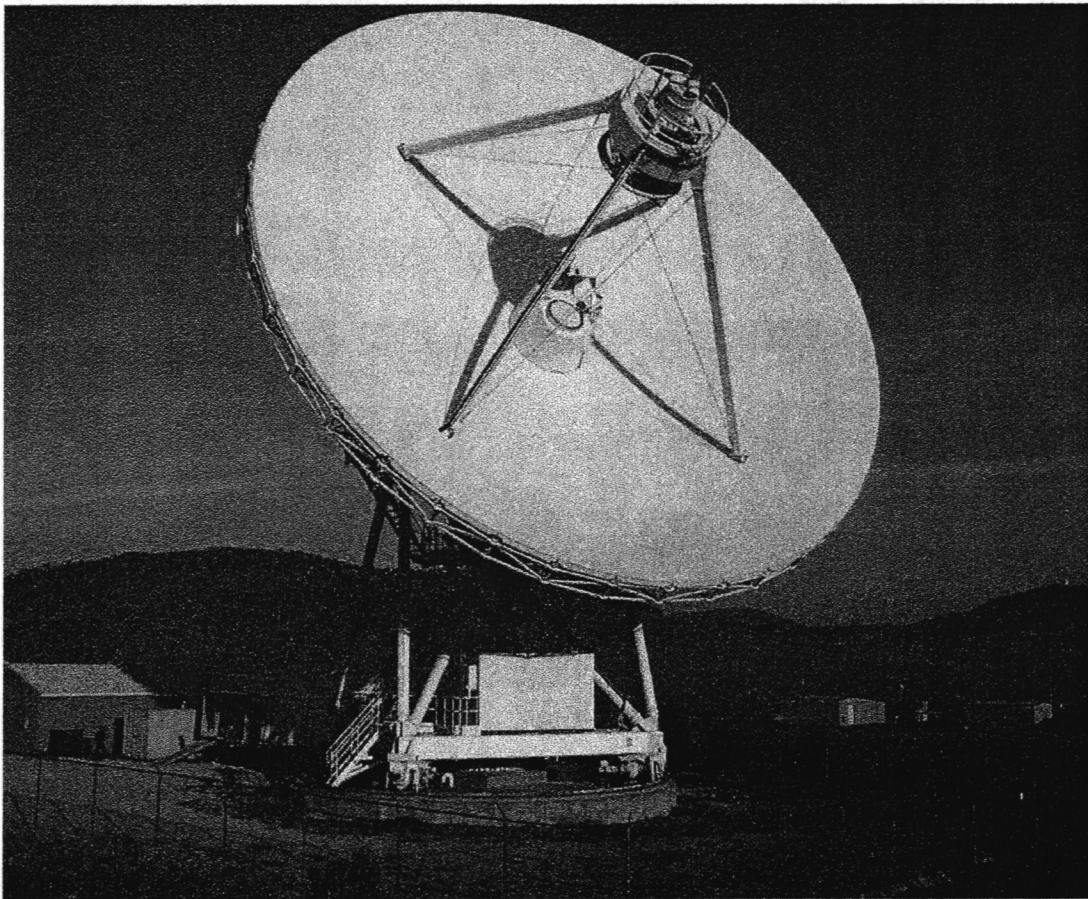


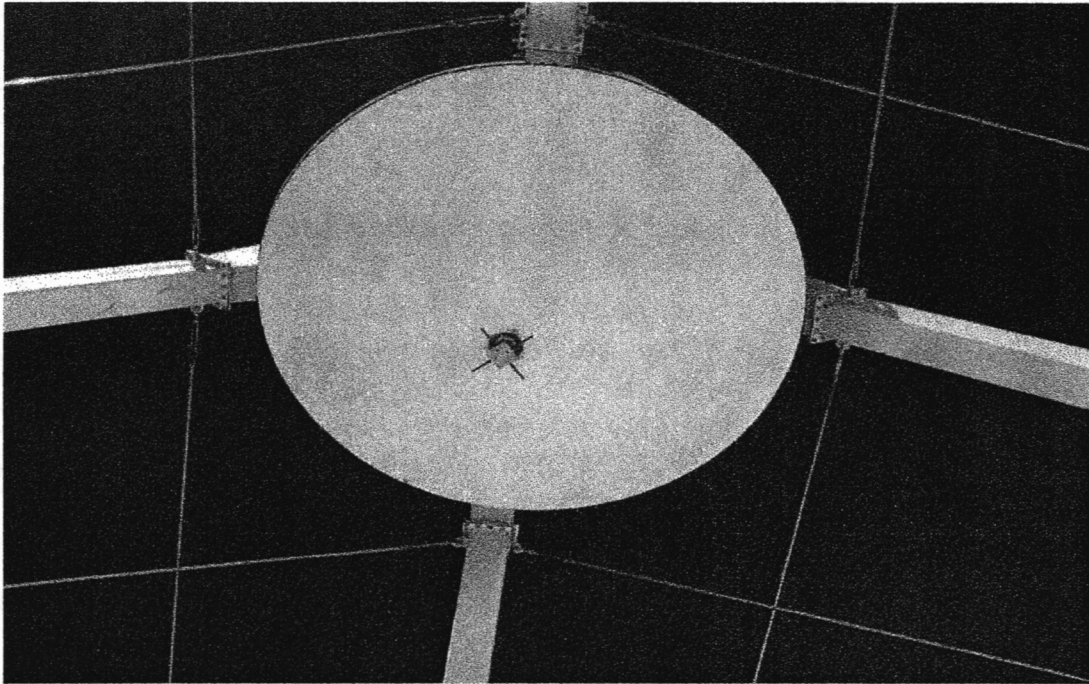
**National Radio Astronomy Observatory
Socorro, New Mexico**

VLBA Antenna Memo #55

Fort Davis, Texas VLBA Maintenance Visit June 10th thru 18th 2004.

