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**NATIONAL RADIO ASTRONOMY OBSERVATORY**  
Socorro, New Mexico

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VLBA Antenna Memo Series No.14

**Brewster Maintenance Visit, August 17 - 22, 1998 - Trip Report**

J. E. Thunborg  
September 10, 1998

**Attachments:** Azimuth Rail Level Survey, VLBA Pintle Bearing Measurements, Servo Trip Report, Electronics Trip Report, Paint Condition Report, Task Schedule

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The Brewster maintenance team consisted of S. Aragon, R. Gutierrez, S. Tenorio, S. Troy, J. Thunborg and P. Ulbricht. The team worked at the Brewster antenna from August 17 to August 22, 1998. The Site techs M. Hofman and B. Sanderson 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.

The cracks by the elevation axle that we have been seeing on most of the antennas were repaired during the previous visit. Metal particles were found in the azimuth #2 inside drive bearing. This drive bearing will require replacement in the near future. All of the azimuth bearing races except the inside #2 idler bearing were rotated 180 degrees. Elevation hard stops and platform extensions were installed on this antenna.

The elevation motors showed signs of excessive armature wear under the brushes. Elevation drive motor #1 was replaced. The armature in the elevation #2 motor was also replaced. New greaseless bearings were also installed in the #2 motor.

A hydraulic wrench was used to loosen 18 pintle bearing bolts. Dial indicators were then placed on the bearing and the antenna was rotated. The horizontal and vertical runout were 0.042" and 0", respectively as shown on the attached chart. These runout numbers are acceptable and no further action is required.

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

1. There is a section of schedule 40 pipe between the propane tank and the generator. This pipe will need to be replaced with schedule 80 either during the next tiger team visit or by a local contractor. A work order for this task has been submitted.
2. The inside #2 azimuth drive wheel bearing needs replacement. A work order for this task has been submitted.
3. Swap weather station boards so existing ones can be inspected in the lab. Wayne Koski is sending replacement boards.

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 toe guard.
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. Installed elevation Hard stops
31. Checked pintle bearing pocket flatness.

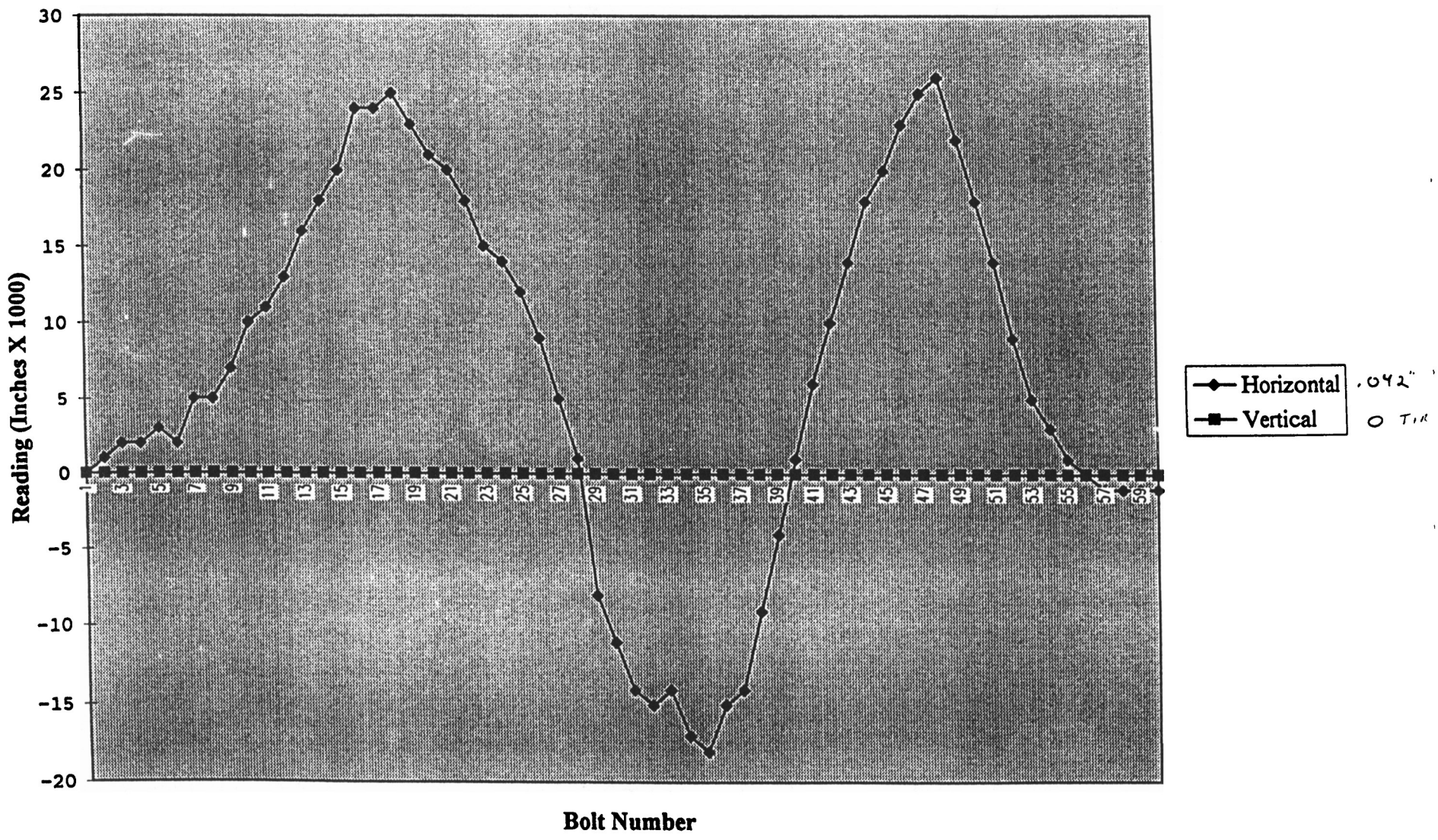
The following non-scheduled items were also completed.

