

National Radio Astronomy Observatory
Socorro, NM

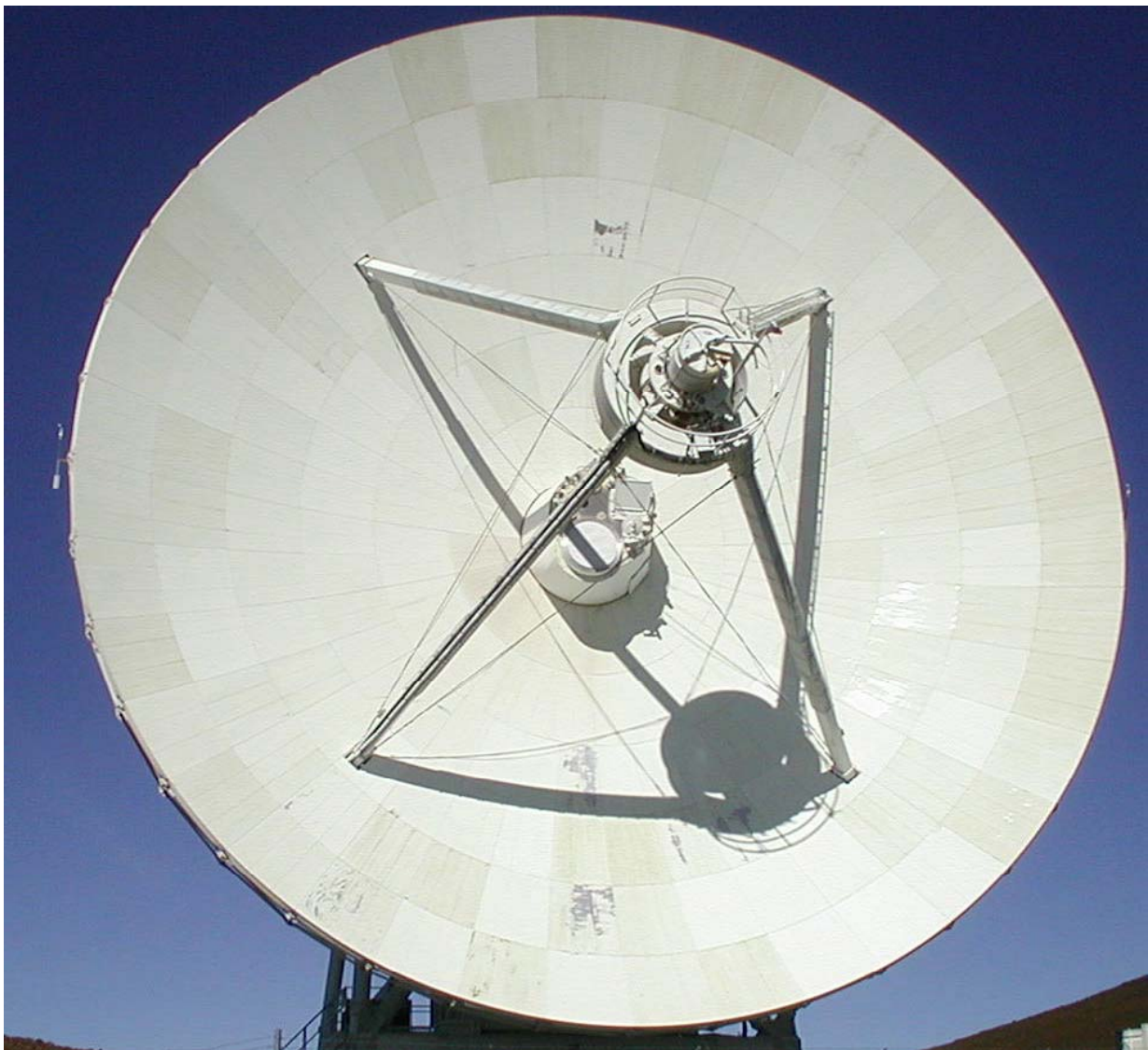
VLBA Antenna Memo Series #45

Mauna Kea Maintenance Visit
August 12th through 21st, 2002

Jim Ruff
9/30/02

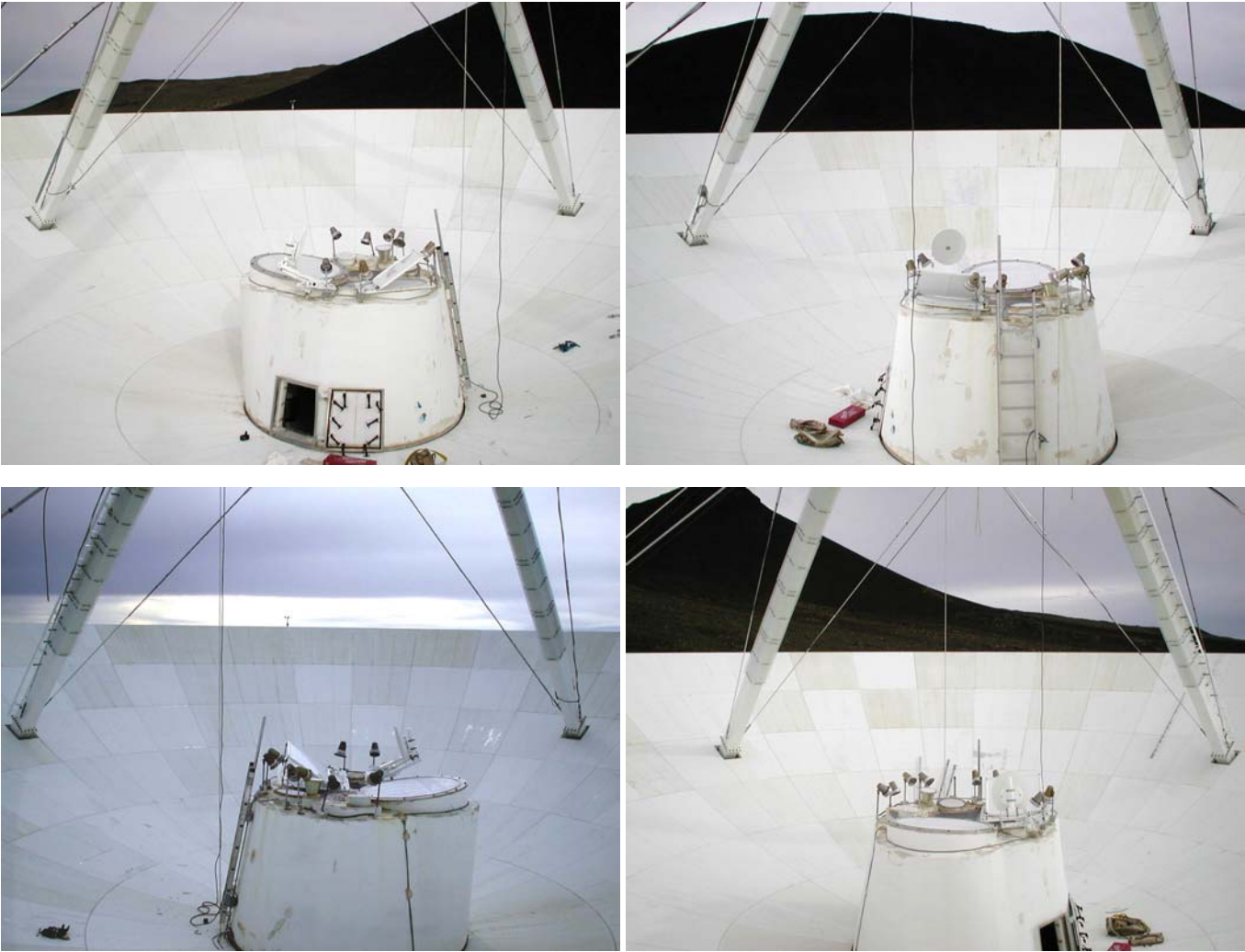
Attachments: Azimuth Rail Survey, Servo Trip Report, Task Schedule

The team consisted of Steve Aragon, Ramon Gutierrez, Eric Carlowe, Steve Tenorio, Steve Troy and Jim Ruff. Site Techs Bill Hancock and Tony Sylvester assisted throughout.



An apex handrail, quad leg ladder and Sellstrom fall arrest system were installed. The site techs were treated to a training session on use of the Sellstrom system and general fall protection.

Some of the panels are losing their paint, but the remaining paint is firmly adhered and not slippery. The guy wire heaters are ineffective because they are not well attached. This should be corrected.