Team members consisted of Nelson Antencio, Steve Aragon, Eric Carlowe Kelly Greene, Ramon Gutierrez and Ken Lakies. VLBA Site Technicians Gary Tobias and John Smith assisted in all areas of maintenance during the visit. A task list and action item list is attached.





Subreflector is in good condition. A new ladder and fall arrest were installed. Site Techs were trained on using the new fall arrest.



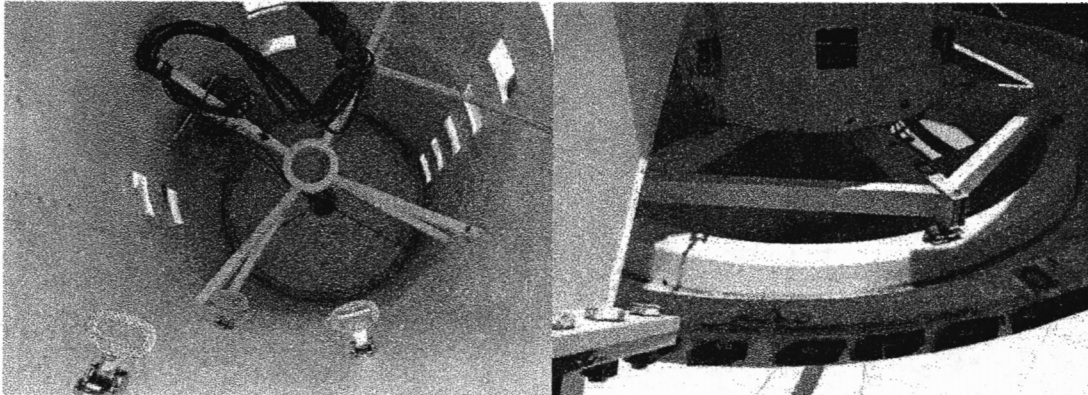
FRM was given a thorough inspection. A focus flex shaft was replaced and the new encoder coupling modification was installed. Focus motion analysis faults were occurring. The problem was found to an unbalanced focus motor amp and water inside the encoder. This was corrected.

FRM INA BEARING CHECK 50LBS PULL ON EAST MOTOR

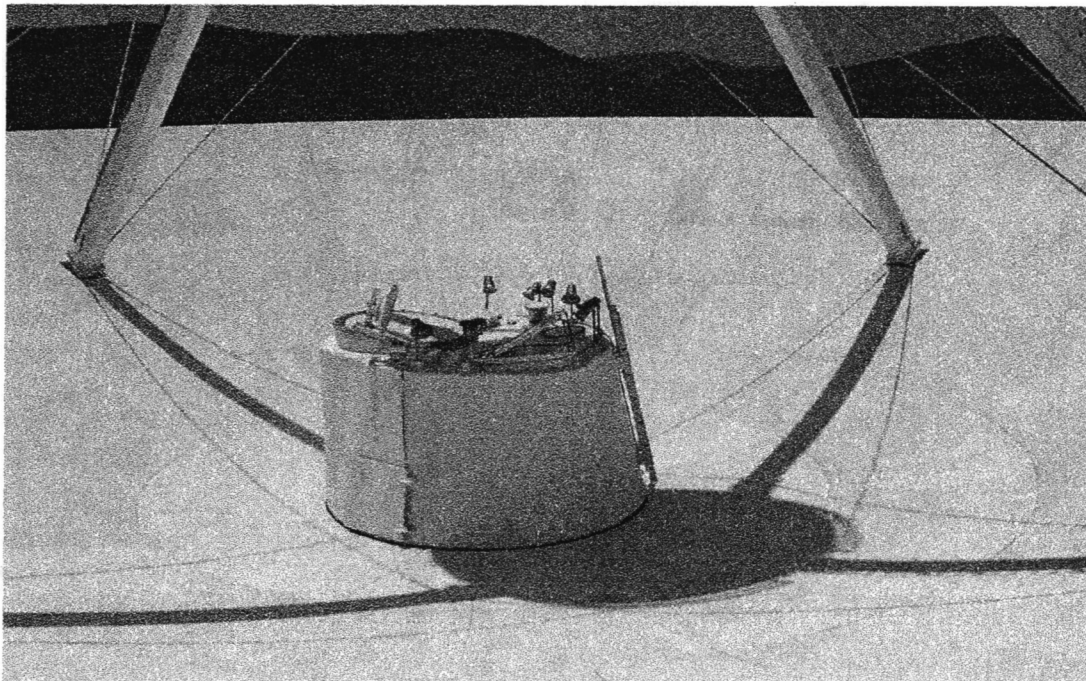
East Travel:	+ .001	West Travel:	- .001
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FRM INA BEARING CHECK 50LBS PULL ON WEST MOTOR

