

NATIONAL RADIO ASTRONOMY OBSERVATORY
Socorro, New Mexico

VLBA Antenna Memo Series No.18

St. Croix Maintenance Visit, June 22 - 28, 1999 - Trip Report

J. E. Thunborg
July 7, 1999

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

The St. Croix maintenance team consisted of S. Aragon, R. Gutierrez, T. Montoya S. Tenorio, S. Troy, J. Thunborg and P. Ulbricht. The team worked at the St. Croix antenna from June 22 to June 28, 1999. The Site techs J. Williams and H. Winchel also worked toward the completion of the scheduled tasks.

A representative from the cryogenics group T. Montoya inspected the cryogenic systems. He also replaced several fittings in the helium lines. This required evacuation and recharging of the cryogenic system.

When the antenna is slewing in azimuth, popping noises emanate from the #1 azimuth drive wheel. These noises occur at random intervals with a frequency of about 30 per minute. Both Bearings in the #1 azimuth drive wheel had pitted outer races that will need to be replaced. It is not obvious that the bearings are responsible for the wheel popping. The wheel and both bearings will need to be replaced as soon as possible.

An azimuth bearing on the inside of idler wheel #2 was replaced because it had a chipped outer race. All of the remaining azimuths bearing races were rotated 180 degrees.

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 measured vertical runout was 0.006".

Since St. Croix is subjected to harsh environmental conditions, the antenna paint condition and level of corrosion will be described in detail in a soon to be released document. Our regimen of painting has helped but we are still losing the corrosion battle with the added on parts that were not originally galvanized. However, This corrosion has not compromised the structural integrity of the antenna.

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. Take Grease samples from elevation, azimuth and pintle bearings
5. Control building Contempo B upgrade.
6. HVAC inspections per detailed checklist.

7. Utilities - Water, Sewer and Propane System (if exists)
8. FRM - per detailed checklist.
9. Subreflector.
10. Ellipsoid and DiChroic inspections
11. Quad legs and guy wires.
12. Anemometers
13. Swinging platform.
14. Elevation platform extensions.
15. Condenser platform toe guard.
16. Elevation axle grease trays.
17. Bearing Inspections - Azimuth, Pintle and Elevation.
18. Gearbox inspections - Azimuth and Elevation.
19. Paint Inspection - Complete Hancock paint report.
20. Rail inspection and level measurement.
21. Antenna structure - Cracks, loose bolts
22. Antenna electrical inspections - Per detailed checklist
23. Station building electrical inspections - Per detailed checklist
24. Other electrical inspections - generator, weather station and ground.
25. Checked pintle bearing pocket flatness.
26. Changed vertex room air handler coils.

The following non-scheduled items were also completed.

1. Replaced Lovejoy couplings on all drive motors
2. Repaired broken lightning protection ground cable.
3. Replaced #2 azimuth inside idler bearing.
4. Replaced light stanchions and rewired lights.
5. Replaced corroded bolts on feed cone.
6. Replaced 2 corroded servo blower motor covers.
7. Replaced corroded FRM bolts on the cable tube and mounting pads
8. Replaced corroded panels on vertex a/c condenser.
9. Replaced vertex a/c flex lines.
10. Replaced room 100 a/c condenser.
11. Upgraded condenser wiring to 3 phase and corrected some wiring problems.
12. Replaced vertex condensing unit disconnect switch with plastic one. The original was badly corroded.
13. Repaired input seal on #2 el and #1 az gearboxes.
14. Replaced corroded bolts on L and C band feeds.
15. Replaced corroded turnbuckles on FRM. Added 5th turnbuckle.
16. Replaced corroded cryo fittings and unistrut tube supports.
17. Repaired cryo compressor.
18. Repaired broken lightning protection ground cables.
19. Reheaded the winch cable.
20. Replaced the winch safety gate.
21. Replaced 2" nuts and washers on pintle room structure.
22. Replaced 2 burned fuses in Az #2 motor controller.
23. Sealed Contempo air duct.
24. Installed cable support hangers on pintle room cables.
25. Checked IF cable runs with TDR and power meter.
26. Aligned FRM.
27. Replaced thermocouple on receiver.

