

GENERAL DYNAMICS
SATCOM Technologies

4096-525
Revision D
January 21, 2002

ASSEMBLY MANUAL

**4 Piece 2.4 Meter
Series 1244 Antenna System
(III)**

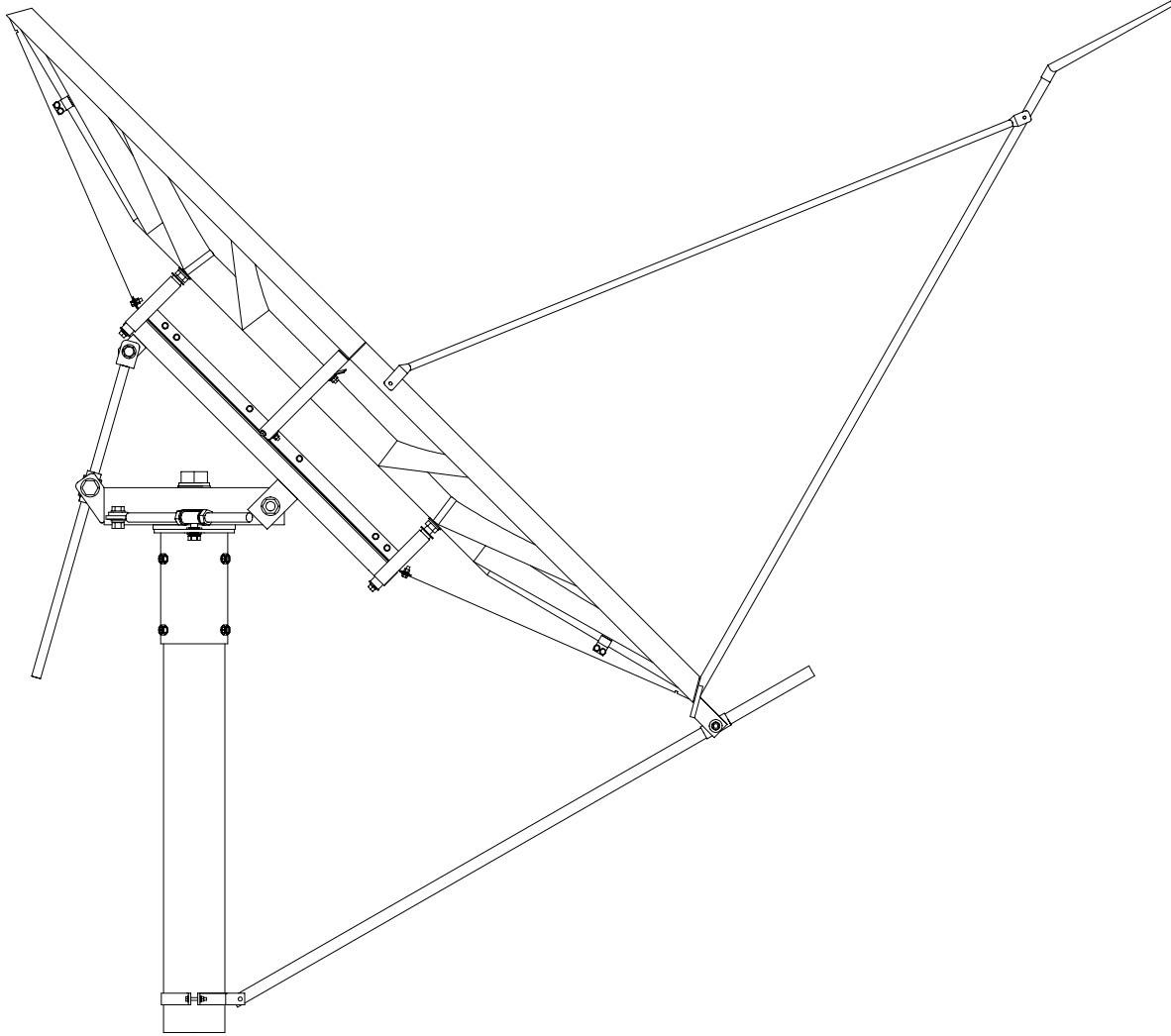
General Dynamics Satcom Technologies
1500 Prodelin Drive
Newton NC 28658

4 Pc. 2.4 Meter Series 1244 Antenna System (III)

D	Revise Logo	4/17/09	RAH
C	Revise Hardware	11/19/04	RAH
B	Revised Address	1/21/02	RAH
A	Revise and update	12/10/97	PGW
-	ORIGINAL RELEASE	4/14/97	PGW
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SECTION I GENERAL INFORMATION**1.0 INTRODUCTION**

This manual describes the assembly and installation of General Dynamics's 2.4M 4-Piece antenna system with an Az/EI mount (series number 1244). The General Dynamics 2.4M is a rugged, reliable antenna system that will operate in the Ku-band frequency with high efficiency and at the same time successfully withstand the effects of the environment.

Sections that cover all areas of assembly and installation list these instructions. Additional sections are included in the manual to provide information on antenna alignment to the satellite and maintenance.

1.1 UNPACKING AND INSPECTION

- 1. UNPACKING & INSPECTION** - The antenna containers should be unpacked and inspected at the earliest date to ensure that all material has been received and is in good condition. A complete packing list for each major component is supplied.

- 2. FREIGHT DAMAGE** - Any damage to materials while in transit should be immediately directed to the freight carrier. He will instruct you on the matters regarding any freight damage claims.

- 3. MATERIAL - MISSING OR DAMAGED** - Any questions regarding missing or damaged materials that is not due to freight carrier should be directed to General Dynamics's Customer Service Department at:

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

1.2 MECHANICAL INSTALLATION TOOLS

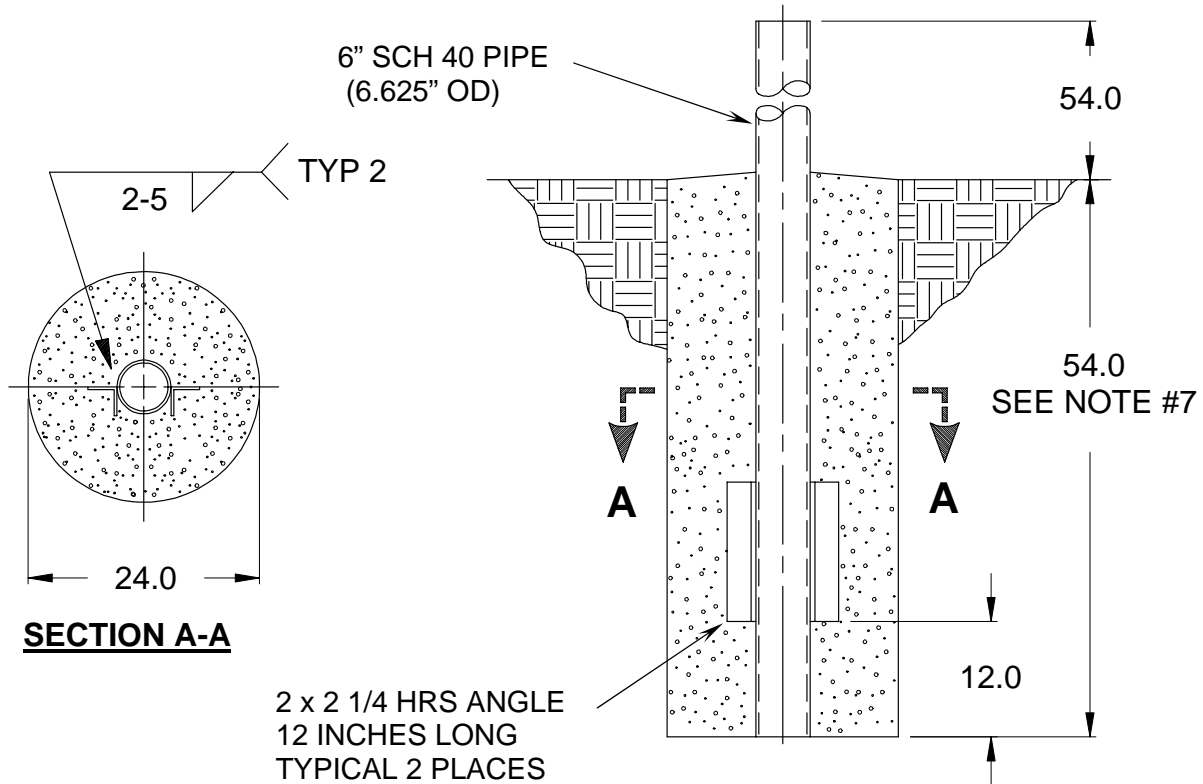
HARDWARE SIZE	SAE WRENCH SIZE	METRIC WRENCH SIZE	MAXIMUM REC. TORQUE
5/16"	1 / 2"	13 mm	12 ft-lbs
1 / 2"	3 / 4"	20 mm	35 ft-lbs
5 / 8"	15 / 16"	24 mm	70 ft-lbs
3 / 4"	1 – 1 / 8"	28 mm	160 ft-lbs
7 / 8"	1 – 1 / 4"	32 mm	190 ft-lbs
1"	1 – 1 / 2"	38 mm	220 ft-lbs

