Patriot 12m Earth Station Antenna System

With S/Band Feed for VLBI

OPERATION & MAINTENANCE MANUAL
(Draft Release: 2MAR10)

The most important thing we build is trust

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INTRODUCTION

In order to provide maximum reliability and service use this manual to become familiar with the antenna system, and execute the maintenance procedures per the recommended intervals.

12m ANTENNA SYSTEM OVERVIEW

The Patriot 12m antenna system is a Cassagrain reflector design supported on a rigid pedestal mount that houses the antenna controller and other electronics. The antenna is capable of +/- 270 degrees movement in azimuth, and 5 - 88 degrees in elevation and uses advanced inverter drive technology to precisely control antenna position. Details on the Motor drive / inverters are provided in the Controller O&M Manual Parts I & II.

The Antenna Structure is a turning head type of pedestal supported by a high-stiffness azimuth bearing. The azimuth drive consists of (2) electrically biased motor and gearbox units with pinions that interface the azimuth gear. The elevation drive is a precision ball screw actuator with gearbox, redundant brakes and motor. The antenna is controlled by a Patriot designed and supplied control system specially suited to this application. Theory of operation and maintenance procedures for the controller are provided in the Controller O&M Manual Parts I & II.

EQUIPMENT PROVIDED

The following major subsystems are included in the antenna system

12. Meter Antenna System including:
Anchor bolt and template kit
Aluminum main reflector with Aluminum backing structure
Composite Sub-reflector and support struts
Steel antenna tower and pedestal system
+/-270 degree continuous azimuth drive
5 to 88 degree continuous Ball Screw Elevation drive
Turning head assembly, all required bearings and gears etc
Servo electronics assembly and housing, Interface Kit with AC drive motors for Azimuth and Elevation.
Three Unidrive SP inverter drives by Emerson Control Techniques.
26 bit Encoders
Main and backup limit switches and cabling
Cable wrap system

1.0 MECHANICAL SYSTEM DESCRIPTION

1.1 FOUNDATION

The antenna foundation is a concrete pad 24′ x 24′ x 4′ deep with #8 (1″ diameter) rebar spaced at 12″ centers both ways on two mats, top and bottom. (dwg#2FD12LP0001)

1.2 ANTENNA TOWER

The Antenna Tower is a cylindrical steel weldment 84″ in diameter with 1/2″ wall thickness. The top and bottom flanges are 2″ thick A36 steel. A minimal access door is provided to allow entry into the tower while maintaining the structural integrity of the system.

1.3 AZIMUTH BEARING

The azimuth bearing (PATRIOT P/N 212L010) incorporates an integral gear, 85.333 PD, for driving the azimuth axis. The bearing is preloaded to eliminate both axial and radial backlash and the gear is manufactured to AGMA standards.

1.4 AZIMUTH PINION

The azimuth pinions are also supplied by PATRIOT (P/N 212L208). The pinions have a 6″ Pitch Diameter and are factory matched to the gear to ensure proper meshing and smooth operation. The pinions have an internal keyway design to mate with the Eskridge gearbox output shaft.

1.5 AZIMUTH GEARBOXES

The azimuth gearbox, Eskridge Model 250LA-417, uses helical gearing for efficiency, smooth operation and long life. The gearbox uses a submerged oil bath lubrication system with a single all season oil.

1.6 TURNING HEAD

The Turning Head is a welded plate construction with an integral machined boss that interfaces with the azimuth bearing/gear assembly. To ensure the azimuth and elevation axes are orthogonal, the elevation bearing housings are machined parallel to the machined azimuth bearing interface flange of the Turning Head base. The alignment of Turning Head components has been completed during shop proof assembly.

The turning head also provides the interface for the elevation ball screw actuator and machined mounting pads for azimuth gearboxes. Location of azimuth gearboxes on the outside of the turning head coupled with external gearing of the azimuth bearing assembly provides easy access for maintenance of the gearboxes and azimuth gear. Covers for the azimuth gear and pinions are incorporated for safety and to provide protection from the environment. Stiffeners are provided at maximum stress points to minimize local distortions. A key feature of this structure is that because of the machining tolerances achieved in the factory the alignment adjustments of the gearboxes are minimized during field installation.

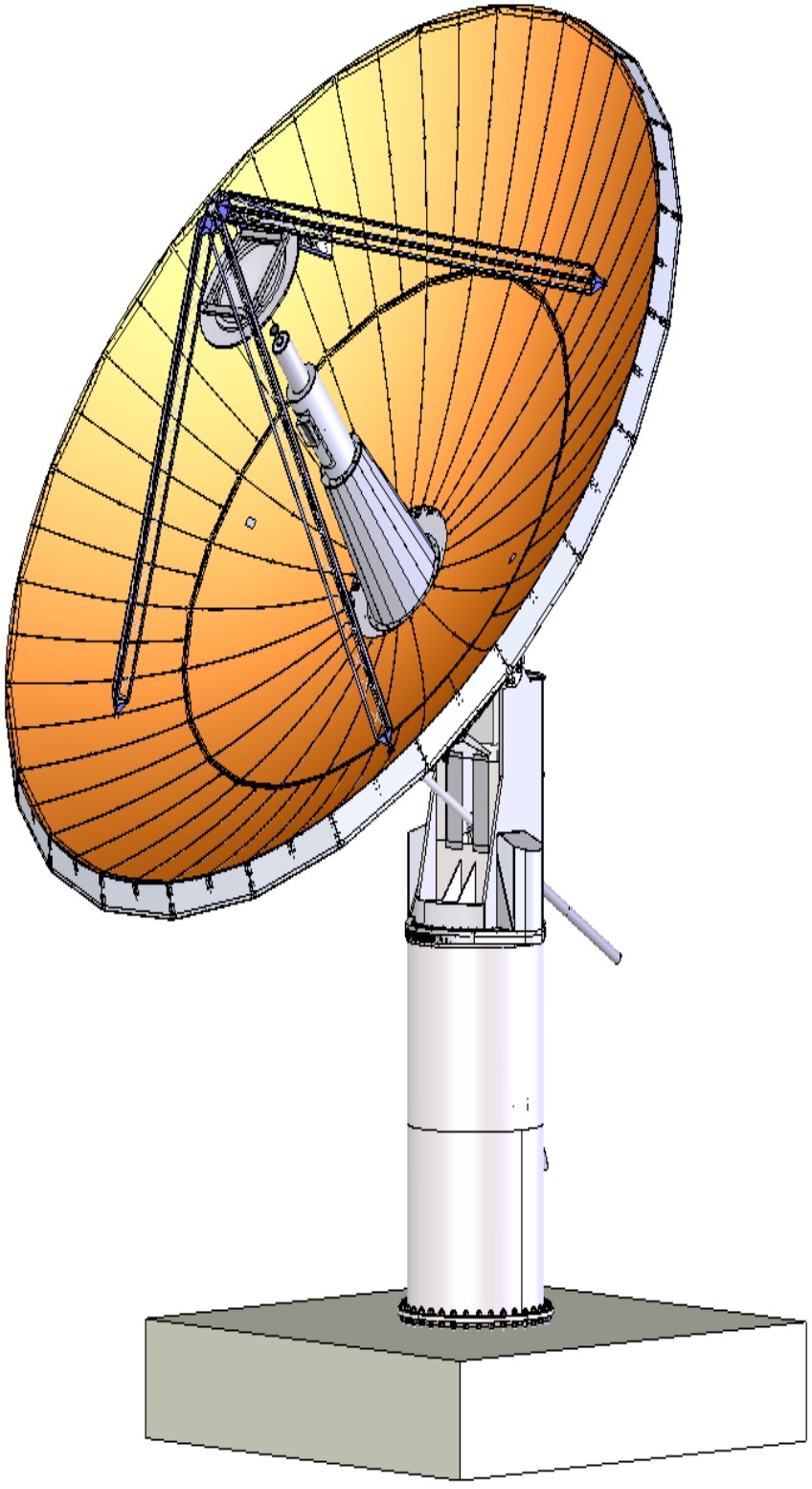


FIGURE 1

1.7 ELEVATION BEARINGS

The elevation shafts are supported by self-aligning spherical roller bearings (SKF P/N 23120, 100mm bore). These bearings are housed in fabricated steel blocks on the turning head. The bearings are factory installed into the bearing housing and onto the elevation shafts with a slight interference fit removing any internal clearance.

1.8 ELEVATION JACK

The elevation drive is a precision bevel ball screw actuator (Joyce BBRS300U2S, 35 Ton Capacity). The actuator is oversized to provide long life and require minimum maintenance. The input drive is a bevel gear to increase travel speed and improve efficiency and duty cycle. The backlash of the ball screw actuator is not a concern by virtue of the geometry of the antenna design, i.e., the actuator is always loaded in compression under operational conditions.

1.9 ELEVATION GEARBOX

The elevation gearbox is an Eskridge 50LA-20 which uses helical gearing for efficiency, smooth operation and long life.

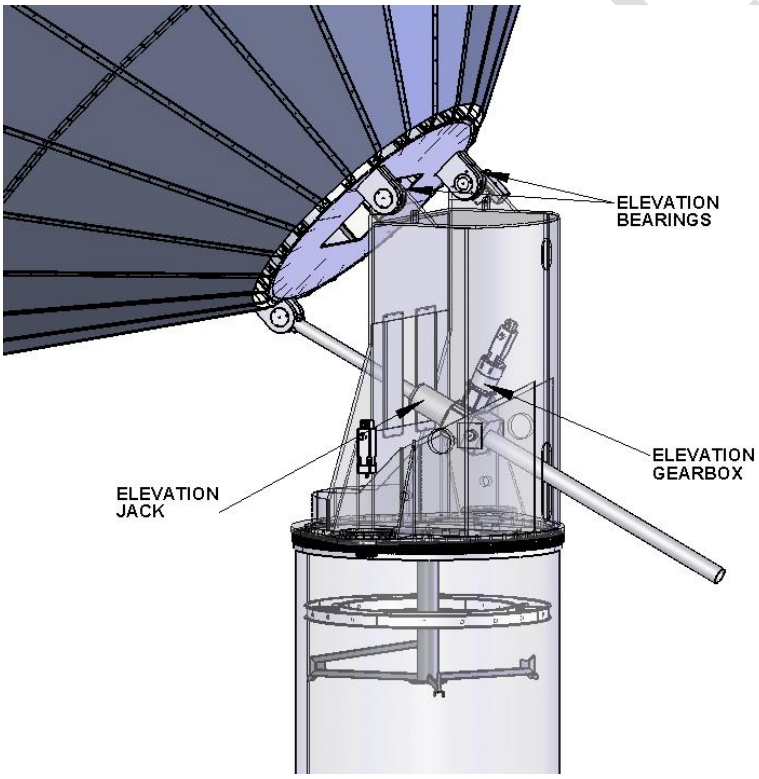


FIGURE 2

1.10 REFLECTOR ASSEMBLY

The antenna reflector back-up structure consists of a rigid hub, precision support ribs and interconnecting bracing. The structure has been designed to be extremely rigid in order to minimize structural deflections over the entire elevation range of motion. The reflector panels are manufactured to very close tolerances by use of industry proven stretch form technology. Panels are cleaned and powder coat painted with a white heat diffusive finish. The panels are designed to survive 100 mph wind loads.

