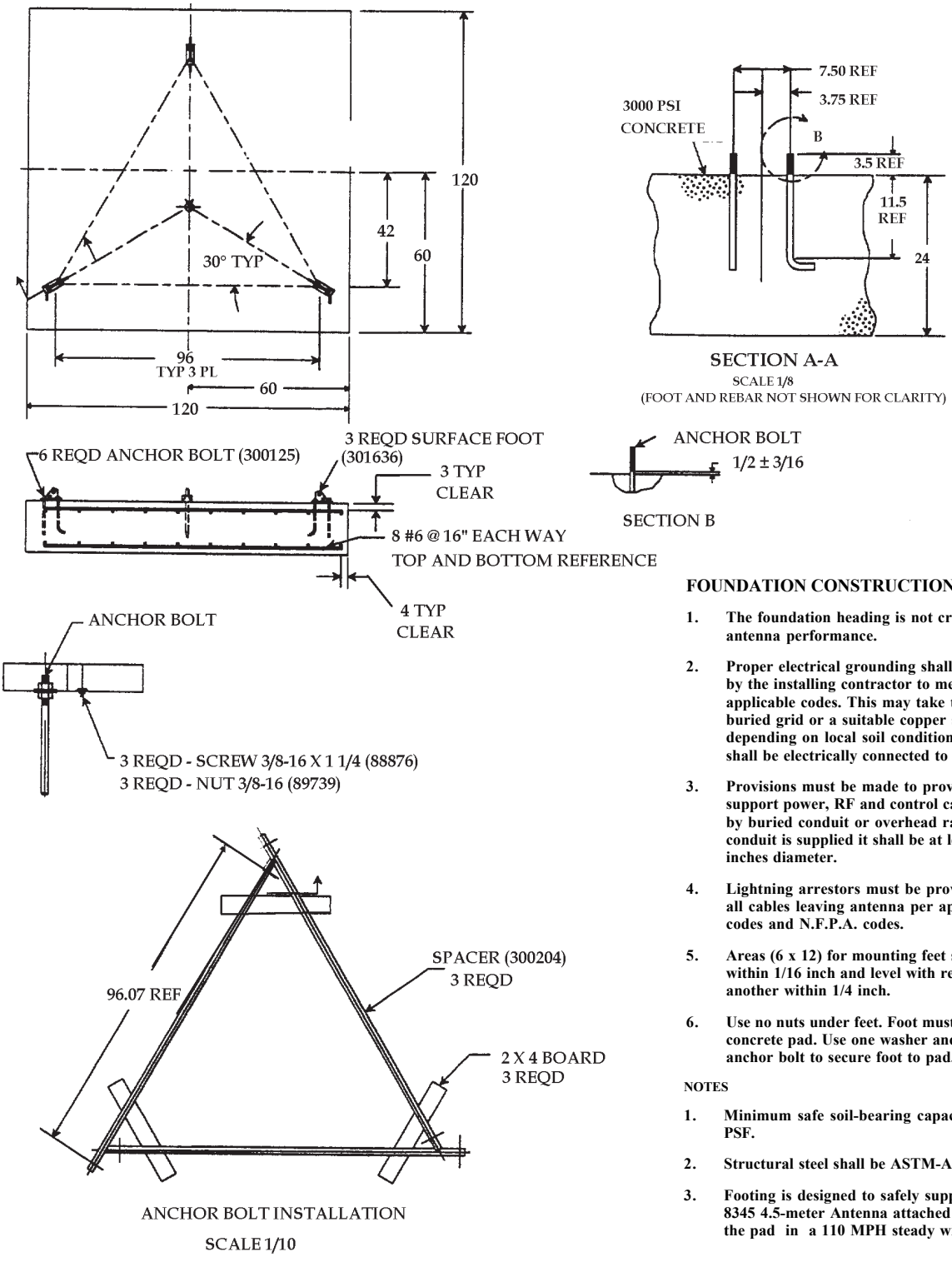


Figure 3.3. Pier Foundation, In-ground Mount



FOUNDATION CONSTRUCTION NOTES

1. **The foundation heading is not critical to antenna performance.**
2. **Proper electrical grounding shall be provided by the installing contractor to meet local applicable codes. This may take the form of buried grid or a suitable copper stake, depending on local soil conditions. The mount shall be electrically connected to ground.**
3. **Provisions must be made to provide suitable support power, RF and control cables either by buried conduit or overhead raceway. If conduit is supplied it shall be at least three inches diameter.**
4. **Lightning arrestors must be provided across all cables leaving antenna per applicable local codes and N.F.P.A. codes.**
5. **Areas (6 x 12) for mounting feet should be flat within 1/16 inch and level with respect to one another within 1/4 inch.**
6. **Use no nuts under feet. Foot must rest flush on concrete pad. Use one washer and one nut per anchor bolt to secure foot to pad.**

NOTES

1. **Minimum safe soil-bearing capacity is 3000 PSF.**
2. **Structural steel shall be ASTM-A-36.**
3. **Footing is designed to safely support a Model 8345 4.5-meter Antenna attached directly to the pad in a 110 MPH steady wind.**

Figure 3.4. Pad Foundation, Surface Mount

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NOTE

For the following procedure, tighten all fasteners in STEPS 1 through 6 only finger tight, then follow STEP 7 (1 through 5) for tightening sequence.

STEP 1. As shown in Figure 3-6, place one end of a leg onto a leg juncture maintaining proper orientation of bend in leg. Bolt in place with 3/4-10 x 2 1/4-inch bolt, washer, and nut, two places. Perform this operation with each of the six legs and three leg junctures.

STEP 2. Attach two leg assemblies to each foundation foot using 3/4-10 x 4 1/2-inch bolt, washer, and nut, six places. At one foundation foot, install a ground attachment lug on the leg ends before bolting the leg ends to the foundation foot. Then ground antenna according to local grounding codes.

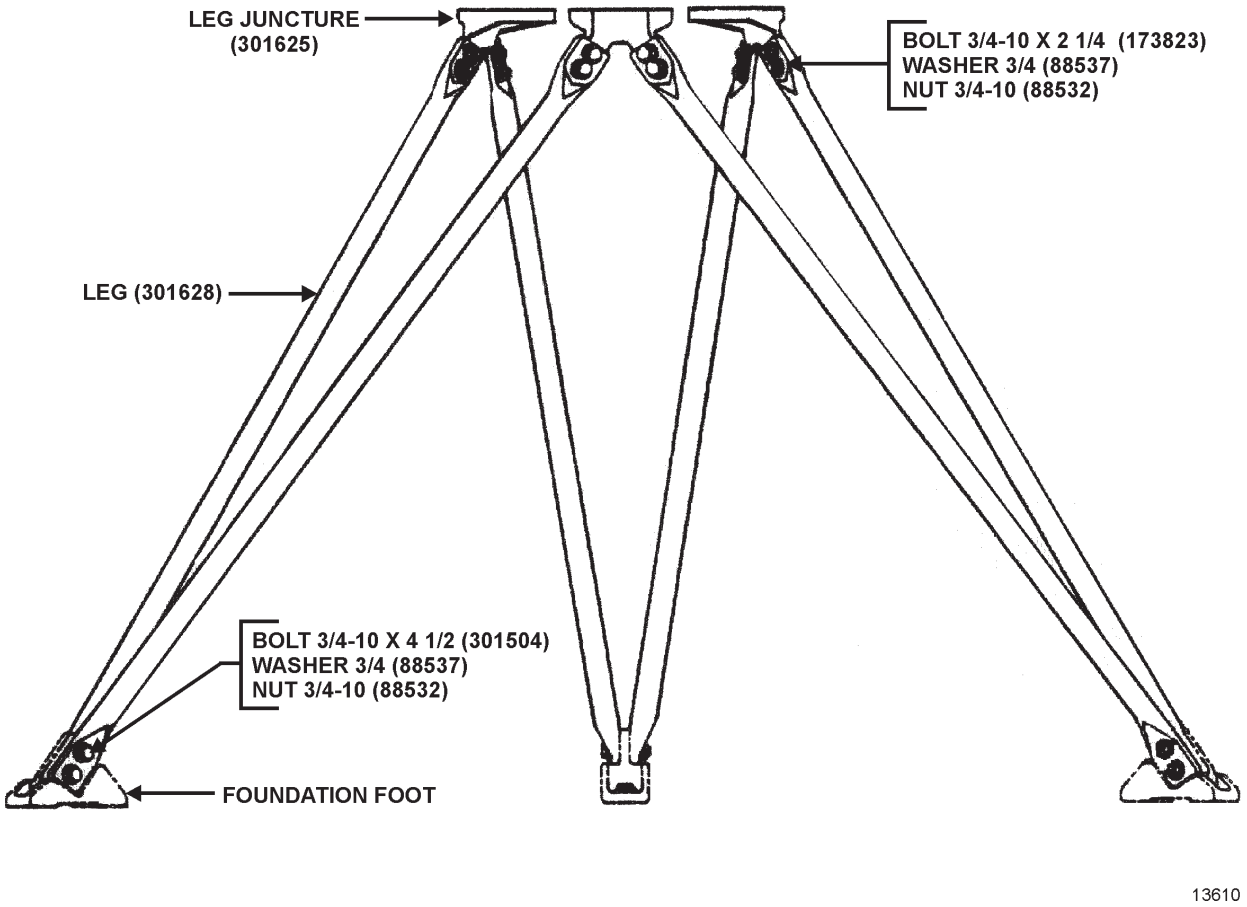

Figure 3.6. Installation of Leg Assemblies

STEP 3. As shown in Figure 3-7, position the leg support bracket (flanges down) on top of the previously assembled leg junctures. Bolt leg support bracket in place at the two inboard holes of each leg juncture using 3/4-10 x 2 1/4-inch bolt, washer, and nut, six places.

