

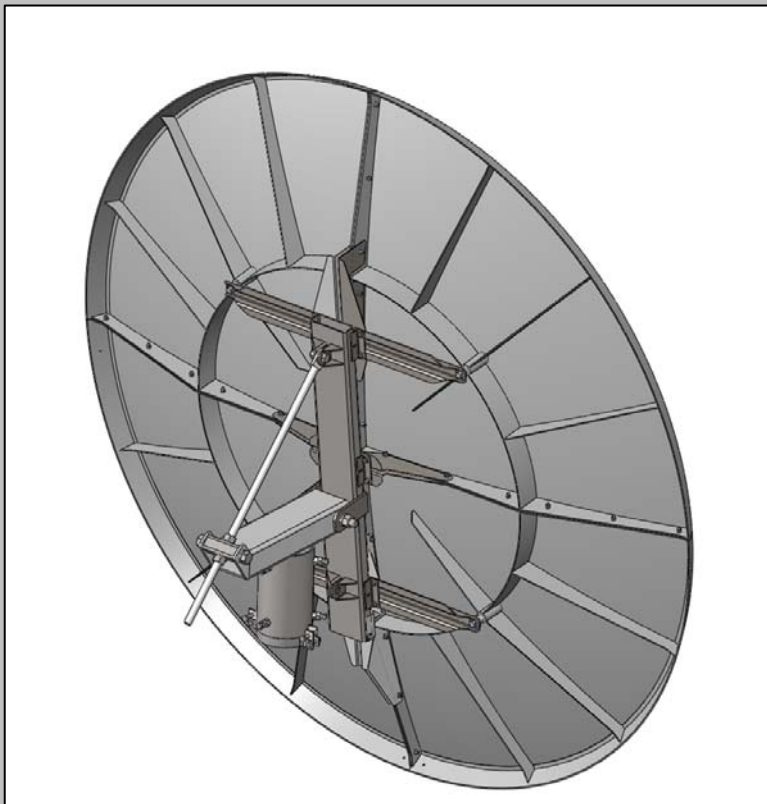
GENERAL DYNAMICS
SATCOM Technologies

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ASSEMBLY MANUAL

2.4M SERIES 1240 ANTENNA



General Dynamics SATCOM Technologies
1700 Cable Drive NE
Conover NC 28613 USA
Phone 770-689-2040
www.gdsatcom.com

2.4M SERIES 1240 ANTENNA ASSEMBLY MANUAL

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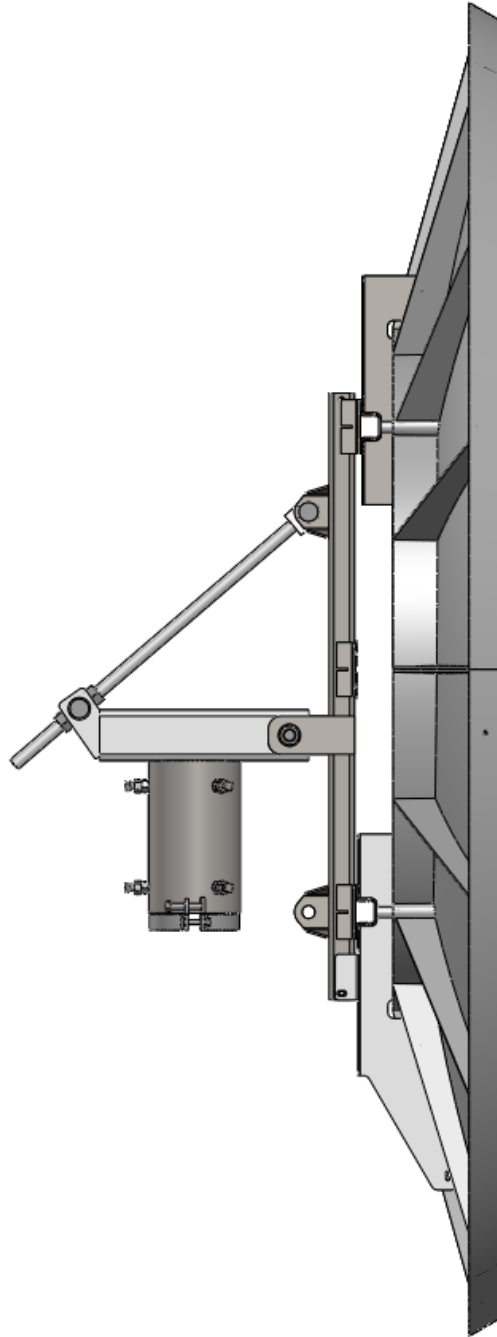


Figure 1: 2.4m Series 1240 Antenna

1. INTRODUCTION

1.1. General Information

This manual describes the assembly and installation of General Dynamics' 2.4m Rx/Tx antenna. These instructions cover all areas of assembly and installation. Additional sections are included in the manual to provide information on antenna pointing and maintenance. **General Dynamics recommends that these instructions be followed closely, and in the order shown, for proper antenna performance.**

1.2. Unpacking and Inspection

The system containers should be unpacked and inspected at the earliest date to insure that all material has been received and is in good condition. A packing list for each major component is supplied.

1.3. Freight Damage

Any damage to materials while in transit should be immediately directed to the freight carrier. They will instruct you on matters regarding any freight damage claims.

1.4. Materials – Missing or Damaged

Any questions regarding missing or damaged materials that are not due to the freight carrier should be directed to General Dynamics' Customer Service Department at:

**General Dynamics SATCOM Technologies
1700 Cable Drive NE
Conover NC 28613 USA
Phone 770-689-2040
www.gdsatcom.com**

1.5. Mechanical Installation Tools

Required Tools:

- Wrenches (see Table 1)



Other Recommended Tools:

- Compass



- Inclinometer



- Adjustable wrench 10"



- 3/8" drive Ratchet with Sockets and 6" extension (see Table 1)



- Variable Torque wrench



- Taper pin hole alignment tool



- Rubber Mallet



- Nut driver set (see Table 1)



- Powered Nut Driver with 1/2" Socket



- Gloves (some of the components have sharp edges. Light, dexterous gloves are recommended)



Table 1: Wrench and Socket Sizes Required

HARDWARE SIZE	SAE WRENCH SIZE	METRIC WRENCH SIZE	MAX RECOMMENDED TORQUE ($\pm 10\%$)
5/16"	1/2"	13mm	15 ft-lbs (20.3 n-m)
3/8"	9/16"	14mm	20 ft-lbs (27.1 n-m)
1/2"	3/4"	20mm	45ft-lbs (61 n-m)
3/4"	1-1/8"	24mm	145ft-lbs (196.6 n-m)
1"	1-1/2"	38mm	220 ft-lbs (298.3 n-m)