1.11 FEED CONE EXTENSION

The feed cone extension is an aluminum fabrication mounted to the face of the hub that provides the mounting interface for the supplied feed. This component is painted white to minimize thermal distortions. An access panel is provided for access to Feed Electronics Assembly.

1.12 SUB-REFLECTOR

The sub-reflector is a carbon fiber fabricated structure. This lightweight structure is extremely rigid and accurate with a surface rms of .003". Three mounting studs attach the sub-reflector to the Quad Support Structure and provide centering, tilt and focus adjustments.

1.13 SUB-REFLECTOR QUAD SUPPORT STRUCTURE

The sub-reflector support structure consists of 4 support struts. The struts for the quad support structure are a fabricated triangular truss to minimize weight but provide the specified stiffness. At the apex is a frame structure constructed to provide the mounting and adjustment points for the sub-reflector.

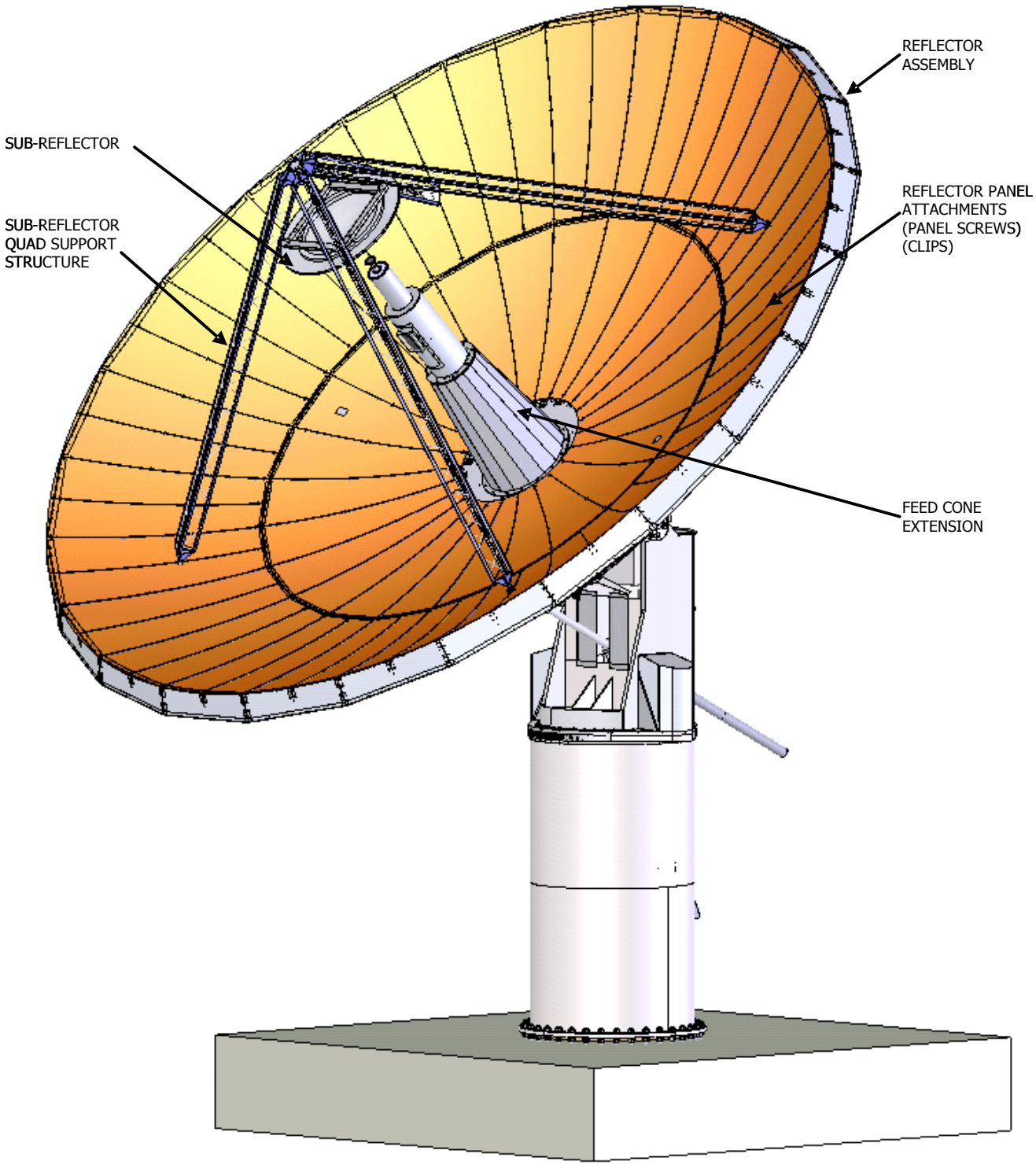

REFLECTOR
ASSEMBLY
SUB-REFLECTOR
SUB-REFLECTOR
QUAD SUPPORT
STRUCTURE
REFLECTOR PANEL
ATTACHMENTS
(PANEL SCREWS)
(CLIPS)
FEED CONE
EXTENSION

FIGURE 3

1.15 ELEVATION ENCODER MOUNTING

The elevation encoder mounting consists of an adjustable bracket which is mounted to the left hub lug and side of the turning head respectively. The brackets allow the elevation encoder to be precisely positioned for alignment to manufacturer's specification and tightened securely once proper alignment is achieved.

1.16 AZIMUTH ENCODER MOUNTING

The azimuth encoder mounting consists of an adjustable bracket which is mounted to the encoder support post attached to the pedestal perimeter wall. The azimuth encoder can be precisely positioned for alignment to manufacturer's specification and tightened securely once proper alignment is achieved.

1.17 AZIMUTH CABLE WRAP

An azimuth cable wrap is provided that supports electrical and other cabling that passes through the azimuth axis. The cable wrap consists of a series of spacer rings which allows the cables to wind around the azimuth axis in a helical manner as the antenna is rotated. The azimuth cable wrap is capable of carrying all the Patriot supplied cables and customer additional requirements and is conservatively designed to operate well beyond ±270 degree antenna azimuth travel. The cable wrap extends from the bottom of the turning head and down into the antenna pedestal. Cables coming out of the wrap are routed into cable trays that are mounted inside.

1.18 FASTENERS

All standard fasteners are ASTM A325 high strength or stainless steel. For special connections such as bearings and drive components, Grade 5 or Grade 8 hardware may be used.

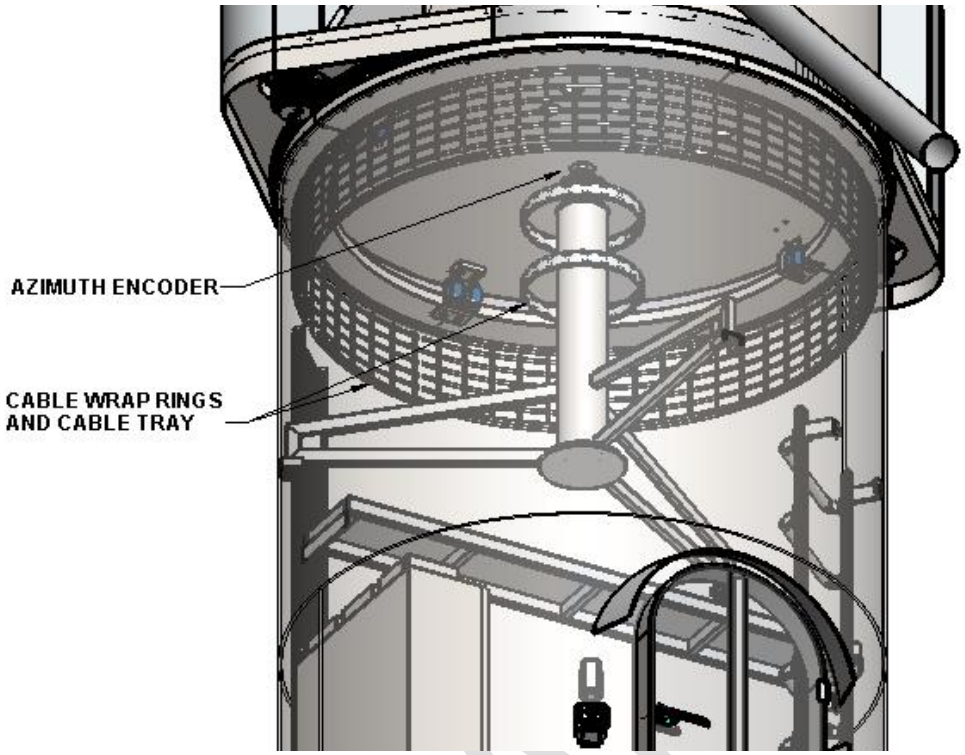


FIGURE 4

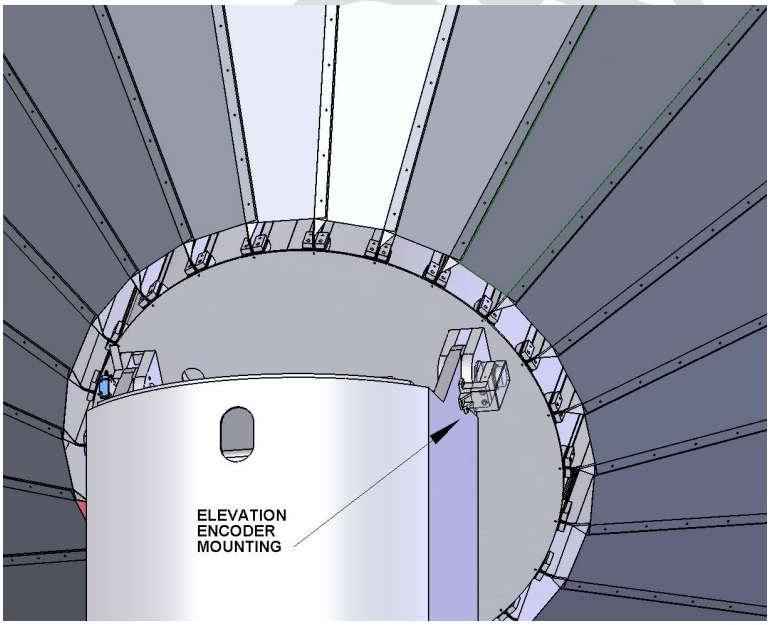


FIGURE 5

2.0 MAINTENANCE PREPARATION

2.1 INTRODUCTION

The antenna is designed for maximum durability and minimal maintenance therefore many of the mechanical components are maintenance free. However, some components require preventative maintenance and lubrication. In order to help ensure long life, reliability and trouble free operation the following maintenance procedures should be done as specified. A good preventive maintenance program will reduce unplanned antenna downtime and help identify major maintenance issues that may arise at an early stage before they become even more costly.

