Norsat Rover™

User Guide

Norsat International Inc.

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Preface

Preface

Purpose and Scope of the User Guide

The user guide explains how best to assemble, operate, transport and care for the Norsat ROVER™ satellite terminal. It also provides guidance on how to interact efficiently with a satellite hub operator.

This user guide is specifically written for the ROVER™ Ku-Band Satellite Terminal:

Model No. 5100-8W-DDK

Audience

The guide will be of interest to the following personnel:

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

Revision History

Date	Nature of Revision	Revision
December 2009	First Release	1.0

READ THE MANUAL BEFORE YOU INSTALL OR OPERATE THE ROVER ™

1 Safety Basics

Safety Basics

YOU MUST READ THIS CHAPTER BEFORE OPERATING THE ROVER™

Observe Electrical Codes

Caution

Grounding the ROVER™

In urban areas, ground the ROVER™ with a grounding conductor according to national and local electrical codes.

Avoid Hazards Leading to Serious Injury or Possible Death

Danger

FCC Radio Frequency Exposure Information for Mobile Transmitting Devices

When the power is on, maintain a distance of 8.4 feet (2.6 meters) or greater from the antenna. Radio Frequency Exposure Minimum calculated separation distance between antenna and persons required is 2.56 meters.

Refer also to “Understanding clearance distance” on later in this chapter.

Hazards of Microwave Radiation in Electromagnetic Fields

When the power is on, the area directly in front of the antenna is an Area of Restricted Occupancy. Observe the safety precautions which follow:

1. Limit human exposure time to the area directly in front of the main antenna assembly.
2. Never place any part of your body between the antenna and the feed horn assembly.
3. Never place any part of your body in line with the direction of the antenna transmission path. The LinkControl application provides a screen which helps users estimate the minimum clearance distance. Please refer to Understanding Clearance Distance on page 10.
4. Locate the terminal as far as possible from ungrounded metal.

Avoid Hazards Leading to Serious Injury or Possible Death - continued

Dielectric Heating

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 the dielectric. If the power in the RF field exceeds 10 milliwatts per centimeter, the individual will have a noticeable rise in body temperature.

The severity of burns may vary from minor to major. Burns or other damage may result in long term injury, or even death.

The vital organs of the body are highly susceptible to dielectric heating.

The eyes are also highly susceptible to dielectric heating. Do not look directly into devices radiating RF energy.

You must not stand directly in the path of RF radiating devices.

Electrical Hazards in Wet and Windy Conditions

During windy and wet weather conditions, observe the following safety precautions:

1. Check cable connectors and power cords.
2. If the ROVER™ is in contact with water, check for signs of electrical dangers.
3. Disconnect the ROVER™ from its power source before you move it.
4. Disconnect the ROVER™ from its power source if you suspect a power malfunction.
5. Shelter the baseband unit and its components from water.

Safety Basics

Operating Regulations

Warning

Unintentional Radio Interference

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.

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.

Frequency Coordination

Users must ensure they co-ordinate proposed frequency and power usage with other terrestrial and satellite users prior to transmission.

Understanding Clearance Distance

There is a Clearance Distance indicator screen within the LinkControl application that can help the user estimate the minimum clearance required in front of the antenna.

It is recommended the user read this entire user guide before attempting system assembly; powering up the system and laptop; or trying to access the LinkControl software.

Operating Regulations - continued

Understanding Clearance Distance - continued

To access the Clearance Distance indicator screen in LinkControl:

1. Launch the LinkControl software.
2. Enter Administrator mode (this mode of operation is password-protected and is accessible to users with “administrator” level rights in LinkControl).
   On the **Menu** bar, click **Settings > Enter Admin Mode**.
3. Type in the Administrator password; the factory default password is “Administrator”. This password is set at the factory and meant to be changed at first use. It is recommended this password be changed and documented as soon as possible by the System Administrator.

   Note: Passwords are case-sensitive.

To exit Administrator mode and to enter Field mode:

1. On the Menu bar click **Settings > Exit Admin Mode**.
   Field mode is an end-user mode that operates without elevated rights and is only used for Auto-Acquire method of access.

To view the Clearance Distance indicator screen, go to **Alignment** tab and click the **down** arrow beside **Clearance Distance** on the right side of the window. The **Clearance Distance** screen opens as shown in *Figure 1* on page 12.

The Clearance Distance screen shows the distance that different types of obstacles must be ‘away’ from the terminal when the antenna is positioned at a given elevation.

Refer to *Table 1* and *Figure 1* in this chapter for more information on LinkControl Clearance Distance screen and sample calculations.

Changes or Modifications to Equipment

Caution: Changes or modifications to this equipment, not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Safety Basics

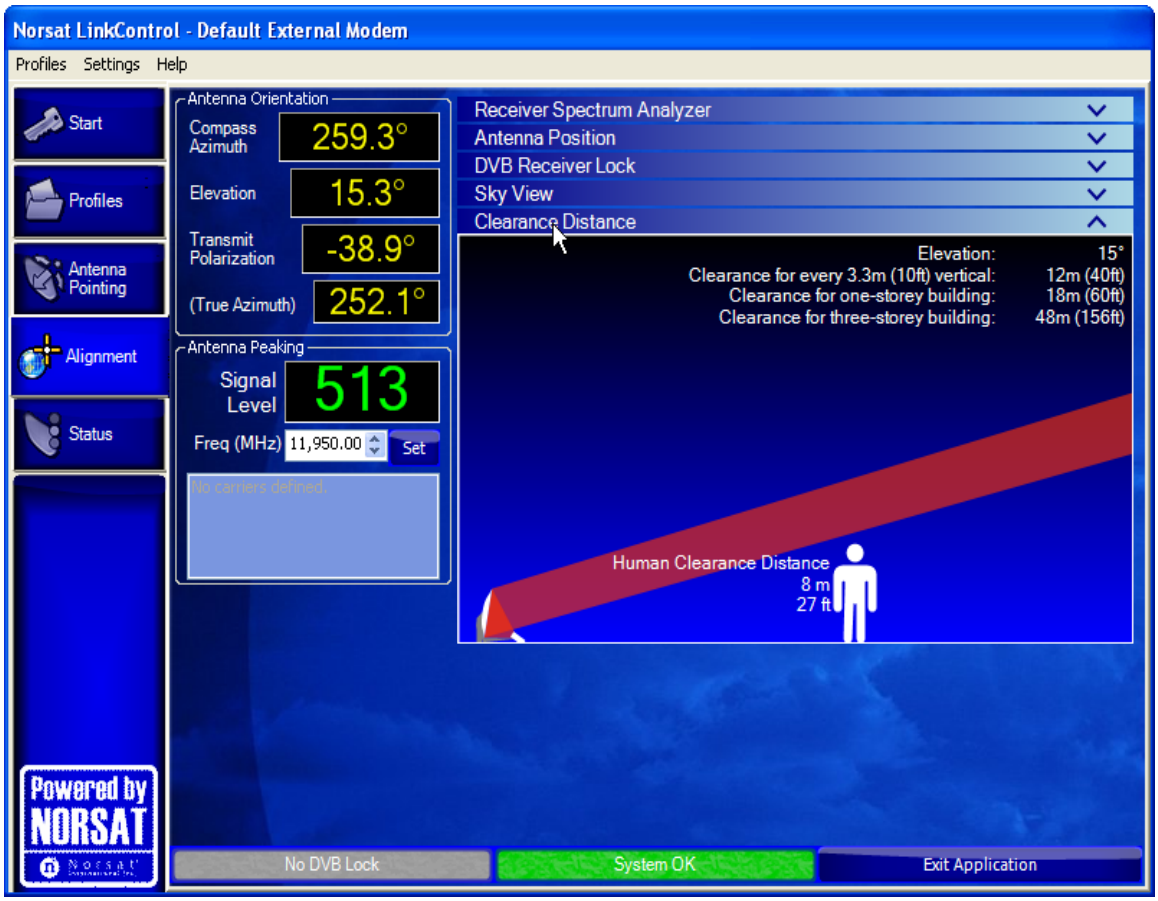


Figure 1: Clearance Distance Screen

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 storey building	8 meters (25 feet)
Clearance for three storey building	20 meters (65 feet)
Human	4 meters (13 feet)

2 Unpacking the System

Unpacking the System

This chapter describes how the Norsat ROVER™ is packaged.

Unpacking the System

The ROVER™ system is packaged in a total of three cases:

- ODU equipment is packaged in two transit cases
- The baseband is packaged in a 2RU Transit Case

Figure 2. ROVER™ Transit Cases

As you are unpacking the Rover™, ensure that your shipment is complete and is not missing any parts or assemblies. Contact the factory at Norsat immediately if there are any missing parts.

Unpacking the System

Parts and Assemblies Checklist

Use this checklist to ensure that your shipment is complete and is not missing any parts or assemblies. Contact Norsat immediately if any parts are missing.
Note: This list does not include any additional spares which you may have ordered.

Case	Table 2. Parts/Assemblies Checklist	Part No.
1	☐ Main Antenna Segment with Backplate, 8W BUC, & Azimuth Plate	032260
1	☐ 20-meter IFL Cable	033244
1	☐ BUC DC Supply Cable (Permanently attached to backplate)	033242
1	☐ Interface Indicator Inclinometer Compass Unit (Permanently attached to backplate)	033295
2	☐ Antenna Segment 2, 3, 4, 5, 6	032139
2	☐ Elevation Assembly	030611
2	☐ Quick Release Nuts (2, on Elevation Assembly)	032185
2	☐ Legs (3)	030106
2	☐ Grounding Rod with Quick Release Clamp	033379
2	☐ Lower Boom Arm Assembly	030441
2	☐ Ku-band Upper Boom Arm and Feed Assembly	030704
2	☐ Flexible Waveguide (Attached to Feed)	027477
2	☐ Low Noise Block Downconverter (LNB) 1000HA (Attached to Feed)	027474
2	☐ Low Noise Block Downconverter (LNB) 1000HC	027475
2	☐ Low Noise Block Downconverter (LNB) 1000HB	027475
2	☐ Global Positioning System (GPS) Receiver	033241
2	☐ 1.7-meter LNB (Rx) to IIIC Unit	033238
3	☐ Baseband & laptop with Power Supply & SAA Modules	033261

3 ROVER™ Basics

ROVER™ Basics

What is the ROVER™?

The Norsat ROVER™ is the industry's leading broadband satellite system. It features built-in intelligence to enable a user to establish a reliable broadband link (up to 4Mbps) – anywhere in the world especially in remote, harsh and hostile environments.

The Norsat ROVER™ represents the next generation of portable satellite systems and was designed with both non-technical and 'power users' in mind. The ROVER™ comes equipped with a software application called LinkControl. LinkControl enables a user to configure and operate the terminal through an innovative user interface. The LinkControl software application has been designed such that the more advanced functions, such as commissioning, are performed by a Systems Administrator (such as an IT Manager or Life Cycle/Sustainment Manager). The regular functions of the ROVER™ terminal, on the other hand, are accessible to all users in field mode.

The NorsatROVER™ is the intelligent choice. Unlike other packages, it is a highly integrated, complete system which includes a segmented carbon fiber antenna, feed assembly, LNB, BUC, built-in inclinometer, compass, GPS, spectrum analyzer, DVB-S receiver, and the LinkControl software.

Figure 3: ROVER™ Deployed In Field

ROVER™ Basics

What is the ROVER™ Designed to Do?

The Norsat ROVER™ is an Ultra-Portable Man-packable Satellite Terminal designed for two-way IP and serial data communication, from remote locations anywhere in the world, over geostationary satellites.

The Norsat ROVER™ was designed from the inside out to be compact, ultra-portable and tough—it is the industry's first backpackable broadband satellite system setting new standards in portability. This attractive design cleverly addresses the need for a lightweight, rugged and ergonomically friendly system.

The Norsat ROVER™ is designed to be transported and operated in even the most challenging environments. It is the only broadband capable satellite system which has been designed specifically to be helicopter-friendly.

