## NATIONAL RADIO ASTRONOMY OBSERVATORY

Socorro, New Mexico

VLBA Antenna Memo Series No.11

Los Alamos Maintenance Visit, July 13 - 17, 1998 - Trip Report

J. E. Thunborg July 28, 1998

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

The Los Alamos maintenance team consisted of S. Aragon, R. Gutierrez ,S. Tenorio, S. Troy, J. Thunborg, P. Ulbricht and a cameo appearance by T. Frost. The team worked at the Los Alamos antenna from July 13 to July 17, 1998. The Site techs G. Dunn and P. Johnson were also instrumental in the completion of the scheduled tasks.

The Servo Safety Tests were performed by the site techs prior to the arrival of the maintenance team. This allowed the maintenance team to begin work on the antenna when they arrived at the site.

Cracked welds were found on the backup structure of the antenna. Two of these cracks were by the elevation axle were we have been seeing cracks on most of the antennas. However this antenna had a third crack where the shear web meets the upper structure behind the vertex room. The cracked welds were ground out and then re-welded. All of the azimuth bearings were in good condition. The grease in the bearings was clean and in excellent condition. All of the outer races on azimuth bearings were rotated 180 degrees. Elevation hard stops and platform extensions were installed on this antenna

A few details were left uncompleted. These details and their required follow-ups are listed below.

- 1. The backup generator needs belts and hoses changed. This task is usually contracted to an outside vendor. Since Los Alamos is relatively close to the VLA, a crew from the auto shop will perform the generator PM.
- 2. The backup generator propane converter has a coolant leak. This will also be repaired by the auto shop personnel.
- 3. The knuckle area had an accumulation of grease. The rail team will be going to LA in August and will pressure wash this area.
- 4. The main support tubes in the knuckle area were collecting water. Due to the geometry, we were unable to cut drain holes. The rail team will fill the areas where the water pools with "Hot Stuff" urethane foam during their August visit.
- 5. A bolt was stripped out on the 20 cm feed cover. The rail team will install a helicoil insert and replace the bolt.

6. A stud on a gearbox oil filter was stripped off. The rail team will also repair this by installing a helicoil insert.

The following items were tested/inspected and repaired if needed. A more detailed list/schedule is attached to this document.

- 1. Drive Motors brakes, couplings, commutators and brushes
- 2. Servo system Complete checkout per servo shop checklist.
- 3. Lightning protection cables, straps and grounding.
- 4. elevation counterweight balance measurement.
- 5. Vertex room HVAC upgrade.
- 6. Control building Contempo upgrade.
- 7. HVAC inspections per detailed checklist.
- 8. Utilities Water, Sewer and Propane System
- 9. FRM per detailed checklist.
- 10. Subreflector.
- 11. Feeds and DiChroic reflector
- 12. Quad legs and guy wires.
- 13. Anemometers
- 14. Bull and pinion gears lubricated and tightened bolts.
- 15. Elevation hoist modifications.
- 16. Swinging platform.
- 17. Elevation platform extensions.
- 18. Condenser platform toeguard.
- 19. Bearing Inspections Azimuth, Pintle and Elevation.
- 20. Gearbox Azimuth and Elevation
- 21. Paint Inspection Complete Hancock paint report.
- 22. Rail inspection and level measurement.
- 23. Antenna structure Cracks, loose bolts
- 24. Antenna electrical inspections Per detailed checklist
- 25. Station building electrical inspections Per detailed checklist
- 26. Other electrical inspections generator, weather station and grounds.
- 27. B-Rack modifications.
- 28. Installed feed heaters for 3 and 7mm receivers.
- 29. Check sensor cards.
- 30. Install elevation Hard stops

The following non-scheduled items were also completed.

- 1. Repaired insulation on tubes
- 2. Replaced Lovejoy couplings on all drive motors
- 3. Repaired antenna 610 RCP connector on UHF receiver.
- 4. Replaced plexiglass pintle bearing hatch cover with aluminum one.
- 5. Replaced sun damaged tie wraps.
- 6. Replaced button head cable wrap screws. The heads of these screws are wearing against the cable wrap. If the heads wear to far, the screws will very hard to replace. Pete suggest that all site techs should check these screws and replace them as necessary.

The scheduled items that were not completed are as follows:

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1. We were unable to check the Pintle bearing pocket flatness. The pintle bearing bolts could not be loosened by hand. A pneumatic or hydraulic wrench will be necessary to complete this task.

LA Azimuth Rail Comparison 1995 to 1998



To: List

From: Steve Tenorio

Subject: Trip report VLBA L.A.

**Date:** July 21, 1998

12jul98 Day # 1 Travel to VLBA Los Alamos.13jul98 Day #2 Drive box truck to site. Unload box truck.

Started on servo P.M.: Checked and seated brushes, and commutators, checked tach.couplings, rubber spider couplings, motor couplings, blower filters, and blower operation, checked wiring in motor j-boxes. Checked Brake tension. On all Az. And El. Motors.

Checked data gearboxes, and limit switches.