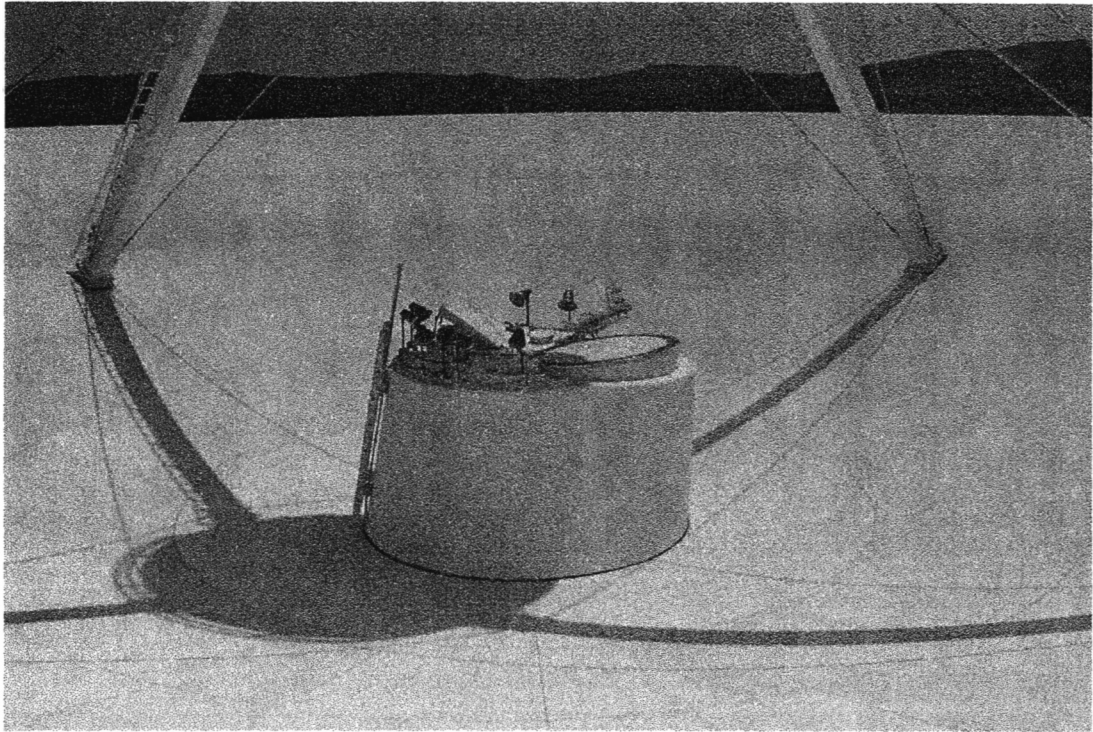
East Travel:	- .001	West Travel:	+ .001
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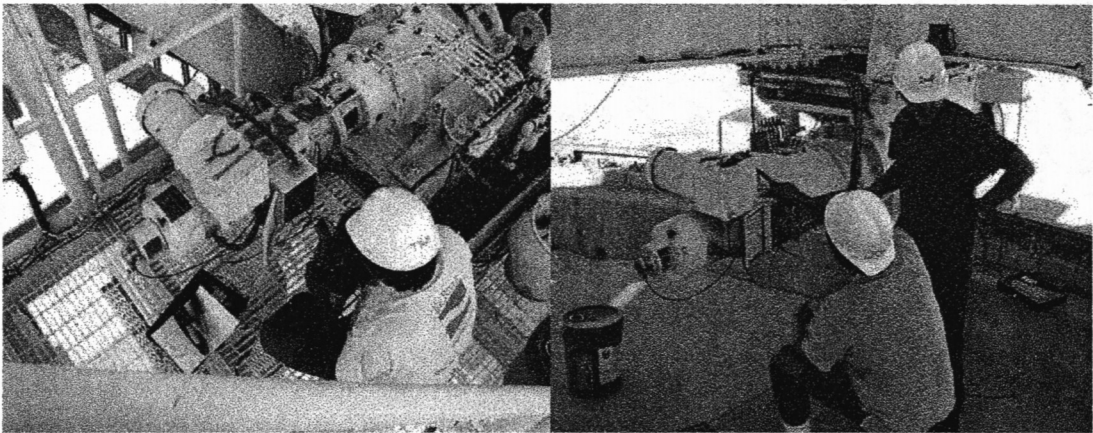
Flip steps were installed for easier access in and out of the FRM tube. 90/50 FE cables and connectors are in good condition. Subreflector drain holes were cleared. Dipole is in good condition.



Feed cone was spot sealed and painted with elastomeric



Dichroic reflector was replaced and aligned. Dish panels are in good condition. Panels paint is in good condition. Quad legs paint and guy wires are in good condition.



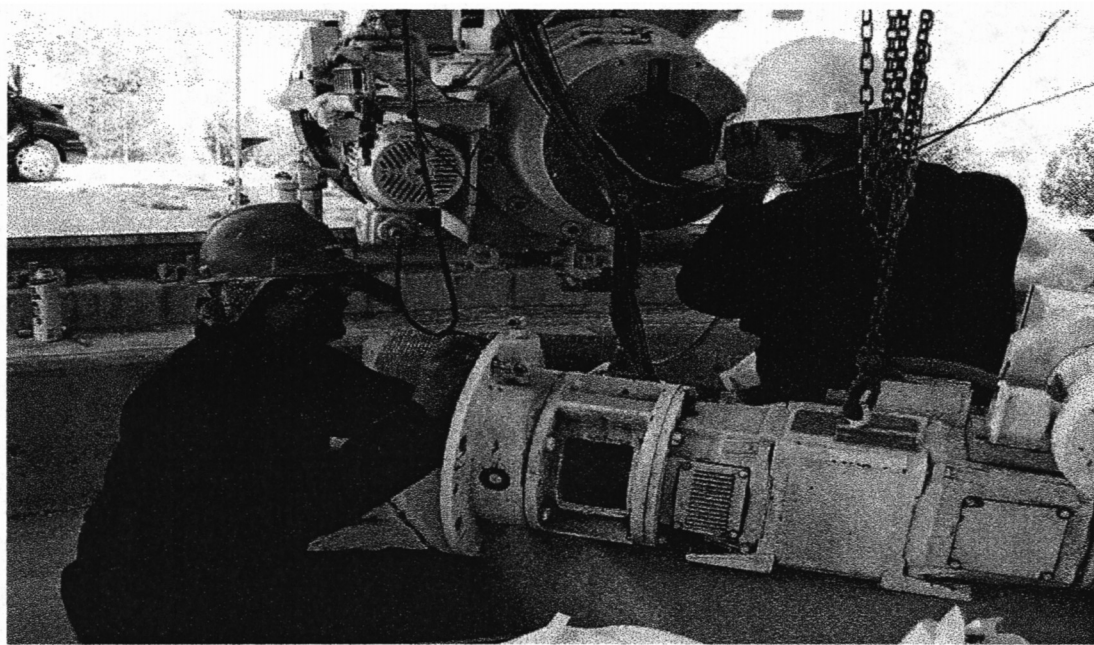
New digital tachs were installed on Elevation and Azimuth motors. Elevation # 2 motor and Azimuth motor #1 were replaced.