ROVER™ Basics

Identifying Basic Elements of the ROVER™

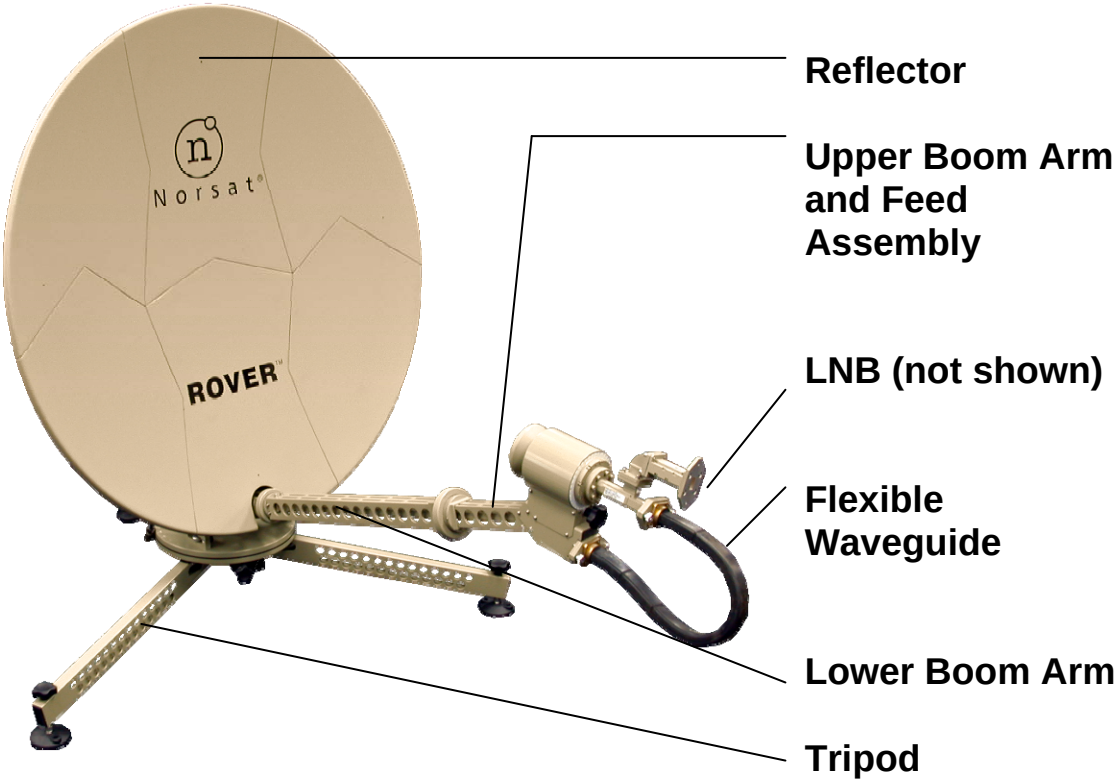


Figure 4: Side View of Assembled ROVER™

ROVER™ Basics

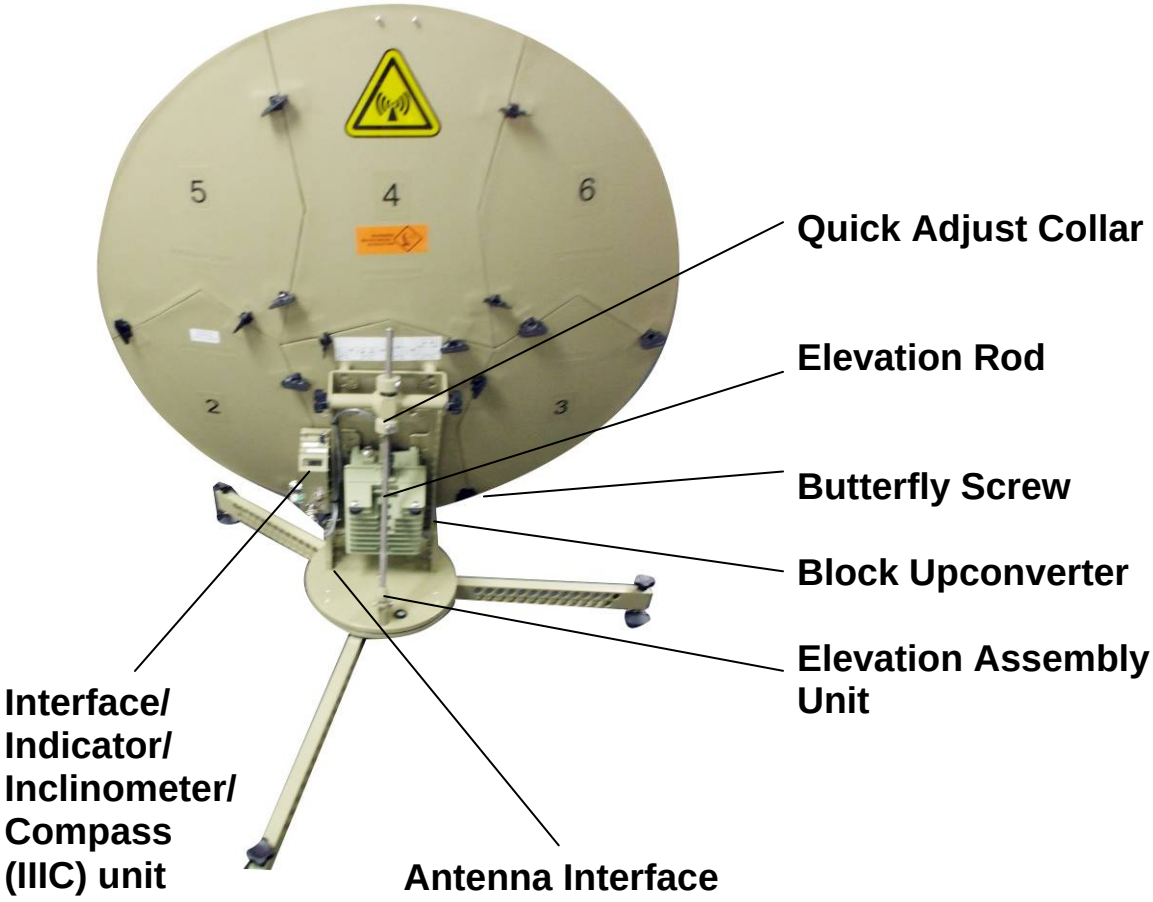


Figure 5: Rear View of Assembled ROVER™

ROVER™ Basics

How Does the ROVER™ Work?

Antenna/RF Unit

The RF/Antenna unit includes the following components:

- 1m segmented (6) carbon fiber antenna reflector
- BUC assembly
- Interface Indicator Inclinometer Compass Unit (IIIC)
- Lower boom arm segment (with transmit fixed waveguide)
- Upper boom arm and feed assembly (includes Transmit fixed waveguide and Receive Reject filter, and Transmit Reject filter assembly)
- LNB quick-connect assembly set (3)
- Transmit flexible waveguide
- Compass
- GPS
- Tripod
- Baseband with Power Supply Module and a Satellite Acquisition Assistant Module (built in Spectrum Analyzer, DVB Receiver, and Ethernet Switch)

Note: Unless the modem option has been ordered, this system enables the user to supply an external modem of choice.

Transmit Path

The transmit side of the uplink chain starts with the modem output IF frequency in the L-band range of 950 – 1700 MHz. The exact output frequency is selected by the modem and is a function of the final carrier frequency at the antenna output. The IFL cable carries the signal from the modem to the block upconverter (BUC), which shifts the L-band output frequency of the modulator to a desired higher (Ku-band) frequency.

ROVER™ Basics

The output of the BUC is fed to the Receive Reject Filter (RRF) filter. RRF filters provide attenuation outside the desired transmitter band; specifically receive frequency range from 10.95 GHz to 12.75 GHz, preventing Receive performance degradation due to the injection of noise from the transmit to receive path. Finally, the transmitter signal is fed through a flexible waveguide to the antenna feed through an Orthogonal Mode Transducer (OMT) which isolates the outbound signal from the receive signal. The feed horn directs feeds energy onto into the antenna. The directivity of the feed horn is added to that of the antenna resulting in a pattern that is a narrow and concentrated beam.

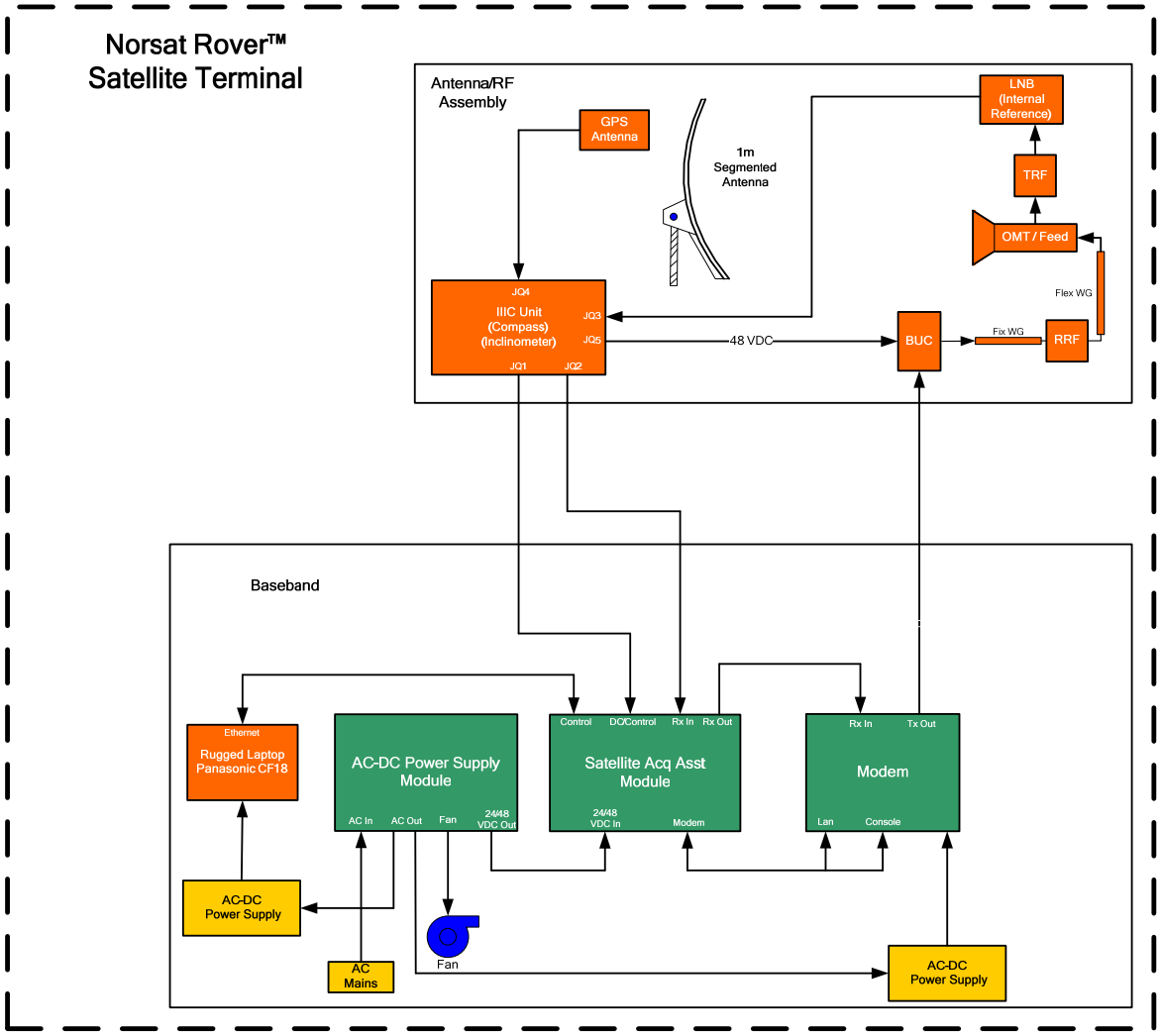


Figure 6: ROVER block diagram

ROVER™ Basics

Antenna Parameters

The ROVER™ is available in both the regular transmit frequency range of 14.0 to 14.5 GHz and in the extended frequency band of 13.75 GHz to 14.5 GHz. See *Appendix D: Configuring for Extended Band* for instructions on selecting the transmit frequency.

The transmit gain on the antenna is 41.9 dBi at 14.125 GHz.

On the receive side, the frequency coverage is from 10.95 GHz to 12.75 GHz, segmented into three sections:

- 10.95 GHz to 11.70 GHz
- 11.70 GHz to 12.20 GHz
- 12.25 GHz to 12.75 GHz

The measured gain at the receive Ku-band is 39.5 dBi at 10.95 GHz (worst case scenario).

The G/T of the antenna is:

- 19.4 dB/K at 10.95 GHz
- for an elevation angle of 20 degrees
- an antenna temperature of 40^0 K
- and the LNB noise figure of 0.8 dB

The antenna is linearly polarized where the polarization selection can either be Vertical/Horizontal (V/H) or Horizontal/Vertical (H/V) on the transmit and receive sides.

Table 3. Antenna Parameters	
RF/Antenna	**Ku-band**
Transmit Frequency	14.0 GHz – 14.50 GHz 13.75 GHz – 14.50 GHz (5100-8W-E-DDK)
Receive Frequency	10.95 GHz – 11.70 GHz 11.70 GHz – 12.20 GHz 12.25 GHz – 12.75 GHz
RF Power (SSPA Output)	8W
EIRP (at 1dB compression point)	44.5 dBW (4W) 47.5 dBW (8W)
G/T	19.4 dB/K (20° elevation, antenna temperature 40°K)
LNB Noise Figure	0.8 dB
Antenna	1m carbon fiber, segmented (6)
Antenna Tx Gain at 14.125GHz	41.9 dBi
Antenna Rx Gain at 10.95 GHz	39.5 dBi
Antenna Platform	Manual elevation over Az Mounted on support tripod
Polarization Configuration	Manual Linear Cross-pol, -90° to +135°
Elevation Adjustment	0-90°, Manual
Azimuth Adjustment	Unlimited, Manual

Receive Path

The isolation between the transmit and receive side is achieved through the use of the OMT (Ortho Mode Transducer) and the TRF (Transmit Reject Filter). The TRF serves to further isolate the two sides with the receive polarization being orthogonal to the transmit polarization.

The Ku-band receive signal at the output of the transmit reject filer, at the input of the LNB, is at the standard Ku-band frequency (10.95 GHz to 12.75 GHz). A block Down-Converter translates the RF frequency into an L-band output (950 MHz to 1700 MHz) required by the modem. The output of the LNB is also fed to the spectrum analyzer to assist with pointing the antenna and to facilitate system monitoring. The modem (user supplied) down-converts, demodulates and decodes the incoming signal. The modem is user supplied.

Power Configuration Options for the Assemblies

The ROVER™ is designed to operate on 48 & 24 VDC. The Power Supply module contains a universal, auto-sensing, AC-DC converter allowing operation with 110-240 VAC, 50-60 Hz.

Modem

The following table outlines the modem requirements for the user supplied modem (when the modem option is not ordered with the ROVER™ system).

Table 5. Modem Requirements		
Frequency ranges	Tx	950-1700 MHz
	Rx	950-1700 MHz
Power	Tx	-5 to -30 dBm
10 MHz	Tx	0 ± 3 dBm
DC	Tx	+24V 1 Amp
	Rx	18-24 V 300mA

Satellite Acquisition Assistant (SAA) Module

The SAA combines the following:

- DVB-S Receiver
- Spectrum Analyzer
- DC-DC Converter
- Ethernet Switch
- Serial-to-ethernet converter

Receive IF (Rx) Cable

The Receive IF (Rx) cable is a 50 ohm coaxial cable with a N-type male connector. This connector has been color coded **green**.

The signals supplied on this interface are:

- Receive IF: the received signal amplified and downconverted by the LNB and supplied to the baseband unit
- 24V DC: supplied to the LNB

This interface does not supply a 10 MHz signal.

Transmit IF (Tx) Cable

The Transmit IF (Tx) cable is a 50 ohm coaxial cable with a N-type male connector. This connector has been color coded **red**.

The signals supplied on this interface are:

- Transmit IF (950 to 1700 MHz) signal to be upconverted, amplified and transmitted to the satellite. This signal may either be a continuous wave (CW) or modulated signal.
- 10 MHz reference: provides a reference signal for the BUC (Block Upconverter)

The transmitter (or BUC), that is located at the base of the antenna, needs the 10MHz signal in order to be enabled and operational. The BUC also requires 48 VDC (supplied from the IIIC unit).

Global Positioning System Receiver (GPS Receiver)

The GPS unit is housed inside a sealed plastic housing and mounts to the reflector. The GPS receiver connects to the IIIC Unit through Connector JQ4 and the signal is sent to both the Baseband (for LinkControl) and the Modem.

Integrated Interface/Indicator/Inclinometer/Compass Unit (IIIC Unit)

The IIIC Unit is permanently mounted to the Reflector Back Beam and includes a Rotary Switch and a 4 Character LED Display. The IIIC unit houses a digital Compass to determine the Antenna Bearing, a digital Inclinometer to measure the Antenna Bore-Sight Angle, and a Receive Signal Strength Indicator (RSSI). The 4-position rotary switch is used to select the operating mode of the IIIC Unit.
The IIIC unit is powered through the IFL connection at JQ1. There is no power switch to turn the unit on or off.

Figure 7: Interface/Indicator/Inclinometer Unit (IIIC unit) – side view

Note: The Digital Compass must be calibrated each time the Terminal is deployed in a new geographic location. For complete calibration instructions, see *Appendix A: Calibrating the Compass.*

Compass

When the Rotary Switch is in the “Compass” Position, the IIIC unit displays a value in the format “CXXX” appears, where “XXX” corresponds to the current Bearing of the Positioner. A reading of “C000” indicates that the positioner is pointing North, while a reading of “C180” indicates that the positioner is pointing South. The compass is calibrated at the factory, but may require a field calibration to compensate for local magnetic field variations. For complete calibration instructions, see *Appendix A: Calibrating the Compass.*

Figure 8: Compass Mode

Inclinometer (Elevation)

When the Rotary Switch is in the “Elevation” position, the IIIC unit displays a value in the format “XX.X”, where “XX.X” corresponds to the true Elevation Angle of the Antenna Bore-Sight. The IIIC unit is pre-programmed to display the correct angle when the reflected is mounted in the normal position. The inclinometer has an accuracy ±0.2°.

Figure 9: Inclinometer

Signal Strength Indicator (Rx Level)
When the Rotary Switch is in the “RX Level” position, the IIIC unit displays a value in the format “RXXX”, where “XXX” corresponds to the received power within a specific 10 MHz window. The center frequency of this window is set in the **Alignment** screen in LinkControl. Note that the number displayed is a relative signal strength only, and does not correspond to the signal power in dBm. This value will vary with frequency and cable length.