2.2 SAFETY COMMETS

WARNING- Automatic machinery- This equipment may move without warning.

WARNING- Do not work on the antenna system alone. A minimum of two personnel are required present while any work is being carried out on the system.

2.3 SERVICING PROCEDURE

The antenna system should be removed from service when performing any maintenance or repair procedures. The following steps describe the method for removing the antenna from service and returning the antenna to service.

REMOVING ANTENNA FROM SERVICE

1. Place the antenna in stow position- any elevation angle above 85 degrees.
2. Place the antenna control unit in 'OFF' mode.
3. Turn the 3 phase power switch on front of antenna control unit to 'OFF'.

RETURNING ANTENNA TO SERVICE

1. Make sure the antenna is clear of all personnel and obstructions.
2. Turn the power switch on front of antenna control unit to 'ON'.
3. Select operation mode- 'STANDBY', 'REMOTE', or 'RUN'.

2.4 MAINTENANCE ACCESS

Warning: Always use fall protection safety devices when working at heights more than 6’ above the ground.

2.4.1 PEDESTAL ACCESS

Access to the antenna control unit and electrical panels is on the ground floor inside the pedestal via an access door on the north side of the pedestal. A maintenance platform 7’ above the floor level is provided in order to access the cable wrap, azimuth limit switches, azimuth bearing lubrication points and azimuth encoder. This platform is accessed via a step ladder from inside the pedestal.

2.4.2 TURNING HEAD ACCESS

The turning head can be accessed either by a tall step ladder or a man lift. Access to the outside allows work on the azimuth drive systems to be carried out. Access to the inside of the turning head is for work on the elevation drive system.

NOTE: The Elevation Drive System repair requires utilizing special Reflector Support Struts provided with the system.

2.4.3 HUB ACCESS

Hub access is via the antenna turning head area with the antenna at stow position. This is most easily done by use of a man lift.

2.4.4 REFLECTOR, FEED CONE AND SUB-REFLECTOR ACCESS

The inside reflector surface, feed cone and sub-reflector are accessed by use of a man lift when the antenna is positioned between 5° and 20° in elevation.

Caution – Walking on the reflector surface is not recommended. Damage could occur to the panel surface if feet are not kept on radial rib locations. Do not set heavy items on panel surface.

2.5 RECOMMENDED LUBRICANTS

See Maintenance Record Table page 17.

2.6 RECOMMENDED SURFACE COATINGS

ACME Paint Primer
ACME White Diffusive Paint

2.7 REQUIRED TOOLS FOR ANTENNA MAINTENANCE

Maintenance of the antenna system can be carried out with standard tools and equipment. The following list contains the typical tools required for maintenance and repair activities.

Qty 1 - Mechanics tool kit including:
Set of standard and Phillips head screwdrivers
Set of pliers, channel lock pliers and vise grip pliers
Set of wrenches both SAE and Metric
Socket and ratchet set both SAE and Metric
Set of hex wrenches both SAE and Metric
24" crescent wrench
Hacksaw
Hammer

Qty 1 - Electricians tool kit including:
Terminal screw driver set standard and Phillips head
Cutters and crimp tool
Crimps and electrical tape
Soldering iron and solder

Qty 1 - Standard hand held grease gun with solid and flex tubes
Supply of paint brushes.
Wire Brush
Sand paper
Penetrating oil
Step ladder

Qty 2 -Fall Protection Safety Harnesses
Qty 2 – Hard hats

3.0 ROUTINE MAINTENANCE PROCEDURES

NOTE: Refer to FIGURE 6 page 18 for 3.1 to 3.12

3.1 VISUAL INSPECTION

Visually inspect all structural and mechanical components for signs of damage and/or wear. Check hardware for tightness and general condition. Visually inspect paint for sign of weather damage or peeling and repair as required.

3.2 PEDESTAL DOOR HINGES

Inspect pedestal door hinge and latch for proper operation. Apply 2 shots of the grease to each hinge on the pedestal door. Remove any excess that may escape from the hinge joints.

3.3 AZIMUTH BEARING

Visually inspect bearing seal for signs of damage or excessive leaking. Lubricate the azimuth bearing via the four grease nipples located at the inner raceway. Access to the lubrication points is from the platform inside the pedestal at the azimuth cable wrap area. Lubricate with 10 shots of grease at each fitting. When the antenna is returned to service rotate the antenna +/- 180° in order to spread new lubrication throughout the bearing.

3.4 AZIMUTH GEAR AND PINION

Check azimuth gear teeth and pinions for obvious signs of damage or wear. Lubricate gear and pinion teeth liberally with a heavy duty gear tooth lubricant grease. Make sure all exposed surfaces of the gear and pinion are lubricated as this also acts as the corrosion prevention for these components.

3.5 AZIMUTH GEARBOX

Visually inspect for signs of leaks or damaged seals. Remove oil fill plug and check oil level in gearbox. If low add oil to appropriate level and replace fill plug. Inspect oil drawn when level is checked for any signs of metal or overheating. If necessary drain gearbox and refill with new oil. (1.75 pints- upper stage, 10 pints- lower stage)

3.6 ELEVATION SCREW JACK

Inspect the elevation actuator bellows for damage and wear. If bellows integrity is compromised replace with new one. Loosen clamp at bottom of bellows and pull bellows back to expose the actuator screw. Inspect screw for damage and/or wear. Apply a liberal amount of grease to the screw. Replace bellows and clamp after inspection and lubrication of the screw. Grease the actuator with 10 shots from hand held grease gun at each lubrication fitting.

3.7 ELEVATION GEARBOX

Visually inspect for signs of leaks or damaged seals. Remove oil fill plug and check oil level in gearbox. If low add oil to appropriate level and replace fill plug. Inspect oil drawn when level is

checked for any signs of metal or overheating. If necessary drain gearbox and refill with new oil. (2 pints)

3.8 ELEVATION JACK TRUNNION AND JACK PIN

Lubricate the 2 elevation trunnion pins found at the jack mounting inside of the turning head with 4 shots of grease at each fitting. Lubricate the jack pin via the lubrication fitting found on the jack rod end at the hub connection with 4 shots of grease.

3.9 ELEVATION AXIS BEARINGS

Inspect elevation bearing seals for signs of damage or excessive leaking. Lubricate each elevation axis bearing at the lubrication fitting found on the elevation axis lug found on the turning head. Apply 4 shots of grease at each fitting.

3.10 ELECTRICAL SYSTEMS CHECK

Check all wiring, conduit and connections for proper installation and integrity. Check cable wraps and cable passage across elevation axis for proper operation and strain relief. Repair any damage and defects prior to returning antenna to service.

3.11 CORROSION PROTECTION AND CONTROL

Visually inspect the painted structure for damage or signs of corrosion. Where required, wire brush the affected area to remove dirt, corrosion and loose paint. Apply 1 coat of a good quality primer followed by 2 coats of white paint.

3.12 REFLECTOR AND SUB-REFLECTOR SURFACES

Visually inspect the reflective surface for signs of excessive dirt, damage and/or weathered paint. Clean surfaces using warm soapy water as required. For damaged surfaces light sand the selected area, taking care not to damage reflective surface, and repaint with one coat of primer and 1 coat of white diffusive paint.

MAINTENANCE RECORD TABLE

Lube Point #	Description	Frequency Months 3	6	12	Type of Service	Type of Lube	No. of Lube Points	Quantity
1	Pedestal Door Hinges		X		Pressure Fitting	grease*	2	2 shots
2	Azimuth Bearing		X			grease*	outer surfaces	
3	Azimuth Gear and Pinions		X			grease**	outer surfaces	
4	Azimuth and Elevation Geardrives	I***	C***		Pipe Plugs	SHC624		
5	Elevation Jack Housing		X		Pressure Fitting	grease*	2	10 shots
6	Elevation Jack Screw		X			grease*	outer surface	
7	Elevation Jack Trunnion Pins		X		Pressure Fitting	grease*	2	4 shots
8	Elevation Jack Clevis Pin		X		Pressure Fitting	grease*	1	4 shots
9	Elevation Axis Bearings		X		Pressure Fitting	grease*	2	4 shots

X = Lubricate I = Inspect C = Change

* Grease- Use Mobil 1 synthetic

** Grease- Glafloscon, Castrol Gripper (or equivalent)

*** Inspection requires checking for visible signs of oil leakage, draining replacing and adding oil to ensure appropriate oil level requirements. Excessively dirty oil will require fresh oil replacement. If oil leakage is found to be excessive perform applicable corrective action. Periodic inspection procedures can be less frequent after first or second scheduled inspections.