Elevation #1 gearbox, 1st and 2nd stage gear inspection.



Steve measures ~.003" of wear with a feeler gauge. Elevation #1 gearbox is in good condition. Both elevation gearboxes oil was changed. Fish eyes and flow gauges were cleaned. Elevation #2 was not opened for inspection.



Azimuth #2 gearbox, 1st and 2nd stage gear inspection.



Steve measures ~.002" of wear with a feeler gauge. Azimuth #2 gearbox is in good condition. Both azimuth gearboxes oil was changed. Fish eyes and flow gauges were cleaned. Azimuth #1 was not opened for inspection.



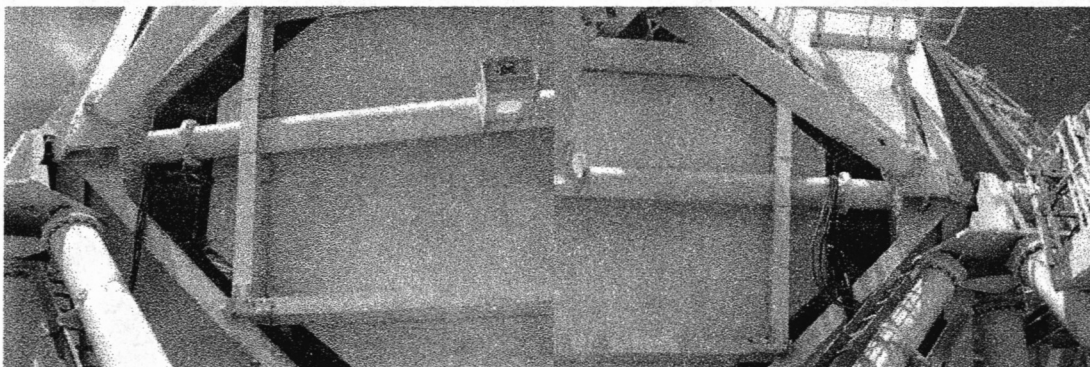
Azimuth bearings were inspected. No azimuth bearings needed replaced.

AZIMUTH BEARING GREASE INSPECTION

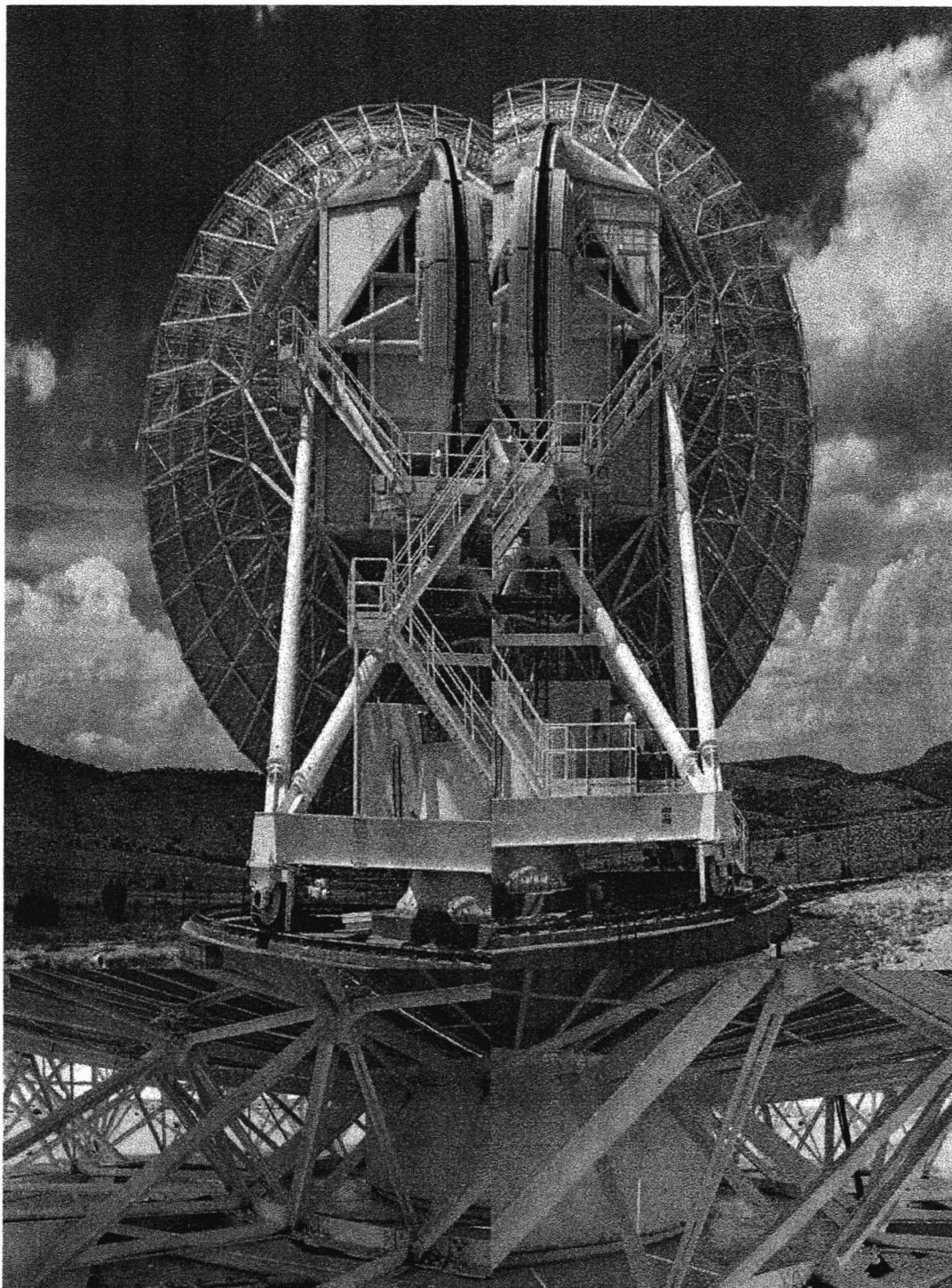
	INNER BEARING	OUTER BEARING
D1	OK	Clean, a few metal flakes.
D2	OK	OK
I1	OK	OK
I2	OK	OK
All bearings were very well lubricated.		

