National Radio Astronomy Observatory
Socorro, NM

VLBA Antenna Memo Series #26

Kitt Peak Maintenance Visit
July 10th through 16th, 2000
Trip Report

Jim Ruff
8/7/00

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

The team consisted of Steve Aragon, Ramon Gutierrez, Doug Scott, Steve Tenorio, Steve Troy, and Jim Ruff. Site Techs Ray McFarlin and Nelson Atencio assisted throughout.

An apex handrail was installed.

The pintle bearing pocket was inspected for flatness. Measured TIR was 0.0015".

The FRM INA bearing was inspected for internal clearance. Clearance measured 0.004"

The station building UPS was replaced.

Elevation bearing grease catchers were installed.

Two elevation gearbox heater thermostats were replaced. The new Grainger replacement worked out OK.

Guy Stanzione arrived Monday to assist with installation of a 3mm receiver mount.

The manual brake release on elevation motor #2 was sticking. This led to an incident wherein the antenna drifted down beyond the second limit. See attached incident report and figure 14.

The azimuth bearings were inspected and found to be OK. The outer races were not rotated, as this had been done previously.

	Stairway Drive	Far Drive	Stairway Idler	Far Idler
Inner	No metal or pitting	Outer ring pitted at bottom	A few small flakes	No metal or pitting
Outer	Very slight pitting	No metal or pitting	Slight pitting & flakes	A few small flakes

Gutierrez and Ruff spent an afternoon screening surplus equipment at Davis Montham Air Base. A sheet brake, warehouse racking, and shipping containers were tagged.

Radial positions were measured for both drive wheels. Az 1 was 300.09". Az 2 was 299.91". These positions are well within spec.

The dichroic panel is delaminated in the corners. (Figure 1).

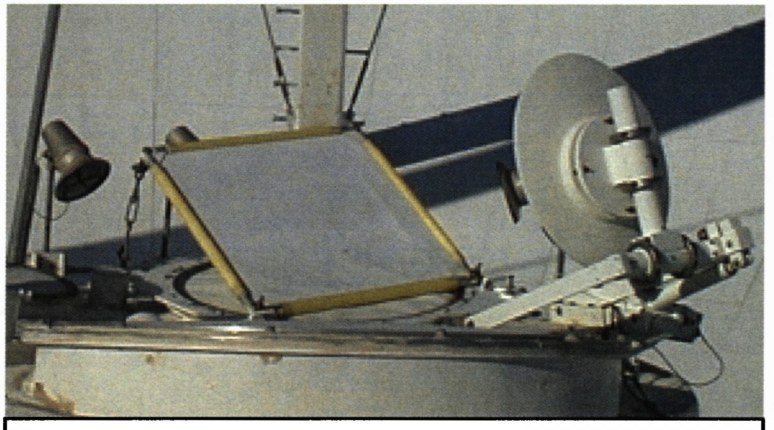

Figure 1: Dichroic Reflector

The azimuth rail and grout were in good condition. Elevation readings appear to be stable.