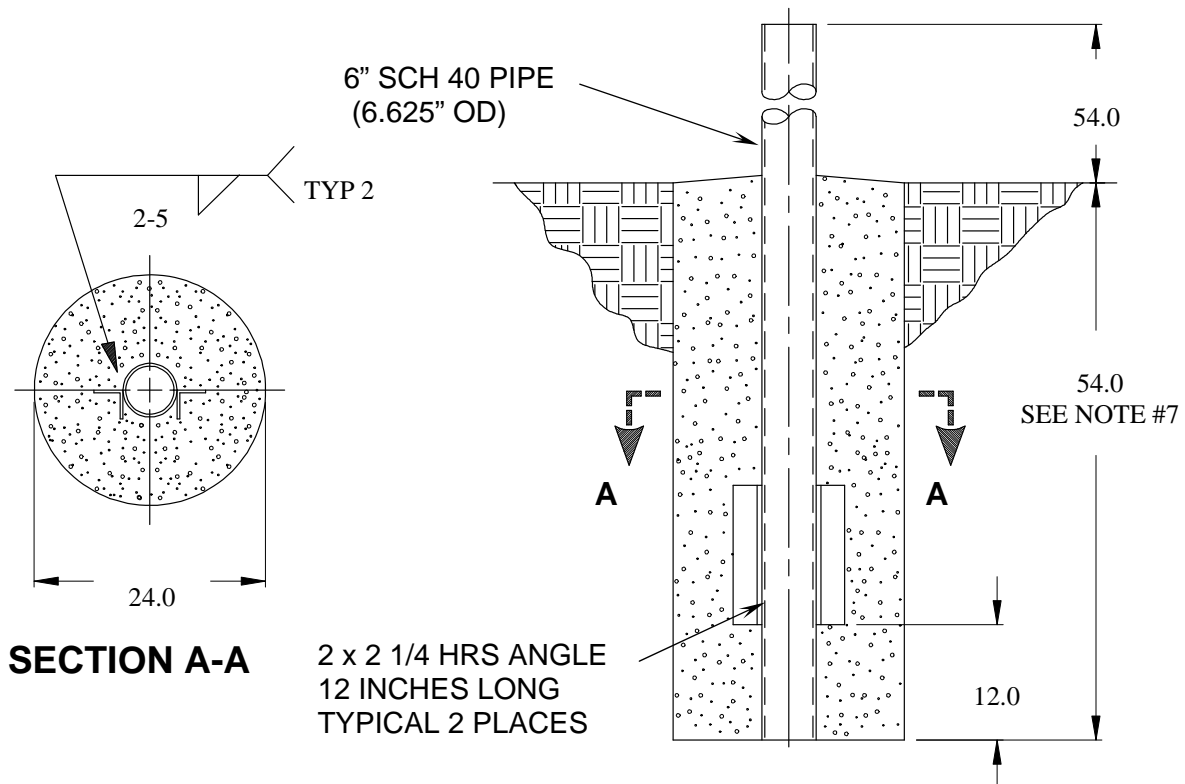
NOTE: The Minimum Torque applied should not be less than 10% of maximum recommended torque.

1.6. Site Selection

In order to achieve maximum performance of your antenna system, it is important to select the correct location for the antenna. The following guidelines should be observed when selecting a site for the installation.

1. The line of site to the satellite should be clear of any obstructions, such as trees or buildings.
2. The site should be relatively flat and level for ease of installation and access to the antenna.
3. The site should be checked for underground obstruction, such as buried cables or pipes.
4. All local building codes should be adhered to (i.e. grounding, foundation requirements, zoning rules, setbacks, etc.).

1.7. Suggested Mast & Foundation



NOTES:

1. 2 x 2 x 1/4 HRS Angle and schedule 40 pipe should conform with ASTM A36 and ASTM A53 Type E and S Grade B.
2. All concrete should conform to building code standards and have a minimum compressive strength of 3000 PSI at 28 days. (Per ACI-318-77)
3. Soil bearing capacity should be no less than 2000 PSF.
4. Concrete should be poured against undisturbed soil.
5. Allow concrete 24 hours set time before installation of antenna.
6. The antenna should be properly grounded to meet applicable local codes.
7. Minimum depth as shown or extend to local frost line.
8. Foundation meets the design requirements as set forth by the uniform building code. (1982 edition)

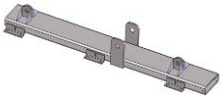













(GENERAL DYNAMICS DOES NOT REPRESENT OR WARRANT THAT ANY PARTICULAR DESIGN OR SIZE OF FOUNDATION IS APPROPRIATE FOR ANY LOCALITY OR EARTH STATION INSTALLATION.)

2. ANTENNA INSTALLATION











Table 2: Reflector and Mount Parts List

ITEM	PART NO.	DESCRIPTION	QTY
1	0179-447	Reflector, 2.4m RT 4pc Quad #1 	1
2	0179-448	Reflector, 2.4m RT 4pc Quad #2 	1
3	0179-444	Reflector, 2.4m RT 4pc Quad #3 	1
4	0179-445	Reflector, 2.4m RT 4pc Quad #4 	1
5	0490-1013	AZ / EL Positioner 	1
6	0188-093	Azimuth Adj. Collar 	1
7	0188-113	Pipe Collar 	1
8	0211-1265	Reflector BTM Bracket LH 	1
9	0211-1266	Reflector BTM Bracket RH 	1
10	0211-1267	Reflector Top Bracket LH 	1
11	0211-1268	Reflector Top Bracket RH 	1
12	0211-1269	Reflector Center Bracket 	2

Parts List Continued

13	0490-1010	2.4m 4pc Reflector Support		1
14	0247-445	2.4m 4pc Crossarm		2
15	0490-1014	Weldment, Elevation Rod		1
0200-948 Reflector Spacer Kit				
16	0159-265	Reflector Spacer #65 Threaded Insert		4
17	8110-007	Nut, 7/8-9 Hex Jam		4
18	8201-052	Flat washer, 7/8 USS STD		4
19	8202-068	Lock washer, 7/8 Internal Tooth		4
0200-1830 AZ / EL Hardware Kit				
20	8032-018	Bolt, 3/8-16 x 2.25 Hex		2
21	8033-020	Bolt, 1/2-13 x 2.50 Full Thread Hex		2
22	8036-072	Bolt, 1-8 x 9.00 Hex		1
23	8036-024	Bolt, 1-8 x 3.00 Hex		1
24	8102-007	Nut, 3/8-16 Hex		2
25	8107-007	Nut, 1-8 Hex		4
26	8201-042	Flat washer, 3/8 USS STD		4

Parts List Continued

27	8201-049	Flat Washer, 1" SAE STD		4
28	8202-042	Lock washer 3/8 STD		2
29	8202-046	Lock washer 1" STD		2
0200-1828 Reflector Seam Hardware Kit				
30	8031-108	Bolt, 5/16-18 x 1.00 Flange Head Hex		24
31	8101-010	Nut, 5/16-18 Serrated Flange Hex		24
0200-1829 Reflector Support Hardware Kit				
32	8039-008	Bolt, 3/8-16 x 1.00 Carriage Bolt		14
33	8102-017	Nut, 3/8-16 Serrated Flange Head Hex		14
34	8033-010	Bolt, 1/2-13 x 1.25 Hex		4
35	8201-043	Flat washer, 1/2 USS STD		4
36	8202-043	Lock washer, 1/2" STD		4

2.1. AZ / EL POSITIONER INSTALLATION

CAUTION: During the assembly procedure, the sequence of instructions must be followed. **DO NOT TIGHTEN ANY HARDWARE UNTIL INSTRUCTED.**

NOTE

- The AZ/EL positioner must be oriented correctly to allow fine azimuth adjustment, before tightening the positioner to the mast pipe, point the positioner within 10deg of the satellite heading as shown in Figure 2 below.
- Make sure the set screws are not protruding into the inside of the AZ/EL positioner canister before proceeding with Step 1.

STEP 1:

Install the AZ/EL positioner (item#5) onto the mast pipe as shown below in Figure 1.

STEP 2:

Using a compass to find the satellite heading for the installation site, rotate the positioner so that it is pointing to the required satellite heading. See Figure 1.

STEP 3:

Tighten the set screws then tighten the 5/8" lock nuts against the canister.