ELEVATION BEARING GREASE INSPECTION

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



Elevation axle has no visible signs of cracks. Paint is good condition. Pintle bearing is well greased with no metal flakes.

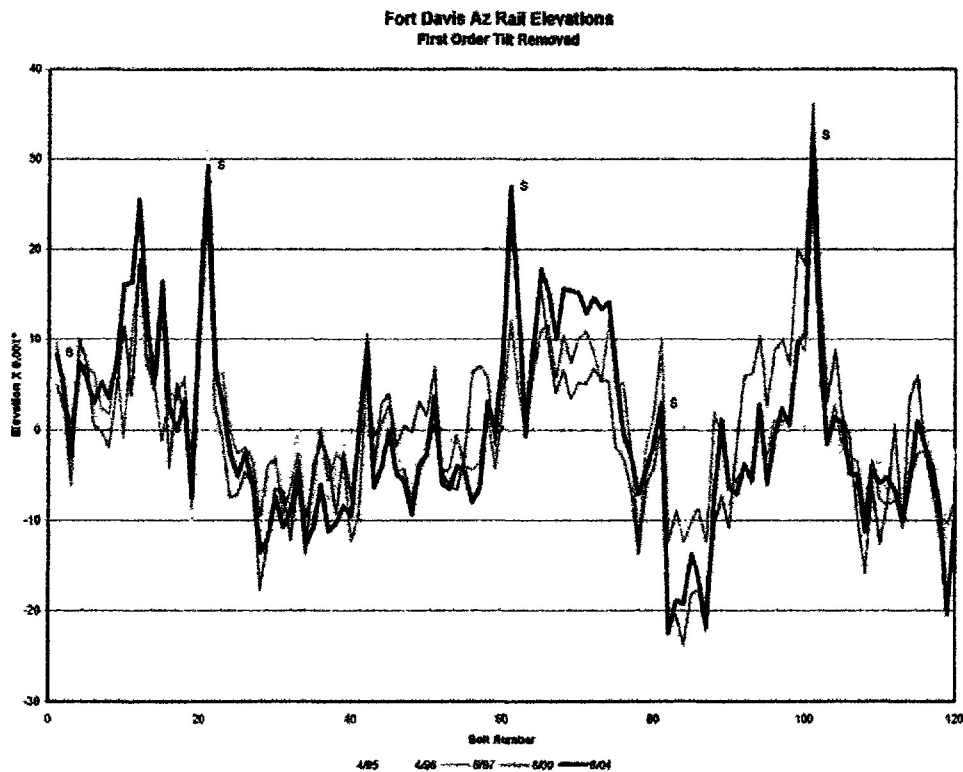


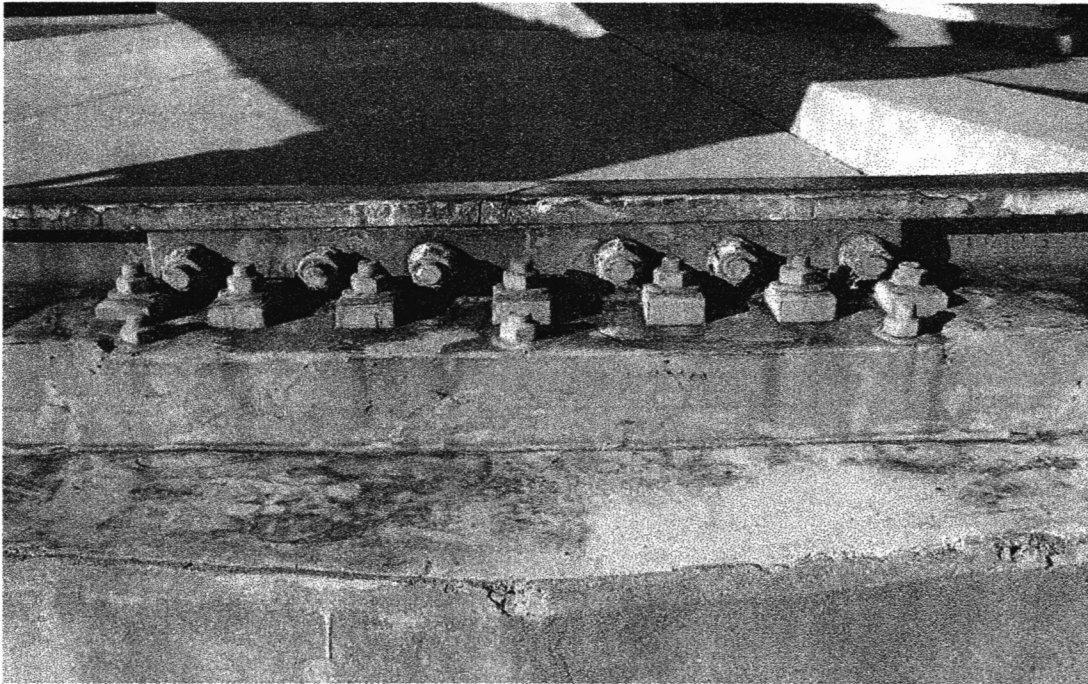
The antenna paint is in great condition.

