

National Radio Astronomy Observatory
Socorro, NM

VLBA Antenna Memo Series #34

Brewster Maintenance Visit
July 23rd through 30th, 2001

Jim Ruff
8/2/01

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

The team consisted of Steve Aragon, Ramon Gutierrez, Doug Scott, Steve Tenorio, Steve Troy and Jim Ruff. Site Techs Bob Sanderson and Mark Hofmann assisted throughout.



An apex handrail, quad leg ladder and Sellstrom fall arrest system were installed. The site techs were treated to a training session on use of the Sellstrom system and general fall protection.

The FRM INA bearing clearance measured 0.002”.

No structural cracks were found.

Kellum grips were installed on the azimuth cable wrap cables.

The elevation pillowblocks were outfitted with button grease fittings. No metal was found in the grease.

The azimuth bearings were inspected. No bearings needed replacing. The outer races had been rotated previously, so we didn't do it.

Note the four arcmin vertical error on D1. This is twice the amount allowed by the spec. We loosened the bolts in the rigid coupling and found a 4.2 arcmin tilt in the same direction as the shaft misalignment. This can not be corrected without replacing the wheel assembly, as there is no shim under the pillowblocks. Since the wheel has been like that for about 10 years, with no popping or wheel/axle sliding, I recommend leaving it alone.

Az Bearing Grease Inspection				
	Drive 1	Drive 2 (new style)	I1	I2
Inner	OK	OK	OK	a few metal flakes
Outer	OK	OK	OK	OK

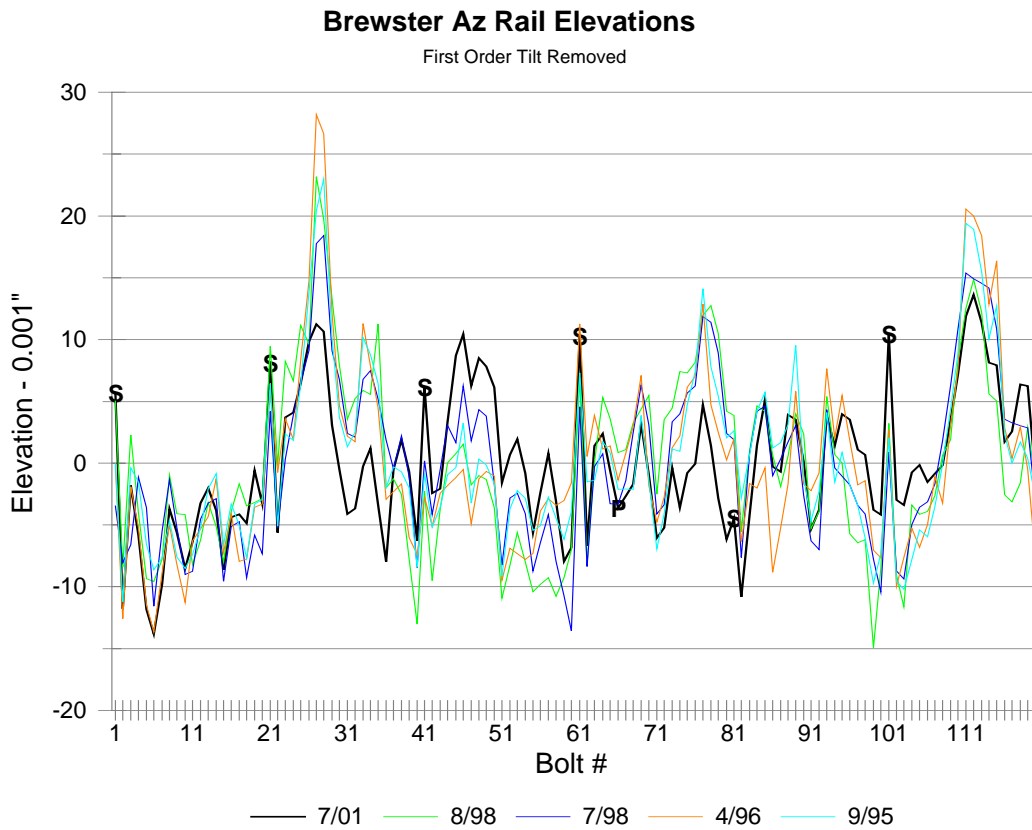
Drive Wheel Alignment			
Wheel #	Horizontal Error	Vertical Error	Radius Error
D1	0° 0' 30"	0° 3' 59" (too flat)	0.134" (out)
D2	Not checked		



The dichroic panel is in good condition. The dish tipper overtravel springs were replaced because they were showing some rust.

