



# USER MANUAL

## GLOBE TREKKER ASSEMBLY MANUAL



## Operator's Manual

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## Technical Support

This manual provides engineers with information necessary to operate the applicable system. Technical support is available from Norsat.

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# Safety

<p>Caution</p> 	<p><b>Grounding the Terminal</b></p> <p>In urban areas, ground the terminal with a grounding conductor in accordance to national and local electrical codes.</p>
<p>Danger</p> 	<p><b>FCC Radio Frequency Exposure Information for Mobile Transmitting Devices</b></p> <p>When the power is on, maintain an off-axis safety distance of 0.7 meters (2.3 feet), where “off axis” means 0.9 meters (3 feet) from the center of the beam, and maintain an on-axis safety distance of 7 meters (23 feet).</p>
<p>Danger</p> 	<p><b>Electrical Hazards in Wet and Windy Conditions</b></p> <p>While the terminal is designed for outdoor use (e.g. optional waterproof power supply), observe the following safety precautions during windy and wet weather conditions. Some steps may not apply depending on the BUC configuration.</p> <p>Check cable connectors and power cords for damage or tears. Replace cables and cords as needed.</p> <p>Disconnect the terminal from its power source before you move it.</p> <p>Disconnect the terminal from its power source if you suspect a power malfunction</p>
<p>Warning</p> 	<p><b>Hot Surfaces</b></p> <p>When transmitting, do not touch the BUC as it may result in burns or injury.</p>
<p>Danger</p> 	<p><b>Hazards of Microwave Radiation in Electromagnetic Fields</b></p> <p>When the power is on, the area directly in front of the antenna is an Area of Restricted Occupancy. Observe the following safety precautions:</p> <ol style="list-style-type: none"> <li>1. Limit human exposure time to the area directly in front of the main antenna assembly.</li> <li>2. Never place any part of your body between the antenna and the Feed Horn assembly.</li> <li>3. Never place any part of your body in line with the direction of the antenna transmission path.</li> <li>4. Locate the terminal as far as possible from ungrounded metal.</li> </ol>

	<p><b>Dielectric Heating</b></p> <p>Dielectric heating is the heating of an insulating material caused by placing it in a high frequency electric field. When a human enters a Radio Frequency (RF) field, the body acts as dielectric. If the power in the RF field exceeds 10 milliwatts per centimeter, the individual will have a noticeable rise in body temperature.</p> <p>The severity of burns may vary from minor to major. Burns or other damage may result in long term injury or even death.</p> <p>The vital organs of the body are highly susceptible to dielectric heating.</p> <p>The eyes are also highly susceptible to dielectric heating. Do not look directly into devices radiating RF energy.</p> <p>You must not stand directly in the path of RF radiating devices</p>
<p>Warning</p> 	<p><b>Unintentional Radio Interference</b></p> <p>This equipment generates, uses, and radiates radio frequency energy. If you install and use the device according to the instruction manual, the device will not cause harmful interference to radio communications.</p> <p>If you operate the device in a residential area, it is likely to cause harmful interference to radio communications; you will correct the interference at your own expense.</p>
<p>Warning</p> 	<p><b>Changes or Modifications to Equipment</b></p> <p>Changes or modifications to this equipment, not expressly approved by the manufacturer could void the user's authority to operate the equipment.</p> <p>Accessories and Devices Use of non-approved accessories or devices may lead to a degradation in performance, damage to equipment, or potential hazards</p> <p>Servicing the Equipment Do not service the equipment alone unless another person is present to administer first-aid</p>

# Preface

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## Purpose and Scope of the User Guide

The user guide explains the system specifics of the Norsat GLOBETrekker™ satellite terminal. This user guide is specifically written for the 1.0m GLOBETrekker™

## Audience

The guide will be of interest to the following personnel:

- Field users
- Systems administrators (or IT; Lifecycle/Sustainment Managers)

**READ THE MANUAL BEFORE YOU INSTALL OR OPERATE THE  
GLOBETREKKER™**

# 1. Positioning the System

## 1.1 Site Selection

1. Find a clear level area. The GLOBETrekker™ can handle 10 degrees of angle on the system, but time to acquisition may suffer.
2. Ensure that there is a clear view of the sky towards the equator and target satellite
  - a. You can use a product like Norsat's Satellite Finder to assist in checking for view angles.
3. Ensure that you have access to sufficient power
4. Ensure that you can provide a safe clearance area or prevent people from walking in the way of transmission.

## 1.2 Clearance Distance

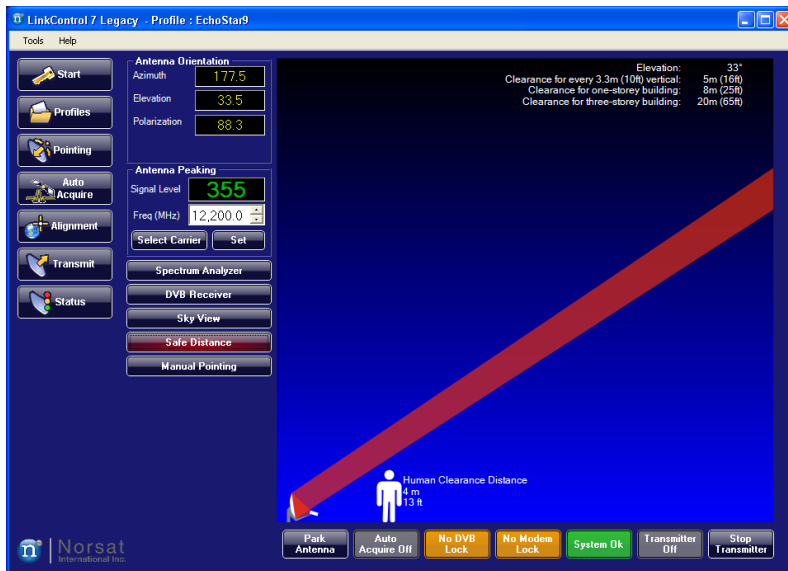


Figure 1: Sample Clearance Distance

Table 1: Sample Clearance Distance Calculations

Types of Obstacles	Clearance Distances
Antenna Elevation = 33°	
Clearance for every 3.3 meters (10 feet) vertical	5 meters (17 feet)
Clearance for one story building	8 meters (26 feet)
Clearance for three story building	20 meters (67 feet)
Human	4 meters (14 feet)



