

**National Radio Astronomy Observatory  
Socorro, NM**

**VLBA Antenna Memo Series #33**

**Owens Valley Maintenance Visit  
June 11<sup>th</sup> through 17<sup>th</sup>, 2001**

**Jim Ruff  
7/10/01**

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

**The team consisted of Steve Aragon, Ramon Gutierrez, Bob McGoldrick, Steve Tenorio, Steve Troy and Jim Ruff. Site Techs Jim Brown and Bill Robbins assisted throughout.**



**An apex handrail and a quad leg ladder and Sellstrom fall arrest system were installed.**

**The pintle bearing pocket was checked for flatness. Measured TIR was 0.004”.**

**The FRM INA bearing clearance measured 0.003”.**

**No structural cracks were found.**

**Kellum grips were installed on three chafing power cables.**

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

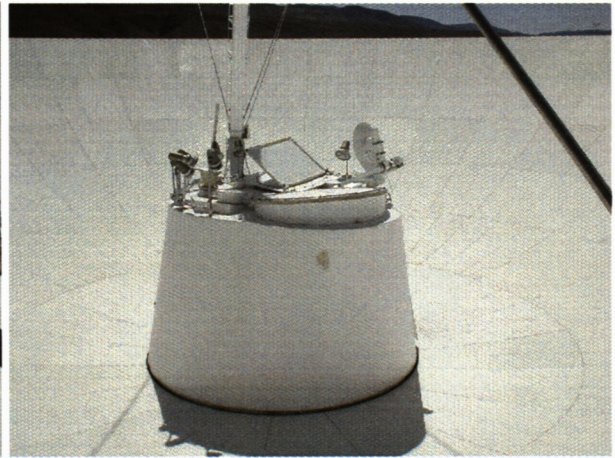
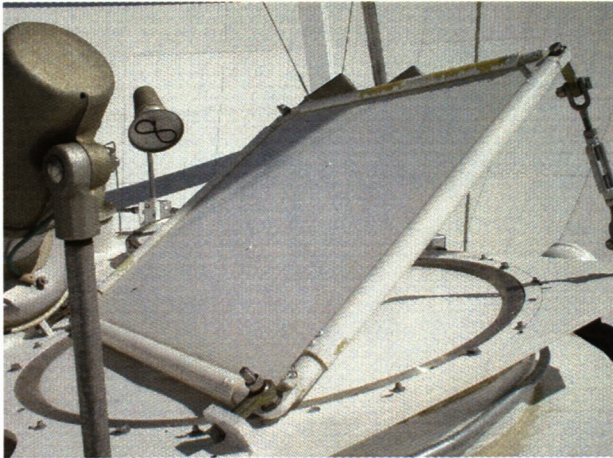


The watch spring cable wrap had some cables dragging on the deck plate. Moved them up.

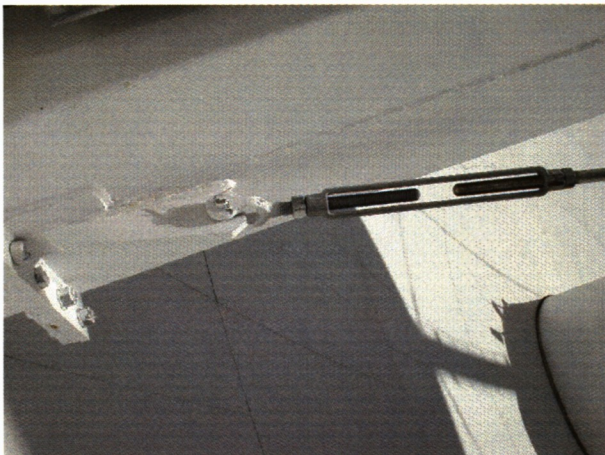
The azimuth bearings were inspected. No bearings needed replacing. The outer races had been rotated previously, so we didn't do it. The bearings on this antenna are getting plenty of grease. Jim and Bill are to be commended for their conscientious job. OV uses a different grease from the other sites. They find that Shell *Darina EP2* and Shell *Alvania EP2* retain oil better in the hot weather common there.