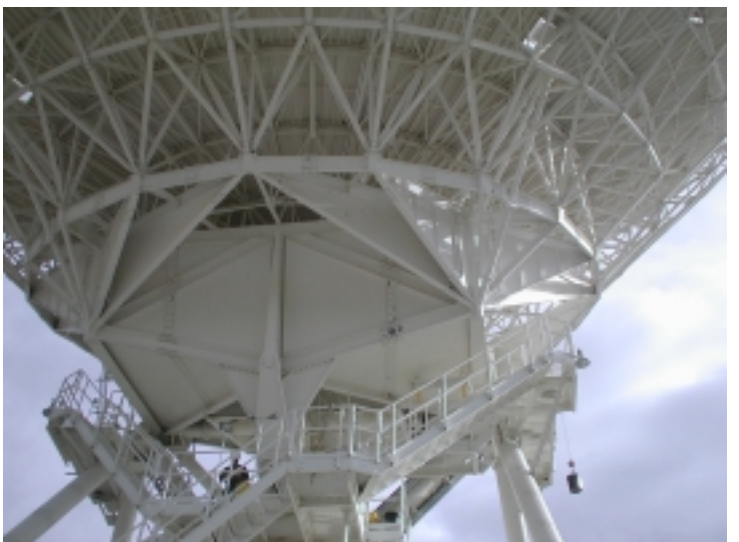


The azimuth rail grout and Vulkem are in good condition, but the grout is crumbling in a few areas.



The rail at Brewster is very flat, with less than 0.030" deviation in elevation after the tilt is removed. The first order tilt is only 6 arcsec.

The paint on this antenna is in excellent condition.





Some of the paint on the subreflector is peeling.