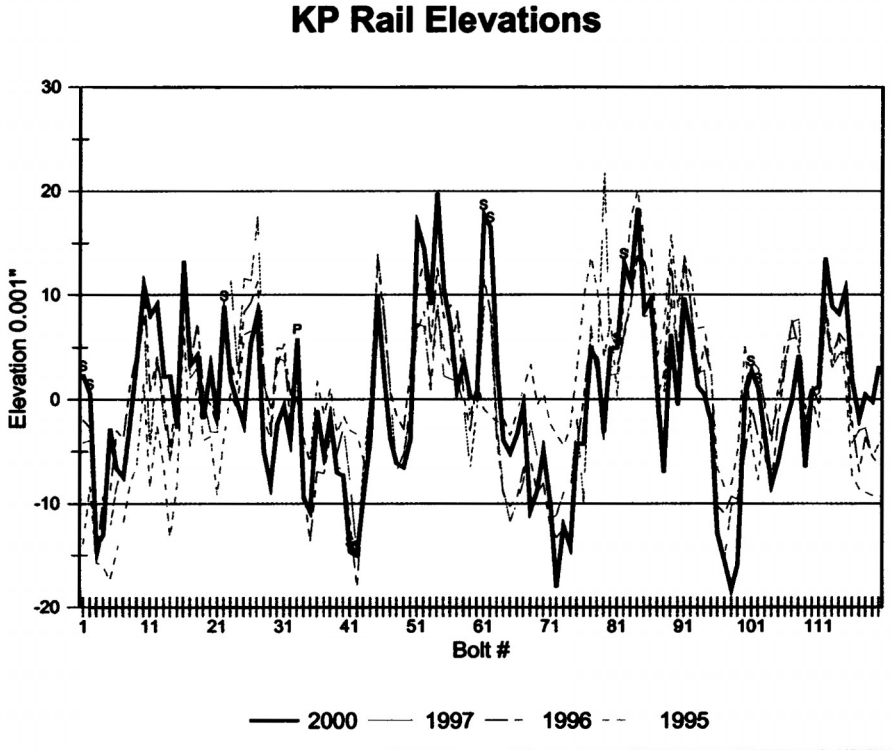

Figure 2: Rail Elevation History

The subreflector looks good. The backup structure is showing a lot of rust. We should attempt to schedule the VLA paint crew for a week or two of rust removal and painting. There is damaged insulation in several areas inaccessible without a manlift. This too should be addressed by the painters.

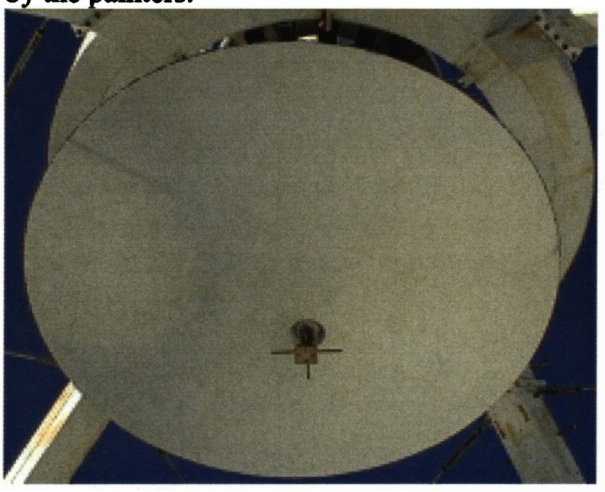

Figure 3 : Subreflector

Figure 6: Counterweights

Figure 4: Upper Backup Structure

Figure 7: B.U.S. Closeup

Figure 5: Upper B.U.S.