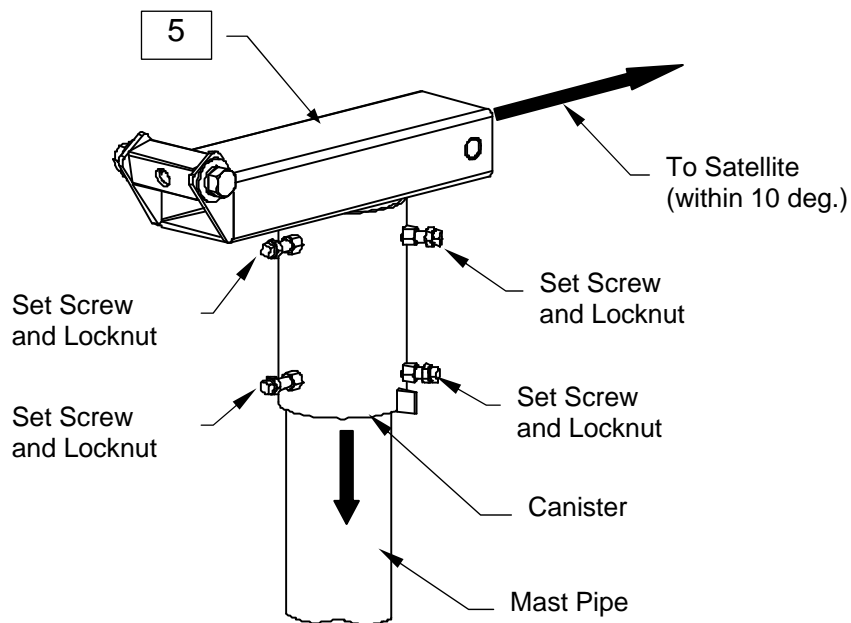


Figure 2: AZ / EL Positioner

2.2. REFLECTOR QUADRANT ORIENTATION

Standard Orientation

The series 1244 reflector quadrants are labeled #1, #2, #3 and #4. These numbers may be found molded into the back of each quadrant at the inside corner. Note that each quadrant has a longer side (major axis) and a shorter side (minor axis). In the standard upright position, the antenna elevation angle range is between 5 and 90 degrees. When viewed from behind in the standard position (feed support at the bottom), quadrant #1 should be in the upper left; #2 is lower left; #3 is lower right and #4 in the upper right position. See Figure 3.

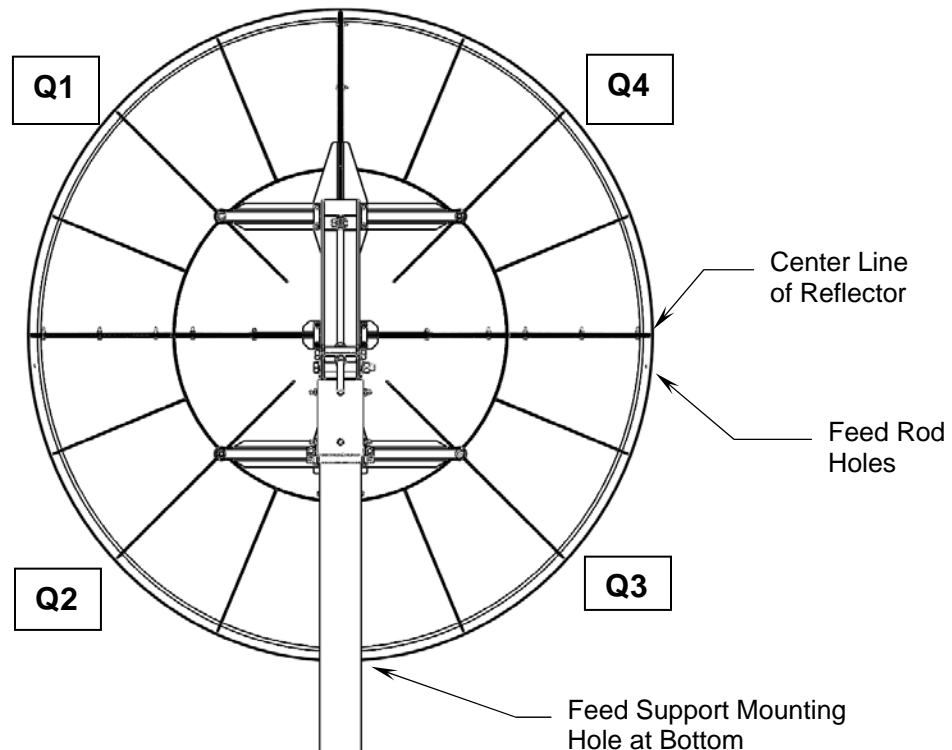


Figure 3: Reflector Orientation Standard

NOTE

- When assembling for the inverted position, the Reflector Support and Cross Arms (item 11, 12) must be turned 180 degrees from its standard position prior to its mounting to the AZ/EL positioner (item #5) – see next section, Inverted Orientation.
- The optional feed stabilization kit cannot be used when the reflector is used in the inverted position.

Inverted Orientation

To allow a lower profile installation or in areas of high snow accumulation, the reflector can be assembled in the inverted position (feed support at the top). In this position, quadrant #1 would be in the lower right; #2 upper right; #3 in upper left and #4 in lower left position. See Figure 4.