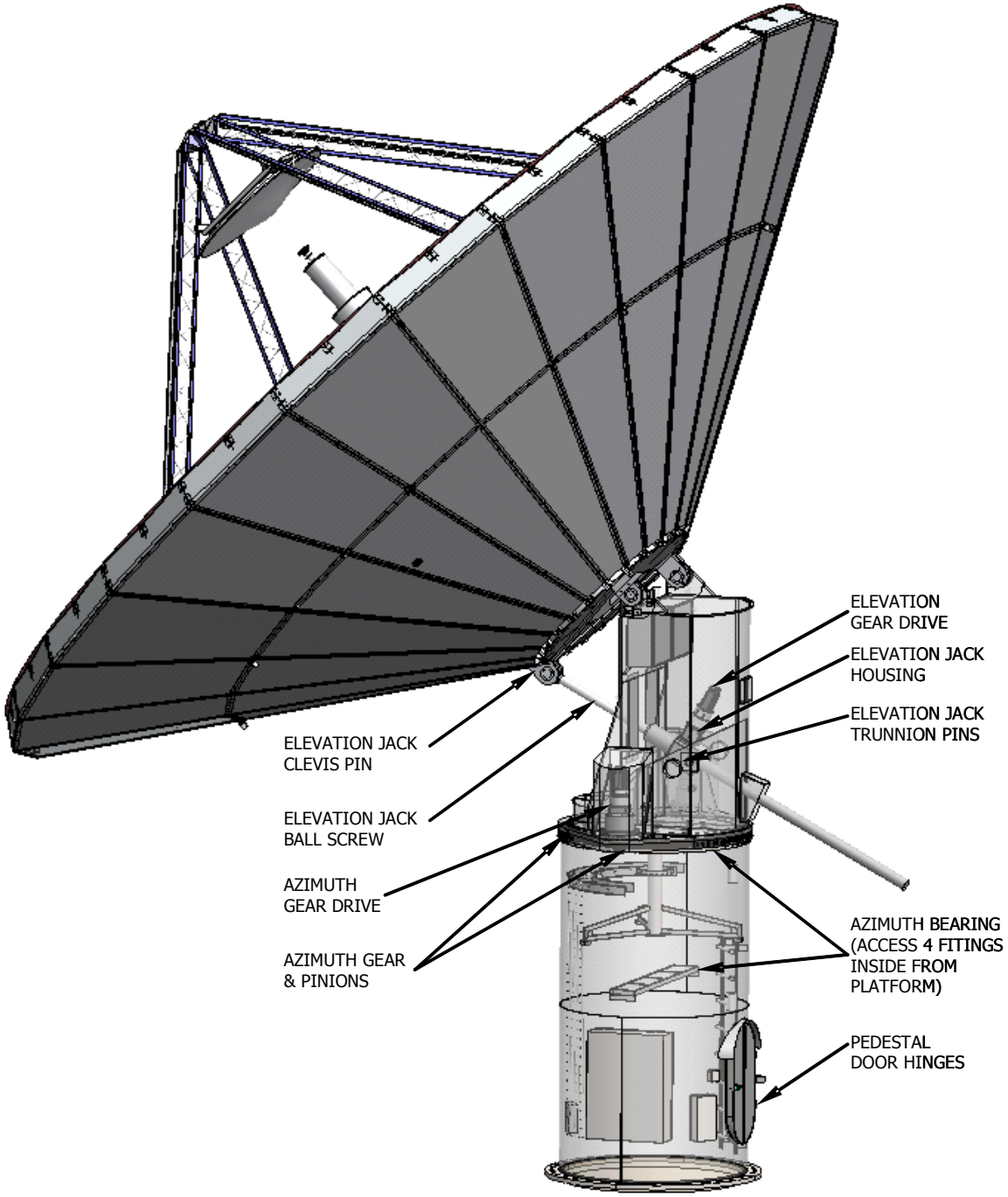

ELEVATION
GEAR DRIVE
ELEVATION JACK
HOUSING
ELEVATION JACK
TRUNNION PINS
ELEVATION JACK
CLEVIS PIN
ELEVATION JACK
BALL SCREW
AZIMUTH
GEAR DRIVE
AZIMUTH GEAR
& PINIONS
AZIMUTH BEARING
(ACCESS 4 FITINGS
INSIDE FROM
PLATFORM)
PEDESTAL
DOOR HINGES

FIGURE 6

4.0 REPAIR MAINTENANCE PROCEDURES

Warning- Antenna system must be removed from service before conducting any of the following procedures.

4.1 LIMIT SWITCH REPLACEMENT

1. Remove antenna from service.
2. Remove limit switch cover-plate, loosen connectors and disconnect the wires. Make note of wire to terminal connections.
3. Unbolt limit switch from mounting.
4. Unscrew limit switch from conduit connector.
5. Install new limit switch in reverse order. (See Appendix F for Part No.)
6. Return the antenna to service in remote mode and operate using hand controller. Check the limit switch operation while antenna is in remote mode by actuating limit switch and checking antenna controller status for limit fault. Adjust position of switch as required to give the desired travel range.
7. Return antenna to service in desired operational mode.

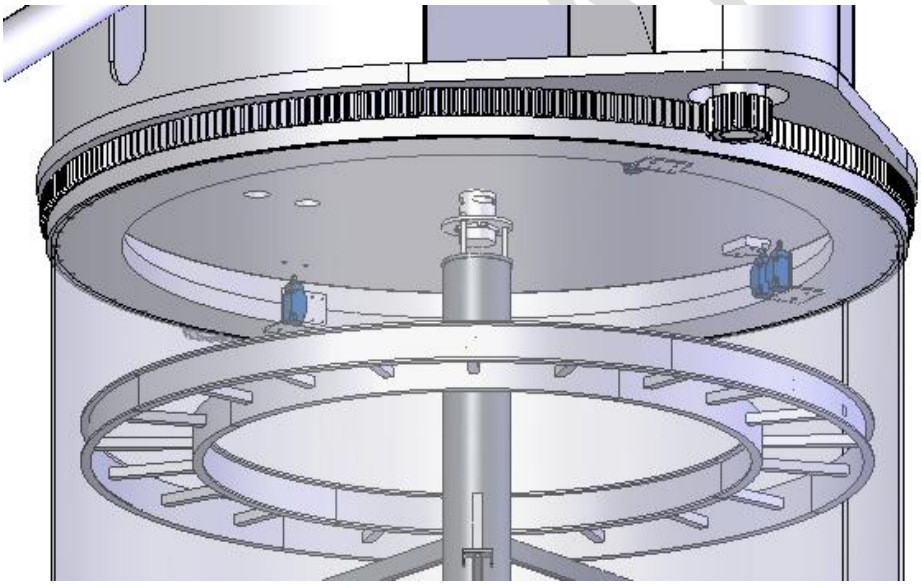


FIGURE 7
AZIMUTH LIMIT SWITCHES

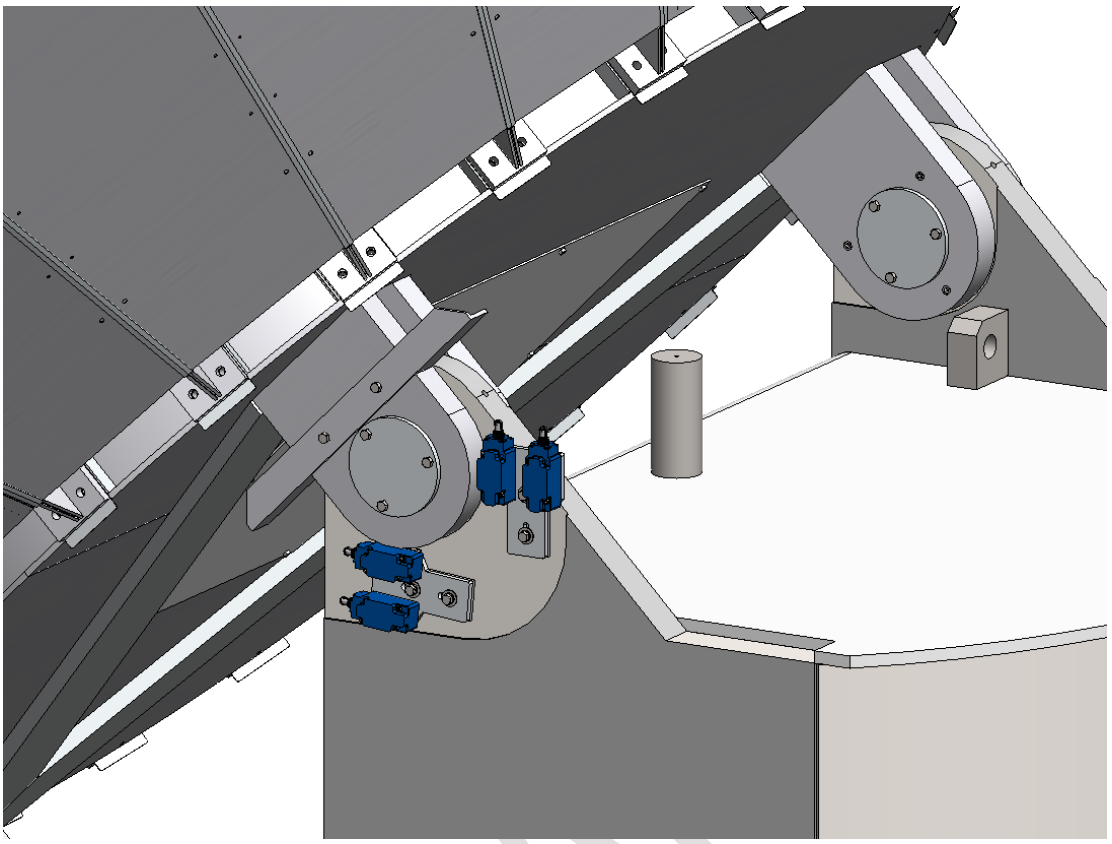


FIGURE 8
ELEVATION LIMIT SWITCHES

4.2 ELEVATION ACTUATOR BELLOWS

1. Position Reflector to approx. 60deg in Elevation. Remove antenna from service.
2. Remove existing bellows from actuator. If bellows is a non zipper type it will have to be cut from the actuator.
3. Install new bellows by unzipping and with large opening at bottom zipping up over the actuator screw. (See Appendix B for Part No.)
4. Install clamps on each end of bellows and tighten.
5. Return antenna service in desired operational mode.

4.3 AZIMUTH MOTOR REPLACEMENT

1. Remove antenna from service making sure antenna is at stow position.
2. Remove azimuth motor cover and set aside.
3. Disconnect the motor encoder cable.
4. Disconnect the motor power cable.
5. Remove the nuts that hold the motor to the gearbox mounting flange, and remove the motor.
6. Install new motor in reverse order. (See Appendix G for Part No.)
7. Return the antenna to service in remote mode and operate using hand controller to make sure motor is operating properly.
8. Return antenna to service in desired operational mode.

