National Radio Astronomy Observatory
Socorro, NM

VLBA Antenna Memo Series #27

Fort Davis Maintenance Visit
August 14th through 19th, 2000
Trip Report

Jim Ruff
8/22/00

Attachments: Azimuth Rail Survey, Servo Trip Report, Electronics Trip Report, Task Schedule

The team consisted of Steve Aragon, Ramon Gutierrez, Bob McGoldrick, Steve Tenorio, Steve Troy, and Jim Ruff. Site Techs Gary Tobias and John Smith assisted throughout.

An apex handrail was installed.

The pintle bearing pocket was inspected for flatness. Measured TIR was 0.010". The spec is 0.012" in 90°. The TIR of this bearing is much worse than NL or KP, but still within spec.

The FRM INA bearing was inspected for internal clearance. Clearance measured 0.0045"

Elevation bearing grease catchers were installed.

The vertex house door was replaced. Ordering spec for the door is Ceco 2868, Right Hand.

The azimuth bearings were inspected and found to be OK. Outside bearings on Drives 1 & 2 and Idler 2 were replaced about 2 years ago. The outer races were not rotated, as this had been done previously on the old bearings and it was too soon to rotate the new ones. Note that the new bearings had a different type of retainer. The design of this retainer makes on-antenna inspection of the inner ring impossible.

	Drive 1	Drive 2	Idler 1	Idler 2
Inner	Metal fines & flakes. Minor pitting.	A few flakes. No pits.	No metal or pits.	Several flakes. No pits. Moisture.
Outer	New. Some fine metal.	New. No metal.	Some flakes. No inner ring pits. Moisture.	New. Some fine metal. Moisture.

The Drive 1 inner bearing would probably have failed by now if not for the conscientious job Gary and John do on greasing.

Radial positions were measured for both drive wheels. Az 1 was 299.76". Az 2 was 299.94". These positions are within the ± 1/4" spec.

The dichroic panel is delaminated in the corners and sagging. It appears a feed heater partially melted the top tube. (Figures 1 & 2). This dichroic should be replaced when a new plate becomes available.