1. Sprayed wasps nests.
2. Replaced Lovejoy couplings on all drive motors
3. Tightened cable wrap rollers
4. Repaired dry air system leak.
5. Repaired cold solder joint on rectifier in drive cabinet.6

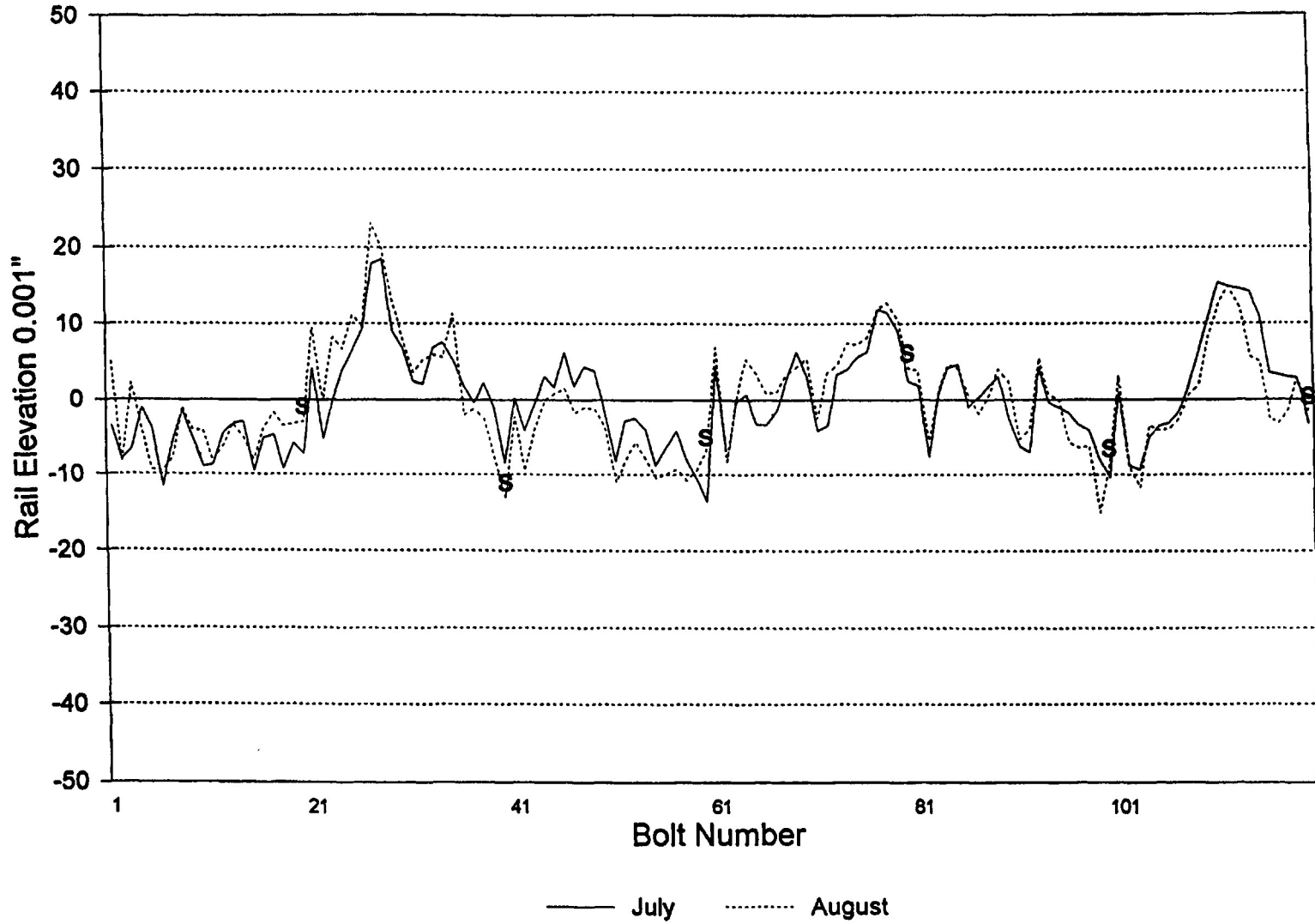
# VLBA Pintle Bearing Measurements

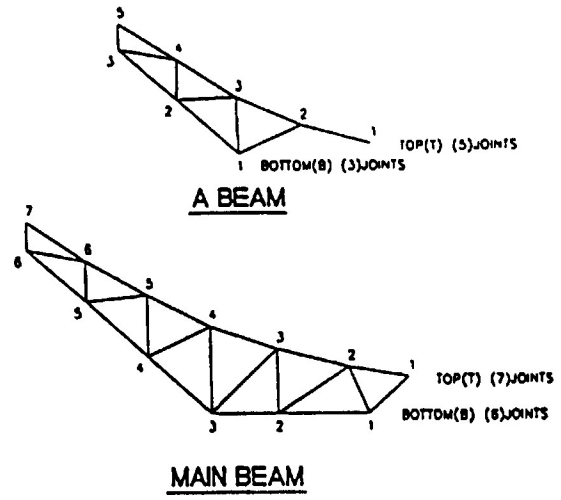
8/20/98

## Brewster Washington VLBA



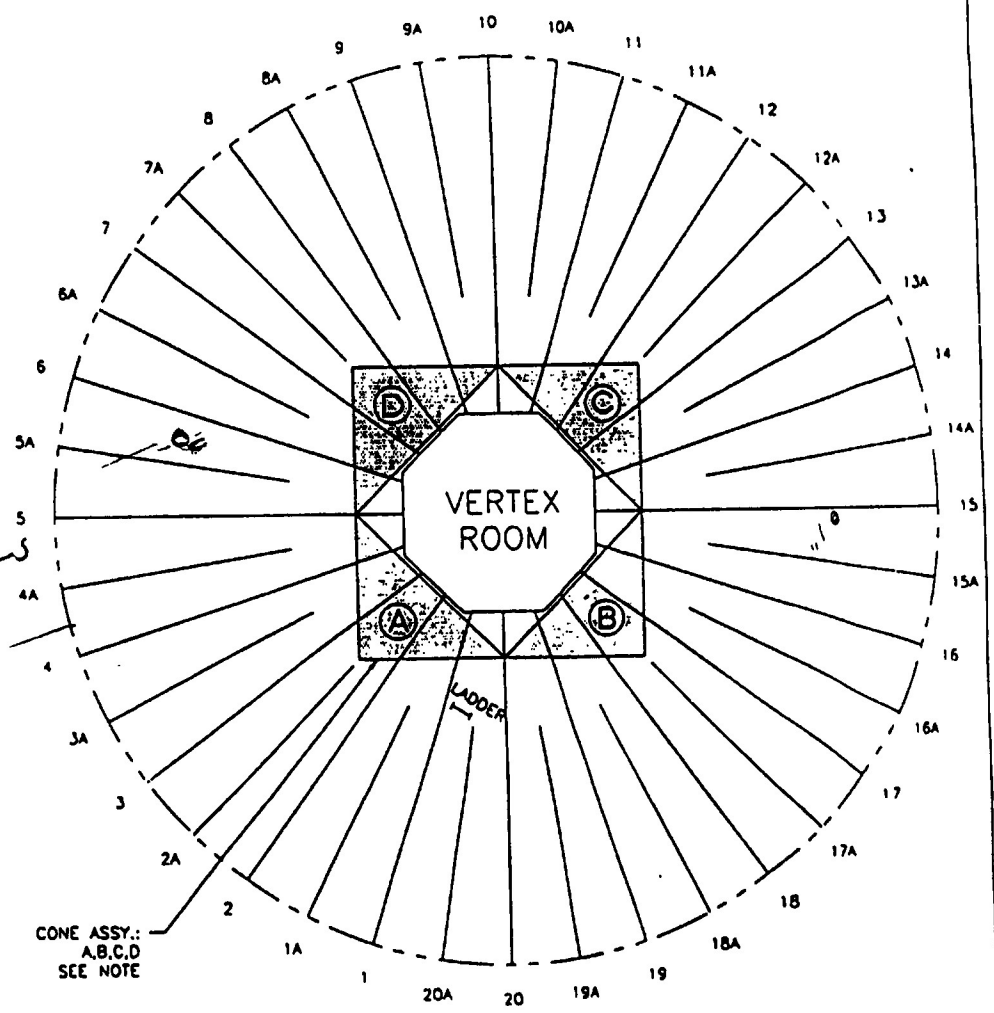
# BR Azimuth Rail Repair 1998





JOINT LISTING REQUIRING REPAIR  
(NOT INCLUSIVE)

*1/4 - 3/4"  
PAINT PEELS*



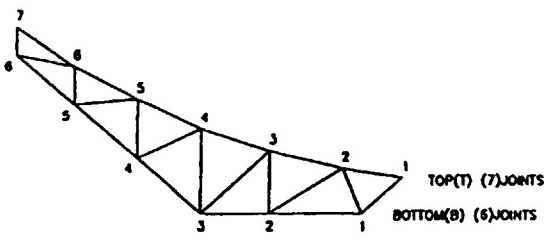
*Some splice plates on large steel beams have peeling paint, up to 10" x 10" spts*

- ANGLE PEELING
- WF BEAM AROUND VERTEX TOUCHUP
- SMALL RUST SPOTS