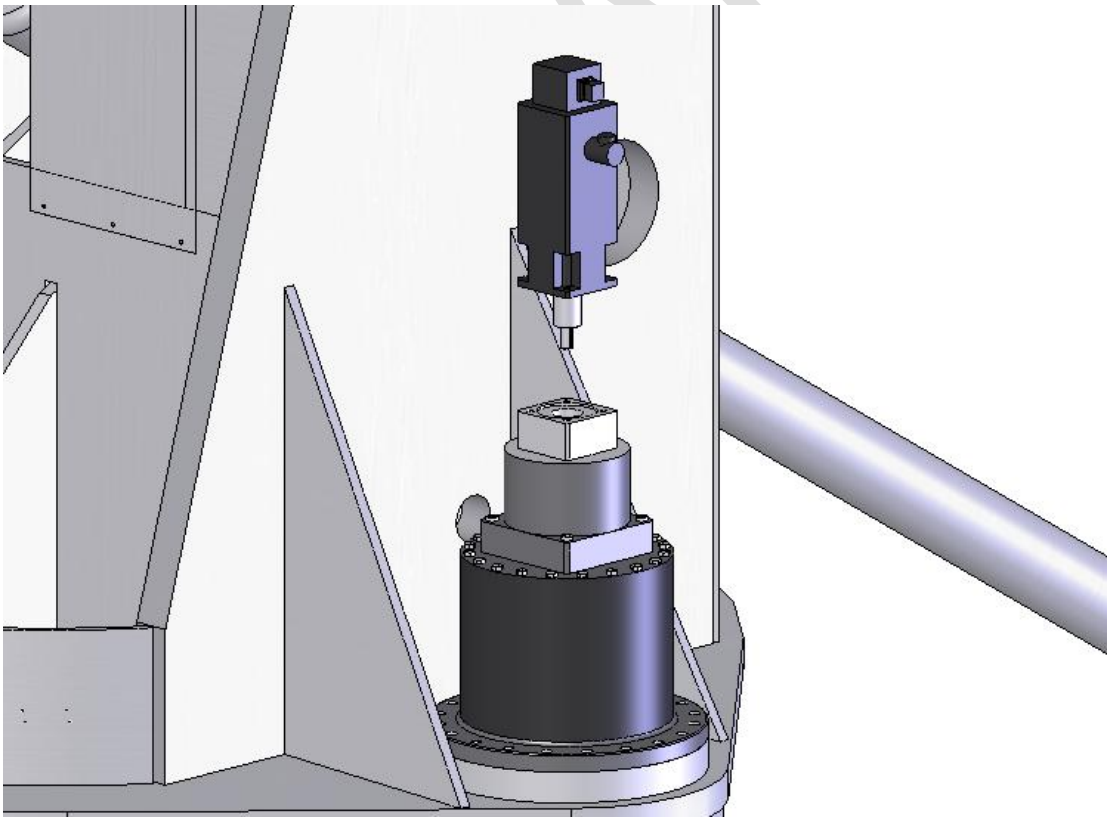


FIGURE 9

4.4 ENCODER REPLACEMENT

1. Remove antenna from service, making note of position readouts before antenna controller is powered down.
2. Access to the elevation encoder is via a man lift on the left side of the antenna pedestal at the elevation axis.
3. Access to the azimuth encoder is via the maintenance platform inside the pedestal.
4. Disconnect the resolver cable from the appropriate resolver.
5. Loosen the encoder coupling that ties the encoder to the anchor shaft. Once this is done the encoder should rotate about the anchor shaft.
6. Remove the attachment screws that connect the encoder to the mounting plate and remove encoder.
7. Remove encoder coupling from old encoder and install on new encoder.
8. Install new encoder in reverse order. (See Appendix H for Part No.)
9. Leaving encoder coupling to anchor shaft loose return antenna to remote mode.
10. Adjust encoder reading to value close to that recorded in step 1 by turning encoder about anchor shaft. Once reading is close lock encoder coupling onto anchor shaft.
11. By using offset function in antenna controller adjust angle readout to precisely match the value recorded in step 1.
12. Return antenna to service in desired mode of operation.

NOTE: Do not loosen or remove any of the hardware fastening the encoder mounting plates to the structure. The mounting plates are precisely positioned and tightened in place to assure that alignment is radially, axially, and concentrically accurate to the specification required by the encoder vendor!

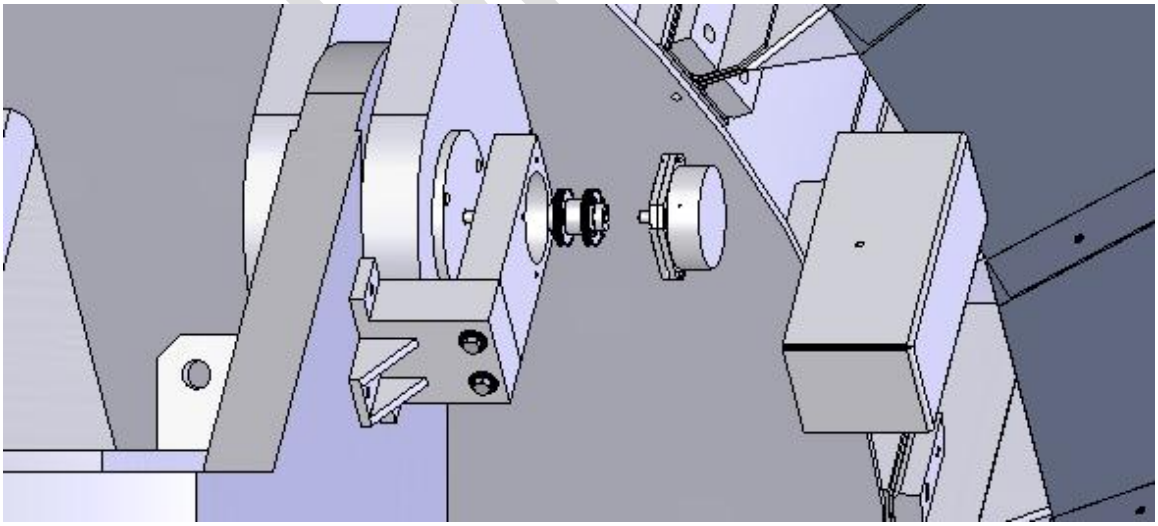


FIGURE 9
ELEVATION ENCODER

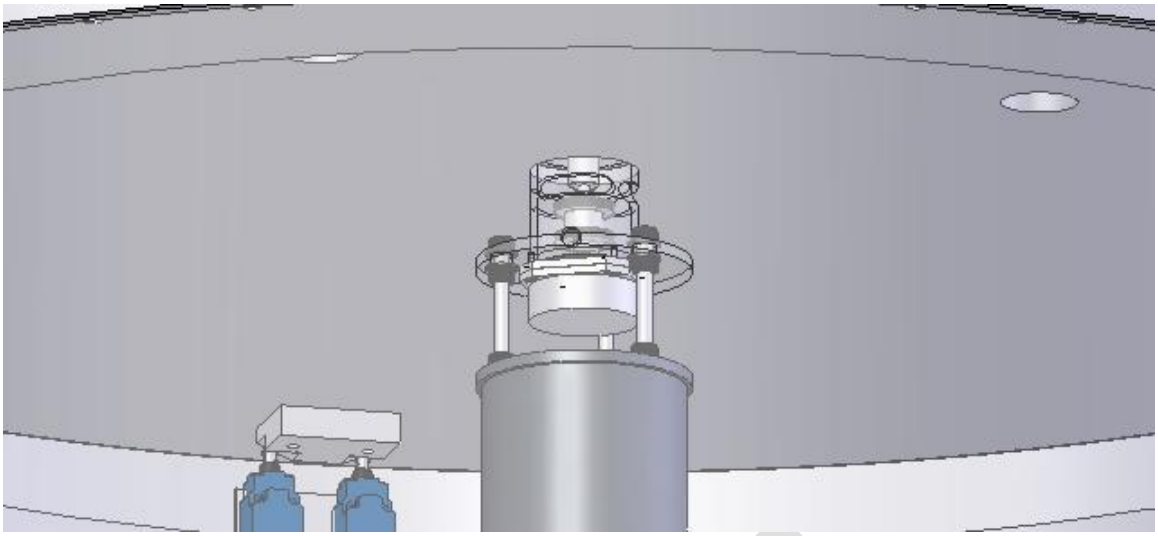


FIGURE 10
AZIMUTH ENCODER

4.5 ELEVATION MOTOR REPLACEMENT

1. Remove antenna from service making sure antenna is at stow position.
2. Install reflector **Support Strut** as a safety against back driving when elevation motor is removed. With the antenna at approx. 82deg position the Support Strut in place from an EWP with the Lug receiving brackets facing the jack lug plates on the Hub (the opposite end will fit between the parrallel center plates and wedge against the vertical plate at the base of the Turning Head).
Lower the antenna slowly in elevation and guide the support strut so that the support strut lug brackets will cradle the jack lug plates of the Hub.

NOTE- do not completely contact the support struts with the hub lugs. Stop 1/8in away. Use a tie strap to secure the struts in place wrapping around the Elevation Jack.

3. Verify that elevation brake is engaged.
4. Disconnect the motor encoder cable.
5. Disconnect the motor power cable.
6. Remove the bolts that hold the motor to the motor adapter plate.
7. Locate the adapter shaft set screws through the brake housing slots, and loosen the set screws.
8. Remove the motor. NOTE- the motor adapter shaft is keyed and trapped in place with the brake rotor. It will not be removed with the motor. Use a screwdriver to force it to separate from the shaft.
9. Install new motor in reverse order. (See Appendix G for Part No.)
10. Return the antenna to service in remote mode and operate using hand controller to make sure motor is operating properly.
11. Return antenna to service in desired operational mode.

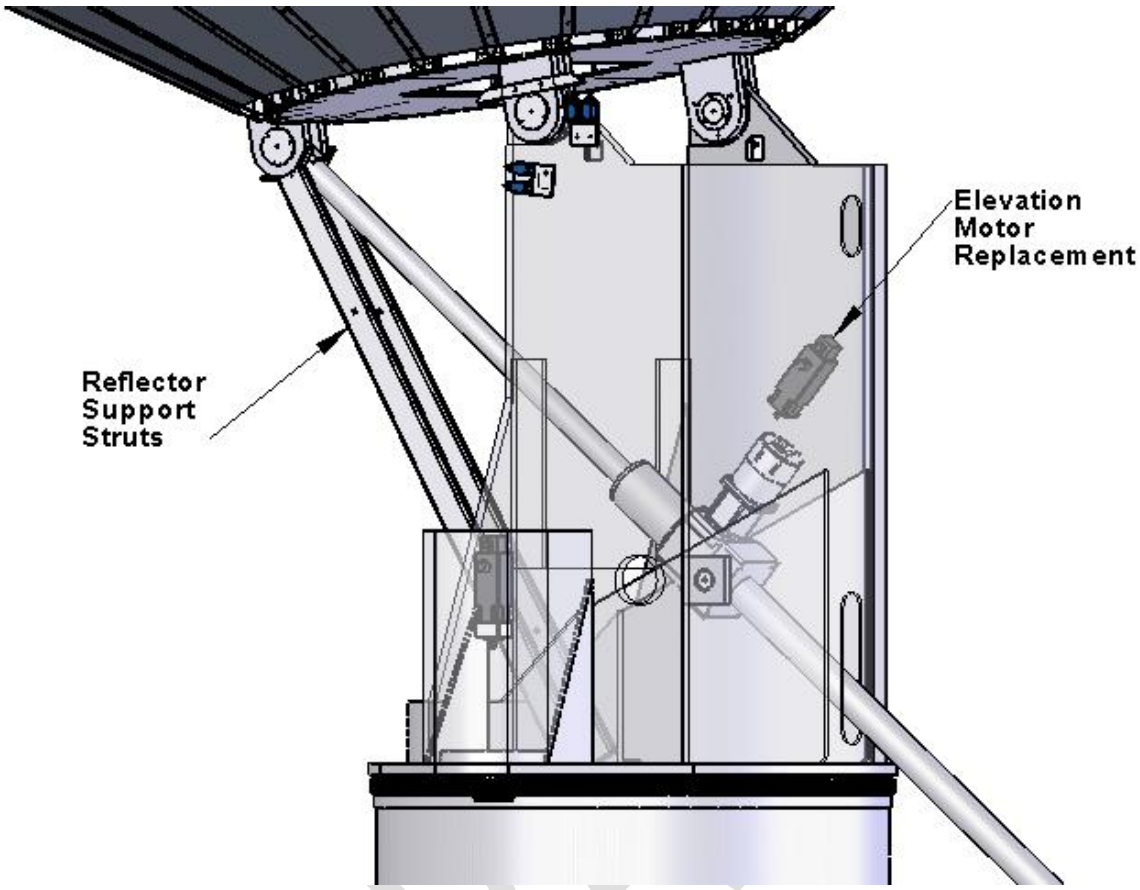


FIGURE 11

4.6 BRAKE ROTOR AND/OR BRAKE SOLENOID BODY REPLACEMENT

1. Remove antenna from service making sure antenna is at stow position.
2. Install reflector support struts to support the weight the antenna while the brake is being serviced. (see FIGURE 11 and read section 4.5 #2)
3. Verify that elevation brake is engaged.
4. Remove the motor as described in 4.5.
5. Remove motor adapter plate.
6. Actuate the brake release handle using short momentary releases until the weight of the antenna has stopped back-driving the jack and is fully resting on the reflector support struts.
7. Remove the 3 bolts holding the brake housing. The brake and rotor can now be changed out.
8. The new brake housing must have the standoffs adjusted identical to the one being replaced. Use a dial caliper or depth mic to set within .003".
9. Replace the components in reverse order. (See Appendix E for Part No.)
10. Return the antenna to service in remote mode and operate using hand controller to make sure motor is operating properly.