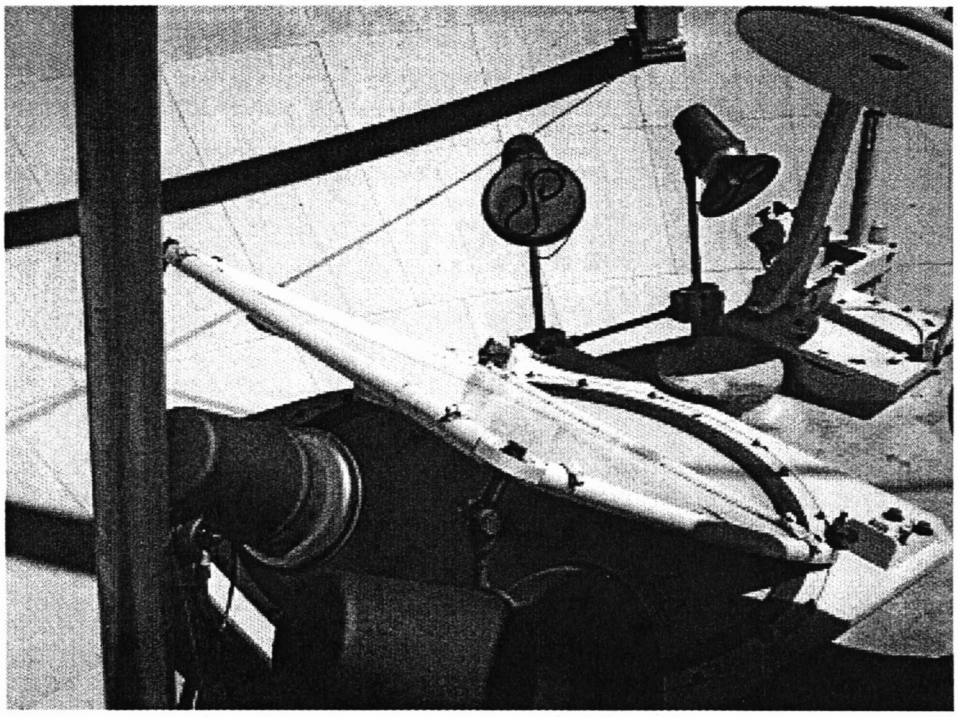


Figure 1: Dichroic Reflector

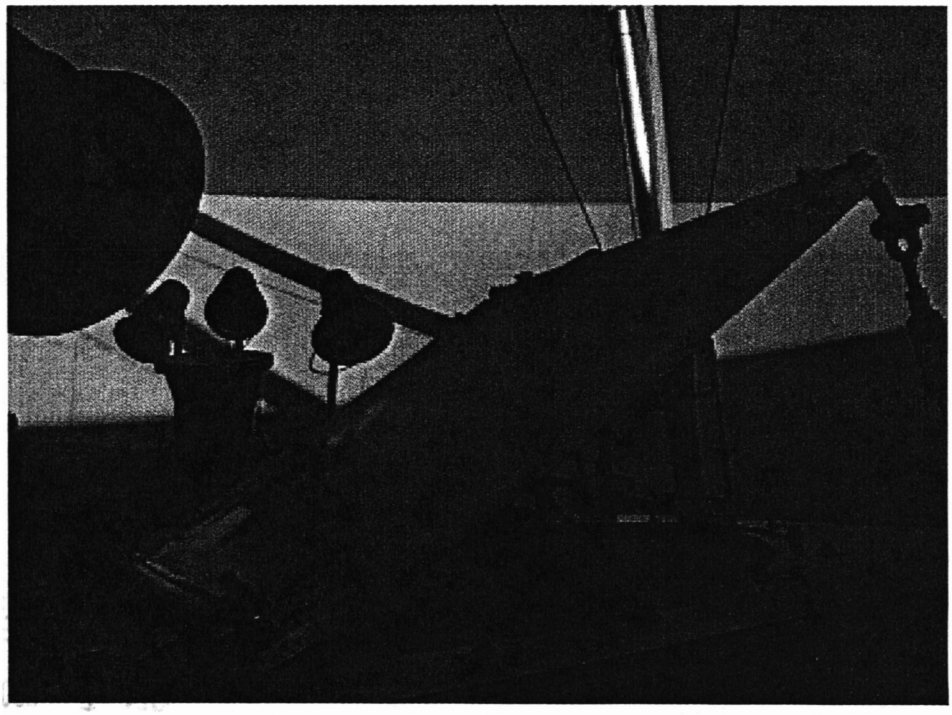
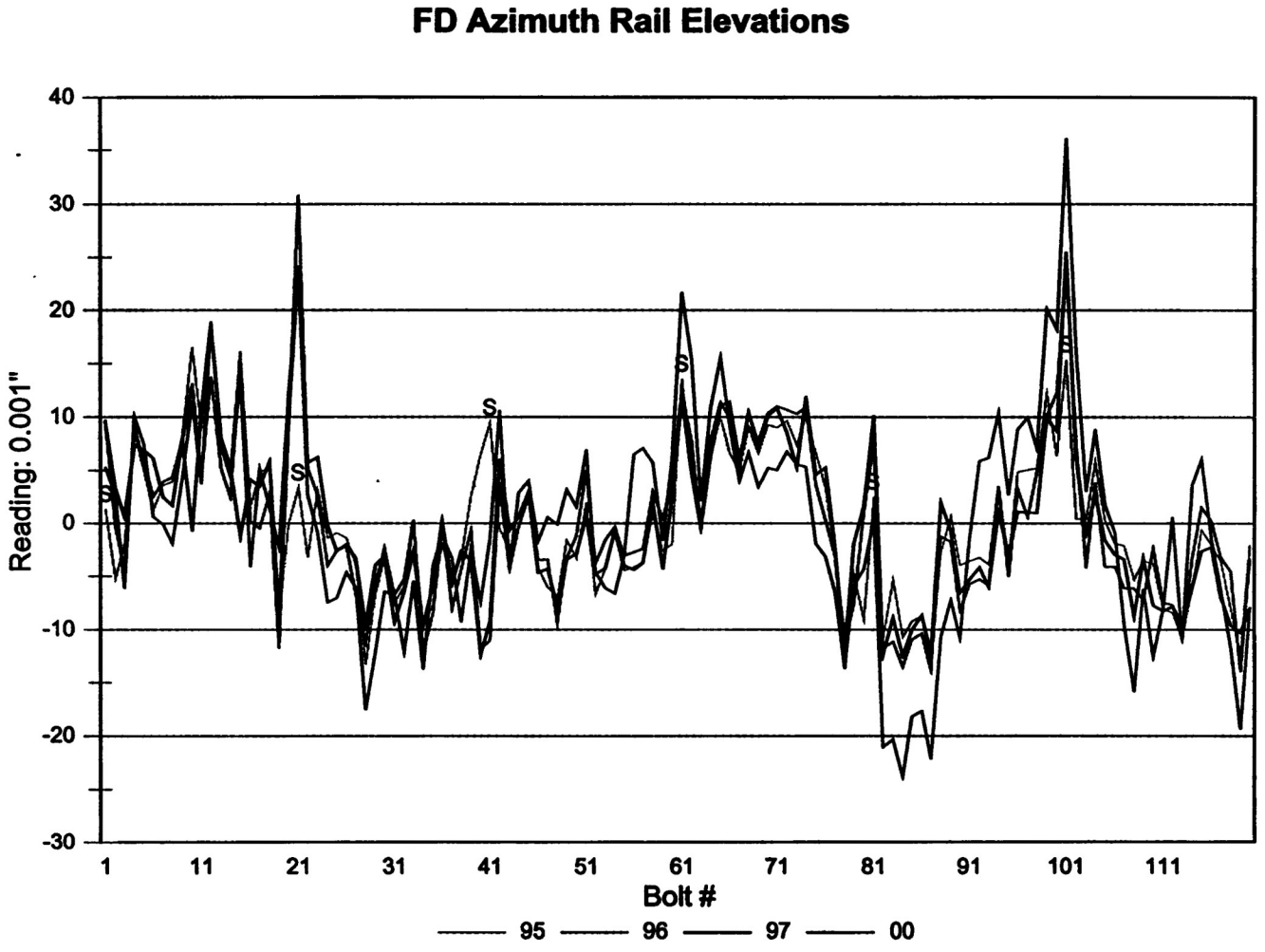