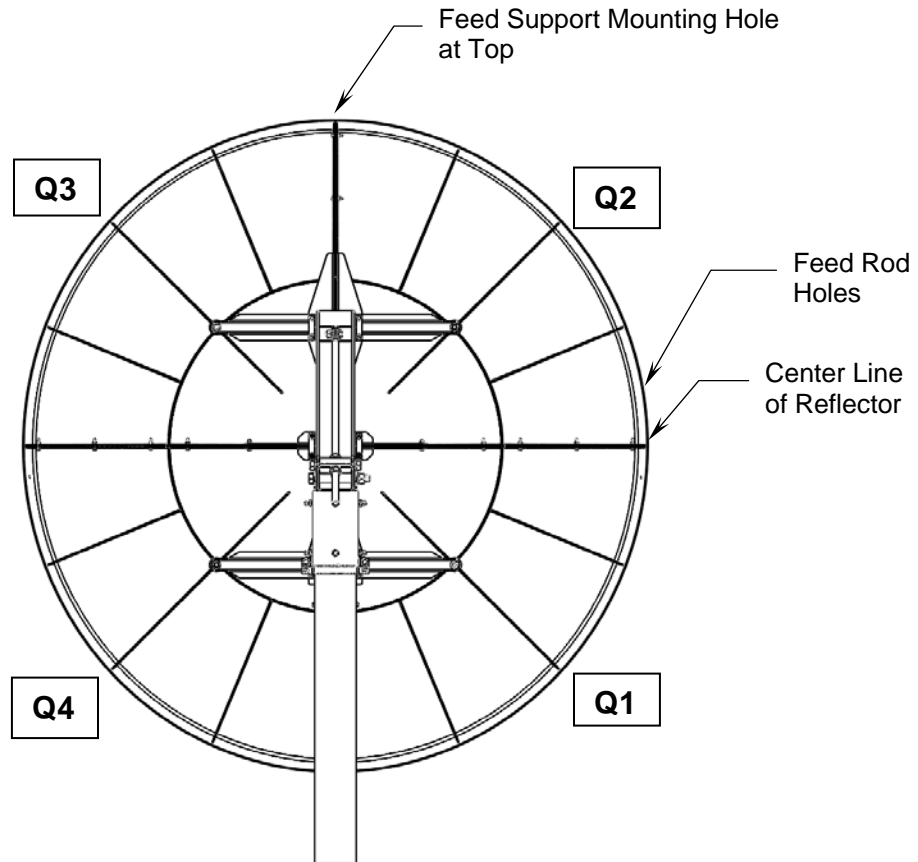


Figure 4: Reflector Orientation Inverted

2.3. REFLECTOR SUPPORT ASSEMBLY

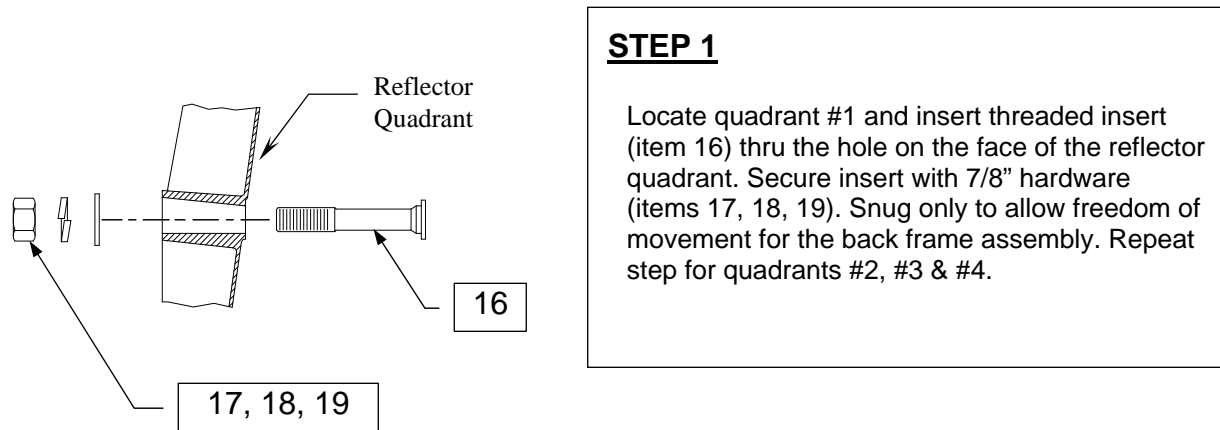


Figure 5: Reflector Spacer Installation

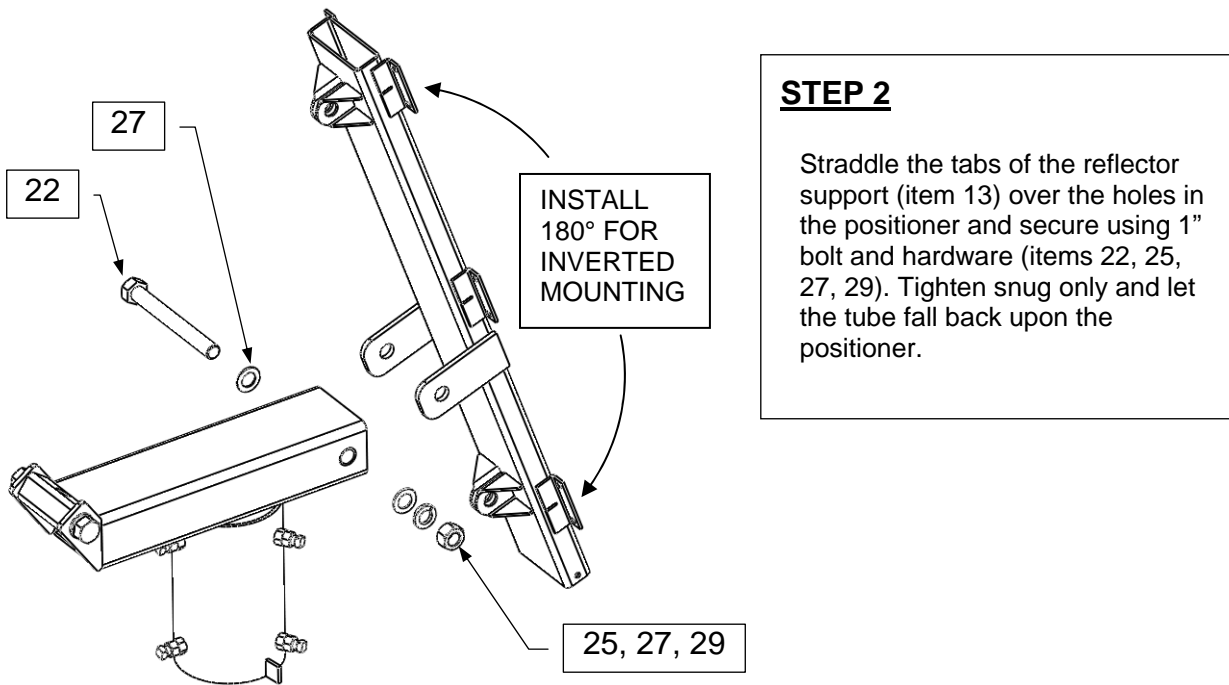


Illustration shown in Standard Orientation.
Flip the reflector support 180° for inverted orientation. See Section 2.2

Figure 6: Reflector Support Assembly

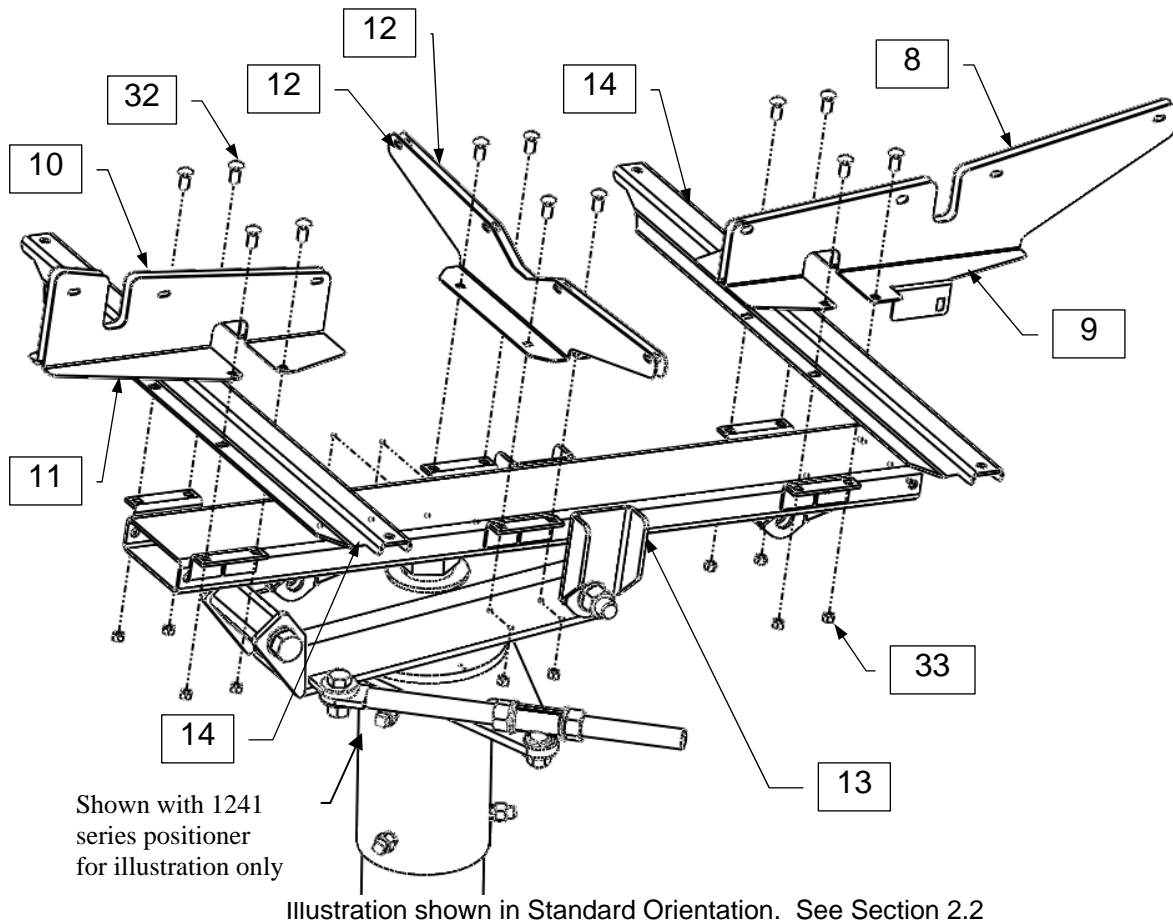


Figure 7: Reflector Support Brackets

STEP 3

(A) Place the cross arms (item 14) on the reflector support (item 13) as shown. Place the RH and LH top brackets (items 10, 11) on the top cross arm and secure with 3/8 hardware (items 32, 33) as shown. Snug hardware by hand only at this time.

(B) Place the RH and LH bottom brackets (items 8, 9) on the bottom cross arm and secure with 3/8 hardware (items 32, 33) as shown. Snug hardware by hand only at this time.

(C) Place the two center brackets (item 12) on the reflector support as shown and secure with 3/8 hardware (items 32, 33) as shown. Snug hardware by hand only at this time.

NOTE: If installing the reflector in the inverted orientation, the locations of the reflector support (item #13) and the brackets (item #8, 9, 10, 11) will be reversed, with respect to the positioner, from the location shown.

