Site Survey Checklist

General Information

Customer: ______________________ Site: ________________ Date: ___________

Existing ACS: ______________ B/R: ________________ D/C: ________________

Antenna Information

Antenna Mfr: ____________________ Type: ☐ AZ/EL ☐ X/Y ☐ HA/DEC

Model No.: ______________________ Size: _____________ Freq: _____________

Measure the antenna axis velocities for each axis and record them in the following table. If the station does not have axis velocity values, and an angular position display and off-air time is available, establish values by measuring axis distance traveled in a fixed time interval.

If values are not available and angular position display capability or off-air time are not available, record the ratio of all gearboxes between the motor and the jackscrew, threads per foot on the jackscrew, the radius from the center of axis rotation to the center of the jackscrew attachment pin as well as the approximate angle between the above radius with respect to the jackscrew,

Alternately, if an angular position display is available but off-air time is not, this value may be checked by manually hand-cranking the motor, after backlash is removed, over a calibrated distance as read on the angular display and calculating velocity based on distance traveled in degrees, number of turns of the hand-crank and base speed of the motor.

If the axis velocities are not in an acceptable range for 1-4 second run times, obtain all mechanical mounting dimensions of the motors and gearboxes in addition to the motor information recorded later in this checklist.

Parameter	Azimuth / X Axis	Elevation / Y Axis	Polarization Axis
Antenna Axis Velocity			

Using the Antenna Wind-Up/Backlash Measurement Procedure at the end of this checklist, measure the wind-up and backlash in the antenna and record the results.

Parameter	Azimuth / X Axis	Elevation / Y Axis	Polarization Axis
Wind-Up Motor/Encoder			
Wind-Up Motor/Beam			
Wind/Up Encoder/Beam			

If wind-up and/or backlash are excessive, record probable cause:

Record encoder pick-off, coupling, and limit switch information as follows:

Parameter	Azimuth / X Axis	Elevation / Y Axis	Polarization Axis
Encoder To Axis Ratio			
Encoder Mounting Redesign (YES/NO) ♦			
Replace Coupler (YES/NO)			
Stub Shaft Diameter			
Limit Switch (NC/NO)			
Motor Contoller Mounting Brackets Required (YES/NO) ♦			

♦ If encoder mounting redesign and/or motor controller mounting is required, attach photos, sketches & dimensions to facilitate the fabrication of these parts.

Antenna overall condition remarks:

Operations Room Information

Rack space available for proposed antenna controller & R.F. equipment? ☐ YES ☐ NO

Power outlets available? ☐ YES ☐ NO

Site Power Information

	Voltage	Frequency	Circuit Breaker/s
Equipment Power			
Motor Power			

Required interfaces customer is willing to provide:

Site power general remarks:

Site Cabling Information

Record length of cable in feet for each listed interface:

	Azimuth / X	Elevation / Y	Polarization	Conduit or Exposed
ACU to MCU				
ACU to Encoder				
MCU to Motors				
MCU to Limit Switch				

	Length	Type
ACU to Tracking Receiver or B/R		
Power Divider or LNA to Tracking Receiver or D/C		
D/C to B/R (if applicable)		

R.F. Equipment Information

Beacon Frequencies ______________________________

Tracking receiver required? ☐ YES ☐ NO

Manufacturer of existing receiver ______________________________

Part / model number of existing receiver ______________________________

Gradient & voltage range of existing receiver ___________________________

Power divider port available? ☐ YES ☐ NO

Power divider connector type ______________________________________

LNA required? ☐ YES ☐ NO

Feed port available? ☐ YES ☐ NO

Feed port flange type ____

Motor Information

	Azimuth / X	Elevation / Y	Polarization
Manufacturer			
Part Number			
Horsepower			
Voltage			
Frequency			
Number of Phases			
Base RPM			
Full Load Amps			
Locked Rotor Amps			
Flange Type			

Antenna Wind-Up/Backlash Measurement Procedure

The following tests need to be performed to ensure antenna wind-up and backlash is within specified limits to ensure accurate tracking results. There are three tests to be performed to determine the wind-up and backlash characteristics between motor/beam, motor/encoder and encoder/beam. The tolerances for these tests are included and should not be exceeded to guarantee optimal tracking and inclined orbit operation. The antenna should be commanded a short distance in the opposite direction prior to making any measurements. This will to ensure the antenna structure is properly wound-up prior to making any measurements.

First, determine the delay between motor movement and RF power level change. This can be accomplished by commanding the antenna to move while monitoring the RF power level using a spectrum analyzer. Drive the antenna clockwise in azimuth to obtain a signal level of -1dB from the peak signal. Reverse direction in azimuth and time the delay between the commanded movement and signal level change. Repeat this test for counter-clockwise and for both directions in elevation. The delay time multiplied by the axis velocity should not exceed 2% of the –3dB receive beam width.

These delays are caused by backlash in the motor drive assembly, backlash in the clevis and structural wind-up. If the delays recorded are larger than 2% of the –3dB receive beam width, reduce the backlash in the drive assembly and clevis if possible. If backlash adjustments are made, retest the axis for new delay times.

Second, measure the delay between motor movement and change in the encoder feedback. Command the antenna to move while monitoring the position displayed at the ACU. Again, drive the antenna clockwise to obtain a signal level of -1dB from the peak signal. Reverse direction and time the delay between commanded movement and a change in the position feedback. Repeat this test for counter-clockwise and both directions in elevation. The delay time multiplied by the axis velocity should not exceed 2% of the –3dB receive bandwidth.

Delays between motor movement and position feedback are caused by the backlash problems discussed above as well as structural wind-up. The azimuth axis commonly has wind-up in the pick-off shaft when the encoder is mounted at the base of the antenna tube and coupled to, load carrying bearing components. This wind-up can be reduced by either mounting the encoder at the top of the tube or by erecting a ground reference bracket to bypass the bearing that is causing the wind-up.

Third, determine the delay between RF power level change and a change in the position feedback. Monitor the RF power level with a spectrum analyzer and the position displayed at the ACU. Drive the antenna clockwise to obtain a signal level of -1dB from the peak signal. Reverse direction and measure the delay between a change in the RF power level and a change in the position feedback. Repeat this test for counter-clockwise and both directions in elevation. The delay time multiplied by the axis velocity should not exceed 2% of the antenna –3dB receive beam width.

These delays are directly related to the wind-up in the antenna structure. If the delays measured are greater than the specified tolerance above, the encoder pick-off shaft arrangement needs to be addressed.

2% has been listed as the goal for each of these three paths of control/measurement inaccuracy. In any event, the algebraic sum of all three should not exceed 8% to realize spec compliant inclined orbit tracking antenna control.