- 1 screwdriver, standard blade
- 1 screwdriver, cross blade
- 1 10" adjustable crescent wrench
- 1 Allen wrench, 5/32"
- 1 3" (76mm) wrench (socket, crescent or pipe) for 2"-4.5 bolt
- 1 Cordless Drill, 3/8" (recommended)
- 1 compass
- 1 inclinometer

1.3 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.

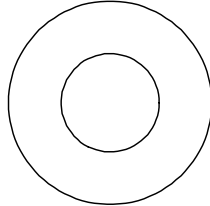
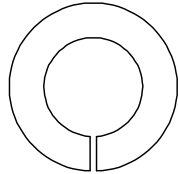
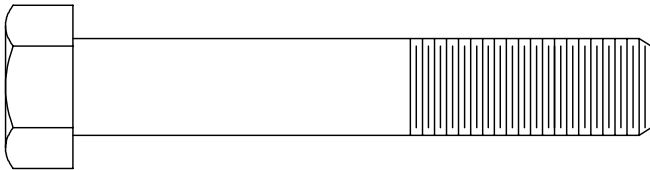
1. The line of site to the satellite should be clear of any obstructions, such as trees or buildings.
2. The site should be relatively flat and level for ease of installation and access to the antenna.
3. The site should be checked for underground obstruction, such as buried cables or pipes.
4. All local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

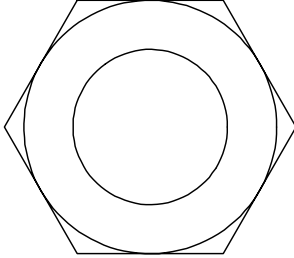
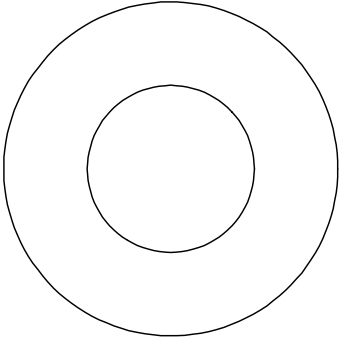
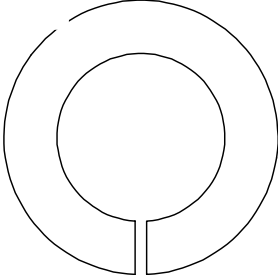
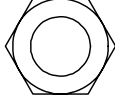
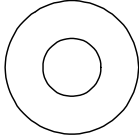
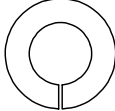
1.4 SUGGESTED MAST & FOUNDATION**NOTES:**

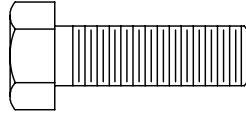
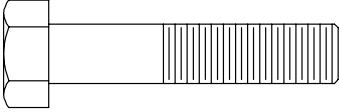
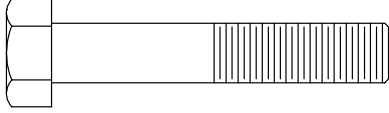
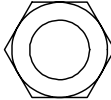
1. 2 x 2 x 1/4 HRS Angle and schedule 40 pipe should conform to ASTM A36 and ASTM A53 Type E and S Grade B.
2. All concrete should conform to building code standards and have a minimum compressive strength of 3000 PSI at 28 days. (Per ACI-318-77)
3. Soil bearing capacity should be no less than 2000 PSF.
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.)

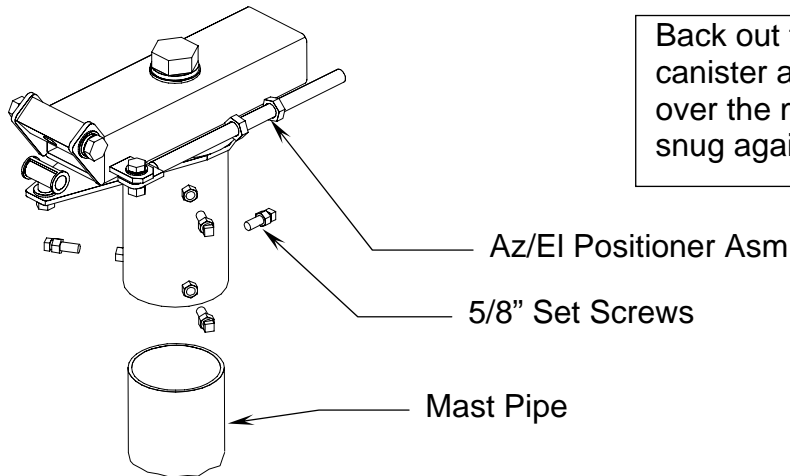
SECTION II REFLECTOR AND SUPPORT ASSEMBLY

REFLECTOR AND SUPPORT ASSEMBLY PART LIST- TABLE 2.0			
ITEM	PART NO.	DESCRIPTION	QTY
1	VARIES	2.4M Reflector Petals	4
2	0181-691	Az/EI Positioner Assembly	1
3	0181-037	Back Frame	1
4	0181-182	Major Template Assembly	1
5	0181-183	Minor Template Assembly	1
6	0181-249	Elevation Rod Assembly	1
7	0159-265	Threaded Insert	4
8	8201-033G	Green 1/2" Wide washer	4
9	8201-043	1/2" Flatwasher	4
			
10	8202-043	1/2" Lockwasher	4
			
11	8033-061	1/2"-13 x 9.00 Bolt	4
			

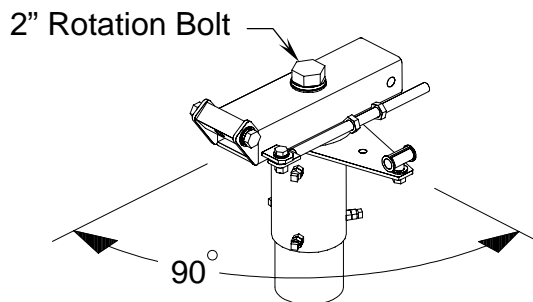
PARTS LIST - CONTINUED			
ITEM	PART NO.	DESCRIPTION	QTY
12	8110-007	7/8" Hex Nut 	4
13	8201-052	7/8" Flatwasher 	4
14	8202-052	7/8" Lockwasher 	4
15	8101-009	5/16" Hex Nut 	12
16	8201-041	5/16" Flatwasher 	84
17	8202-041	5/16" Lockwasher 	12

PARTS LIST - CONTINUED			
ITEM	PART NO.	DESCRIPTION	QTY
18	8031-008	5/16"-18 x 1.00 Bolt 	8
19	8031-012	5/16"-18 x 1.50 Bolt 	4
20	8031-014	5/16"-18 x 1.75 Bolt 	20
21	8101-005	5/16" Nylon Hex Nut 	20

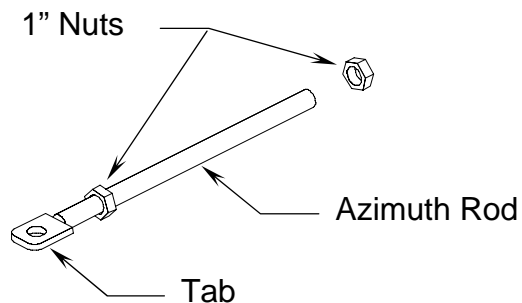
CAUTION: During the assembly procedure, the sequence of instructions must be followed. **Do Not Tighten Any Hardware Until Instructed.** Refer to the antenna assembly parts list and the following steps.

