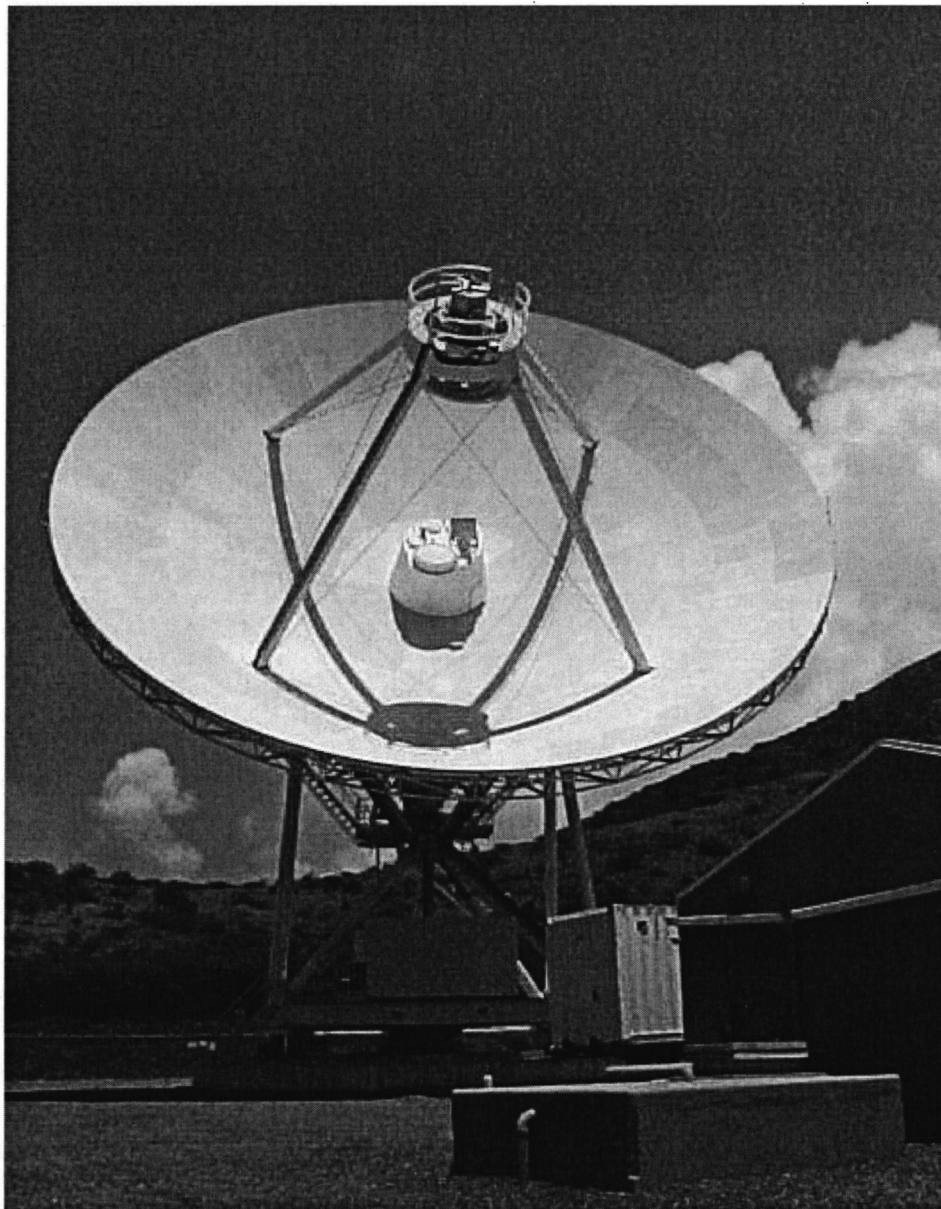


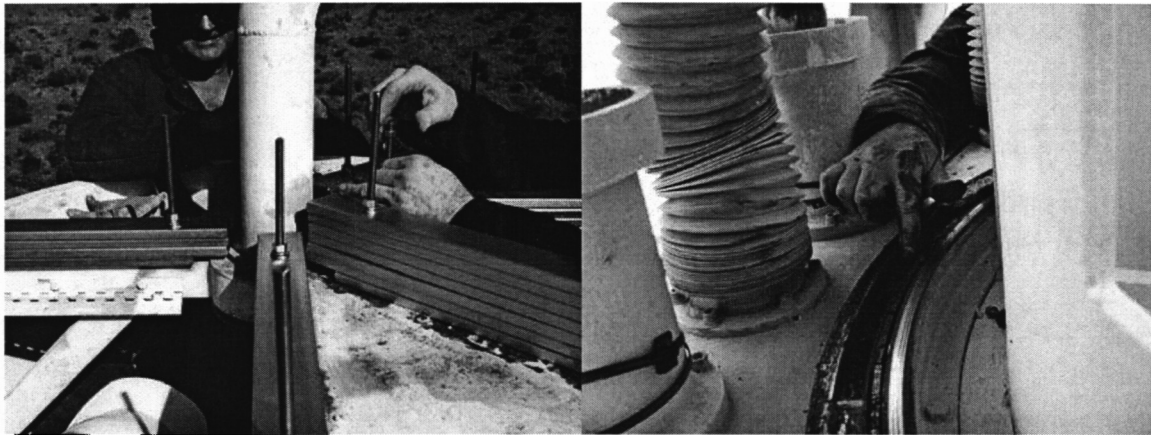
**National Radio Astronomy Observatory  
Socorro, New Mexico**

**VLBA Antenna Memo #59**

~~VLBA~~ VI. VLBA Maintenance Visit April 4<sup>th</sup> thru April 22<sup>nd</sup> 2005.  
~~Saint Croix~~

Team members consisted of Steve Aragon, Eric Carlowe, Kelly Greene, Ken Lakies, Bob McGoldrick and Phillip Sanchez. VLBA Site Technician Greg Worrell assisted in all areas of maintenance during the visit. A task list is attached.





