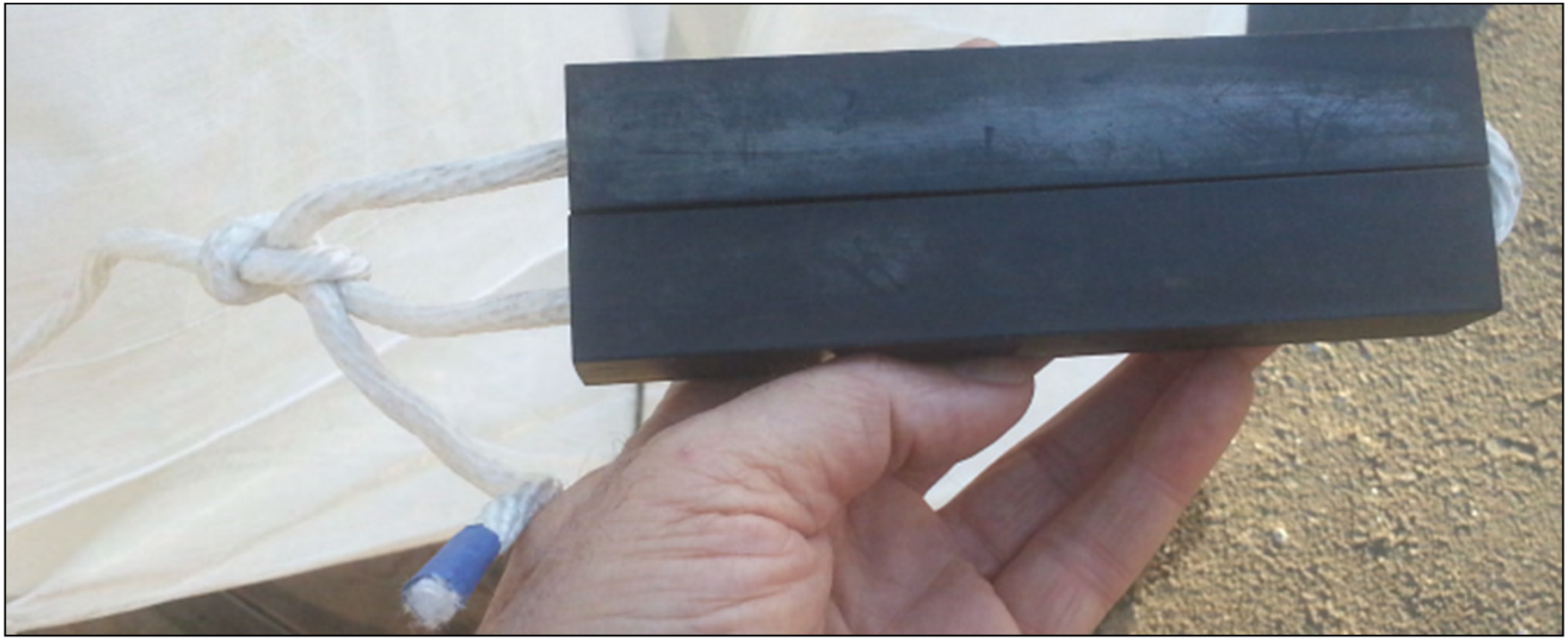
SNOW ROPE INSTALLATION

SNOW ROPE INSTALL

A. Pass rope end through rubber blocks and knot securely, using a bowline. (http://www.animatedknots.com/bowline/#ScrollPoint)

Fig 3: Weighted end, close-up.



SNOW ROPE INSTALLATION

B. BEING CAREFUL NOT TO GET ENTANGLED IN THE LIGHTNING DIVERTER
Throw rope over top of radome then, looping rope around lightning diverter post, bring ends together, (at about waist height).
Thrown end is A, other part is B…which must be long enough to go up to the top AND BACK AGAIN.

Fig 4: Weighted end thrown over.

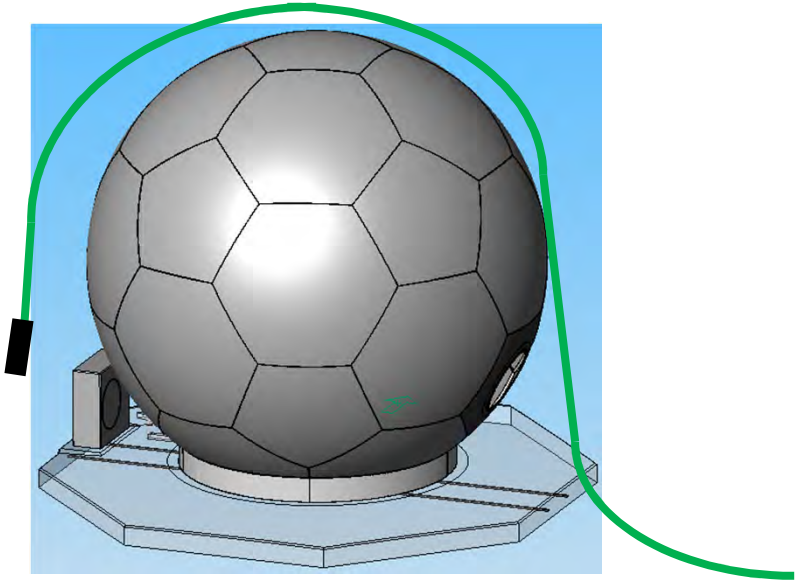
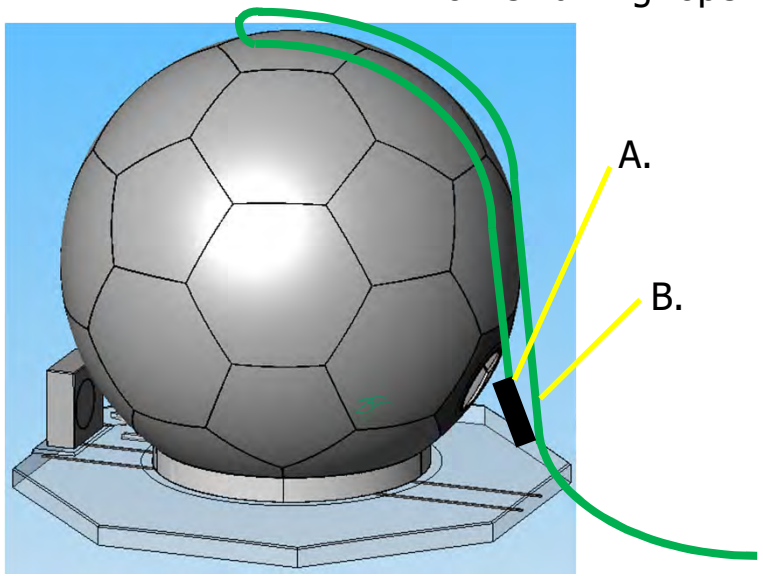


Fig 5: Weighted end brought back to middle of remaining rope.



SNOW ROPE INSTALLATION

C. Tie loop in roughly the middle of B.

Fig 5: Loop location.

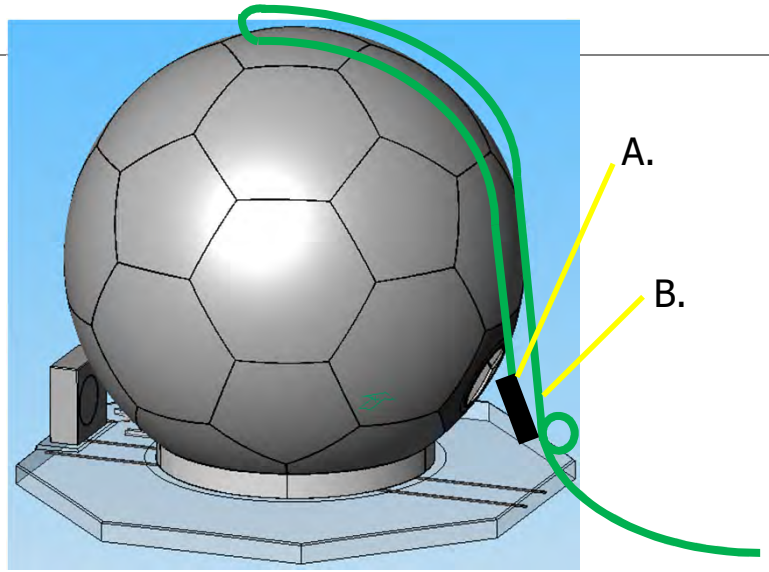


Fig 6a: Loop step 1

Fig 6b: Loop step 2

Fig 6c: Loop step 3

Fig 6d: Loop step 4

SNOW ROPE INSTALLATION

D. Feed rope end through loop then, BEING SURE TO KEEP AN EXTRA LINE DOWN AT GROUND LEVEL, pull loop up to the radome top so it is snug against the lightning arrestor rod.

Fig 7a: Feeding weighted rope end through loop.