Figure 10: Signal Strength Indicator

Calibration
When the Rotary Switch is in the “Compass Calibration” position, the IIIC Unit is calibrated to compensate for local magnetic variations. You must calibrate the compass whenever the system is first deployed in a new geographic location. Calibration settings are preserved when the IIIC unit is powered off. When first entering this mode, the IIIC Unit displays brief prompts to aid with the calibration process. For complete calibration instructions, see *Appendix A: Calibrating the Compass.*
When you finish the calibration process, return the Rotary Switch to the desired operating mode.

Note: Do not power down the IIIC unit during calibration. Finish the calibration procedure and return the Rotary Switch to any of the other three operating modes before powering down.

Figure 11: Calibration Mode

4 Assembling the ROVER™

Assembling the ROVER™

The chapter explains how to assemble the ROVER™ satellite terminal.

Opening the Transit Cases

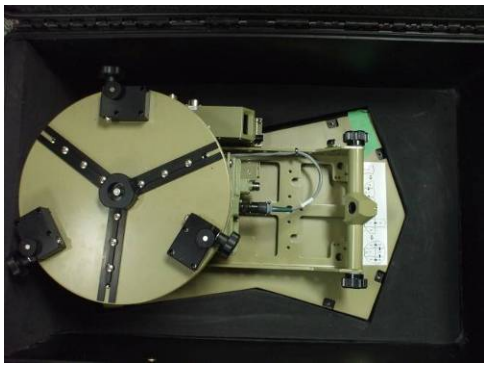
1. From their stand-up transport position, lay down transit cases 1 and 2 to safely open the three main latches on each case.

2. Open Case 2 and set aside the reflector petals bag.

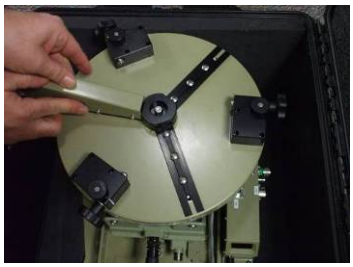
3. Remove the Leg foam tray and set it aside to expose the Feed & Boom arm tray.

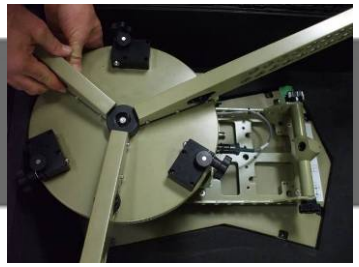
Assembling the ROVER™

4. Open Case 1 and set aside the cables.



5. Remove the tripod legs from the foam tray and attach them to the bottom of the azimuth plate.

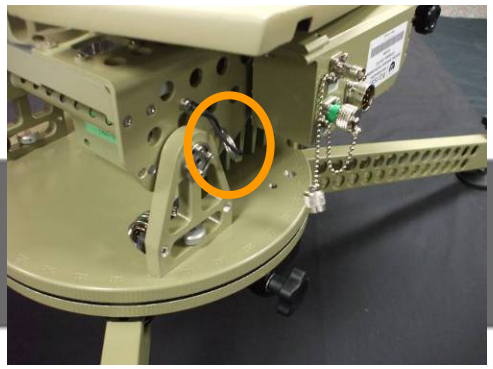




Assembling the ROVER™

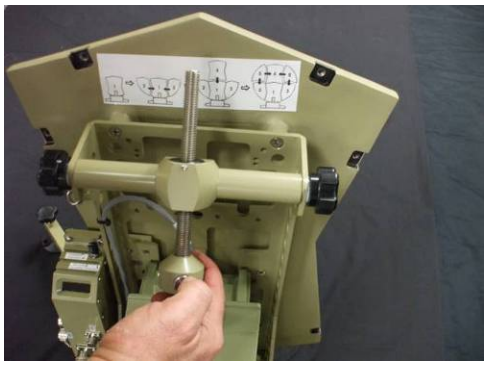
6. Remove the Leg & RF Backplate Assembly from the transit case and set it down on the Tripod legs.

7. Remove the Elevation Lock Pin from the Lock Position and place it in the Storage Position.



Assembling the ROVER™

8. Raise the RF Backplate to the standing position



9. Remove the Elevation Rod from the foam and remove one quick adjust collar from the elevation rod assembly.

10. Insert the rod through the top axle.

11. Re-attach the quick adjust collar.

12. Secure the elevation rod to the azimuth plate and tighten the thumb screw.

Assembling the ROVER™

Note: The dowel pins should fit into the guide holes on the azimuth plate.

Note the orientation of the elevation rod base.

Assembling the Main Antenna Segments

The next section outlines the assembly of the remaining five main antenna segments to the main antenna unit. The antenna segments can be found in the reflector petals bag, labeled and numbered in the order they are meant to be attached.

Segments are numbered in the sequence in which they should be assembled as follows:

- Segment 2: attaches to the **bottom left** of the main antenna unit
- Segment 3: attaches to the **bottom right** of the main antenna unit
- Segment 4: attaches to the **top center** of the main antenna unit
- Segment 5: attaches to the **top left** of the main antenna unit
- Segment 6: attaches to the **top right** of the main antenna unit

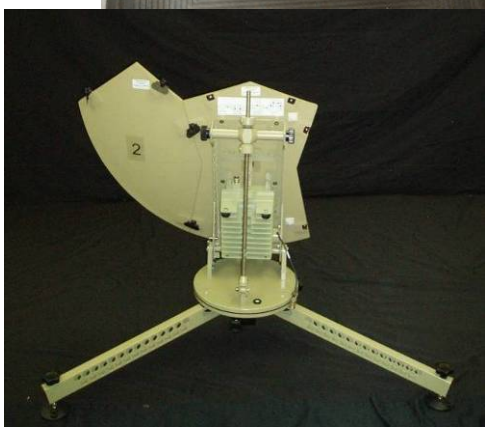
Illustrations and instructions on how to attach each of the five main antenna segments are described on the following pages.

Tip: The segments should be loosely attached at first so that all segments can be fitted. Once all fitted, all the segment's butterfly screws can be tightened (but not over-tightened).

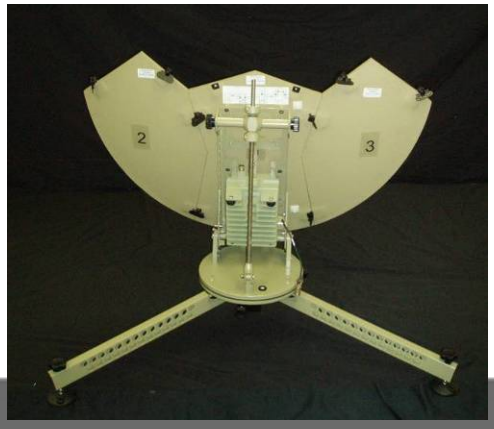
Assembling the ROVER™

1. To prepare for assembly, remove all the antenna segments from the Reflector Petals bag.

2. Using the butterfly screws, loosely attach Segment 2 to the bottom left of the main antenna petal.

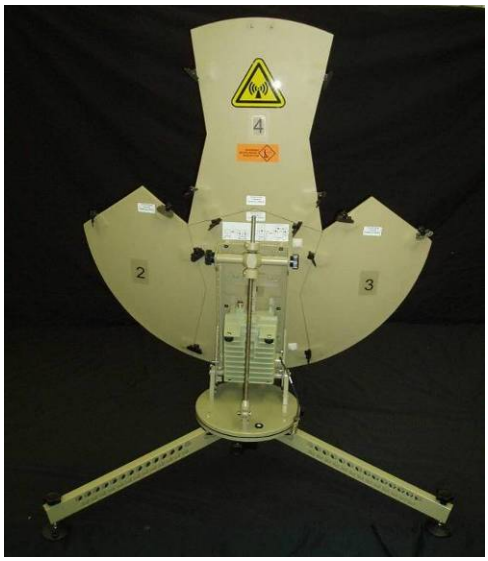


3. Loosely attach Segment 3 to the bottom right of the main antenna panel.



Assembling the ROVER™

4. Loosely attach Segment 4 to the top center.



5. Loosely attach Segment 5 to the top left.

Assembling the ROVER™

6. Loosely attach Segment 6 to the top right.

7. Tighten all of the latches on each of the segments.

Note: To avoid damaging the antenna, do not over-tighten the butterfly screws.

Assembling the Boom Arm and Feed Assembly

1. Remove the waveguide cap from the boom arm stub.

2. Insert the lower boom arm into the main antenna assembly.

   Tip: Use the guide pins at the base of the lower boom arm to align it to the front of the antenna assembly.

   Secure the boom arm by tightening the threaded collar.

Note: Do not over-tighten collar.

The plastic cable clips on the underside of the boom arm should be facing the ground.

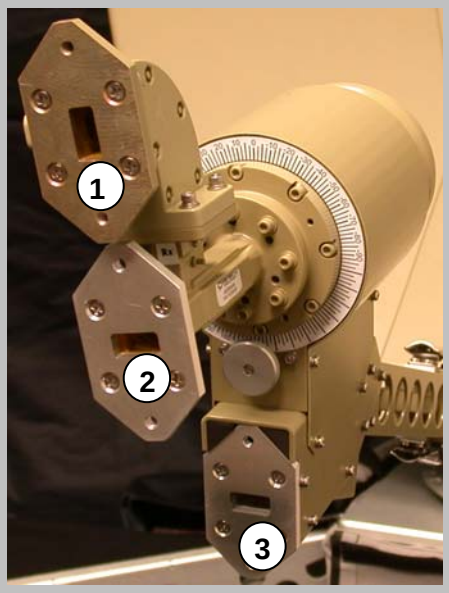
3. Insert the feed & upper boom arm into the lower boom arm with the feed facing up.

   Secure the feed by tightening the threaded collar.

   Note: Do not over-tighten collar.

Understanding the Feed Assembly

Additional components can be attached to the feed assembly at three interfaces:



INTERFACE 1: Receive (Rx) Output
- Connects to the Low Noise Block (LNB).

INTERFACE 2: Transmit (Tx) Input
- Connects to an end of the flexible waveguide.

INTERFACE 3: Transmit (Tx) Output
- Connects to the other end of the flexible waveguide.
- The RF Terminator is also connected here during system testing and troubleshooting.

Figure 12: Front View of the Feed Assembly without Protective Covers

Assembling the ROVER™

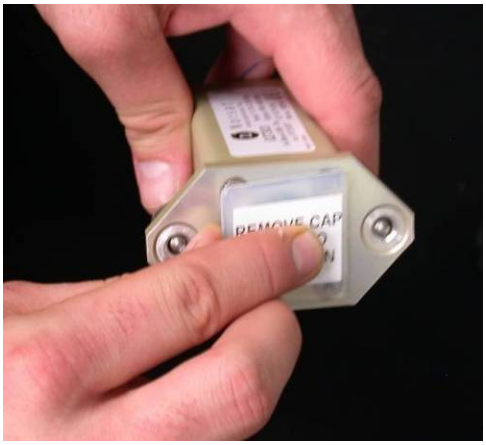
Attaching the Low Noise Block to the Feed Assembly

1. Select the LNB that is appropriate for the region of deployment:

   North America = 1000HA
   Europe = 1000HB
   Asia = 1000HC

2. Remove the protective cover from the LNB.

   Note: Store the protective plastic covers in the transit case. They will need to be reapplied upon disassembly.



3. Attach the LNB to the top waveguide interface of the feed assembly using the thumb screws, as shown.

Attaching the GPS Unit

1. Attach the GPS Unit to the mounting hardware on the top of antenna segment 4 (top middle).

Assembling the ROVER™

2. Connect the GPS to JQ4 on the IIIC unit.

Completing the Cable Connections

1. Locate the “Antenna” end of the IFL and attach the Strain Relief to the hook on the backplate.

   Tip: Slide the cable through the hook and then guide the crimped end through the hook.

2. Connect the N connector (color coded red) to the BUC and coil up the excess cable.

Assembling the ROVER™

3. Connect the F connector to the LNB

4. Connect the BNC connector to the JQ3 port on the IIIC unit

5. Remove the cap from the N JQ2 connector and attach the green coded Rx cable to it.

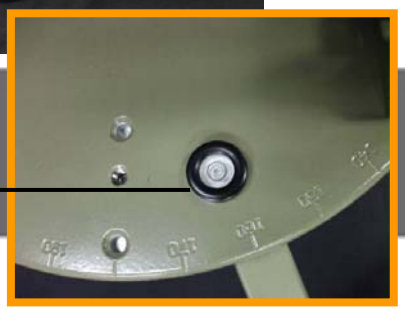
Assembling the ROVER™

6. Connect the 12-pin circular connector to JQ1 on the IIIC unit.

Leveling the Rover™

1. Point the terminal roughly in the direction of the satellite, or, if the direction of the satellite is unknown, point the terminal south.

2. Adjust the handwheels on the feet until the unit is level and monitor the spirit level to ensure the system is level.



Spirit Level

5 Powering the ROVER™

Powering the ROVER™

Connecting the Baseband/IF Unit Cables

1. From the RF Module case, locate the AC Power IDU cable.

Figure 13: AC Power IDU Cable

The cable has an IEC connector on one end and an AC-mains plug on the other end.

2. Connect the cable to the Indoor Unit (IDU).

AC Power Cable

Figure 14: Connections on Rear of BaseBand

About the Interfacility Link

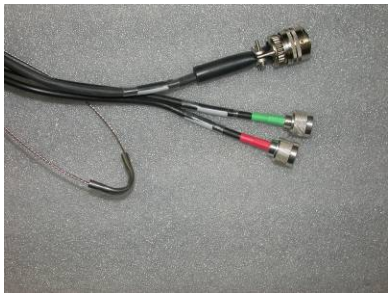


Figure 15: IFL Baseband End

The Baseband/IF unit and RF Module are connected via a 20 meter multi cable assembly called the Interfacility Link (IFL). The IFL is comprised of three individually shielded cables encased in a braided sheath.

The cables are:

- Transmit IF (red)
- Receive IF (green)
- Monitor and Control

The two IF cables are 50 ohm co-axial cables with N type male connectors on each end. In addition to L-band IF signals. The Transmit cable carries a 10 MHz reference.

The Receive cable in the IFL carries 24V DC and does not carry a 10 MHz reference signal.

The Monitor and Control cable contains the following control signals:

- RS485
- Receive Signal Strength
- DC for the IIIC Unit & 8W BUC
- GPS information from the IIIC Unit to the baseband

The Monitor and Control cable is terminated in a common bayonet-style multi-pin connector. The Baseband/IF unit features a male connector and the RF Module side features a female connector. The cable ends are labeled **Antenna** and **Baseband** accordingly. Each end of the cable also features a strain relief.

Connecting the Baseband/ IF unit and the RF Module

1. Locate the IFL cable (see Figure 15 on page 47).
   Important: The IFL is a calibrated cable assembly and must be used to connect the Antenna/RF and Baseband/IF units. Using alternate cable assemblies will result in incorrect power settings.
2. On the end of the cable that is marked **Baseband**, locate the reinforced portion of the IFL strain relief loop and set it into the hook on the rear of the Baseband/IF unit.

Figure 16: IFL strain relief loop

3. Connect the N-type Tx IF connector from the IFL (red) to the Tx port on the user supplied modem.

Figure 17: Connecting the Tx IF connector

4. Connect the N-type Rx IF connector from the IFL (green) to the Rx In port on the Baseband/IF unit.

Figure 18: Connecting the Rx IF connector

5. Connect the DC/Control bayonet connector from the IFL to the DC/Control port on the Baseband/IF unit.

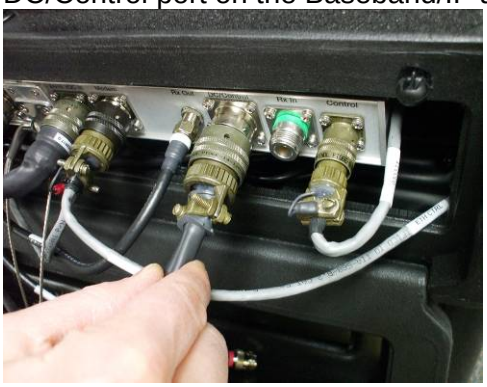


Figure 19: BaseBand IFL connections

About the laptop connections

The laptop is permanently connected to the BaseBand/IF unit through the Ethernet Control Cable and a Power Cable via AC/DC Converter.