The feed cone finish is checked

Servo Trip Report

From: Steve Tenorio

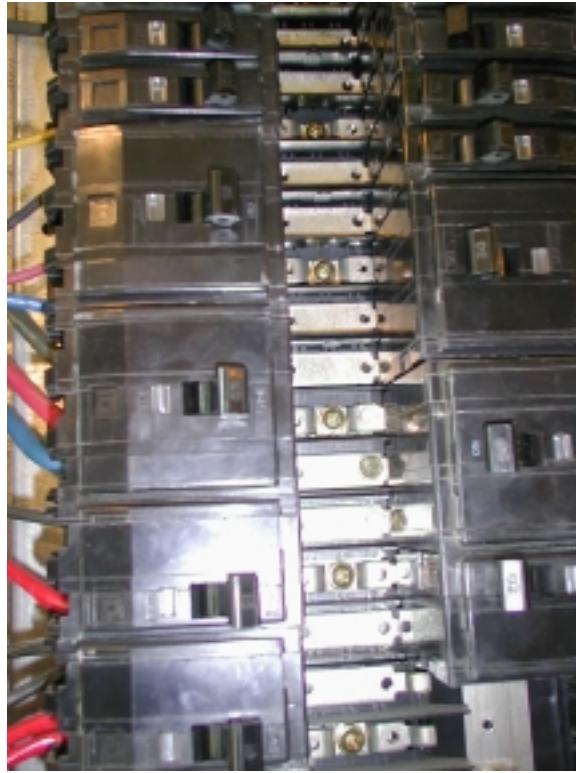
Subject: Trip report Brewster

Date: 20mar99

20jul01	Day # 1	Travel from San Antonio NM. To Colorado Springs CO.
21jul01	Day # 2	Travel from Colorado Springs to Butte Montana.
22jul01	Day # 3	Travel from Butte Montana to Okanogan Washington.
23jul01	Day # 4	Unloaded container. Removed apex ladder, and installed new apex ladder with new fall arrest system.
24jul01	Day # 5	Checked brake torque on Az. And El. Brakes. Recorded parameters on ACU. Changed ACU. Installed cards from original ACU into shop ACU. Re-entered original parameters. Completed ACU pm. Completed Drive cabinet pm. Completed ped. Room grounding checks.
25jul01	Day # 6	Completed IR thermometer checks on Electrical Panels in ped. Room. Checked Gear box heater current. Cleaned Az. Motor commutators and seated Az. Brushes. Completed El. Motor pm. Completed servo test fault checks.
26jul01	Day # 7	Changed El. Motor coupling spiders. Completed servo test. Completed Az. And El. Synchro alignment procedure.
27jul01	Day # 8	Checked lightning protection and grounding from pintle bearing room to apex. Power washed Az. Motors and gear boxes. Helped Aragon install new Stow pin tray and re-located stow pin switch. Helped Aragon repair antenna hoist.
28jul01	Day #9	Helped Gutierrez & Ruff grease El bearings. Changed ant. Hoist switch. Helped check Az. Wheel alignment.
29jul01	Day #10	Changed Az. And El. Gearbox oil. Helped install new 86 GHz feed.
30jul01	Day #11	Helped index new feed mount. Looked for El. Motor lube pump leak. Loaded and checked out truck, and drove to Yakama Washington.
31jul01	Day #12	Drove from Yakama Washington to Twin Falls Idaho.
01aug01	Day #13	Drove from Twin Falls Idaho to Cortez Colorado.
02aug01	Day #14	Drove from Cortez Colorado to San Antonio NM.

Conclusion: Brewster sites looks good except for the intermittent problems that they were having when we got there. I changed out the ACU body but left their original cards in that ACU so we can verify that the problem is actually in the ACU body and not the cards. The problem doesn't show up for up to six months sometimes so it could be a while before we know for sure.

Also while I was doing the IR. Thermometer checks in the ped. Room electrical panels, Steve Troy noticed that the buss for the breakers is a screw in type and the breakers themselves are not the screw in type. So the breakers will pop out if the panel cover is off. Steve Troy notified Tom Baldwin of the problem and Tom will follow up on it.



Ped Room Breakers

Electronics Trip Report

August 2, 2001

From: Doug Scott
To: Clint Janes
Cc: J. Ruff
P. Rhodes

Electronics Division Tiger Team Report
For VLBA Brewster WA, July 23-29
Site Manager: Robert Sanderson
Site Technician: Mark Hoffman
Tiger Team Leader: Jim Ruff

General.

The VLBA Brewster Site reflects the tremendous effort of Bob and Mark in keeping on top of all aspects of running this site. The grounds and surrounding fencing are uncluttered and clear of debris. The station signs are legible and information pamphlets are in ample supply for the public.

Inside the site reflects Bob's abilities as a cabinetmaker. He has made many functional shelves and cabinets for the site but his desk/cover for the UPS shows creativity. Tools and technical documentation are arranged in a clear and organized manner.

Many thanks are in order for Bob and Mark's assistance. They were always lending a hand and available for questions and suggestions. Their cooperation was invaluable.

Item List.

My inspections took me from the antenna apex to the bottom of the pintle bearing room. Listed below are the areas in which some action was taken or action is still required. This is not in any order of priority.

1. UPS's, located in the building and antenna pedestal room, were briefly taken off line and given a light cleaning. Batteries are in good condition and should not need to be replaced within the next two years.
2. Ground Fault Circuit Interrupter (GFCI) electrical outlets were installed in two locations. The first is outside the building for the external telephone ringer. The second is in the kitchen area.
3. Antenna hoist switch had a broken spring. The switch was replaced and relabeled.
4. Apex barrel access is restricted due to location of the barrel's cutout ladder, relative to hatch. Supplemental steps are being researched.
5. Requested tape recorders be labeled (No.1/No.2) as well as tape storage areas (climitizing / not prepassed / prepassed). This is for the benefit of visiting technicians.
6. Cable strain reliefs were hung and attached atop the pintle bearing room.
7. Some technical reports were not on file. These are being collected and are to be shipped shortly.

I would also like to thank the rest of the team for their assistance, cooperation and patience. As one of the junior members, I have growing respect for their talents and experience.