Figure 8: B.U.S. Closeup

Figure 9: B.U.S. Closeup

Figure 10: B.U.S. Closeup

Figure 11: B.U.S. Closeup

Figure 12: B.U.S. Closeup

Figure 13: B.U.S. Closeup

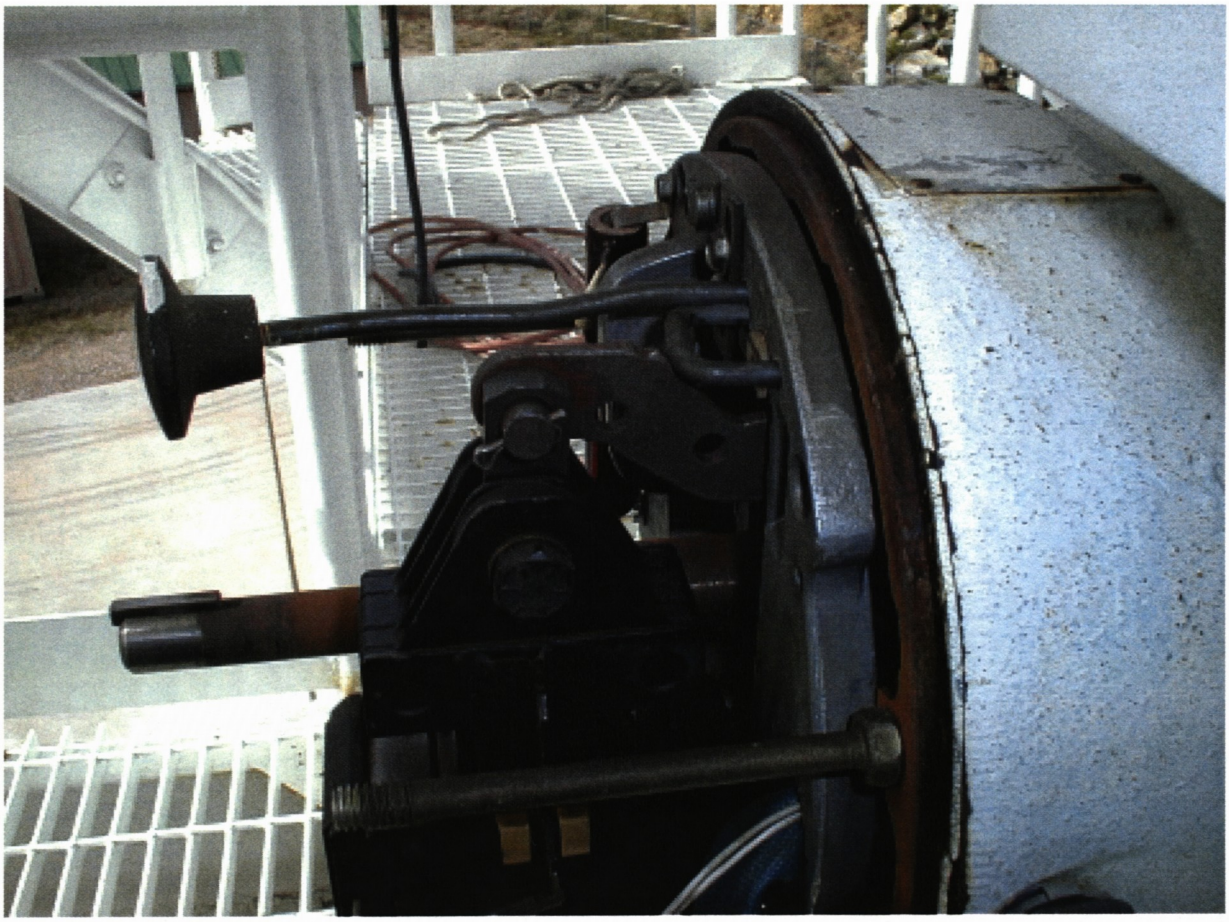

Figure 14: Brake lever stuck in mid travel

Servo Trip Report

From: Steve Tenorio

Subject: Trip Report Kitt Peak **Date:** 9 jul 00

9 jul 00	Day # 1	Travel from Magdalena to Tucson..
10 jul 00	Day # 2	Pre-trip on Top Kick truck, drove truck from Tucson to Kit Peak. Helped unload container. Remove and replaced El. J-box #1 and Az. J-box #2.
11 jul 00	Day # 3	Finished installing J-boxes El. #2 and Az. #1. Checked brake tension on all motors. Az #2 not within spec. Completed Drive cabinet pm. Replaced bad drive cabinet fan. Completed ACU. Pm Completed Data Converter pm. Changed spiders on #1 & #2 Az. Motors and El #2 Motor. Found #1 El motor gear box seal leaking Gutierrez said replace it tomorrow.
12 jul 00	Day # 4	Found antenna down in lower limit when we got to site. Apparently when Aragon applied brake on El. #2 brake didn't fully engage. Brake release handle was bent. Completed gearbox heater current checks. Both El heaters were bad. Replaced both switches. Replaced seal on El. #1 gearbox. Swapped Az. #2 brake assembly. Repaired El #2 brake release mechanism. Relaced Az. Brushes with new style brushes.
13 jul 00	Day # 5	Seated Az. Brushes. Replaced El. Brushes with new style and seated them. Completed servo test. Replaced Az. #2 brake assembly. Replaced El. First down limit. Replaced stow pin engaging switch.
14 jul 00	Day # 6	Checked ped room grounding. Checked air gap on Az. #2 brake. Trouble shot El. Brake fault problem. Found miss wire. Drilled drain holes in El gearbox heaters. Cleaned blower motor filters. Caulked cracks on feed cone. Checked electrical panels in ped room with IR thermometer..
15 jul 00	Day # 7	Helped Steve Troy install ped room A/C. Helped antenna mechanics check pintal bearing for flatness. Helped antenna mechanics grease pintal bearing.
16 jul 00	Day # 8	Pre-trip inspection on truck and traveled back from Tucson to home.

Conclusion: Someone needs to go back to Kit Peak and pre-load Az. #2 brake.

Electronics Trip Report

Interoffice
National Radio Astronomy Observatory
Socorro NM

August 9, 2000

To: Paul Rhodes
From: Doug Scott
Subj: Kitt Peak Maintenance Visit July 7-15: Electronics Report

The overall condition of the Kitt Peak Station is good. The efforts provided by the site manager, Ray McFarlin, and new site technician, Nelson Atencio, were instrumental in getting me rolling. Their cooperation as well as those of the tiger team are greatly appreciated.

Actions Completed:
- new UPS installed in station building
- old UPS disassembled for parts
- installed cable strain reliefs (7) in pintel bearing room