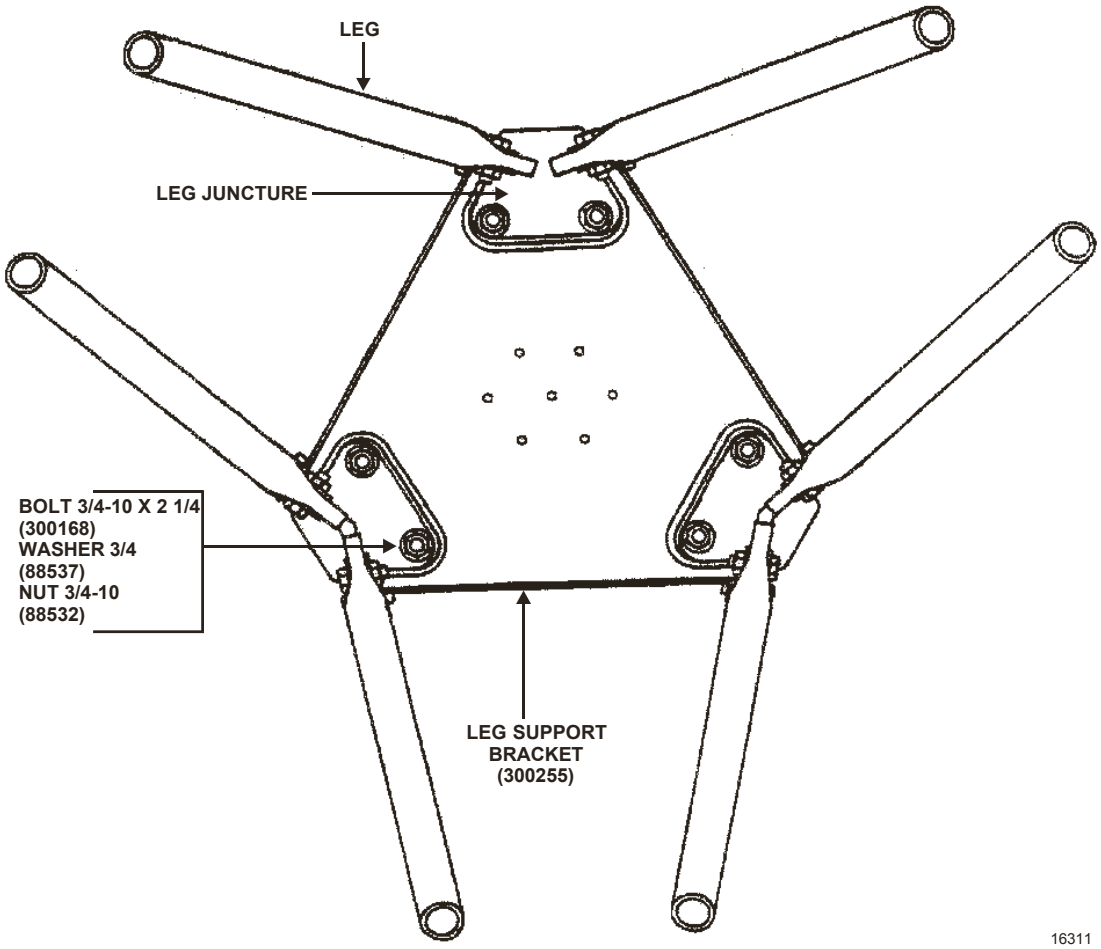

Figure 3.7. Installation of Leg Support Bracket

STEP 4. Attach short extension of each support arm to the center hole at the underside of each leg juncture using 3/4-10 x 2 1/4-inch bolt, washers and nut, three places. (See Figure 3-8.) Bolt the three support arms together at the center using 3/4-10 x 2 1/4-inch bolt, washer, and nut, three places. At one of the center locations, install a ground attachment lug to the support arm before fastening the support arms together. Then attach a terminal lug to the ground attachment lug using 1/4-20 x 3/4-inch screw, washers, and nut. This will be used later to ground the antenna feed/LNBs.

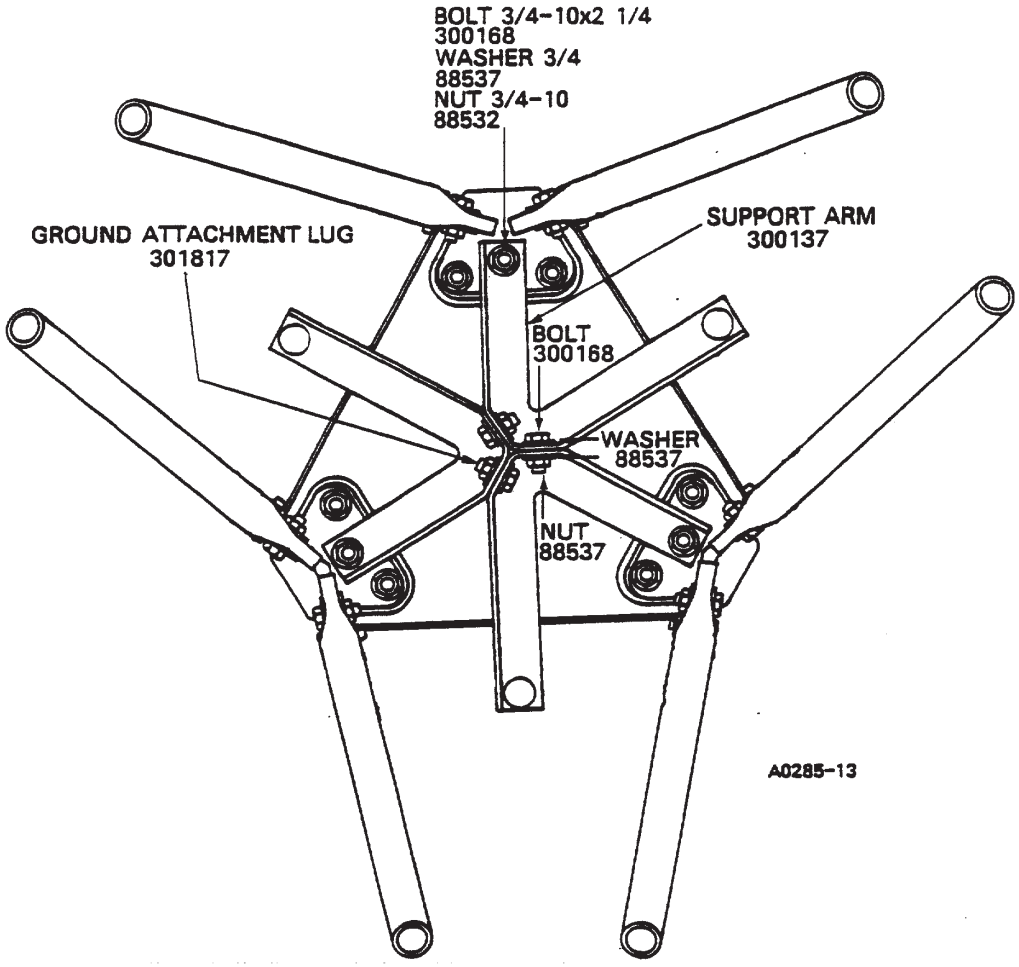

Figure 3.8. Installation of Support Arms

STEP 5. Position the azimuth ring on top of the leg support bracket and bolt in place at outboard holes using 3/4-10 x 2-inch bolt and washer, six places. (See Figure 3-9.)