## 1.3 High Wind Set-up

If the system is to be used in a high wind situation ensure that you have sufficient ballast or tie downs to secure the legs of the GLOBETrekker™

Table 2: Minimum Ballast Required per Leg

Reflector Size	Wind Speed (km/h)		
	50	72	100
1.0m Ballast (kg) *	0	10	25
1.2m Ballast (kg) *	0	10	30

\* Note: the specified ballasts are assumed to be applied directly on top of the footpad. If the ballast is applied further up the leg then the mass must be increased. Contact Norsat for details.

## 2. Assembling the System

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*This chapter details the steps necessary to assemble a GLOBETrekker™  
Disassembly is done by reversing the following instructions*

### 2.1 Preparing the cases

1. Ensure that all the transit cases are at hand.
2. Unlatch the cases

### 2.2 Deploying the Legs for the Base band unit

1. Remove the BBU from the BBU case. The BBU provides the mounting points for the four (4) legs.

2. Place the system so that the leg mount brackets are visible.



Figure 2: Backside of the Baseband Unit

3. Hook the legs into the slots of the brackets. Ensure the locating pins on the brackets are aligned with the slots in the legs. Assemble so that the legs are flat on the bracket. Secure the legs using thumbscrews.

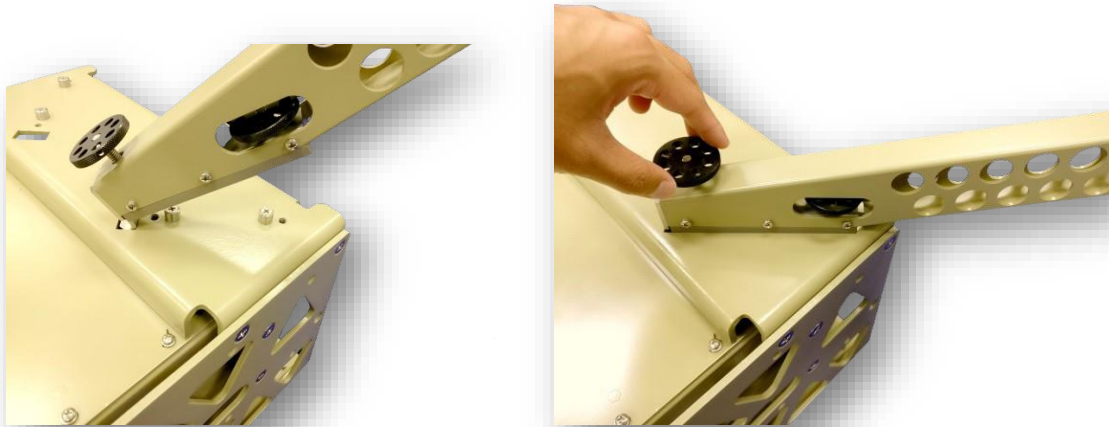


Figure 3: Supporting Legs and the Bracket

4. Place the system on its legs in the general direction of the satellite.

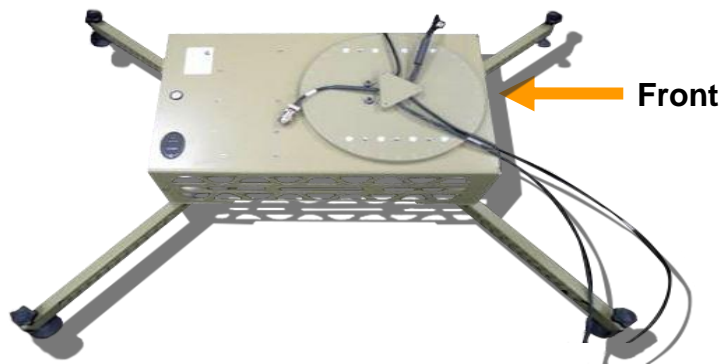


Figure 4: Place the System to Face the Right Position

**Example:** If your position is north of the equator, place the unit with the front facing the South.

5. Level the BBU using the threaded feet on the quad pod legs. The spirit level in the top of the unit will assist in the leveling process.



Figure 5: Bubble Level Adjustment

## 2.3 Assembling the Main Antenna Unit

This section describes how to set up the GLOBETrekker™ in either X-Band or Ku-Band configuration. Ensure that you do not mix components from the provided kits.

1. Remove the appropriate backplate from the components case you are installing and remove Elevation Lock Pin (if installed).