Connecting the Modem

See *Appendix C: Connecting a User Supplied Modem*.

Powering the ROVER™

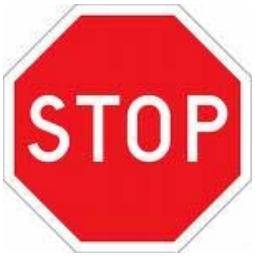
Turning on the Baseband/IF Unit

Note: Always turn on Baseband/IF unit main power before turning on the laptop. Always shut down the laptop before powering down the Baseband/IF unit.
The modem component and main power component are powered on and powered off at the same time.

1. Connect the AC Power Cable to power source.
   When the Baseband/IF unit is on, the fans on the rear panel will start.

Turning on the Laptop

After you turn on the Baseband/IF unit, you can turn on the laptop.



NOTE:

READ this chapter prior to:

- your first use
- a change in satellite transponder
- a change in hub
- a change in location

6 Commissioning the ROVER™

Commissioning the ROVER™

This is a chapter describes how to commission the ROVER™ and transmit successfully.

The commissioning process ensures correct operation of the ROVER™ after the following scenarios:

- Receipt of the ROVER™ from the factory
- Change in satellite or transponder
- Change in hub (or network operator) configuration
- Change in location

LinkControl Overview:

LinkControl is a Norsat proprietary software application that controls the ROVER™. The LinkControl application interfaces with the integrated pointing tools of the system and enables users to point the antenna towards the desired satellite, peak on the antenna, save user settings; and access the “alarm console” in the System Status screen.
For versatility, the ROVER™ system can be ordered from Norsat with or without an external modem. A modem can be attached after the antenna has acquired the satellite and the terminal is ready to transmit and/or receive data.

Why is the Commissioning Process Necessary?

In order for the ROVER™ to operate successfully, the settings of all of the elements within a satellite network need to match.

The three elements are:

(i) Satellite and its transponders
(ii) The satellite hub/teleport
(iii) The ROVER™ terminal.

Note: In some cases, a hub operator can help you ensure that the settings of the ROVER™ are synchronized with both the hub and the satellite. Users will then communicate with the hub operator who will in turn communicate with the satellite operator. In other cases, users will check these settings directly with the satellite operator.

The commissioning process ensures that the characteristics of the satellite (and/or satellite transponder) match the parameters of the selected “Profile” in the ROVER™ or in the Satellite Almanac. This is important because the Satellite Operator may have:

- added / deleted / modified the DVB-S carrier properties;
- added / deleted / modified the alignment / beacon properties;
- taken the satellite out of orbit for maintenance
- ceased operation

Commissioning the ROVER™

Commissioning Process Overview

The commissioning process comprises four key steps:

1. Launching the LinkControl Application (see page 53)
2. Call the Hub/Satellite Operator (see page 55)
3. Create or Edit Profile (see page 56)*
4. Edit Satellite Almanac (see page 60)*

* These steps can be skipped in the case of a location change. If you will still be served by the same spot beam as the last transmission, and the network hub and satellite used in the last transmission will also be used in this transmission, you do not need to create or edit a profile, or edit the satellite almanac.

Step 1: Launch LinkControl Application

The LinkControl application will launch automatically after the ROVER™ has been powered up and the laptop has been connected to the ROVER™.

It may take several minutes for the application to appear on the laptop. The application will open with the start-up screen being displayed as in *Figure 20*.

The LinkControl application performs numerous diagnostics upon start-up.

The user should allow the LinkControl application to fully complete its start-up and diagnostics process before attempting to take control of the application. The results of the diagnostics can be viewed by clicking the **Details** button below the System Status indicator. The screen in *Figure 20* will appear on the laptop when the application is launched.

Commissioning the ROVER™

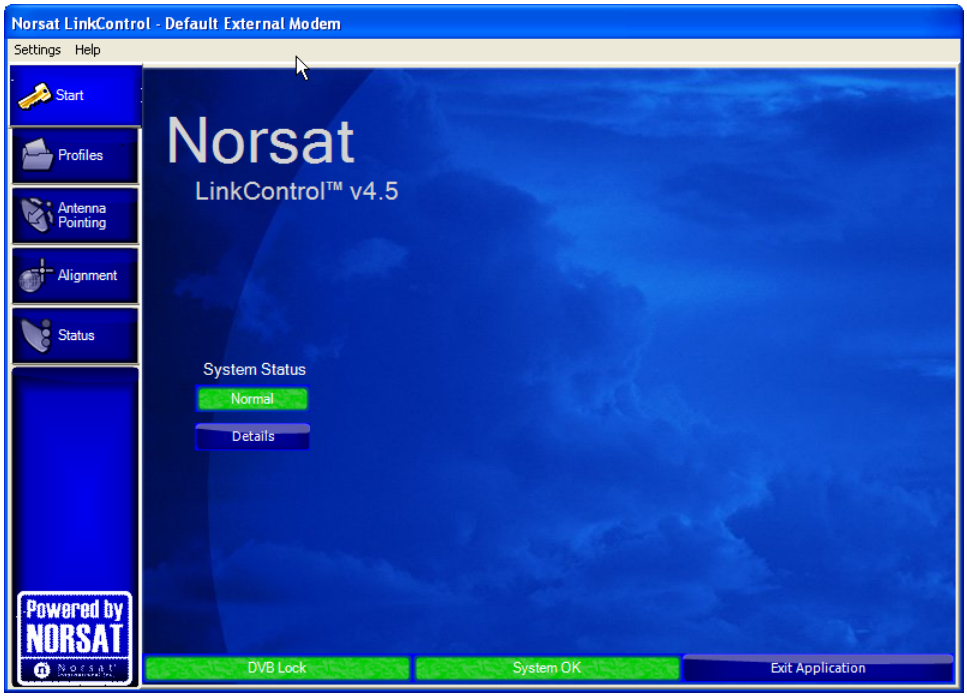


Figure 20. LinkControl Startup Screen

The commissioning process is password-protected and is accessible only to users designated as "administrator(s)" in LinkControl.

If you are using the ROVER™ for the first time, LinkControl will launch in Field Mode (i.e. non-Administrator Mode). You will first need to switch to Administrator Mode. The system comes with a default Administrator password. It is strongly recommended that you change the default password and document your password.

To enter Administrator mode:

1. On the Menu bar, select **Settings > Enter Admin Mode**.
2. Enter the Administrator password.
   The default the password is “Administrator”.
   Note: Passwords are case-sensitive.

To exit Administrator mode:

- Select **Settings > Exit Admin Mode**.

Step 2: Call the Satellite (or Hub) Operator

In order to verify certain settings, you will need to call the Satellite Operator.

Go through the following topics with the Satellite Operator, in the sequence provided:

1. Confirm Satellite Profiles:

   Ask the Satellite Operator to confirm the characteristics of the satellite and transponder you wish to use. Address each of the following with the Satellite Operator:

Satellite Name	_____ (Transponder #; Slot #)	
PROFILE INFORMATION		
Transmit Frequency:	_____	MHz
Receive Frequency:	_____	MHz
LNB Frequency Range:	_____	MHz
Polarization (Transmit):	_____	(V/H)
Polarization (Receive):	_____	(V/H)
SATELLITE ALMANAC INFORMATION		
Orbital Position (Longitude)	_____	(E/W)
Alignment / Beacon Frequency	_____	MHz / H or V
DVB-S carrier Frequency	_____	MHz / H or V

   Note 1: For each satellite, there are five properties which relate to a “profile” saved (or to be saved) in the LinkControl application; and three properties which relate to the satellite almanac in the LinkControl application.

   Note 2: Satellites have multiple beacons and DVB receivers. Alignment works best if beacons and DVB receivers are on both polarities.

2. Confirm the modem settings for the transmission. In order to have a successful transmission, all modem parameters must match. These include:
   - Tx/Rx Data Rates
   - Error Correction Settings
   - Framing Settings
   - Modulation Scheme
   - Terrestrial Interface Type

Note: If you have recently used the same hub operator and hub, you should ask the hub Operator if it is still necessary to update the options files. Refer to the details and profile of your last transmission.

Step 3: Create or Edit Profile

The Link Control Application relies on a Profile to orient the antenna and peak on the satellite. It is important to ensure that the Target Satellite information provided by the Satellite Operator matches an existing profile. If the information does not match an existing profile, you must create a new profile or edit an existing profile.

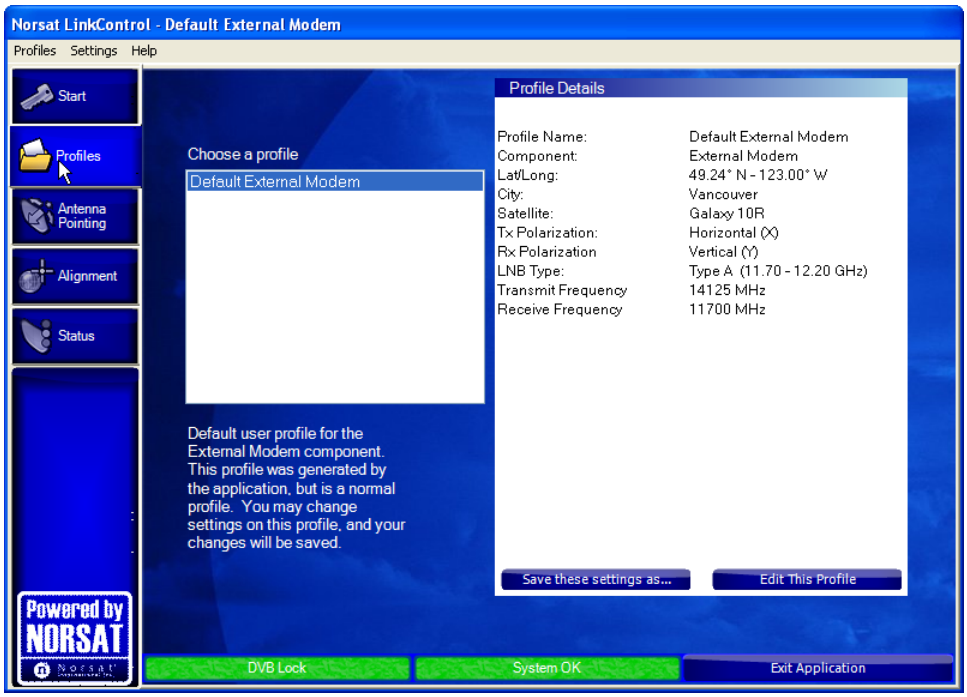


Figure 21. Choose a Profile

To view an existing profile:

1. Click the **Profiles** tab on the left side of the screen.
2. Click a profile in the list of profiles under **Choose a Profile**.
3. A summary of the selected profile is displayed on the right side of the screen.
4. Compare the information (target satellite, polarization, GPS coordinates and LNB to use) provided by the Satellite Operator with the existing profile data.
5. If there is a perfect match, proceed to *Step 4: Edit/Review Satellite Almanac* on page 60, otherwise go to the next step).
6. If there is a difference in the information provided by the Satellite Operator and that found in the Profiles, you must decide whether to create a new profile or edit an "existing profile".
   If you do not plan to use the existing profile ever again, then you may wish to edit an existing profile. Otherwise, create a new profile.

To create or edit a Profile:

a) In Administrator Mode, click the **Profiles** tab on the LinkControl menu bar.

- To create a new Profile: Select **Add New Profile**.
- To edit an existing Profile: Select **Edit Existing Profile** and make your selection from the listed profiles.

Tip: You can also click the Profiles button from the Profile tab along the left side of LinkControl and then make your Profile selection under **Choose a profile** from the right side of the screen. If you use this method, click **Save these settings as** or highlight a profile, click **Edit This Profile** at the bottom of the Profile Details window and then save the Profile with its new name.

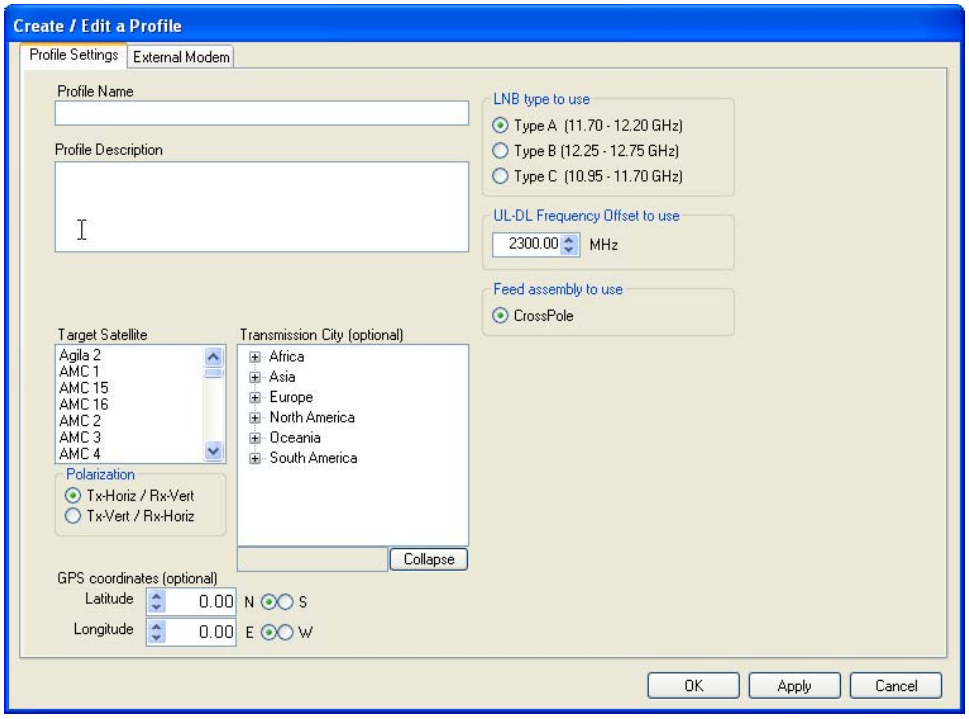


Figure 22. Create / Edit a Profile

b) The **Profile Settings Screen** opens.

c) To create the new profile, type a profile name in the **Profile Name** box.

d) Enter a brief profile description in the **Profile Description** box.

e) Choose a target satellite from the **Target Satellite** list.

f) Click under **Polarization** to select the type of transmit polarization.

g) (Optional) From the **Transmission City** list, select the city of transmission, or, in the **GPS coordinates** area, enter the latitude and longitude coordinates.

h) Choose the LNB that is applicable for your transmission location from **LNB type to use**.

i) If applicable, under **Feed assembly to use**, choose the feed assembly that you want to use.

j) If applicable, under **SSPA to use**, select the SSPA that you want to use.

k) Click **Apply**.

To Set Modem Parameters:

To set Transmit (Tx) and Receive (Rx) parameters for the external modem, click on the **External Modem** tab. The External Modem window appears. You cab edit the modem configuration in this window.