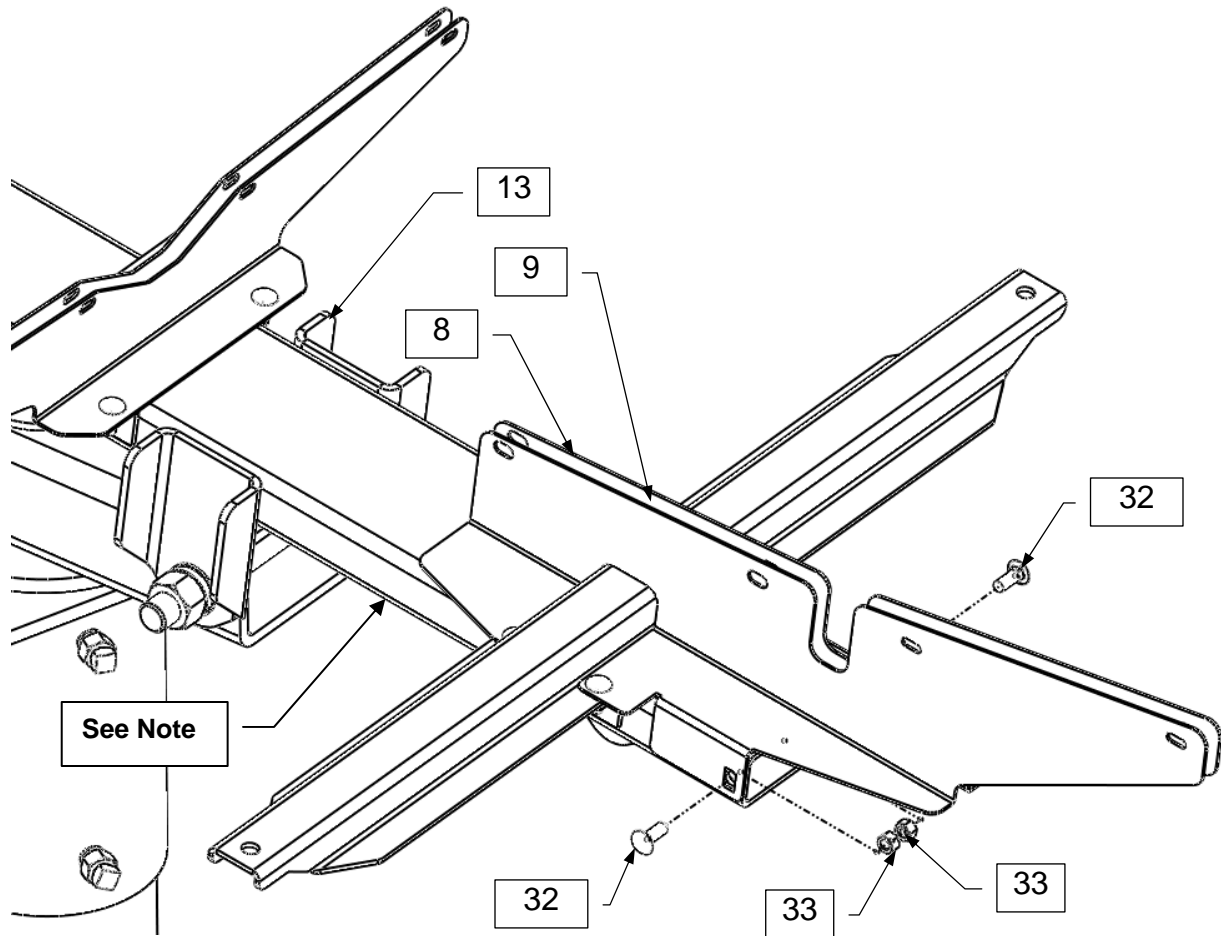


Illustration shown in Standard Orientation. See Section 2.2

Figure 8: Reflector BTM Support Brackets

STEP 4

Note: Make sure the BTM brackets (items 8, 9), and the cross arm (item 14), are fully seated against the reflector support with no gaps between any of the components before completing the next procedure.

Insert 3/8" hardware (items 32) thru the reflector support (item 13) and the BTM brackets (item 8, 9) as shown. Secure with 3/8" hex nuts (item 33). Tighten this hardware to recommended torque to secure the BTM brackets. (See table 1).

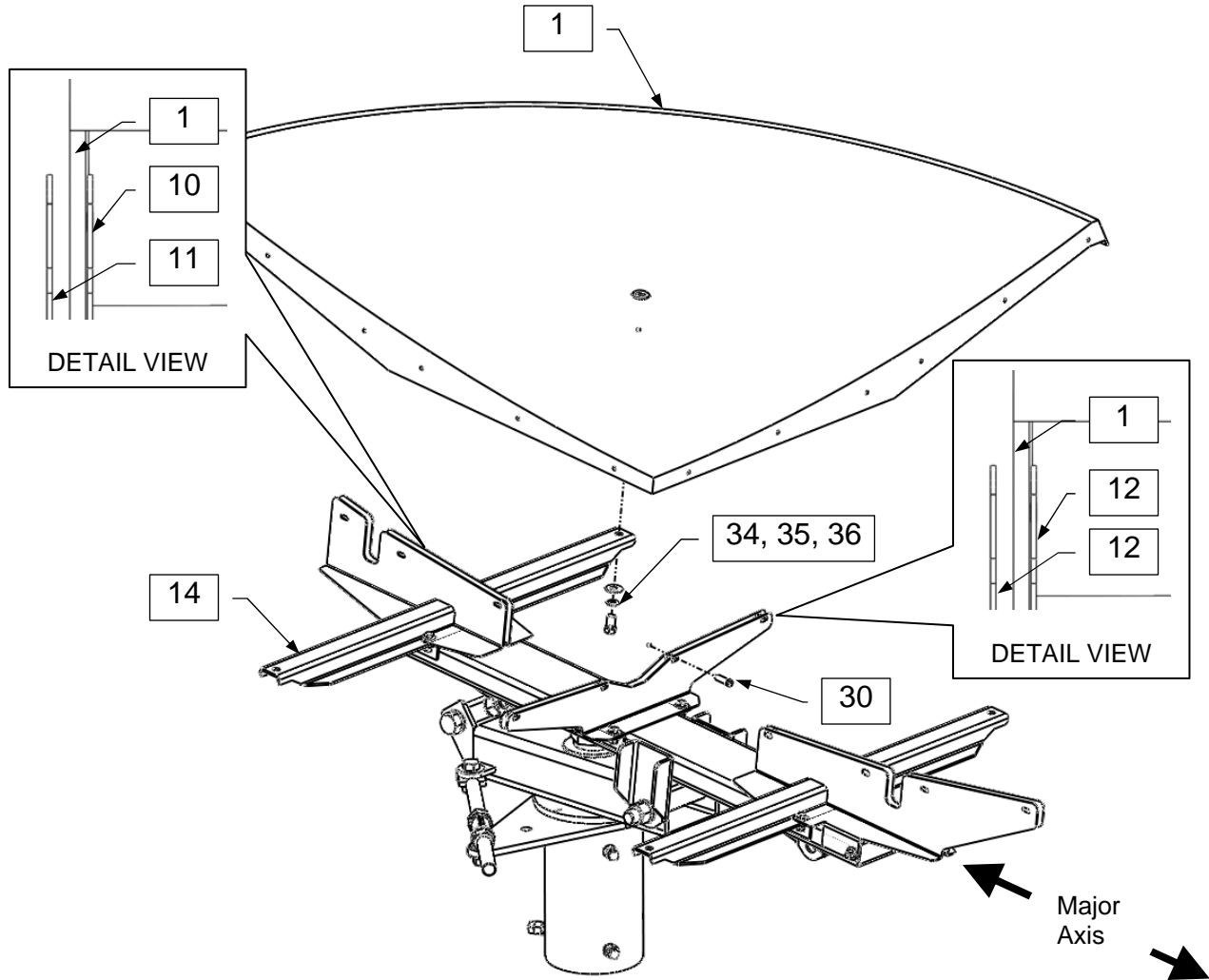


Illustration shown in Standard Orientation. See Section 2.2

Figure 9: Quad #1 Installation

STEP 5

Note: Installing the upper quads (#1, #4) first will ease installation.