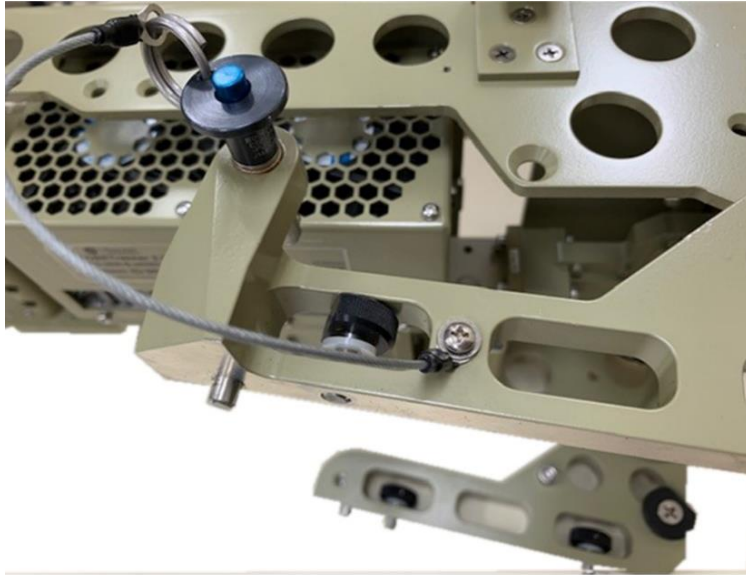


Figure 6: RF Backplate and Elevation Lock Pin

2. Fold the backplate support arms to bring the RF backplate to the standing position.



Figure 7: Fold the Supporting Arms of the RF Backplate

3. Install the backplate onto the baseband.

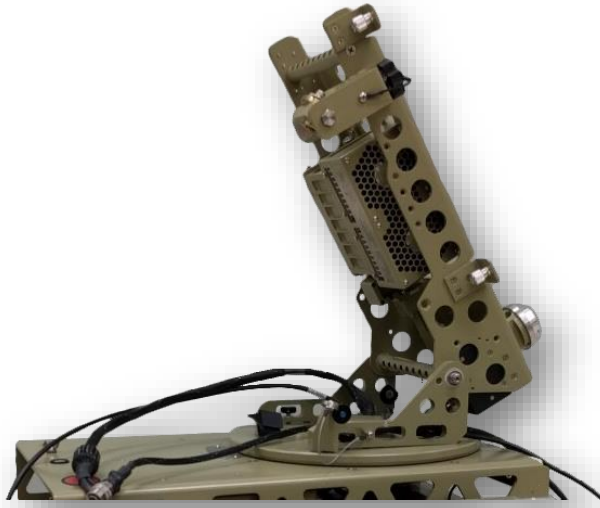


Figure 8: Install the Backplate onto the Baseband

**Important:** Do not rest the RF backplate on the Baseband cables; ensure that the cables rest fully behind the backplate.

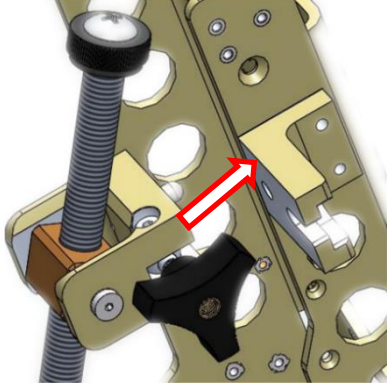
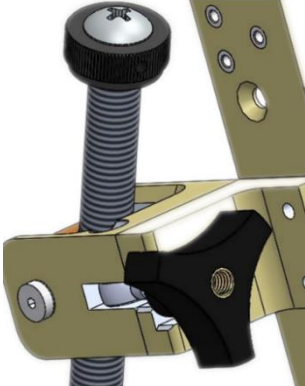
4. Secure the backplate using the elevation lock pins.



Figure 9: Secure the Backplate with Elevation Lock Pins

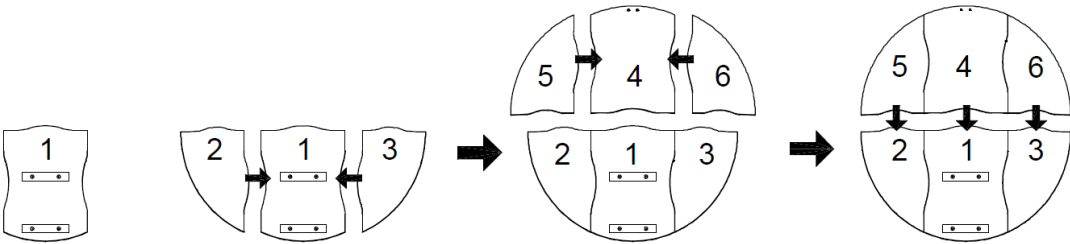
## 2.4 Assembling the Elevation Motor

Step	Instruction	Stepper Motor	DC Motor
1.	<p>Install lower end of elevation rod assembly. Secure with elevation lock pin (push button on end to release ball).</p> <p>Note the orientation:</p> <ul style="list-style-type: none"> <li>• For DC Motor, the motor sits to the outside of the structure.</li> <li>• For Stepper Motor, the cable sits to the outside of the structure.</li> </ul>		

1.	Align the dowel pins with the holes in the bracket.	
2.	Tighten the handwheel.	

### 2.5 Assembling the Antenna Reflector

The assembly order of the petals may vary slightly depending on the type of reflector supplied with the system. Refer to the photos below for a summary of the assembly order:





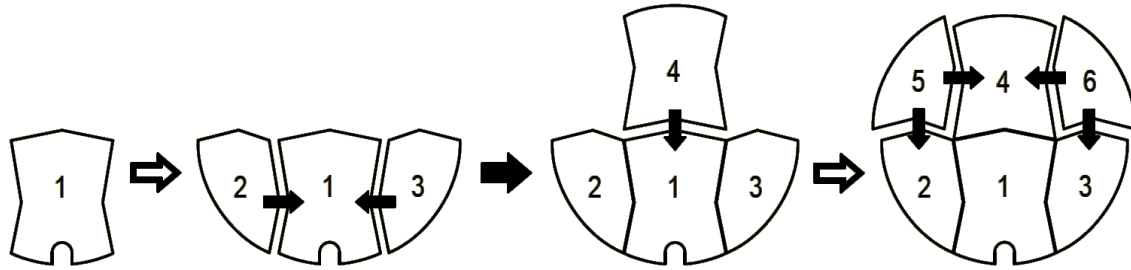


Figure 10: Assembly Steps of the Antenna Reflector

Note that a Ku-band configuration is shown in the following photographs. Antenna assembly steps are the same for both X-Band and Ku-Band systems.