2.1 Az / EI POSITIONER INSTALLATION**STEP 1:**

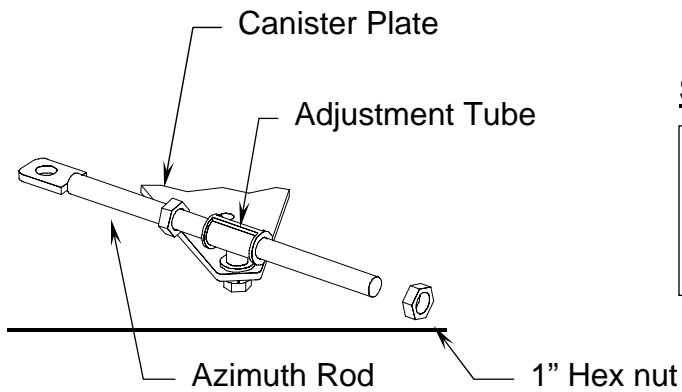
Back out the [8] 5/8" set screws from the canister and slip Az/EI positioner assembly over the mast pipe. Tighten the set screws snug against the mast pipe.

**STEP 2:**

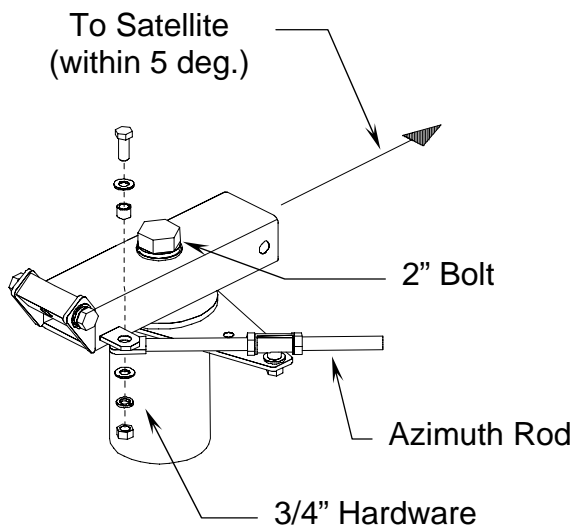
- Loosen the 2" rotation bolt on top of the positioner.
- Rotate the positioner so that the canister plate is oriented as shown.
- Lightly tighten the 2" bolt.

**STEP 3:**

- Remove the azimuth rod from the positioner.
- Run one of the 1" nuts up towards the tab end of the rod and remove the other 1" nut.

**STEP 4:**

Place the end of the azimuth rod thru the adjustment tube attached to the top of the canister plate and replace the 1" hex nut.

**STEP 5:**

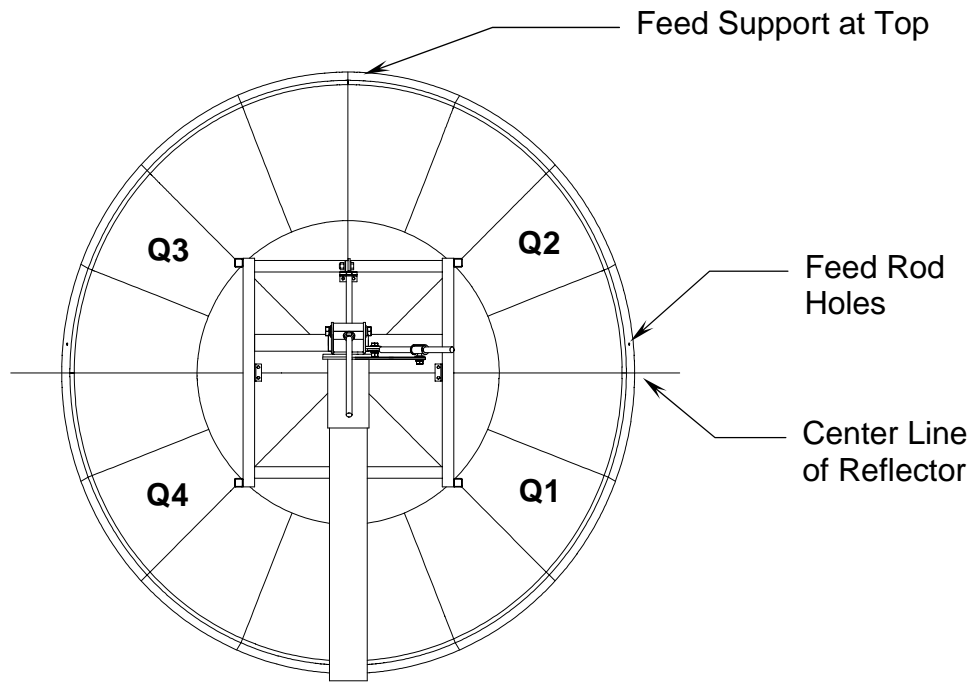
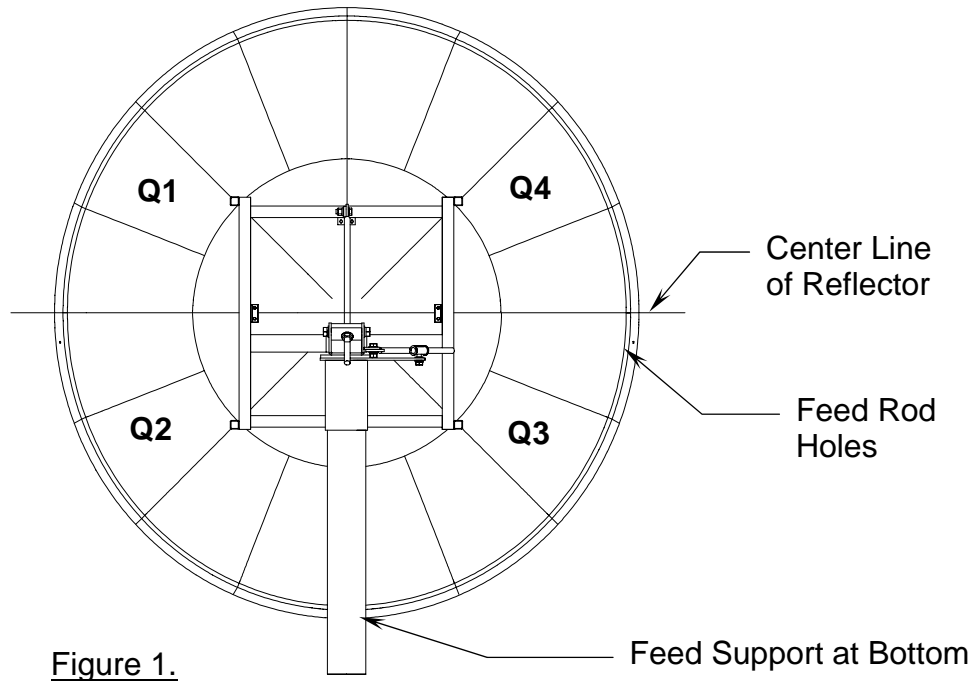
- A) Re-attach the azimuth rod to the positioner with the 3/4" x 2.00 bolt flatwashers, lockwasher, sleeve and nut. Tighten securely. Snug the 2" rotation bolt at this time.
- B) The positioner must be oriented correctly to the center of the satellite orbital arc. Loosen the set screws and rotate the canister on the mast pipe to the required position. Tighten the set screws then tighten the 5/8" lock nuts against the canister.