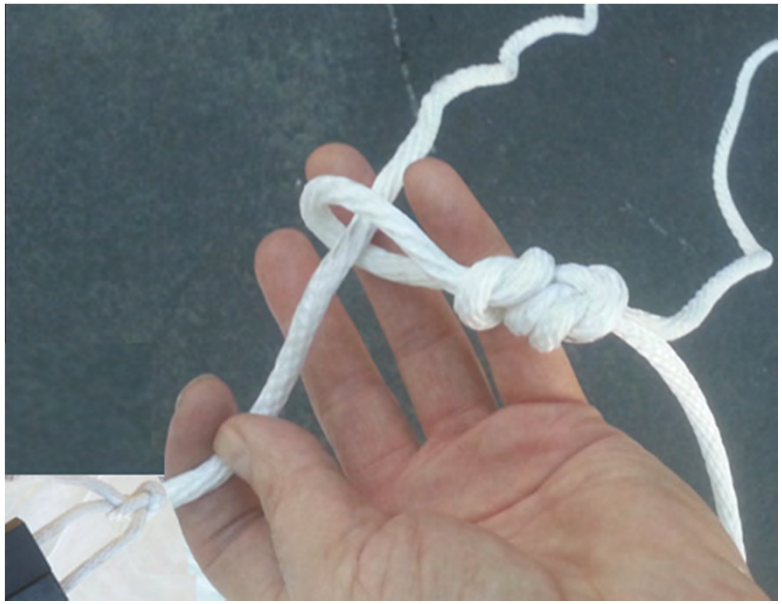
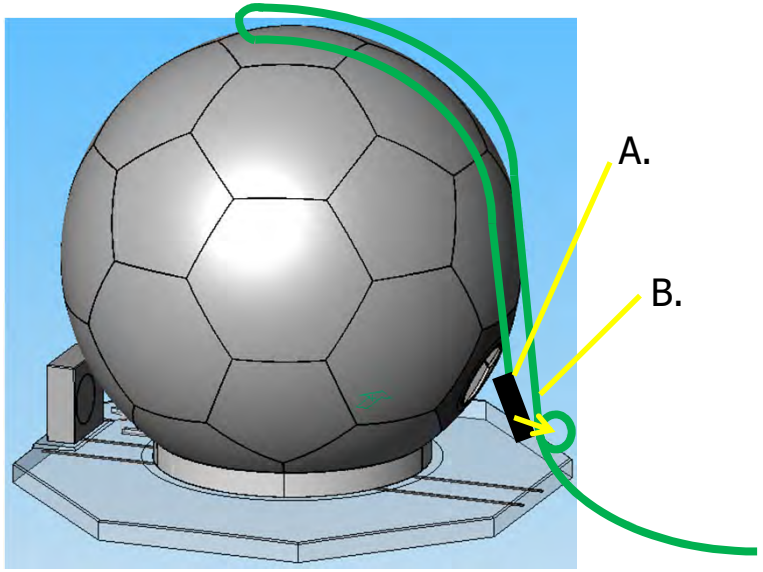


Fig 7b: Feeding weighted rope end through loop.



SNOW ROPE INSTALLATION

E. Neatly bundle looped A and the remaining B ropes together.

Fig 8: Loop shown pulled to top.

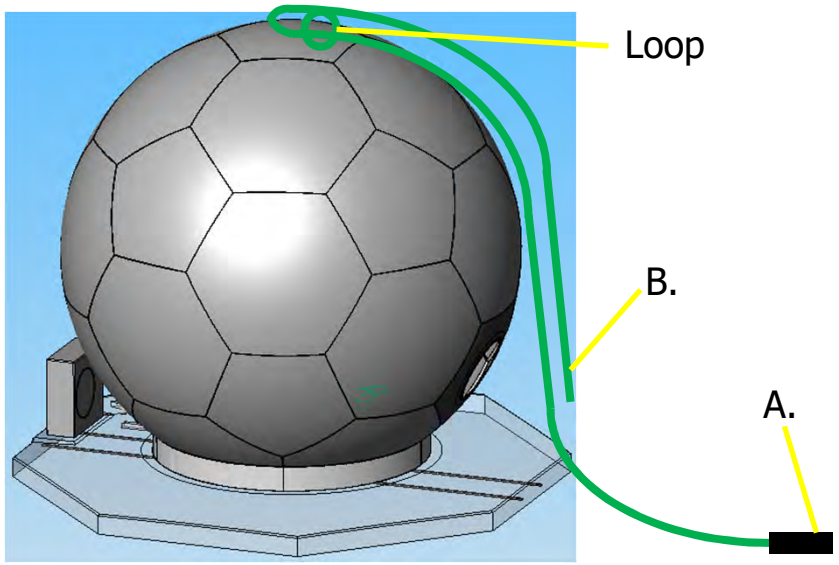
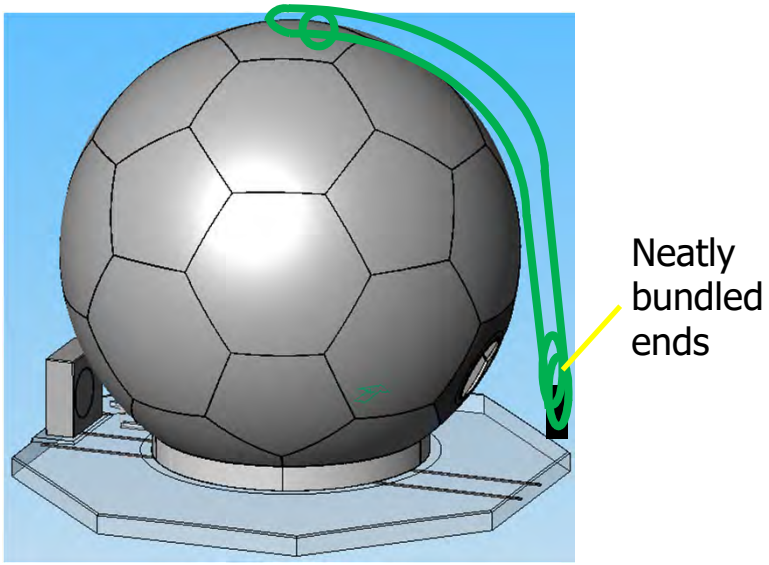


Fig 9: Neatly bundle ends.



F. SERVICE REPLACEMENT

We strongly recommend replacing the rope before it breaks, at the first signs of wear, by using the existing rope to pull a new one around the lightning diverter.

ROPE ONLY: 41-207543-025 - ROPE, 0.25 IN X 100 FT, POLYESTER, WHITE

ROPE KIT: 62-156979 – KIT, SNOW ROPE ASSEMBLY
(INCLUDES RESILIENT WEIGHTS)

Quality Management System

Procedure, Test, Product, Tracker 6000 Site Test

Document number:	99-169239
Version:	E
Author(s):	Bee Vang
Document classification:	Engineering
Date:	12-22-2020

This document is applicable for:
Sea Tel, Inc., doing business as Cobham SATCOM

Approval Routing	
Position	**Approving Authority (Electronic Signature)**
System Design Engineer	John Martin
Rami Adada	Director of New technology
Test Engineer	Bee Vang
Project Manager	Phil Cartaciano

Version History				
Ver.	**DCO**	**Description of Change**	**Author**	**Date**
A	00033339	Initial release	B. Vang J. Martin H. Hoang	06/17/2020
B	00039001	Change the RBW to 100kHz, added details and pictures to section 16.	B. Vang	08/06/2020
C	00039551	Add punch list. Add section to record power readings. Move plot insert into the test section instead of towards the back of the document. Add instructions on how to configure IP addresses. Add Antenna Name.	B. Vang	10/15/2020
D	00040270	Reference Antenna and RTU software upgrade procedures on this procedure. Make change to spec in section 12.8. Add details to steps 13.1 and 13.8. Add typically AGC value to section 14.8 and 17.8.	B. Vang	11/11/2020
E	00040825	Add to section 13 SHOW SATELITTE TX_POL Response: R SHOW SYSTEM AUTO_TRACK Response: OFF	B. Vang	12/22/2020

1.1. Purpose

To provide the required procedure for certifying the Tracker 6000 antenna system at the installation site.

1.2. Scope

This test procedure is use to validate the Tracker 6000 antenna system after the system has been built and integrated at the installation site. It is not intended to be a step-by-step instruction to guide the individual on how to connect, setup, and test the product. The Technician or Engineer using this procedure to validate the antenna should have knowledge of the antenna system, basic PC communication, and use of test equipment.

1.3. Definitions

AZ: Azimuth
CL: Cross Level
EL: Elevation
REL: Relative Azimuth
ICU: Integrated Control Unit
IMA: Integrated Marine Antenna
ADE: Above Deck Equipment
BDE: Below Deck Equipment
RX: Receive
TX: Transmit
RTU: Remote Terminal Unit
GUI: Graphical User Interface
BUC: Block Up Converter
LNB: Low-Noise Block Downconverter
M&C: Monitor and Control
RHCP: Right Hand Circular Polarization
LHCP: Left Hand Circular Polarization
GTS: Gateway Transceiver Subsystem

1.4. Responsibilities

Field Technician or Engineer: Personnel tasked to test functionality of product utilizing this test procedure. Maintain test results in accordance with Cobham documentation retention policies and ensure availability of those results to Cobham staff upon verbal or written request.

1.5. Safety

All work to be completed by trained Cobham personnel or authorized dealer in accordance with all local, state, and federal regulations.

PPE (Personal Protection Equipment): Safety glasses and steel toe work boots are required.

To avoid injuries, it is important to be aware of the risks present when handling and testing an antenna from inside the dome. There is a risk of the antenna injuring the operator, as the antenna moves, so the operator must be aware of the position of the antenna at all time while inside the dome.

1.7 Training

All personnel involved in execution of this procedure/process shall be retrain and certified as deemed necessary by Cobham.