	Drive 1	Drive 2	Tach-side Idler	Other Idler
Inner	OK	OK. Pits in O.R.	OK	OK
Outer	OK	Very fine metal flakes	OK. Minor pitting.	OK

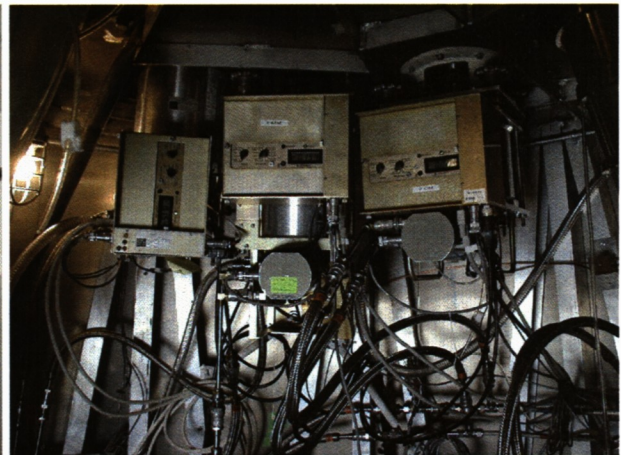
Drive Wheel Alignment			
Wheel #	Horizontal Error	Vertical Error	Radius Error
D1	0° 0' 9"	0° 1' 45" (too flat)	0.09" (out)
D2	-0° 0' 34"	-0° 1' 5" (too steep)	0.17" (out)



The dichroic panel is in good condition, but the paint on the frame needed touch-up.



One quad leg t-buckle jam nut needed tightening.