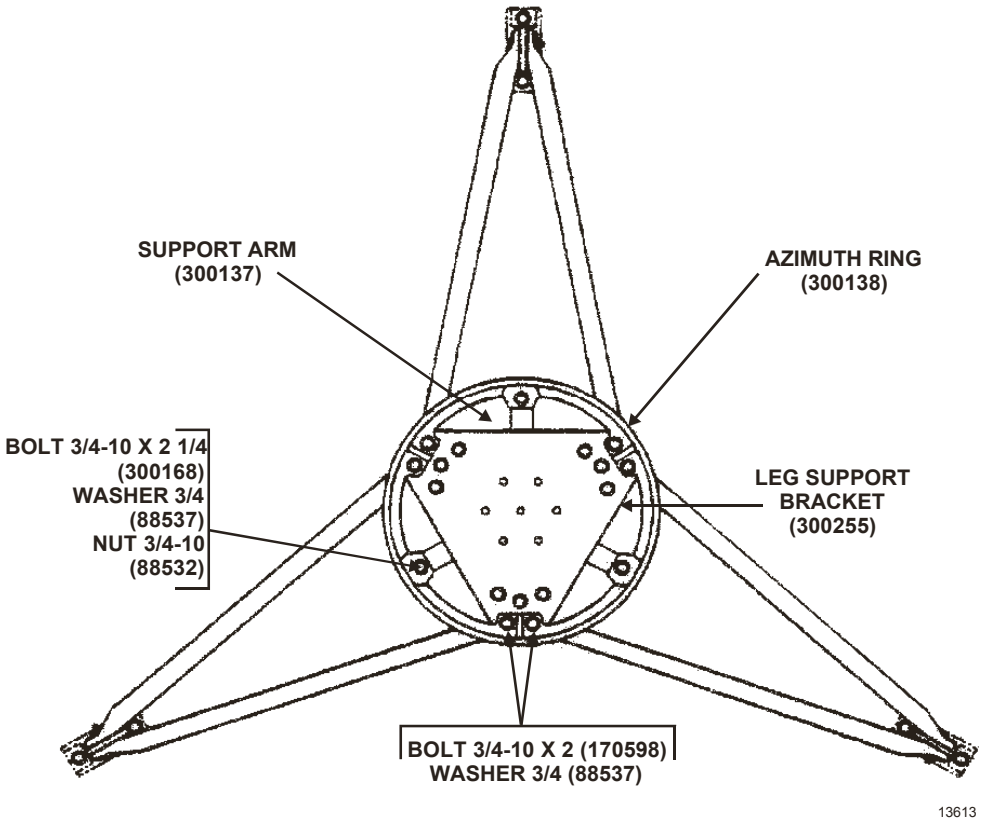

Figure 3.9. Installation of Azimuth Ring

STEP 6. As shown in Figure 3-9, bolt the long extension of each support arm to the azimuth ring using 3/4-10 x 2-inch bolt, washer, and nut, three places.

STEP 7. Using the following sequence (as shown in Figure 3-10), torque all 3/4-inch fasteners to 130 ft-lbf.

(1) Torque the two inboard bolts of each leg juncture.

(2) Torque the six outboard bolts of each leg juncture which connect the azimuth ring to the leg junctures.

NOTE

Using a carpenter's level, make sure that the azimuth ring remains level during steps 3 and 4.

(3) Torque the two bolts at each foot.

(4) Torque the two bolts at the upper end of each leg.

(5) First, snug all nine bolts in the support arms to ensure that there is no binding of the arms at any connecting point; then, torque all nine bolts in the support arms.

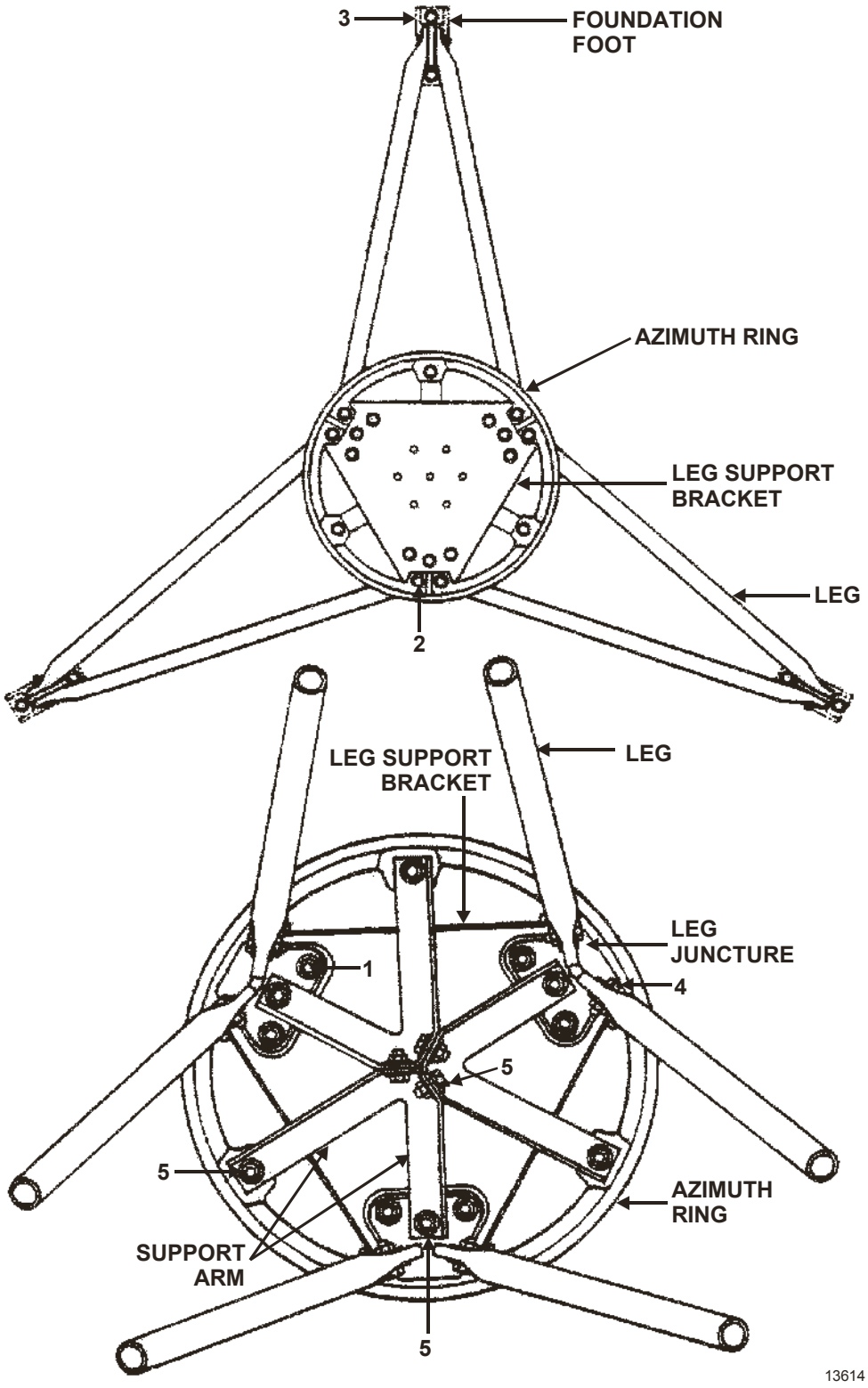

Figure 3.10. Tightening Sequence for Pedestal

STEP 8. Insert one button backing plate into each two front clamps of the A-frame, four places. (See Figure 3-11.)

STEP 9. Apply a generous amount of grease to one side of the anti-friction buttons and insert an anti-friction button into each two front clamps of the A-frame, four places. (See Figure 3-11.)

STEP 10. Position the A-frame on top of the previously installed azimuth ring. (See Figure 3-11.)

NOTE

Make sure that the anti-friction buttons do not drop out of the A-frame.

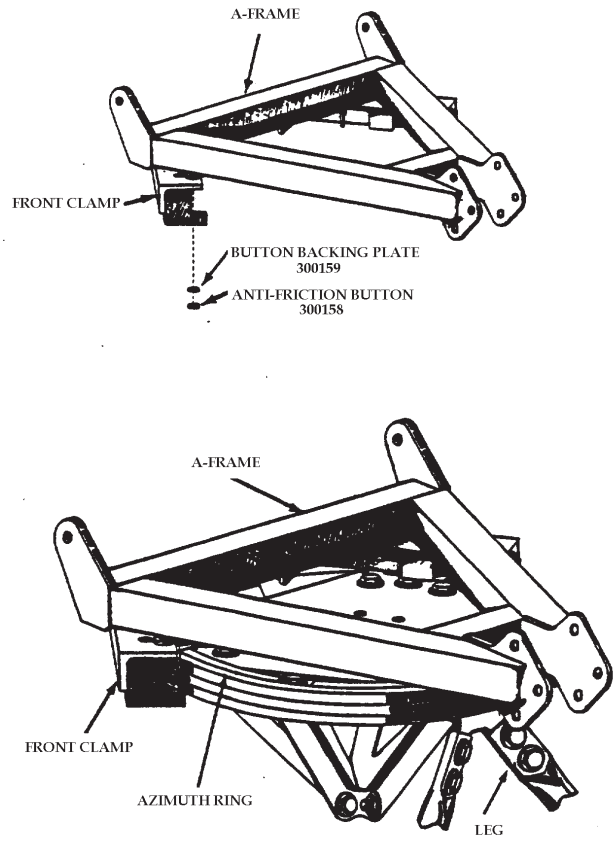

Figure 3.11. Positioning A-frame on Azimuth Ring

STEP 11. Insert one button backing plate into the right-hand actuator fitting and another button backing plate into the left-hand actuator fitting. (See Figure 3.12.)