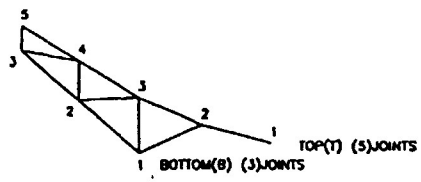
NOTE: INSPECT CONE ASSY. INTERNALLY  
REPAIR/PAINT AS REQUIRED

HEAD LABEL: VLBA PAINT

	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES ± .015		V L B A HANCOCK PAINT REPORT LOCATION OF DELAMINATIONS	NATIONAL RADIO ASTRONOMY OBSERVATORY SECOND NEW HAVEN STAGE	
	3 PLACE RECEIPTS Lab # 003			DRAWN BY: C. GARCIA DATE: 12/28/94	
	2 PLACE RECEIPTS Lab # 01			CHECKED BY: [ ] DATE: [ ]	
	1 PLACE RECEIPTS Lab # 05			MATERIAL: [ ] FINISH: [ ]	
PROJECT: [ ] SHEET: 1 OF 1 DRAWING NO.: A52502500			SCALE: [ ]		



**MAIN BEAM**



**A BEAM**

**JOINT LISTING REQUIRING REPAIR  
(NOT INCLUSIVE)**

BEAM #	BOTTOM	TOP	BEAM #	BOTTOM	TOP
1			11		
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		