Brewster Task List

SERVO		
SAFETY TESTS		Recordings
MULTIPLE FAULT STATUS		EL System Response Test
MANUAL MODES TEST		Implement test setup
INDIVIDUAL FAULT STATUS		Calculate acceleration
REMOTE BOX TESTS		Locked rotor resonance, AZ/EL
AZ Travel Limit Switch Tests		AZ System Response Test
AZ Clockwise tests		Implement test setup
AZ Counter-Clockwise tests		Calculate acceleration
EL Travel Limit Test		Locked rotor resonance, AZ/EL
Elevation up tests		AZ Position Loop Tests
Elevation down tests		Small signal step response
BRAKE HOLDING -TORQUE TESTS		Large signal step response
1 Troubleshoot -drops DPM/MCB errors		Single motor step response
Motor Inspections		EL Position Loop Tests
2 Install stainless steel j-boxes on drive motors (4)		Small signal step response
Motor and Tach Couplings		Large signal step response
Drive motors wiring orientation		Single motor step response
Commutator & Brush Inspection		Auto Modes Test
Servo PM		Check stow commands
Replace SCR EL cooling fan		Synchro feedback operation
ACU PM		Test AUI COMM DEAD
Lightning Grounding		
EL Bearing Ground Cables		<i>moved stow pin switch</i>
EL Motor Platform to Pintle Turret		
Pedestal Room Grounding		
AZ Wheel Ground Straps		
Pintle Bearing Room Grounding		
Detailed Test		
System and Axis Faults		
Motor Fault Status		
Measure EL Velocity		
EL counterweight balance measurements		
Measure AZ Velocity		
Record 1st Limits EL/AZ		
1 <i>Changed ACU</i>		
2 <i>Skipped per Bob S</i>		

HVAC	
Antenna	Control Building
Pedestal room A/C inspection	Building A/C System
Provide Site Techsw/manual and hold Q&A session	Perform operational checks
	Inspect indoor & outdoor units
Vertex Room A/C	Correct deficiencies as needed.
Inspect air handler	Stand-By Contempo
Inspect condenser unit	Indoor Unit
inspect lines & bulkhead fittings	Install primary unit interface relay board
Repair/replace damaged line insulation	Instal Hoffman SCR's
Replace any suspect bulkhead fitting	Install auxillary terminal block
Evacuate & place unit back in service	Replace V-belt & adjust pully to maximum
Install ROC & set to (C1, set 135, Dif.30)	Perform operational checks
Check PCtool to DDC connection @ computer	Condensing Unit
Make hard copy of program parameters	Inspect for leaks & clean oil
Check programing, save program file to disk.	Inspect electrical connections
Hold Q&A session w/ Site Tech's	Perform operational checks
	Primary Contempo
	Indoor Unit
	Install auxillary terminal block
	Install utility interface auxillary switch & cable
	Install wiring to stand-by unit
	Install upgraded interface
	Install UPS transformer & cable to DDC
	Replace control transformers
	Replace humidity sensor
	Condensing Unit
	Inspect for leaks & clean oil
	Inspect electrical connections
	Peform operational checks
	Check PCtool to DDC connection at computer
	Make hard copy of program parameters
	Check program & save program file to disk
	Schedule and perform hard test of emergency power interface for both Contempo units.
	Hold Q&A session w/ Site Tech's
	Review site documentation with site techs
	Inspect site utilities
	Water supply & distribution
	1 Propane system
	Sewer/septic system
	site techs will replace sch 40 propane pipe with sch 80 1 this fall.