1. Remove Segment 1 from the reflector petal bag and rest it on the RF backplate.



Figure 11: Install Segment 1 Reflector Petal on the Backplate

2. Attach the Petal to the RF backplate using the thumbscrews. Loosely attach all four screws before tightening.



Figure 12: Secure Segment 1 Reflector Petal Using the Thumbscrews

3. Attach Segment 2 to the bottom left of the main antenna unit.



Figure 13: Install Segment 2 Reflector Petal

4. Attach Segment 3 to the bottom right of the central antenna unit.

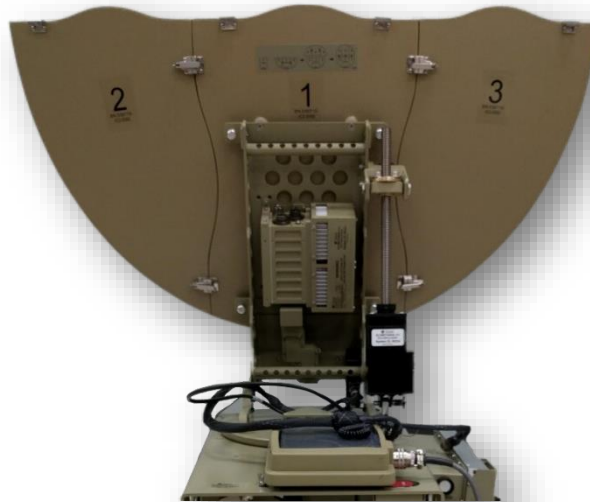


Figure 14: Install Segment 3 Reflector Petal

5. Attach Segments 4,5 and 6 together on their own (do not attach to segments 1, 2, or 3 at this time)











Figure 15: Assemble Segment 4,5, and 6 Reflector Petals together



6. Attach the two halves together.






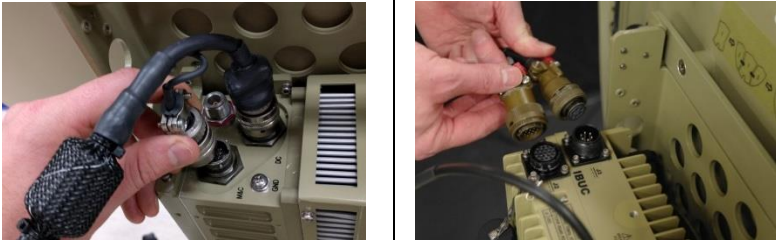
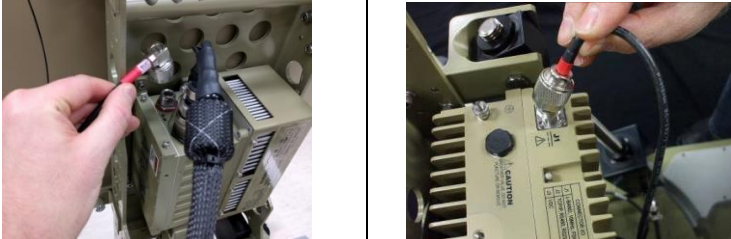
Figure 16: Install the Two Halves Reflector Together

## 2.6 Assembling Boom Arm and Feed

Step	Instruction	Ku-Band	X-Band
1	<p>Remove the Lower Boom arm from the transit case and insert it into the main antenna assembly.</p> <p><b>Note:</b> Ensure that the lower boom arm is properly seated and the alignment mechanism is properly seated</p>		
2	<p>Secure the Lower boom arm by tightening the threaded collar</p>		
3	<p>Install the upper boom arm and feed assembly.</p> <p><b>Note:</b> Ensure that the upper boom arm is properly seated and the alignment mechanism is properly seated.</p>		
4	<p>Attach the green color-coded Rx cable with the N connector to the LNB. Loop the cable over the boom arm once to prevent the cable from snagging or dragging.</p> <p><b>Note:</b> Leave enough slack in the LNB cable to allow the LNB to rotate freely.</p>		

<p>5</p>	<p>Attach the 8-pin connector to the underside of the feed assembly. Loop the cable over the boom arm once to prevent the cable from snagging or dragging.</p>		<p>n/a</p>
<p>6</p>	<p>Coil and secure the excess cables on the Azimuth plate using the Velcro strap.</p>	<p>n/a</p>	

## 2.7 Connecting Main Antenna Cables

Step	Instruction	Ku-Band	X-Band
1	Connect the 4-pin connector from the azimuth frame to the inclinometer on the lower right corner of the RF Backplate		
2	Connect the 6-pin (Stepper Motor) or 10-pin (DC Motor) connector from the azimuth frame to the elevation assembly		
3	(multi-band systems) Connect the X-band M&C adapter to the large 32-pin cable from the azimuth frame on the main system	n/a	
4	Connect the M&C and DC Input connector(s) to the BUC/SSPA		
5	Connect the Red TX cable to the N-Connector at the top of the BUC/SSPA		



## 2.8 Assembling the Struts (Optional)

1. Optional: Struts are provided with some antennas to support the upper boom arm. Thread the two halves of the struts together, taking care to not cross-thread the tapped holes.