1.8 References

System Block Diagram: 92-162776

Schematic: 93-164211

Antenna Software Upgrade Procedure: 99-174141

RTU Software Upgrade Procedure: 99-174989

1.9 Equipment / Programs Required

CL_Global_Star_Friction Test
EL_Global_Star_Friction Test
AZ Friction Torque Test
csvgain_3dB10dB
DacRemP
FileLogger.exe
CLTrimCal.xlsx
Microsoft Excel
Windows PC
Spectrum Analyzer (must be able to generate CSV file)
Signal Generator
Power Meter
Ethernet cable
Coax test cables

PUNCH LIST

1. TEST INFORMATION

Tested By: Click or tap here to enter text. **Date:**

Antenna Serial Number: Click or tap here to enter text.

Site: Click or tap here to enter text.

Antenna Name: Click or tap here to enter text.

2. RADOME LIGHT VERIFICATION

2.1 Turn on the light switch and verify that all dome lights come on. ☐

3. SYSTEM ERROR VERIFICATION

3.1 Set the static IP V4 address on the PC to be within the same IP address range as the antenna.

- Default IP: 10.1.1.100

3.2 If the Radome door switch is installed onto the door, press down onto the Mute Override Mode switch button at the safety circuit interface assembly towards the base of the antenna. This will allow the antenna to boot up while the door is open.

If the Radome door switch has not been installed onto the Radome door, close the door switch, by pressing the tabs together and keeping the tabs together by applying a piece of tape around the tabs.

Ensure that the E-stop is in the up position.

3.3 Energize the antenna pedestal and allow the antenna to initialize.

3.4 Open a telnet session (10.1.1.100 port 2003), and enter the Username and Password.

- Username: Dealer
- Password: seatel3

3.5 After the system completes initialization, issue CLI command, SHOW ERROR ALL and verify that there are no system errors besides the errors listed below. ☐

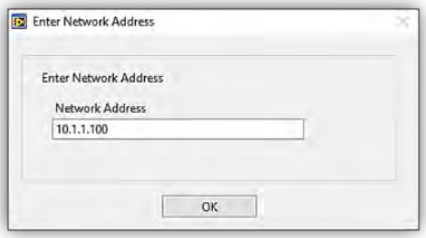
- Error 1031: AGC Below Threshold
- Error 1003: AGC Below Noise Threshold

3.6 Issue command, SET ANTENNA NAME XXXX (X = the name of the antenna) and record the antenna name above. ☐

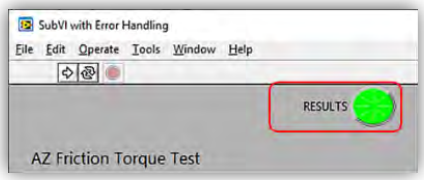
3.7 Issue command, SET INTERFACE NETWORK WEB ENABLE ON to access the antenna GUI and SAVE.

4. AZIMUTH FRICTION TORQUE TEST

4.1 In the IMA GUI; from the Position Antenna Page, target AZ to 0 and EL to 90.
4.2 From the Reflector Page, turn DishScan off.
4.3 Turn tracking off by clicking on Tracking Off at the upper left hand corner of the GUI.
4.4 From the telnet session, issue command, SET ANTENNA PATH_DELTA -240 0 0 10 .2.
4.5 Close the telnet session.
4.6 Allow the antenna to move AZ to 120 degrees before starting the AZ_Torque test.
4.7 Open program (**AZ_Torque**).
4.8 Enter the IP address of the antenna system, click OK, and allow test to run.



4.9 Verify that the system passes test (LED turns green).



4.10 Copy and paste the test plot below. ..... ☐

(Click on the plot, hold the ALT + Print Screen button and paste the plot here)

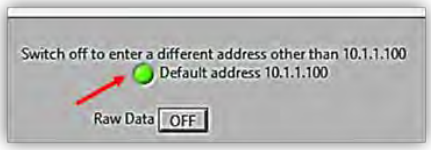
5. CROSS-LEVEL FRICTION TORQUE TEST

5.1 Open the **CL_Global_Star_Friction Test** program.

5.2 If the IP address of the antenna system is the default IP address (10.1.1.100), select the arrow [→] to start test.

5.3 If the IP address of the antenna system is not the default IP address, click on the green LED, and then click on the arrow.

5.4 Enter the IP address of the antenna system and allow the test to run.



5.5 Verify that the system passes test (LED turns green); copy and paste the test plot below. ☐

(Click on the plot, hold the ALT + Print Screen button and paste the plot here)

6. ELEVATION FRICTION TORQUE TEST

6.1 Open the **EL_Global_Star_Friction Test** program.
6.2 If the IP address of the antenna system is the default IP address (10.1.1.100), select the arrow [→] to start test.
6.3 If the IP address of the antenna system is not the default IP address, click on the green LED, and then click on the arrow.
6.4 Enter the IP address of the antenna system and allow the test to run.
6.5 Verify that the system passes test (LED turns green); copy and paste the test plot below. ☐

(Click on the plot, hold the ALT + Print Screen button and paste the plot here)

7. BUC M&C TEST

7.1 Set the static IP V4 address on the PC to be within the same IP address range as the BUC.

- Default LHCP BUC IP: 192.168.1.21
- Default RHCP BUC IP: 192.168.1.22

7.2 Log onto the BUC GUI, by entering the BUC IP onto the web browser.

- Password: 1234

7.3 Verify that the LHCP BUC (192.168.1.21) GUI can be access. ☐

7.4 Verify that the RHCP BUC (192.168.1.22) GUI can be access. ☐

7.5 To configure the BUC IP addresses, access the LHCP/RHCP GUI.

7.6 Select the Interface Cfg tab; set the BUC IP address, and click on the [submit] button.

New LHCP BUC IP: Click or tap here to enter text.
New RHCP BUC IP: Click or tap here to enter text.

8. CLIMATE MONITOR M&C TEST

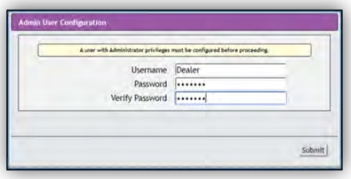
8.1 Ensure that the static IP address on the test PC is set to be within the same IP address range as the climate monitor IP address.

- Default IP: 192.168.1.25

8.2 Launch a web browser and enter in the device IP address onto the address bar.

8.3 Username and Password

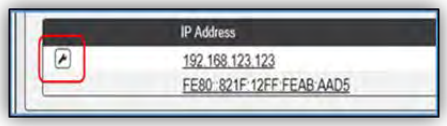
- UN: Dealer
- PW: seatel3



8.4 Ensure that the climate monitor web page can be access and verify that the WG15 internal temperature, humidity, and dew point are display on the GUI. ☐

8.5 Verify that the WG15 detects the two sensors and the sensors internal temperature, airflow, humidity, and dew point are display on the GUI. ☐

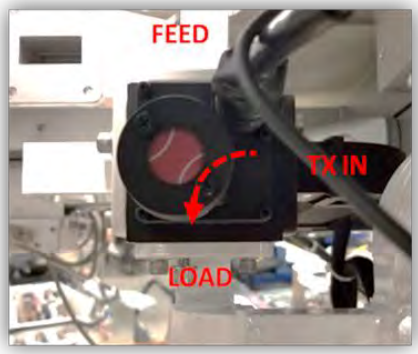
8.6 To configure the IP address, select the System tab, then Network.
8.7 Click on the setting icon, set the IP address, and then save. ☐



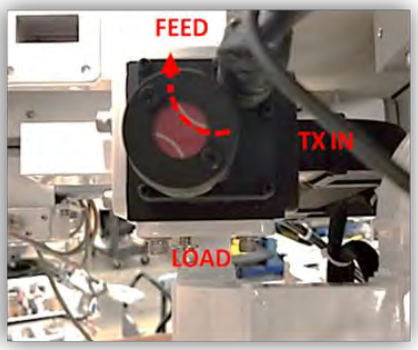
New Climate Monitor IP: Click or tap here to enter text.

9. DOOR SWITCH TEST

9.1 Reopen a telnet session, issue command, SET ANTENNA TX_LOAD OFF.
9.2 Open the Radome door switch, if the door switch has not been installed onto the door. If the door switch is installed onto the Radome door, depress the Mute Override Mode switch button at the safety circuit interface assembly.
9.3 Issue command, SHOW ERROR ALL.
9.4 Verify that the antenna system flags error "Open Door Detected". ☐
9.5 Verify that Safe mode is engaged. ☐
9.6 Verify that the baseball switches are in the Load position. ☐
SHOW STATUS SYSTEM BASE_BALL_SWITCH
⇨ Response: BB1/R LOAD = ON, BB2/L LOAD = ON



LOAD POSITION



NORMAL POSITION

9.7 Close the Radome door switch, or press down onto the Mute Override Mode switch button at the safety circuit interface assembly.
9.8 Verify that the "Open Door Detected" and "Safe mode engaged" errors clear. ☐

10. MAINTENANCE MODE SWITCH TEST

10.1 Drive the antenna down to 20° in EL.
10.2 Issue command, SET ANTENNA TX_LOAD OFF.
10.3 Push down the Maintenance Mode E-stop.

10.4 Verify that the antenna no longer moves (Park positon). ☐
10.5 Move the antenna by hand and verify that the antenna can move freely without any resistances from the motors. ☐
10.6 Verify that the baseball switches are in the Load position. ☐
- o SHOW STATUS SYSTEM BASE_BALL_SWITCH
  - ⇨ Response: BB1/R LOAD = ON, BB2/L LOAD = ON

10.7 Verify that the antenna system flags the "Maintenance Mode engaged" Error. ☐
10.8 Pull up the Maintenance Mode E-stop and reboot the antenna by issuing command, REBOOT.
10.9 Verify that the antenna initializes and operates normally. ☐
10.10 Verify that the antenna system clears the "Maintenance Mode engaged" Error. ☐

11. TRANSMIT GAIN CALIBRATION AND COMBINED POWER SENSOR CHECK

✎ ***Note**: Since the BUC is* iBUC R 300W Globalstar C-Band Intelligent Block Upconverter *, the iBUC R manual needs to be used for TX power configuration and Monitoring.*

Configuring ALC / AGC:
IBUC R offer two methods of ensuring consistent signal levels: automatic level control (ALC) and automatic gain control (AGC).