STEP 12. Insert one anti-friction button into the right-hand actuator fitting and another anti-friction button into the left-hand actuator fitting. (See Figure 3.12.)

STEP 13. Insert greased actuator nut into the right hand actuator fitting and left-hand actuator fitting. Be sure that the actuator nut is flush with the outside surface of each actuator fitting. (See Figure 3.12.)

STEP 14. Carefully attach the actuator fitting assembly to the A-frame and snugly bolt in place using 3/4-10 x 2 1/4-inch bolt, washer, and nut, six places. Check to see if the actuator nut rotates without binding. If not, adjust the actuator fittings by tapping from above or below until the actuator nut rotates with minimal binding. Torque the six bolts (alternating from one actuator fitting to the other) to 130 ft-lbf. (See Figure 3-12.)

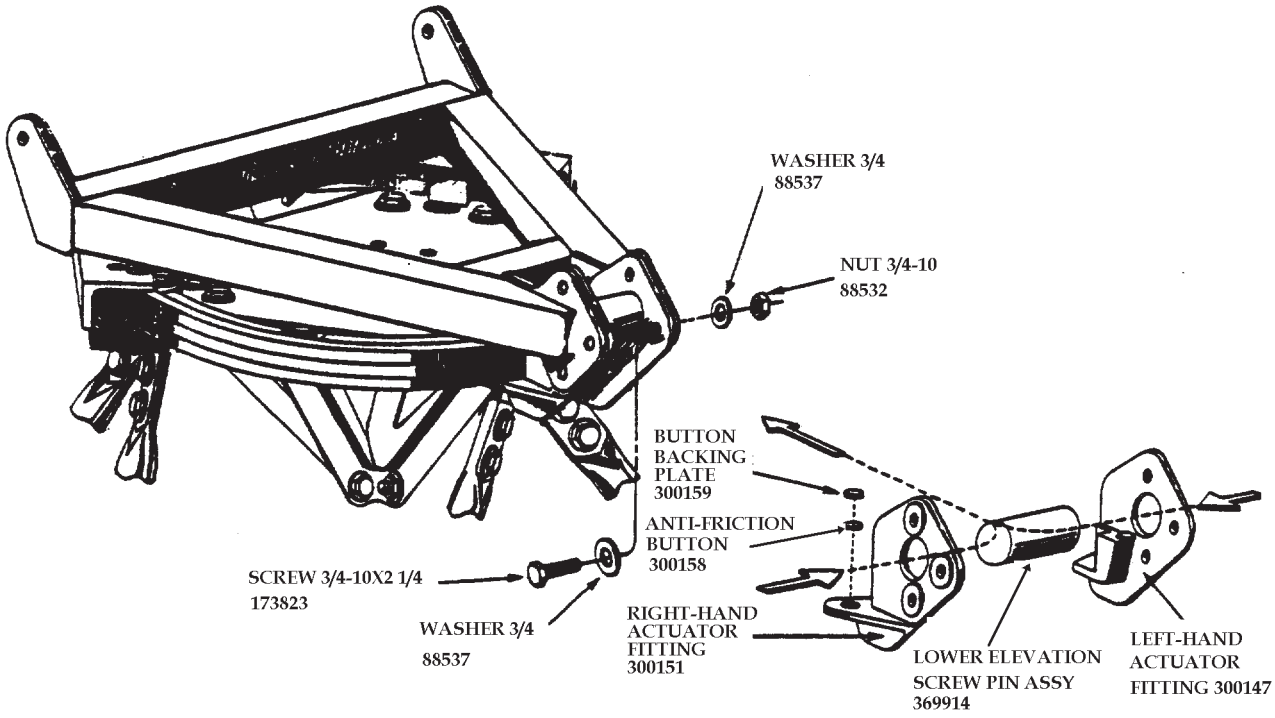

Figure 3.12. Actuator Fitting Assembly

STEP 15. Loosely bolt the front clamp plates to each of the two front clamps of the A-frame using 3/4-10 x 5-inch bolt, washer, and nut, four places. (See Figure 3-13.)

STEP 16. Loosely bolt the rear clamp plate to the actuator fittings using 3/4-10 x 5-inch bolt, and washer, two places. (See Figure 3-13.)

STEP 17. Thread each of six jam nuts onto each of six 3/8-16 x 1-inch screws until they are against the heads of the screws. Thread screws into front clamps of A-frame, four places, and hand tighten jam nuts against clamps. Thread remaining two screws into actuator fittings, and hand tighten jam nuts against actuator fittings. (See Figure 3-13.)

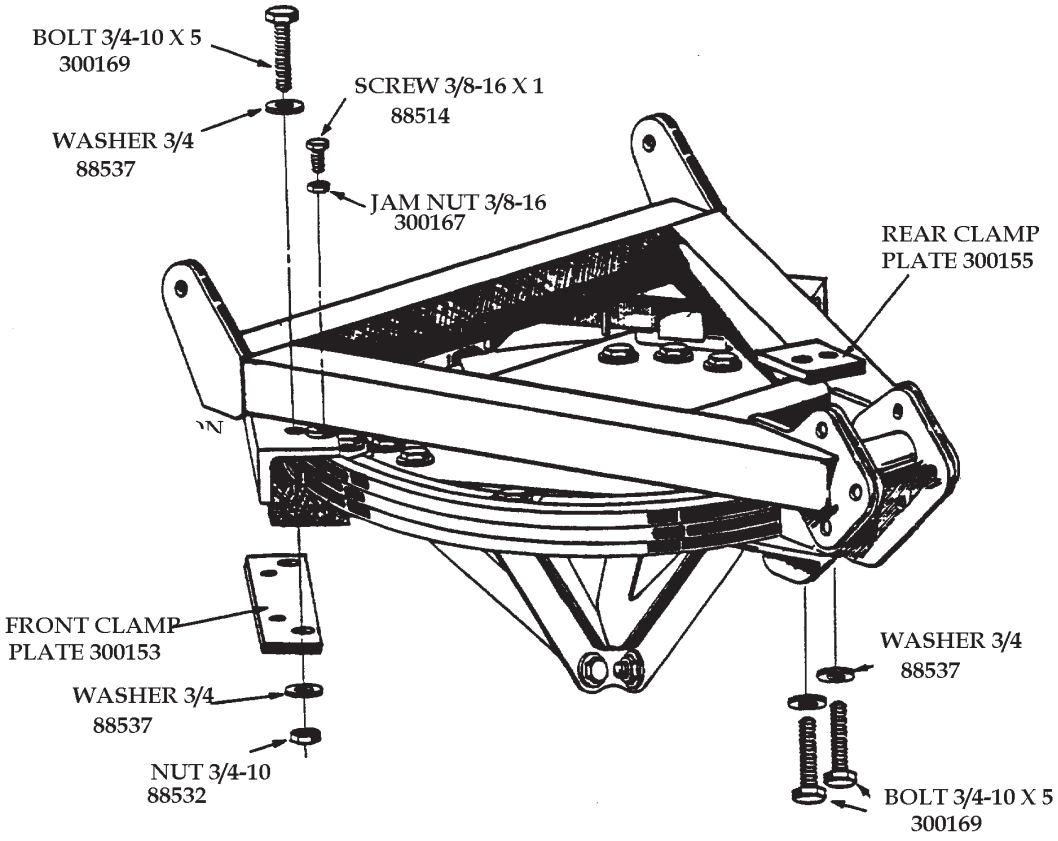

Figure 3.13. Installation of A-frame

STEP 18. Position the blade of the left-hand elevation pivot bracket onto the pivot blade of the A-frame. Position the blade of the right-hand elevation pivot bracket onto the pivot blade of the A-frame. The pivot blades of the A-frame should be between the blades of the elevation pivot brackets. (See Figure 3-14.)

