National Radio Astronomy Observatory
Socorro, NM

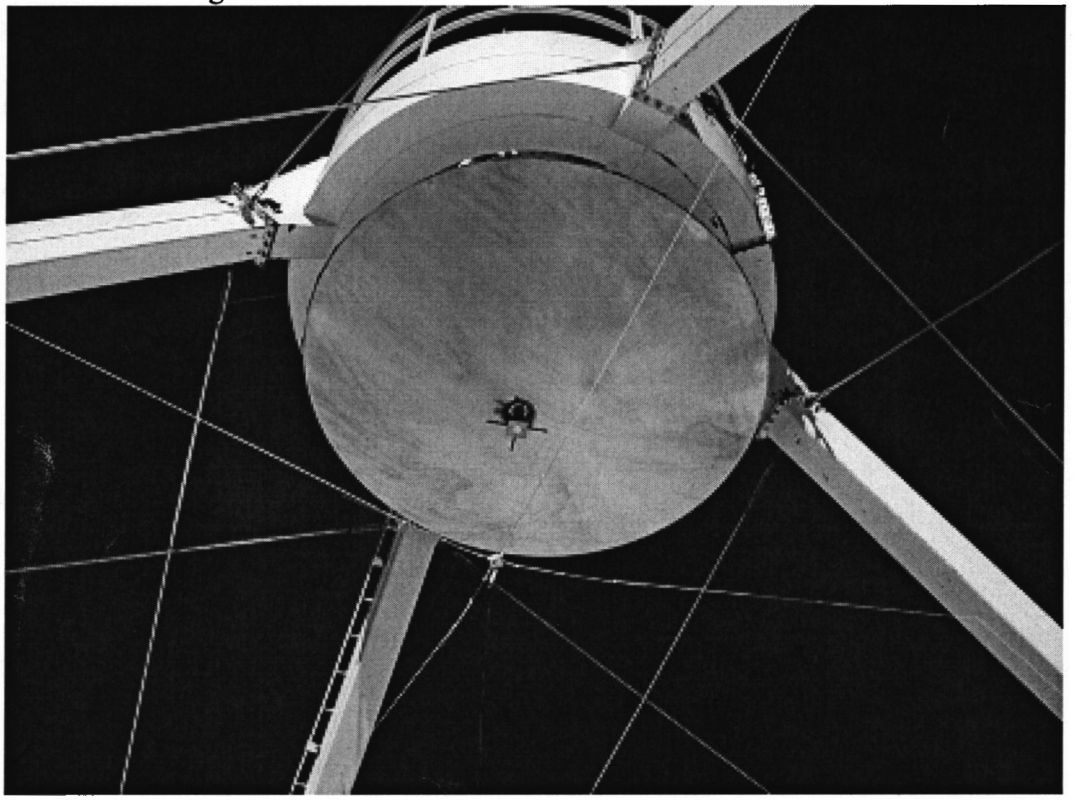
VLBA Antenna Memo Series #36

Pie Town Maintenance Visit
2001

Jim Ruff
1/04/02

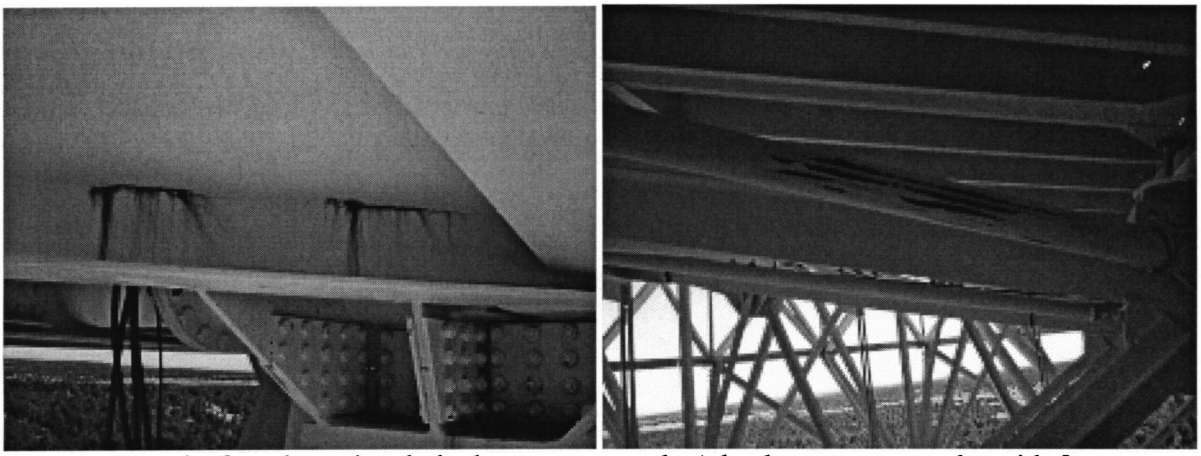
Attachments: Azimuth Rail Survey, Servo Trip Report, Electronics Trip Report, Task Schedule