- \* ANGLE PEELING
- \*\* WF BEAM AROUND VERTEX TOUCHUP
- \*\*\* SMALL RUST SPOTS

ACAD LABEL: VLBPAPIT

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

1 PLATE THICKNESS 1/8" 2 PLATE THICKNESS 1/4" 3 PLATE THICKNESS 3/8" 4 PLATE THICKNESS 1/2" 5 PLATE THICKNESS 5/8" 6 PLATE THICKNESS 3/4" 7 PLATE THICKNESS 1" 8 PLATE THICKNESS 1 1/4" 9 PLATE THICKNESS 1 1/2" 10 PLATE THICKNESS 1 3/4" 11 PLATE THICKNESS 2" 12 PLATE THICKNESS 2 1/2" 13 PLATE THICKNESS 3" 14 PLATE THICKNESS 3 1/2" 15 PLATE THICKNESS 4" 16 PLATE THICKNESS 4 1/2" 17 PLATE THICKNESS 5" 18 PLATE THICKNESS 5 1/2" 19 PLATE THICKNESS 6" 20 PLATE THICKNESS 6 1/2" 21 PLATE THICKNESS 7" 22 PLATE THICKNESS 7 1/2" 23 PLATE THICKNESS 8" 24 PLATE THICKNESS 8 1/2" 25 PLATE THICKNESS 9" 26 PLATE THICKNESS 9 1/2" 27 PLATE THICKNESS 10" 28 PLATE THICKNESS 10 1/2" 29 PLATE THICKNESS 11" 30 PLATE THICKNESS 11 1/2" 31 PLATE THICKNESS 12" 32 PLATE THICKNESS 12 1/2" 33 PLATE THICKNESS 13" 34 PLATE THICKNESS 13 1/2" 35 PLATE THICKNESS 14" 36 PLATE THICKNESS 14 1/2" 37 PLATE THICKNESS 15" 38 PLATE THICKNESS 15 1/2" 39 PLATE THICKNESS 16" 40 PLATE THICKNESS 16 1/2" 41 PLATE THICKNESS 17" 42 PLATE THICKNESS 17 1/2" 43 PLATE THICKNESS 18" 44 PLATE THICKNESS 18 1/2" 45 PLATE THICKNESS 19" 46 PLATE THICKNESS 19 1/2" 47 PLATE THICKNESS 20" 48 PLATE THICKNESS 20 1/2" 49 PLATE THICKNESS 21" 50 PLATE THICKNESS 21 1/2" 51 PLATE THICKNESS 22" 52 PLATE THICKNESS 22 1/2" 53 PLATE THICKNESS 23" 54 PLATE THICKNESS 23 1/2" 55 PLATE THICKNESS 24" 56 PLATE THICKNESS 24 1/2" 57 PLATE THICKNESS 25" 58 PLATE THICKNESS 25 1/2" 59 PLATE THICKNESS 26" 60 PLATE THICKNESS 26 1/2" 61 PLATE THICKNESS 27" 62 PLATE THICKNESS 27 1/2" 63 PLATE THICKNESS 28" 64 PLATE THICKNESS 28 1/2" 65 PLATE THICKNESS 29" 66 PLATE THICKNESS 29 1/2" 67 PLATE THICKNESS 30" 68 PLATE THICKNESS 30 1/2" 69 PLATE THICKNESS 31" 70 PLATE THICKNESS 31 1/2" 71 PLATE THICKNESS 32" 72 PLATE THICKNESS 32 1/2" 73 PLATE THICKNESS 33" 74 PLATE THICKNESS 33 1/2" 75 PLATE THICKNESS 34" 76 PLATE THICKNESS 34 1/2" 77 PLATE THICKNESS 35" 78 PLATE THICKNESS 35 1/2" 79 PLATE THICKNESS 36" 80 PLATE THICKNESS 36 1/2" 81 PLATE THICKNESS 37" 82 PLATE THICKNESS 37 1/2" 83 PLATE THICKNESS 38" 84 PLATE THICKNESS 38 1/2" 85 PLATE THICKNESS 39" 86 PLATE THICKNESS 39 1/2" 87 PLATE THICKNESS 40" 88 PLATE THICKNESS 40 1/2" 89 PLATE THICKNESS 41" 90 PLATE THICKNESS 41 1/2" 91 PLATE THICKNESS 42" 92 PLATE THICKNESS 42 1/2" 93 PLATE THICKNESS 43" 94 PLATE THICKNESS 43 1/2" 95 PLATE THICKNESS 44" 96 PLATE THICKNESS 44 1/2" 97 PLATE THICKNESS 45" 98 PLATE THICKNESS 45 1/2" 99 PLATE THICKNESS 46" 100 PLATE THICKNESS 46 1/2"

**ANTENNA PAINT REPORT**

WORKSHEET

DATE: \_\_\_\_\_

BY: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**NATIONAL RADIO ASTRONOMY OBSERVATORY**

12/20/04

12/20/04

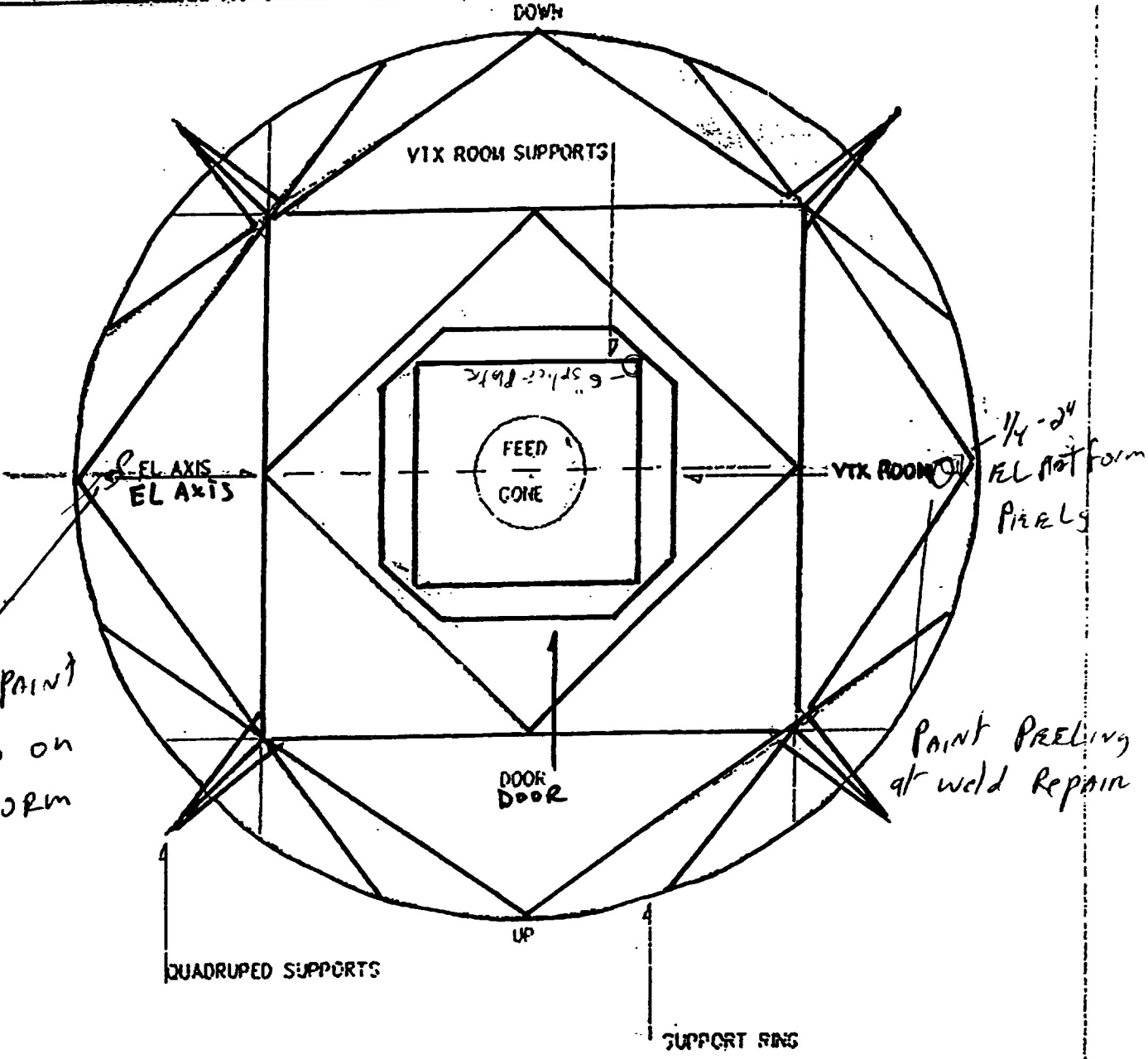
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12/20/04