Antenna Surface Panels

The vertex room hatch door does not close tightly. We left some of the new latches for the site techs to install.

The azimuth bearings were inspected. One was replaced. The outer races had been rotated previously, so we did not do it. The RBC bolt heads are only 0.012” away from the outer D2 pillowblock.

Az Bearing Grease Inspection				
	Drive 1	Drive 2	Idler 1	Idler 2
Inner	fine flakes, no pits	Some flakes, no pits	clean	small flakes
Outer	much metal, no pits	Some flakes, Rollway	fine metal, Rollway	Replaced

The el bearings were inspected. Zirk fittings were left in the housings per the site tech’s request.

El Bearing Grease Inspection	
Encoder Side	OK
Tach Side	OK

Drive wheel positions were measured.

Drive Wheel Alignment			
Wheel #	Horizontal Error	Vertical Error	Radius Error
D1	0° 2’ 15”	0° 1’ 2”	0.003”
D2	54”	16”	0.003”



The subreflector is stained, but otherwise in good condition. Some of the cover seams are ripped.

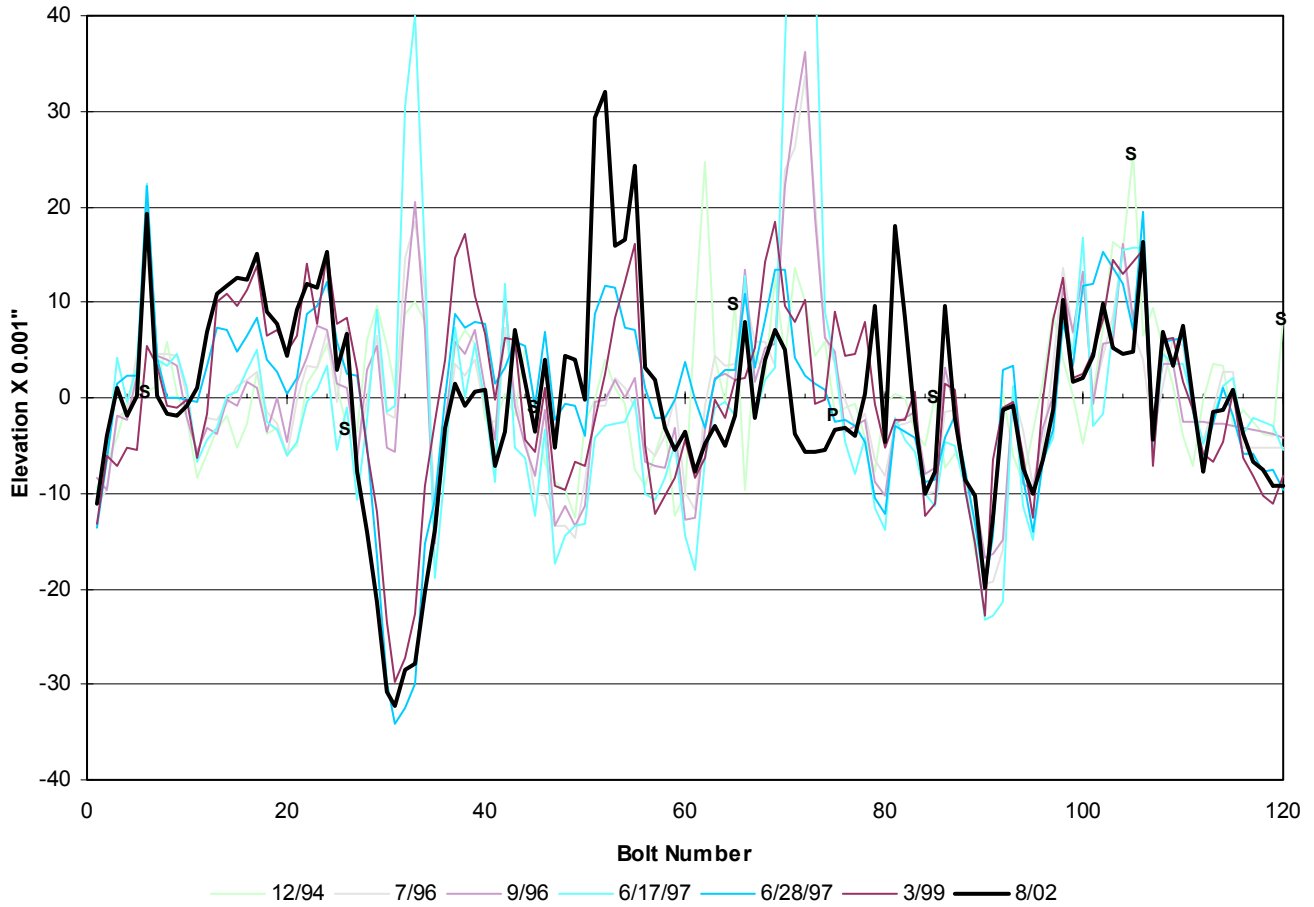
The stow pin tray and hard stops were installed. Hard stops are now installed on all antennas.