The work was performed on maintenance days over a period of months. Contributing personnel included Ramon Gutierrez, Steve Aragon, Adrian Zamora, Steve Troy, the VLA Servo Techs, Doug Scott, Bob Broilo, and Jim Ruff. Site Techs Eric Carlowe, Kelly Gatlin and Nelson Atencio assisted throughout.



Kelly and Eric were treated to a training session on use of the Sellstrom system and general fall protection. They are using short nylon webs to attach the Sellstrom trolleys to their harnesses. These webs are lightweight and strong, and would facilitate rescue in event of a fall. But, they can not be left outside when not in use. This issue is being investigated.

The FRM INA bearing clearance measured 0.0025".



Structural cracks found previously had not progressed. A backup structure tube with freeze cracking was found.

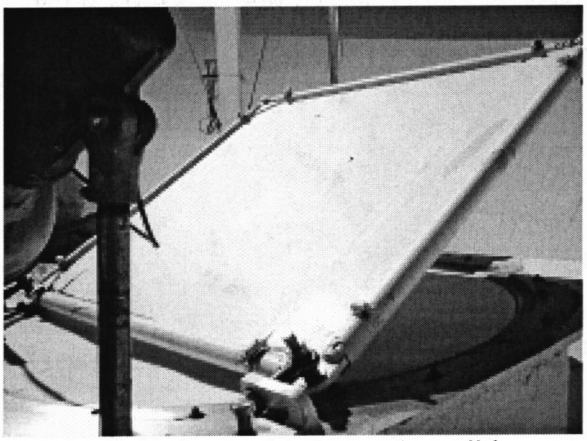
No metal was found in the elevation pillowblock grease.

The azimuth bearings were inspected. The outer races had been rotated previously, so we didn't re-do it.

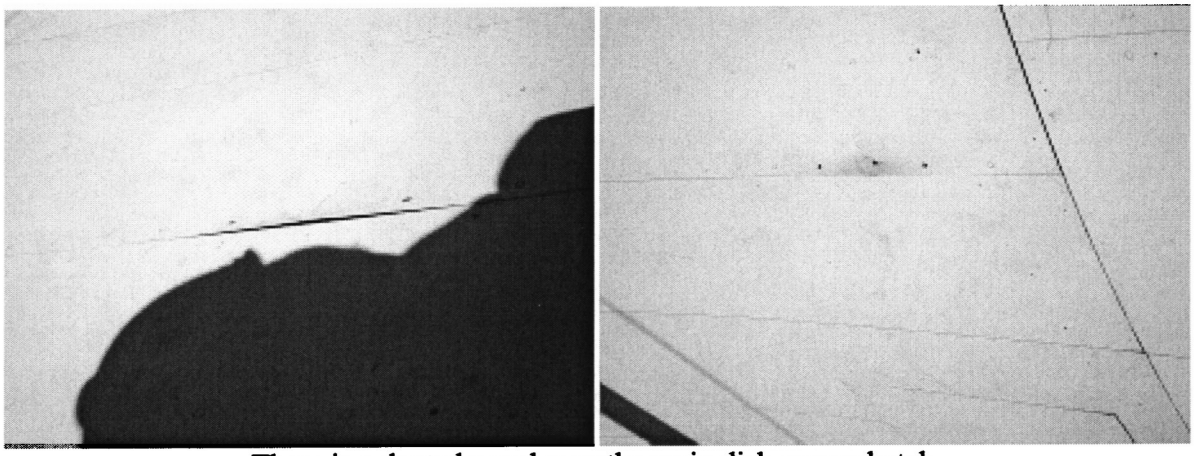
Az Bearing Grease Inspection				
	Drive 1	Drive 2	I1	I2
Inner	small flakes	some flakes	flakes to 1/16"	OK
Outer	OK	replaced	OK	OK

The drive wheels are located within spec.