# VERTEX LEVEL PAINT CONDITION AND DEGRADATION

VENEFROMSKY

PERFORMED BY:



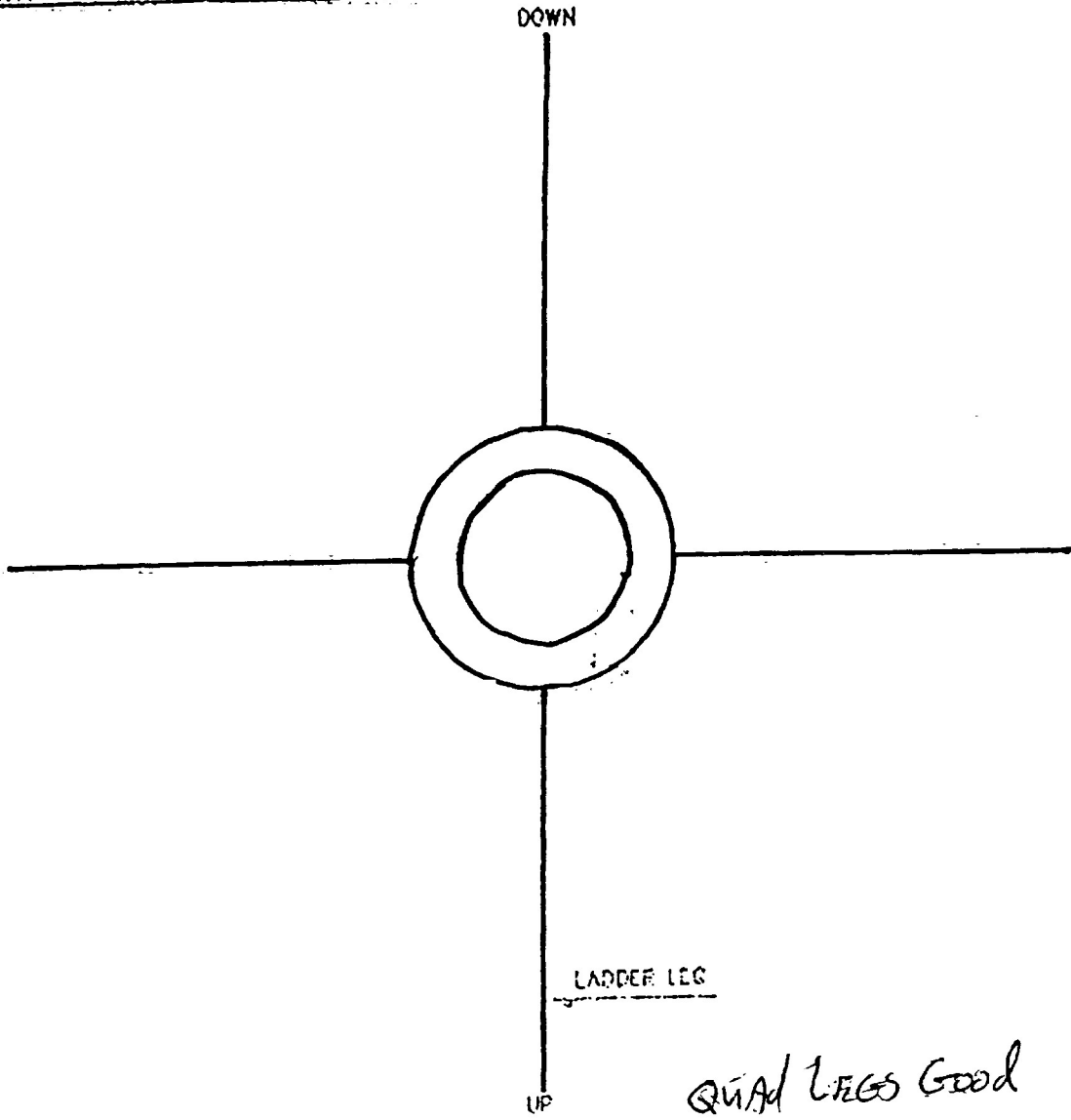
SYMBOL KEY	
SURFACE AREA DEGRADATION	
■ RUST	□ NO RUST
SPICE PLATE DEGRADATION	
● RUST	○ NO RUST
WELDED SEAM DEGRADATION	
↔ RUST	↔ NO RUST
T=TOP, B=BOTTOM, S=SIDE	
* =PREVIOUSLY REPAIRED	