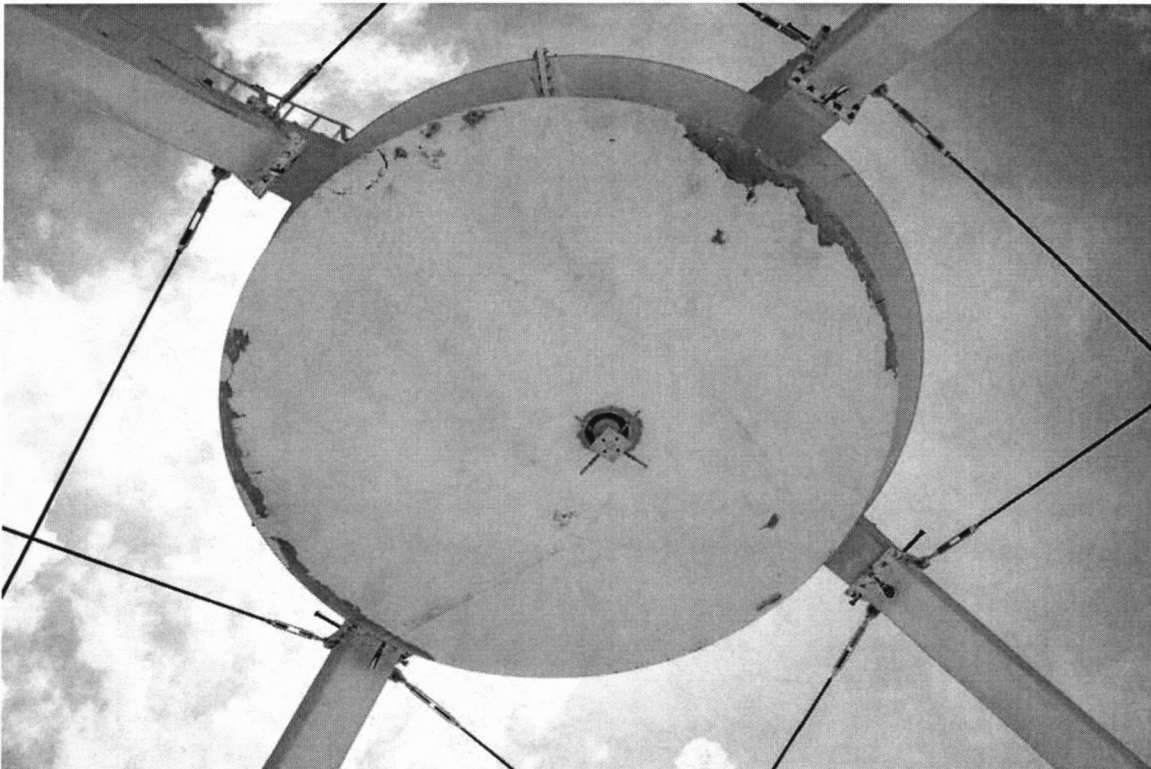
Sub reflector needed rebalancing. During the FRM inspection a broken INA bearing segment was found and repaired. The INA cap seal was replaced.

**FRM INA BEARING CHECK 50LBS PULL ON EAST MOTOR**

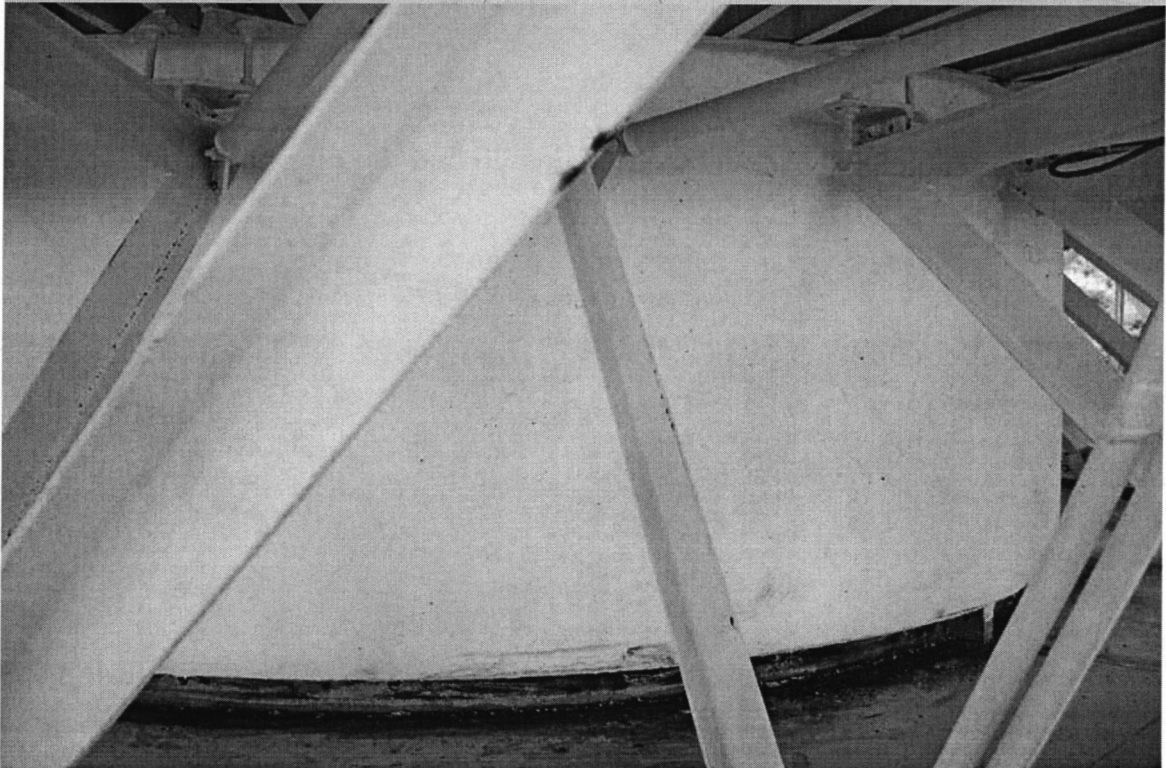
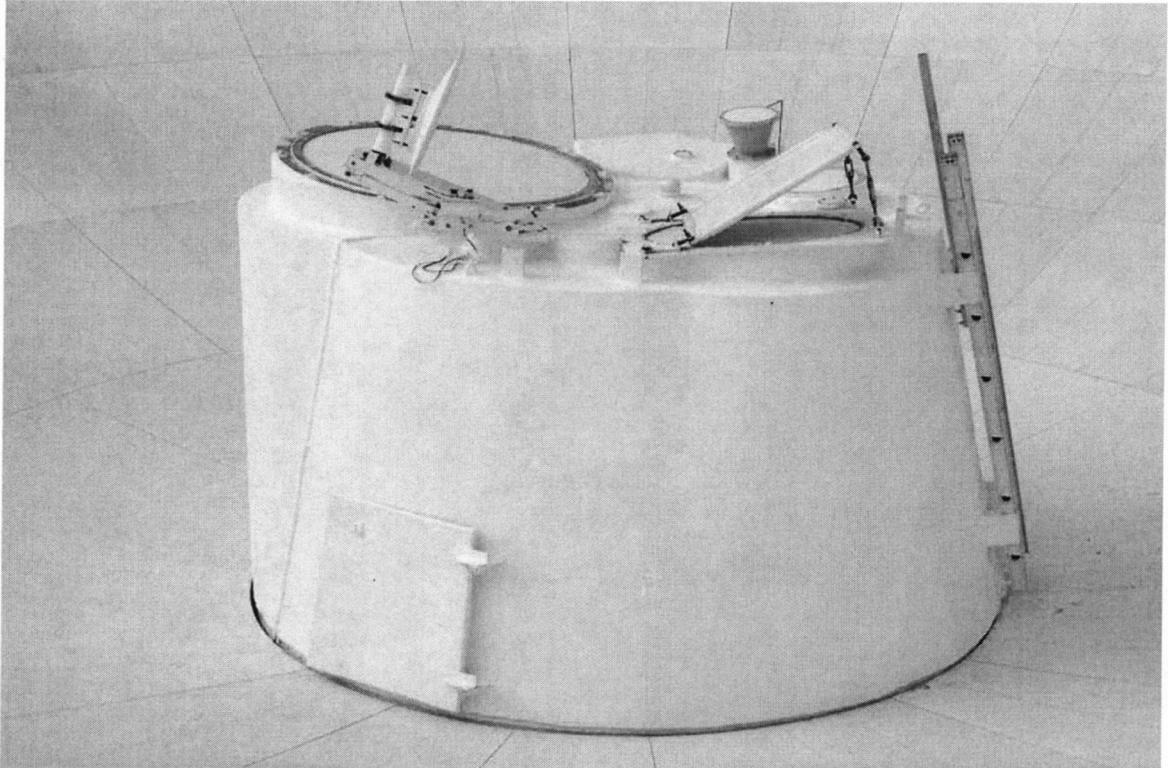
East Travel:	+0.002	West Travel:	.000
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**FRM INA BEARING CHECK 50LBS PULL ON WEST MOTOR**