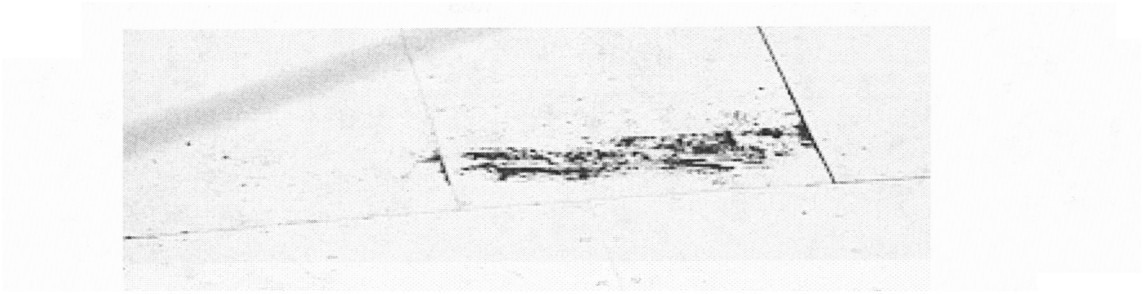
Drive Wheel Alignment			
Wheel #	Horizontal Error	Vertical Error	Radius Error
D1	0° 0' 14"	0° 1' 9" (flat)	0.02" (in)
D2	0° 0' 6"	0° 1' 1" (steep)	0.16" (out)



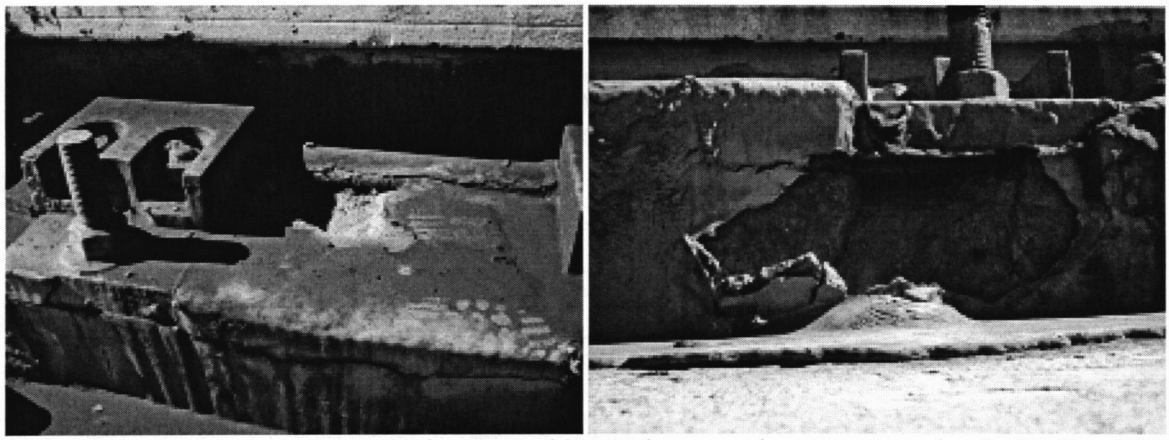
The dichroic panel is in good condition.