ALC:
When enabled, the Automatic Level Control (ALC) circuitry in the IBUC monitors output levels and adjusts the gain to maintain a consistent output for input signal variations. If a signal level is consistently below the predetermined target level, the ALC will cause the gain to be increased until the target level is reached. If a signal level exceeds the target level, the ALC will decrease the gain.

To enable ALC:
With the Gain Mode set to "Open" and the Tx Input and Tx Output Thresholds set, monitor the Tx Output level in order to determine a baseline setting.

When the Tx Output Level reading is equal to the level that you want to maintain, enable ALC by using any of the M&C interfaces.

The IBUC will now continuously self-monitor, increasing or decreasing the gain in order to maintain a constant signal at the level you defined.

AGC:
When enabled, the Automatic Gain Control (AGC) circuitry in the IBUC maintains the gain constant and equal to the target gain that was established when AGC was enabled.

Gain control settings can drift with time or temperature changes. You can reset the Gain Control function (when reset, the Gain Control returns to mid-range or 0.0).

Terrasat units enable you to offset the target by using the attenuation control without having to first disable the ALC or AGC.

Example: Set the output power level to 51.5 dBm and enable ALC. From this point forward, the ALC algorithm will maintain the output level at 51.5 dBm.

If you want to change the output level to 52 dBm, reduce the attenuation by 0.5 dB. The target level will be updated automatically.

✎ ***Note**: The Tx Output Level is "captured" when ALC is enabled.*

Recommended iBUC R Input Power and Output power,

TX Input threshold level Low	=	-30 dBm
TX Input threshold level High	=	5dBm
TX Output threshold level Low	=	30.5 dBm
TX Output threshold level High	=	54.0 dBm

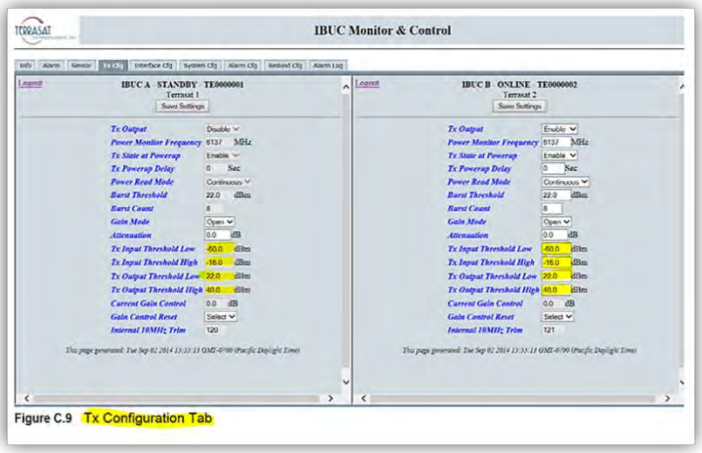
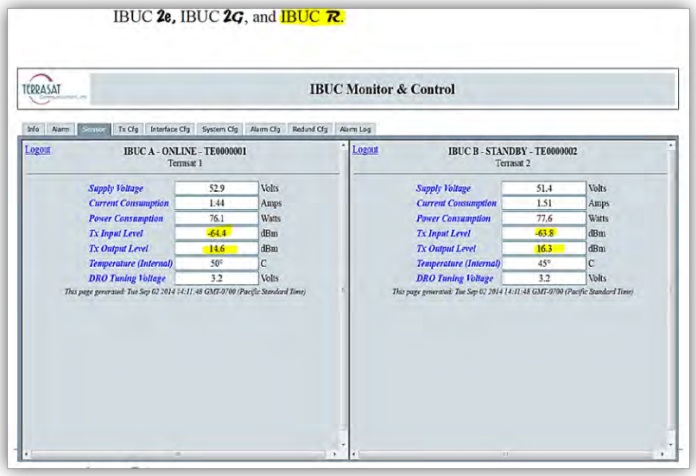


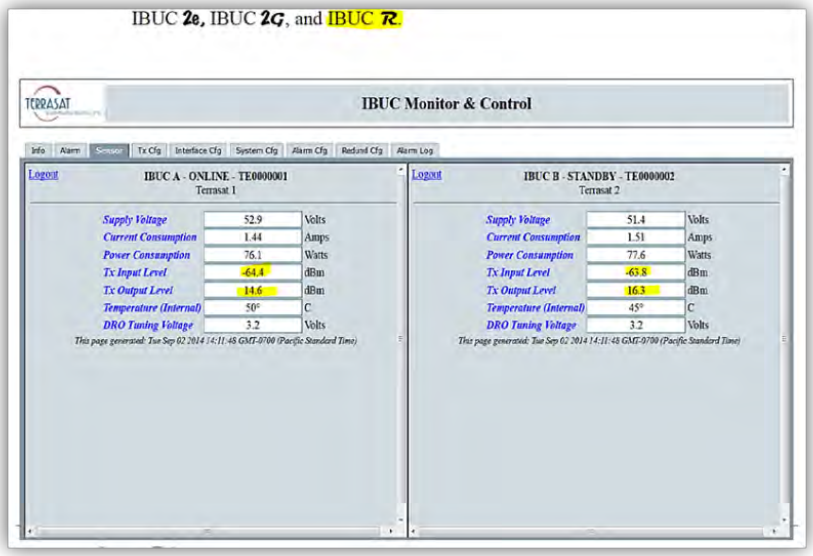
Figure C.9 Tx Configuration Tab



Here is the example Table for RF line up using the previous measured data for IF loss to get about ~68 dBW output power.

The row highlighted in Green color is the recommend setting to get the ~ 68.0 dBW output power.

The ALC/AGC is to maintain a constant (fixed Gain) for temperature and frequency variation after initial setting.
The BUC output power level can be lower or increase by the Modem for about 5.6 dB, OR it can be Increase/Decrease by adjusting the Attenuation setting of the BUC.

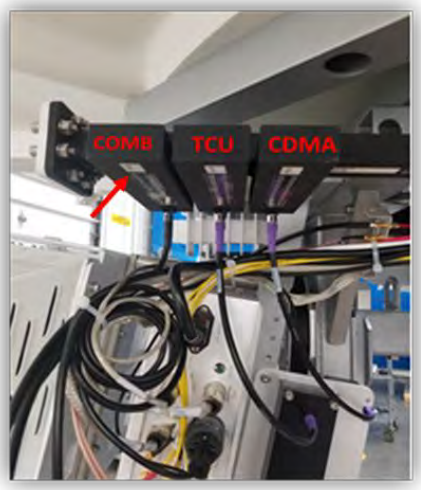


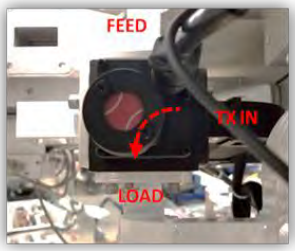
GCU TXIF Output Power (dBm) RHCP, Adjust Range 5.62 dB	Cable Loss GCU to Arrester (dB)	Signal Level @ Arrester Input (dBm)	IF Loss from Point A to BUC Input (dB)	Input Power Level to BUC N-Connector	Attenuation setting in BUC, Default 0 (dB)	BUC Gain (dB)	BUC Output Power PSAT (dBm)	Wave Guide, Filter, OMT, and Ant Gain Total (dB)	EiRP (dBW), add -30 dB conversion to dBW
0 dBm	-3.4 dB	**-3.4 dBm**	-4.5 dB	-7.9 dBm	0 dB	61 dB	53.1 dBm	46.5	**69.6 dBW**
0 dBm	**-3.4 dB**	**-3.4 dBm**	-4.5 dB	**-7.9 dBm**	**-1 dB**	**61 dB**	**52.1 dBm**	**46.5**	**68.6 dBW**
0 dBm	-3.4 dB	**-3.4 dBm**	-4.5 dB	-7.9 dBm	-2 dB	61 dB	51.1 dBm	46.5	**67.6 dBW**
0 dBm	-3.4 dB	-3.4 dBm	-4.5 dB	-7.9 dBm	-3 dB	61 dB	50.1 dBm	46.5	**66.6 dBW**
Can also adjust TXIF power level here					Fine tune in 0.1 dB Step				

11.1 Verify that the baseball switches are in the Load Position before conducting test (see images below). ..... ☐

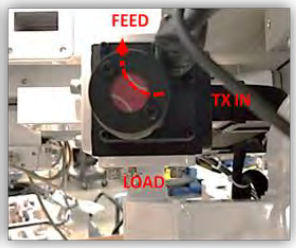
- o SET ANTENNA TX_LOAD ALL
- o SHOW STATUS SYSTEM BASE_BALL_SWITCH
  - ⇨ Response: BB1/R LOAD = ON, BB2/L LOAD = ON

11.2 Coaxial connection from the antenna to the ICC rack (indoor cable demark point).
11.3 Configure the Signal Generator to **900 MHz** CW and **0dBm** power.
11.4 Set the Power Meter to 900MHz (with no offset) and calibrate the Power Meter.
11.5 Allow the Signal Generator to warm up for one hour before conducting test. ..... ☐
11.6 Verify that the BUC has been active for a minimum of 15 minutes. ..... ☐
11.7 Connect the Power Meter to the Signal Generator and measure the output power of the signal generator.
11.8 Adjust the Signal Generator power level until the Power Meter reading = 0dBm.
11.9 Connect the Signal Generator to the ICC rack RHCP TX port.
11.10 Set the Power Meter frequency to **5150MHz** and calibrate the Power Meter.
11.11 Add the RHCP COMB cross guide coupler offset value into the power meter. (Label is on the COMB coupler as shown below.)