1. Enter new Transmit and Receive frequencies. The Notes is available for you to enter any other transmission information (e.g. bitrate, FEC rate, transmit spectral inversion, etc.), reminders, and any other information you would like to include.

2. Click on Apply and then OK.

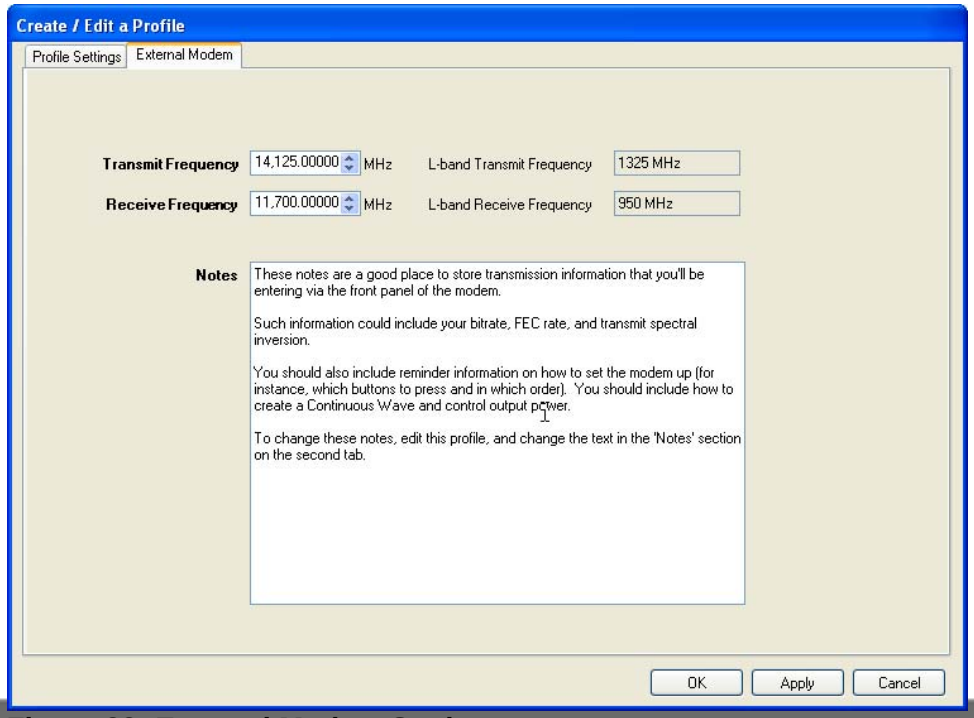


Figure 23: External Modem Settings

Step 4: Edit/Review Satellite Almanac

a) On the **Menu** bar, press **Settings** > **Edit Satellite**

b) In the list, select your **Target Satellite**.

c) If there are any differences in the alignment carrier, DVB-S carrier or orbital position then you can modify them or add new carriers.

d) Click **Close** when you are done.

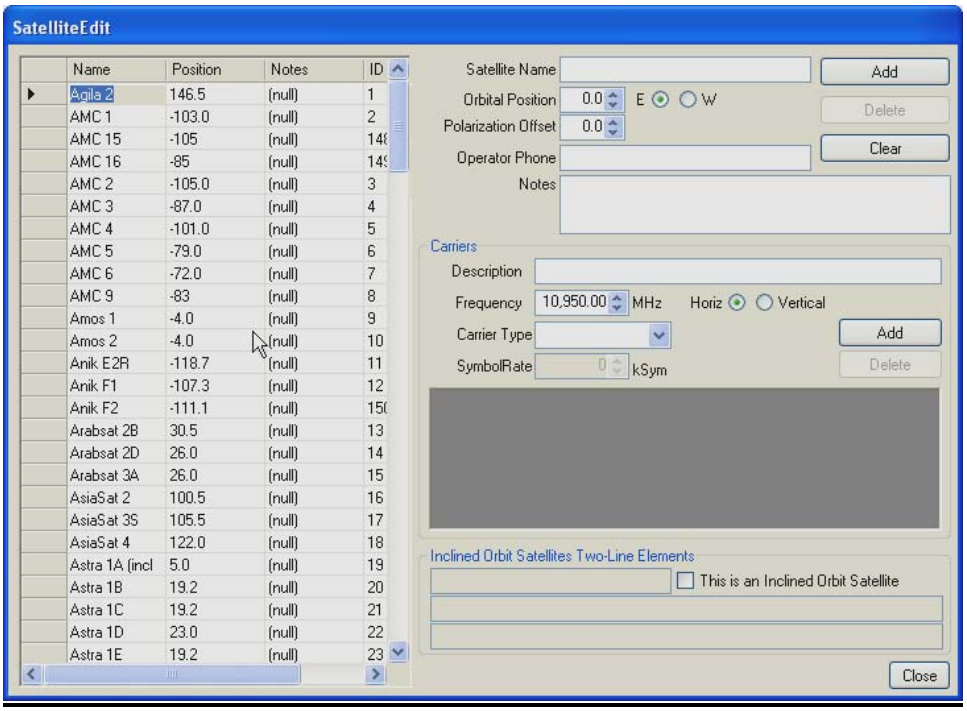


Figure 24: Satellite Edit screen

To Add a New Carrier:

1. Enter the Description, Frequency, Polarization, Carrier type and Symbol Rate; (Symbol Rate is always 0 (zero) for Alignment Carriers); for the new carrier inside the Carriers sub-window on the right-hand side.

2. Click Apply, Change on the Carriers sub-window.

3. The new carrier will appear in the list.

To Edit an Existing Carrier:

1. Highlight the entire row, (click on the cell in front of the row describing carrier), for the carrier you wish to modify from the list.

2. Edit the desired parameter for the carrier.

3. Click Apply change in the Carriers sub-window.

To Delete a Carrier:

1. Highlight the entire row, (click on the cell in front of the row describing carrier), for the carrier you wish to modify from the list.

2. Click on Delete in the Carriers sub-window.

When you have finished working with the Carriers, click on Apply Change in the upper right-hand corner to update the Satellite information.

Other Administrator Mode Features

Some of the RF components on the ROVER™ have been matched and optimized using calibration files. Figure 25 shows the calibration files that are preloaded prior to operation. If any of these components are replaced, the LinkControl application needs to be updated with the corresponding calibration files. For the ROVER™ system, users should not attempt to reload any files before consulting the Norsat Helpdesk.

Figure 25: Calibration Settings

Figure 26 shows the three levels of logs that the LinkControl application can maintain. The most detailed level of logging is Factory Log, followed by Information and, lastly, Warning. Normally, factory logging is not required unless there is a specific issue that requires troubleshooting (typically, by the Norsat Helpdesk). For most uses, Information, and Warning level logs are sufficient.

Note: The picture in Figure 26 indicates that no log files will generated.

When log levels are selected, users can access the log files by clicking the **Status** tab and clicking the **Log Files** section (right-hand side of the LinkControl screen).

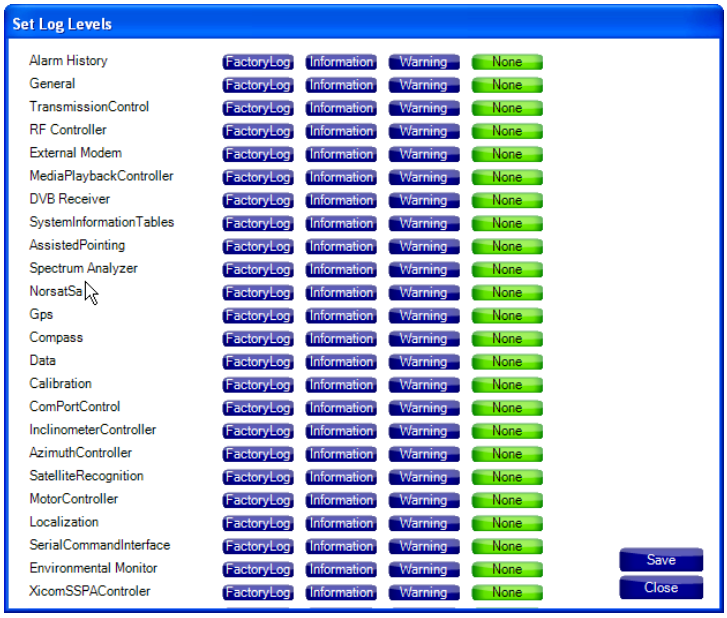


Figure 26: Log Levels

The LinkControl application is available in different language options. To change the LinkControl language, select **Settings > Languages** from the menu bar.

Note: LinkControl's language options are only enabled when you have pre-ordered them with the system.

7 Operating the ROVER™: Satellite Acquisition

Operating the ROVER™: Satellite Acquisition

This chapter explains how you can leverage LinkControl's assisted-acquire capability to point and peak your antenna to the correct satellite.

Note: Before operating the Rover™; ensure that a profile has been set up for the desired satellite. To create a profile for the satellite, the user must be logged in with Administrator rights and operating in Administrator Mode. Once a profile has been selected, the user may continue in Administrator Mode or switch back to Field Mode. The profile must contain enough information about the location of both the desired satellite and the ROVER™ system in order to successfully locate it (Satellite name, alignment/beacon and DVB-S carriers; GPS coordinates for latitude and longitude). For information, see Chapter 6.

The satellite acquisition process involves two hardware configurations, performed one after the other:

1. An IFL connection from the LNB to the Satellite Acquisition Assistant (SAA) to enable antenna pointing, satellite recognition and acquisition, antenna peaking;
2. An IFL connection from the LNB to the modem (Norsat- or user-supplied) to enable data transmission.

Note: In the event of Satellite Acquisition Assistant failure, see Appendix B: Manual Satellite Acquisition for manual satellite acquisition instructions.

Launch the LinkControl Application

The application may take several minutes to appear on the screen.

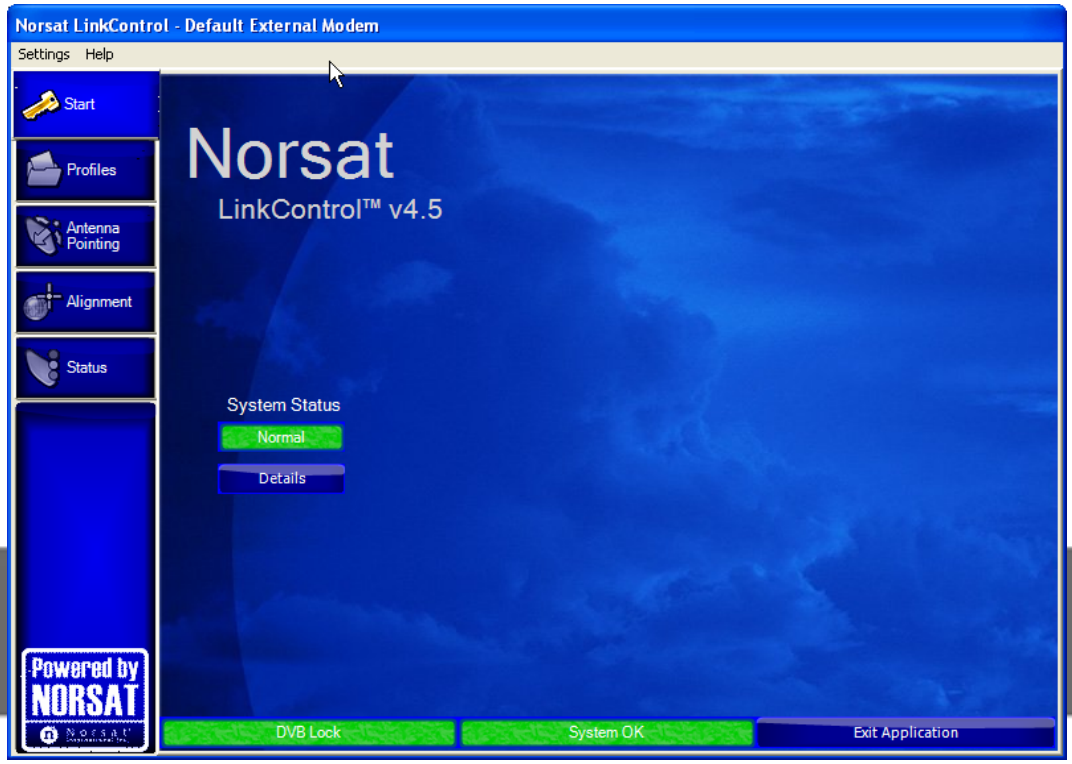


Figure 27. LinkControl Startup Screen

Operating the ROVER™: Satellite Acquisition

The LinkControl application performs numerous diagnostics upon start-up.

You can click the **Details** button on the Startup screen to view system status details.

Allow the LinkControl application to fully complete its diagnostics before attempting to take control of the application. The results of the diagnostics can be viewed by pressing the **Details** button below the System Status indicator.

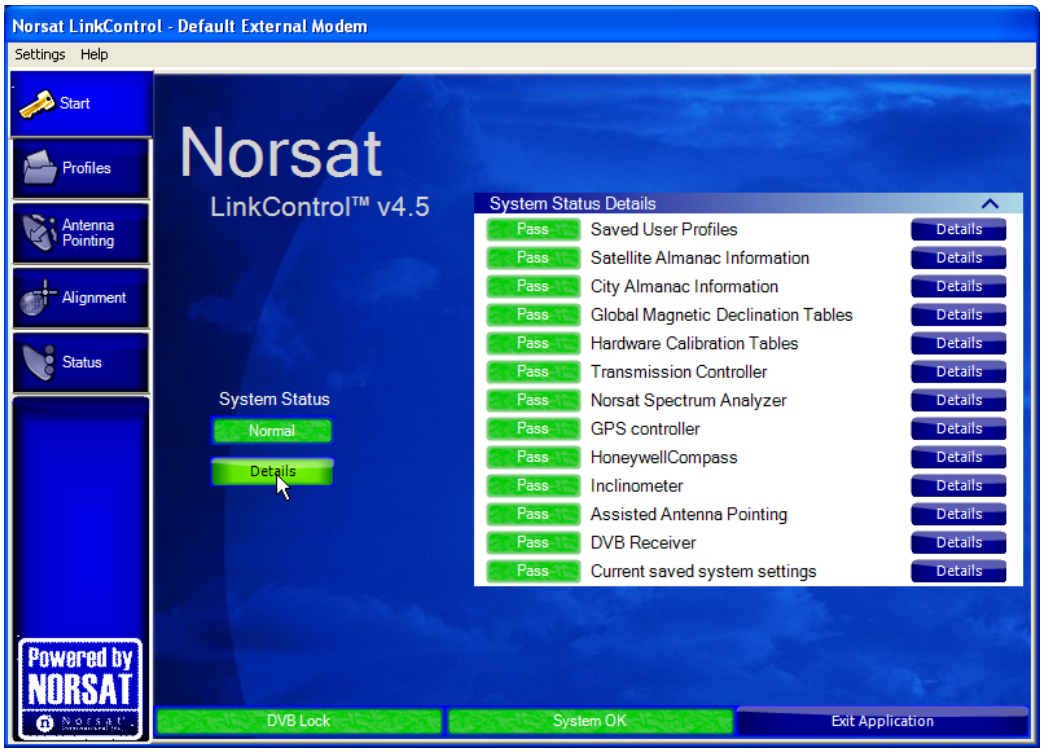


Figure 28. LinkControl System Details

Choose an existing Profile

1. Click on the **Profiles** tab on the left side of the screen.
2. Click on a profile in the **Choose a profile** list.
   A summary of the selected profile is displayed on the right side of the screen. To create / edit a profile, see Chapter 6. Note that you can only create / edit a profile in Administrator mode.