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

1. The bolts on the donut, quad legs, backup structure, gear sector and panels were not checked. Because of the corrosion, we did not want to break the paint.
2. The feed mounting and DiChroic hardware on the feed cone is severely rusted and will need to be replaced. Several of the bolts holding the feeds needs to be replaced. We will either replace this hardware during the next azimuth wheel repair trip or we will leave material behind for the site techs to install.
3. Elevation counterweight balance measurement was not performed. This should be accomplished during the next tiger team visit.
4. New stainless steel servomotor J-boxes were not installed. These will be installed by the site techs. A work order has been issued for this task.
5. The original hard rubber stops on the FRM turned soft and gooey. We replaced the originals and the new stops deteriorated overnight. We will fabricate stops out of a more suitable material and send to the site where they will be installed by the site techs. A work order has been issued for this task.
6. The gearbox flow indicators and level indicators need to be either cleaned or replaced. This will be accomplished by the site techs. A work order has been issued for this task.
7. The mount for the flow indicators on the elevation gearbox has rusted through and needs to be replaced. A new mount will be fabricated at the VLA and sent to the site where it will be installed by the site techs. A work order has been issued for this task.
8. The cotter keys on the FRM guy rods have rusted beyond usefulness and need to be replaced. The site techs will accomplish this task. A work order has been issued for this task.
9. The supports for the vertex room a/c condenser have rusted and need to be replaced. This will be accomplished during the next tiger team visit.
10. The vertex room door is rusted through and needs replacement. A work order has been issued for this task.
11. The SO cables have deteriorated and will need to be replaced soon. This is happening at several sites and needs to be added to the tiger team task list.
12. The antenna needs to be steamed cleaned, as there is sur-tac grease and gearbox oil all over the structure. A work order has been issued for this task.
13. Additional chaffing rings are needed on the cable wrap. Pete will have some made by the VLA machine shop and send them to St. Croix where they will be installed by the site techs.
14. The feedheaters were all corroded and will need to be replaced. Pete will rebuild them and send them back to St. Croix where they will be installed by the site techs.
15. The gore track on the FRM is badly corroded and needs replacement. This will be accomplished on the next maintenance visit.
16. The second screw sensor gear on the FRM is badly corroded, This needs to be replaced.

interoffice

MEMORANDUM

To: List
From: Steve Tenorio
Subject: Trip report VLBA St. Croix
Date: 30jun99

20jun99	Day # 1	Travel from San Antonio NM. To Alb.
21jun99	Day # 2	Travel from Alb. To St. Croix.
22jun99	Day # 3	Emptied container. Checked brake tension Az. and El. Brakes. Helped Herb with safety checks. Helped antenna mechanics with platform extensions. Replaced spiders on motors couplings on Az. #1 and Az. #2 and El. #1 motors. Helped antenna mechanics replace gearbox seals Az. # 1 gearbox. Moved warning horn on El. Platform.
23jun99	Day # 4	Replaced spider El. # 2 motor coupling. Helped antenna mechanics replace seals El. # 2 gearbox. Changed and seated brushes on Az. #1 , Az. # 2, El. # 1, El. # 2 motors.
24jun99	Day # 5	Completed drive cabinet pm. Completed fault condition check per pm. Completed servo test. Checked electrical panels in ped. Room with I.R. thermometer. Checked ped. Room grounding. Replaced two burned fuses in Az. # 2 motor controller.
25jun99	Day # 6	Replaced broken ground cable on encoder side of El. Bearing. Checked grounding on antenna structure. Repaired broken ground cable on FRM. Replaced blower fan covers on Az. # 1 and El. # 2 blower motors. Re-wired El. Platform E-stop on new platform extension. Repaired wench cable. Removed Az. Data gearbox so inside bearing could be replaced.

26jun99	Day # 7	Repaired Az. Data gearbox coupling. Helped Thunborg replace inside bearing on data gearbox wheel. Greased Az. Wheels and pinal bearing. Helped Thunborg check pinal bearing bolts. Repaired tach. Coupling on Az. # 2.
27jun99	Day # 8	Helped antenna mechanics align FRM. And replace broken turnbuckle. Cut off rusted light support pipes.
28jun99	Day # 9	Installed and wired antenna lighting. Helped Aragon with hardstops. Loaded up container, cleaned up ped. Room and bottom of antenna.
29jun99	Day # 10	Traveled back from St. Croix to San Antonio N. M.