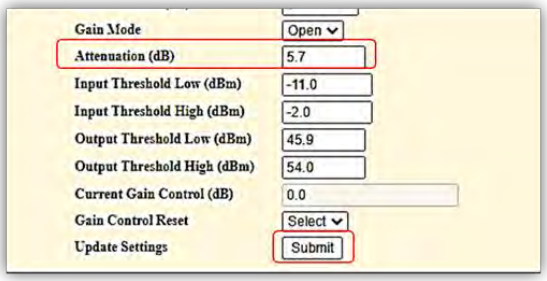
LOAD POSITION



NORMAL POSITION

11.12 Turn the antenna tracking off to prevent the antenna from going into search.
11.13 Target the antenna to AZ 0 degrees and EL 90 degrees.
11.14 Take the Power Meter up to the antenna hub and connect it to the RHCP COMB port of the test cross guide coupler. (See image above for the COMB port.)
11.15 Turn the Signal Generator RF on.
11.16 Log onto the RHCP BUC; select the [Tx Cfg] tab.
11.17 Adjust the BUC attenuation via its web page until the power meter reading = **50.5 ± 0.1dBm** (or **10.5 ± 0.1dBm** with no Power Meter offset). ..... ☐

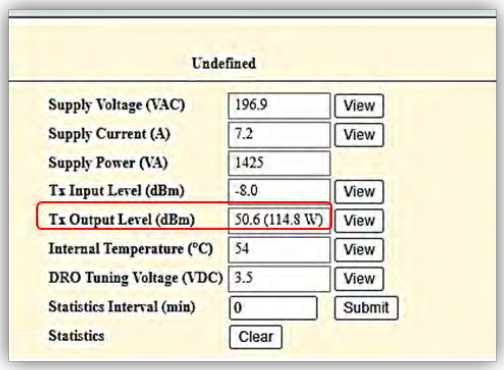
Power Meter Reading: Click or tap here to enter text.



11.18 In the RHCP BUC GUI, select the [Sensor] tab.

11.19 Verify that the BUC Tx Output Level is **50.5 ± 0.5dBm.** ☐

BUC GUI TX Output Reading: Click or tap here to enter text.



11.20 Reattach the RHCP COMB sample coax cable to the RHCP COMB port of the cross guide coupler. ☐

11.21 Open the Chrome web browser and log onto the RTU GUI, by typing 192.168.1.11/gs.html onto the address bar.

11.22 Select RHCP COMBINED and verify that the RHCP COMB power sensor reading = **50.5 ±0.5dBm.** ☐

Current RHCP COMB Reading: Click or tap here to enter text.

11.23 If the RHCP COMB reading does not meet spec, the COMB INTERNAL and CABLE values will need to be adjusted slightly, so that the power meter reading meets spec. … N/A ☐

- To make change to the COMB INTERNAL and CABLE values, select the [INTERNAL] or [CABLE] button and make the change to the value.
- Record down the new value(s) below.

  New Internal Value: Click or tap here to enter text.
  New Cable Value: Click or tap here to enter text.

  New RHCP COMB Reading: Click or tap here to enter text.

RHCP CDMA POWER SENSOR CHECK:

11.24 Select RHCP CDMA and verify that the RHCP CDMA power sensor reading = **50.5 ± 0.5dBm**. ..... ☐

Current RHCP CDMA Reading: Click or tap here to enter text.

11.25 If the RHCP CDMA reading does not meet spec, the CDMA INTERNAL and CABLE values will need to be adjusted slightly, so that the power meter reading meets spec. ... N/A ☐

- To make change to the CDMA INTERNAL and CABLE values, select the [INTERNAL] or [CABLE] button and make the change to the value.
- Record down the new value(s) below.

New Internal Value: Click or tap here to enter text.
New Cable Value: Click or tap here to enter text.

New RHCP CDMA Reading: Click or tap here to enter text.

RHCP TCU POWER SENSOR CHECK:

11.26 Set the Power Meter frequency to **5091.5MHz** and calibrate the Power Meter.
11.27 Add the TCU cross guide coupler offset value into the power meter. (Label is on the TCU coupler.)
11.28 Connect the Power Meter to the RHCP TCU port of the test cross guide coupler.
11.29 Change the frequency of the signal generator to **841.5MHz** and turn RF on.
11.30 Record the power meter reading. (Reading = **50 ± 1dBm**)

Power Meter Reading: Click or tap here to enter text.

11.31 Reattach the RHCP TCU sample coax cable to the RHCP TCU port of the cross guide coupler.
11.32 From the RTU GUI, select RHCP TCU and verify that the RHCP TCU power sensor reading = the recorded Power Meter reading (from step 11.30) **± 0.2dBm**..... ☐

Current RHCP TCU Reading: Click or tap here to enter text.

11.33 If the RHCP TCU reading does not meet spec, the TCU INTERNAL and CABLE values will need to be adjusted slightly, so that the power meter reading meets spec. ..... N/A ☐

- To make change to the TCU INTERNAL and CABLE values, select the [INTERNAL] or [CABLE] button and make the change to the value.
- Record down the new value(s) below.

New Internal Value: Click or tap here to enter text.
New Cable Value: Click or tap here to enter text.

New RHCP TCU Reading: Click or tap here to enter text.

11.34 Turn the signal generator RF to off.

LHCP TRANSMIT GAIN CALIBRATION & COMBINED POWER SENSOR CHECK:

11.35 Configure the Signal Generator to **900MHz** CW and 0dBm power.
11.36 Connect the Signal Generator to the ICC rack LHCP TX port.
11.37 Set the Power Meter frequency to **5.150GHz** and calibrate the power meter.
11.38 Add the LHCP COMB cross guide coupler offset value into the power meter. (Label is on the COMB coupler as shown below.)
11.39 Take the Power Meter up to the antenna hub and connect it to the LHCP COMB port of the test cross guide coupler. (See image above for the COMB port.)
11.40 Turn the Signal Generator RF on.
11.41 Log onto the LHCP BUC; select the [Tx Cfg] tab.

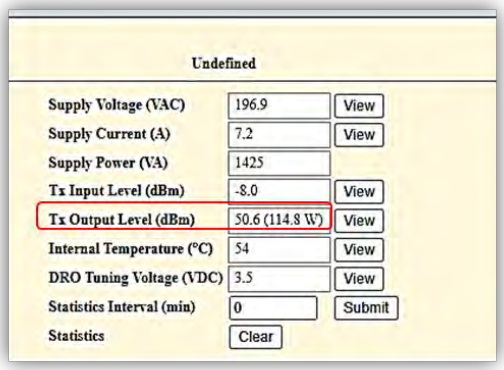
11.42 Adjust the BUC attenuation via its web page until the power meter reading = **50.5 ± 0.1dBm** (or **10.5 ± 0.1dBm** with no Power Meter offset). ☐

Power Meter Reading: Click or tap here to enter text.

11.43 In the LHCP BUC GUI, select the [Sensor] tab.

11.44 Verify that the BUC Tx Output Level is **50.5 ± 0.5dBm**. ☐

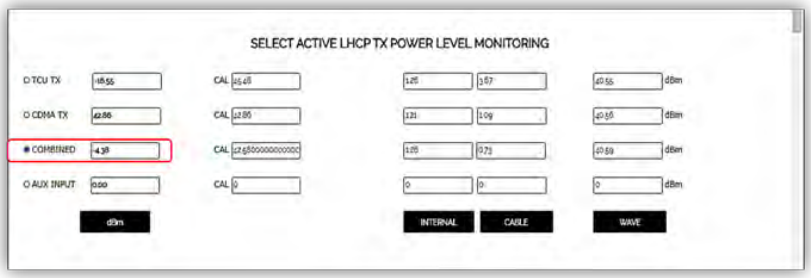
BUC GUI TX Output Reading: Click or tap here to enter text.



11.45 Reattach the LHCP COMB sample coax cable to the LHCP COMB port of the cross guide coupler. ☐

11.46 In the RTU GUI, select LHCP COMBINED and verify that the LHCP COMB power sensor reading = **50.5 ± 0.5dBm**. ☐

Current LHCP COMB Reading: Click or tap here to enter text.



11.47 If the LHCP COMB reading does not meet spec, the COMB INTERNAL and CABLE values will need to be adjusted slightly, so that the power meter reading meets spec. … N/A ☐

- To make change to the COMB INTERNAL and CABLE values, select the [INTERNAL] or [CABLE] button and make the change to the value.
- Record down the new value(s) below.

  New Internal Value: Click or tap here to enter text.
  New Cable Value: Click or tap here to enter text.

  New LHCP COMB Reading: Click or tap here to enter text.

LHCP CDMA POWER SENSOR CHECK:

11.48 Select LHCP CDMA and verify that the LHCP CDMA power sensor reading = **50.5 ± 0.5dBm**. ..... ☐

Current LHCP CDMA Reading: Click or tap here to enter text.