We made a valiant effort to seal the vertex room leaks. Time will tell whether or not we succeeded.



We tightened the rail splice plates. The unpainted base plates are rusting and should be painted with rust conversion primer. All remaining original grout should be replaced – soon.

Mauna Kea Az Rail Elevations First Order Tilt Removed



Note deteriorating grout around bolts 48 to 58 and 80 to 83. Grout is also failing at bolts 17-22, 44, 98, 110 and 115. All epoxy grout looks good, including partial patches around bolt 62.



The dichroic panel is in good condition. We realigned it and replaced the dish tipper springs.

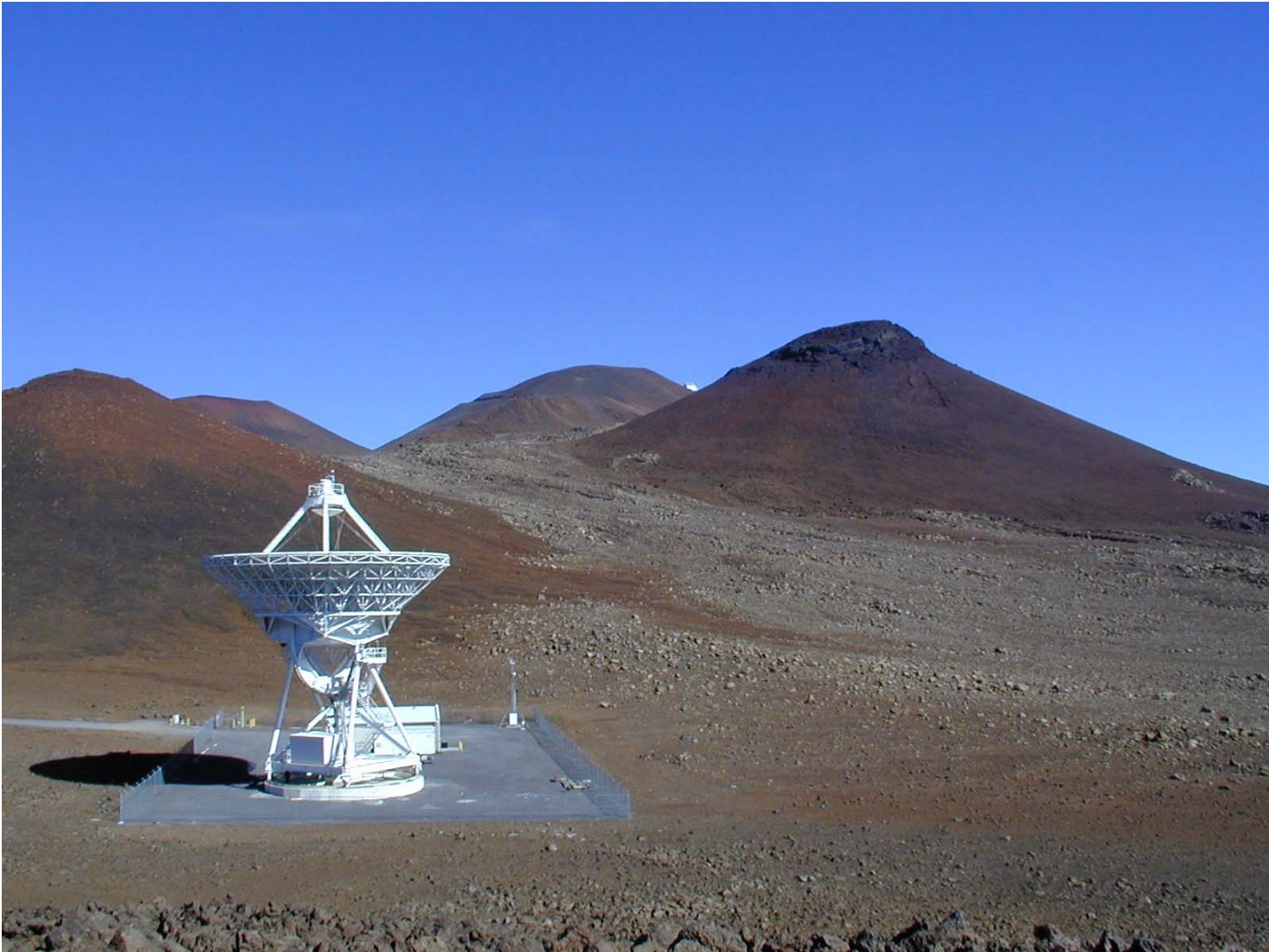
The FRM was put on UPS power.