Conclusion:

Overall the servo system is in pretty good shape. Worked with John and Herb on some brush seating tips and tach. Coupling checks. Other than that servo system seems to be doing good.

St. Croix Maintenance Report
June 21-29, 1999
Pete Ulbricht

I installed a humidity sensor and a temperature sensor for Steve Troy to the Smart II controller. The RFI screen under the floor between Rooms 103 and 104 has been cut out in the air flow area. I checked and oiled the D-Rack Blower. I also ran control cables for both the Vertex Room DDC and the Contempo DDC into room 103 so they can both be monitored by the new PCTool 5.0 software I installed on their PC. I also added a perforated panel under the Maser. The DDC temp sensor is directly below the maser to keep the temperature stable. While installing the humidity sensor I noticed a large opening above the Contempo return air duct. This would allow air in the mechanical room to be drawn back into the Contempo. Steve and I worked on the duct and sealed the opening. I checked all the junction boxes in the building with the Infrared Thermometer for hot spots. I found only one and tightened down the connection to fix the problem.

I installed cable support hangers on all the cables in the Pintle Bearing Room. The St. Croix cable wrap has the worst chafing problem of all the sites due to the location of the three large power cables. Instead of being spaced 120 degrees apart, they are all on the same side, maybe within 200 degrees. One of the power cables had broken the tyraps holding it off the floor at the bottom of the Pintle Bearing room. I strapped it back up with tyraps. Normally we only get chafing on the top two, and sometimes the bottom rings. I used up all my spare chafing rings, and I still need 5 more to protect the cables a little better. I will have some made up and sent to the site techs. The Azimuth Cablewrap spring assembly looked to be in good condition, no maintenance on it was required.

The SO cable outside the Pedroom is deteriorating. The insulation is splitting on several of the cables. I've noticed this at several of the sites. We will have to decide what the best method will be to replace the SO on the VLBA antennas and how long we can go before we have to take care of it. Talking to Lew Serna, we started replacing the SO on the VLA antennas after about 14 years, and using conduit instead.

Steve Tenario and I rewired the antenna lights after Steve Aragon welded the stainless steel conduit up to replace the old ones.

Steve and I also helped Ramon Gutierrez with the subreflector alignment.

I checked the IF cable runs and the 500Mhz and 100Mhz runs with the TDR and also with the Power Meter. There were no bad connections, and the cables all measured between 8.1 and 8.3 dBm loss from the back of the C-Rack to the back of the B-Rack. This compared favorably with the caculated loss for a 260 ft. run of 3/8" heliax, RG141, and RG214 cables with connectors.

I removed the Station Computer from the rack and installed the new SCSI hard drive into it. The modification went very well. The cables were all clearly labeled in the back of the rack.

I had Herb remove all the feedheaters from the feedcone----the heating elements were all corroded through. I will rebuild them with the new elements and send them back.

I was unable to replace the FRM cables at the apex. The flexible cable trays from the donut to the center ring could not be taken apart without destroying them. As no replacement parts were available, I decided to wait until I could get all the needed parts (goretrack, stainless steel hardware, new stainless steel j-boxes, coated unistrut, etc.) together before tearing out the old cables. This should be done by the next maintenance trip at the latest.