Figure 2: Dichroic Reflector

The azimuth rail and grout were in good condition. Elevation readings appear to be stable. The course focus on the Wild level was not working properly and may have caused some error in the readings.



An original RSi bolt ID was located. It is a numeral 3 welded on the rail support plate.

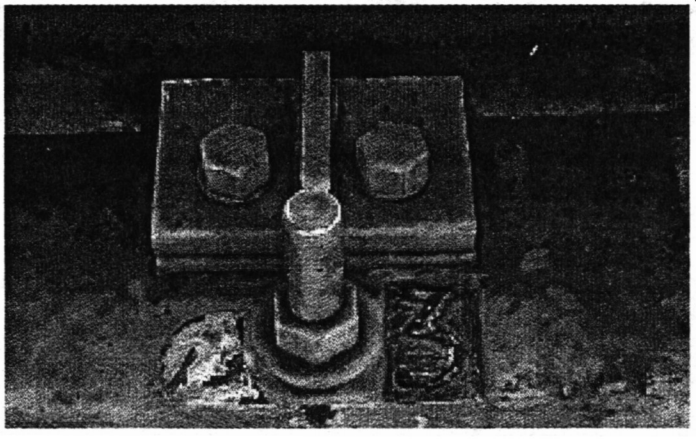


Figure 3: Az Bolt ID

The subreflector appears to be in excellent condition.

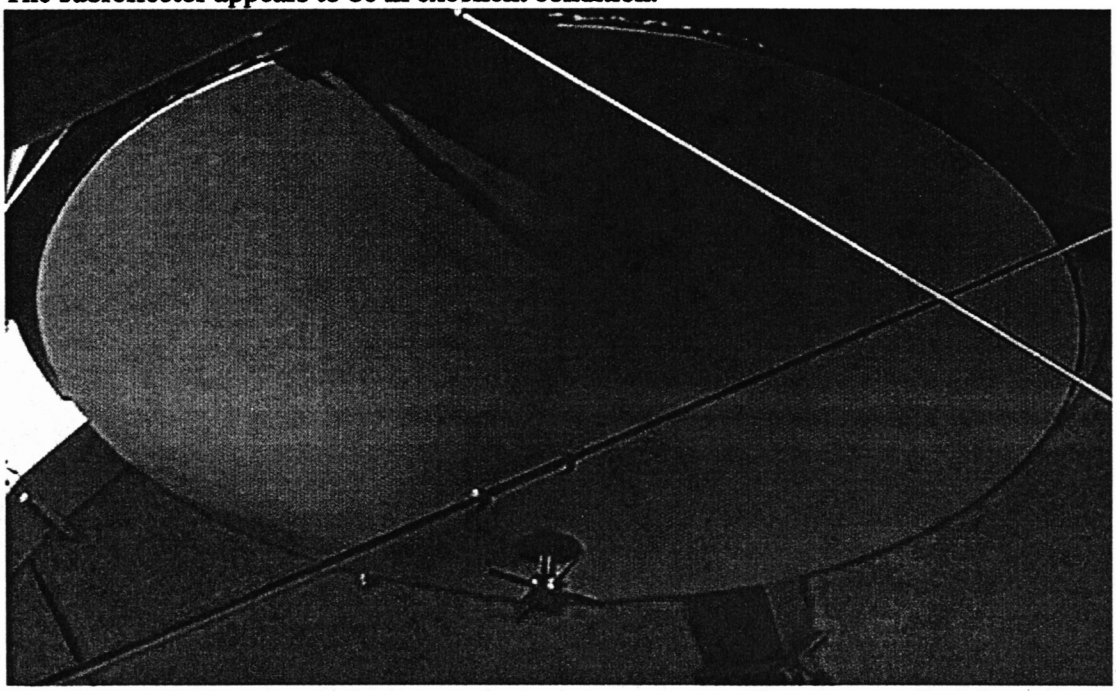


Figure 4: FD Subreflector

The 3mm receiver was checked for clearance. Clearance is adequate.