11.49 If the LHCP CDMA reading does not meet spec, the CDMA INTERNAL and CABLE values will need to be adjusted slightly, so that the power meter reading meets spec. ... N/A ☐

- To make change to the CDMA INTERNAL and CABLE values, select the [INTERNAL] or [CABLE] button and make the change to the value.
- Record down the new value(s) below.

New Internal Value: Click or tap here to enter text.
New Cable Value: Click or tap here to enter text.

New LHCP CDMA Reading: Click or tap here to enter text.

LHCP TCU POWER SENSOR CHECK:

11.50 Set the Power Meter frequency to **5091.5MHz** and calibrate the Power Meter.
11.51 Add the TCU cross guide coupler offset value into the power meter. (Label is on the TCU coupler.)
11.52 Connect the Power Meter to the RHCP TCU port of the test cross guide coupler.
11.53 Change the frequency of the signal generator to **841.5MHz** and turn RF on.
11.54 Record the power meter reading. (Reading = **50 ± 1dBm**)

Power Meter Reading: Click or tap here to enter text.

11.55 Reattach the LHCP TCU sample coax cable to the LHCP TCU port of the cross guide coupler.
11.56 From the RTU GUI, select LHCP TCU and verify that the LHCP TCU power sensor reading = the recorded Power Meter reading (from step 11.54) **±0.2dBm.** ..... ☐

Current LHCP TCU Reading: Click or tap here to enter text.

11.57 If the RHCP TCU reading does not meet spec, the TCU INTERNAL and CABLE values will need to be adjusted slightly, so that the power meter reading meets spec. ..... N/A ☐

- To make change to the TCU INTERNAL and CABLE values, select the [INTERNAL] or [CABLE] button and make the change to the value.
- Record down the new value(s) below.

New Internal Value: Click or tap here to enter text.
New Cable Value: Click or tap here to enter text.

New LHCP CDMA Reading: Click or tap here to enter text.

11.58 Turn the signal generator RF to off.

11.59 To configure the RTU IP address, open Putty and select SSH.
11.60 Enter the default RTU IP address.
11.61 Log onto the RTU.

- User: root
- PW: Globalstar

11.62 Type cd /etc/sysconfig/network-scripts
11.63 Type vi ifcfg-eno1
11.64 Change the IP address, and save change.

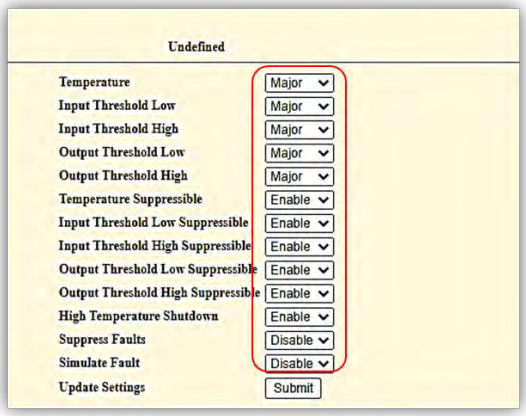
New RTU IP: Click or tap here to enter text.

LHCP & RHCP BUC SETUP:

11.65 Select the [Tx Cfg] tab.
11.66 Set the parameters as below and submit.

- Input Threshold Low (dBm) = -11.0
- Input Threshold High (dBm) = -2.0
- Output Threshold Low (dBm) = 35.0
- Output Threshold High (dBm) = 54.0

11.67 Select the [Alarm Cfg] tab.
11.68 Set the parameters as below and submit.



12. RECEIVE RF ALIGNMENT

✎ ***Note:*** *Ensure that the internal radome temperature is between 50° F and 80° F before conducting test.*

12.1 Configure the Signal Generator to **6.975GHz** CW and **-25dBm** power.
12.2 Set the Power Meter to 6.975GHz (with no offset) and calibrate the Power Meter.
12.3 Allow the Signal Generator to warm up for one hour before conducting test. ..... ☐
12.4 Verify that the LNBs have been active for a minimum of 15 minutes. ..... ☐
12.5 Connect the Signal Generator along with the test coax cable to the Power Meter and measure the output power of the signal generator.
12.6 Adjust the Signal Generator power level until the Power Meter reading = **-25dBm**.
12.7 Connect the test coax cable from the Signal Generator to the LNB coupler at the antenna and turn the Signal Generator RF on.
12.8 Attenuate the input of the line amps (at the base of pedestal) by adding Fixed Attenuators (SMA Male to SMA Female) until the reading at the ICC rack = **0 ± 0.5dBm.**

LHCP Reading: Click or tap here to enter text.

RHCP Reading: Click or tap here to enter text.

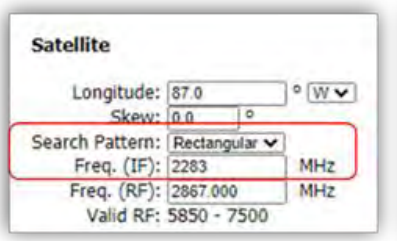
13. INITIAL ANTENNA TRIM

13.1 From the telnet session, issue the CLI commands below and verify that the responses match what are listed below. ..... ☐

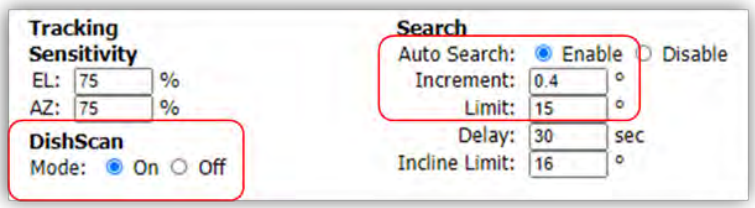
> ***Note:*** *To set the parameter, issue SET instead of SHOW in the command line. Issue, Save to save the change.*
>
> - ***Example:*** *SET INTERFACE TIME SOURCE GPS*

- SHOW INTERFACE TIME SOURCE
  - ⇨ Response: GPS
- SHOW INTERFACE GPS GPS_ID
  - ⇨ Response: RMC
- SHOW SYSTEM AUTO_TRACK
  - ⇨ Response: OFF
- SHOW ANTENNA DATASTREAM TIME_SYSTEM
  - ⇨ Response: GPS
- SHOW SATELLITE TRACK_MODE
  - ⇨ Response: TLE_TRACK
- SHOW SATELLITE BAUDRATE
  - ⇨ Response: 500
- SHOW SATELLITE FREQ
  - ⇨ Response: 2283
- SHOW SATELLITE MODULATION
  - ⇨ Response: DVB-S
- SHOW SATELLITE LNB
  - ⇨ Response: X-POL
- SHOW SATELLITE THRESHOLD AUTO_MODE
  - ⇨ Response: OFF
- SHOW SATELLITTE TX_POL
  - ⇨ Response: R

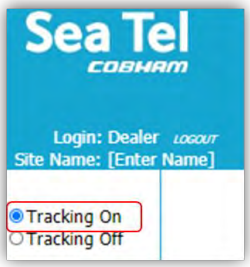
13.2 In the IMA GUI, select the Position Antenna page. Set the Search Pattern to Rectangular and Auto Offset to 30.



13.3 Select the Reflector page, Enable Auto Search, set the Increment to 0.4, Limit to 15, and ensure DishScan is on.

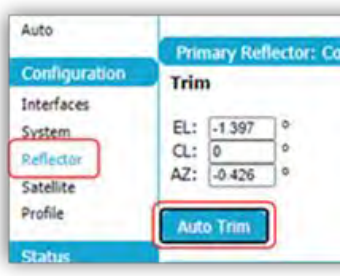


13.4 Ensure Tracking in On.

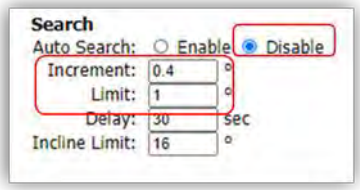


13.5 From the telnet session, issue command, SET ANTENNA SUN_TARGET and allow the antenna to search and track onto the sun for 3-5minutes. ☐

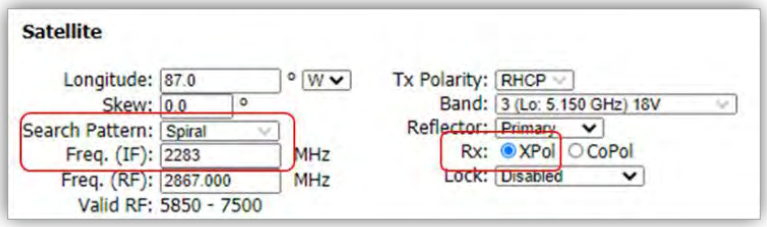
13.6 In the Reflector page, select the [Auto Trim] button. ☐



13.7 Set the Limit to 1 and Disable Auto Search. ☐

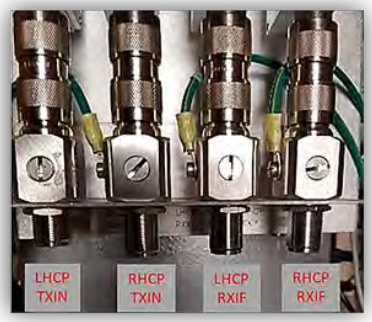


13.8 In the Position Antenna Page, set the Search Pattern to Spiral, RX to XPOL, and then select the [Save] button ☐

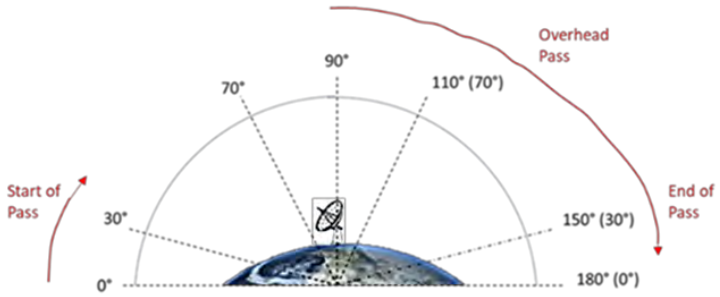


14. SATELLITE ACQUISITION WITH TLE & CL TRIM

14.1 Connect the Spectrum Analyzer to the LHCP RXIF OUT port of the IFL interface assembly at the base of the antenna. (Connect to the coupler if testing from inside the radome.)