STEP 19. Insert greased left-hand pivot pin through the left-hand elevation pivot bracket and A-frame. Hold in place and drive two spring pins

into the pivot pin (one on each side of the elevation pivot bracket). Secure the spring pins with safety wire (See Figure 3.14).

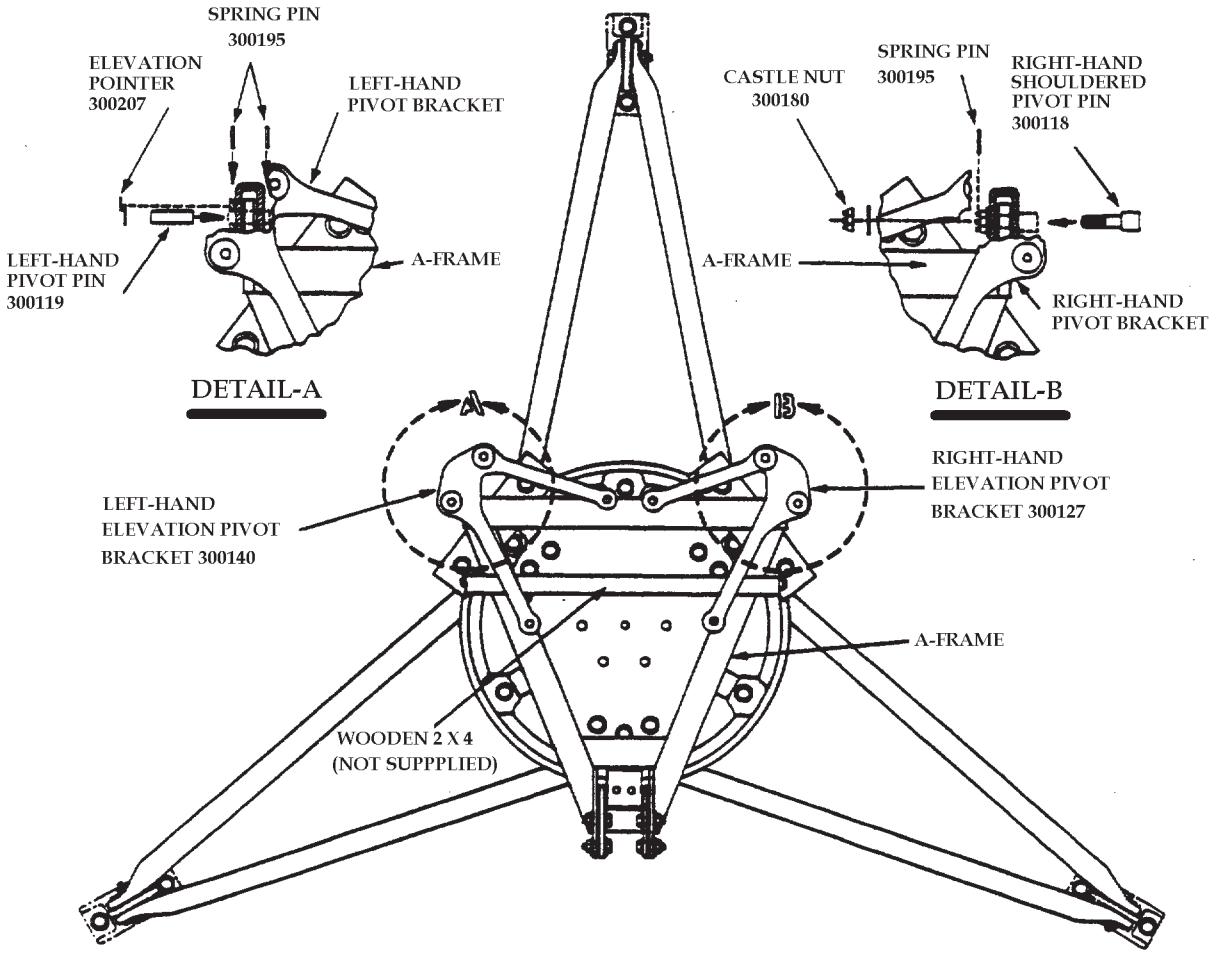

Figure 3.14. Installation of Elevation Pivot Brackets

STEP 20. Insert greased right-hand shouldered pivot pin (threaded end facing inward) through the right-hand elevation pivot bracket and A-frame. Secure with castle nut, first by hand tightening the castle nut, then loosening the castle nut just enough to align one of the slots in the castle nut with the hole in the end of pivot pin. Drive spring pin through slot in castle nut and right-hand shouldered pivot pin. Secure with safety wire. (See Figure 3-14.)

STEP 21. Support left-hand elevation pivot bracket and right-hand elevation pivot bracket using a wooden 2 x 4 (not supplied). (See Figure 3-14.)

NOTE

Wooden 2 x 4 will be removed after mount assembly is complete.

STEP 22. Lift hub onto left-hand elevation pivot bracket and right-hand elevation pivot bracket. Locate welded seam in hub and position seam to the front of the A-frame (viewed from front clamps of A-frame). Bolt hub to elevation pivot brackets using 1/2-13 x 2 1/2-inch bolt, washer, and nut, four places. (See Figure 3-15.)

STEP 23. Bolt the upper actuator attachment bracket to the hub using 1/2-13 x 2 1/2-inch bolt, washer, and nut, two places. (See Figure 3-15.)

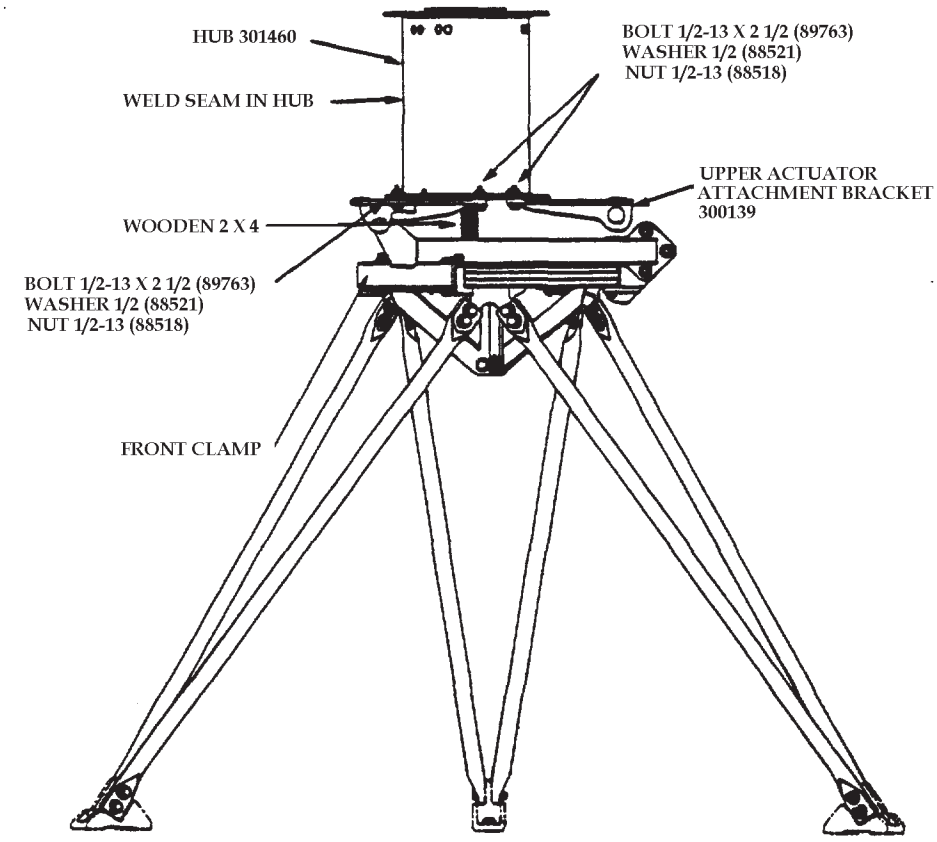

Figure 3.15. Attachment of Hub to A-Frame

STEP 24. Attach the upper ends of the three hub braces to the hub using 3/8-16 x 1 1/2-inch bolt, washer, and nut, twelve places. Bolt the lower end of the hub braces to the elevation pivot brackets and the upper actuator attachment bracket using 1/2-13 x 2 1/2-inch bolt, washer, and nut, six places. Torque 3/8-inch bolts at upper end of hub braces to 31 ft.-Ibf. The front clamp and rear clamp, should not be tightened until the antenna is aimed at desired satellite. (See Figure 3.16.)