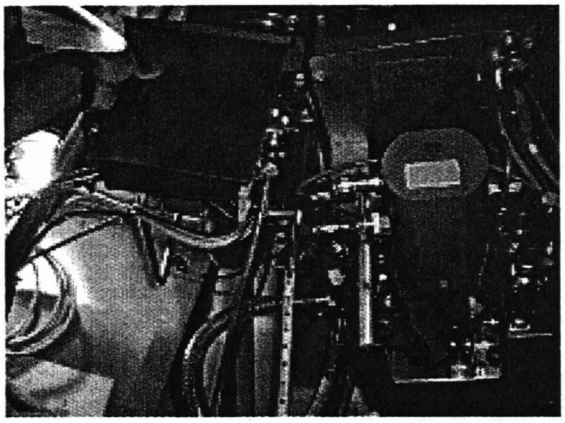


Figure 5: 3 mm receiver

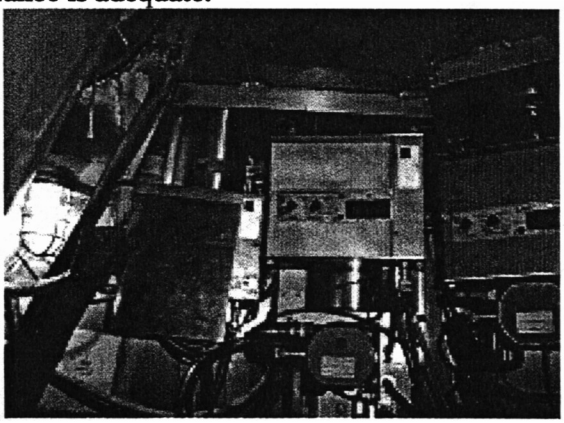


Figure 6: 3 mm receiver

The paint on this antenna is in excellent condition. There is very little rust, and most failures are flaking of paint from galvanized metal. (Figures 8 & 9)

About 50% of the paint under the pedestal room was flaking off the galvanized structure. We scraped most of the loose paint off. I recommend that the site techs borrow a water blaster from the VLA and use it to remove the rest of the paint from this area. (Figure 7)

The mid-level handrail was repainted. (Figure 10)

A structural crack was found over the El encoder-side bearing and re-welded. (Figure 11)