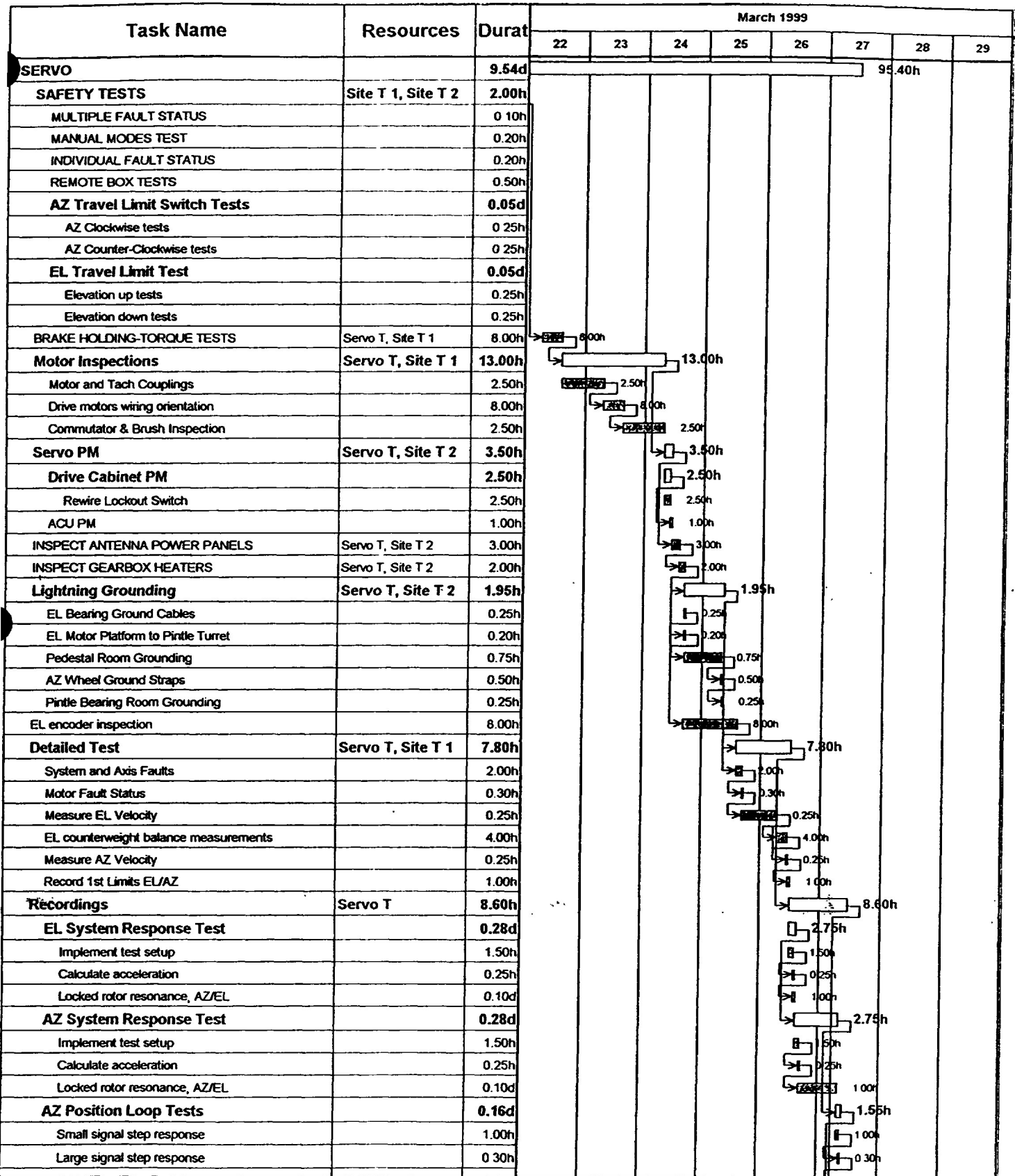
Overall, my inspection of the site confirmed that electronically, it is in as good a shape as all the other sites. We are, however, losing the battle of exterior maintenance due to the corrosive atmosphere. We need to come up with a daily routine, rather than relying on painting contractors trying to keep ahead of the rust a couple of days every month or two. St. Croix could use a full time employee whose only job would be to work on the outside structures. He would spend his time replacing corroded hardware with stainless steel hardware; and prepping, priming, and painting bad areas before they get too bad.

The FRM rubber hard stops are, for lack of a better description, melting. I replaced them all, but found the new ones starting to do the same thing....overnight. They are "dripping" all over the subreflector and dish. I am bringing one back to determine what is causing this. (Temperature, chemical, salt air?). This problem showed up about a year ago when J. Oty found one on the ground. The melting, dripping problem is more recent, within the last month and a half. We should probably remove them, and find a different material to make new ones for this site.