East Travel:	-.002	West Travel:	+0.001
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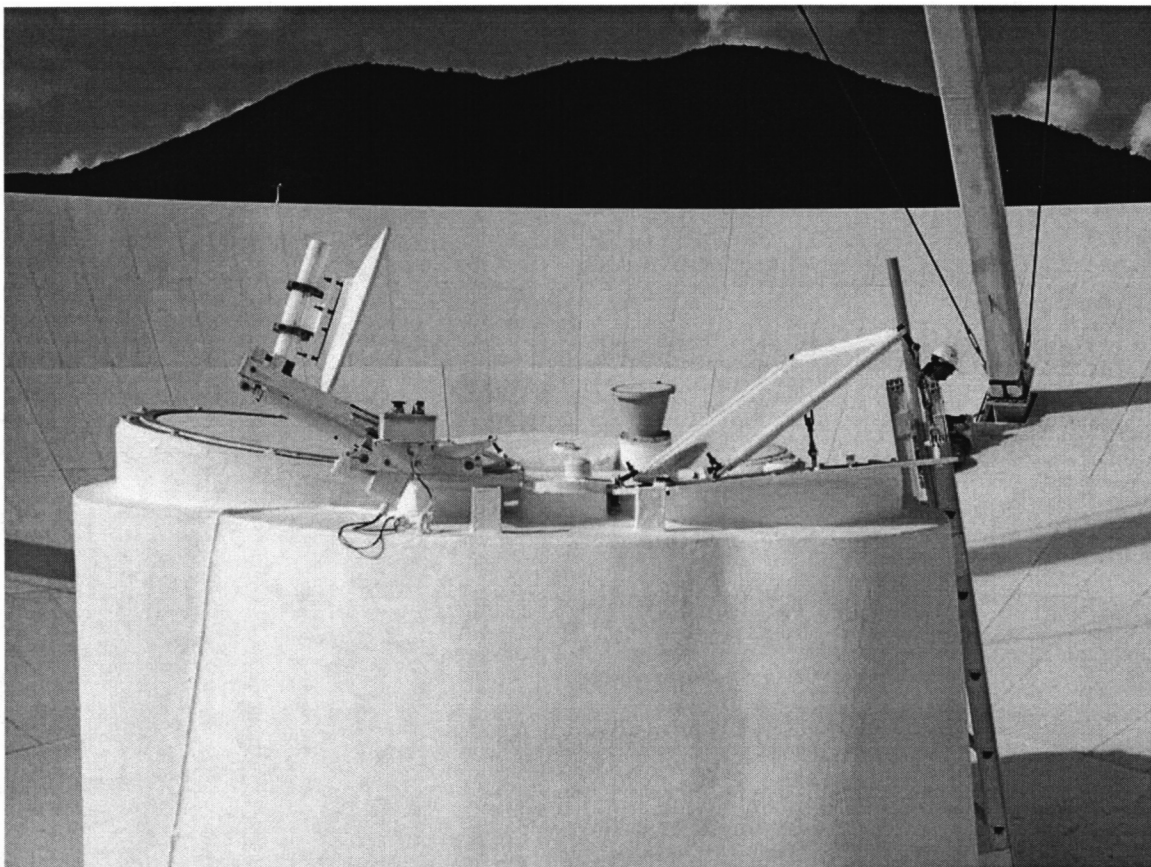


Sub reflector is in fair condition. The outside edges are soft, (spongy) and delaminating. Three 1 inch holes were drilled in the center of the reflector for extra drainage.

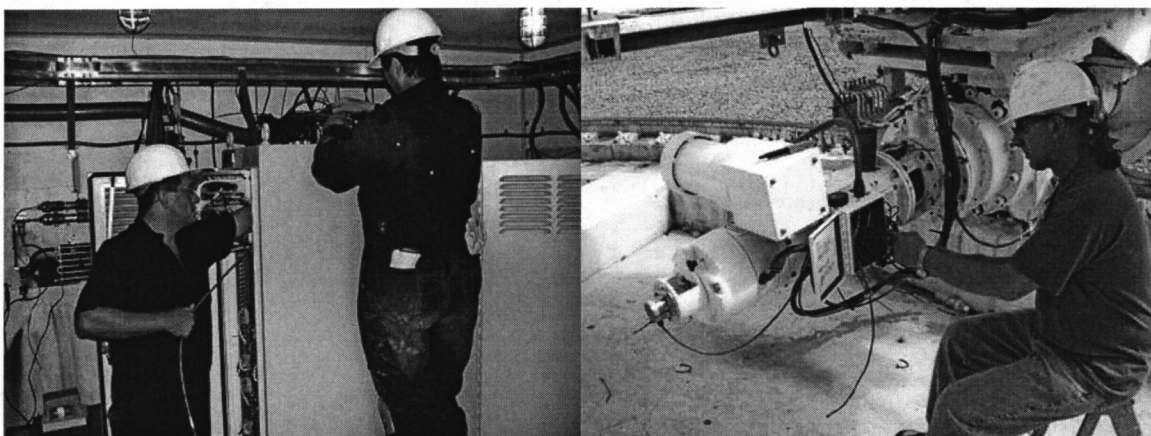


The feed cone was leaking into the vertex room. 5 gallons of elastomeric paint and 2 cases of caulk were used to seal it above and below the panels. The dish panel's paint is in good condition.