# QUADRUPED PAINTING CONDITIONS

LEVEL & DATE

VIEW FROM SKY

PERFORMED BY:

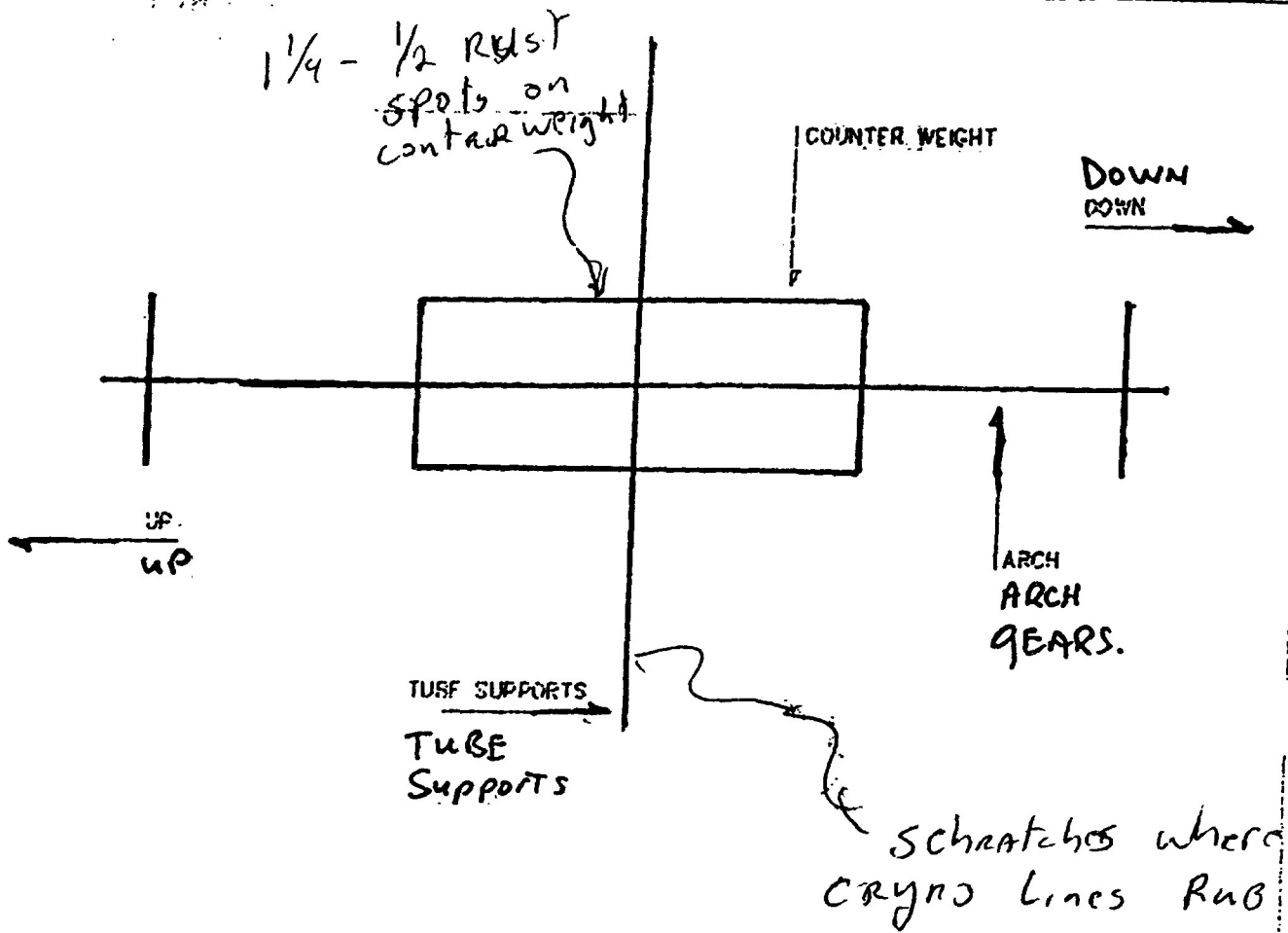


SYMBOL KEY	
SURFACE AREA DEGRADATION	
■	RUST
□	NO RUST
SPLICE PLATE DEGRADATION	
●	RUST
○	NO RUST
WELDED SEAM DEGRADATION	
—	RUST
- - -	NO RUST
T-TOP, B-BOTTOM, S-SIDE	
*	PREVIOUSLY REPAIRED



# COUNTERWEIGHT PAINT CONDITIONS

VIEW FROM SKY PERFORMED BY: DATE:

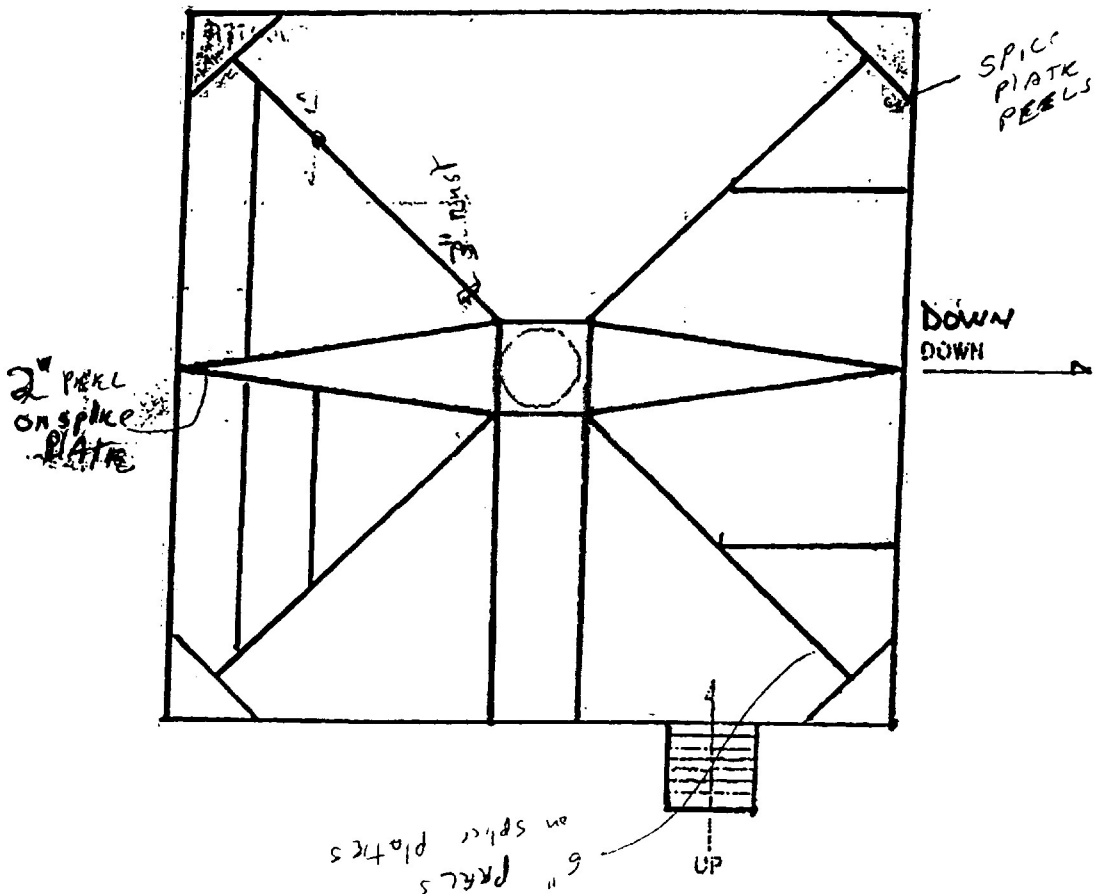


Paints is in General Good condition

SYMBOL KEY	
SURFACE AREA DEGRADATION	
■ RUST	□ NO RUST
SPICE PLATE DEGRADATION	
● RUST	○ NO RUST
WELDED SEAM DEGRADATION	
~ RUST	~ NO RUST
T-TOP, B-BOTTOM, S-SIDE	
* -PREVIOUSLY REPAIRED	

AZIMUTH LEVEL PAINT CONDITIONS - DATE:

VIEW FROM: PERFORMED BY:



PAINT IS PEELING OFF SEVERAL OF THE GALVANIZED SPICE PLATES

SYMBOL KEY	
SURFACE AREA DEGRADATION	
■ RUST	□ NO RUST
SPICE PLATE DEGRADATION	
● RUST	○ NO RUST
WELDED SEAM DEGRADATION	
↙ RUST	↘ NO RUST
T=TOP, B=BOTTOM, S=SIDE	
* -PREVIOUSLY REPAIRED	

# interoffice

MEMORANDUM

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**To:** List  
**From:** Steve Tenorio  
**Subject:** Trip report VLBA Brewster

**Date:** 15 AUG 98

15 AUG 98 Day # 1 (Sat.) Traveled to Alb.

15 AUG 98 Day # 2 (Sun.) Traveled to Brewster.

17 AUG 98 Day # 3 (Mon.) Unloaded truck., Pulled El. # 2 motor to replace armature. # 2 motor had grease type bearings in it so I ordered greaseless bearings. Unwired horn and El. Platform E-Stop for S. Aragon. Helped Mechanics remove old handrails and install new platform extensions.

18 AUG 98 Day # 4 (Tue.) Took down # 1 El. Motor and picked up new motor to El. Platform. Waited to install it so Aragon could weld platform. Worked with Mark on seating brushes on Az. # 2 motor. Replaced and seated brushes on Az. # 1 motor. Assembled #2 El. Motor and Zero'ed new armature. Installed new greaseless bearings. Installed & wired both El. Motors.

19 AUG 98 Day # 5 (wed.) Replaced spiders on all motors. Started servo test. Trouble shot El. #2 field fault. Found cold solder joint on rectifier in drive cabinet. Continued servo test.

20 AUG 98 Day # 6 (thur.) Finished servo test. Checked grounding in Ped. Room and on Antenna. Checked Power cabinets in ped. Room with I.R. thermometer. Installed breaker for mechanics for hydrolic wrench. Helped Gutierrez and Mark change flex shaft at apex.

21 AUG 98 Day # 7 (fri.) Seated brushes on El. # 2 motor. Helped Aragon with hard stops. Checked gearbox heater current.

List  
Page 2  
July 21, 1998

22 AUG 98	Day # 8 (sat.)	Ty-rapped E-stop & horn wires. Tightened panel and structure bolts. Loaded truck & traveled to Seattle.
23 AUG 98	Day # 9 (sun.)	Traveled from Seattle to Alb. and from Alb. To San Antonio N.M.

**To: Jon Thunborg**  
**From: Pete Ulbricht**  
**Subject: Brewster Maintenance Trip, August 16 - 22, 1998**

Steve Troy and I drove the box truck up to Brewster, leaving Socorro on August 14. We arrived Sunday night and the maintenance week began at the site at 7:00 am Monday morning.

I modified the B-Rack to accommodate the future 3mm installation. This included removing the old switches S11 and S12 and mounting the new switches to control the 2cm/ 3mm inputs into the T108 module. We then checked and set the levels for the 2cm, 20cm, and 6cm frontends to verify proper operation after re-plumbing and re-wiring the rack. (NOTE: The 6cm frontend had just been installed so we checked levels while we had all the equipment up there).

I also installed the feedheaters for the 7mm and 3mm frontends. I removed the damper in the Vertex Room AC unit and foiltaped the lines for Steve Troy. I also made up cables to connect the VR SmartII controller to Room 103 in the station building. I inspected the Apex area including the FRM, barrel, J-boxes, and cabling. I found no problems in this area.