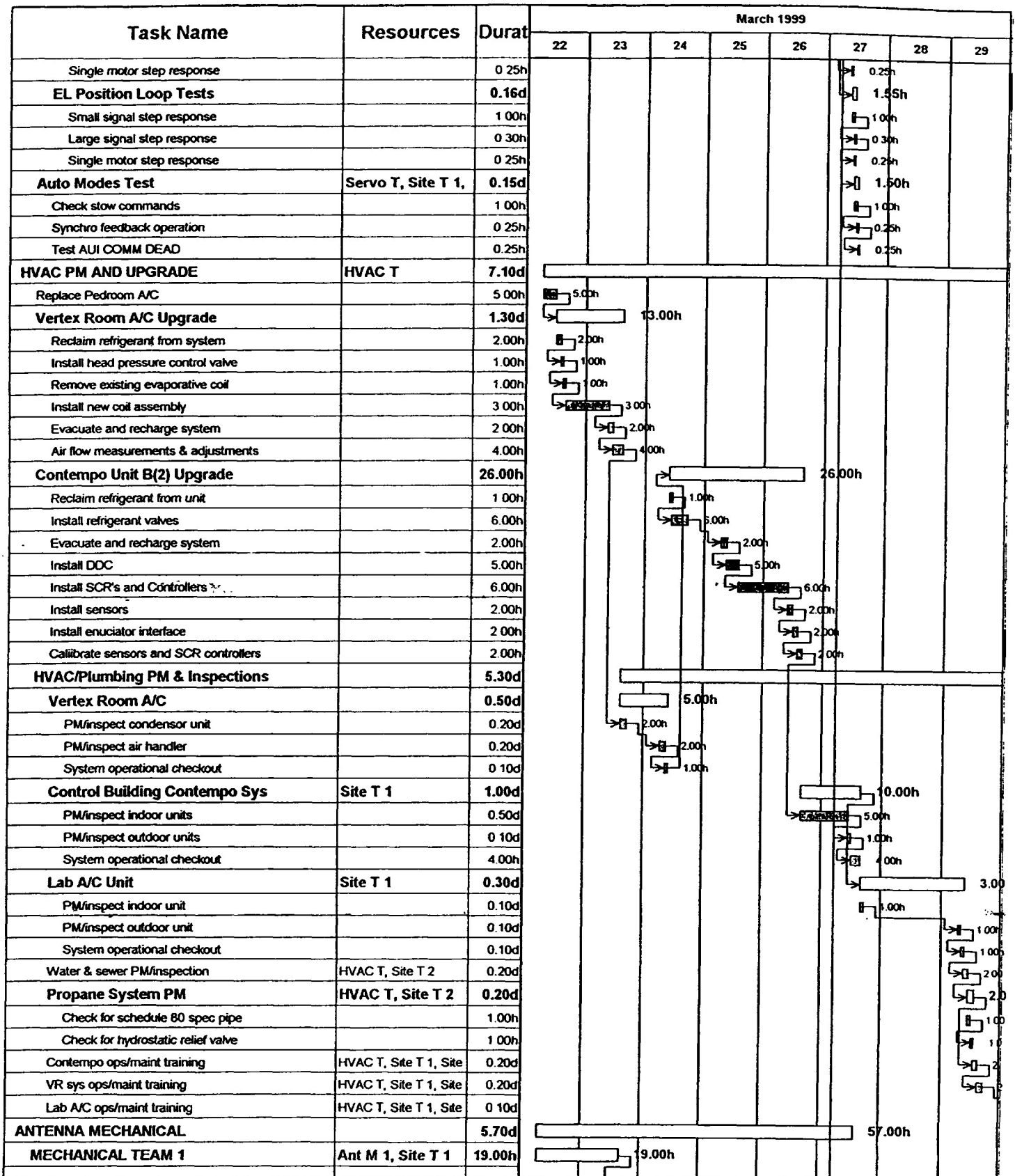
While checking out the weatherstation cabinet, I stripped out two bolts on the door trying to get it open. I replaced them with new bolts, but had to put nuts on the backside. This is a site wide problem. We had to break several of the 5/16" bolts holding the turnbuckles on at the FRM to replace them. We found one turnbuckle that had already corroded through. This is another justification for having a fulltime mechanical maintenance person at this site.

This trip involved more cross-training among the team, as well as with the site techs in order to complete the large workload due to the condition of the site from the corrosive environment. I know I gained a greater respect for all the mechanical tasks involved in maintaining the structural integrity of our VLBA antennas.