The ACU was retrofitted with the new power supply upgrade. During the ACU servo tests Ken found a problem with the ACU not auto stowing on synchro after an encoder failure. We discovered the ACU encoder coarse fault line was tied to ground on the manual board. This was corrected on site and the ACU tested. The area inside the fence is neat and orderly.

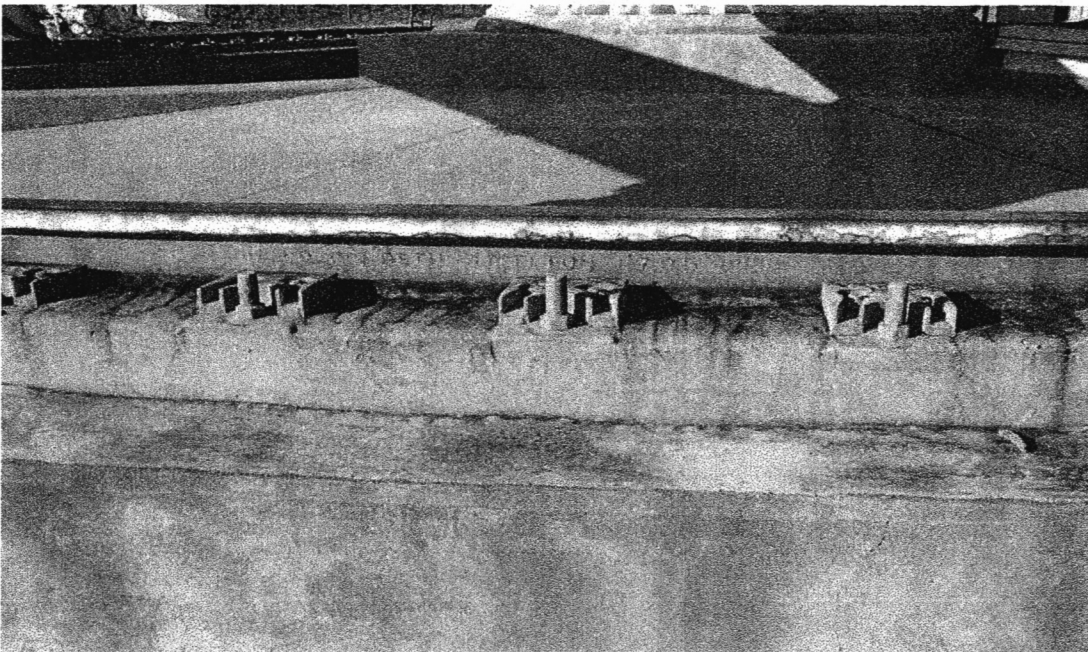
AZIMUTH DRIVE WHEEL ALIGNMENT

	Spec.	D1	D2
Horizontal error	0d00'00"(~1'30")	0'53"	0'00"
Vertical error	3d26'23"(~1'30")	3d25'25"	3d26'37"
Radius error	300.002"(+/- .25)	300.05"	299.87"





Vulchem is beginning to deteriorate from this rail splice and all others.



Vulchem is deteriorating off rail clips and will have to be removed.

ACTION ITEMS

- 1. INSTALL PED ROOM BACK UP AC.**
- 2. INSTALL PED ROOM 6KVA LIEBERT UPS.**
- 3. INSTALL NEW ACU BACKPLANE.**
- 4. REMOVE VULCHEM FROM RAIL.**

On July 5th Paul Rhodes and Bob McGoldrick returned to Fort Davis and completed ACTION ITEMS 2 and 3. Site technicians Gary Tobias and John Smith completed ACTION ITEM #1 the following week.

ANTENNA MECHANICAL MAINTENANCE FDVLBA 6/10-18/04

APEX INSPECTION:

FRM 2-YEAR INSPECTION PM.

Install INA zirks. Done 6/12

FRM INA BEARING CHECK 50 LBS PULL ON EAST MOTOR

East Travel: +.001

West Travel: -.001

FRM INA BEARING CHECK 50 LBS PULL ON WEST MOTOR

East Travel: -.001

West Travel: =.0015

SUBREFLECTOR INSPECTION:

Mounting Hardware. OK, all tight.

Dipole. OK.

Peeling paint/delaminating. Good shape.

QUAD LEGS INSPECTION:

Guy wires. Pins all in.

Turn buckles. Tight.

Quad leg flange bolts. All tight, no cracks.

DISH INSPECTION:

Anemometer mounts/operation. OK, cups dented.

Panel surfaces. Chalky Panels.

Spot check panel bolts. Spot checked, all tight.