2.2 **REFLECTOR QUADRANT 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 12 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 1.

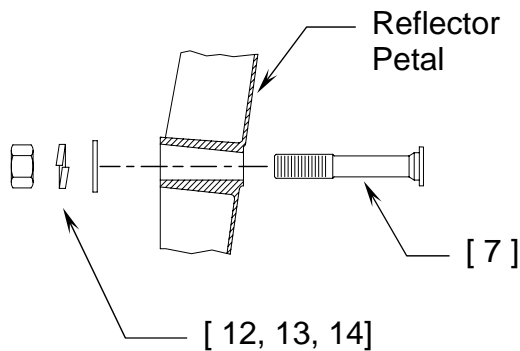
However, to allow a lower profile installation or in areas of high snow accumulation, the reflector can be assembled in the inverted position (feed support at the top). In this position, quadrant #1 would be in the lower right; #2 upper right; #3 in upper left and #4 in lower left position. See Figure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

When assembling for the inverted position, the Back Frame (item 3) must be turned 180 degrees from its standard position prior to its mounting to the Az/EI positioner – see Step 7. *Also note* that the feed stabilization kit cannot be used when the reflector is used in the inverted position.



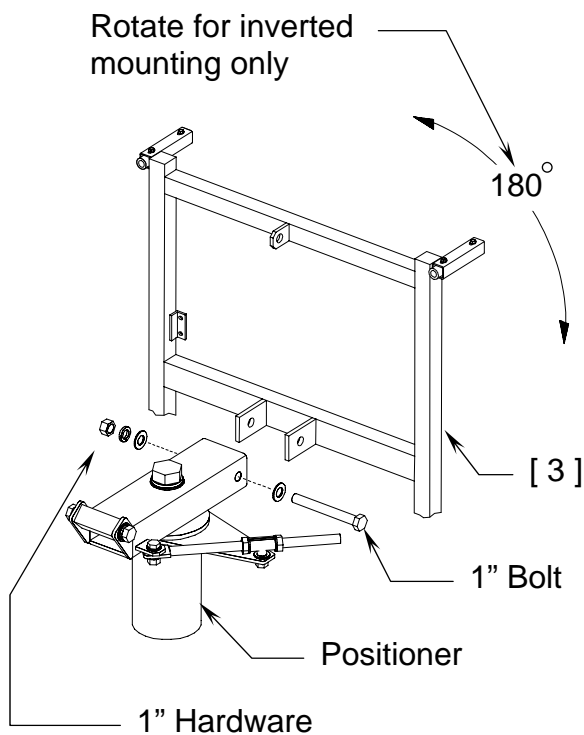
2.3 REFLECTOR SUPPORT ASSEMBLY

WARNING! The reflector support frame includes a precision alignment feature. Do not drop or drag the frame during the installation process. Do not attempt to adjust the round tube spacers in the frame assembly, as these are factory pre-set. If these spacers are loose or damaged, or there is any obvious damage to the frame, then you must obtain replacement parts for a successful installation.



STEP 1:

Locate quadrant #1 and insert threaded insert (item 7) thru the hole on the face of the reflector. Secure insert with 7/8" hardware (items 12, 13, 14). Snug only to allow freedom of movement for the back frame assembly. Repeat step for quadrants #2, #3 & #4.



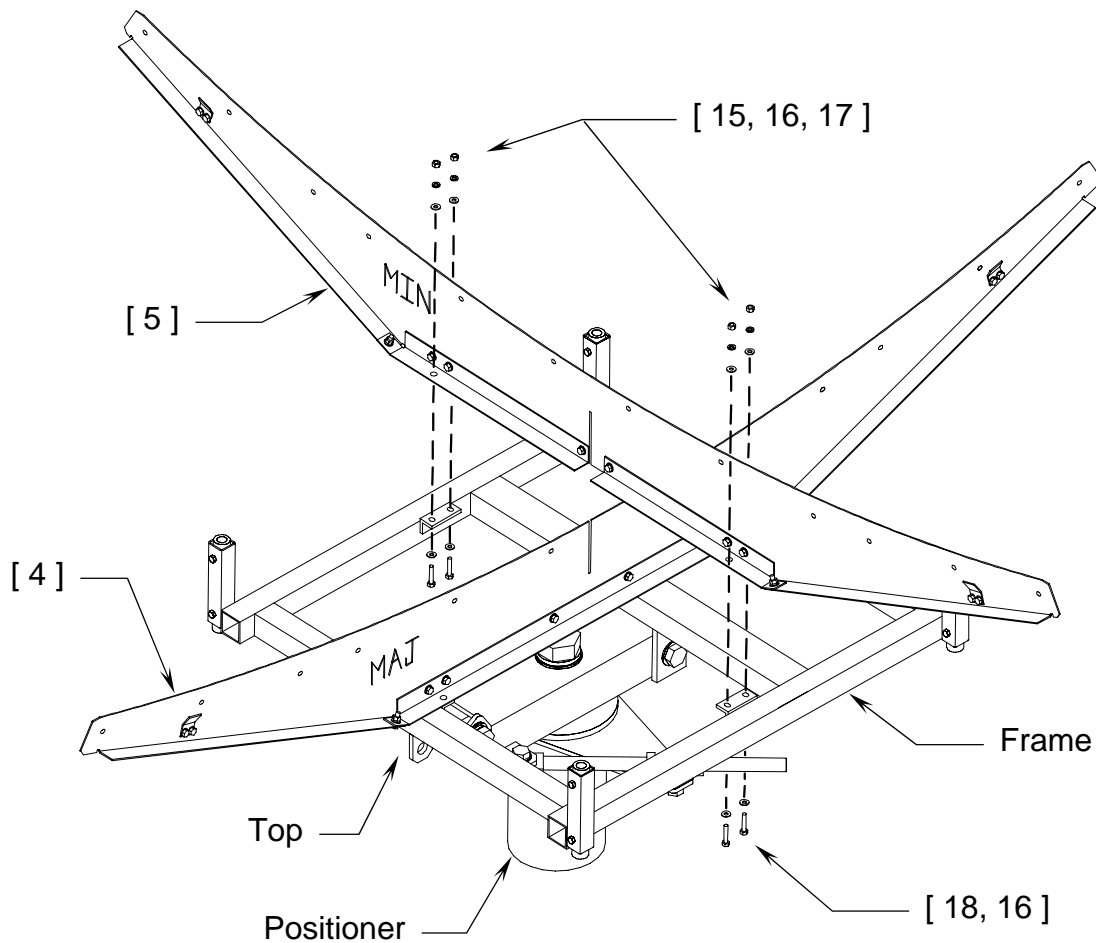
STEP 2:

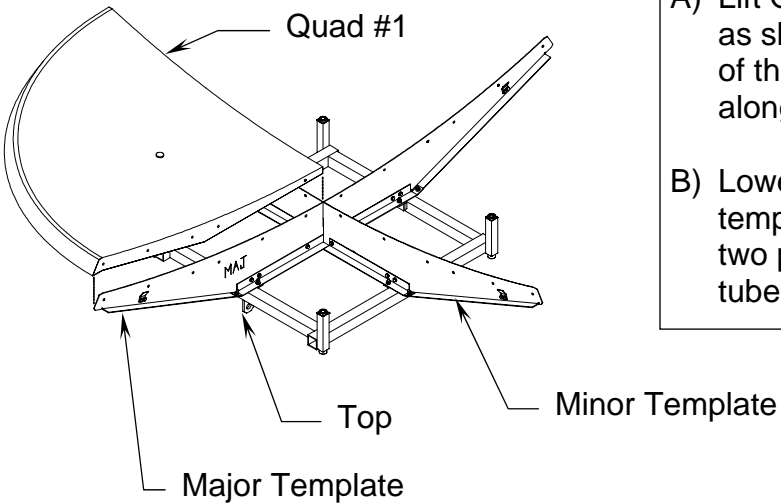
- Remove the 1" bolt from the Az/EI positioner.
- Straddle the tabs of the back frame (item 3) over the holes in the positioner. *NOTE: for inverted mounting, rotate the frame 180 deg*

Replace the 1" bolt and hardware. Tighten snug only and allow the frame to fall back and rest on top of the positioner.

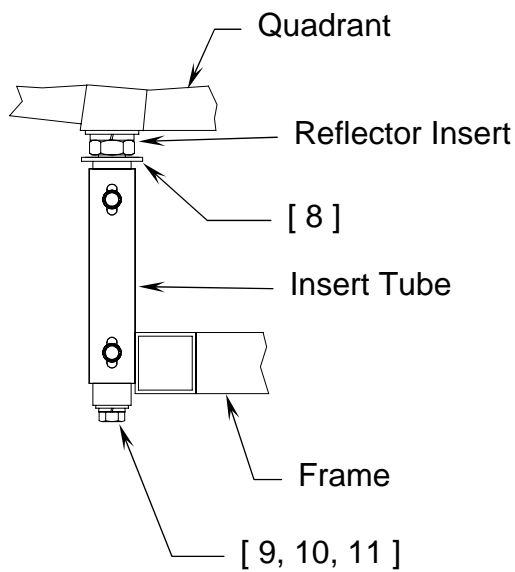
STEP 3:

- A) Place the major template assembly (item 4) on the back of the frame with the letters "MAJ" pointing towards the top of the frame (top being where the positioner is closest to the elevation tab).
- B) Insert the 5/16" bolts (item 18) thru the angles in the frame and into the angles on the template. Secure with 5/16" hardware (items 15, 16, 17). Snug hardware but **do not tighten**.
- C) Slip minor template assembly (item 5) over the major template as shown and also secure with 5/16" hardware (items 15, 16, 17, 18) but **do not tighten**.

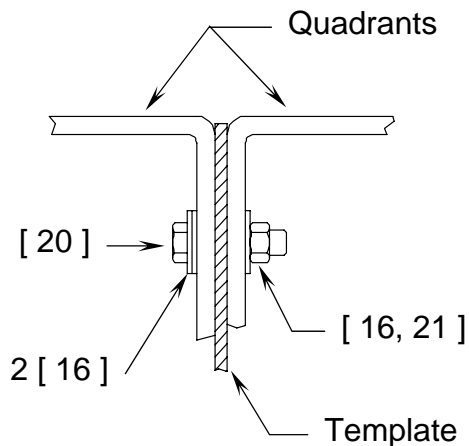
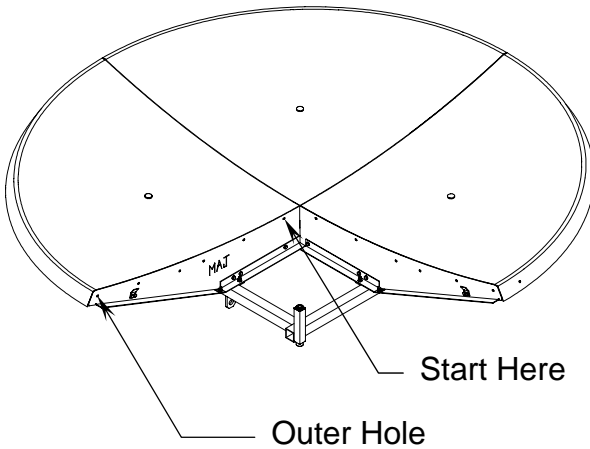


**STEP 4:**

- A) Lift Quadrant #1 over the templates as shown. Note that the longer side of the quadrant should be aligned along the major axis.
- B) Lower the quadrant between the templates and let it rest upon the two petal helpers and the insert tube.

**STEP 5:**

- A) Slip a green washer (item 8) between the insert tube on the frame and the reflector insert on the quadrant.
- B) Insert the 1/2" x 9" bolt and hardware (items 9, 10, 11) into the bottom of the insert tube, thru the green washer and into the reflector insert. Snug the bolt but do not tighten.
- C) Repeat steps 4 and 5 with the three remaining quadrants.

**STEP 6:**

- A) Working from the center out, place two 5/16" flatwashers (item 16) under the head of the 5/16" x 1.75" bolt (item 20). Insert bolt thru the holes, place another flatwasher and thread a nylon lock nut (item 21) onto end of bolt and tighten. Leave the outer four holes open.

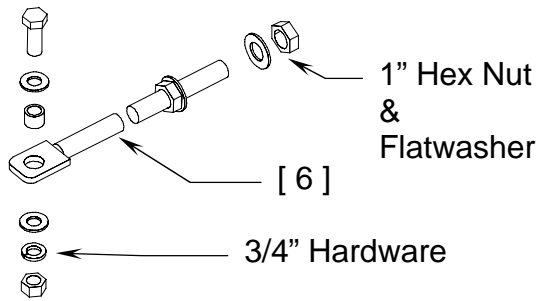
NOTE: once the nut is tight, the bolt will still be loose. DO NOT add washers or change the bolt length.

- B) For the four remaining holes closest to the outer rim, secure with 5/16" x 1.50 bolt and hardware (items 19, 15, 16, 17). Tightening these last bolts will clamp the petals together – desired result.

- C) Now return to where the templates are attached to the frame and securely tighten the eight pieces of hardware.

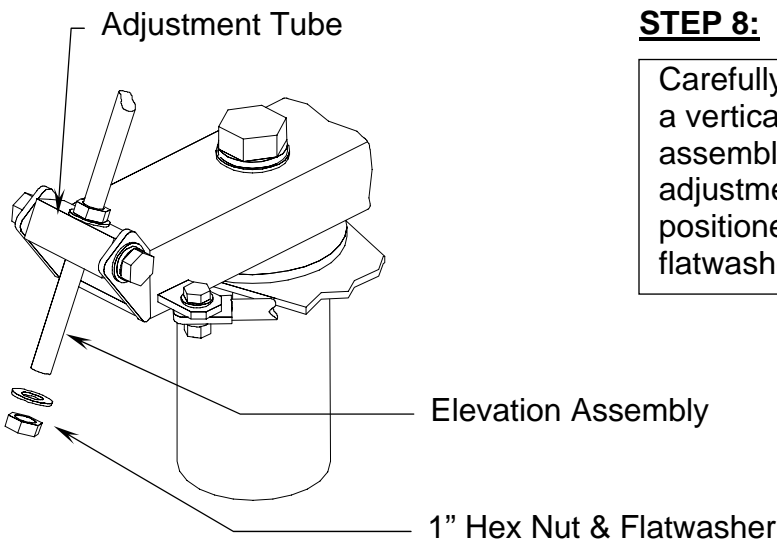
- D) Next tighten the four 1/2" bolts going thru the insert tubes and into the reflector inserts.