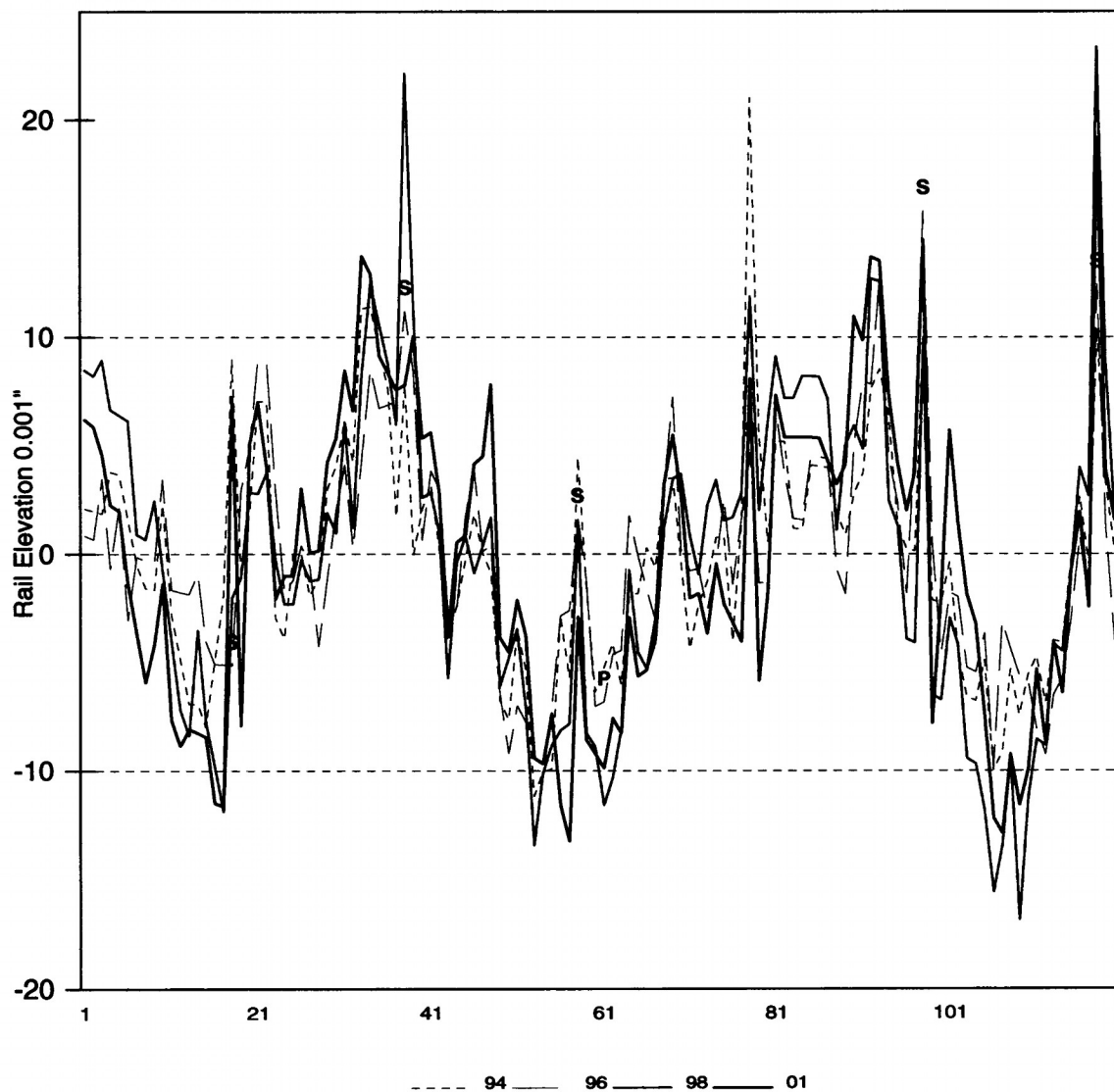


86 GHz Receiver



The azimuth rail grout and Vulkem are in excellent condition.

## OV Azimuth Rail

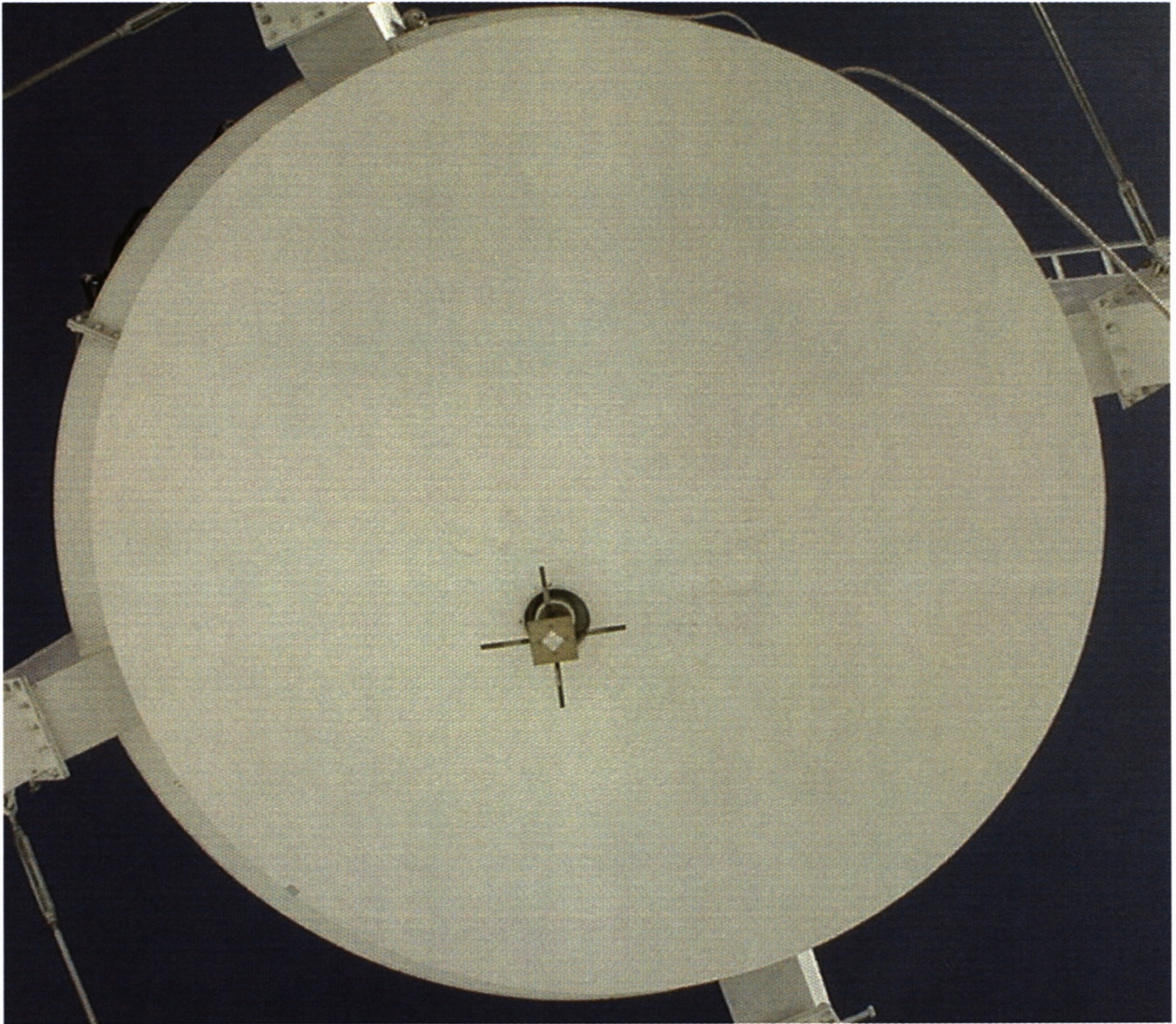




The paint on this antenna is in excellent condition.