- antenna anemometer roll pins were replaced with bolts
- repaired generator leak
- broken/missing cable ties were replaced in most trays
- adjusted A rack power supplies, discovered bad P102
- cleaned and resealed vertex room electrical bulkheads
- repaired ground lug and cable on elevation platform
- telephone cable shield was soldered to ground bus
- replaced rain gauge screen on weather station.

Items To Be Addressed:
- routing of electrical power to storage container and building surveillance camera
- securing and releasing contract for grounds maintenance
- labeling of critical/non-critical power on electrical panel and site drawings
- use of cherry picker to secure remaining cables in cable trays
- new NO PARKING sign for maser wall, sun faded
- removal of pvc pole on building, extends above lightning rod
- repair of apex ground plate
- finish building interior painting
- clean electrical connectors on cryo compressors
- difference in actual voltage and monitor voltage in B rack (+28.15Vdc vs. 27.95) set per Ray's instructions, possible a/d conversion error.

cc: Ray McFarlin, J. Ruff and T. Baldwin

Elevation Incident Report

Subject: [Fwd: KP antenna incident report.]
Date: Wed, 12 Jul 2000 08:23:31 -0700
From: Jim <jruff@cv3.cv.nrao.edu>
To: jthunbor@cv3.cv.nrao.edu

Jon,
Here's Steve Tenorio's preliminary report on last night's incident. According to the I.S. data, the dish started drifting at 8:45pm local time. Winds at the time were about 4 meters/sec. Maximum drift rate was 6 degrees/min.
Jim

>Subject: KP antenna incident report.
>Date: Wed, 12 Jul 2000 07:23:12 -0700
>From: Noid <stenorio@cv3.cv.nrao.edu>
>To: jruff@cv3.cv.nrao.edu
>
>This morning when we arrived at the KP site the antenna was past the final
>down limit. The hard stops had not been installed yet. Just before quiting time
>yesterday (11 jul 00) we were replacing the spiders on the motors. We replaced
>#2 El motor spiders first. Steve aragon set the brake manually when we were
>done, but had a little trouble pushing the handle in. It did go in but apparently
>not all the way. We then took off motor # 1 to replace the spiders on it and we
>discovered that the gear
>box seal was leaking. We needed to drain some oil out of the gear box in order
>to replace the seal, and Ramon Gutierrez told us to wait until today to finish
>because it was quiting time. My lock out was on and we thought # 2 brake was
>set.
> From this point on I guess we should set the stow pin if we're going to have
>to leave only one motor holding the antenna overnight. I did check the brake
>tension on all the motors yesterday and both El. motors were within specs. So
>apparently when we set the brake on # 2 El. motor it didn't go in all the way.