- E) Now tighten the 7/8" hardware on the reflector inserts that run thru each quadrant. **Do not tighten all at once.** Alternate between the inserts, tightening a little at a time. Follow this pattern until the lockwashers are flat. Be careful not to over tighten as this will damage the boss on the quadrant.



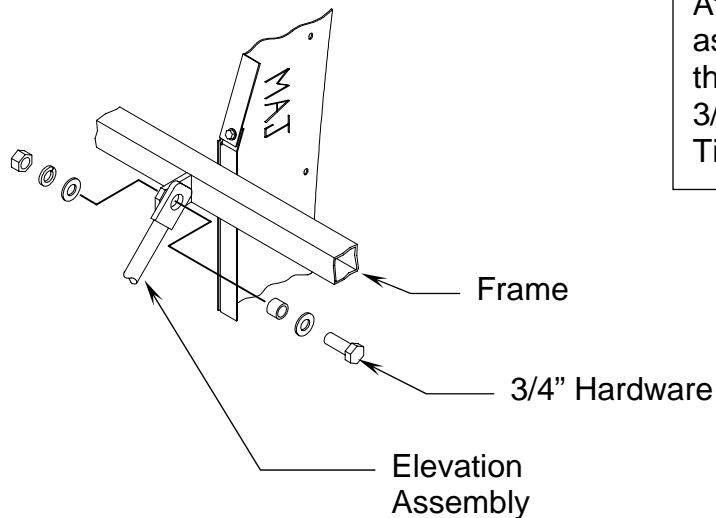
STEP 7:

Locate the elevation assembly (item 6) and remove the 3/4" hardware as well as one 1" hex nut and washer.



STEP 8:

Carefully swing the reflector up into a vertical position. Insert the elevation assembly (item 6) thru the elevation adjustment tube at the back of the positioner. Replace the 1" hex nut and flatwasher.



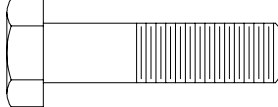
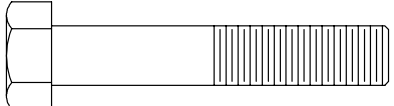
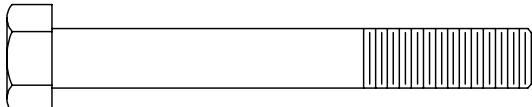
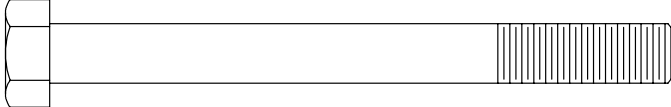
STEP 9:

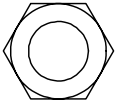
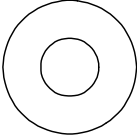
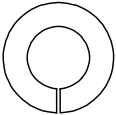
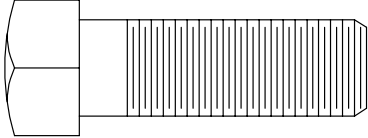
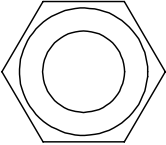
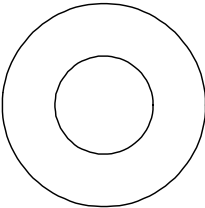
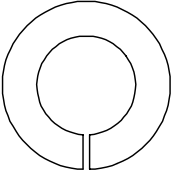
Attach tabbed end of the elevation assembly to the tab on the back of the reflector support frame with the 3/4" hardware removed in step 6. Tighten securely.

SECTION III FEED SUPPORT AND STABILIZATION KIT

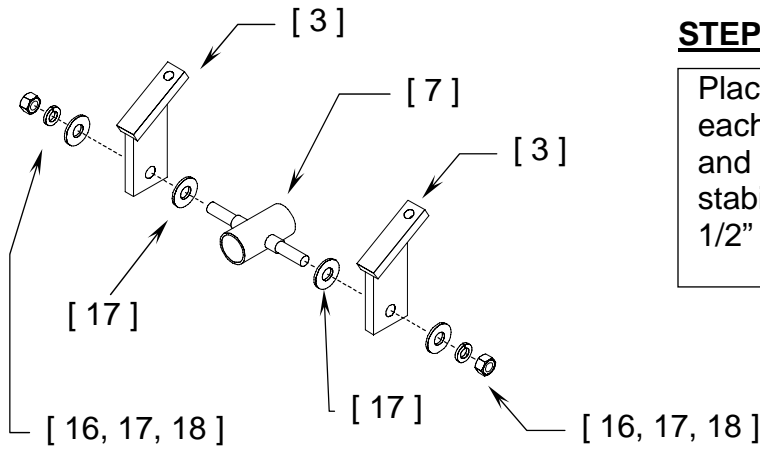
The following instructions cover the installation of a typical 2.4M feed system and feed stabilization kit onto the General Dynamics 4 pc 2.4M antenna. For details concerning the specific feed and ODU installation, refer to the instructions packaged with the feed system.

Refer to the part list below and the following steps.

FEED SUPPORT PART LIST – TABLE 3.0			
ITEM	PART NO.	DESCRIPTION	QTY
1	VARIABLES	Feed Rod	2
2	VARIABLES	Feed Support	1
3	0490-489	Feed Stabilization Bracket	2
4	0250-469	Feed Stabilization Rod	1
5	0188-113	Rear Pipe Collar	1
6	0490-393	Front Pipe Collar	1
7	0490-368	Pivot Collar	1
8	8031-008	5/16"-18 x 1.00 Bolt 	2
9	8031-014	5/16"-18 x 1.75 Bolt 	2
10	8031-020	5/16"-18 x 2.50 Bolt 	2
11	8031-026	5/16"-18 x 3.25 Bolt 	2

PARTS LIST - CONTINUED			
ITEM	PART NO.	DESCRIPTION	QTY
12	8101-009	5/16" Hex Nut 	8
13	8201-041	5/16" Flatwasher 	14
14	8202-041	5/16" Lockwasher 	8
15	8317-102	1/2" Sq Head Screw 	1
16	8104-007	1/2" Hex Nut 	3
17	8201-043	1/2" Flatwasher 	4
18	8202-043	1/2" Lockwasher 	2

3.1 FEED SUPPORT / STABILIZER INSTALLATION

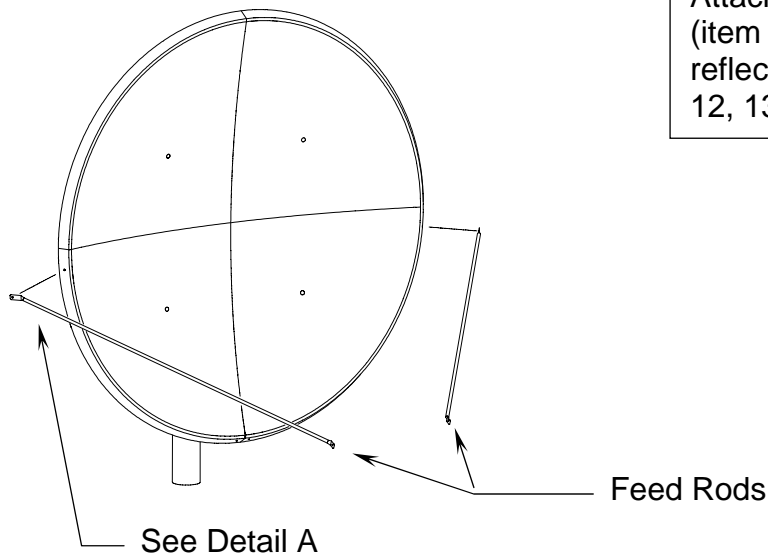


STEP 1:

Place a 1/2" flatwasher (item 17) onto each stud of the pivot collar (item 7) and assemble between the two feed stabilization brackets and secure with 1/2" hardware (items 16, 17, 18)