Important Note: *The satellite pass used for this test must not be an EL pass of less than 60° and greater than 78° (no overhead satellite pass).*



14.2 Contact Globalstar for satellite schedule passes. Use the scheduler to determine satellite passes with an EL pass between 60° and 78°. The satellite TLE can be found https://www.tle.info/ or https://www.celestrak.com/NORAD/elements/active.txt


NASA's NSSDC Master Catalog

Two Line Element Set (TLE):

```
1 25874U 99041C   20161.42982561 -.00000114 +00000-0 -13484-2 0  9996
2 25874 051.9427 043.1682 0012580 065.2455 105.6825 11.25670607916360
```

Source of the keplerian elements: AFSPC

14.3 Open **FileLogger.exe**:

14.3.1 Open a command window and change the directory to where FileLogger.exe is located.

14.3.2 At the command prompt type, FileLogger.exe Antenna IP address.

Example: C:\FileLogger>FileLogger.exe 10.1.1.100

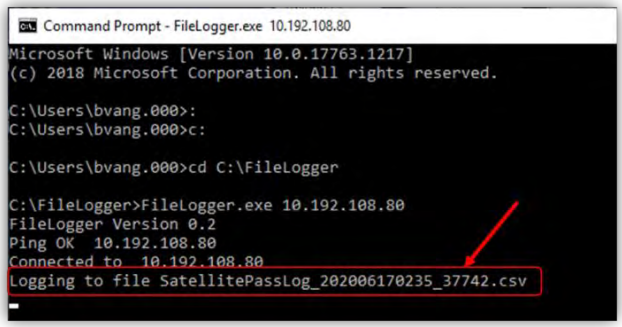
14.4 From the telnet session, issue command, SET SATELLITE TLE (copy and paste the first TLE line here).

14.5 Issue command, SET SATELLITE TLE (copy and paste the second TLE line here).

Example:

SET SATELLITE TLE 1 25874U 99041C 20161.42982561 -.00000114 +00000-0 -13484-2 0 9996
SET SATELLITE TLE 2 25874 051.9427 043.1682 0012580 065.2455 105.6825 11.25670607916360

14.6 As soon as the TLE command executes, FileLogger.exe will start data log.

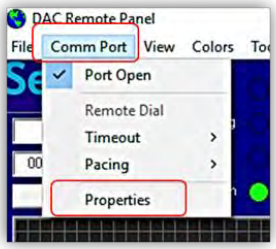


14.7 The antenna system will automatically target the satellite.

14.8 Open DacRemP and monitor the signal level.

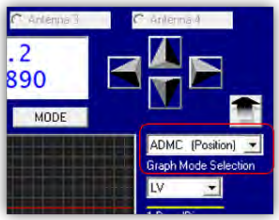
> ✎ ***Note:*** *One satellite signal level will vary from the next, but typically the AGC is around 1100 counts.*

14.9 Select Comport, and then Properties.



14.10 Select TCP/IP; enter in the IP address of the antenna system; set the port number to 2000 or 2001, and then click [OK].

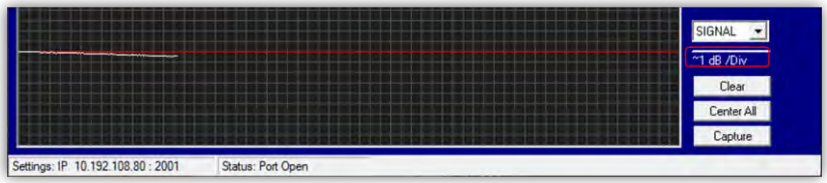
14.11 Use ADMC to monitor and display the AGC level.



14.12 Select [Clear] and [Center All].

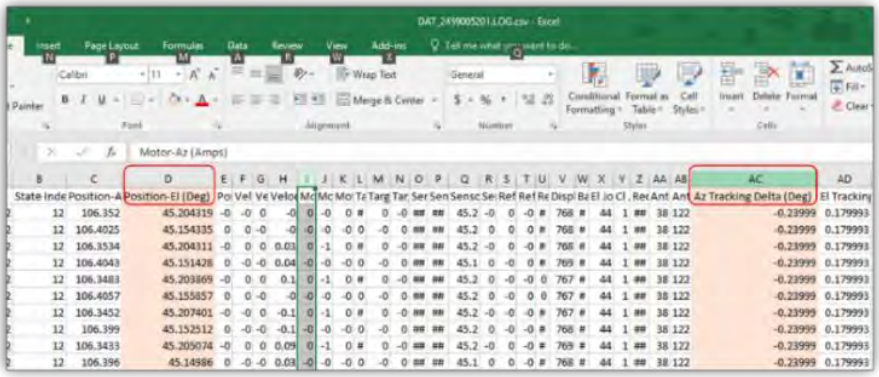
14.13 Observe the signal level (4th trace down). During the entire satellite pass, ensure that the signal level in DacRemP does not fluctuate by more than 2dB, or the data will be invalid. If the signal level fluctuates by more than 2dB, repeat steps 14.2 to 14.13.

- 1 division = 1dB in DacRemP



14.14 Allow the antenna system to track the satellite for a complete pass.
14.15 Exit the FileLogger.exe window to stop the data log.
14.16 Open the CSV file and locate the POSITION EL (Deg) and AZ TRACKING DELTA (Deg) Columns.

✎ ***Note:*** *The data log file will be stored in the same directory as FileLogger.exe.*



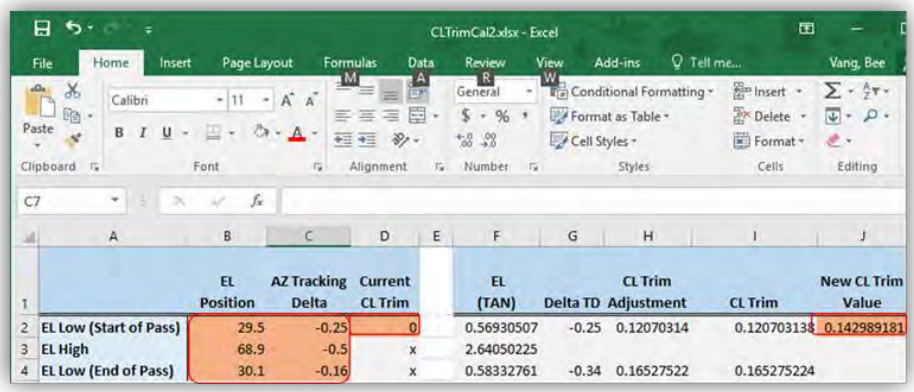
14.17 Note down the EL Positions and AZ Tracking Delta values in EL positions:

- Low EL Position at the start of pass (30±2°)
- High EL Position (Highest EL positon of the pass - between 60° and 78°)
- Low EL Position at the end of pass (30±2°)

14.18 Open Excel program **CLTrimCal.xlsx**.
14.19 Enter the Low EL Position (start of pass) and AZ Tracking Delta value into B2/C2.
14.20 Enter the Highest EL Position and AZ Tracking Delta value into B3/C3.
14.21 Enter the Low EL position (end of pass) and AZ Tracking Delta value into B4/C4.
14.22 If the antenna has a CL Trim value, enter the CL Trim value into D2.

✎ ***Note:*** *To determine if there is a CL Trim value stored in the antenna system, issue command, SHOW SYSTEM PRIMARY_REFLECTOR TRIM CL.*

14.23 For a new antenna installation, there will be no CL Trim value. Enter 0 into D2.
14.24 The calculated CL Trim value is to the right as shown below.



14.25 Record the New CL Trim value.

CL TRIM: Click or tap here to enter text.

14.26 Set the CL Trim by issuing command, SET SYSTEM PRIMARY_REFLECTOR TRIM CL X.XX.

- Example: SET SYSTEM PRIMARY_REFLECTOR TRIM CL -0.15.

14.27 SAVE and REBOOT.

15. ANTENNA AZ & EL TRIM

15.1 Open the IMA GUI, enable Auto Search, ensure DishScan and Tracking are on.
15.2 Set the IF frequency to 2283MHz.
15.3 From the telnet session, issue command, SET ANTENNA SUN_TARGET and allow the antenna to search and track onto the sun for 3-5minutes. ☐
15.4 In the IMA, GUI, Disable Auto Search. ☐
15.5 Select the [Auto Trim] button. ☐
15.6 Record the new EL and AZ Trim values. ☐

EL TRIM: Click or tap here to enter text.

AZ TRIM: Click or tap here to enter text.

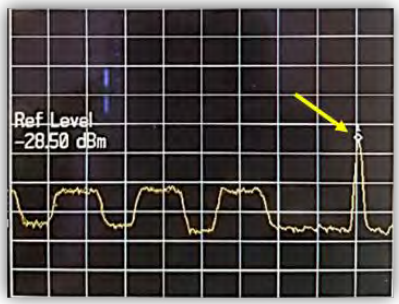
16. ANTENNA BEAMWIDTH TEST

16.1 Determine the satellite used for test.
16.2 From the telnet session, issue command, SET SATELLITE TLE (copy and paste the first TLE line here).
16.3 Issue command, SET SATELLITE TLE (copy and paste the second TLE line here).