ANTENNA MECHANICS													
Apex Safety		E Bearings											
Install new ladder & fall arrest system		Inspect EL bearings lip seals											
Install apex guardrail		Clean off excess grease											
Fall Protection training (sign-in sheet)		Install E bearing grease trays done previously											
FRM		Grease											
2-year PM cablewrap springs a bit rusty		<table border="1"> <tr> <th colspan="2">E bearing Grease Inspection</th> </tr> <tr> <td>Encoder Side</td> <td>OK</td> </tr> <tr> <td>Tach side</td> <td>OK</td> </tr> </table>		E bearing Grease Inspection		Encoder Side	OK	Tach side	OK				
E bearing Grease Inspection													
Encoder Side	OK												
Tach side	OK												
INA bearing check													
<table border="1"> <tr> <th colspan="2">FRM INA Bearing Check</th> </tr> <tr> <td colspan="2">50# pull on primary side</td> </tr> <tr> <td>Pr'y Travel: +.002"</td> <td>Sec'y Travel: -.002</td> </tr> <tr> <td colspan="2">50# pull on secondary side</td> </tr> <tr> <td>Pr'y Travel: -.002</td> <td>Sec'y Travel: +.002</td> </tr> </table>		FRM INA Bearing Check		50# pull on primary side		Pr'y Travel: +.002"	Sec'y Travel: -.002	50# pull on secondary side		Pr'y Travel: -.002	Sec'y Travel: +.002	Az Bearings	
FRM INA Bearing Check													
50# pull on primary side													
Pr'y Travel: +.002"	Sec'y Travel: -.002												
50# pull on secondary side													
Pr'y Travel: -.002	Sec'y Travel: +.002												
		Open, clean & inspect pillowblocks											
		Az Bearing Grease Inspection/Bearing Replacement											
		Inner	Outer										
		D1	OK										
		D2	OK, hub OK										
		I1	OK										
		I2	A few flakes										
Subreflector													
Check for peeling, delam. 5% of area peeled		Rotate outer races done previously											
Check cover		Close pillowblocks and grease											
Quad Legs, Guy Wires Etc..		Az Wheels											
Inspect guywires & tumbuckles		Check wheel to struct clearances											
Inspect quadleg flange bolts		Check axle bolt tightness											
Anemometer		AZ wheel radii and alignment											
Inspt mounts/chk operation			D1										
Install Baldwin bracket parts			D2										
Feeds & Dichroic		Horiz. Error	30 arcsec										
Inspect feeds, mounts, heaters, etc.		Vert. Error	4 arcmin										
Check dish tipper		Radius	.134" out										
Check Dichroic reflector													
Check feedcone exterior finish checked													
Replace hatch latches as req'd none													
Dish Surface & Panels		Az Motors & Gearboxes											
Inspect for damaged panels		Inspect pumps, seals & couplings											
Spot check panel bolts-looseness		Check gearbox heater enclosures											
Elevation Hoist/Swing Platform replaced drum sw		Paint & Insulation Inspection											
Instl hoist safety mods		Inspect ant paint some peeling. Almost no rust											
Checkout swinging platform		Inspect & repair ant insulation as needed											
Instl condensor platform toe guard		Pintle Bearing											
Structural		Inspect seals											
Spot check structural bolts		Check pocket level done previously											
Inspect structural welds		Check for loose bolts											
Inspt ant backup/lower struct		Lubricate											
Inspect EL axle for cracks		Close gap in grease catcher done previously											
E Bull and Pinion Gears		Az Rail Inspection											
Inspt bull/pinion gears		Inspect ant foundation, grout and Vulkem											
Lub bull gear as req		Inspect for excessive rail movement											
Check stow pin		Inspect joint bars & clips											
E Motors & Gearboxes		Rail level measurements											
Inspect pumps, seals & couplings		Check for popping wheel											
Check gearbox heater enclosures													

ELECTRONICS		
Antenna Maintenance & Inspections		
Apex/FRM inspections		
Feedcone/Receiver system inspections		
Activate & test feed heaters		
Vertex Room/Racks & cable inspections		
Vertex to pintle bearing inspection		
Replace tie wrap on antenna cabling with metal type		
Install cable wrap strain reliefs		
Inspect pintle bearing rm bulkhead, cablewrap, etc.		
Inspect pedroom UPS, FRM controller, dry air sys, etc.		
Install breaker for air comp & hydraulic wrench		
Station Building Inspections		
100 - Check electrical, UPS and test operation		
103 - Chatter/supervisory boxes, alarms, etc.		
104 - Bulkhead, underfloor, maser, etc		
Check tools, test equip, manuals, wtr sys, UIS, etc		
Outside Building and Misc. Inspections		
Run and inspect site generator		
Inspect weather station <i>mild corrosion on circuit boards. Decided to leave alone.</i>		
Check gates, fence, signs, grounds, etc		
Inspect lightning protection for antenna & bldg		
Check safety items/hazmat storage, etc.		
<i>hard-wired outdoor phone ringer</i>		
<i>installed GFCI duplex outlets outside & at sink</i>		
FINAL INSPECTIONS		
Spot check critical PM's		
Review problem areas with site tech's		
Ste Inspections for Oversights		
Ste clean-up		
Contact VLBA Operations for Station Startup Verification Tests		