NOTE: Be sure to EXTEND the Elevation Jack with the first momentary moves of the jack ensuring that no forces are stacked out on the reflector support struts!

11. Return antenna to service in desired operational mode.

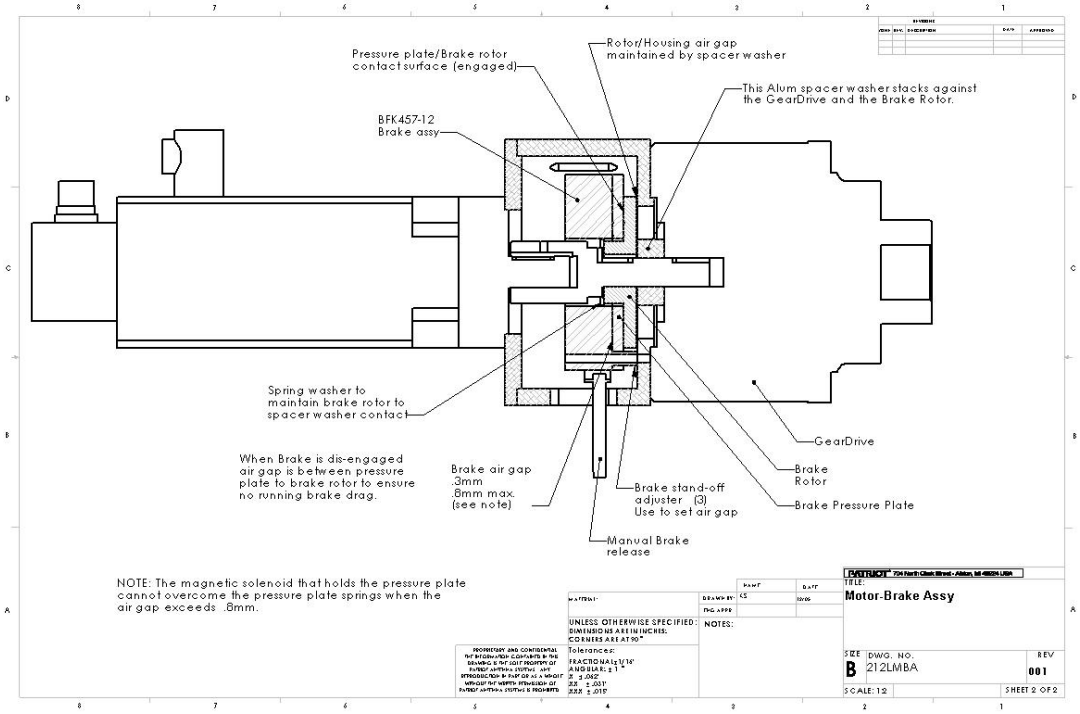

Pressure plate/Brake rotor contact surface (engaged)
Rotor/Housing air gap maintained by spacer washer
This Alum spacer washer stacks against the GearDrive and the Brake Rotor.
BFK457-12 Brake assy
Spring washer to maintain brake rotor to spacer washer contact
When Brake is dis-engaged air gap is between pressure plate to brake rotor to ensure no running brake drag.
Brake air gap .3mm .8mm max. (see note)
Brake stand-off adjuster (3) Use to set air gap
Manual Brake release
GearDrive
Brake Rotor
Brake Pressure Plate
NOTE: The magnetic solenoid that holds the pressure plate cannot overcome the pressure plate springs when the air gap exceeds .8mm.
Motor-Brake Assy
B
212LMBA
001
SHEET 2 OF 2

FIGURE 12

4.7 ELEVATION BRAKE/MOTOR SERVICE (NOT AT STOW)

There could be times where the Elevation Drive System could become inoperable and not capable of being driven to the 85degree stow position for the Reflector Support Struts to be put in place.

The following is a recommended solution for this special case. The parts are not provided with the antenna system and will need to be purchased from Patriot or fabricated per Patriot supplied prints and field installed when needed.

1. Remove antenna from service accepting the circumstance that the antenna cannot be driven to stow position.
2. The close-out panel near the Hub Elevation Lugs will need to be removed so that one of the Kit assemblies can be bolted to the Lugs.

NOTE: For first installation of the Kit, at least 2- 6 hole patterns will need to be tapped into the lugs to attached the Rod Clevis Plate assembly in place. Two locations will provide the desired mechanical advantage for supporting the weight- one for 30degrees and above, the other for less than 30 degrees.

Also drill 4- 1in holes into the vertical gussets of the Turning Head as shown for anchoring the Elevation Service Support Plates.

3. Install recommended Elevation Service Kit parts.
4. Tighten the jam nut till it is supporting the weight of the reflector.
5. Momentarily bump the brake release handle to verify the Service Kit is supporting the weight.
6. Proceed with servicing the Elevation motor and/or Brake assembly as described in 4.5 and 4.6.

NOTE: Be sure to EXTEND the Elevation Jack with the first momentary moves of the jack ensuring that no forces are stacked out on the Elevation Service Support assembly!

7. Disassemble Elevation Service Support assembly parts.
8. Return the antenna to service in remote mode and operate using hand controller to make sure motor is operating properly.