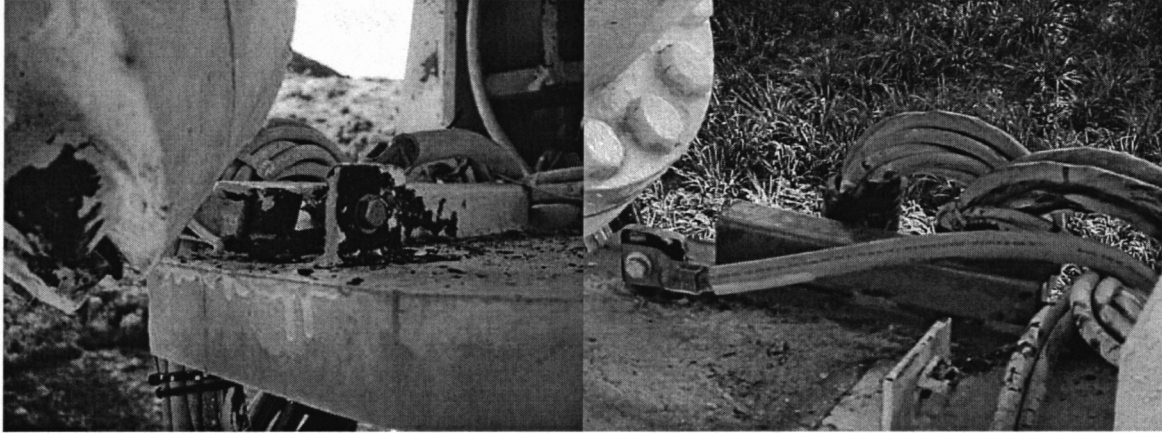


**The ellipsoid actuator was replaced. Ellipsoid and the dichroic reflectors were aligned and are in good condition.**



**New digital tachs were installed on EL and AZ motors. Azimuth #1 and Elevation #2 motors were replaced. The ACU backplane upgrade was installed and tested.**





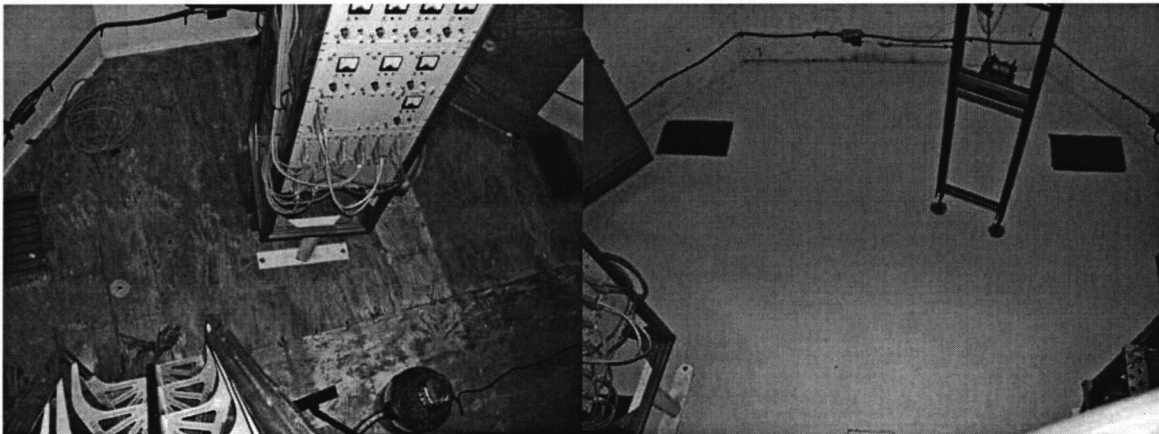
Both the encoder and synchro side elevation cable wraps were severely corroded. Stainless steel uni-strut was used to hold the new strain relief brackets in place.

#### AZIMUTH BEARING GREASE INSPECTION

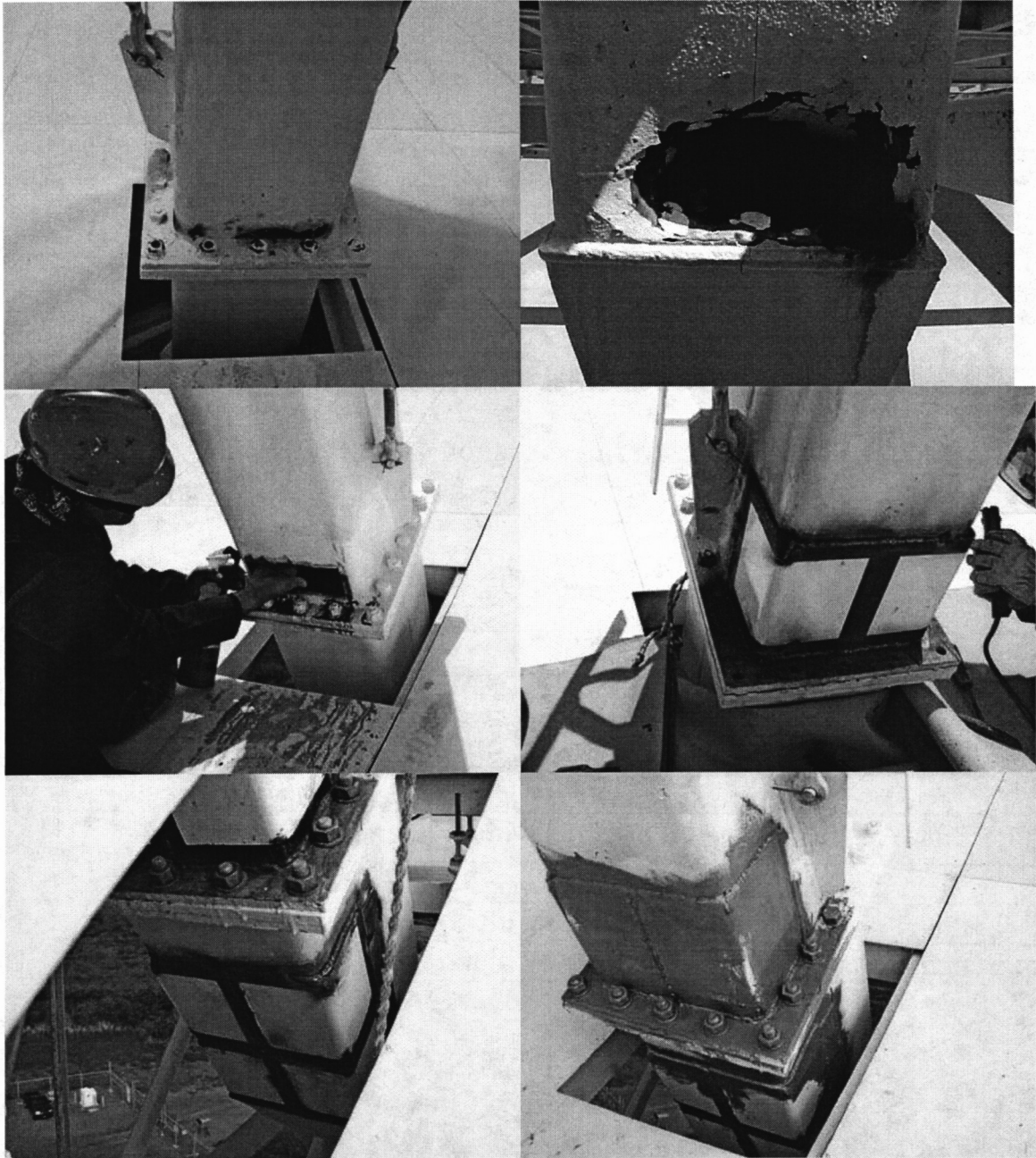
	INNER BEARING	OUTER BEARING
D1	OK	OK
D2	Small scratches in race.	OK
I1	OK	Small metal flakes, small scratches.
I2	OK	OK
Pintle bearing is well lubricated with no metal flakes in grease.		