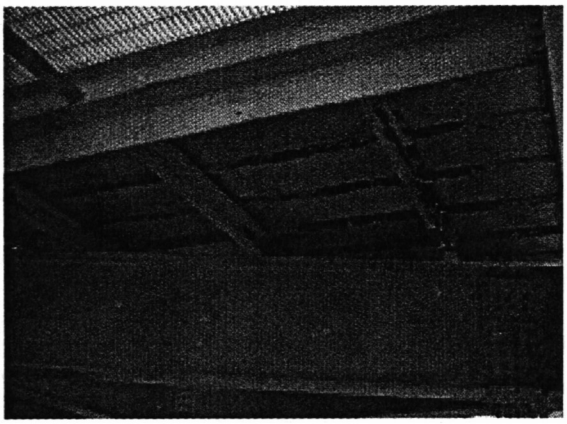


Figure 7: Ped room underside, before scraping

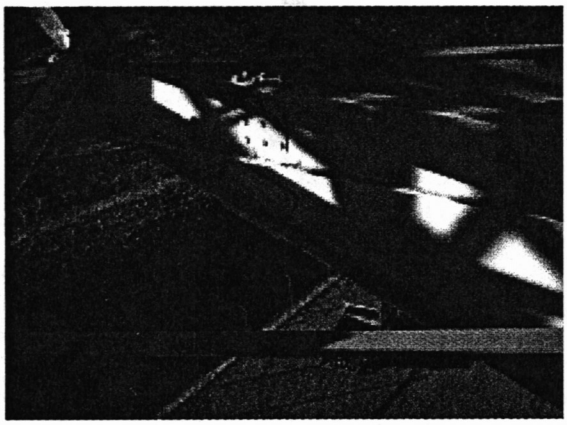


Figure 8: Paint failure

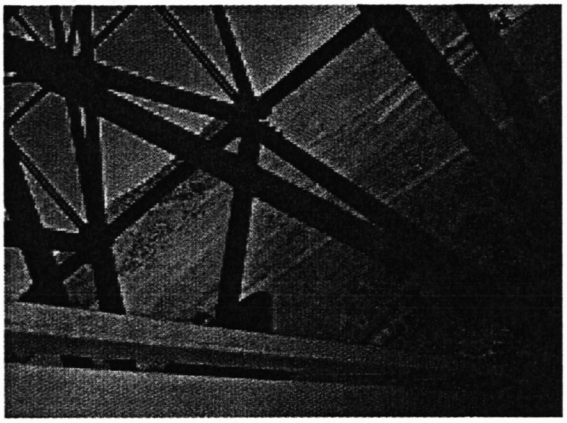


Figure 9: Paint failure

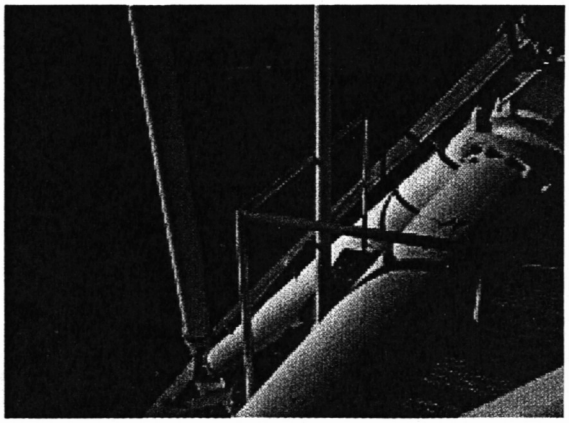


Figure 10: Mid-level handrail before painting

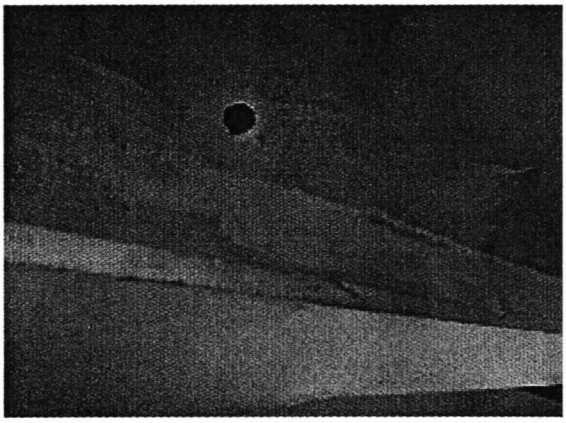


Figure 11: Repaired weld over El bearing

When we returned to the motel Saturday night, there was a message saying that the antenna was faulting on el overspeed and that the pedestal room was hot. Tenorio and Aragon went back and corrected the overspeed problem. I went back and checked the MarvAir unit. All functions on the MarvAir were working properly. A fan was used to cool the room, and no further problems have been reported.

From: Steve Tenorio

Subject: Servo Trip Report Ft. Davis

Date: 13 aug 00

13aug00	Day # 1	Traveled from Magdalena to Alpine Tx.
14aug00	Day # 2	Traveled from Alpine to Ft. Davis site. Unloaded truck, installed Az. J-boxes. Trouble shot servo power fault problems. Problem turned out to be slow blow fuse on Drive cabinet interface panel. Started on El. # 2 j-box.
15aug00	Day # 3	Finished El. J-boxes. Checked ped. room electrical panels with IR. Thermometer. Completed Drive cabinet pm., ACU pm, and Data Converter pm. Changed and seated Az. brushes (armature scarred needed a lot of work). Changed El. # 2 brushes. Checked brake tension on all motors. Checked gear box heaters El. # 2 bad (no current).
16aug00	Day # 4	Completed Fault test . Changed and seated El. Brushes. (armatures scarred also needed a lot of work.) Mounted warning horn on El. Platform j-box. Checked velocity and limits and recorded. Completed servo test.
17aug00	Day # 5	Trouble shot El. Counting problem. (not counting correctly in slew mode. Turned El. #2 tac. so that the strain relief is facing down. Replaced all tac. Plugs. Changed out El. # 2 gear box heater switch. Helped Aragon mount stow pin extension tray. Moved El. Platform E-stop box (fried drive cabinet interface card and slow blow fuse on az. side doing this) swapped out El. Drive cabinet interface card, and replaced fuse. Moved stow pin engaging switch to accommodate the new stow pin extension tray. Helped change spiders (WITH STOW PIN ENGAGED !!!) Ty-wrapped all motor cables. Helped Aragon install grease trays.
18aug00	Day # 6	Helped Aragon check hoist on Encoder platform. Reset antenna stow position to 93 degrees from 87 degrees. Per site techs request. Oked by Tom Baldwin. Helped check panel bolts. Repaired door closer on ped. room door.
19aug00	Day # 7	Finished replacing doors on Electrical panels in ped room. Helped Troy remove and replace ped. room A/C unit. Cleaned ped. room. Helped mechanics grease pintal bearing and El. Bearings. Loaded truck. Got called back from motel to trouble shoot El. Overspeed problem. Swapped Az. and El. Drive cabinet interface cards.
20aug00	Day # 8	Traveled back from Alpine Tx. to Magdalena.