Example:

SET SATELLITE TLE 1 1 25874U 99041C 20161.42982561 -.00000114 +00000-0 -13484-2 0 9996
SET SATELLITE TLE 2 2 25874 051.9427 043.1682 0012580 065.2455 105.6825 11.25670607916360

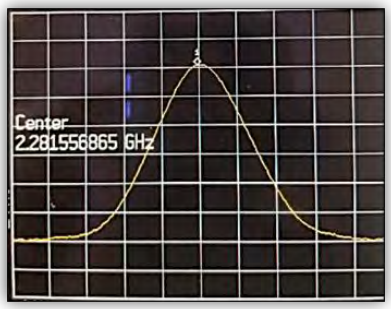
16.4 The antenna system will automatically target the satellite.
16.5 Allow the antenna system to track and peak onto the satellite.
16.6 Obtain a beacon receive signal.



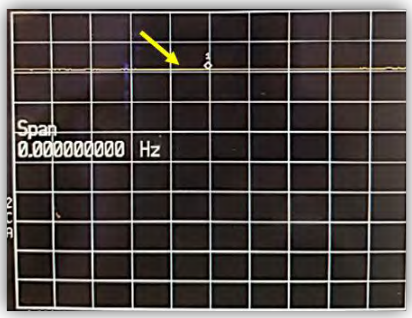
16.7 Set the spectrum analyzer to the following:

- RBW: 100 kHz
- VBW: 30 Hz
- Sweep Time: 10 sec.
- Scale/Div.: 5 dB
- Span: 1MHz

16.8 Adjust the beacon signal to the center frequency.



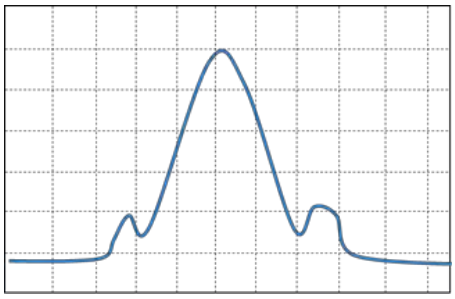
16.9 Set the Span to 0 kHz.
16.10 Adjust the REF Level to place the trace near the top of the display.



16.11 Ensure that the signal is stable before proceeding.

Note: *The horizontal sweep needs to occur below* ***30°*** *in Elevation.*

16.12 Issue command, SET ANTENNA PATTERN_SCAN HORIZONTAL 3 1.
16.13 Press Single Sweep at the spectrum Analyzer and allow the spectrum analyzer sweep to complete.



16.14 From the IMA GUI, record the EL reading at the time of the horizontal sweep. ..... ☐

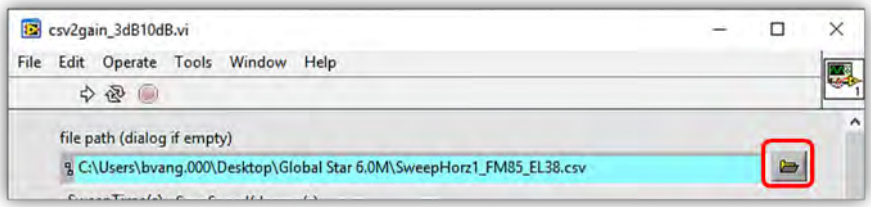
Current EL reading: Click or tap here to enter text.

16.15 Save the CSV file as **HORZ-Sweep**.
16.16 Re-target the antenna (issue command: SET SYSTEM RETARGET) and allow the antenna to peak onto the satellite.
16.17 At the spectrum analyzer, press Last Span and adjust the beacon signal to the center frequency if require, then press Zero Span.
16.18 Allow the trace to run to the center of the analyzer display and ensure that the signal is stable before proceeding.

Note: *The vertical sweep needs to occur below* ***60°*** *in Elevation.*

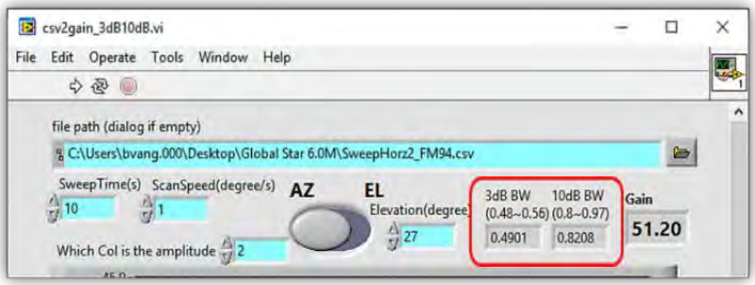
16.19 Issue command, SET ANTENNA PATTERN_SCAN VERTICAL 3 1.
16.20 Press Single Sweep at the spectrum Analyzer and allow the spectrum analyzer sweep to complete.
16.21 Save the CSV file as **VERT-Sweep**.

16.22 Open the **csvgain_3dB10dB** program, and load the HORZ-Sweep CSV file by clicking onto the folder icon.



16.23 Set the Spectrum Analyzer sweep time to 10.
16.24 Set the scan speed to 1 or 2.
16.25 Select AZ; and enter in the EL reading (reading recorded in step 16.14).
16.26 Click on run (Arrow).

16.27 Ensure readings meet specification. ..... ☐



16.28 Copy and paste plot below.

(Click on the plot, hold the ALT + Print Screen button and paste the plot here)

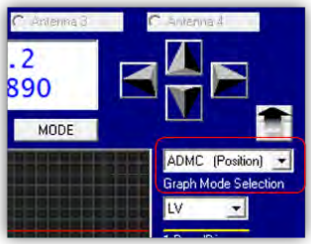
16.29 Load the VERT-Sweep CSV file.
16.30 Set the Spectrum Analyzer sweep time to 10.
16.31 Set the scan speed to 1.
16.32 Select EL; and leave the EL reading as is.
16.33 Click on run (Arrow).
16.34 Ensure readings meet specification. ☐
16.35 Copy and paste plot below.

- If tests pass, provide the CSV files along with this test documentation to Cobham.
- If the measurements do not meet specifications, repeat tests. If test fails, contact Cobham support and provide the CSV file to Cobham. Cobham will review the data and provide further instructions or actions if required.

(Click on the plot, hold the ALT + Print Screen button and paste the plot here)

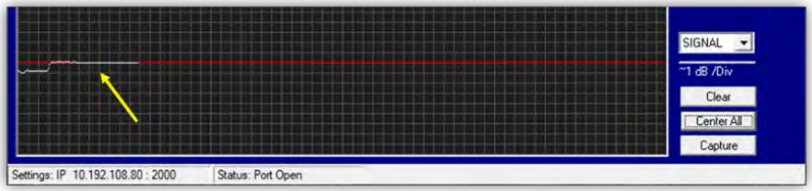
17. FOUR QUAD TRACKING TEST

17.1 Determine the satellite used for test.
17.2 From the telnet session, issue command, SET SATELLITE TLE (copy and paste the first TLE line here).
17.3 Issue command, SET SATELLITE TLE (copy and paste the second TLE line here).
17.4 Allow the antenna to track the satellite for 1 minute.
17.5 Open DacRemP.
17.6 Use ADMC to monitor and display the AZ, EL, REL and AGC level.

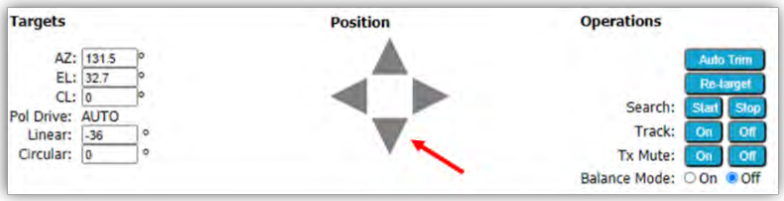


17.7 Select [Clear] and [Center All].
17.8 Observe the signal level (4th trace down) and verify that the signal level is peak and stable.

> ✎ ***Note:*** *One satellite signal level will vary from the next, but typically the AGC is around 1100 counts.*



17.9 In the IMA GUI, from the Position Antenna Page, step EL Down by clicking on the down arrow until the signal in DacRemP drops approximately 2 divisions as shown below.



17.10 Verify that the AGC trace returns to peak signal level. ..... ☐
17.11 Repeat test for EL Up (Up arrow), AZ Down (Left arrow), and AZ Up (Right arrow).
17.12 Verify that during each test, the AGC trace returns to peak signal level.

EXAMPLE

17.13 Verify that test passes; copy and paste the test plot below ..... ☐

(Click on the plot, hold the ALT + Print Screen button and paste the plot here)

18. FULL PASS TRACKING TEST

Note: *If Program Track is unavailable at the installation site, test is not required.*

Program Track Mode: ..... **N/A** ☐

18.1 Start the ACU/GCU Service and ensure that the antenna can track the satellite for an entire satellite pass without any issues. ..... ☐

19. TEST DATA

19.1 Issue command, SET INTERFACE NETWORK WEB ENABLE OFF to disable the antenna GUI; SAVE. ..... ☐

19.2 Provide data below along with this test documentation to Cobham. ..... ☐

- ☑ HORZ-Sweep CSV file
- ☑ VERT-Sweep CSV file
- ☑ INI File