#### ELEVATION BEARING GREASE INSPECTION

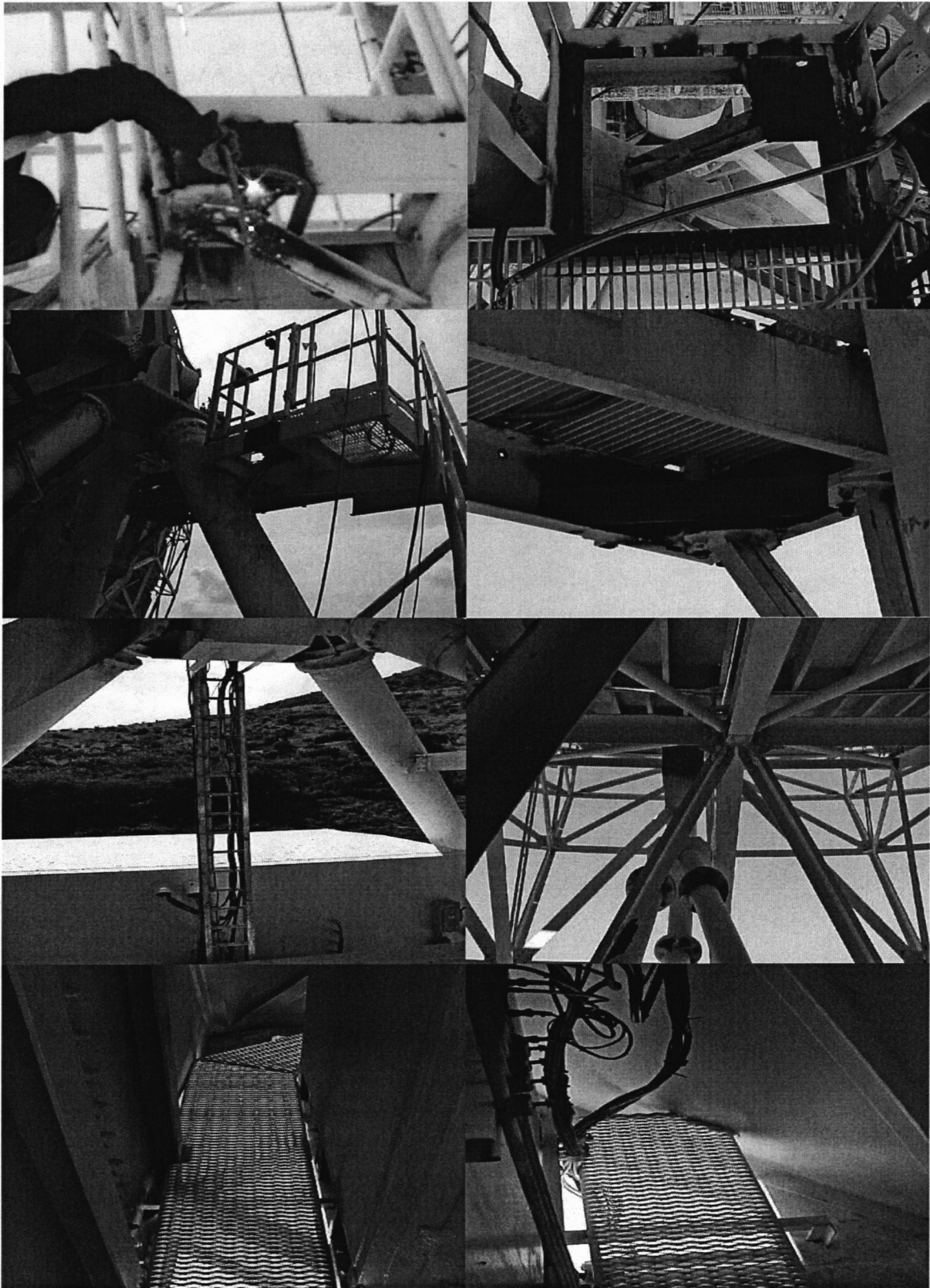
Encoder	Good grease with no metal flakes.
Synchro	Good grease with no metal flakes.



The feed cone leak had damaged part of the vertex room floor tiles. The floor was repaired and sealed, then covered with deck paint.