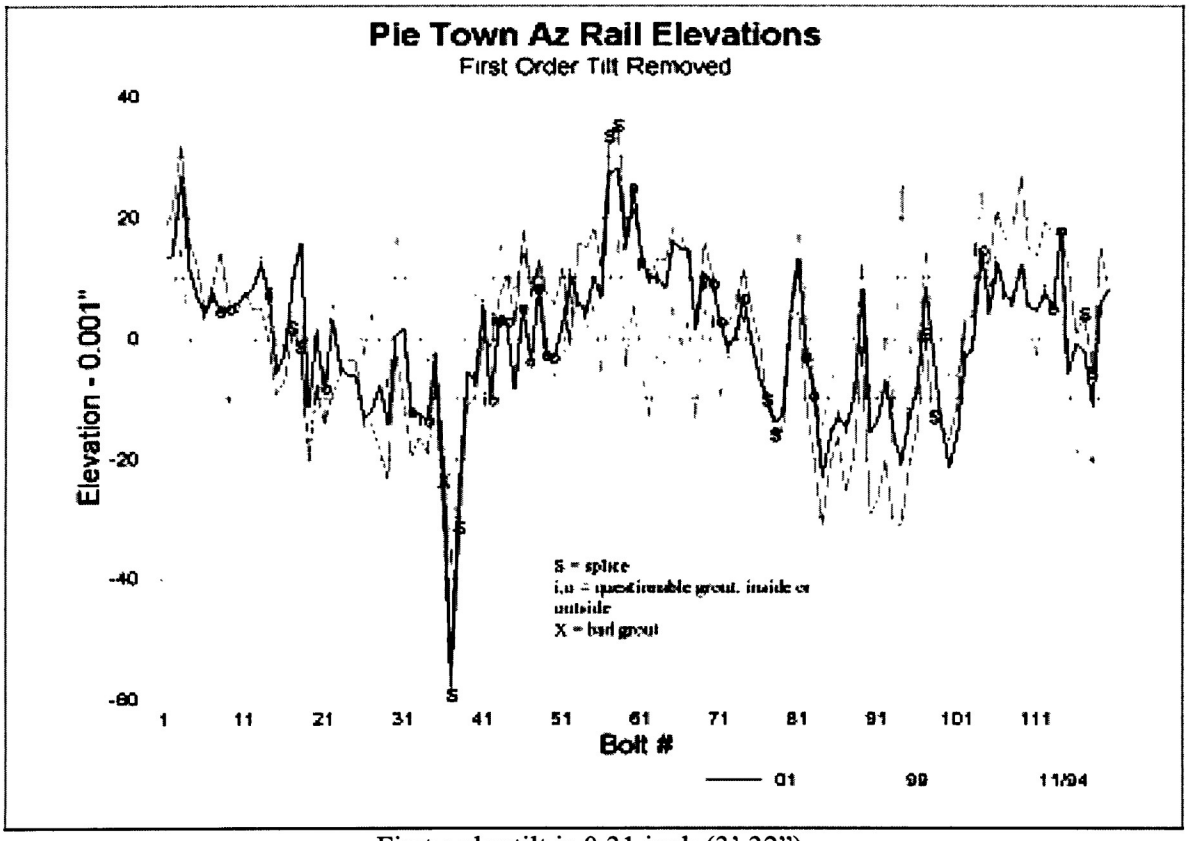
There is a dented panel near the main dish access hatch.



There are areas of eroded paint on some of the panels.