(A) Place Quad #1 on the cross arm (item 14) with the seam ribs between the reflector brackets (items 10, 11, 12). Note that the longer side should be aligned with the major axis.

(B) Insert a 5/16 bolt (item 30) thru the seam rib and the center bracket (item 12) to temporarily hold the reflector quadrant.

(C) Insert the 1/2" bolt and washers (item 34, 35, 36) thru the cross arm and into the reflector spacer. Hand snug only at this time.

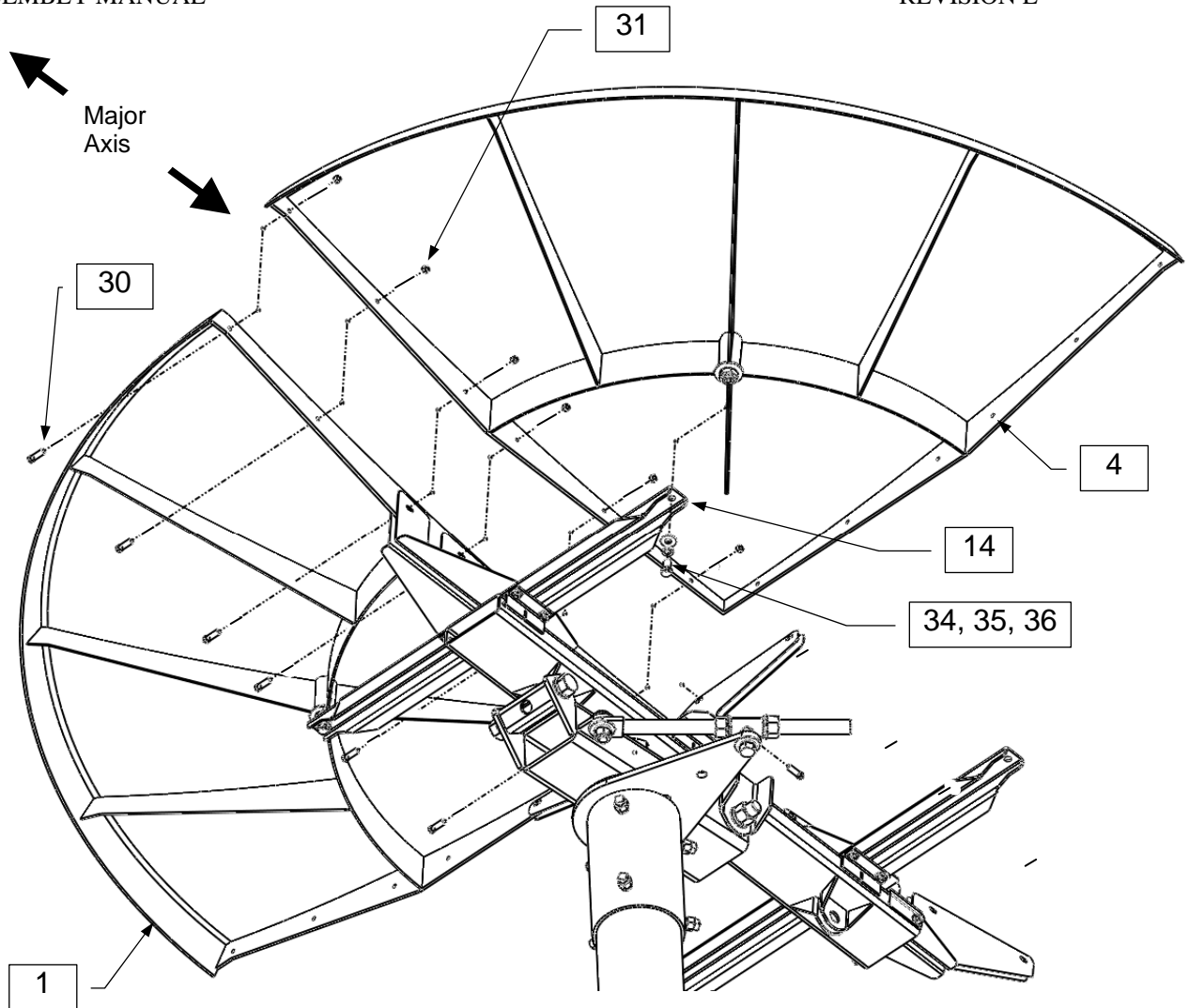


Illustration shown in Standard Orientation. See Section 2.2

Figure 10: Quad #4 Installation

STEP 6

- (A)** Place Quad #4 on the cross arm (item 14) with the seam rib against the seam rib of quad #1 and between the reflector brackets (items 10, 11, 12). Note that the longer side should be aligned with the major axis.
- (B)** Insert a 5/16 bolt (item 30) thru the seam rib and the center bracket (item 12) to temporarily hold the reflector quadrant.
- (C)** Insert the 1/2" bolt and washers (item 34, 35, 36) thru the cross arm and into the reflector threaded insert. Hand snug only at this time.
- (D)** Insert 5/16" bolts (item 30) thru the brackets and the major seam ribs as shown. Secure with 5/16" hex nuts (item 31). Hand snug only.
- (E)** Remove the temporary 5/16" bolts placed thru the center bracket in STEP 5 (B) and STEP 6 (B), after Quads #1 and #4 are supported by the major seam bolts and the 1/2" hardware.