14jul98 Day #3 Helped welder install El. Motor Extension Platforms. Moved E-Stop and warning horn due to El. Platform mod. Changed Motor spider couplings on Az. # 1 Az. #2 and El. # 2 motors.

15jul98 Day #4 Changed spider coupling on El. # 1 motor. Performed Servo Test. Performed counterweight test. Assisted ant. Mechanics on FRM. P.M. and replacement of flex shaft.

16 jul98 Day #5 Inspected encoders, checked Ped. Room J-Boxes with I.R. Thermometer. Assisted Welder in installation of Hardstops. Helped ant. Mech. Check panel bolts.

17jul98 Day #6 Finished checking panel bolts. Helped check Structure bolts. Cut drain holes in knuckle. Checked anemometers. Helped ant. Mech. Check Ellipsoid operation. Picked up tools and loaded truck.

Conclusions:

The Servo Systems is in pretty good shape. Worked with Paul on brush seating tips to extend the life of the brushes. All in All Site techs have things in good shape.

To: Jon Thunborg From: Pete Ulbricht Subject: Los Alamos Maintenance Trip, July 13-18, 1998

I completed the Electronics Inspection Sheet and found the Los Alamos antenna to be in good shape. There were many signs that the site technicians not only maintain the sub-systems, but in many cases have made improvements to the equipment to better protect the equipment/technicians from problems in the future.

I installed new pressure transducers on the "A" side helium supply and return lines in the feedcone. During the antenna mechanic's work on the FRM, Ramon noticed a cable connector problem in the barrel. I took apart and rebuilt the 610 RCP connector on the UHF receiver. I also installed heatshrink on the dipole connectors.

I made a new hatch cover to replace the cracked plexiglass cover. While looking over the azimuth cablewrap, I noticed that the new 'coated' outside ring is working very well (no signs of wear). It is, however, wearing the heads off the stainless steel buttonhead screws. I replaced 15 worn screws holding the spring together. I was unable to remove 2 of the screws because the heads were worn off too flat. We should have all sites take inventory of screw wear before this becomes a problem. We should consider getting some screw replacements-----possibly have them coated as well.

I replaced quite a few tyraps on the antenna structure. All the exterior ones are very brittle and ready to break and fall off.

In the station building, I ran cables for contempo control, humidity sensor, and a temperature sensor for Steve Troy. I checked for hot spots in all the electrical panels----found only one loose connection. I also sketched a possible mod to install at all the VLBA antennas. The mod would reposition the helium compressors to make the spare easier to put into service, should it be needed. I will attach a copy to this report.

I suggested to the site techs that they should have their Onan generator completely gone over, replacing all the hoses, gaskets, etc. It has been in service for 10 years and still has all the original hoses.

While looking over the weather station, I noticed they had modified the crank to keep it from getting out of control when the weight of the tower shifts. I have noticed that this can be a safety problem for the site tech or the anemometer cups if the tower goes all the way to the ground.

The site techs are experimenting with ways to soundproof the UPS in room 100. This is a problem at several sites.

Paul and Gene worked very hard during our visit and were instrumental in helping us complete our work.





ACAD LABEL: VLBAPAIT

ANGLE PEELING

SMALL RUST SPOTS

WF BEAM AROUND VERTEX TOUCHUP

1A	11A	
2	12	
2A	12A	
3	13	
3A	13A	
4	14	
4A	14A	
5	15	
5A	15A	
6	16	
6A	16A	
7	17	
7A	17A	
8	18	
8A	18A	
9	19	
9A	19A	
10	20	· · · ·
10A	20A	

TOP(T) (7) JOINTS BOTTOM(B) (6)JOINTS TOP(T) (5)JOINTS BOTTOM(B) (3)JOINTS

JOINT LISTING REQUIRING REPAIR (NOT INCLUSIVE)

BEAM #

11

11A

TOP

A BEAM

BOTTOM

MERVISE SPECIFICS

TOP

MAIN BEAM

воттом

BEAM #

1

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SCSCRIPTION

NATIONAL RADIO ASTRONOMY OBSERVATORY AL ALC: A ALC: A C. GMICH in.