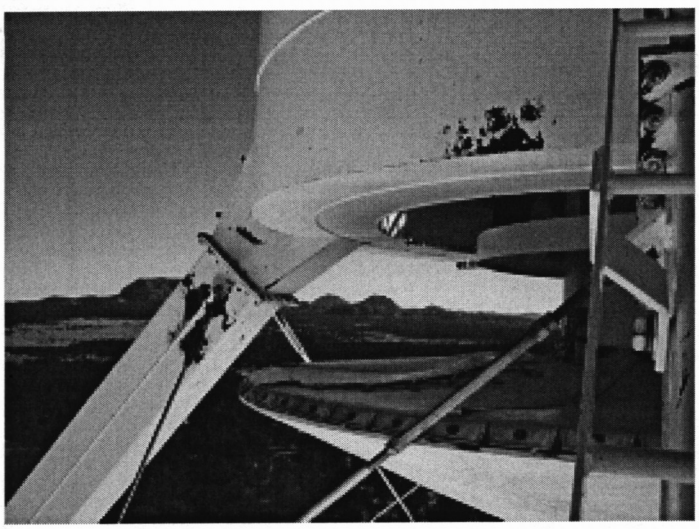


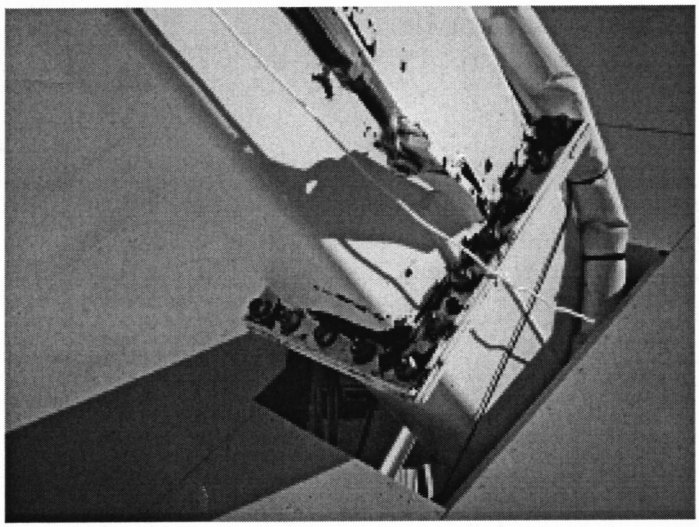
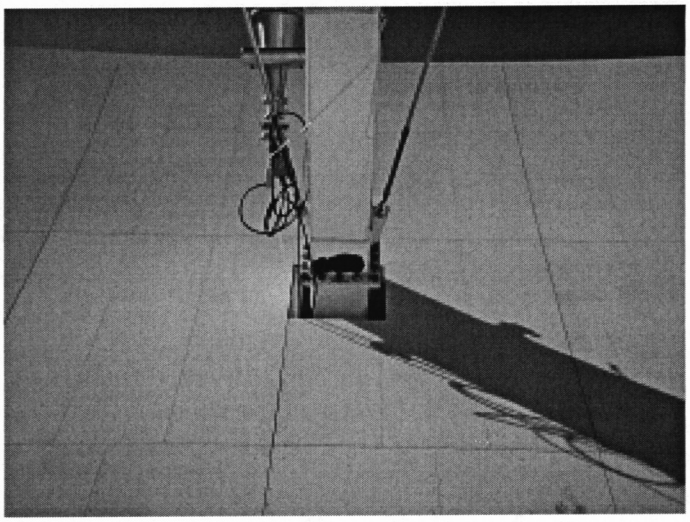
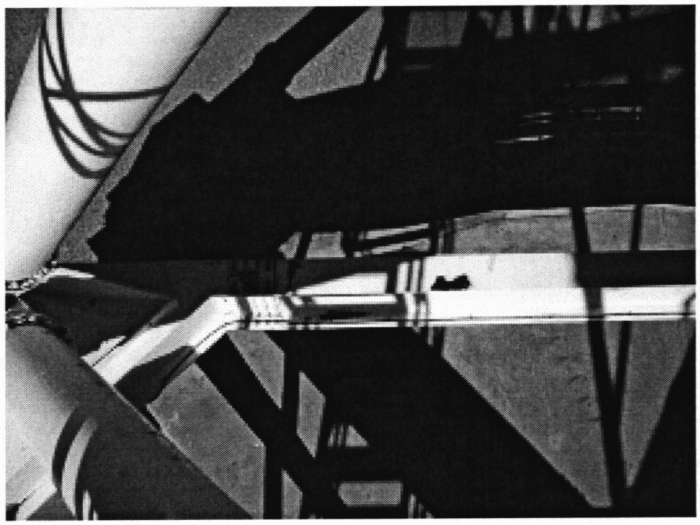
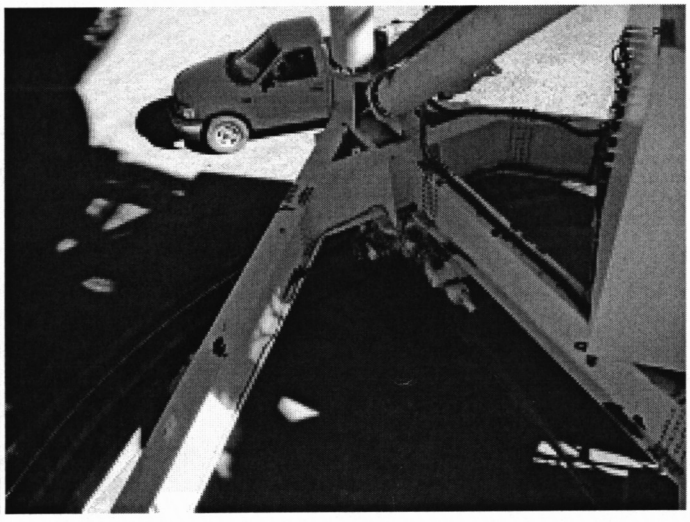
The azimuth rail grout is in need of spot patching. There are damp spots under the Vulkem that may promote further degradation.