Figure 17: Assemble the Struts

2. Retract the spring loaded collar and slide the strut onto the ball joints on the sides of the antenna and the sides of the upper boom arm.

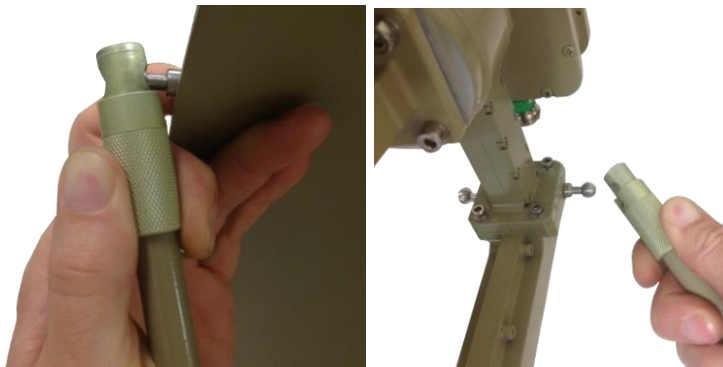


Figure 18: Install the Struts

## 2.9 Connecting Peripherals to your System

### 2.9.1 Daylight Readable Touch Screen Display

1. Connect the Daylight readable touch screen display to the monitor port of the [Subject] Base.



Figure 19: Connect LCD Touchscreen to Baseband

## 2.9.2 External Modems

Norsat VSAT systems work with L-Band frequency RF components. When deploying a modem or video encoder with a [Subject] ensure that it operates in this frequency band.

1. External Modems should be set up according to the manufacturer's instructions.
2. The External Modem can be connected to the [Subject] via coaxial cable or fiber optic cable depending on the [Subject] configuration:
  - a. For coaxial:
    - i. Connect the External Modem's TX and RX connections to the [Subject] TX and RX connectors.



Figure 20: Tx and Rx Port on the Baseband

- b. For fiber optic:
        - i. Connect the External Modem's TX and RX connection to the fiber optic indoor unit's input and output:



Figure 21: Tx and Rx Port on the External Modem

- ii. Connect the fiber optic cable from the fiber optic indoor unit to the [Subject]. Ensure the units are not powered on when connecting the fiber optic cable.



Figure 22: Fiber Optic Port on the Baseband

**Warning:** The [Subject] cannot operate with both coaxial and fiber optic at the same time. Doing so may cause damage to the internal components.

**Note:** If your system has an internal modem, ensure that it has been disabled using your LinkControl software.

## 2.10 Powering on the System

1. Connect any peripherals per *Connecting Peripherals to your System*
2. Connect the power cables to the system according to your System Manual
3. Press the power button on the baseband



Figure 23: Power Button on the Baseband

4. Press the power button on the external power supply (if equipped; refer to System Manual)

## 3. Troubleshooting

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*The GLOBETrekker™ continuously monitors its own health and status.*

### 3.1 LinkControl Status

To view the system status select the “Status” icon from the left-hand toolset. Major system component health will be presented in real time. Some components have a simple alarm icon with a detail button to retrieve extra information.