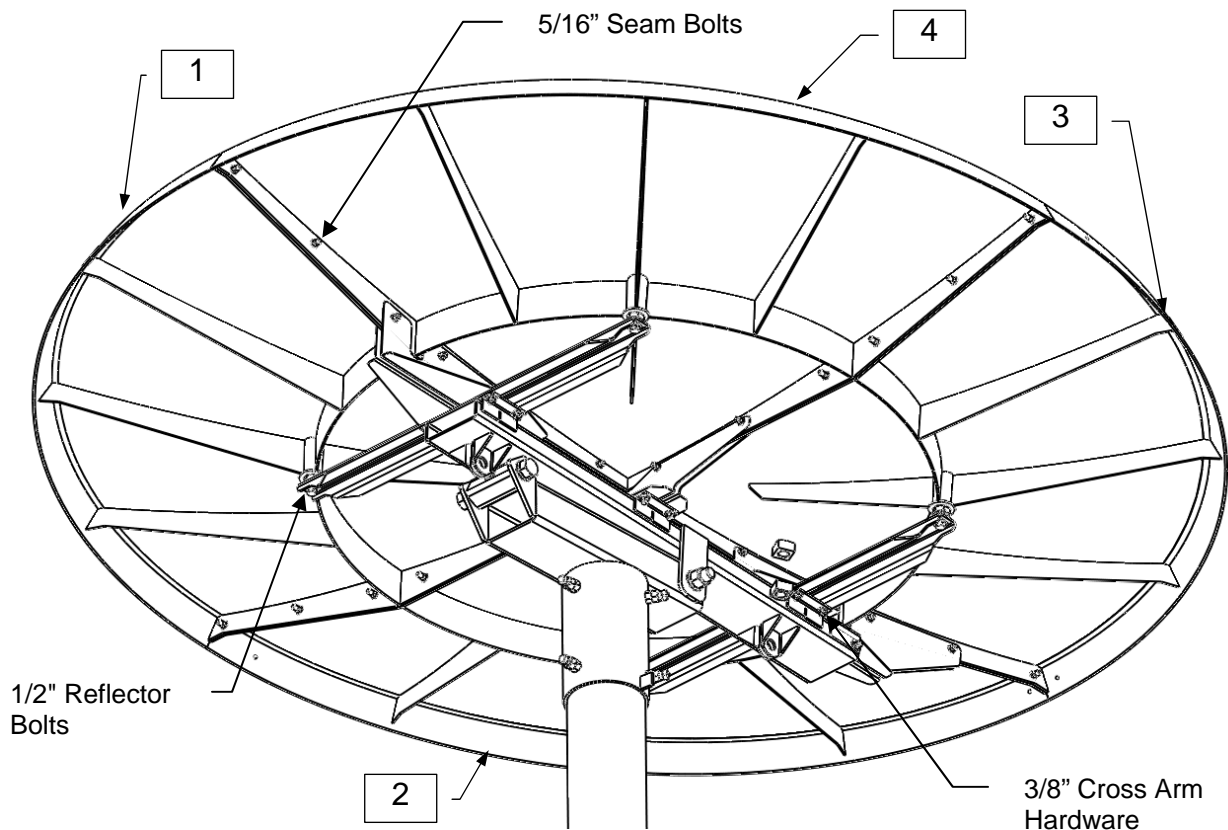


Illustration shown in Standard Orientation. See Section 2.2

Figure 11: Complete Reflector

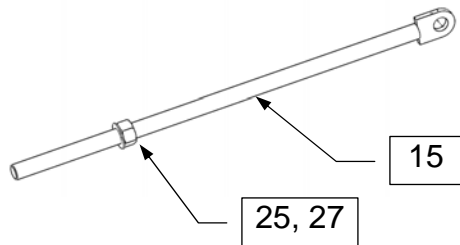
STEP 7

(A) Install Quad #1 and Quad #4 using the same procedures as outlined in STEP 6. After all the seam bolts are installed, begin tightening the 5/16" seam bolts from the center out until all the seam bolts are tightened to the recommended torque. (See table 1)

Note: Make sure the Reflector brackets (items 8, 9, 10, 11, 12), and the cross arm (item 14), are fully seated against the reflector support with no gaps between any of the components before completing the next procedure.

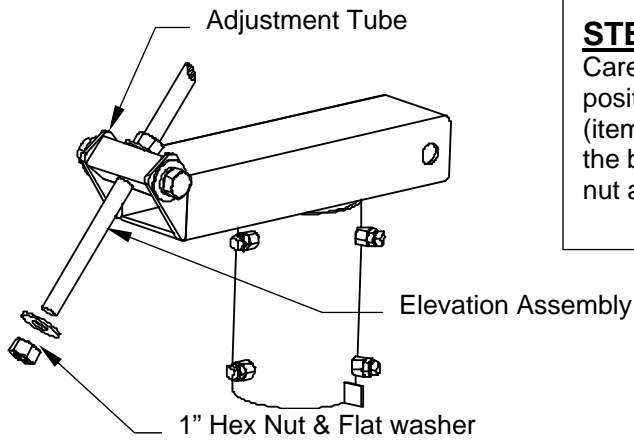
(B) Next tighten the 3/8" cross arm and center bracket hardware to the recommended torque. (See table 1)

(C) To complete the reflector assembly, tighten the four reflector insert nuts and the four 1/2" reflector bolts to the recommended torque. (See table 1)



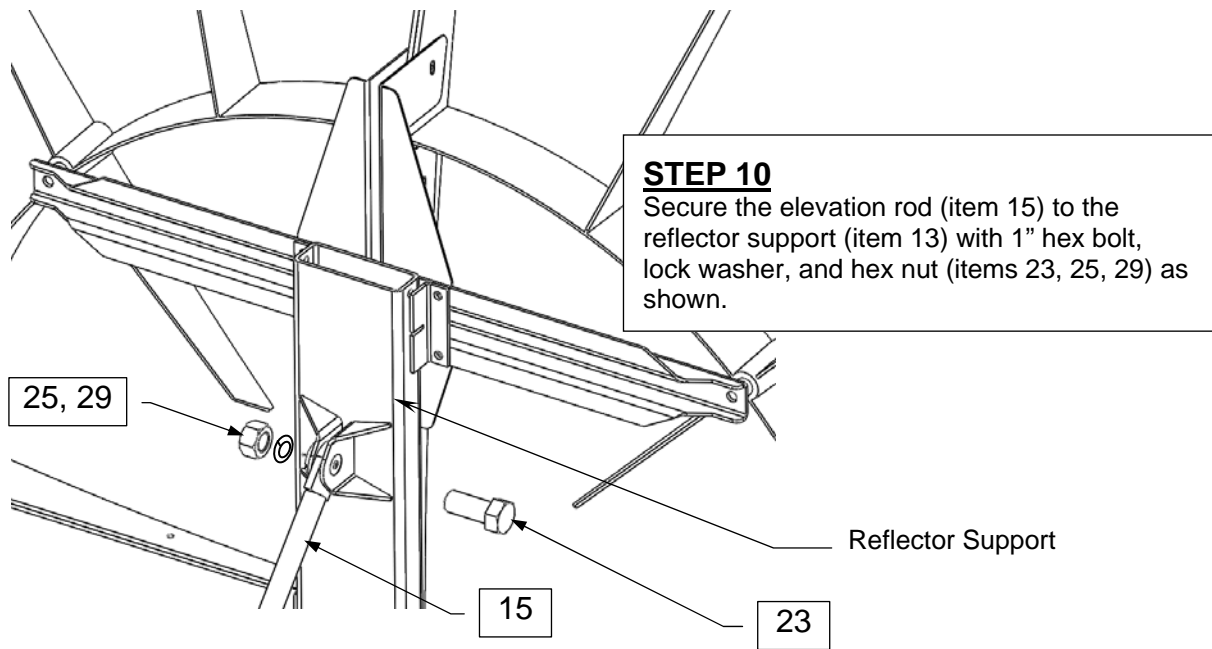
STEP 8
Locate the elevation rod (item 15) and install the 1" hex nut and washer (items 25, 27).

Figure 12: Elevation Rod Sub-assembly



STEP 9
Carefully swing the reflector up into a vertical position. Insert the elevation rod assembly (item 15) thru the elevation adjustment tube at the back of the positioner. Install the 1" hex nut and flat washer (items 25, 27).

Figure 13: Elevation Rod Assembly thru Elevation Tube



STEP 10
Secure the elevation rod (item 15) to the reflector support (item 13) with 1" hex bolt, lock washer, and hex nut (items 23, 25, 29) as shown.

Figure 14: Elevation Rod Assembly to Reflector Support

2.4. Azimuth Adjustment Kit

Note: This step should be performed after initially locating satellite, see Section 4.2.