Operating the ROVER™: Satellite Acquisition

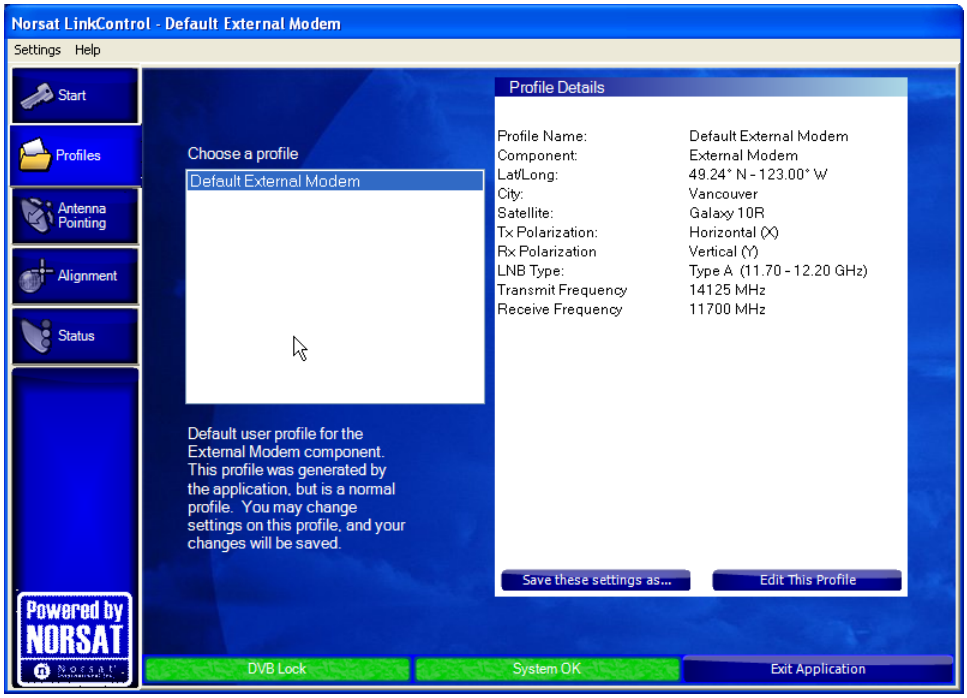


Figure 29. Choose a Profile

Specify Location

1. Click **Antenna Pointing** on the Toolbar. The **Antenna Pointing Screen** opens. The **Antenna Orientation** fields display the antenna pointing values.

   The world map displays the ROVER™ position and the position of the selected satellite.

Operating the ROVER™: Satellite Acquisition

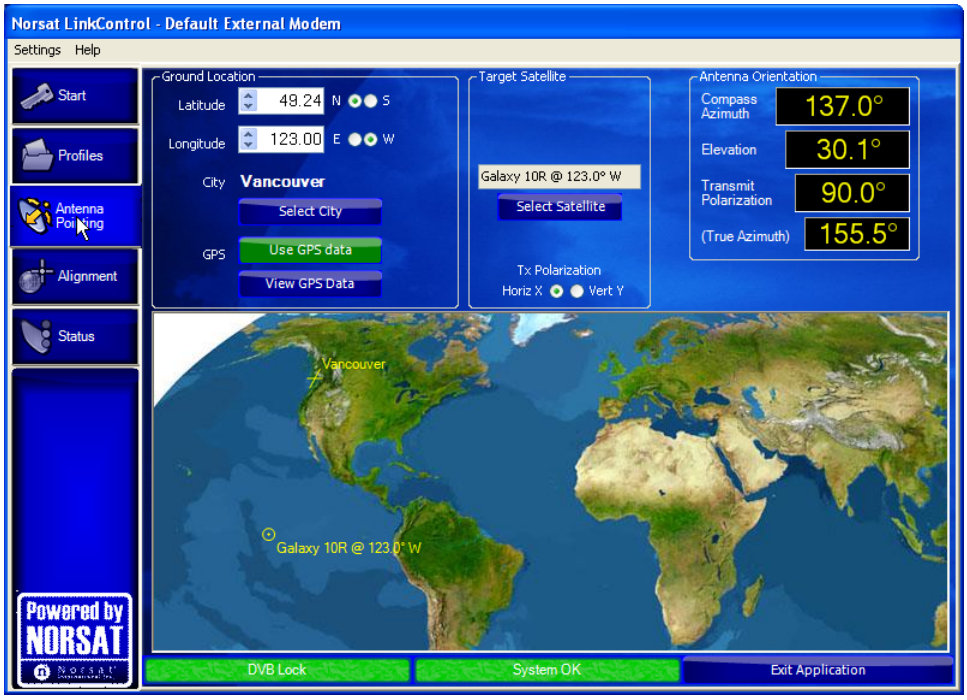


Figure 30. Antenna Pointing Screen

2. Specify the location of the terminal in one of the three different ways.
   i. Select your location from the City list;
   ii. Use the supplied GPS receiver;
   iii. Manually enter the latitude and longitude.

The LinkControl application must know your current ground location in order to calculate the look angles required to point the antenna at the satellite.

To select location from the city list:

1) Click on **Select City**
2) Expand the continent and country trees by clicking on the **+** sign.
3) Click on the nearest city.
4) Click **OK.**

Operating the ROVER™: Satellite Acquisition

To determine location using the GPS:

1) Ensure the GPS is connected. If this was not done during the set up, the GPS will not be initialized.

   To initialized the GPS:

   a Click on **View GPS Data**
   b Click on **Initialize**
   c Click on **Close**

   If the **Use GPS Data** button is green, it has acquired a location. Press the button to use the GPS information as its position.

   Note: The GPS unit requires a clear and unobstructed view of the sky to operate properly. If portions of the sky are blocked, it may impact acquisition time.

To manually enter latitude and longitude:

1) Enter the Latitude in the box or select the value using the scroll arrows.

2) Select the North or South radio button.

3) Enter the Longitude in the box or select the value using the scroll arrows.

4) Select the East or West radio button.

   Note: The format for latitude and longitude is <Degrees.Decimal Degrees>

Verify Target Satellite

Confirm the satellite name that appears in the white **Target Satellite** box on the **Select Satellite** drop down screen.

Operating the ROVER™: Satellite Acquisition

Pointing the Antenna

To help you point the antenna accurately, the application automatically calculates three values:

Compass Azimuth:
The magnetic compass bearing to which the antenna should be set;
Elevation:
The angle to which the inclinometer should be set;
True Polarization:
The bearing relative to Geographic North rather than Magnetic North.

1. To start antenna alignment, click **Alignment** on the left side menu.

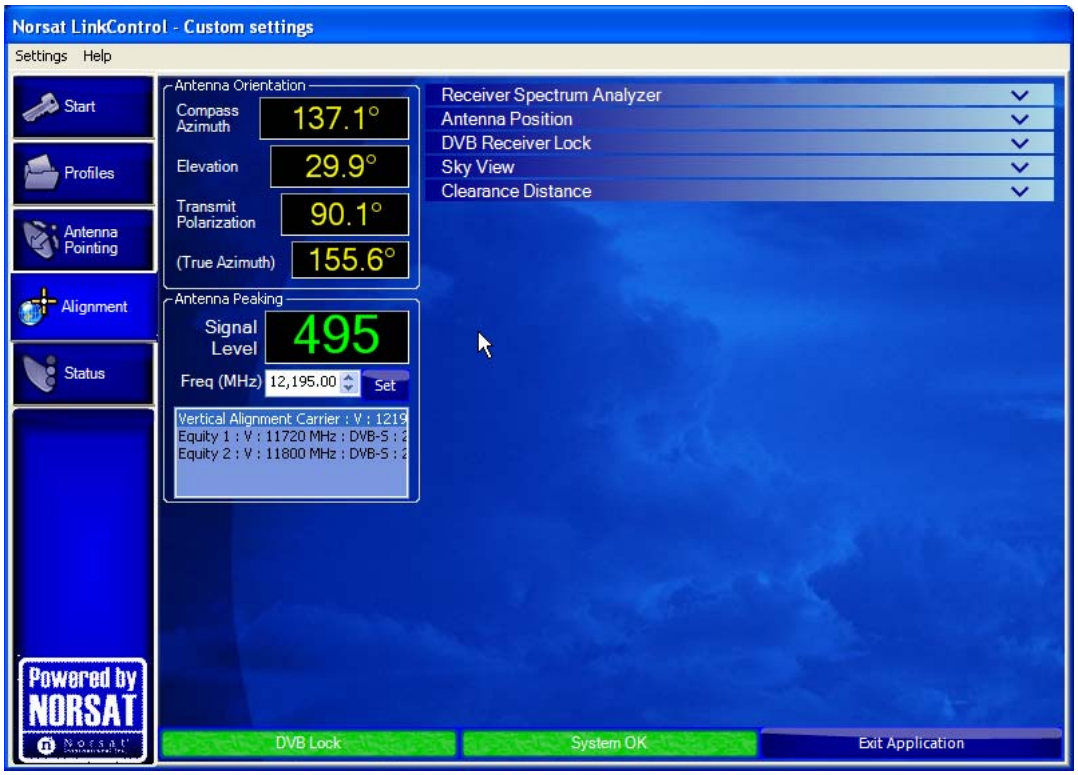


Figure 31: Alignment Tab (all views minimized)

2. Adjust the Azimuth

   a. Click the **Antenna Position** drop-down tab.

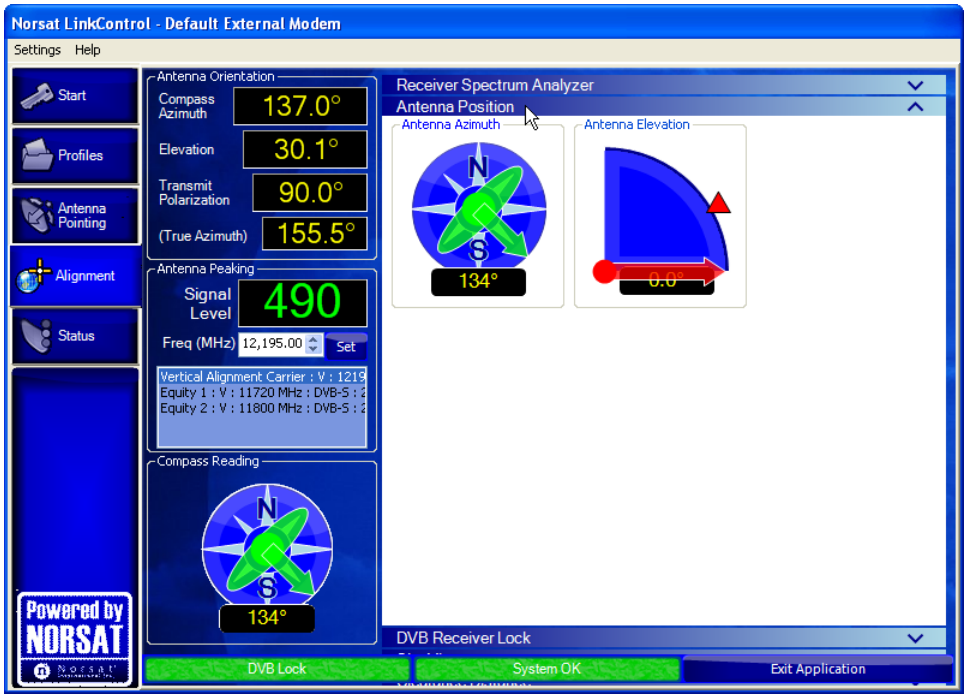


Figure 32: Antenna Position – Adjust Azimuth

The **Antenna Azimuth** diagram indicates the current azimuth position of the antenna. Monitor this in between manual adjustments.

   b. While monitoring the current compass bearing below the diagram, manually adjust the azimuth plate until the value matches the degrees shown in the **Compass Azimuth** field.

Figure 33: Adjust the Azimuth

3. Adjust the Elevation

   Manually adjust the antenna elevation until the elevation value displayed on the IIIC unit matches the elevation value displayed in the **Elevation** field.

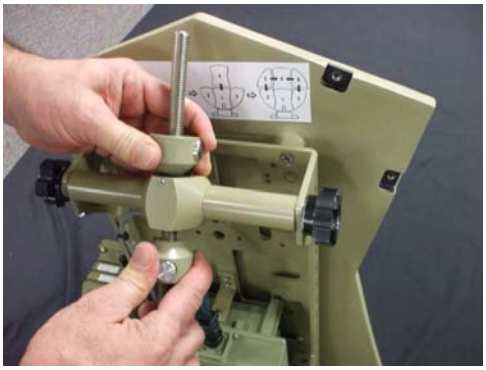


Figure 34: Elevation adjustment

4. Adjust the Polarization

   Manually adjust the feed assembly, until the polarization values match the degree values shown in the **Transmit Polarization** field.

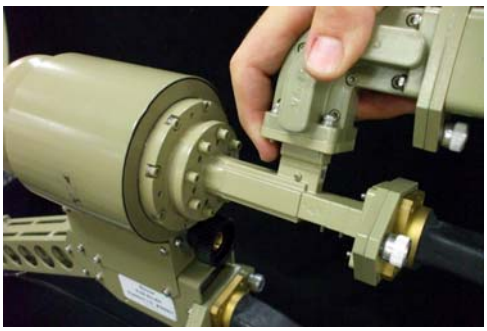


Figure 35: Polarization adjustment

Operating the ROVER™: Satellite Acquisition

Checking Clearance Distance

The system calculates human clearance distance values depending on two variables:

- Satellite location
- Terminal or antenna location

To view clearance distance:

1. Click on the **Clearance Distance** drop-down tab.
2. Ensure that there are no obstructions within the indicated clearance range listed.

Acquiring the Satellite

1. Select a carrier:

   On the DVB Receiver Screen, choose a modem carrier or beacon carrier from the list.

   When the system is locked on a DVB carrier, the DVB Lock indicator at the bottom of the screen will turn green.

   Note: If the carrier is not a DVB carrier, no lock will be indicated. You must proceed to the spectrum analyzer step to peak the antenna.