FEED CONE INSPECTION:

Feed cone surface/insulation. Needs painted.--- SPOT SEALED AND PAINTED.

FE feed windows. OK.

FE feed mounting hardware. OK.

FE feed heaters. OK.

Dichroic reflector cracking/delaminating. (NOP #69E4) needs replacing cracked. REPLACED.

Ellipsoid dish/mount. OK, All mounting hardware tight.

FC hatch latches replace as needed. OK.

ANTENNA MECHANICAL MAINTENANCE FDVLBA 6/10-18/04

ELEVATION BEARING/AXLE INSPECTION:

EL. Grease inspection/Encoder side	No metal flakes.
EL. Grease inspection/DGB side	No metal flakes.

Grease elevation bearings. Done.
Check elevation axle for cracks. No cracks found.
Listen for popping or grinding. None detected.

ELEVATION BULL/PINION GEAR INSPECTION:

Bull gear. OK, well lubricated.
Bull gear welds/hardware. OK, no weld cracks.
Pinion gears. OK.
Lube bull/pinion gears as needed. OK.
Check stow pin. Added safety pin.

ELEVATION MOTOR AND GEARBOX INSPECTION:

EL.#1 seals/coupling/internal gears. ~.003 wear on EL#1, replaced coupling spider.
EL.#2 seals/coupling/internal gears. Gear box not checked, motor replaced.
Gearbox heaters/lube pumps. OK.
Flow gauges/fish eyes. Removed and cleaned.
Change gearbox oil. Done.
Listen for popping or grinding. None detected.

ELEVATION PLATFORM INSPECTION:

Swinging catwalk. OK
Hoist. Hoist and cable OK.

ANTENNA STRUCTURAL INSPECTION:

Spot-check structural bolts. All tight.
VTX walk way. OK.
Antenna structural welds. OK.
Antenna backup/lower structure. OK.

ANTENNA MECHANICAL MAINTENANCE FDVLBA 6/10-18/04**AZIMUTH BEARING/GREASE INSPECTION**

	INNER	OUTER
D1	(8/2000 metal flakes) OK, few metal flakes.	OK, very few metal flakes.
D2	OK.	OK.
I1	OK.	OK.
I2	OK.	OK.
All bearings were very well lubricated.		

AZIMUTH WHEEL INSPECTIONS:

Wheel to structure clearances. Good, plenty of clearance.

Listen for popping or grinding. Good, none detected.

AZIMUTH WHEEL RADIUS/ALIGNMENT

Measured	Specified	D1	D2
Horizontal	0.00.00 (<1'24")	00'53"	00'00"
Vertical	93.26.23(+/-1'24")	93d2'25"	93d26'37"
Radius	300.000"(+/-0.25")	(8/2000 299.76") 300.055"	(8/2000 299.94") 299.873"

AZIMUTH MOTOR AND GEARBOX INSPECTION:

AZ#1 seals/coupling/internal gears. OK, motor and spider replaced.

AZ#2 seals/coupling/internal gears. Gears ok, <.002 of wear.

Gearbox heaters/lube pumps. OK.

Flow gauges/fish eyes. Removed and cleaned.

Change gearbox oil. Oil changed, done.

Listen for popping or grinding. None detected.

PINTLE BEARING INSPECTION:

Cable wrap & cables. Bottom ring on wrap power showing a little wear.

Check for loose bolts. All tight.

Check bearing grease. Greased-no metal flakes.

ANTENNA MECHANICAL MAINTENANCE FDVLBA 6/10-18/04

AZIMUTH RAIL INSPECTION:

Rail level measurements. Done.

Excessive rail movement. OK.

Joint bars and clips. OK.

Antenna foundation/grout/vulchem. Vulchem needs removed.

Re-torque rail splice plates as needed. Done, Got +/- ½ turn on nuts.

ANTENNA PAINT/INSULATION INSPECTION:

Antenna paint condition. Great shape, only a few bad spots.

Repair antenna insulation as needed. Done, repaired at elevation platform.

Spot Seal and Paint Feed Cone with Elastomeric. Done, 3 coats.

MECHANICAL MAINTENANCE ITEMS TO BE COMPLETED:

1. Replace tie wraps w/metal as needed.
2. Install QUAD LEG LADDDER and FALL ARREST. Complete, Techs trained.
3. Check encoder side EL bearing for over greasing. Grease-no metal flakes.
4. Replace AZ motor. AZ #1 replaced.
5. Install steps inside subreflector tube. Done.
6. Replace EL motor. Done, EL #2 replaced.

ANTENNA MECHANICS NOTES:

ANTENNA SERVO MAINTENANCE FDVLBA 6/10-18/04

ANTENNA SAFETY TESTS:

BRAKE HOLDING-TORQUE TESTS (FT-LBS)

AZ #1	~ 75lbs. New motor.
AZ #2	~86lbs. With new brake.
EL #1	~72-75lbs. With new motor.
EL #2	~70-72lbs. With old motor and brake.

MOTOR INSPECTIONS:

Elevation motor/tach couplings. New tachs and couplings installed.
Elevation brush/commutator. Motor#1 good, motor #2 replaced.
Azimuth motor/tach couplings. New tachs and couplings installed.
Azimuth brush/commutator. Motor #1 replaced, motor #2 good.

ANTENNA GROUNDING INSPECTION:

Elevation ground cable. Good.
Elevation platform to pintle turret. Good.
Pintle room. Good.
Azimuth wheel contacts. New. Replaced.
Pintle room/cable wrap. Done, good.
Apex/Dish lightning rods. Good, wire wraps replaced.

SERVO RECORDINGS:

Elevation response test. Done.
Azimuth response test. Done.
Elevation position loop test. Done.
Azimuth position loop test. Done.