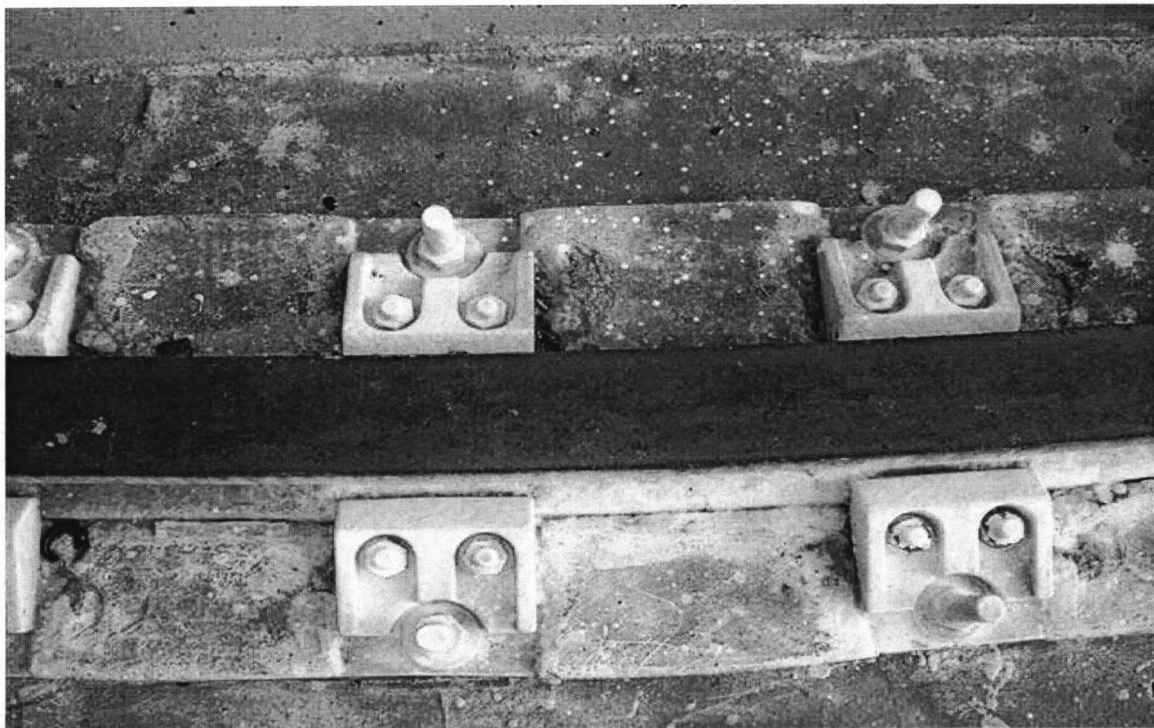
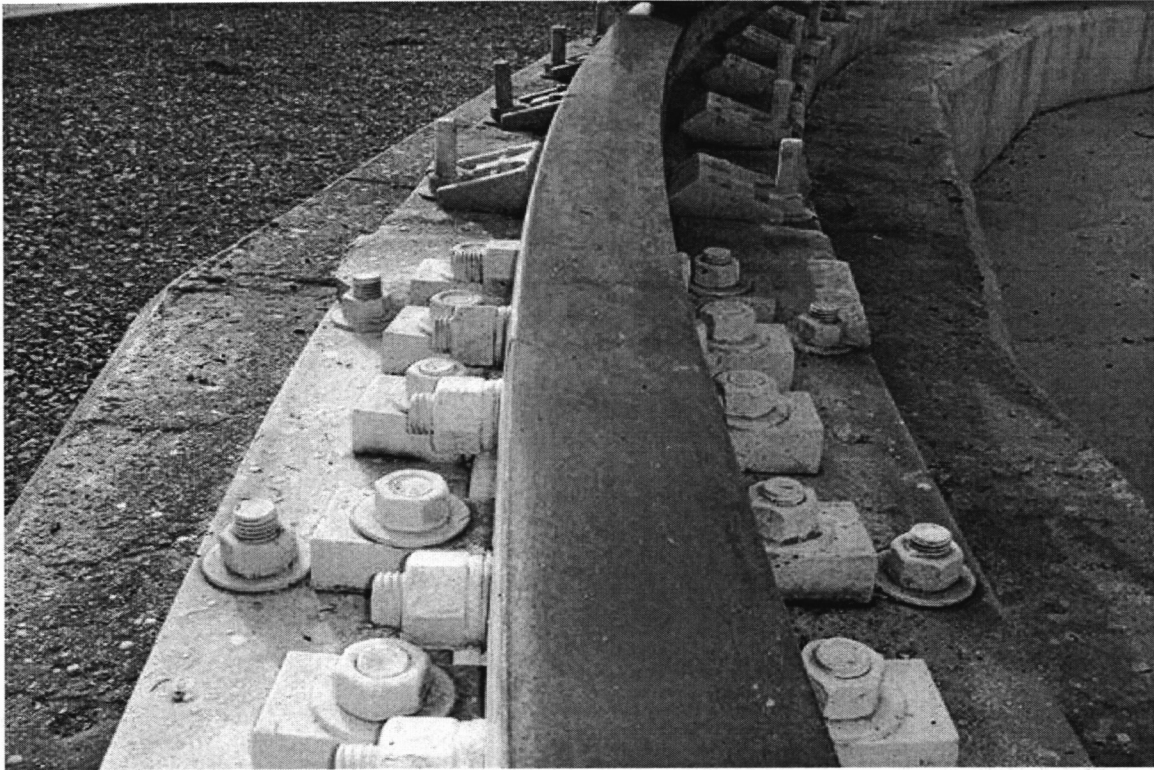


Rust holes were repaired in the ladder quad leg above and below the dish surface. All quad legs were inspected, patched and painted with rust bullet.

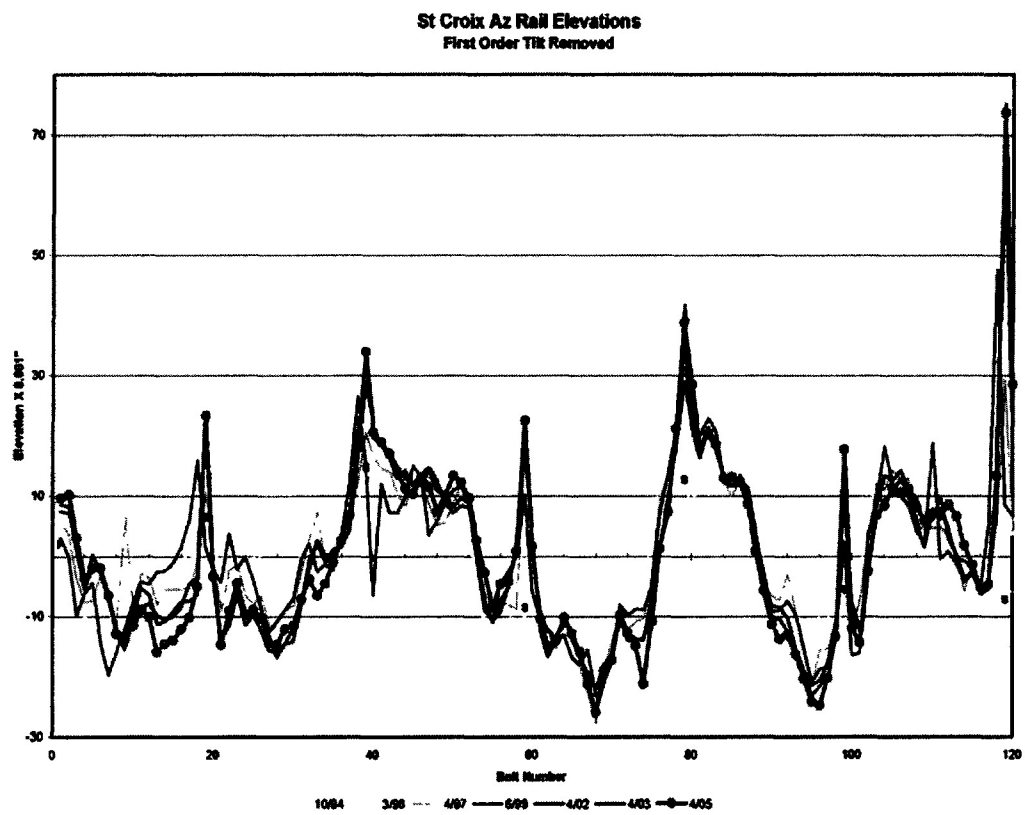


A tremendous amount corrosion repair was accomplished. Much more work is still needed.





Site techs have done a great job removing vulchem and painting rail clips and splices. Overall the rail is in good condition.



It appears the rail splice at bolt # 119 the failing.





## ANTENNA MECHANICAL MAINTENANCE SCVLBA 4/04-22/05

### APEX INSPECTION:

FRM 2-YEAR INSPECTION PM. Well lubricated.