Task Schedule

Date Range: 7/10/2000 to 7/16/2000
Project: Kitt Peak 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	wind too high...< 5 mph
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
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 A/C Upgrade	
* Replace Pedroom A/C	done
* Reclaim refrigerant from system	done
* Install head pressure control valve	done
* 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 enuciator interface upgrade	done
* Caliibrate sensors and SCR controllers	done
* HVAC/Plumbing PM & Inspections	
* Vertex Room A/C	done
* Install head pressure valve	done
* PM/inspect condensor 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	installed
ANTENNA MECHANICAL	
MECHANICAL TEAM 1	
FRM 2-year PM	done
FRM INA bearing check	done
Install apex guardrail	done
Subrefector	
Check for peeling, delamination	done
Check spider bolts, backside,etc	done
Check Donut Bolts	done
Feeds & Dichroic	
Install new 3 mm receiver mount	gimble in. Receiver won't fit as is.

INA Bearing Test Readings:		
	Primary Side	Secondary Side
no load	0.0018	-0.007
50# > Secnd'y	0.004	-0.004
no load	0.00175	-0.0069
50# > Primary	-0.00025	-0.0093
no load	0.0016	-0.0071

Inspect feeds,mounts,htrs,etc	done
Repair dichroic reflector, check panel	panel about 40% delaminated.
Quad-Legs Guy Wires Etc..	
Inspect guywires & turnbuckles	loose jam nuts on one t-buckle.
Inspect quadleg flange bolts	done
Lightning Protection/Anemometer	
Inspt mounts/chk operation	replaced both pivot stop pins with bolts.
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 internals	done
Inspect EL bearings lip seals	done
Clean off excess grease	replaced zirks with button fittings.
Install El bearing grease trays	done
EL Motors & Gearboxes	attached caution stickers to brake housings.
Change gear oil in gearbox	done previously
Inspect pumps, seals & couplings	done
Weep gearbox heater enclosures	done
AZ Wheels & Bearings	
Pressure wash gear boxes	not done. They're clean.
Rotate outer races on Az wheel bearings	done previously
Check wheel to struct clearances	done
Check AZ wheel radii	az 1 = 300.0923. Az 2 = 299.907
Check axle bolt tightness	done
Pillow block brgs-open & clean	done
Lubricate & take sample as req	done
AZ Motors & Gearboxes	
Internal gear inspection	not done
Inspect pumps, seals, couplings	done
Install grease fitting on #2 motor bearing	Tenorio to send a plug.
Paint & Insulation Inspection	
Inspect ant paint and report	done
Inspect & repair ant insulation as needed	many places not accessible without manlift.
Pintle Bearing	0.0015" Flatness TIR. Replaced hatch cover w/ Lexan.
Inspect seals, check pocket level & for loose bolts	done
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
Check popping wheel	couldn't identify source of noise.
Dish Surface & Panels	

Inspect panels, check distortion, shifting, etc	done
Check all panel bolts-looseness	done
Repaint panel where needed	not done
Structural	
Install EL hard stops	done
Check ant structural bolts	done
Inspect ant structural welds	done
Inspt ant backup/lower struct	done
Inspect EL axle	done
Repair Insulation	many places not accessible without manlift.
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	replaced UPS
Rm 103 - Chatter/supervisory boxes, alarms, etc.	done
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