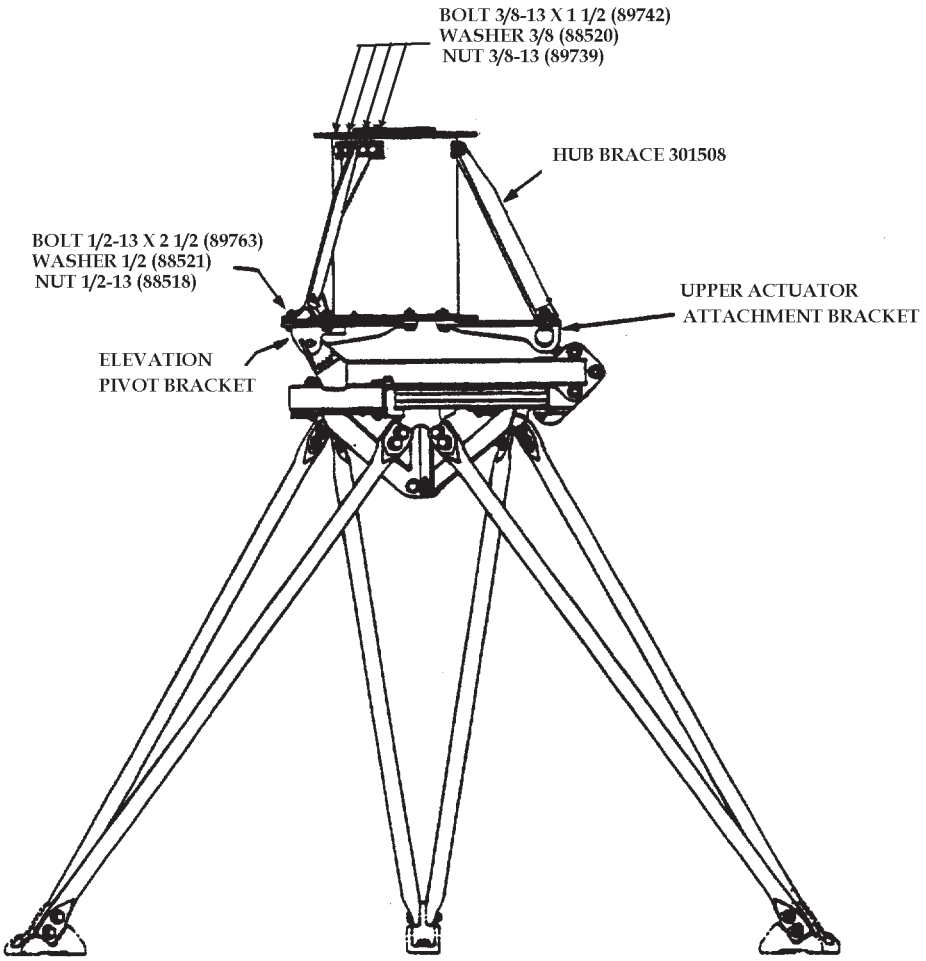

Figure 3.16. Installation of Hub Braces

STEP 25 Insert actuator pivot shaft into upper actuator attachment bracket and secure using retainer rings, two places. Thread 1-1/4 jam nut onto actuator screw until it contacts the welded nut, and then slide actuator sleeve onto actuator screw. (See Figure 3.17.)

STEP 26. Thread actuator screw (with actuator sleeve and 1-1/4 jam nut attached) through actuator nut and slide thrust washer over end of actuator screw. Continue to thread actuator screw through actuator nut and into actuator pivot shaft. Slide another thrust washer over end of actuator screw. Secure with slotted nut, first by hand tightening the nut, then loosening just enough to align one of the slots in the nut with the hole in the end of actuator screw. Drive spring pin into the actuator screw and secure with safety wire. (See Figure 3.17.)

WARNING

Ensure that the spring pin (300194) and safety wire (300452) are properly installed in the slotted castle nut (300191). If not properly secured, the castle nut could detach from the elevation screw due to vibration or screw rotation. Failure to observe this warning may result in antenna damage and injury to personnel.

STEP 27. Turn the elevation actuator screw clockwise until the hub assembly is no longer supported by the wooden 2 x 4; then remove the 2 x 4. (See Figure 3.17.)

CAUTION

Do not try to rotate the A-frame and hub assembly in azimuth using actuator screw or hub brace. Such action could damage the actuator screw or hub assembly.

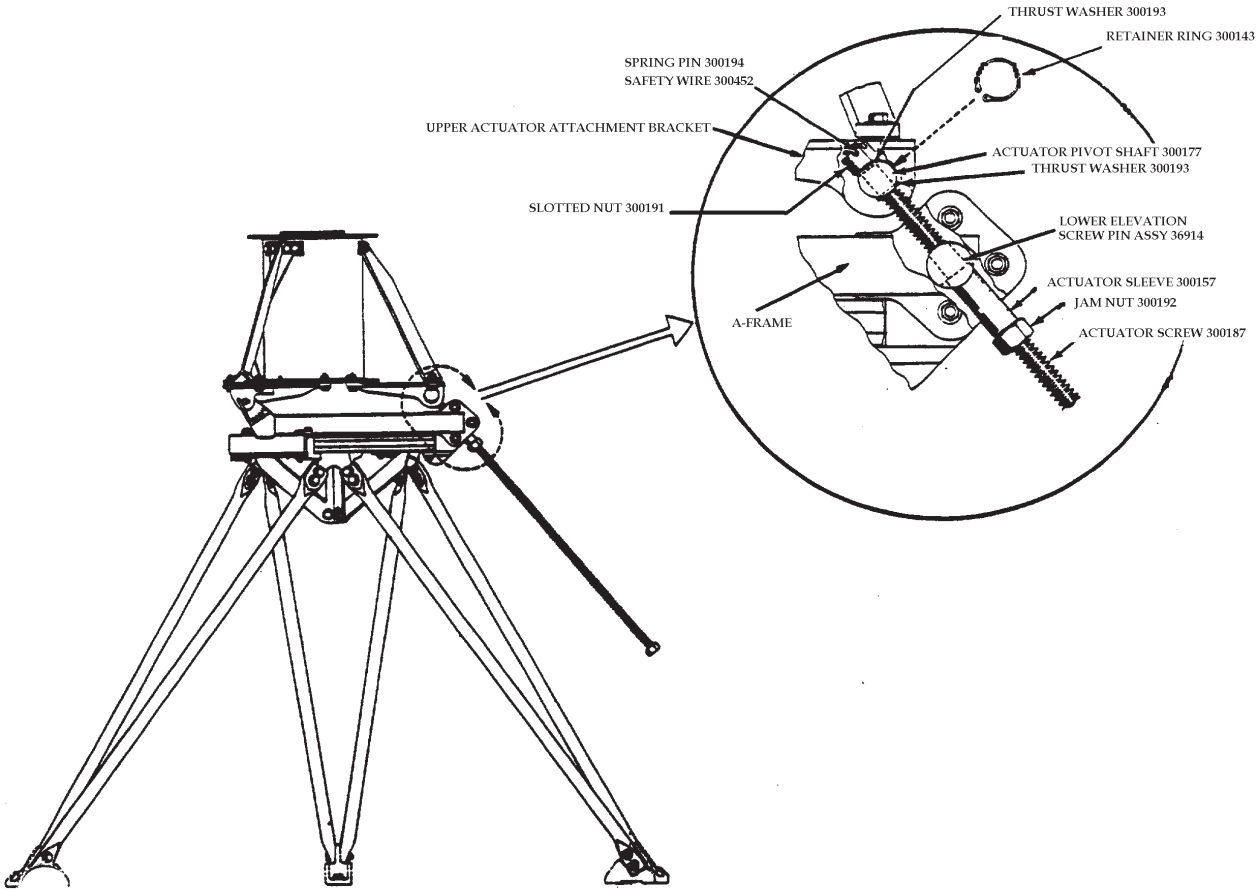

Figure 3.17. Actuator Installation

3.7 Assembly Of Reflector

The following procedure describes the complete assembly of the reflector, which includes the reflector hub, panels, ribs, and braces:

CAUTION

If it is necessary to walk inside the reflector during assembly, walk only on the portion of the reflector closest to the hub and directly over the ribs. Any weight placed on unsupported areas of the reflector can deform the panel curvature, and severely degrade antenna performance.

STEP 1. Adjust the elevation actuator until the hub flanges are near horizontal.

NOTE

Install all hardware loosely (unless otherwise instructed) until assembly of the reflector is complete. The recommended tightening procedure is provided at the appropriate stage of installation.

Install spring pins in the hub top and bottom, and the straight end of the panel braces where they will be attached to the ribs.

STEP 2. Attach the bent end of a panel brace (flat side down) onto the lower hub flange using either a 1/2-13 x 1- 1/2 bolt and nut or a 1/2-13 x 2-1/2 bolt and nut (previously installed to attach the elevation pivot and upper actuator attachment brackets to the lower flange). Use washer on nut side of joint. Tighten the 1/2-13 bolt to no more than 2 ft-lbs. This is connection "A".