● LANCE AND REPAIR FRM TUBE. Done, replaced counter weights. Repaired SW INA---  
Bearing segment which had broken bolts. Replaced INA cap ring bearing seal.

#### FRM INA BEARING CHECK 50 LBS PULL ON EAST MOTOR

East Travel: +.002

West Travel: .000

#### FRM INA BEARING CHECK 50 LBS PULL ON WEST MOTOR

East Travel: -.002

West Travel: +.001

### SUBREFLECTOR INSPECTION: Delaminating—thin in spots (spongy).

Mounting Hardware. OK—Replaced 1 turn buckle.

Dipole. OK—Looks good.

Peeling paint/delaminating. Needs to be redone, reflector is soft in some places.

Drill 3-1 inch drain holes. Done.

### QUAD LEGS INSPECTION:

Guy wires. Surface Rust.

Turn buckles. Surface Rust.

● d leg flange bolts. OK, minor superficial rust. Bottom ½ of bolts replaced.

REPAIR CORROSION AFFECTED AREAS. All 4 patched—Ladder leg the worst. Clean out rust &  
Pant with rust bullet.

### DISH INSPECTION:

Anemometer mounts/operation. OK.

Panel surfaces. Overall OK, Some paint degradation.

Spot check panel bolts. Done, Reset ladder leg panel.

### FEED CONE INSPECTION:

Feed cone surface/insulation. Ok.

FE feed windows. OK, sealed w/caulk.

FE feed mounting hardware. OK.

Seal and Paint. (Leak between FC & VTX). Done, gallons elastomeric & 2 cases of caulk.

Dichroic reflector cracking/delaminating. (NOP#6E5C) Good shape, Replaced 2 eye bolts & aligned

Ellipsoid dish/mount. Replaced ellipsoid actuator and realigned dish.

FC hatch latches replace as needed. All OK.

**ELEVATION BEARING/AXLE INSPECTION:**

EL. Grease inspection/Encoder side	OK
EL. Grease inspection/DGB side	OK

Cable Wraps Brackets. Replaced uni-strut brackets on both sides.

Grease elevation bearings. Well lubricated.

Check elevation axle for cracks. Welded a small crack on the HVAC side.

Listen for popping or grinding. No popping or grinding noises noted.

**ELEVATION BULL/PINION GEAR INSPECTION:**

Bull gear. Well lubricated and signs of adverse wear.

Bull gear welds/hardware. Welds and hardware OK.

Pinion gears. Well lubricated and no signs of adverse wear.

Lube bull/pinion gears as needed. Previously done by site techs.

Check stow pin. Good shape—replaced lock pin with new.

**ELEVATION MOTOR AND GEARBOX INSPECTION:**

EL.#1 seals/coupling/internal gears. Done.

EL.#2 seals/coupling/internal gears. Done.

Gearbox heaters/lube pumps. Done.

Flow gauges/fish eyes. Cleaned flow gauges and replaced fish eye's.

Change gearbox oil. Done.

Listen for popping or grinding. No popping or grinding noises notes.

Replace motor air boxes. Done.

**ELEVATION PLATFORM INSPECTION:**

Swinging catwalk. Check out OK.

Hoist. Checked OK.

Install (VTX AC platform). Ran out of time(low priority).

REPAIR & PAINT CORROSION AFFECTED AREAS. Spot chipped & painted w/rust bullet.

**ANTENNA STRUCTURAL INSPECTION:**

Spot-check structural bolts. Rusty, Spot chipped bad bolts and painted w/rust bullet.

VTX walk way. Ok, repainted.

Antenna structural welds. (REPAIR & PAINT CORROSION AFFECTED AREAS). Spot chipped

Antenna backup/lower structure. And painted with rust bullet.

**AZIMUTH BEARING/GREASE INSPECTION**

	INNER	OUTER
	OK	OK
D2	Sight scratches while probing bearing	OK
I1	OK	Little metal in grease w/bearing scratches
I2	OK	OK

**AZIMUTH WHEEL INSPECTIONS:**

Wheel to structure clearances. Good clearance on all wheels.

Listen for popping or grinding. No popping or grinding noted except on Idler #1 on the 99<sup>th</sup> bolt.

**AZIMUTH WHEEL RADIUS/ALIGNMENT**

Measured	Specified	D1	D2
Horizontal	0.00.00 (<1'24")		
Vertical	93.26.23(+/-1'24")		
Radius	300.000" (+/- .25")		

**AZIMUTH MOTOR AND GEARBOX INSPECTION:**

AZ#1 seals/coupling/internal gears. Done.

AZ#2 seals/coupling/internal gears. Done.

Gearbox heaters/lube pumps. Done Ok.

Flow gauges/fish eyes. Replaced oil pump seal on #1. Cleaned flow gauges and replaced fish eyes.

Change gearbox oil. Done.

Listen for popping or grinding. No grinding or popping noted.

Replace motor air boxes. Done.

**PINTLE BEARING INSPECTION:**

Cable wrap & cables. OK

Check for loose bolts. OK

Check bearing grease. OK well lubricated.



**AZIMUTH RAIL INSPECTION:**

Rail level measurements. Done.

Excessive rail movement. Done—none.

Joint bars and clips. Done.

Antenna foundation/grout/vulchem. Grout is in good shape----vulchem is removed.

Re-torque rail splice plates as needed. Done.

**ANTENNA PAINT/INSULATION INSPECTION:**

Antenna paint condition. Bad, spot chipped, spot painted w/rust bullet.

Repair antenna insulation as needed. Good shape.

**MECHANICAL MAINTENANCE ITEMS TO BE COMPLETED:**

1. Replace ellipsoid actuator. Done, and aligned.
2. Spot Seal and Paint Feed with Elastomeric. Done, used 5gallons of paint & 2 cases of caulk.
3. Repair & Paint Antenna structure as needed.(Leak between VTX & FC). Repaired.
4. Replace and repair both Elevation cable wraps. Done—w/stainless uni-strut.
5. Install antenna AC outlets above AZ motors. Done.
6. Install VTX compressor platform. Platform left behind for future install.
7. Replace VTX door & strip above door. Door left behind for future install.
8. Replace motor air boxes. All 4 done.

**ANTENNA MECHANICS NOTES:**

**Painted all patches w/rust bullet.**

**Replaced 9 bolts per quad leg.**

**Patched quad legs, Ladder leg above and below dish surface.**

**Reworked walkway and railing above ped room. Replaced cable tray.**

**Repaired pockets and 6 pieces of grating on both elevation platforms.**

**Replaced gate to cat walk.**

**Used 2 gallons of rust bullet and 3 gallons of paint.**

## ANTENNA SERVO MAINTENANCE SCVLBA 4/04-22/05

### ANTENNA SAFETY TESTS:

Ped Room Electrical Panel Inspections. ½ done, no time to finish.