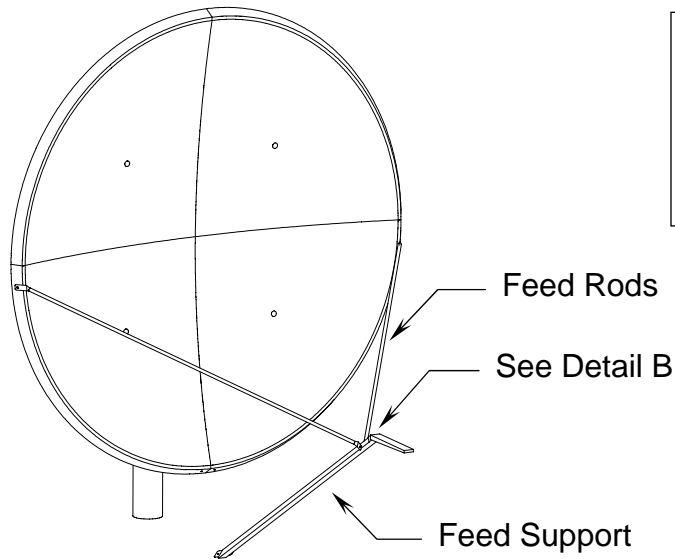
STEP 2:

Attach the long end of each feed rod (item 1) loosely to the sides of the reflector with 5/16" hardware (items 8, 12, 13, 14). See detail A

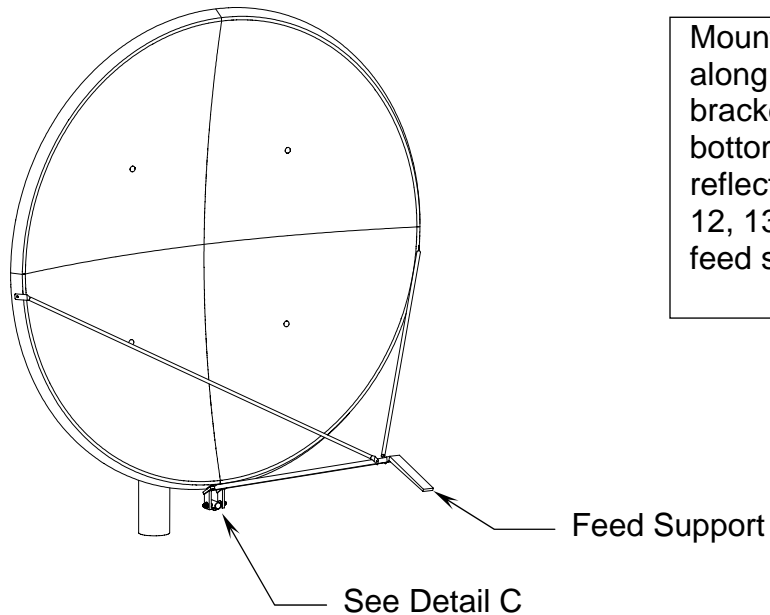


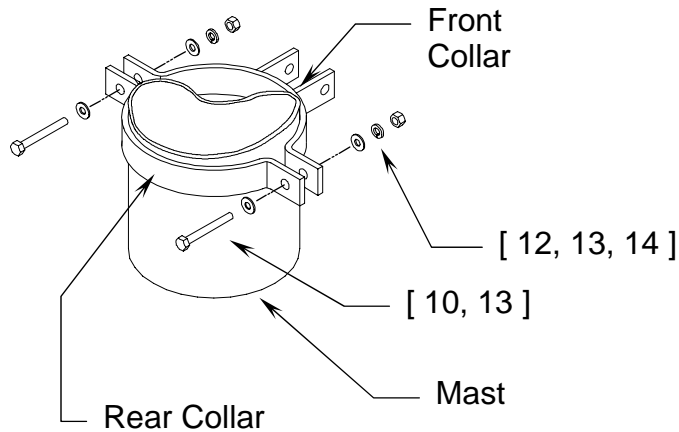
STEP 3:

Position the feed support (item 2) in front of the reflector as shown and attach to the to ends of the feed rods with 5/16" hardware (items 11, 12, 13, 14). See Detail B.

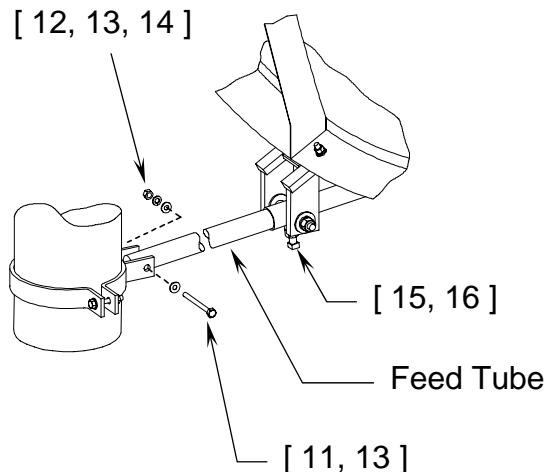
**STEP 4:**

Mount the other end of the feed support along with the feed stabilization brackets and pivot assembly to the bottom of the reflector with 5/16" hardware (items 9, 12, 13, 14). See detail C. Tighten all feed support hardware at this time.

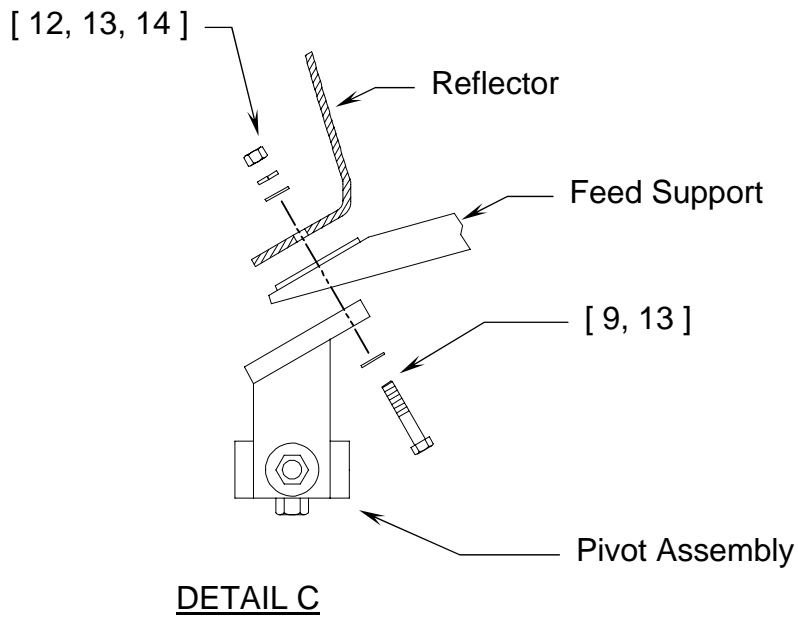
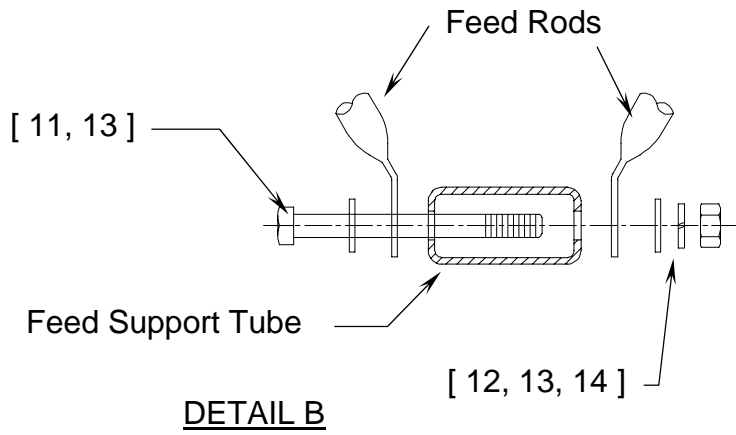
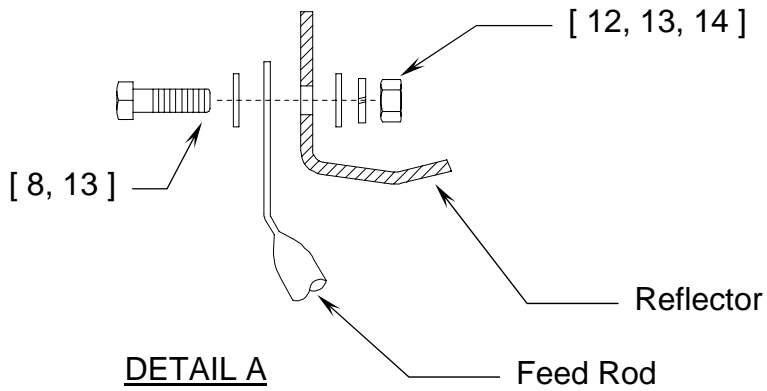