The station building UPS is noisy and should be replaced.

The paint is eroded or delaminating in many areas, but not much rust is evident yet.







"The Moon"

On behalf of the entire team, I would like to thank Bill & Tony again for their hospitality during our visit!

Mauna Kea trip report

- Day # 1 12aug02 Traveled from San Antonio N.M. to Kona Hawaii.
- Day # 2 13aug02 Helped antenna mechanics install apex hand rails and ladder.
- Day # 3 14aug02 Completed El. # 2 Motor J-box mod. & started on El. # 1 J-box.
Checked El. Encoder.
- Day # 4 15aug02 Completed El. #1 motor J-box mod. And Az. # 1 J-box mods.
Started Az. # 2 J-box.
- Day # 5 16aug02 Completed & checked out Az. # 2 J-box mod. Started Motor pms.
Found wires on El. # 2 brushes has broken off and damaged brush
Holder. Changed brushes and brush holder, and seated brushes.
Az. # 2 had old style brushes, I swapped them out.
- Day # 6 17aug02 Checked power panels in ped. Room with I.R. Thermometer.
Checked grounding. Completed fault checks. Completed
Velocity checks, and Data converted pm.
- Day # 7 18aug02 Completed A.C.U. pm. Completed Servo Test.
- Day # 8 19aug02 Helped Jim Ruff check Az. Wheel bearings. Picked up old grout
From around antenna. Changed Wheel bearing.
- Day # 9 20aug02 Work with Eric Carlowe on F.R.M. problem. Greased El.
Bearings.
- Day # 10 21aug02 Site clean up and Load container.
- Day # 11 22aug02 Started trip home.
- Day # 12 23aug02 Completed trip home.

Conclusion: Mauna Kea site is in good shape. I pointed out a couple of minor things to the site techs such as the broken wire on the El. Brushes and a couple of loose armature wires, but other than that the antenna seemed to be in real good shape.

SERVO

SAFETY TESTS			Recordings
x	MULTIPLE FAULT STATUS		x EL System Response Test
x	MANUAL MODES TEST		x Implement test setup
x	INDIVIDUAL FAULT STATUS		x Calculate acceleration
x	REMOTE BOX TESTS		x Locked rotor resonance, AZ/EL
x	AZ Travel Limit Switch Tests		x AZ System Response Test
x	AZ Clockwise tests		x Implement test setup
x	AZ Counter-Clockwise tests		x Calculate acceleration
x	EL Travel Limit Test		x Locked rotor resonance, AZ/EL
x	Elevation up tests		x AZ Position Loop Tests
x	Elevation down tests		x Small signal step response
	BRAKE HOLDING-TORQUE TESTS		x Large signal step response
			x Single motor step response
			x EL Position Loop Tests
			x Small signal step response
			x Large signal step response
			x Single motor step response
			Auto Modes Test
			x Check stow commands
			x Synchro feedback operation
			x Test AUI COMM DEAD
	Motor Inspections		
x	Motor and Tach Couplings		
x	Commutator & Brush Inspection		Check E Counterweight balance
x	Install stainless j boxes on drive motors (4)		
			x <i>replaced motor j-boxes</i>
x	ACU PM		
	Servo PM		
	Lightning Grounding		
x	EL Bearing Ground Cables		
x	EL Motor Platform to Pintle Turret		
x	Pedestal Room Grounding		
x	AZ Wheel Ground Straps		
x	Pintle Bearing Room Grounding		
	Detailed Test		
x	System and Axis Faults		
x	Motor Fault Status		
x	Measure EL Velocity		
x	Measure AZ Velocity		
x	Record 1st Limits EL/AZ		