### BRAKE HOLDING-TORQUE TESTS ( FT-LBS)

<b>AZ #1</b>	<b>Motor replaced w/ new air boxes.</b>
<b>AZ #2</b>	<b>82lbs</b>
<b>EL #1</b>	<b>74lbs—Replace brake pads and adjusted block.</b>
<b>EL #2</b>	<b>Motor replaced w/ new air boxes.</b>

### MOTOR INSPECTIONS:

Elevation motor/tach couplings. Tight.

Elevation brush/commutator. Some wear—replaced brushes on EL #1.

Azimuth motor/tach couplings. Tight.

Azimuth brush/commutator. Some wear----replaced brushes AZ#2

Install new design air boxes. Done.

### ANTENNA GROUNDING INSPECTION:

Elevation ground cable. Replaced both Elevation grounds.

Elevation platform to pintle turret. Replaced cable tray.

Restal room. Good.

Azimuth wheel contacts. Good.

Pintle room/cable wrap. Added Teflon to wrap.

Apex/Dish lightning rods. Replaced ground to cable wrap.

### SERVO RECORDINGS:

Elevation response test. Timed and adjusted DB interface boards.

Azimuth response test. Timed and adjusted DB interface boards.

Elevation position loop test. No time to complete.

Azimuth position loop test. No time to complete.

### ACU AUTO MODE TESTS:

System/axis faults. Ok

AZ/EL motor fault status. OK

Stow commands. OK

Synchro position feedback. OK

VME to ACU communication. OK

Restore ACU parameters. OK.

## **ANTENNA SERVO MAINTENANCE SCVLBA 4/04-22/05**

### **SERVO MAINTENANCE ITEMS TO BE COMPLETED:**

1. Install Digital tachs on both axis. Done and calibrated.
2. Install New ACU Back plane. Done and tested.
3. Install Drive Cabinet power supply Mod. No time for upgrade.
4. Spot Seal and Paint Feed Cone with Elastomeric. (Leak between VTX & FC). Done.
5. Replace Tie wraps w/metal as needed. From top to bottom of the antenna.
6. Install electrical outlets above AZ1 & AZ2. Done.
7. Replace motor air boxes. Done—AZ#1 blower made noise for 2 days.
8. Replace AZ or EL motors as needed. Replaced Elevation #2 and Azimuth #1.

### **SERVO TECHNICIAN NOTES:**

**Replaced Hoist switch.**

**Found major seal problem on FC down side. Repaired.**

**Stripped VTX room floor—repaired, sealed and painted.**

**EL#2's new brake pads were defective, (square hole lager than block) after 2days  
Of operation they were replaced.**

**Wrapped Elevation motor cables to prevent chaffing.**



**APEX FRM INSPECTION:**

FRM cable/j-box condition. OK.

FRM motor/encoder. Couplings and casting are OK.

90/50cm FE/dipole/cables. OK.

Replace tie-wraps w/metal as needed. Replaced 5.

Repair FRM electronics. Checked, cables and connectors(some corrosion).

**FEEDCONE INSIDE/OUTSIDE INSPECTION:**

Ellipsoid operation. (Replace ellipsoid actuator). Replaced, aligned and tested.

Repair or replace cables as necessary. OK.

All FE cables. Checked OK and tight.

CRYO systems. Most of the cryo lines and connectors need replcd.

FE dry air. Replaced air compressor.

Replace tie-wraps as needed with metal. Replaced a few.

**VTX ROOM IN/OUT INSPECTION:**

IF/PWR cable/connector blkhd. Sealed and caulked.

Power blkhd/rfi filters. Checked OK, tight.

A/B racks/cables. Checked OK, connections tight.

**ANTENNA CABLE INSPECTION:**

Repair and replace Elevation cable wraps. Replaced many tie-wraps.

All cable trays. Knuckle cable was replaced.

Elevation platform/limit switches. All OK.

Replace tie-wraps with metal as needed. Replaced a few.

Replace cable as necessary. OK

**PINTLE BEARING INSPECTION:**

Cable wrap/blkhd. OK.

Limit switches. All work OK.

Cable strain relief. Did some adjusting.

Replace cables as necessary. Ok, no chaffing.

**PEDESTAL ROOM INSPECTION:**

ACU/FRM logic on UPS. Checked OK.

UPS operation/by-pass switch. OK

Breakers labeled correctly. OK.

Dry air compressor. (Run time <25%) New compressor, lower psi.

FRV Air operation. Weak to worse, Backup AC works well.

**STATION BUILDING INSPECTION:**

ROOM 100: No time.

UPS operation. No time.

Electrical panels in all rooms. No time.

Onan x/switch test generator. No time.

ROOM 102:

Contempo 1&2 operation/inspection. Ok, HVAC local tech did a great condenser install.

ROOM 103:

VME/comm rack. Neat and orderly.

Recorders 1&2. PM's completed.

Fire alarm operation. No time.

Chatter box/phone operation. No Time.

Under floor cables/bulk head. No Time.

ROOM 104:

Maser/C&D rack. Neat and orderly, Cables secure.

Under floor cables/bulk hd. OK

**WEATHER STATION INSPECTION:**

Check operation/test alarms. No time to do PM or check operation.

Cabinet/tower. No time.

**SITE GROUNDS & STATION INSPECTION:**

Check generator. Ok

Contempo condensers. Great Shape.

Station building. OK

Fence/gate/signs/grounds/storage. OK.

**ELECTRONIC MAINTENANCE ITEMS TO BE COMPLETED:**

1. Repair FRM rotation electronics. Replaced west motor & amp, S101, S104, backlash card.
2. Install New ACU Backplane. Installed and tested.
3. Install Drive Cabinet power supply mod. No Time to do modification.
4. Install digital tachs on both axis. Done, Tachs tested.
5. Repair VTX blk hd cables as needed. Done.
6. Spot Seal and Paint Feed Cone with Elastomeric. (Leak between VTX & FC). caulked and painted
7. Replace Tie wraps with metal as needed. Used 3 pkgs of SS tie wraps.
8. Check FRM servo amp contactors for auto reset/FRM on UPS. Done, OK
9. Replace ellipsoid actuator. Done and aligned.

**FINAL ANTENNA/SITE INSPECTIONS:**

Spot-check PM's. No Time.

● TT oversights. Didn't finish all tasks.

Site cleanup. Done.

Review TT list/problems with site techs. Done w/Greg.

VLBA operations startup tests. Done several times for testing throughout maintenance. Visit.

**ELECTRONIC TECHNICIAN NOTES:**

- 1. Found water in critical power box located in bottom of pintle bearing room. Cleaned Panel out and added drain hole in bottom to drain chase moisture.**
- 2. Had problem with ACU backplane rails. 1 rail had to be opened to accommodate the Backplane.**
- 3. Replaced and plumbed in new dry air, (aquarium pump).**
- 4. Repaired Vertex room floor and painted with deck paint.**