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To: Jim Ruff
Subject: Fort Davis Tiger Ream Report
From: Bob McGoldrick

The Fort Davis Station is well maintained, and a considerable amount of maintenance was completed by the Tiger Team in conjunction with the Site Techs, Gary Tobias and John Smith. The members of the Tiger Team were Jim Ruff (PE Engineer in charge), Ramon Gutierrez, Steve Tenorio, Steve Aragon, Steve Troy, and Bob McGoldrick.

The Site Techs leave little to find fault with around the station as is evidenced with their clean and replace as you go attitude concerning station maintenance and upkeep. Many improvements and maintenance issues were corrected, but some items were left for the Site Techs to correct.

ACTION COMPLETED

1. The Electronics Inspection Sheet was completed, except where Tom Baldwin left specific instructions to leave for him on a later visit.; this is a FRM to Station Building electronic inspection.
2. A new RH sensor over the recorders for Contempo temperature control was installed by Steve Troy.
3. Strain reliefs for all cables needing strain relief in the Cable Wrap were installed; three holes were drilled in the top-plate(just below the bulkhead ceiling) to hang the strain relief by John Smith and Bob McGoldrick.
4. Bob McGoldrick was trained by John Smith on decontaminating, cleaning and talcing the Cable Wrap after hanging the strain reliefs.
5. The Pedestal Room bulkhead feedthroughs (adjacent to the outside Pintelbearing Room bulkhead) were found to have some water damage on the inside/outside wall surfaces. One PVC feedthrough was replaced by Gary Tobias, and several were pluged. The large feedthrough on the bottom had come unglued from its fitting, and it was reattached with the standard two-piece plumbers adhesive by Bob McGoldrick, but the amount of PVC fitting to work with was insufficient to provide an idea joint; the joint cured but it moved a little before doing so. The joint was caulked liberally along with the other bulhead joints, and found to be leak free.
6. Bob McGoldrick inspected both site Tape Recorders and looked at some Recorder Test results to determine if any major work would be needed, and found that the machines were operating satisfactorily at that time.
7. Jim Ruff relaced the dish anemometer roll pin blocks with replacement blocks and new bolts rather than roll pins; He had the machine shop modify old blocks prior to the visit, and plans to take the old blocks back for modification prior to the next trip.
8. John Smith and Bob McGoldrick checked the generator out and found it to be up to par with the rest of the station; hoses, wires, filters, and switches were in good condition; the charger and battery were recently replaced. Steve Troy, Gary Tobias, and John Smith replaced the propane line from the propane tank to the generator.
9. Gary Tobias has constructed a rock water runoff diversion wall of minimal height just outside and along the outside edge of the dirt road for about 15 feet; water had been

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running right through the property and down into the station building front door area when it rains.

10. Tie wraps from Az motors to the Apex were replaced as needed; the cable run from the bottom of the quadraped leg to the Apex showed no sign of any tie wrap problems at the time.
11. The lightning rod ground strap(Apex) needed one lug replaced and one hold down replaced by Ramon Gutierrez. Ramon Gutierrez trained Bob McGoldrick on the installation and alighnment of the of the flexible shaft at the Apex.
12. Steve Troy did extensive HVAC work in the Vertex room, and it was found that the RS232 com cable to the contoller from Room 100(station building) was not working. Also Jim Ruff and Bob McGoldrick installed a new door to the Vertex room.
13. Steve Tenario replaced the j-boxes for all motors, including wiring, and the new filters were installed by the site techs.
14. Jim Ruff trained Bob McGoldrick on inspecting the Az wheels & bearings, and inspecting the Pintel bearing. John Smith trained Bob McGoldrick on cleaning the elevation gear box filters, purging the oil in the system, and Gary Tobias trained Bob McGoldrick on dissasembly and cleaning of the see through flow indicators of the system.
15. Steve Tenario installed the Hacr-breaker in non critical panel in Pedestal room.