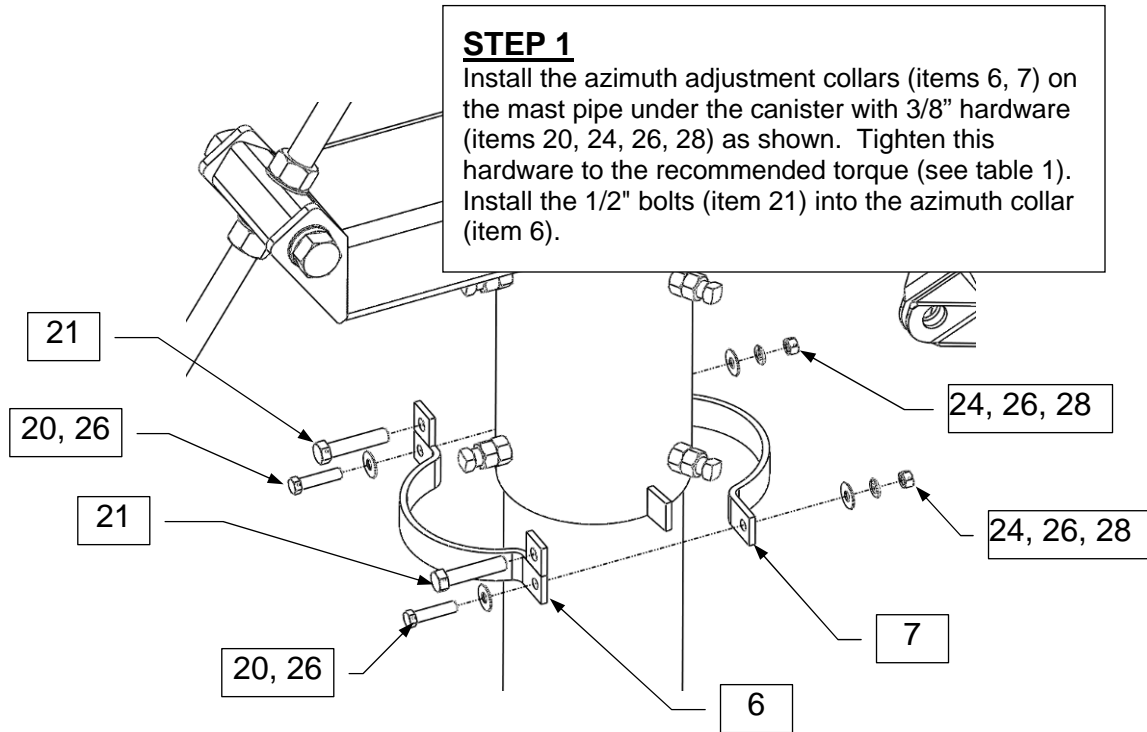


Figure 15: Azimuth Adjustment Kit Assy

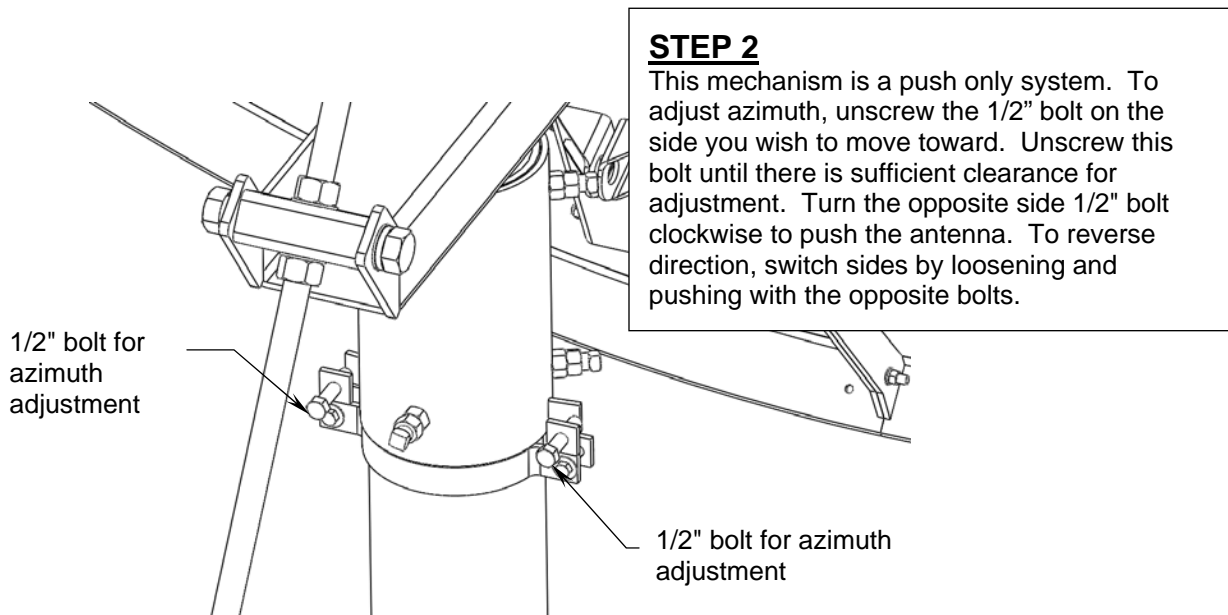


Figure 16: Azimuth Adjustment Kit Operation

3. FEED SUPPORT

This antenna will accept a variety of feed supports and feed systems. For Feed support installation instructions, refer to the manuals supplied with the feed support.

4. ANTENNA ALIGNMENT

4.1. Alignment to Satellite

The 2.4M offset reflector contains a 17.35° elevation offset angle. Therefore, when the reflector aperture is perpendicular to the ground, the antenna is actually looking 17.35° in elevation. The following alignment procedure is intended only as a general reference guide for this antenna. For proper antenna performance, accurate alignment is critical. Therefore, it is recommended that your own detailed procedure be used or contact General Dynamics' Technical Support Department for additional recommendations.

4.2. Initial Alignment

- 1) Place an inclinometer on the reflector support as shown in Figure 4. Remember to add 17.35 degrees to the reading to allow for the reflector's offset angle (or subtract 17.35 degrees if inverted)
- 2) Raise or lower the antenna to find the desired elevation by turning the 1" nuts located at the elevation block. Position the top nut so that it will not interfere with adjustment. Turn the bottom nut clockwise to increase elevation and counterclockwise to decrease elevation.
- 3) After the correct elevation angle is set, rotate the antenna in azimuth by loosening the 6 canister set screws and rotating the entire antenna about the mast pipe. Rotate azimuth until a signal is reached.
- 4) Peak the antenna signal by fine adjustments made in both azimuth and elevation.
- 5) For azimuth fine adjustment, attach the fine adjust collar assembly. See Section 2.4 for details.
- 6) Once optimal signal is obtained, tighten all of the hardware used for adjustments.

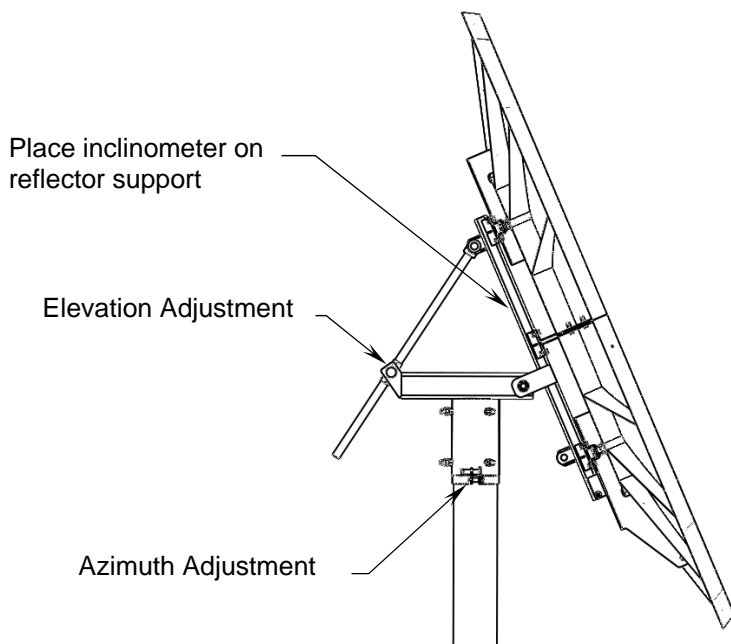


Figure 17: Antenna Alignment

5. MAINTENANCE

5.1. *Maintenance Overview*

After installation, the antenna requires only periodic inspection. It is anticipated that maintenance, if required, will be minimal and easily handled by a local or in-house maintenance staff.

5.2. *Periodic Inspection*

It is suggested that a periodic inspection be performed at least every six months.

NOTE: After any very severe weather conditions, inspection of the antenna should be performed to determine if foreign objects have caused damage or if survival specifications have been exceeded.

This inspection should include the following:

- 1) Check all bolting locations - all bolts should be tight.
- 2) Check all structural members - repair or replace if damaged.
- 3) Check the foundation anchor bolts - they must be secure and with no failure signs in foundation.
- 4) Check for corrosion - on the reflector structure and mount.

5.3. *Reflector*

General Dynamics' reflector does not require any maintenance. The composite construction of the reflector is virtually impervious to any damages that could be caused by weather or other atmospheric conditions. It is only necessary to inspect for any physical damage done by vandalism or very severe weather conditions. Should any damage be detected to a portion of the reflector, contact the Customer Service Department at General Dynamics for recommendations involving reflector repair.

5.4. *Mount and Reflector Support Structure*

The mount and reflector support structure supplied with this antenna is of steel construction and has a hot-dipped galvanized finish. If inspection shows any signs of structural failure, the mount members that are damaged should be repaired or replaced.

Corrosion: Any corrosion on steel members may be repaired with a zinc-rich cold galvanizing paint.

5.5. *Repair and / or Replacement*

Any questions or issues regarding repair or replacement parts should be addressed to General Dynamics's customer service department at:

**General Dynamics
SATCOM Technologies
1500 Prodelin Drive
Newton NC 28658
USA
(828) 464-4141**