Operating the ROVER™: Satellite Acquisition

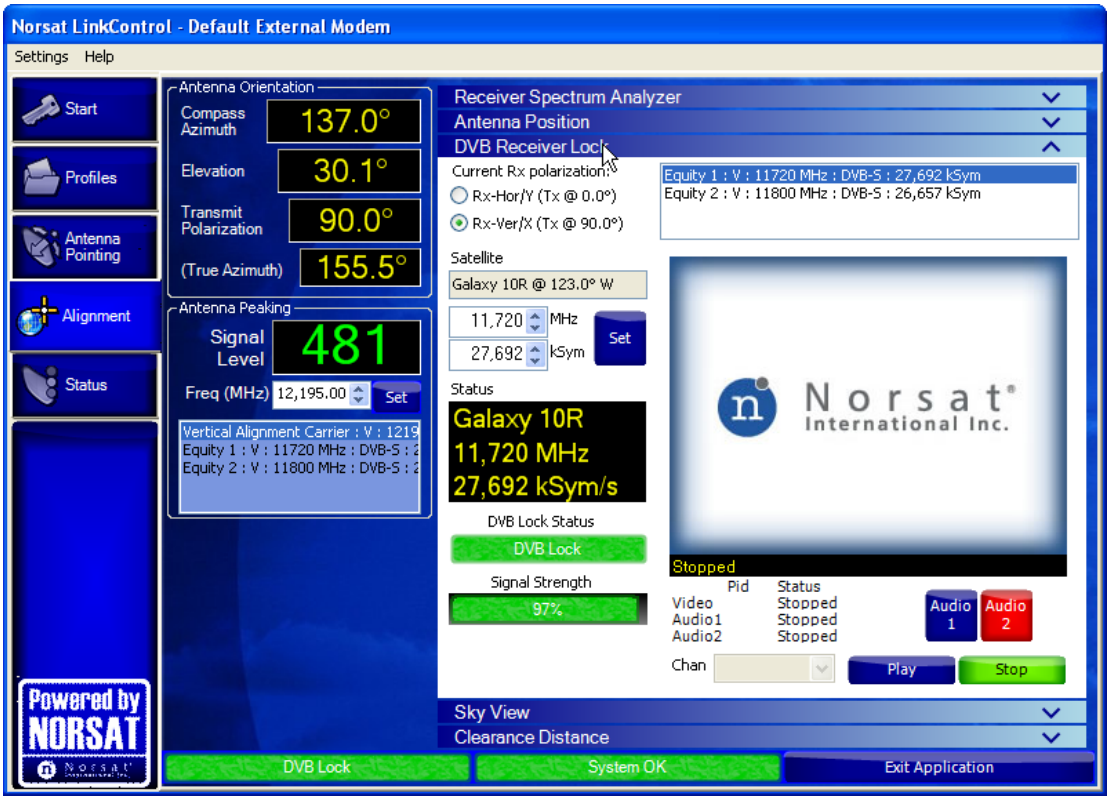


Figure 36: Establishing a Carrier Lock

2. Sweep for a signal:
   a. Click on the **Receiver Spectrum Analyzer** drop-down tab.
   b. Manually sweep for a signal peak; that is, adjust the azimuth until a spike in the middle of the screen.
   c. If no signal (spike) appears, use the quick release collars to adjust the elevation. Then, try repeating the previous steps until a spike appears.

Note: If the modem carrier is chosen, ensure the signal is in the center of the screen.

Operating the ROVER™: Satellite Acquisition

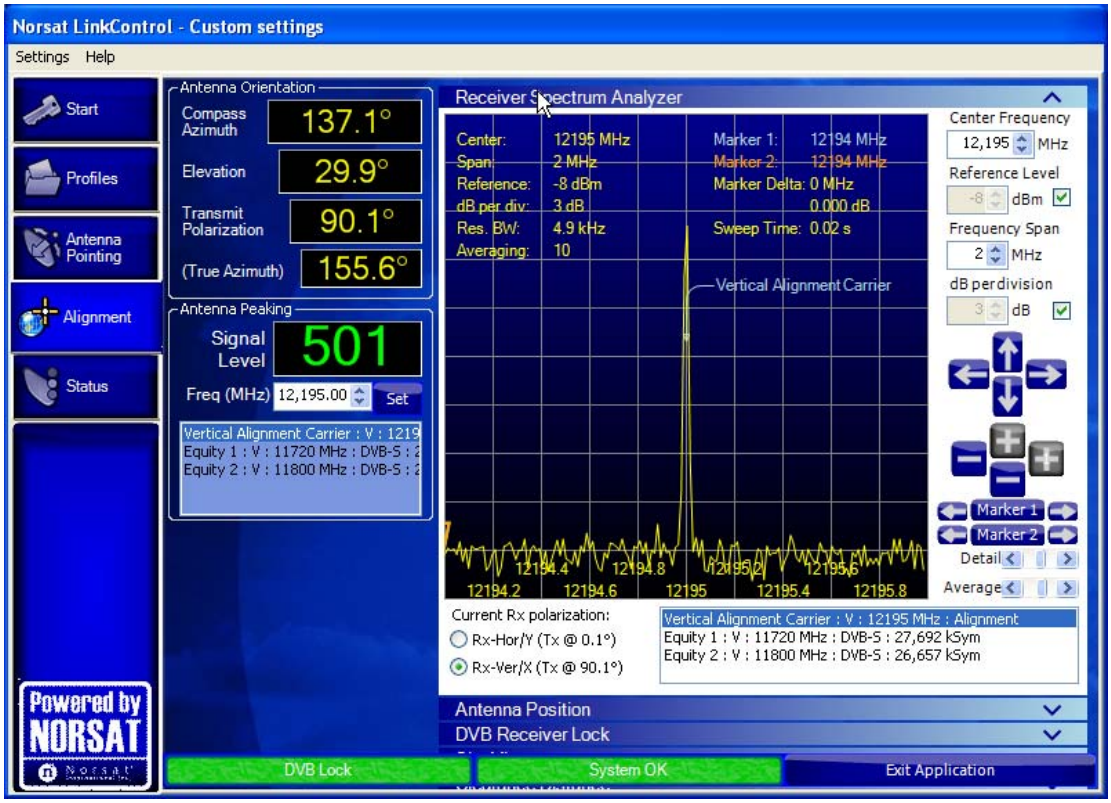


Figure 37: Antenna Peaking using Built-in Spectrum Analyzer

About Receiver Spectrum Analyzer Functions

The Receiver Spectrum Analyzer analyzes downlink signals being received by the antenna. The Receiver Spectrum Analyzer aids the operator to positively identifying the correct satellite. This verification can be achieved by determining if known signals (i.e. satellite beacon frequencies) exist at the expected correct frequency and polarization.

Note: Beacon frequencies are not unique to each satellite. While a peaked beacon frequency ensures that you are pointing directly at *a* satellite, it does not guarantee that you are pointed to your *desired* satellite.

Operating the ROVER™: Satellite Acquisition

The Spectrum Analyzer displays frequency along the x-axis (horizontal) and signal amplitude along the y-axis (vertical).

The following controls are available for the Spectrum Analyzer:

- Center frequency
- Reference level
- Frequency span
- Decibels per division
- Center frequency and reference level incremental (arrows)
- Frequency span and decibels per division incremental (+/-)
- Marker functions
- Sweep detail
- Signal averaging
- Rx polarization
- Carrier selection list

Manual Control
The center frequency, reference level, frequency span and dB per division can all be controlled manually. The user can either enter the desired values or use the scroll arrows to adjust the values by unit(s).

Marker Functions
The marker functions allow the user to measure the amplitude and bandwidth of signals viewed in the spectrum analyzer, as well as to quickly change the center frequency.

To set a marker:

a. On the Spectrum Analyzer, move the pointer to the spot you wish to mark;
b. Left-click to set Marker 1 (blue arrow);
c. Right-click to set Marker 2 (orange arrow).

To change the Center Frequency:

a. Set a marker to the desired frequency
b. Click on the button for Marker 1 or Marker 2, depending on which marker is set to your desired frequency.

Sweep Details
The sweep **Detail** slider controls how many sweep samples are used in drawing the signal trace and corresponds to resolution bandwidth as found on stand alone spectrum analyzers.

Increasing the sweep detail increases the amount of time required to draw the trace on the Spectrum Analyzer. However, it is normal to leave this set to high detail as it may be difficult to distinguish signals when the detail is set to low.

Signal Averaging
The signal **Average** slider controls how many sweep samples are averaged and displayed as one trace. The range of averaging is from 1 (no averaging) to 16.

Current Rx Polarization
Selecting the **Current Rx polarization** controls which carriers will appear in the carrier selection list. The calculated polarization setting for the feed is also displayed. This allows the operator to check for a known signal on the opposite polarization to help verify that the correct satellite has been found.

To view signals on the alternate polarization:

a. Click the radio button for the polarization that you want to view;
b. Adjust the polarization settings of the feed on the antenna;
c. Be sure to return to the desired polarization before transmitting.

Carrier Selection List
The carrier selection list allows the operator to quickly set the spectrum analyzer to optimally view a known signal from the almanac. Clicking on a carrier in the list automatically sets the center frequency and span to match the selected carrier.

Peaking the Antenna

Antenna Peaking is performed once the operator has verified that they are pointed at the correct satellite. Manually peaking the antenna will achieve the greatest **Signal Level** value.

3. Reset the frequency span to 10 MHz (if the frequency span is currently set at a level higher than 10MHz). The reading on the **Signal Level** indicator in the **Antenna Peaking** box should be green.

   Tip: If the signal strength indicator is red, it cannot be used for peaking. Reset your frequency span until it turns green.

4. Manually adjust the system Azimuth to peak the signal.
5. Manually adjust the system Elevation to peak the signal.
6. Manually adjust the system Polarization to peak the signal.

Once the highest Signal Level value has been achieved, peaking is complete.

Connecting the Modem

For information on connecting a modem, see Appendix C: Connecting a User Supplied Modem. Figure 38 shows the hardware configuration during the ROVER™ transmission.

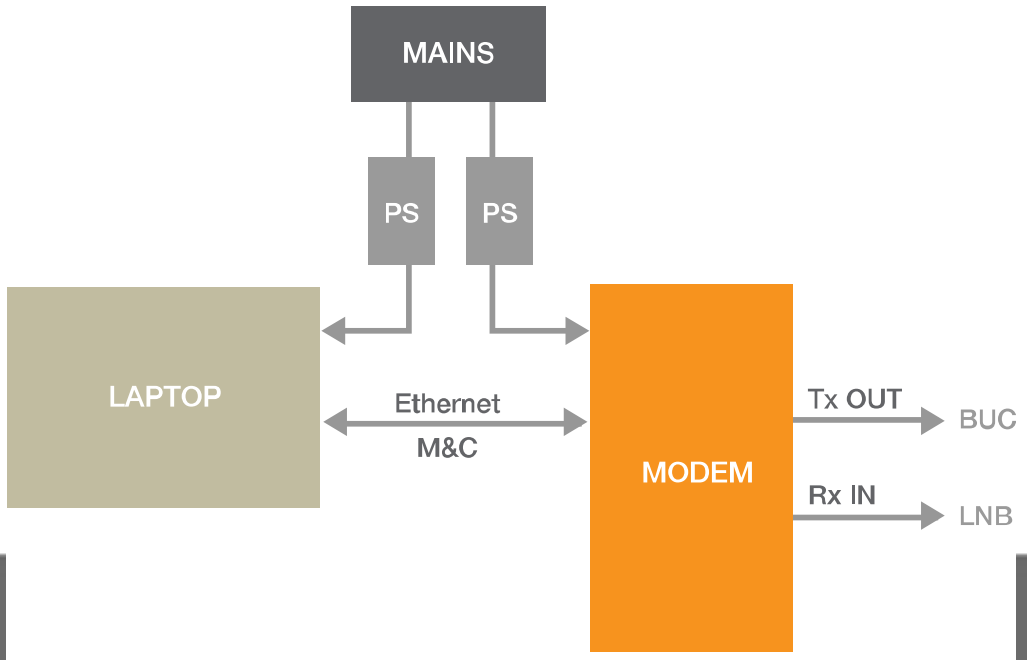


Figure 38: Transmission Configuration

Goodnight Call

The purpose of the Goodnight Call is to inform the Satellite Operator that you have completed your transmission and that you wish to end your transmission.

Note: Use the described buttons at the bottom of the LinkControl screen.

1. When you are finished transmitting, contact the Satellite Operator to confirm the end of your transmission. Then, click the red **Stop Transmitter** button to stop your transmission.

8 Disassembling the ROVER™

Dissassembling the ROVER™

The chapter explains how to disassemble and pack the ROVER™ satellite terminal.

Powering Down the ROVER™

1. Exit the LinkControl application by clicking on the **Exit Application** button located on the bottom right side of the LinkControl screen.

2. Turn off the power laptop.

3. Detach the power supplies from the modem and the laptop.

Disconnect the Cables and Components

1. Disconnect the N-type Rx IF connector of the IFL (green) from the Rx In port on the Baseband/IF unit.

2. Disconnect the DC/Control bayonet connector of the IFL from the DC/Control port on the Baseband/IF unit.

Dissassembling the ROVER™

3. Disconnect the N-type Tx IF connector of the IFL (red) from the Tx port on the user supplied modem.

4. Unhook the IFL strain relief loop.

5. Disconnect the AC Power cable from the baseband

Dissassembling the ROVER™

6. Disconnect the 12-pin circular connector from JQ1 on the IIIC unit.

7. Detach the green coded Rx cable and replace the cap on the N JQ2 connector.

8. Disconnect the BNC connector from the JQ3 port on the IIIC unit

Dissassembling the ROVER™

9. Disconnect the F connector from the LNB

10. Disconnect the N connector (color coded red) from the BUC.

11. Unhook the IFL strain relief.

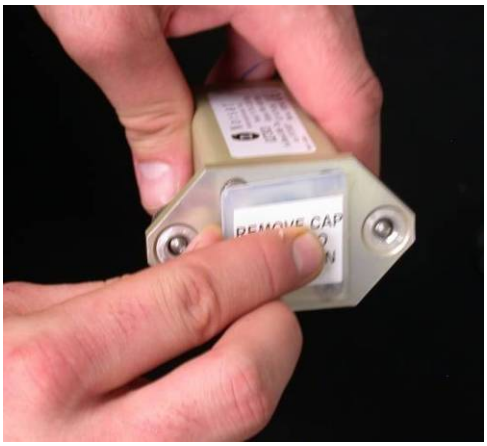
12. Disconnect the GPS from JQ4 on the IIIC unit.

Dissassembling the ROVER™

13. Detach the GPS Unit from antenna segment 4 (top middle).

14. Detach the LNB using the thumb screws.

15. Replace the protective cover on the LNB and store the LNB.



Dissassembling the ROVER™

Disassemble the Boom Arm and Feed Assembly

1. Loosen and remove the threaded collar of the upper boom arm from the lower boom arm.

2. Loosen and remove the lower boom arm segment from the main antenna assembly.

3. Thread the waveguide cap onto the boom arm stub.

Dissassembling the ROVER™

Disassembling the Main Antenna Unit

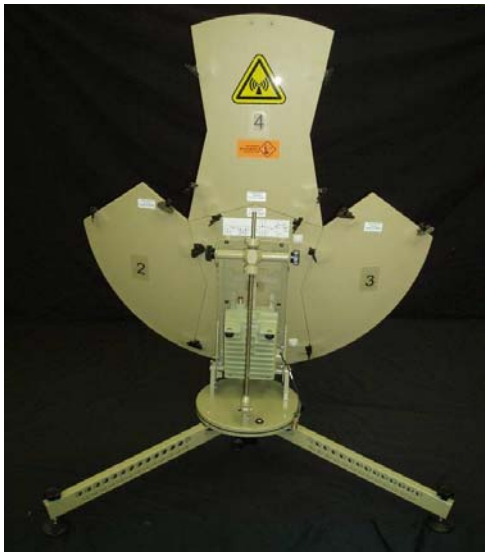
1. Loosen the butterfly screws form each of the five antenna segments.

   Slide each petal into its designated compartment in the reflector petal bag as you remove the petals from the reflector assembly.

Dissassembling the ROVER™

2. Detach Petal 6 (top right segment).

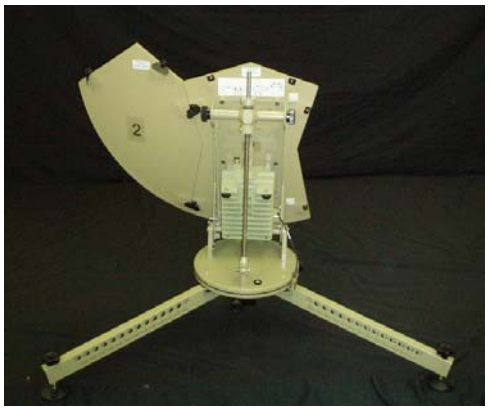
3. Detach Petal 5 (top left segment).