CAUTION

Do not apply any weight to the panel brace before it is attached to its rib. This could bend the brace near the hub flange.

STEP 3. Attach a rib to the underside of the upper hub flange and onto the spring pin. Fasten with a 3/8-16 x I- 1/4 bolt and nut. This is connection "B". Support the rib by hand until STEP 4 is completed. Refer to Figure 3-18.

STEP 4. Attach the upper end of the panel brace to the rib so that the spring pin is fully inserted through both parts. Fasten using a 3/8-16 x 1-1/4 bolt, washer, and nut. This is connection "C". Tighten the 3/8-16 bolts of connections "B" and "C" to 31 ft-lbs. Refer to Figure 3-18.

Repeat STEPs 2 through 4 above until all panel braces and ribs have been installed. (Note that the bolt and nut for six of the panel brace attachment points at the bottom of the hub will already be in place, holding the hub to the pivot brackets and upper actuator bracket.)

STEP 5. Use the supplied rib setting template to ensure that the ribs are properly set for the most accurate reflector surface.

a. Place the template on the top of the hub using two tapered dowel pins as shown in Figure 3-19. Hold the template flat against the top of the Hub and examine the alignment of the hole at the small end of the template with the hole below it in the rib. If the holes are not aligned, the bolt at connection "A" must be loosened just enough to allow movement.

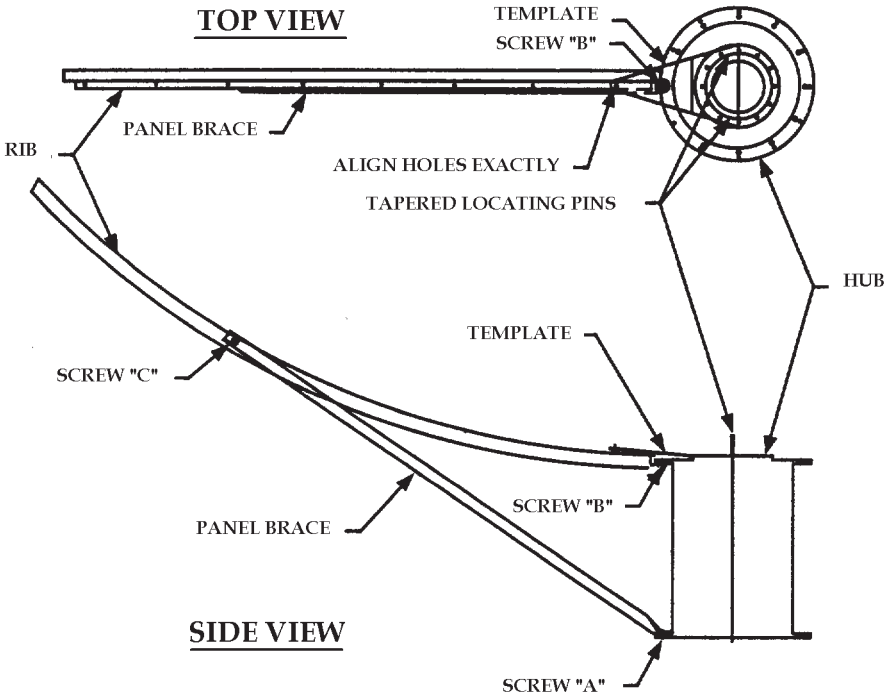

Figure 3.18. Assembly and Adjustment

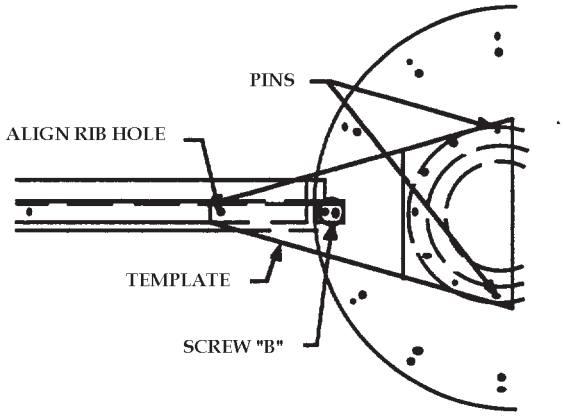

Figure 3.19. Template Installation

b. If the holes are not aligned laterally, the bolt at connection "B " must be loosened just enough to move the rib and align the holes. After moving the rib, retighten the bolts.

c. With the rib and template holes aligned laterally, inspect the longitudinal alignment. If they are not aligned, push the rib to the left or right to slightly bend it at the location shown in Figure 3-20. This will lengthen or shorten the rib, allowing alignment of the rib and template holes longitudinally, but it will cause a lateral misalignment of the holes.

Repeat STEPS 5b and 5c until the holes in the template and rib are aligned exactly, and the tapered pins may be inserted partially through both holes.

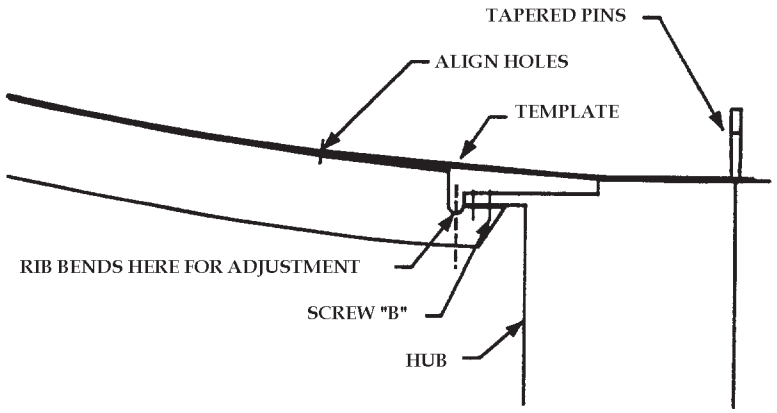

Figure 3.20. Tapered Pins

d. Retighten the bolt at connection "B" to 31 ft-lbs, and tighten the bolt at connection "A" to 76 ft-lbs, ensuring that the rib does not become misaligned during the tightening.

Perform the inspection and adjustment procedure of STEP 5 on each of the ribs.

STEP 6. Place two overlapping reflector panels onto ribs. Use a 1/4-20 x 1-3/4-inch panel-mounting screw to attach the panels to the center of the Hub. Use a 1/4-20 x 5/8-inch panel-mounting screw, washer, and nut (eight places) along the common panel edges to join the panels to the common rib. Continue installing panels in a counter-clockwise direction.

STEP 7. Insert three 1/4-20 screws through the reflector center plate and spacers and install the plate into the center of the hub. The surface of the plate should be even with the panels when the panels are installed.

NOTE

Tighten each panel screw just enough to close the gaps between the two panels and between the bottom panel and rib, but loosely enough to allow the two panels to slip laterally with respect to each other.

STEP 8. If the reflector is to be used for transmitting, a panel shape template is supplied to ensure that the panels maintain their accuracy during shipping and installation. Refer to Figure 3-21.

a. Place the template into the concave side of the panel surface, with the ends of the template curve at the corners of the wide end of the panel. The template should be positioned perpendicular to the panel surface.

b. If a gap of more than 1/32" (0.03") is observed at the mid-position of the panel-template interface, gently push upward on the panel rim to "straighten" the panel slightly. Repeat until the panel curvature matches the template as closely as possible.

c. If a gap of more than 1/32" (0.03") is observed at either end of the panel-template interface, gently pull down on the panel rim to "curve" the panel more. Repeat until the panel curvature matches the template as closely as possible.

Repeat the above procedure for all 12 panels.