Brake Holding Torques (ft-lbs)	
Az 1	96
Az 2	72
El 1	80
El 2	70

		HVAC	
	Antenna		Control Building
	Pedestal room A/C inspection		Building A/C System
	Provide Site Techsw/manual and hold Q&A session		Perform operational checks
			Inspect indoor & outdoor units
	Vertex Room A/C		Correct deficiencies as needed.
x	Inspect air handler		Stand-By Contempo
	Inspect condenser unit		Indoor Unit
	inspect lines & bulkhead fittings	x	Install primary unit interface relay board
x	Repair/replace damaged line insulation	x	Install Hoffman SCR's
	Replace any suspect bulkhead fitting	x	Install auxillary terminal block
	Evacuate & place unit back in service	x	Replace V-belt & adjust pully to maximum
	Install ROC & set to (C1, set 135, Dif.30)	x	Perform operational checks
	Check PCtool to DDC connection @computer		Condensing Unit
	Make hard copy of program parameters	x	Inspect for leaks & clean oil
	Check programing, save program file to disk.	x	Inspect electrical connections
	Hold Q&A session w/ Site Tech's	x	Perform operational checks
			Primary Contempo
			Indoor Unit
		x	Install auxillary terminal block
			Install utility interface auxillary switch & cable
		x	Install wiring to stand-by unit
		x	Install upgraded interface
			Install UPS transformer & cable to DDC
			Replace control transformers
			Replace humidity sensor
			Condensing Unit
		x	Inspect for leaks & clean oil
		x	Inspect electrical connections
		x	Perform operational checks
		x	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		E Bearings																			
x	Install new ladder & fall arrest system																				
x	Install apex guardrail	x	Clean off excess grease																		
x	Fall Protection training (sign-in sheet)	x	Install E bearing grease trays																		
	FRM	x	Grease																		
x	2-year PM	<table border="1"> <tr> <th colspan="2">E Bearing Grease Inspection</th> </tr> <tr> <td>Encoder Side</td> <td>OK</td> </tr> <tr> <td>Tach side</td> <td>OK</td> </tr> </table>		E Bearing Grease Inspection		Encoder Side	OK	Tach side	OK												
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	Subrefector	x	Open, clean & inspect pillowblocks																		
x	Check for peeling, delamination <i>discolored</i>	<table border="1"> <tr> <th colspan="3">Az Bearing Grease Inspection/Bearing Replacement</th> </tr> <tr> <th></th> <th>Inner</th> <th>Outer</th> </tr> <tr> <td>D1</td> <td>fx / fine metal / no pits</td> <td>fl/lots of metal / no pits</td> </tr> <tr> <td>D2</td> <td>fx/ some metal / no pits</td> <td>fl/some flakes/Rollway</td> </tr> <tr> <td>I1</td> <td>fl / clean / no pits</td> <td>fl/fine metal/Rollway</td> </tr> <tr> <td>I2</td> <td>fx/small flakes / no pits</td> <td>fl / replaced</td> </tr> </table>		Az Bearing Grease Inspection/Bearing Replacement				Inner	Outer	D1	fx / fine metal / no pits	fl/lots of metal / no pits	D2	fx/ some metal / no pits	fl/some flakes/Rollway	I1	fl / clean / no pits	fl/fine metal/Rollway	I2	fx/small flakes / no pits	fl / replaced
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x	Check cover <i>Some seams ripped</i>																				
	Quad Legs, Guy Wires Etc.. <i>Heaters no good</i>																				
x	Inspect guywires & tumbuckles																				
x	Inspect quadleg flange bolts		Rotate outer races																		
	Anemometer	x	Close pillowblocks and grease																		
x	Inspt mounts/chk operation	Az Wheels																			
x	Install Baldwin bracket parts	x	Check wheel to struct clearances																		
	Feeds & Dichroic	no	Check axle bolt tightness																		
x	Inspect feeds, mounts, heaters, etc.	<table border="1"> <tr> <th colspan="3">AZ wheel radii and alignment</th> </tr> <tr> <th></th> <th>D1</th> <th>D2</th> </tr> <tr> <td>Horiz. Error</td> <td>2'-15"</td> <td>54"</td> </tr> <tr> <td>Vert. Error</td> <td>1'-2"</td> <td>16"</td> </tr> <tr> <td>Radius</td> <td>0.003"</td> <td>0.003"</td> </tr> </table>		AZ wheel radii and alignment				D1	D2	Horiz. Error	2'-15"	54"	Vert. Error	1'-2"	16"	Radius	0.003"	0.003"			
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x	Check dish tipper <i>Replaced springs</i>																				
x	Check Dichroic reflector																				
x	Check dichroic alignment																				
x	Check feedcone exterior																				
x	Replace hatch latches as req'd																				
	Dish Surface & Panels	Az Motors & Gearboxes																			
x	Inspect for damaged panels <i>some eroded paint</i>		Inspect pumps, seals & couplings																		
x	Spot check panel bolts-looseness		Check gearbox heater enclosures																		
	Elevation/Hoist/Swing Platform	x	Paint & Insulation Inspection																		
x	Checkout swinging platform		Inspect ant paint and report																		
	Structural	x	Inspect & repair ant insulation as needed																		
	Spot check structural bolts	x	Pintle Bearing																		
x	Inspect structural welds		Inspect seals																		
	Inspt ant backup/lower struct		Check pocket level																		
x	Inspect E axle for cracks	x	Check for loose bolts																		
	E Bull and Pinion Gears	x	Lubricate																		
	Inspt bull/pinion gears	x	Close gap in grease catcher																		
	Lub bull gear as req		Az Rail Inspection																		
x	Check stow pin		Inspect ant foundation, grout and Vulkem																		
x	Install Hard Stop	x	Inspect for excessive rail movement																		
	E Motors & Gearboxes	x	Inspect joint bars & clips																		
	Inspect pumps, seals & couplings	x	Rail level measurements																		
x	Check gearbox heater enclosures	x	Check for popping wheel																		
		x	Re-torque fish plates																		
x	Find/Repair leaks in Vertex Room <i>caulked</i>	x																			
	Check Cracks:																				
x	E Axle encoder side	no	Drill weep holes over az wheels																		
x	HVAC-side cwt tube		Fill holes in HVAC side el platform grating																		
		x	<i>show site tech show to use motor replacement bracket</i>																		