First order tilt is 0.31 inch (3' 32").

The paint on this antenna is in need of touch-up.



Memo

To: Distribution
From: Servo Group
Date: 10 APR 01
Subject: VLBA PT SERVO TESTS

Day 1 Travel to PT and perform VLBA Servo Safety Tests
Performed Servo Response Tests

Day 2 Travel to PT and performed VLBA Servo PM's

The PT VLBA Station's Servo System was in great shape, as is usual with this Site. The Station Technicians have obviously been keeping up with the Servo System PM procedures, and with the exception of AZ #2 motor, the armatures of the other 3 motors were spotless. AZ #2 motor's armature had a slight case of threading that was most likely precipitated by the use of the 'old style' brushes. These have since been replaced by the much softer 'new style' brushes.

While performing the Safety tests, the antenna inadvertently drove into the CW limit due to the failure of the CW/CCW switch in the upper pintle bearing room. A replacement switch was sent to the Site and has been replaced by the Techs. The brake torque tests revealed that both AZ brakes were only 50 ft-lbs instead of the specified 75 ft. lbs. The brakes were disassembled and adjusted to within tolerance.

On day 2 we traveled back to PT to perform the Servo PM procedures. During the course of the procedures, we discovered that the motor j-box modifications have not been done at this Site. We tightened some connections inside the Servo Drive Cabinet that were a little loose, and inspected the power distribution panels with an IR thermometer for loose/hot connections; none were found.

Action Items:

A. Replace lightning protection cable from EL axle to DGB platform.
Cable is on Site, waiting for install by Site Techs

B. Install motor j-box mods on AZ/EL motors to permit easier access to bushes.
Site Techs declined this mod, saying "We don't need this" to service our brushes

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

Electronics Division Tiger Team Report January 5, 2002
For VLBA Pie Town, December 2001
Site Manager: Nelson Atencio
Site Technician: Kelly Gatlin
Tiger Team Leader: Jim Ruff

General.

The VLBA Pie Town station is in transition. Our new station manager, Nelson Atencio, is sorting out the differences between Pie Town and Kitt Peak. A good portion of the differences between PT and other sites are old project components and associated cables. These are left on the antenna long after the people who requested them have gone. These should be removed or labeled and documented.

The former and most original VLBA PT site manager, Eric Carlowe, is to be congratulated for his effort in running PT. No other VLBA station manager has had the number of engineers, technicians and scientists go through his front door like Eric has. He suffered us with great results.

I wish both Nelson and Eric, the best on their new assignments.

Item List.

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

1. Missing antenna warning signs were replaced.
2. Focus motor coupling was replaced (broken). Suspect focus motor needs to be replaced but currently is not available. Motor noise can be heard from the front of the control building when focus is driving down.
3. Reattached ground cable at elevation yoke, located on the opposite side of vertex access ladder.

Action Required:

4. Power cable, in pedestal room, needs replaced. The cable's outer protective insulation has broken down. It connects to J13 Input Power on FRM panel and to the isolation transformer, located in same room.
5. Replace protective glass on exterior light, above door to control building.
6. Weather proofing of FRM boxes at the apex, should be re-done. Cables and connectors will be taped and sealed with waterproof coating.
7. Antenna apex hatch strap is missing.

The cryo compressors are functioning fine. They should be cleaned out more and to do so would require they go off line. If a spare compressor is available it should be moved to VLBA PT for this purpose.