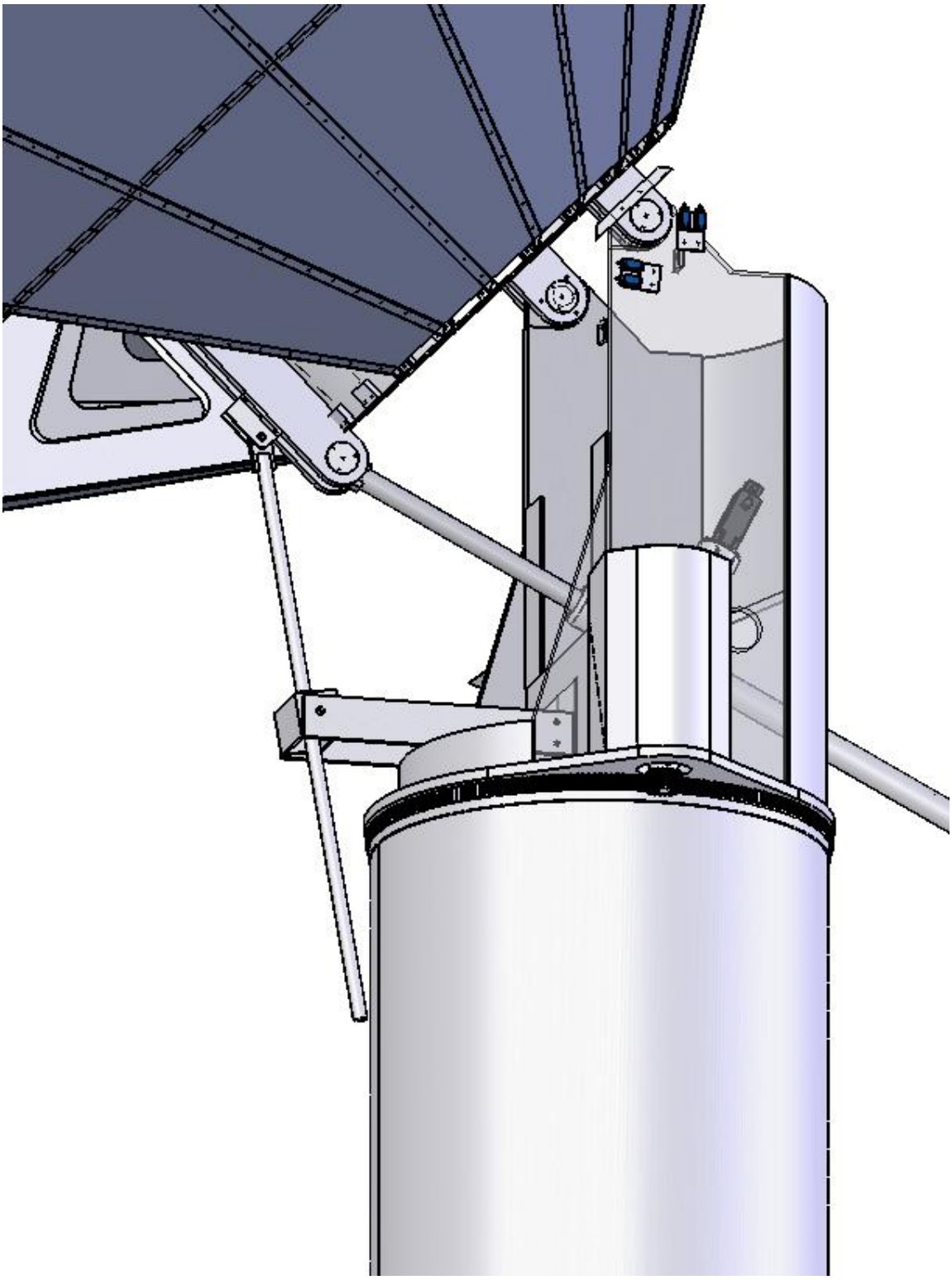


FIGURE 13

APPENDIX

Component Vendor Data

A. Azimuth Bearing

Commerce Brgs, LLC

Patriot Part No./Rev: 212L010/Rev.C

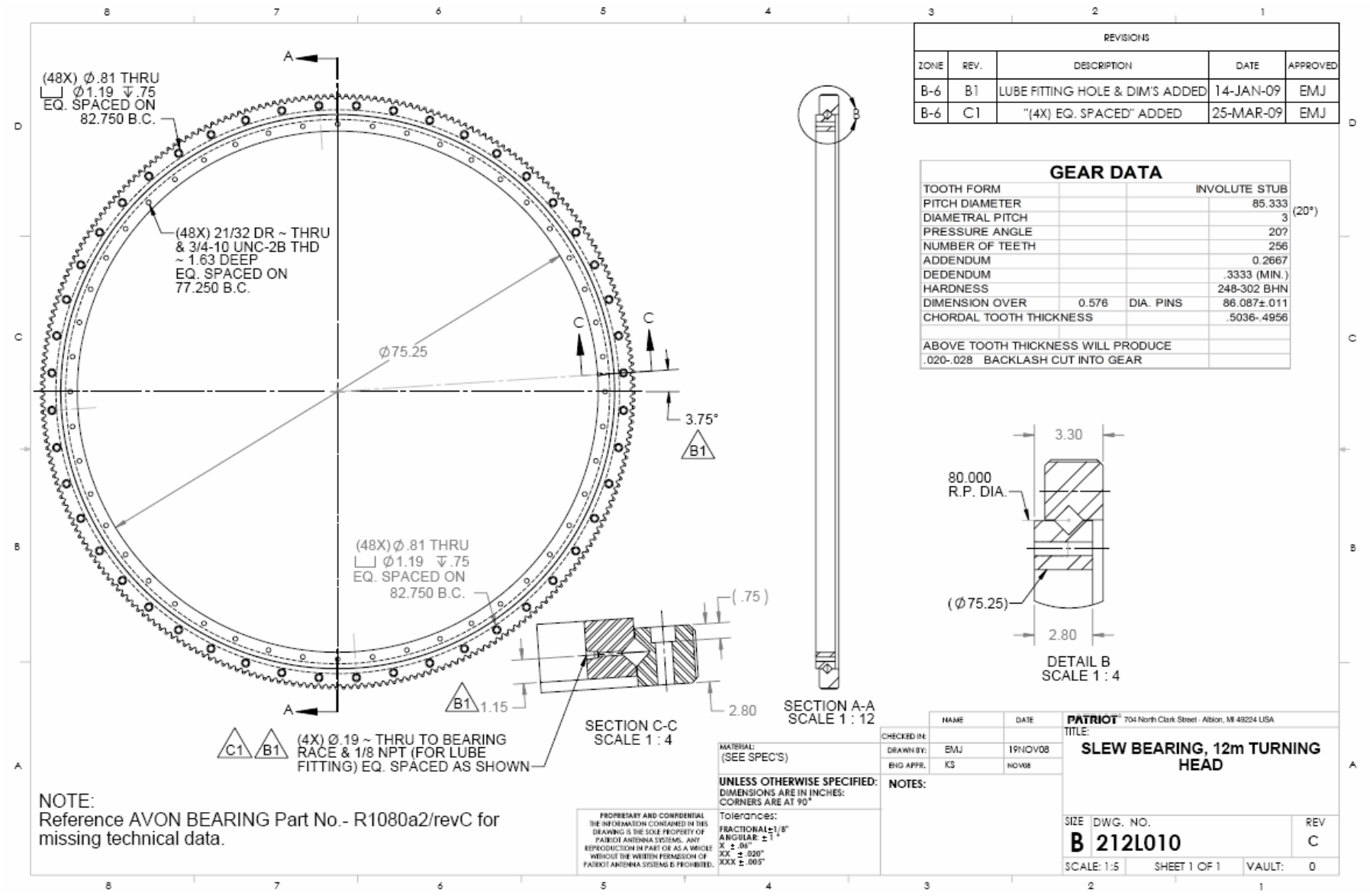
See Patriot Drawing# -212L010/Rev.C for detailed specifications. (Fig. 14 page 30)

Vendor Data-

Commerce Brgs, LLC

1730 Traditional Drive

Suite 100
Commerce, MI 48390
1-866-862-3357



REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
B-6	B1	LUBE FITTING HOLE & DIM'S ADDED	14-JAN-09	EMJ
B-6	C1	"(4X) EQ. SPACED" ADDED	25-MAR-09	EMJ

GEAR DATA

TOOTH FORM			INVOLUTE STUB
PITCH DIAMETER			85.333 (20°)
DIAMETRAL PITCH			3
PRESSURE ANGLE			20?
NUMBER OF TEETH			256
ADDENDUM			0.2667
DEDENDUM			.3333 (MIN.)
HARDNESS			248-302 BHN
DIMENSION OVER	0.576	DIA. PINS	86.087±.011
CHORDAL TOOTH THICKNESS			.5036-.4956
ABOVE TOOTH THICKNESS WILL PRODUCE .020-.028 BACKLASH CUT INTO GEAR			

	NAME	DATE
CHECKED IN:		
DRAWN BY:	EMJ	19NOV08
ENG APPR.	KS	NOV08

MATERIAL: (SEE SPEC'S)

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES; CORNERS ARE AT 90°

Tolerances: FRACTIONAL ±1/8" ANGULAR ± 1° X ±.06" XX ±.020" XXX ±.005"

NOTES:

PATRIOT 704 North Clark Street - Albion, MI 49224 USA

TITLE: **SLEW BEARING, 12m TURNING HEAD**

SIZE	DWG. NO.	REV
B	212L010	C

SCALE: 1:5 | SHEET 1 OF 1 | VAULT: 0

FIGURE 14

B. Elevation Jack

Joyce Dayton model- BBRS300U2S-85-T4, W/BT

35ton capacity 3.52:1 Internal Gearset

This jack has the following additions/modifications:

*Input shaft housing turned and faced- JD drw# B-09050003D

*Bellows boots- standard material

*Output shaft is 4in OD ball shaft.

See Joyce Dayton Drawing#- QD-2850 for detailed specifications. (Fig. 15, page 32)

Vendor Data-

Joyce Dayton
Dayton, Ohio 45401
(937)294-6261

Actuator Bellows replacement (w/ zipper)-

P/N- xxxxxxxxxxxxxxx

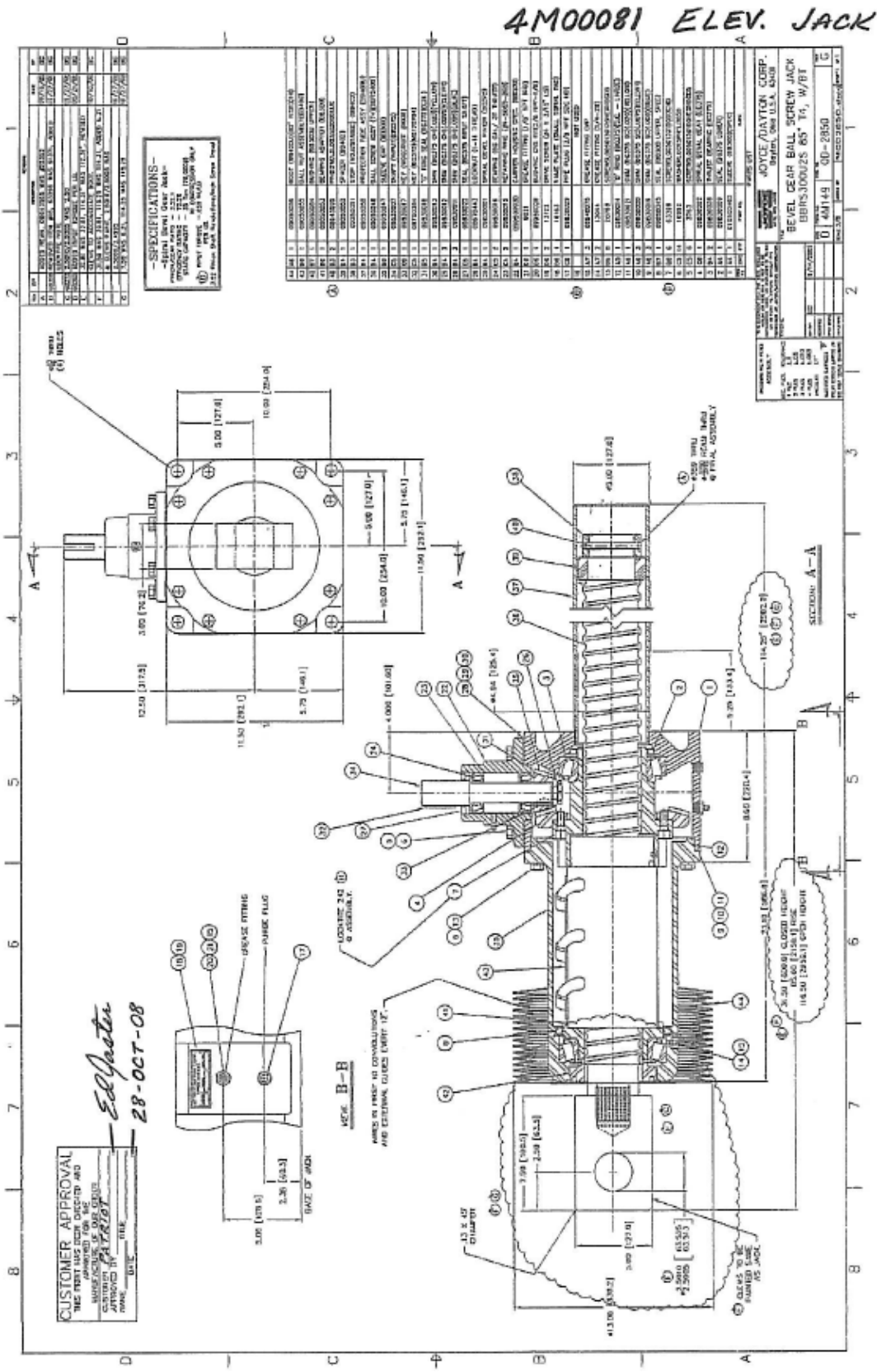

4M00081 ELEV. JACK
BEVEL GEAR BALL SCREW JACK
BBRS3000/25 65° Tri, W/BT
JOYCE/DAYTON CORP.
CUSTOMER APPROVAL
Ed Yaster
28-OCT-08
SECTION A-A
VIEW B-B

FIGURE 15

C. Elevation Geardrive

Eskridge model- 28P

See Eskridge Drawing# - 28-006-5213 for detailed specifications. (Fig. 16 page 34)

Vendor Data-

Eskridge
1900 Kansas City Road
Olathe, Kansas 66061
(913)782-1238

FIGURE 16

D. Azimuth Geardrive

Eskridge model- 250.72:1

See Eskridge Drawing# - 25-006-5617 for detailed specifications. (Fig. 17, page 36)