ANTENNA PAINT REPORT

WORKSHEET









## 1998 VLBA Tiger Team Maintenance Task Listing for OV, BR, LA

Task Name	Basauraaa	July 1998									
	Resources	13	14	15	16	17	18	19	20	21	
SERVO		J	r	1	T		<b>90.</b> 1	6h			
SAFETY TESTS	Site T 1, Site T 2	1				ļ					
MULTIPLE FAULT STATUS			1		1		1				
MANUAL MODES TEST			1	1	1	1		1 1			
INDMIDUAL FAULT STATUS						-					
REMOTE BOX TESTS				1		1					
AZ Travel Limit Switch Tests											
AZ Clockwise tests					ł						
AZ Counter-Clockwise tests		4									
EL Travel Limit Test											
Elevation up tests		4			l						
Elevation down tests											
BRAKE HOLDING-TORQUE TESTS	Sarvo T, Site T 1										
Motor Inspections	Servo T, Site T 1	9	יבה	.001							
Motor and Tach Couplings		25	<sup>2</sup>								
Drive motors wiring orientation		5									
Commutator & Brush Inspection			40 23	n i				1			
Servo PM	Servo T, Site T 2		ركم	.501							
Drive Cabinet PM			௺	.50h							
Rewire Lockout Switch			<b>a</b> 2	50h							
ACUPM			9	.00h			1				
INSPECT ANTENNA POWER PANELS	Servo T, Site T 2		5	3.00							
INSPECT GEARBOX HEATERS	Servo T, Site T 2		ĺ	200	ih NGL	- 1	ļ		1		
Lightning Grounding	Servo T, Site T 2		ļ		n de	1					
EL Bearing Ground Cables				<b>P</b> ° <b>‡</b>	1			}	ł		
EL Motor Platform to Pintle Turret		1			]						
Pedestal Room Grounding					Î I						
AZ Wheel Ground Straps		1			I I				1		
Pinte Bearing Room Grounding				7 4	ľ d						
Et encoder inspection						7 200					
	Servo I, Site I I					= <u> </u>	'				
System and Ads Fauns									2		
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EL System Response Test						P.T	"				
Implement test setup									Í		
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AZ System Response Test		1			ł	254					
Implement test setup						HP'I					
Calculate acceleration			1			伊江		1	1		
Locked rotor resonance, AZ/EL									- 1		
AL Position Loop Tests				[		ייביך	~~				
Small signal step response			ł	ł	ł						
Large signal step response					1			1			
Single motor step response		1				l, f					
EL POSITION LOOP Tests								1	1		
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**....** Fixed Delay ---- Slack

## 1998 VLBA Tiger Team Maintenance Task Listing for OV, BR, LA

Task Name	<b>D</b>					auty	330				
	Resources	13	14	15	16	17		18	19	20	21
Large signal step response						M	Бd×	jh			
Single motor step response						×	l 42	5h			
Auto Modes Test	Servo T, Site T 1, Site T 2					<b>א</b>	<u> </u>	] 1.50	h	1	
Check stow commands							Ь і.о	Oh		1	
Synchro feedback operation						-	6þ2	Sh		1	1
Test AUI COMM DEAD						5		0.25			
HVAC PM AND UPGRADE	HVAC T			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·						66.00h
Vertex Room A/C Upgrade			13	boh						1	
Reclaim refrigerant from system		2.00									1
Install head pressure control valve		፞፞፞፞ቚ									
Remove existing evaporative coil		- 54-1.0	'n								
Install new coll assembly		- <b>1</b> 5-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	DON	1							
Evacuate and recharge system		╡⋤	.00h								
Air flow measurements & adjustments			- 4.00	<b>h</b>	[ [						
Contempo Unit B(2) Upgrade				·			26 00	n			
Reclaim refrigerant from unit		1 1	TH.	.00h							
Install refrigerant valves		7			n l						
Evacuate and recharge system					þan i						
Install DOC				-	- 5.00						1
install SCR's and Controllers					5	) Dh					
Install sensors		1	1 1		<b>5</b>	.00h				ł	
Install enuciator interface					ግ	2	.00				1
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HVAC/Plumbing PM & Inspections				J	L	<u></u>	_!				53.00h
Vertex Room A/C		-		.00h							
Philospect condensor unit		-	50.10	ah i							
DM/inspect air handler		-	5-6	noh							
System operational checknut		-1		00h							
Control Building Contompo Suc	Cito T 1	-						1 10	юь		
Control Building Contempo Sys		-					1.	יןיים	~~		1
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System operational checkout		-					IT.				
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PM/inspect indoor unit		-						ĿΨ			
PM/inspect outdoor unit		-	1						h		
System operational checkout		-									
Water & sewer PW/inspection	HVAC 1, Site 1 2	4							Oh .		
Propane System PM	HVAC T, Site T 2	-	1		1			'я <u> </u>		2 <sup>2.00</sup>	2n
Check for schedule 80 spec pipe		-						۳th	201		
Check for hydrostatic relief valve		- 1		1	1		1		ľ	<b>91</b> 1.00	1
Contempo ops/maint training	HVAC T, Site T 1, Site T 2	4	ļ	ļ						2.0	ľ.
VR sys ops/maint training	HVAC T, Site T 1, Site T 2	4								20	n l
Lab A/C ops/maint training	HVAC T, Site T 1, Site T 2	┨┍┻┻			<u> </u>					<b>9</b> 1.	<b>1</b> 0h
AN I ENNA MECHANICAL						-+	T				
MECHANICAL TEAM 1	Ant M 1, Site T 1		<u>}_</u> 1\$.	50h							
FRM Inspection/PM		ייר <b>י</b> ין ו	on [								l I
Subrefector		40-72	006								
Check for peeling, delamination		54	ቀ	1			1	1			
Check spider bolts, backside,etc			a∽ Í	1				1			1
Check Donut Bolts		जि	spn	1							
Feeds & Dichroic			1.50	h				1		1	
Inspect feeds, mounts, htrs, etc		1 1	F-1.00	1			1				
		-11 17	+ I			1	1				