ACTIONS TO BE COMPLETED

I. The Chatter box isn't working; Tom Baldwin will furnish replacement.
II. The acces hatch to the Pintel bearing room needs to be replaced; the plexiglass is broken. Jim Ruff is aware of this and assured the Site Techs that a new one would would be sent.
III. The com cable(RS232) from room 100 to the HVAC controller in the Vertex room isn't working, and the site techs will troubleshoot that.
IV. The Ellipsoid actuator arm switch mounted by the Ellipsoid arm is operating intermittantly. The Site Techs are aware of the problem.
V. The Dichroic needs to be replaced; Jim Ruff is aware of the wear problem.
VI. The upper room of the Vertex room, inside the feed cone, hatch has some styrofoam insulation on the door sill that is loose and should be repaired or replaced; the Site Techs are aware of the problem. Some large feedcone bolts have some old evidence of corrosion, snd the Site Techs assure me that they have been aware of it and they are monitoring it; there has been no change since they arrived at the site. There is no other evidence of leakage at this time.
VII. A couple of cinder blocks on the station building are broken, particularily one at a corner roof line, which could cause a leakage problem. They should be able to be patched rather than replaced provided a suitable material can be provided. The Site Techs are aware of the problem.
VIII. The Antenna paint is in remarkable condition considering it has never been painted, however the lower underside of the structure seems to have accelerated its coating detereioration, and paint is flaking off at a seemingly greater rate. Jim Ruff is aware of this.
IX. The Safety Mats for the Station Building and the Pedestal room were not in use, and should be used. The Site Techs have been advised of this.

CC: Paul Rhodes, Tom Baldwin, Steve Durand

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Task Schedule

Date Range: 8/14/2000 to 8/20/2000
Project: Fort Davis VLBA Tiger Team
Maintenace Schedule

Task	Notes
SERVO	
SAFETY TESTS	done
MULTIPLE FAULT STATUS	done
MANUAL MODES TEST	done
INDIVIDUAL FAULT STATUS	done
REMOTE BOX TESTS	done
AZ Travel Limit Switch Tests	done
AZ Clockwise tests	done
AZ Counter-Clockwise tests	done
EL Travel Limit Test	done
Elevation up tests	done
Elevation down tests	done
BRAKE HOLDING-TORQUE TESTS	done
Motor Inspections	done
Install stainless steel j-boxes on drive motors (4)	done
Motor and Tach Couplings	done
Drive motors wiring orientation	done
Commutator & Brush Inspection	done
Servo PM	
Replace SCR EL cooling fan	done
ACU PM	done
Lightning Grounding	
EL Bearing Ground Cables	done
EL Motor Platform to Pintle Turret	done
Pedestal Room Grounding	done
AZ Wheel Ground Straps	done
Pintle Bearing Room Grounding	done
Detailed Test	
System and Axis Faults	done
Motor Fault Status	done
Measure EL Velocity	done
EL counterweight balance measurements	
Measure AZ Velocity	done
Record 1st Limits EL/AZ	done
Recordings	
EL System Response Test	done
Implement test setup	done
Calculate acceleration	done
Locked rotor resonance, AZ/EL	done
AZ System Response Test	done
Implement test setup	done
Calculate acceleration	done
Locked rotor resonance, AZ/EL	done
AZ Position Loop Tests	done
Small signal step response	done
Large signal step response	done

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Single motor step response	done
EL Position Loop Tests	done
Small signal step response	done
Large signal step response	done
Single motor step response	done
Auto Modes Test	done
Check stow commands	done
Synchro feedback operation	done
Test AUI COMM DEAD	done
* HVAC PM AND UPGRADE	
* Replace Pedroom A/C	done
* Vertex Room	
* Remove existing evaporative coil	done
* Install new coil assembly	done
* Evacuate and recharge system	done
* Air flow measurements & adjustments	done
* Contempo Unit B(2) Upgrade	
* Exchange humidifier sensor	done
* Install enunciator interface upgrade	done
* Calibrate sensors and SCR controllers	done
* HVAC/Plumbing PM & Inspections	
* Vertex Room A/C	done
* Install head pressure valve	done
* PM/inspect condenser unit	done
* PM/inspect air handler	done
* Replace evaporative coil	done
* System operational checkout	done
* Control Building Contempo Sys	
* PM/inspect indoor units	done
* PM/inspect outdoor units	done
* System operational checkout	done
* Lab A/C Unit	
* PM/inspect indoor unit	done
* PM/inspect outdoor unit	done
* System operational checkout	done
* Water & sewer PM/inspection	done
* Propane System PM	done
* Replace schedule 80 spec pipe	done
* Check for hydrostatic relief valve	done
* Contempo ops/maint training	done
* VR sys ops/maint training	done
* Lab AC ops/maint training	done
ANTENNA MECHANICAL	
MECHANICAL TEAM 1	
FRM 2-year PM	done
FRM INA bearing check	done
Install apex guardrail	done
Subreflector	
Check for peeling, delamination	Done
Check spider bolts, backside,etc	Done
Check Donut Bolts	Done
Feeds & Dichroic	
Inspect feeds,mounts,htrs,etc	done
Repair dichroic reflector, check panel	panel 40% delaminated. Top tube damaged.