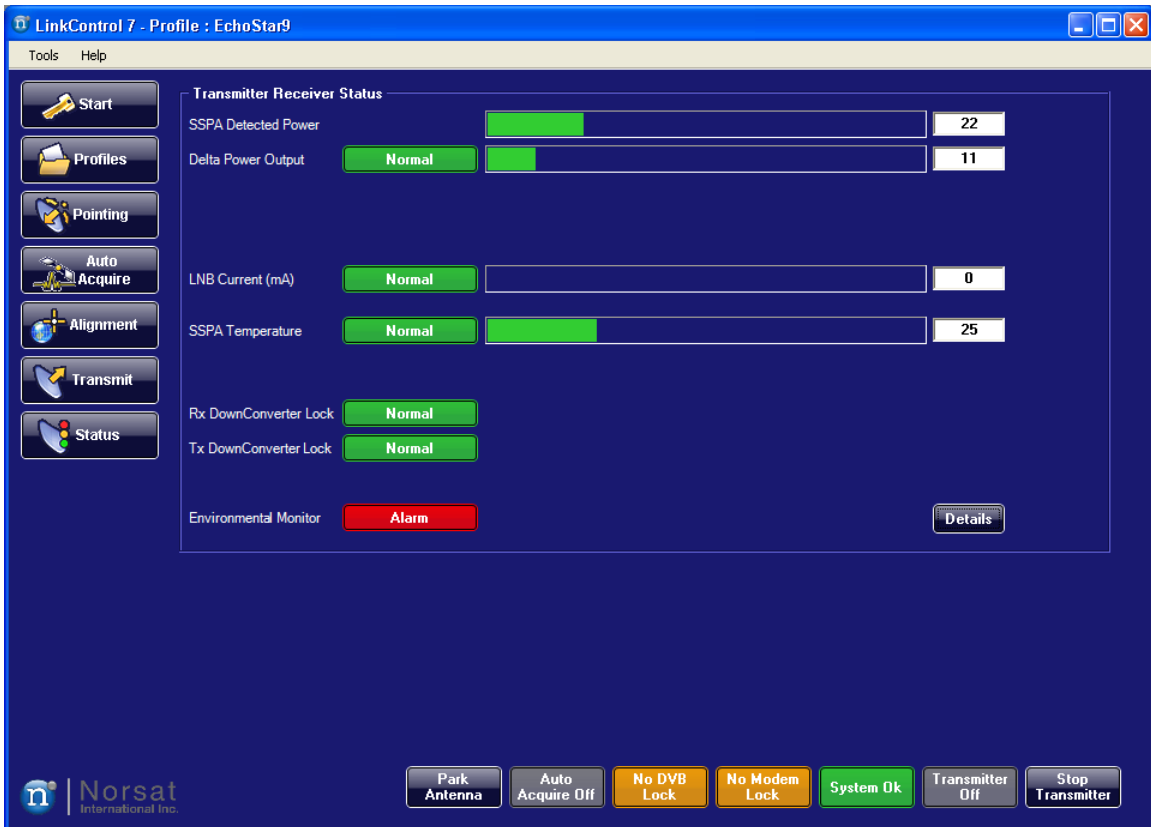


Figure 24: System Status

Table 3: Status Indicators

Status Indicator	Type of Status Indicator	Description
SSPA Detected Power	information only	the measured output power of the amplifier
Delta Power Output	variable range alarms	difference in the requested power versus the measured output power
Rx Downconverter Level	information only	Rx signal strength indicator
LNB Current	variable range alarms	DC current the LNB consumes
SSPA Temperature	variable range alarms	internal temperature of the amplifier
Rx Downconverter Lock	Binary Alarm	The Local Oscillator PLL lock status for the downconverter in the Rx Spectrum Analyzer must be locked to use the Rx spectrum analyzer.
Tx Downconverter Lock	Binary Alarm	The Local Oscillator PLL lock status for the downconverter in the Tx Spectrum Analyzer. Note that this is not used on the GLOBETrekker™ and can be ignored.
Environmental Monitor	Binary Alarm	Indicates whether the environmental conditions within the GLOBETrekker™ are suitable for operation. Details tab will show the full values of all components. The ACU component will turn to alarm if the desiccant needs changing.

### 3.1.1 Software Troubleshooter

In the event of an alert requiring user attention, either clicking the alarm button or selecting the troubleshooter from the help menu will give the user directions to resolve the issue.

A pop-up window will give the user a list of actions that should be attempted to resolve the issue

### 3.2 Hardware Issues

Most problems or questions can be answered using the Troubleshooting tips. Should any problems or questions arise, use the following Troubleshooting Tips *before* calling Customer Service.

Table 4: Troubleshooting

Symptom	Possible Cause	Corrective Action
<b>Power Up</b>		
Baseband chassis fans are not spinning.	No power is getting to the Baseband from the power supply.	Confirm that the power cable between the Baseband and the power supply is connected.
		Check that the DC fuse is not blown. (Back panel of the baseband. Unscrew protective cover and check fuse.)
<b>Application Startup</b>		
Internal modem does not power up.	Environmental conditions are preventing the modem from being powered up.	The power to the internal modem is controlled by LinkControl. If LinkControl does not sense appropriate environmental conditions (i.e. too cold or too humid), it will not apply power to the modem. Allow the internal fans and heaters to run for a while, to improve internal environmental condition.

<b>LinkControl Alarms</b>		
LinkControl unable to connect to: SSPA, Compass, Inclinometer, GPS, Motor Control Board, and Feedback Controller.	ACU not powered.	Ensure that power connections are true and the power supply is on.
	ACU and BBU not connected.	Power off the system completely, check and reseal all connections.
LinkControl is unable to connect to the SSPA.	SSPA M&C not connected.	Make sure the SSPA M&C cable is connected.
	SSPA Power not connected	Ensure the SSPA DC Power connector is connected
	Profile uses a different SSPA	Depending on your requirements; check and ensure that you have the correct SSPA installed, or change your profile so that you are using uses the installed SSPA
Receive Signal Strength Indicator is very low and doesn't change (below 030) or no reading on the spectrum analyzer	LNB cable problem.	Ensure LNB cable is plugged in and is not damaged.
LNB current alarm.	LNB cable problem.	Ensure LNB cable is plugged in and is not damaged.
Spectrum Analyzer is slow to update and "jumpy".	Auto scale taking up resources.	If you see this, try turning the auto-leveling off. The auto-leveling switches are two check boxes next to the Reference Level and dB per Division numeric fields. They take CPU cycles and, if the leveling is correct, you don't need auto-leveling on.
<b>LinkControl Errors</b>		
Cannot set DVB receiver or Spectrum Analyzer to listed carrier.	Wrong LNB type.	Ensure the correct LNB is selected for the carrier you want to select.
The application reports a "Timed Out. Could Not Read GPS" message.	GPS is not connected.	Confirm the GPS is connected (on the azimuth plate).
	GPS signal interference.	Make sure you are in clear sky, not next to a wall.



	Poor GPS location.	Make sure you are not in an area where GPS is degraded or blocked by the government.
Inclinometer could not be found.	Inclinometer not connected.	Check that the cable is plugged in (side of the antenna backplate).
<b>Display Errors</b>		
Wired display displays no signal.	Connection problem.	Ensure the display is correctly seated. Press the power button at the side of the display.  Reboot the system.
<b>Antenna Alignment</b>		
Unable to get DVB lock or locate signals on the Spectrum Analyzer.	Incorrect or missing carrier information in the database.	Verify carrier frequencies that can be used to align the antenna (i.e. satellite beacon frequencies, DVB carriers). For DVB carriers, ensure the correct symbol rate is also entered.
	Antenna pointing error.	Verify the antenna is level and the elevation and polarization are set correctly. Be aware the compass may be corrupted by local interference and may not be displaying the correct azimuth reading.
Antenna only moves in one direction or does not move in the desired direction (either for azimuth, elevation or polarization).	Antenna position is out of the software limits.	The antenna has software limits that prevent it from moving “out-of-bounds” for any of the three parameters. If the antenna is currently out-of-bounds, any movement command sent to the antenna will cause the antenna to move in the direction that will take it back in-bounds. Therefore, if you try to move the antenna further out-of-bounds, it will go in the opposite direction.
Elevation Axis does not move	Elevation motor has reached internal error limit. (Either antenna is obstructed or elevation move command was sent while cable was unplugged)	Ensure antenna is free of obstruction and elevation motor cable is plugged in, then power cycle the system.