I inspected the Pintle Bearing Room and found several of the rollers at the bottom of the wrap to be loose. The cablewrap was in excellent condition-----although it still had the old panhead screws (*instead of the buttonhead screws*), there were almost no signs of wear on the spring sections of the spring assembly. I could not determine why it looks so much better than the other sites. I decided not to replace the screws or do anything to it at this time.

Mark and I tried to determine where the leak was in the dry air system near the K-Band receiver. We found an O-ring folded over on the end of the dessicant tube, but were still not sure it was totally responsible for the increase in the duty cycle of the compressor.

I ran cables for the temperature sensor and the humidity sensor from the Smart II controller into rooms 104 and 103 respectively. I put in a perforated floor panel under the Maser. I made up a control cable and ran it into Rm. 103 so the site techs could plug directly into either the VR or the contempo Smart II controller from the station building to monitor or adjust the settings.

I checked for hot spots in all the J-boxes in the station building. I tightened quite a few connections-----but only three were hot in comparison with the norm. I tested the chatterbox for operation and found an old number. I also found that although you can use the microphone to talk to whoever is on the line, they can "almost " hear you and probably not make out what you are saying to them.

I dug up the propane line going from the generator to the tank to determine where it changed from 1/2" schedule 40 to 3/4" schedule 80. The tank was moved at one time from near the entrance gate to the corner of the lot. It only took two holes to find the elbow. We planted a 4x4 to mark the spot for future reference and painted the top of the marker with flourescent orange paint to keep people from running into it.

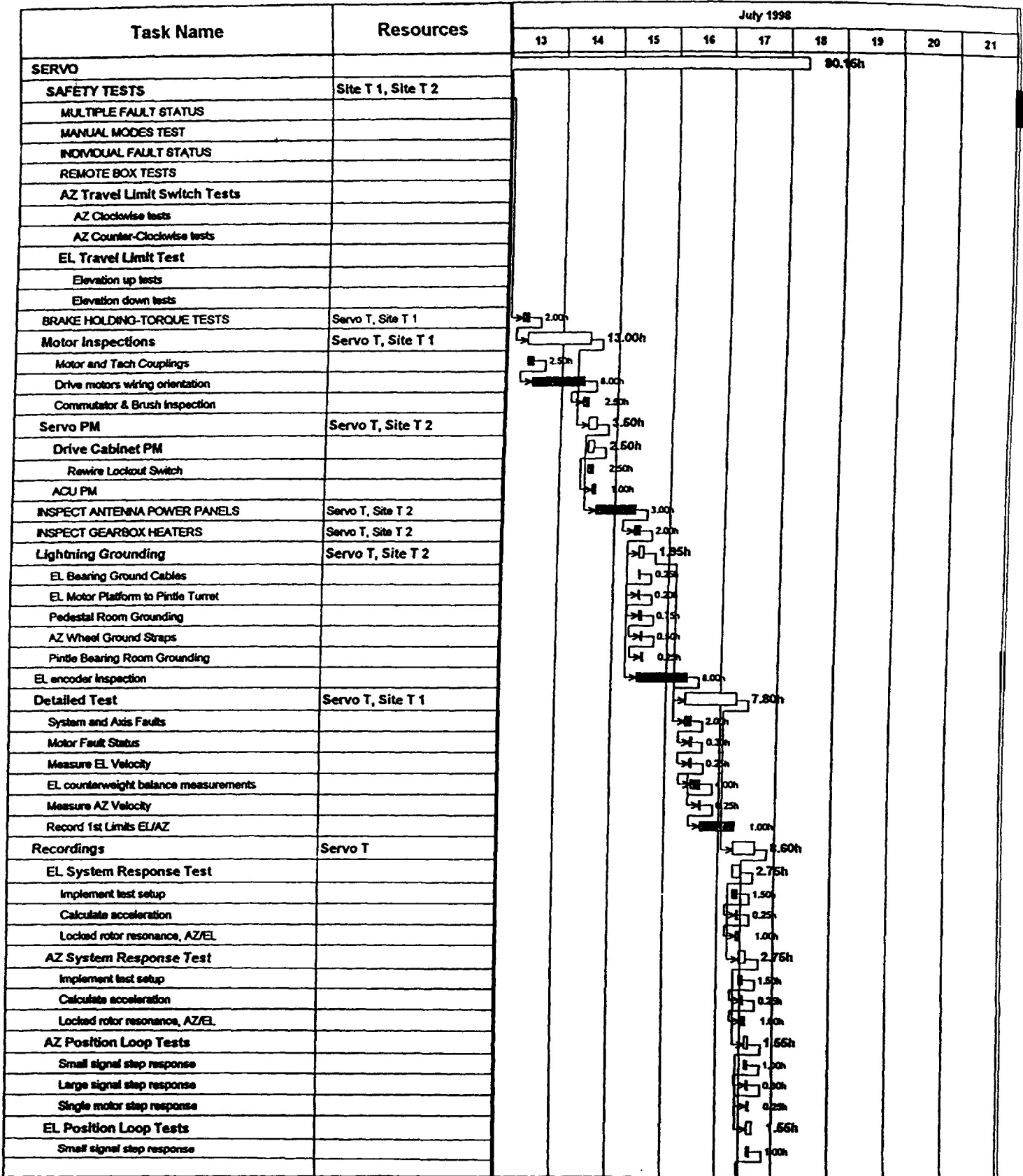
I sprayed the two wasp nests in the barrel. Three of us were stung during our week on site.

The weatherstation boards looked worse than St. Croix as far as corrosion. Bob said it was like that when it arrived. I have notified Wayne Koski and he plans to send a replacement board to swap so he can inspect the corosion here in the lab.

The new batteries were ordered for the station building UPS and received. Mark and I installed them. (The old ones were brought back to the VLA for disposal). The Brewster UPS has a shell over it made of plywood. The unit is very quiet compared to LA or KP.

Steve and I left the Brewster site on Tuesday afternoon---all systems up and running to the site techs and operations satisfaction.

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



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