1999 VLBA Tiger Team Maintenance
Task Listing for MK, HN and SC



**1999 VLBA Tiger Team Maintenance
Task Listing for MK, HN and SC**

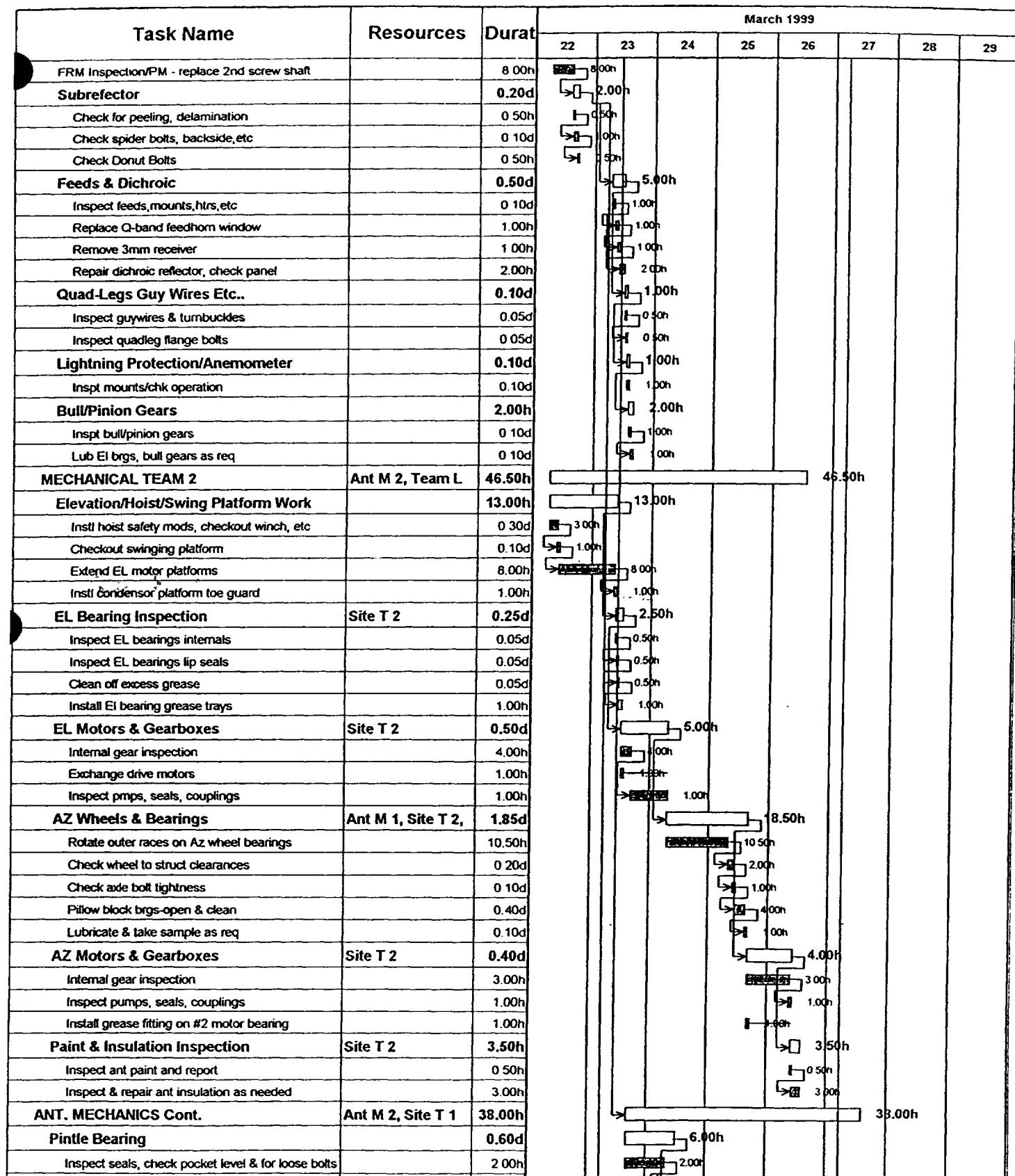


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Milestone △ Summary
Fixed Delay - - - Slack . . .