<b>Transmission</b>		
System loses AC power when the transmitter is turned on.	Supply power source is under rated.	Verify your AC power source can deliver a sustained output sufficient for your system
The satellite operator does not see your transmitted CW signal.	Antenna peaking and pointing.	Verify the antenna is pointed on the correct satellite and that its pointing has been fine-tuned by going through the peaking procedure.
	Configuration or cabling could be incorrect.	Verify that the correct transmit frequency is selected and that all cables are connected.
Transmitter turns off immediately when you turn it on.	SSPA not functioning correctly.	This is likely due to alarm conditions that exist as soon as you turn on the transmitter. Check that the SSPA is plugged in, that the fan is operating and that the reported SSPA temperature is accurate
Transmitter will not power up.	Water in connection.	Ensure that the SSPA connection is dry.
Transmitter Power does not increase when the modem power increases and remains at start up power.	A Radyne modem defect is not producing a 10MHz reference line.	Reset the modem.  - Close the LC7 user interface and restart the Baseband.  - Alternately go to Tools->Administration->System Panel and use the Environmental Control to power cycle the modem itself.

## 4. X-Band Feed Polarization

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### 4.1 Changing the Feed Polarization

When shipped from the factory, the Feed is set up in the RIGHT-HAND TRANSMIT orientation, as shown. Note that the “RHCP” label and the 6x counter-bores head cap screws are facing up, indicating RIGHT-HAND TRANSMIT. If the polarization of the Feed must be changed to LEFT-HAND TRANSMIT, remove the Feed and Polarizer assembly from the Waveguide and rotate it axially so that the “LHCP” label will be facing up.

The “RHCP” label and the 6x counterbores facing up, indicating RHCP.

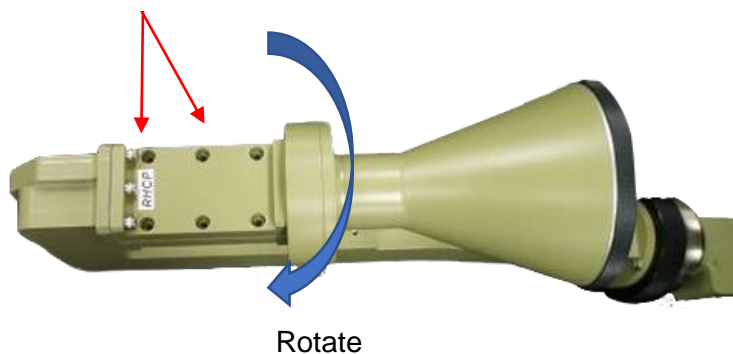


Figure 25: Change the Feed Polarization

1. To change the Feed to LEFT-HAND TRANSMIT, remove the 6x socket-cap screws (#8) from the Polarizer using the 9/64” ball-end hex driver provided with the system.



Figure 26: Location of the 6 socket-cap screws to remove.

2. Remove the Feed and Polarizer assembly from the Waveguide. Ensure the blue conductive gasket is in place, wipe clean the two surfaces between the Polarizer and the Waveguide (if a line of silver grease had previously been added, wipe it off completely), and apply a new line of the silver grease (Thermal Non-Silicone Grease) to the middle place as shown.

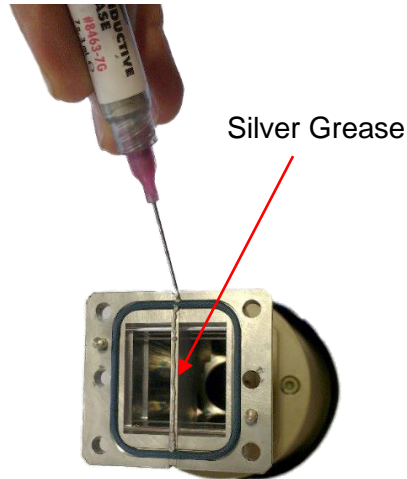


Figure 27: Apply a new line of silver grease.

3. Turn the Feed and Polarizer assembly over so that the “LHCP” label is facing up and the 6 counter-bores are facing DOWN, indicating LEFT-HAND TRANSMIT.

“LHCP” label facing up, indicating LHCP

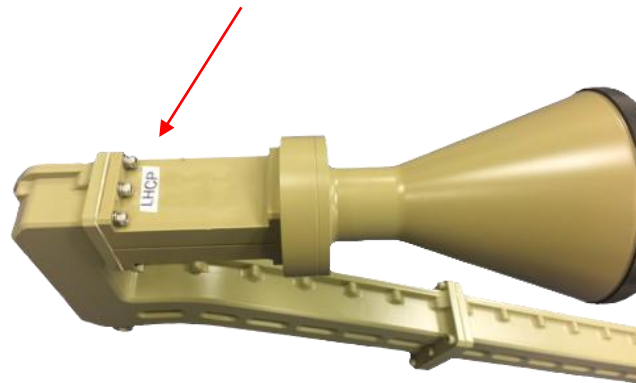


Figure 28: X-Band Feed Left-Hand Transmit

4. Re-assemble the Polarizer to the Waveguide using the dowel pins for alignment. Install and tighten all 6 socket-head cap screws.