INA Bearing Test Readings:		
	Primary Side	Secondary Side
no load	0.0920	0
50# > primary	0.0945	-0.0023
no load	0.0910	0
50# > scd'y	0.0900	+.0020
CW Rotation force: 25#		
CCW Rotation force: 27#		

Quad-Legs Guy Wires Etc..		
Inspect guywires & turnbuckles	Done	
Inspect quadleg flange bolts	Done	
Lightning Protection/Anemometer		
Inspt mounts/chk operation	Done	
Replace travel limits	done	
Bull/Pinion Gears		
Inspt bull/pinion gears	Done	
Lub El brgs, bull gears as req	Done	
Check stow pin	Done	
MECHANICAL TEAM 2		
Elevation/Hoist/Swing Platform Work		
Instl hoist safety mods, checkout winch, etc	Adjusted brake.	
Checkout swinging platform	Done	
Extend EL motor platforms	Done	
Instl condensor platform toe guard	done previously.	
EL Bearing Inspection		
Inspect EL bearings for metal in grease	OK	
Inspect EL bearings lip seals	Encoder housing full of grease.	
Clean off excess grease	Replaced zirks with button fittings.	
Install El bearing grease trays	done	
EL Motors & Gearboxes		
Change gear oil in gearbox	done	
Inspect pumps, seals & couplings	done	
Weep gearbox heater enclosures	el done. Az not.	
AZ Wheels & Bearings		
Pressure wash gear boxes	not done. They're clean.	
Check wheel to struct clearances	done	
Check AZ drive wheel radii	Drive 1 = 299.938. Drive 2 = 299.763	
Check axle bolt tightness	done	
Pillow block brgs-open & clean	done	
Lubricate & take sample as req	done	
AZ Motors & Gearboxes		
Inspect pumps, seals, couplings	done	
Install grease fitting on #2 motor bearing	no	
Paint & Insulation Inspection		
Inspect ant paint and report	done	
Inspect & repair ant insulation as needed	Done	
Pintle Bearing		
Inspect seals, check pocket level & for loose bolts	Done	0.010" TIR
Lubricate bearing as needed	Done	
Close gap in pintle grease catcher	Done	
AZ Rail Inspection		
Inspect ant foundation	Done	
Inspect for rail movement	Done	
Inspect joint bars & clips	Done	
Move ant, chk rail movement	Done	
Rail level measurements	Done	
Dish Surface & Panels		
Inspect panels, check distortion, shifting, etc	Done	
Spot Check panel bolts-looseness	Done	
Structural		
Install EL hard stops	Done	
Check ant structural bolts	Done	
Inspect ant structural welds	Done	Re-welded a crack above RH el bearing.

Pintle Bearing Pocket	
Az	Reading
270	0
240	-.0045
210	-.0010
180	+.0045
150	+.0040
120	+.0020
90	-.0030
60	-.0045
30	+.0020
0	+.0040
330	+.0040
300	+.0035
270	0

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Inspt ant backup/lower struct	Done
Inspect EL axle	Done
Repair Insulation	done
ELECTRONICS	
Antenna Maintenance & Inspections	
Activate & test feed heaters	done
Apex/FRM inspections	done
Feedcone/Receiver system inspections	done
Vertex Room/Racks & cable inspections	done
Vertex to pintle bearing inspection	done
Install cable wrap strain reliefs	done
Inspect pintle bearing rm bulkhead, cablewrap, etc.	done
Inspect pedroom UPS, FRM controller, dry air sys, etc.	done
Install electrical breaker for air comp & hydraulic wrench	done
Station Building Inspections	
Rm 100 - Check electrical, UPS and test operation	Left for T. Baldwin to do.
Rm 103 - Chatter/supervisory boxes, alarms, etc.	Chatter box broken
Rm 104 - Bulkhead, underfloor, maser, etc	done
Check tools, test equip, manuals, wtr sys, UIS, etc	done
Install protective cover over maser	done
Outside Building and Misc. Inspections	
Run and inspect site generator	done
Inspect weather station	done
Check gates. fence, signs, grounds, etc	done
Inspect lightning protection for antenna & bldg	done
Check safety items/hazmat storage, etc.	done
FINAL INSPECTIONS	
Spot check critical PM's	done
Review problem areas with site tech's	done
Site Inspections for Oversights	done
Site clean-up	swabbed the decks
Station Startup Verification Tests	done

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