ACU AUTO MODE TESTS:

System/axis faults. All work, good.
AZ/EL motor fault status. All work, good.
Stow commands. All work, except encoder/synchro failure. ACU manual board repaired on site.
Synchro position feedback. AZ and EL—good feed back.
ACU-VME communication. Stows in 10 minutes.
Restore ACU parameters. Done.

ANTENNA SERVO MAINTENANCE FDVLBA 6/10-18/04

SERVO MAINTENANCE ITEMS TO BE COMPLETED:

1. Install Digital Tachs on both axis. Cable done 6/10, all tachs installed. Done.
2. Check encoder side El bearing for over greasing. OK, ~2 qts. grease removed.
3. Install ACU power supply Mod. Done and tested.
4. Replace AZ motor. AZ motor #1 replaced. Done.
5. Replace EL motor. EL motor #2 replaced. Done. Blower motor swapped.
6. Spot seal and Paint Feed cone with Elastomeric. Done, 3 coats.
7. Install Ped Room AC. Not available.
8. Install New ACU Backplane Not available.

SERVO TECHNICIAN NOTES:

Elevation motor #1 in good condition, not sealed bearings.

Azimuth motor #2 in good condition, not sealed bearing.

ANTENNA ELECTRONIC MAINTENANCE FDVLBA 6/10-18/04

APEX FRM INSPECTION:

IFM cable/j-box condition. Power J-Box good condition, signal box some corrosion, cables good.
FRM motor/encoder. Good Condition, coupling replaced.
90/50cm FE/dipole/cables. All componets in good condition.
Replace tie-wraps w/metal as needed.

FEED CONE INSIDE/OUTSIDE INSPECTION:

Ellipsoid operation. Defective Ruff switch. (1 orderd).
Feed heater operation. Done, works OK.
All FE cables. 7mm FE lcp/rcp 90 degree connecters needed. Heliax close to being kinked
CRYO systems. PM-Done in April by Cryo
FE dry air. Working Good. Over 12000hrs needing rebuilt soon.
Replace tie-wraps as needed. Done.

VTX ROOM IN/OUT INSPECTION:

IF/PWR cable/connector blkhd. Blk hd. & cable ends are in good condition.
Power blkhd/rfi filters. Good condition, no water.
A/B racks/cables. Neat and orderly, cables marked.

ANTENNA CABLE INSPECTION:

Elevation cable wraps. Synchro side cable wrap repaired.
All cable trays. Cables secured w/metal ty-wraps.
Elevation platform/limit switches. Good Condition.
Replace tie-wraps with metal as needed. Done.

PINTLE BEARING INPECTION:

Cable wrap/blkhd. IF wrap needs powder cleaned out. Powder removed.
Limit switches. All work, good condition.
Cable strain relief. All cables in good condition, need a little more teflon on power cables-will send.

PEDESTAL ROOM INSPECTION:

ACU/FRM logic on UPS. FRM on UPS—panel relabeled.
UPS operation/by-pass switch. Operating in by-pass mode.
Breakers labeled correctly. Relabeled FRM and UPS breakers.
Dry air compressor. (run time <25%) Working good.
Mow Air operation/inspection/clean filter/no leaks. No leaks—blows cold air.

STATION BUILDING INSPECTION:

ROOM 100:

UPS operation. Works good.

Electrical panels. Relabeled several panels.

Onan x/switch test generator. All operational.

ROOM 102:

Contempo 1&2 operation/inspection/no leaks/clean filters/evaporator. Operation good, replaced

ROOM 103: contactor connectors.

VME/comm rack. Clean, cables are neat and orderly.

Recorders 1&2. OK.

Fire alarm operation. Tested Good

Chatter box/phone operation. Operation OK.

Under floor cables/bulk head. Orderly

ROOM 104:

Maser/C&D rack. Clean, OK.

Under floor cables/bulk head. Looked Good.

WEATHER STATION INSPECTION:

Check operation/test alarms. Done, Operation good, adjusted optical loop.

Cabinet/tower. Done, Cleaned out box.

SITE GROUNDS & STATION INSPECTION:

Check generator. Operated properly.

Contempo condensers/clean coil/no oil residue. Clean, operated properly.

Station building. Clean and orderly.

Fence/gate/signs/grounds/storage. Weeds need attention.

ELECTRONIC MAINTENANCE ITEMS TO BE COMPLETED:

1. Install FRM focus motor encoder/coupling. Done, Old casting very brittle.

2. Replace AZ motor. Done, used old blower.

3. Install ACU power supply mod. Done and tested.

4. Install new ACU backplane. Not available.

5. Install PED room AC. Not available.

6. Spot seal and paint Feed Cone with elastomeric. Done.

7. Install digital tachs on both axis. Cable installed 6/10, tachs done.

8. Replace EL motor. Replaced elevation #2.

9. Install New ACU Backplane. Not available.

10. Check FRM servo contactors for auto reset/FRM on UPS. On auto reset.

ANTENNA ELECTRONIC MAINTENANCE FDVLBA 6/10-18/04

FINAL ANTENNA/SITE INSPECTIONS:

Site-check PM's. Done, OK.

Any TT oversights. None.

Site cleanup. Done.

Review TT list/problems with site techs. Done with Gary.

VLBA operations startup tests. Done 3 days ahead of schedule.

ELECTRONICS TECHNICIAN NOTES:

**ACU antenna auto stow w/encoder failure--probably never worked. Traced
Encoder coarse fault line from encoder interface card to back of ACU-verified OK.
Found manual board J1-27 grounded. This grounded the encoder status line—no
Logic level change. Removed ground and tested.**