# 5. Manual Acquisition

## 5.1 Operating the GLOBETrekker™ without Motors

1. Follow the steps in Chapter 2 Assembling the System.
2. Select **Tools > Motor Control Tools > Disable Motors**.

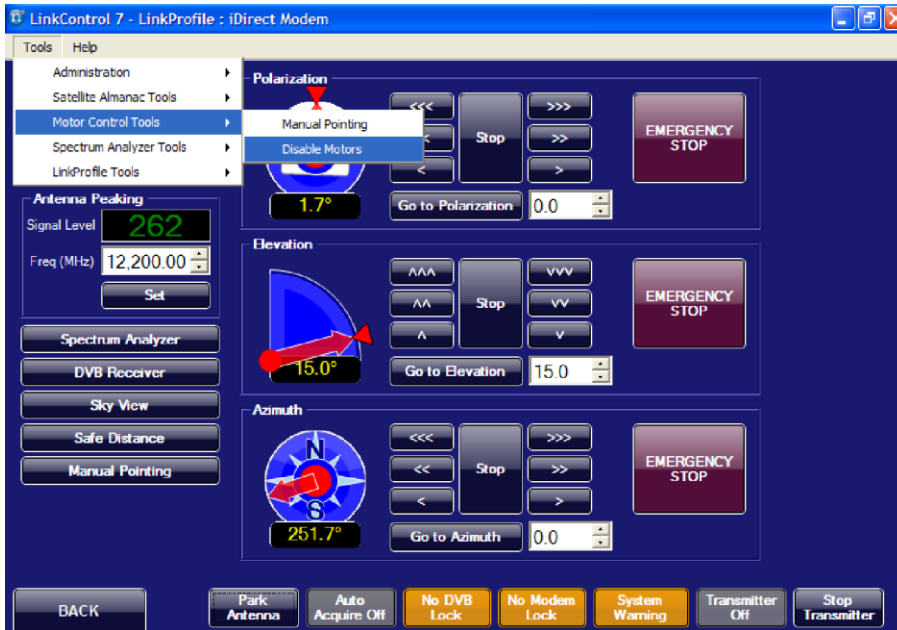


Figure 29: Disable Motors via LinkControl

3. For Ku-band systems, rotate the feed to adjust the polarization setting until the value matches the **Transmit Polarization** value shown in LinkControl.

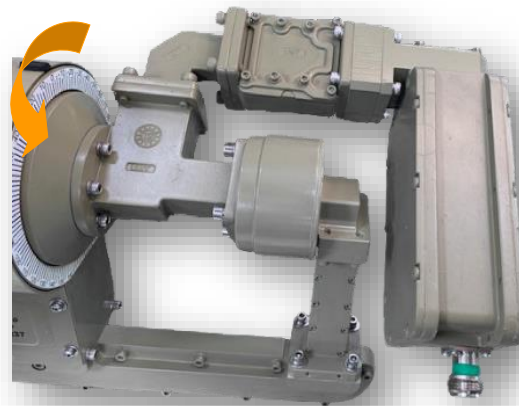


Figure 30: Rotate the Feed to Adjust the Polarization

- For Stepper Motor systems, turn the elevation adjustment knob by hand until the value matches the **Elevation** value shown in LinkControl.  
For DC Motor systems, **disconnect the elevation cable** and then use the hand crank to adjust the elevation setting until the value matches the **Elevation** value shown in LinkControl.



Figure 31: Adjust the Elevation Manually

- Turn the azimuth hand wheel to adjust the azimuth setting until the value matches the **Compass Azimuth** value shown in LinkControl.



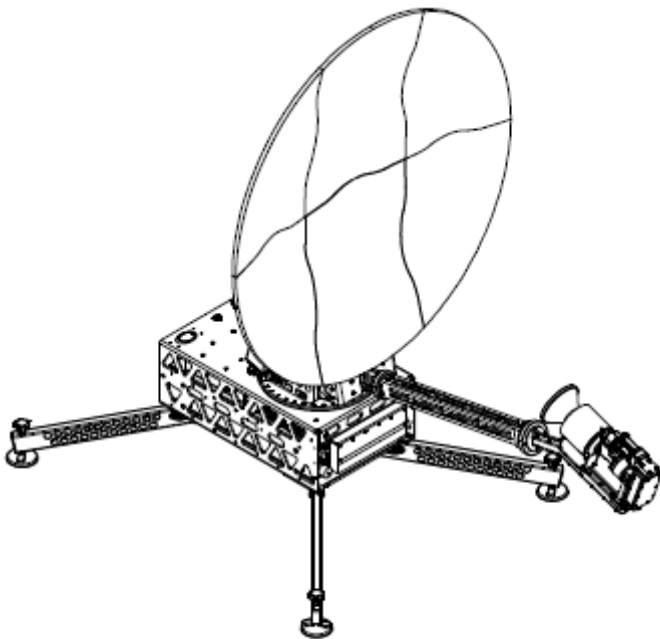
**Azimuth Manual  
Override**

Figure 32: Azimuth Manual Override

**Tip:** Depending on the azimuth value that is required, you may find it easier to lift the system and turn it so that it is within range of the required azimuth, and then fine tune the setting using the hand wheel.



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## ABOUT NORSAT

Norsat International Inc., founded in 1977, is a leading provider of innovative communication solutions that enable the transmission of data, audio and video for remote and challenging applications. Norsat's products and services include customizable satellite components, portable satellite terminals, maritime solutions and satellite networks. The company's products and services are used extensively by telecommunications services providers, emergency services and homeland security agencies, military organizations, health care providers and Fortune 1000 companies.

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