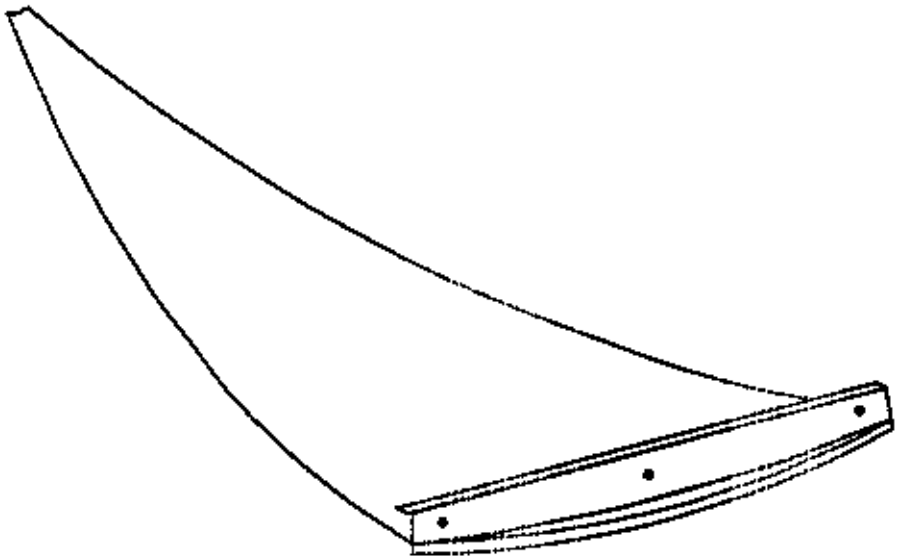

Figure 3.21. Placing the Template onto the Panel

STEP 9. A "stringing" procedure will help to further ensure that the reflector will have the best surface accuracy, and thus achieve the best performance possible for Ku-band or transmit operation. Refer to Figures 3-22a and 3-22b.

a. Choose three Ribs equally spaced around the reflector (120 degrees apart). Attach a length of 8 to 10 lb. fishing line (.010-.012 inch diameter) across the reflector between two of the three chosen points. Seat the line in the left side of the corner notch between two Panels. Fasten the line to the rib below using strapping tape.

b. Similarly stretch two more lengths of line between the other chosen points to form an equilateral triangle on the reflector. Tighten the fasteners at connection "C" for the three ribs located at the vertices of the triangle.

c. Stretch another line from one triangle vertex (in the left corner of the notch) to one of the three opposite notches included within the triangle. Where this movable string crosses the opposite leg of the triangle, the lines should just touch each other. If the lines more than touch, i.e., one actually displaces the other, or, if a gap is observed between them, then the corresponding rib must be raised or lowered. In order to raise or lower a rib, the attached panel brace must be loosened slightly from it at connection "C". Because accuracy is critical, two persons are required, one to hold the rib in position, and one to retighten the bolt at the panel brace connection.

d. Similarly measure and adjust the other two ribs that fall within the same part of the triangle.

e. Reposition the movable line at each of the other two vertices of the triangle, similarly adjusting the opposite ribs which fall within the corresponding sector of the triangle.

When the above procedure has been completed, the panel joints at the rim of the reflector should lie in an almost perfect plane.

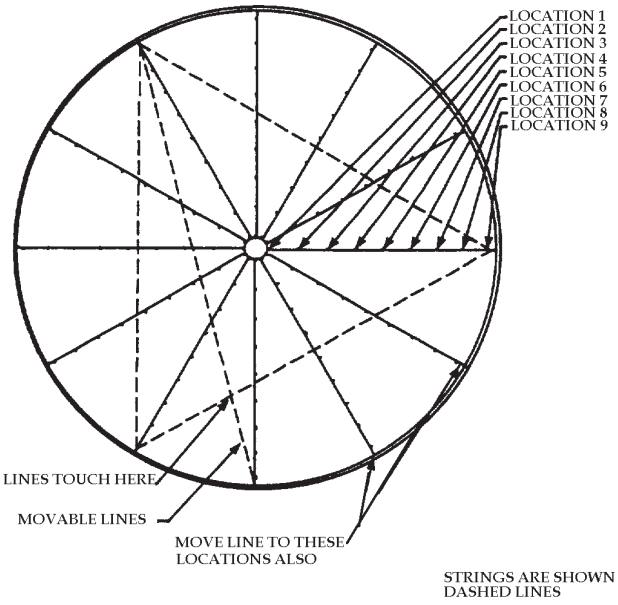

Figure 3.22a. Stringing the Reflector

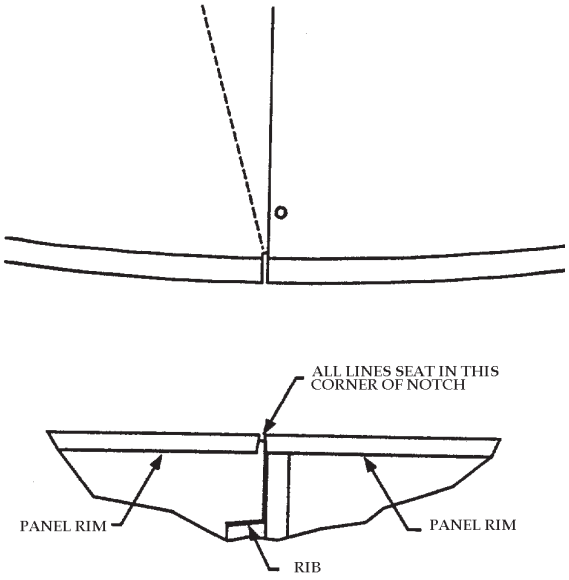

Figure 3-22b. Locating the Strings

STEP 10. Torque all panel fasteners to 7 to 9 ft-lbs if using a torque wrench, or 1/2 to 2/3 turn past snug tight if no torque wrench is available. To avoid distortion of the reflector during tightening, use the following sequence:

a. Starting at any reflector panel, tighten the bolts at Location 1 on each panel, the bolts which hold the panels to the hub.

b. Tighten the next larger ring of bolts on each panel (Location 2) and continue tightening bolts in ever-increasing concentric circles until the reflector is completely tight.

STEP 11. Re-check the panel curvature according to the procedure in STEP 8. Also re-check the stringing accuracy of the reflector, according to

STEP 9, to verify that the reflector shape was maintained during the panel tightening sequence.

If the reflector requires further adjustment, loosen the panel screws and repeat STEPs 8 through 10 until the reflector aperture is flat.

Remove the reflector alignment strings.

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3.8 Satellite Pointing Procedure

The location of each satellite, from which reception is desired, is defined in Degrees West Longitude. In order to receive signals from a desired satellite, an antenna must be pointed properly (i.e., have the correct elevation and azimuth). The coordinates (degrees elevation and degrees azimuth) used for pointing the antenna are referred to as Aiming Coordinates.

The following procedure describes the method for pointing the antenna at the desired satellite. With the feed installed and the electronics operational, use the following procedure for pointing at the desired satellite and peaking the signal. The procedure is described as follows:

1. Determine the latitude and longitude of your selected antenna site.

2. Obtain the longitude of the satellite from which you desire to receive signals.

3. Calculate the local pointing angles using method A or B.

- Method A.

Use the site angle calculator available on the internet at url: http://www.satsig.net/ssazel.htm

- Method B.

Use the following formulas.

Local Azimuth =

ATAN(TAN((S1–S2)*0.017453)/SIN(S2*0.017453))*57.29578+180

Local Elevation =

ATAN(((COS((S1-S2)*0.017453))*(COS(S2*0.017453))-0.151263)/SQRT(1-((COS((S1-S2)*0.017453))^2)*((COS(S2*0.017453))^2)))*57.29578

Where

S1 = Satellite Latitude in decimal degrees. Enter West as positive numbers and East as negative numbers.

S2 = Site Longitude in decimal degrees. Enter values as true angles (verses uncompensated magnetic compass readings) Enter North as positive numbers and South as negative numbers.

S3 = Satellite Latitude in decimal degrees. Enter West as positive numbers and East as negative numbers.

NOTE

When using a compass to locate the azimuth aiming coordinate it may be necessary to adjust your compass indication (because of magnetic deviation) before pointing the antenna

4. Tighten the six 3/4-inch screws used to fasten clamps to 130 ft-lbf. There are two fasteners in each of the three azimuth ring clamp plates. This will level the antenna for the following elevation setting.

5. Using an inclinometer or angle indicator held across the upper actuator attachment bracket of the hub, move antenna to required elevation angle (i.e., to point where angle indicator or inclinometer indicates the elevation aiming coordinate) by turning the elevation screw.

6. Loosen the six 3/4-inch screws used to fasten the three claps. Tighten the six 3/8-inch screws (located at the clamps) which engage the anti-friction buttons to the azimuth ring. Hand tighten jam nuts against clamp plates. Rotate reflector to the approximate azimuth direction of the satellite (i.e, to point where compass or other device indicates the azimuth aiming coordinate). Slowly rotate the reflector in azimuth (in either direction) away from this point. The system should pick up the desired satellite signal. If not, slowly rotate the reflector in the opposite direction until the peak of the desired signal is detected.

7. Slowly readjust the elevation angle by turning the elevation actuator screw until the peak of the desired signal is obtained.

8. Continue to adjust azimuth and elevation as necessary, until the peak of the desired signal is obtained.

9. Loosen the 3/8-inch screws which engage the anti-friction pads to the azimuth ring, and lock the reflector in azimuth by tightening the six 3/4-inch screws (at the three clamps) to 130 ft-lbf. There are two fastening screws in each of the three azimuth ring clamp plates.

WARNING

If the six clamp fasteners are not properly torqued, the antenna could rotate under windloads, causing possible injury or loss of satellite signal.

10. Lock the elevation actuator screw by tightening the jam nut and actuator sleeve against the actuator nut.