ELECTRONICS		
	Antenna Maintenance & Inspections	
x	Apex/FRM inspections	Replace FRM focus encoder mounting bracket
x	Feedcone/Receiver system inspections	
	Activate & test feed heaters	
x	Vertex Room/Racks & cable inspections	
x	Vertex to pintle bearing inspection	
x	Replace tie wrap on antenna with metal type	
x	Install cable wrap strain reliefs	
x	Inspect pintle bearing rm bulkhead, cablewrap, etc.	
x	Inspect pedroom UPS, FRM controller, dry air sys, etc.	
x	Install breaker for air comp & hydraulic wrench	
	Station Building Inspections	
x	100 - Check electrical, UPS and test operation	
x	103 - Chatter/supervisory boxes, alarms, etc.	
x	104 - Bulkhead, underfloor, maser, etc	
x	Check tools, test equip, manuals, wtr sys, UIS, etc	
	Outside Building and Misc. Inspections	x put frm on UPS
x	Run and inspect site generator	x repaired 2nd screw cable. need to be replaced.
x	Inspect weather station	
x	Check gates, fence, signs, grounds, etc	
	Inspect lightning protection for antenna & bldg	
x	Check safety items/hazmat storage, etc.	
FINAL INSPECTIONS		
x	Spot check critical PM's	
x	Review problem areas with site tech's	
	Site Inspections for Oversight's	
	Site clean-up	
x	Contact VLBA Operations for Station Startup Verification Tests	
	Notes:	
	Rail plates & nuts rusting. Paint w/ rust conv. primer	
	recommend new UPS. Old one is noisy.	
	Seal around pintle bearing?	