Vendor Data-

Eskridge
1900 Kansas City Road
Olathe, Kansas 66061
(913)782-1238

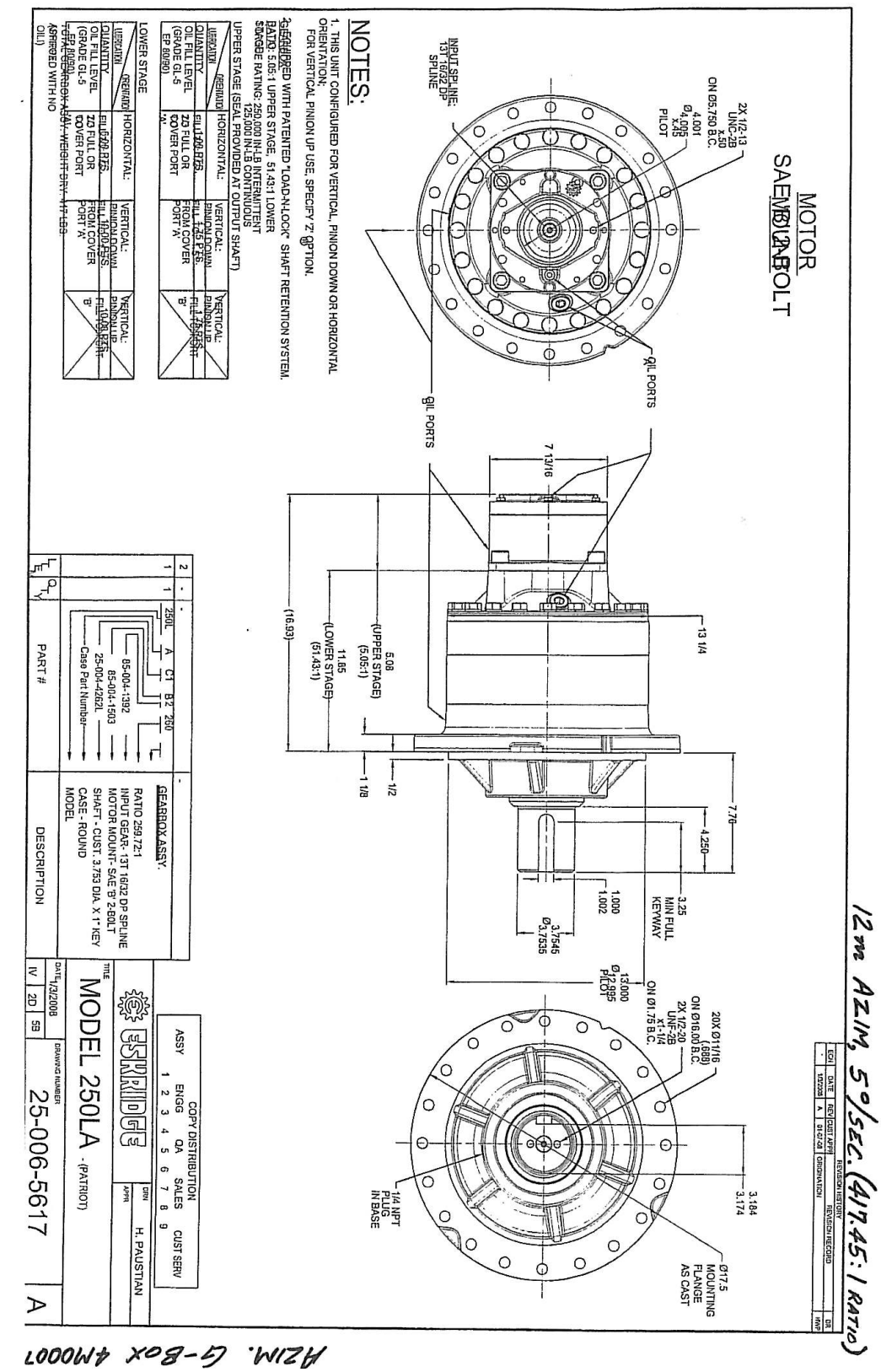

MOTOR
SAE B 2-BOLT
NOTES:
1. THIS UNIT CONFIGURED FOR VERTICAL, PINION DOWN OR HORIZONTAL ORIENTATION;
FOR VERTICAL PINION UP USE, SPECIFY 'Z' OPTION.
2. EQUIPPED WITH PATENTED "LOAD-N-LOCK" SHAFT RETENTION SYSTEM.
RATIO: 5.05:1 UPPER STAGE, 51.43:1 LOWER
SERVICE RATING: 250,000 IN-LB INTERMITTENT
125,000 IN-LB CONTINUOUS
UPPER STAGE (SEAL PROVIDED AT OUTPUT SHAFT)
LOWER STAGE
2X 1/2-13 UNC-2B ↧.50 ON Ø5.750 B.C.
4.001 Ø4.000 PILOT
INPUT SPLINE: 13T 16/32 DP SPLINE
OIL PORTS
7 13/16
13 1/4
5.08 (UPPER STAGE) (5.05:1)
11.85 (LOWER STAGE) (51.43:1)
(16.93)
1 1/8
1/2
7.70
4.250
3.25 MIN FULL KEYWAY
1.000 1.002
3.7546 Ø3.7535
13.000 Ø12.995 PILOT
ON Ø1.75 B.C.
20X Ø11/16 (.688) ON Ø16.00 B.C.
2X 1/2-20 UNF-2B ↧.74
3.184 3.174
Ø17.5 MOUNTING FLANGE AS CAST
1/4 NPT PLUG IN BASE
12m AZIM, 5°/SEC (417.45:1 RATIO)
AZIM. G-Box 4M0007
REVISION HISTORY
REVISION RECORD
EGI
DATE
REV
QUST APPR
ORIGINATION
DR
MKP
1/22/08
A
3/7/08
SEARBOX ASSY.
RATIO 259.72:1
INPUT GEAR- 13T 16/32 DP SPLINE
MOTOR MOUNT- SAE 'B' 2-BOLT
SHAFT - CUST. 3.753 DIA. X 1" KEY
CASE - ROUND
MODEL
PART #
DESCRIPTION
85-004-1392
85-004-1503
25-004-4262L
Case Part Number
COPY DISTRIBUTION
ASSY ENGG QA SALES CUST SERV
1 2 3 4 5 6 7 8 9
DRN
APPR
H. PAUSTIAN
MODEL 250LA - (PATRIOT)
DRAWING NUMBER
25-006-5617
A
DATE 1/31/2008
IV
2D
SB

FIGURE 17

E. Elevation Brake

Specifications-

Lenze model-

BFK457-06 basic brake with hand release and hub

Voltage: 24 VDC

Bore: 25mm

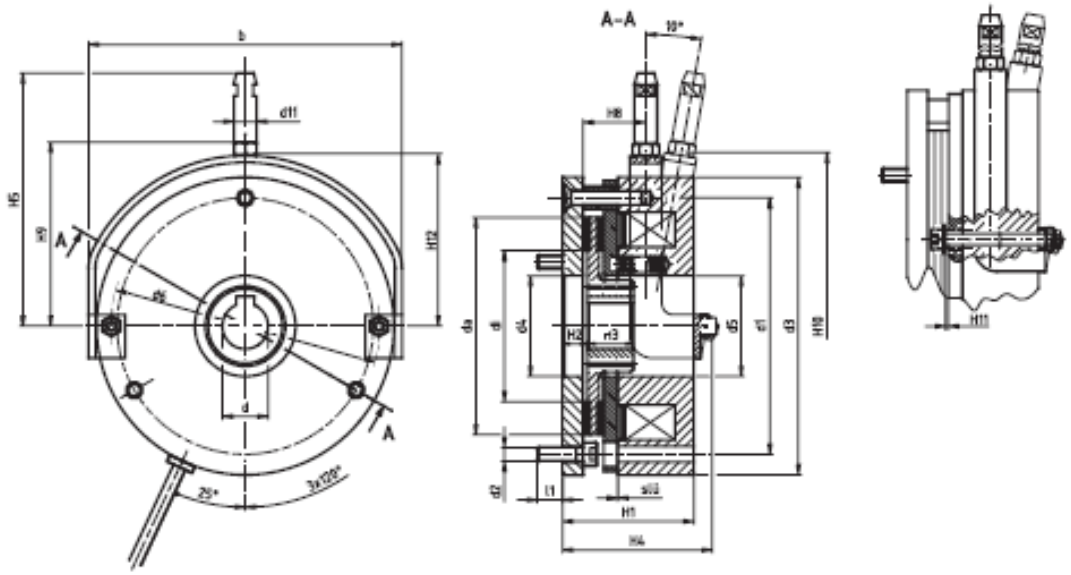
Vendor Data-

BrakeClutch, LLC
48 Vista Dr.
Flanders, NJ 07836
(973)584-4539

COBHAM

Spring-operated brake INTORQ BFK457-06 ... 16

Basic and compact design with assembled manual release



Size	M_K	M_K max.	$P_{20°}$	b	dJ7 pilot	dH7 standard	dH7 max.	d1	d2	d3	d4	d5	d6	d7	d11	da	di	H1	H2
06	4	6	20	90	10	11/ 12/ 14/ 15	15	72	3xM4	84	31	31	77	M4x30	8	60	40	41.3	7.5
08	8	12	25	108	10	11/ 12/ 14/ 15/20	20	90	3xM5	102	42	41.5	93.5	M5x35	8	77	47	49.8	8.5
10	16	23	30	137	10	15/20	20	112	3xM6	130	44	44	117	M5x40	10	95	66	56.4	10
12	32	46	40	157	14	20/25	25	132	3XM6	150	52	52	136.3	M5x45	10	115	70	62.4	10
14	60	95	50	174	14	20/25/30	30	145	3XM8	165	60	60	150	M6x55	12	124	80	77.3	13
16	80	125	55	203	15	25/ 30/35/38	38	170	3xM8	190	70	70	174.5	M6x60	12	149	104	83.5	13.3

Size	M_K	M_K max.	H3	H4	H5	H6	H8	H9	H10	H11	H12	l1 *	l2	S_{l0} ±0.1	$S_{l0\,max.}$ at M_K	$S_{l1\,max.}$ at $M_{K\,max.}$	m (kg)
06	4	6	18	45.3	107	15.8	15.8	53	52.4	1	49	6	400	0.2	0.6	0.4	1.1
08	8	12	20	54.8	118	16.3	16.3	64	64	1	59	9	400	0.2	0.6	0.45	1.9
10	16	23	20	61.4	142	27.4	27.4	79	77.3	1	74	12	400	0.2	0.7	0.5	3.8
12	32	46	25	67.4	162	29.4	29.4	89	88.3	1	84	12	400	0.3	0.8	0.5	5.7
14	60	95	30	83.3	201	33	33	100	99.7	1	94	14	400	0.3	0.8	0.5	8.6
16	80	125	30	89.5	250	37.4	37.5	116	114.8	1	108	14	600	0.3	0.9	0.6	12.0

FIGURE 18

F. Limit Switches

Honeywell #GLAA01C (1NC/1NO)

Honeywell #GLAA20C (2NC/2NO)

Honeywell #GKEA06L (LS with Safety InterLok- #GKZ51M)

G. Drive Motors-

Azimuth- Control Techniques #142U2D301VASAB165240

Elevation- Control Techniques #142U2D401VASAB165240

H. Encoders-

Heidenhain Model ROC 226 Encoder (same for both AZ and EL)

Heidenhain Model K03 Coupling (same for both AZ and EL)