The subreflector is in good condition.



# **National Radio Astronomy Observatory**

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**To: Jim Ruff**

**Subject: Owens Valley Tiger Team Report**

**From: Bob McGoldrick**

**Date: 2 July 2001**

The Owens Valley Station is well maintained, and a considerable amount of maintenance was completed by the Tiger Team in conjunction with the Site Techs, Jim Brown and Bill Robbins. The members of the Tiger Team were Jim Ruff (PE Engineer in charge), Ramon Gutierrez, Steve Tenorio, Steve Aragon, Steve Troy, and Bob McGoldrick.

The Site Techs leave little to find fault with around the station as is evidenced with their replace as you go attitude concerning station maintenance and upkeep. Many improvements and maintenance issues were corrected, but some items were left for the Site Techs to correct.

## **ACTION COMPLETED**

1. The Electronics Inspection Sheet was completed, except where Tom Baldwin left specific instructions to leave for him on a later visit.
2. Ramon Gutierrez, Steve Aragon, and Steve Tenorio removed the old bolt-ladder on the apex leg, installed a new safer ladder in its place, and also installed the new fall arrest rail on the ladder; Ramon Gutierrez installed the apex safety rail also.
3. A new RH sensor over the recorders for Contempo temperature/humidity control was installed by Steve Troy. He also did the HVAC upgrades in the station building and pedestal room.
4. Strain reliefs for all cables needing strain relief in the Cable Wrap were installed; three holes were drilled in the top-plate(just below the bulkhead ceiling) to hang the strain reliefs. Steve Aragon found one of the strain reliefs needed to be reinstalled as it was being interfered with and coming undone, while another was too big. He showed me how to use a smaller size to compensate. Tom Baldwin has acquired some more strain reliefs of the proper size.
5. Bob McGoldrick cleaned/decontaminated the cable wrap and all the rings in pintel bearing room; Jim Brown cleaned out the grease from the pintel bearing overflow. Ring three through ring six has only the OEM supplied cheap plastic rings in each hole to protect the cables; there were nine holes per ring that have cables running through them which totals out to thirty six holes that need the improved plastic protectors.
6. The Pedestal Room bulkhead feedthroughs (adjacent to the outside Pintel bearing Room bulkhead) were found to have some water damage on the inside/outside wall surfaces, but the damage is old and the previous caulking is still working well.
7. Bob McGoldrick inspected both site Tape Recorders and looked at some Recorder Test results to determine if any major work would be needed; He found that recorder one needed a replacement idler roller and some hub parts were needed for both recorders. It was found that the denatured alcohol contained some questionable ingredients, specifically "1% of either (gasoline, kerosene or a rubber hydrocarbon solvent)."
8. Jim Ruff replaced the dish anemometer roll pin blocks with replacement blocks and new



bolts rather than roll pins; He had the machine shop modify old blocks prior to the visit, and plans to take the old blocks back for modification prior to the next trip.

9. Jim Brown and Bob McGoldrick checked the generator out and found it to be up to par with the rest of the station; hoses, wires, filters, and switches were in good condition.
10. Tie wraps from Az motors to the Apex were replaced as needed; the cable run from the bottom of the quadraped leg to the Apex showed no sign of any tie wrap problems at the time.
11. Steve Tenorio replaced the j-boxes for all motors, including wiring, and replaced brushes and holders where necessary.
12. Steve Tenorio installed the Hacr-breaker in the non critical panel in Pedestal room.

#### **ACTIONS TO BE COMPLETED**

1. The upper room of the Vertex room, inside the feed cone, hatch has some styrofoam insulation on the door sill that is loose and should be repaired or replaced; the Site Techs are aware of the problem.
2. A couple of cinder blocks on the station building are cracked, but do not appear to be serious.
3. The Antenna paint is in remarkable condition considering it has never been painted, however the lower underside of the structure seems to have accelerated its coating deterioration, and paint is flaking off at a seemingly greater rate. Jim Ruff is aware of this.
4. The phone system will be upgraded when the rest of the phones arrive.
5. Chafe rings for rings three through six on the cable wrap need to be replaced; Tom Baldwin is aware of this.
6. The denatured alcohol used to clean the recorders and heads should be replaced with isopropyl alcohol.
7. The dirt road should be routinely graded by Cal Tech rather than infrequently graded.
8. The weather station to pedestal room MCB portable cable will be built by the site techs.