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

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
	Troubleshoot -drops DPM/MCB errors		Single motor step response
	Motor Inspections		EL Position Loop Tests
	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
			Synchro feedback operation
	ACU PM		Test AUI COMM DEAD
	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		
	Measure AZ Velocity		
	Record 1st Limits EL/AZ		
	broken ground cable - el bearing opposite encoder		

HVAC	
Antenna	Control Building
Pedestal room A/C inspection	Building A/C System
Provide Site Techs w/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 insulatiion	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
	Propane system
	Sewer/septic system

ANTENNA MECHANICS

	Apex Safety (nylon webs?)
x	Install new ladder & fall arrest system
x	Install apex guardrail
x	Fall Protection training (sign-in sheet)
	FRM
x	2-year PM
x	INA bearing check
x	
	Subreflector
x	Check for peeling, delamination (stained)
x	Check cover
	Quad Legs, Guy Wires Etc..
x	Inspect guywires & turnbuckles
x	Inspect quadleg flange bolts
	Anemometer
x	Inspt mounts/chk operation
x	Install Baldwin bracket parts
	Feeds & Dichroic
x	Inspect feeds, mounts, heaters, etc.
x	Check dish tipper
x	Check Dichroic reflector (sealed panel)
x	Check feedcone exterior
	Replace hatch latches as req'd
	Dish Surface & Panels
x	Inspect for damaged panels (1 - next to hatch)
x	Spot check panel bolts-looseness
	Elevation/Hoist/Swing Platform
x	Instl hoist safety mods
x	Checkout swinging platform
x	Instl condensor platform toe guard
	Structural
x	Spot check structural bolts
x	Inspect structural welds (cracks haven't progressed)
x	Inspt ant backup/lower struct (1 freeze-cracked tube)
x	Inspect EL axle for cracks
	El Bull and Pinion Gears
x	Inspt bull/pinion gears (checked backlash: OK)
x	Lub bull gear as req
x	Check stow pin
	El Motors & Gearboxes
x	Inspect pumps, seals & couplings
x	Check gearbox heater enclosures
x	replaced FRM focus motor

FRM INA Bearing Check	
50# pull on primary side	
Pr'y Travel:+0.001	Sec'y Travel:-0.0015
50# pull on secondary side	
Pr'y Travel:-0.001	Sec'y Travel:-0.0015

	El Bearings
x	Inspect EL bearings lip seals
x	Clean off excess grease
x	Install El bearing grease trays
x	Grease

El Bearing Grease Inspection	
Encoder Side	OK
Tach side	OK

	Az Bearings
x	Open, clean & Inspect pillowblocks

Az Bearing Grease Inspection/Bearing Replacement		
	Inner	Outer
D1	small flakes	OK
D2	some flakes, but OK	replaced
I1	flakes to 1/16"	OK
I2	OK	OK

	Rotate outer races (done previously)
x	Close pillowblocks and grease
	Az Wheels
x	Check wheel to struct clearances
x	Check axle bolt tightness

AZ wheel radii and alignment		
	D1	D2
Horiz. Error	0' 14"	0' 6" (!)
Vert. Error	1' 9" flat	1' 1" steep
Radius	0.02 in	0.16 out

	Az Motors & Gearboxes
x	Inspect pumps, seals & couplings
x	Check gearbox heater enclosures
	Paint & Insulation Inspection
x	Inspect ant paint and report
x	Inspect & repair ant insulation as needed
	Pintle Bearing
x	Inspect seals
x	Check pocket level
x	Check for loose bolts
x	Lubricate
x	Close gap in grease catcher
	Az Rail Inspection
x	Inspect ant foundation, grout and Vulkem
x	Inspect for excessive rail movement
x	Inspect joint bars & clips
x	Rail level measurements
x	Check for popping wheel
	vulkem poor. grout needs repairs

	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 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 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		
	Check gates. fence, signs, grounds, etc		
	Inspect lightning protection for antenna & bldg		
	Check safety items/hazmat storage, etc.		
	FINAL INSPECTIONS		
x	Spot check critical PM's		
	Review problem areas with site tech's		
	Site Inspections for Oversights		
x	Site clean-up		
	Contact VLBA Operations for Station Startup Verification Tests		