STEP 5:

Bolt the rear and front pipe collars to the mast with 5/16" hardware (items 10, 12, 13, 14), leaving all hardware loose. Note that the two tabs on the front collar should point towards the reflector.

STEP 6:

- Slide the feed stabilization tube thru the pivot collar, drilled end first.
- Attach the tube between the tabs on the front pipe collar with 5/16" hardware (items 11, 12, 13, 14). Do not tighten hardware.
- Install the 1/2" sq. head set screw with 1/2" nut on it (items 15, 16) into the nut on the bottom of the pivot collar.
- After antenna pointing and alignment all feed stabilization hardware should be fully tightened. The feed stabilization tube can be held parallel to the feed support by adjusting the pipe collars up or down on the mast pipe.



SECTION IV ANTENNA POINTING**4.0 ALIGNMENT TO SATELLITE**

The 4 pc 2.4 meter offset reflector contains a 17.35° elevation offset look angle. Therefore, when the reflector aperture is perpendicular to the ground, the antenna is actually looking 17.35° in elevation.

Step 1: Place an inclinometer on the back reflector ring to read the initial rough elevation as shown in figure 3. Note that the look angle of the reflector is the reading on the inclinometer plus 17.35° .

Step 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.

Step 3: After the correct elevation angle is set, rotate the antenna in azimuth by turning the 1” nuts located at the azimuth adjustment tube. Turn the front (near reflector) nut to decrease azimuth angle and the back nut to increase azimuth angle. Rotate azimuth until the signal is acquired.

Step 4: Peak the antenna signal by fine adjustments made in both azimuth and elevation.

Step 5: Tighten the four 1” nuts used for adjustments.

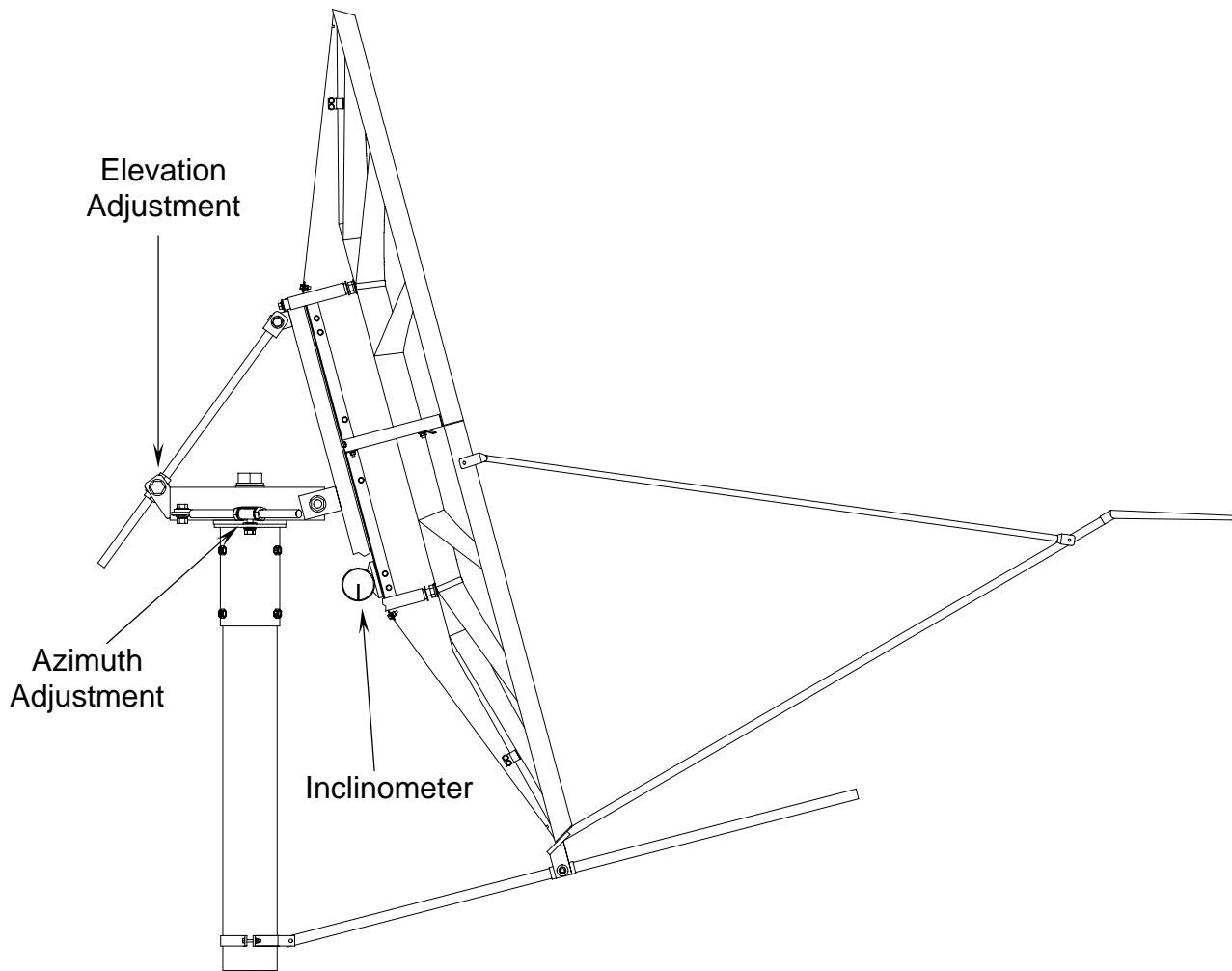


Figure 3.

SECTION V MAINTENANCE**5.0 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. The materials used in the construction of this Earth Station Antenna virtually eliminate any maintenance repairs.

5.1 PERIODIC INSPECTION

It is suggested that a periodic inspection be performed at least every six months. NOTE: After any 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:

STEP 1: Check all bolting locations - all bolts should be tight.

STEP 2: Check all structural members - repair or replace if damaged.

STEP 3: Check the foundation anchor bolts - they must be secure and show no failure signs in foundation.

STEP 4: Check for corrosion - on the reflector structure and the mount.

5.2 REFLECTOR

General Dynamics's 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 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.

5.3 **MOUNT AND REFLECTOR SUPPORT STRUCTURE**

The mount and reflector support structure supplied with this antenna is of steel construction and has a hot-dip 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 cold, zinc-rich galvanizing paint.

5.4 **FEED AND FEED SUPPORT**

The feed support should be inspected to insure that all hardware is secure. The feed/radio mounting bolts should be tight. The feed horn window should be inspected to insure that it is intact so that no moisture can collect inside the feed horn. Replace if damaged.