CC: Paul Rhodes, Tom Baldwin, Steve Durand



**To:** List  
**From:** Steve Tenorio  
**Subject:** Trip report Owens Valley  
**Date:** 20mar99

09jun01	Day # 1	Travel to Laughlin Nevada
10jun01	Day # 2	Travel from Laughlin to Bishop.
11jun01	Day # 3	Emptied container. Helped ant. Mechanics remove apex quad. Leg bolts and install new ladder and fall arrest system. Changed Az. #2 motor J- Box.
12jun01	Day # 4	Had two tires changed on truck.. Changed out #1 & #2 Elevation motor J- Boxes.
13jun01	Day # 5	Checked power panels in ped. Room with IR thermometer. Checked gear box heaters. Checked ped room grounding. Completed Drive Cabinet pm. Completed A.C.U. pm. Completed motor pms. Seated Brushes, cleaned commutator on Az. #1. Az. #1 quit failing single motor cw.
14jun01	Day # 5	Changed Az. & El. Motor coupling spiders, Checked Brake tensions. Completed servo test.
15jun01	Day # 6	Trouble shot stow setting problem. When you set stow parameters they don't repeat. Off by .005 degrees. Auto control board bad. Will send one from VLA. Moved E-stop on El. Platform. Moved claxton horn on El. Platform. Helped Aragon with hard stops. Moved stow pin switch for Aragon. Ty-rapped El. Motor cables.
16jun01	Day # 7	Checked wave shapes on tp 14 on SCR cards. No difference on Az. #1. Checked grounding from ped room up.
17jun01	Day # 8	Checked Az. #1 motor. Changed Brushes holders on Az. #1 motor . Cleaned ped. Room. Loaded tools into container. Showed Jim & Bill how to change parameters. Loaded container, cleaned up site, Did pre-trip on truck.
18jun01	Day #9	Traveled from Bishop to Flagstaff.
19jun01	Day #10	Traveled from Flagstaff to San Antonio.

**Conclusions:**

Owens Valley site looks pretty good as far as the servo systems goes. Az. #1 seems to be fixed now. Site techs should keep an eye on it though. The servo shop will send a replacement Auto Board to Site techs to correct the Stow parameter setting problem.



## Task Name Resources

### SERVO

#### SAFETY TESTS

MULTIPLE FAULT STATUS  
MANUAL MODES TEST  
INDIVIDUAL FAULT STATUS  
REMOTE BOX TESTS

#### AZ Travel Limit Switch Tests

AZ Clockwise tests  
AZ Counter-Clockwise tests

#### EL Travel Limit Test

Elevation up tests  
Elevation down tests  
BRAKE HOLDING-TORQUE TESTS Servo T, Site T 1

#### Motor Inspections

Install stainless steel j-boxes on drive motors (4)  
Motor and Tach Couplings  
Drive motors wiring orientation  
Commutator & Brush Inspection

#### Servo PM

Replace SCR EL cooling fan  
ACU PM

#### Lightning Grounding

EL Bearing Ground Cables  
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

#### Recordings

#### EL System Response Test

Implement test setup  
Calculate acceleration  
Locked rotor resonance, AZ/EL

#### AZ System Response Test

Implement test setup  
Calculate acceleration  
Locked rotor resonance, AZ/EL

#### AZ Position Loop Tests

Small signal step response  
Large signal step response  
Single motor step response

#### EL Position Loop Tests

Small signal step response  
Large signal step response  
Single motor step response

#### Auto Modes Test

Check stow commands  
Synchro feedback operation  
Test AUI COMM DEAD

### HVAC PM AND UPGRADE

#### Antenna

#### Pedestal room A/C replacement

Remove window A/C unit & wall sleeve  
Remove wall heater  
Remove environmental control box  
Install Marvair unit  
Install thermostat  
Install power & control wiring  
Perform operational tests & place unit in service  
Provide Site Techs w/manual and hold Q&A session.

#### Vertex Room A/C

Inspect air handler  
Inspect condenser unit  
inspect lines & bulkhead fittings  
Repair/replace damaged line insulation  
Replace & calibrate Hoffman fan control  
Replace any suspect bulkhead fitting  
Evacuate & place unit back in service  
Check ROC settings (C1, set 120, Def.30)  
Check PCTool to DDC connection @ computer  
Make hard copy of program parameters

Check programing, save program file to disk.