1999 VLBA Tiger Team Maintenance
Task Listing for MK, HN and SC



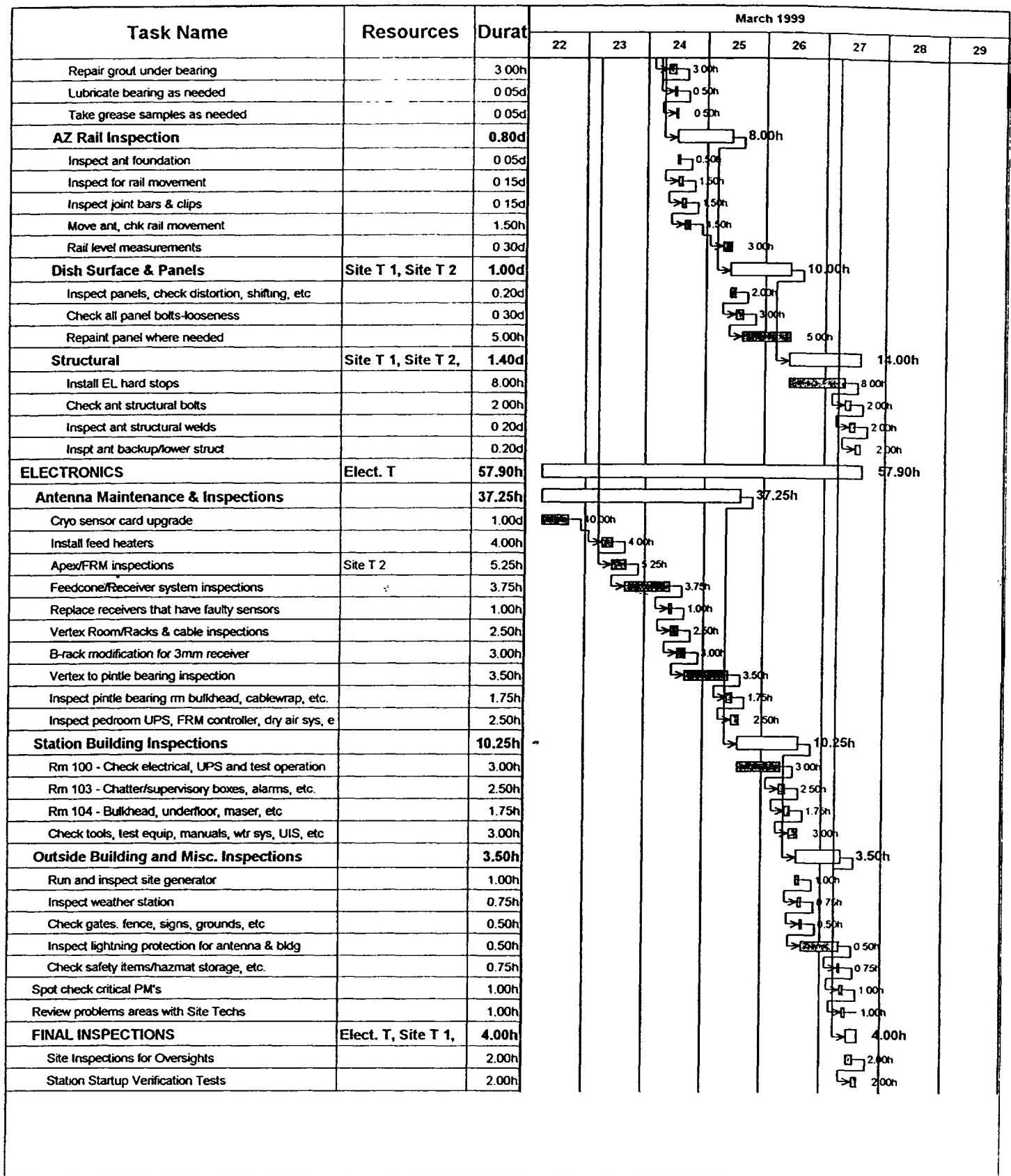
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Milestone △ Summary

Fixed Delay - - - Slack

1999 VLBA Tiger Team Maintenance
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SC Azimuth Rail

Measured 6/28/99