Hold Q&A session w/ Site Tech's

#### Control Building

#### Building A/C System

Perform operational checks  
Inspect indoor & outdoor units  
Correct deficiencies as needed.

#### Stand-By Contempo

Recover refrigerant

#### Condensing Unit

Install head pressure control by-pass valve  
Install & calibrate Hoffman fan units  
Replace fan unit

#### Indoor Unit

Install primary unit interface relay board  
Install controll relay  
Install Hoffman SCR's  
Replace control panel light  
Install auxillary terminal block  
Replace V-belt & adjust pully to maximum  
Evacuate & recharge refrigerant  
Perform operational checks

#### Primary Contempo

#### Condensing Unit

install & calibrate Hoffman fan control  
Replace fan switch

#### Indoor Unit

Install auxillary terminal block  
Install utility interface auxillary switch  
Install wiring to stand-by unit  
Perform operational checks  
Check PCTool to DDC connection at computer  
Make hard copy of program parameters  
Check program & save program file to disk  
Perform hard test of emergency power w/ Contempo's  
Review site documents with Site Techs  
Inspect site utilities

### ANTENNA MECHANICAL

Install new ladder & fall arrest system

FRM 2-year PM

FRM INA bearing check

Installed Zirk extensions

Install apex guardrail

#### Subreflector

Check for peeling, delamination

#### Feeds & Dichroic

Inspect feeds,mounts,hts,etc  
Repair feedcone housing exterior, chk dichroic reflector

#### Quad-Legs Guy Wires Etc..

Inspect guywires & turnbuckles One jam nut loose  
Inspect quadleg flange bolts

#### Lightning Protection/Anemometer

Inspt mounts/chk operation  
Install Baldwin bracket

#### Bull/Pinion Gears

Inspt bull/pinion gears  
Lub El brgs, bull gears as req  
Check stow pin

#### Elevation/Hoist/Swing Platform Work

Instl hoist safety mods, checkout winch, etc  
Checkout swinging platform  
Extend EL motor platforms done previously  
Instl condensor platform toe guard done previously

#### EL Bearing Inspection

Inspect EL bearings lip seals  
Clean off excess grease  
Install El bearing grease trays done previously

#### EL Motors & Gearboxes

Change gear oil in gearbox  
Inspect pumps, seals & couplings  
Check gearbox heater enclosures

#### AZ Wheels & Bearings

Pressure wash gear boxes not needed  
Rotate outer races on Az wheel bearings done previously  
Check wheel to struct clearances  
Check AZ wheel radii and alignment  
Check axle bolt tightness  
Pillow block brgs-open & clean  
Lubricate & take sample as req

**AZ Motors & Gearboxes**

Inspect pumps, seals, couplings

**Paint & Insulation Inspection**

Inspect ant paint and report

Inspect & repair ant insulation as needed

**Pintle Bearing**

Inspect seals, check pocket level & for loose bolts

Lubricate bearing as needed

Close gap in pintle grease catcher           done previously

**AZ Rail Inspection**

Inspect ant foundation

Inspect for rail movement

Inspect joint bars & clips

Move ant, chk rail movement

Rail level measurements

Check popping wheel                           none

**Dish Surface & Panels**

Inspect panels, check distortion, shifting, etc

Spot check all panel bolts-looseness

**Structural**

Install EL hard stops

Spot check ant structural bolts

Inspect ant structural welds

Inspt ant backup/lower struct

Inspect EL axle

**ELECTRONICS****Antenna Maintenance & Inspections**

Activate & test feed heaters

Apex/FRM inspections Site T 2

Feedcone/Receiver system inspections

Vertex Room/Racks & cable inspections

Vertex to pintle bearing inspection

Replace tie wraps 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 electrical breaker for air comp & hydraulic wrench

**Station Building Inspections**

Rm 100 - Check electrical, UPS and test operation

Rm 103 - Chatter/supervisory boxes, alarms, etc.

Rm 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

Check gates, fence, signs, grounds, etc

Inspect lightning protection for antenna & bldg

Check safety items/hazmat storage, etc.

**FINAL INSPECTIONS**

Spot check critical PM's

Review problem areas with site tech's

Site Inspections for Oversights

Site clean-up

Station Startup Verification Tests

Fall Protection training