4. Detach Petal 4 (top center segment).

Dissassembling the ROVER™

5. Detach Petal 3 (bottom right segment).



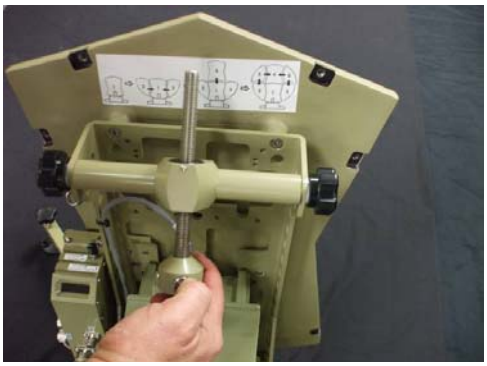
6. Detach Petal 2 (bottom left segment).

7. Unfasten the elevation assembly unit with the thumb screws.

Dissassembling the ROVER™

8. Unfasten the quick adjust collar to remove the elevation assembly rod from the elevation top axis assembly.

9. Replace the quick adjust collar on the elevation rod for storage.

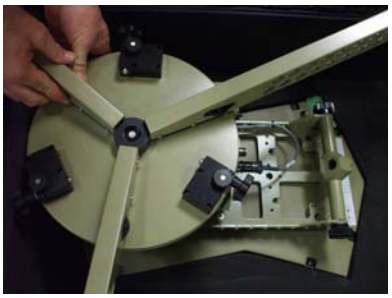


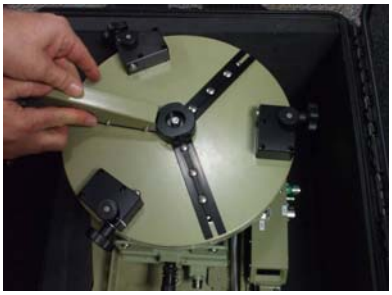
10. Remove the Elevation Lock Pin from the Storage Position and install it in the Lock Position.

Dissassembling the ROVER™

11. Flip the RF backplate and azimuth assembly over and place it in the foam cutout face down in the transit case.

12. Unfasten each tripod leg and slide the leg off of the azimuth plate





Packing the System

1. Coil up the IFL cable and place it in the transit case.

Dissassembling the ROVER™

2. Place the Lower Boom Arm, Upper Boom & Feed, LNBs, & GPS module into the bottom foam tray.

3. Set the second foam tray on top of the first and place the Elevation Rod, Legs, and Grounding Rod into their respective places.

4. Set the Reflector Petal Bag on top of the second foam tray.

9 Alarms and Troubleshooting Tips

Alarms and Troubleshooting Tips

The ROVER™ is a sophisticated communications device. It has been designed to be easy to use even by non-technical users.

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.

Troubleshooting

Symptom	Possible Cause	Corrective Action
Power Up		
Windows reports new Serial Mouse installed.	Windows error.	This is a benign error in Windows. Cancel the “auto-hardware detection” and proceed as normal.
LinkControl Errors		
No reading on spectrum analyzer.	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.
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
	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 turned of by the government.
The compass reading is incorrect	The compass has not been calibrated.	Calibrate the compass. See *Appendix A: Calibrating the Compass.*

Alarms and Troubleshooting Tips

Antenna Alignment		
Carrier list in Spectrum Analyzer, DVB Receiver, or Antenna Peaking controls is empty, even though you know you have carriers entered for this satellite.	Wrong polarization.	Check the other polarization, to make sure the carriers you are expecting to see aren't all on the other pole. Do this by finding the radio buttons that show Tx Horizontal and Tx Vertical, and clicking the one that is not currently selected. This will show the carriers for the other pole.
	Wrong LNB.	Check to make sure you have the correct LNB selected in your current profile. If you have the wrong LNB selected or installed for the satellite you're looking for, you won't be able to see those carriers.
Unable to get DVB lock or locate signals on the Spectrum Analyzer.	Wrong LNB is connected.	Verify the correct LNB is connected for the receive frequency range desired (A, B, or C type).
	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). Ensure that for DVB carriers that the correct symbol rate is also entered.
	Antenna pointing error. (Administration mode)	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.

Alarms and Troubleshooting Tips

Transmission		
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 of at least 500W.
The satellite operator does not see your transmitted CW signal.	Antenna peaking and pointing. (Administration mode).	Verify the antenna is pointed on the correct satellite and that it is 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. Check History on the Status screen and see if an error was recorded.
Transmitter will not power up.	Water in connection.	Check that the SSPA connection is dry.

Alarms and Troubleshooting Tips

The ROVER is a sophisticated satellite system with powerful alarm reporting capabilities. The user will need to log in as an Administrator to access the alarm panel, found under the Status Screen.

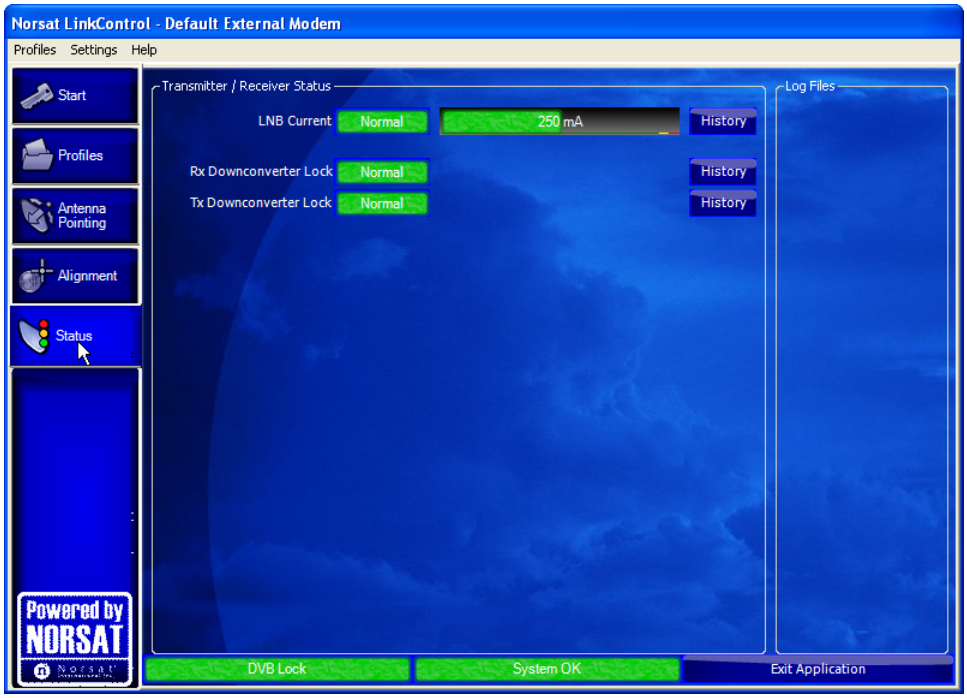


Figure 39. Status Screen

Status Indicators

The **Status Screen** provides details about the health of the ROVER system. To view the **Status Screen**, click **Status**. The **Status Screen** opens.

Status indicators shown on the Status Screen (Figure 39) perform the following functions:

- Indicators update the Tx/Rx in real time.
- Each status indicator provides a history of associated alarm conditions.

Alarms and Troubleshooting Tips

To access the history of an indicator, perform the following steps:

1. Click on the **History** button next to the indicator.
2. Click **Refresh** to update with the most recent events.
3. Click **Close**.

The three types of status indicators are:

- **Information only:** no alarm conditions results from these indicators.
- **Binary alarm:** the condition is either normal or in alarm.
- **Variable range alarms:** these values give normal indications, warnings, or alarm indications.

The following table lists the type and meaning of each status indicator on the **Status Screen**. Click the History button beside each status indicator for a more detailed description.

Table 4. Status Screen Indicators

Status Indicator	Type of Status Indicator	Description
LNB Current	Variable range alarms	DC current the LNB consumes
Tx Downconverter Lock	Binary alarm	The Local Oscillator PLL lock status for the downconverter in the Tx path must be locked to use the Tx spectrum analyzer.
Rx Downconverter Lock	Binary alarm	The Local Oscillator PLL lock status for the downconverter in the Rx path must be locked to use the Rx spectrum analyzer.

Appendix A: Calibrating the Compass

Appendix A: Calibrating the Compass

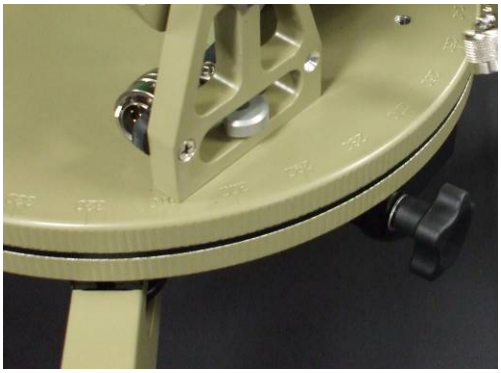
About the Compass Calibration Mode

The Rover Ku-Band™ Terminal incorporates a digital compass to aid with the satellite acquisition process. Although factory calibrated prior to shipping, when deploying the terminal in a new geographic location for the first time it is necessary to recalibrate the compass so that local magnetic field variations can be compensated for. The calibration settings are retained when the IIIC unit is powered down so it is not necessary to recalibrate the terminal every time the compass is used in the same geographic location. To successfully complete the calibration procedure, the compass must be rotated a full 360° in at *least* 10 seconds. It is not necessary to assemble the reflector or boom arm to calibrate the compass.

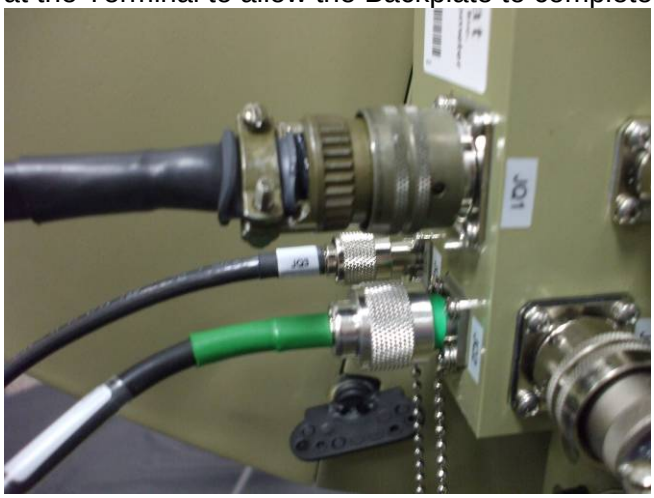
Calibration Procedure

1. Install the Tripod legs and level the azimuth plate as per instructions in *Chapter 4*. Install the Elevation Rod and lock the backplate so that it is vertical.

2. Loosen the three Azimuth Lock Handwheels on the bottom of the azimuth plate.



3. Connect the IFLs *DC/Control* connector to JQ1 of the IIIC unit. No other connections are required to calibrate the compass. Ensure there is enough cable at the Terminal to allow the Backplate to complete 1 full rotation.



4. Set up the Baseband as described in *Chapter 5*.

5. Power on the Baseband.

6. Once the IIIC unit has powered on, switch to the *Compass Calibration* mode. The IIIC will display the following prompt: *Comp Clbr Turn Comp 360*, indicating that the user must rotate the Reflector Back Beam 1 full rotation.

Appendix A: Calibrating the Compass

7. Once the display starts counting down from 10 to 1, slowly and steadily begin rotating the Backplate. The minimum period of rotation is 10 seconds, however there is no limit to the maximum period. Once the counter reaches *0*, the IIIC unit will flash *Exit Clbr Mode When Done*. Ignore this prompt if you have not completed the full rotation before this time; do not exit the calibration mode until one full revolution has been achieved.

8. Once you have completed 1 revolution and returned to the starting position, select any of the other 3 operation modes.

9. Turn off the Baseband power and resume system assembly as per *Chapter 5*.

10. The compass calibration procedure is now complete.

Appendix B: Manual Satellite Acquisition

Appendix B: Manual Satellite Acquisition

Manual Satellite Acquisition

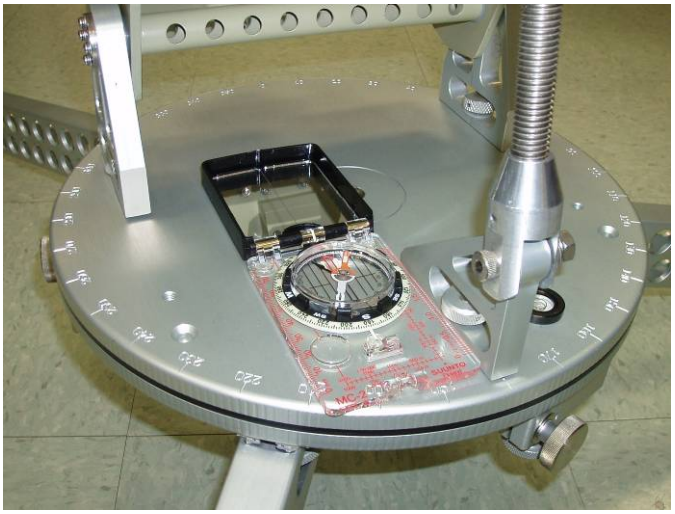
In the event of IIIC unit failure, a satellite may be acquired manually by using the following reference planes:

1 *Compass Alignment*

The azimuth angle of the ROVER™coincides with the orientation of the boom arm. Therefore, any surface parallel to the boom arm may be used to orient the compass. A convenient surface to use as a mounting reference is the elevation support bracket. Align the compass bearing indicator so that it is parallel to an edge of the compass (Suunto MC-2 Global Compass shown).

Position the compass so that the edge parallel to the bearing indicator is flush with the mounting bracket of the elevation rod assembly.

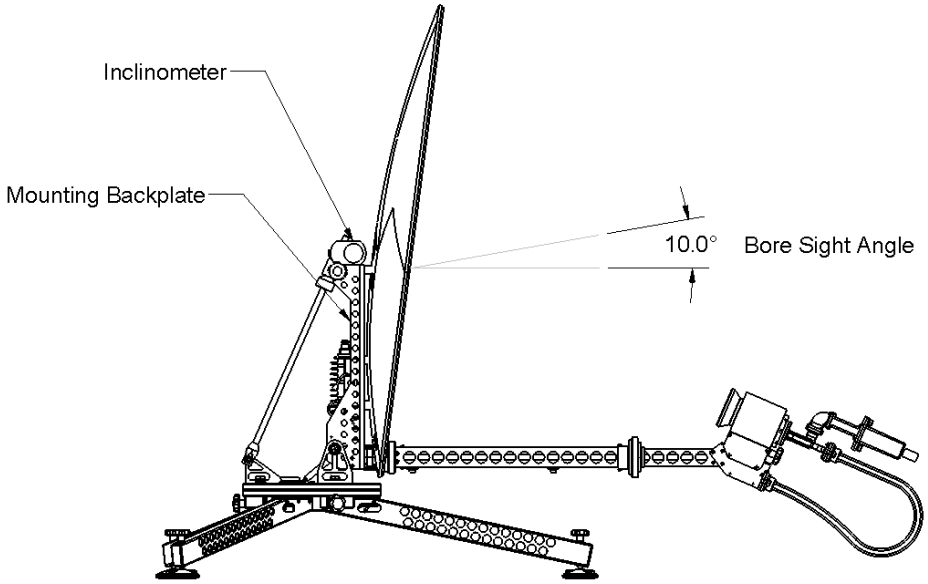
Appendix B: Manual Satellite Acquisition



The compass may now be used to orient the Rover to the correct azimuth angle.

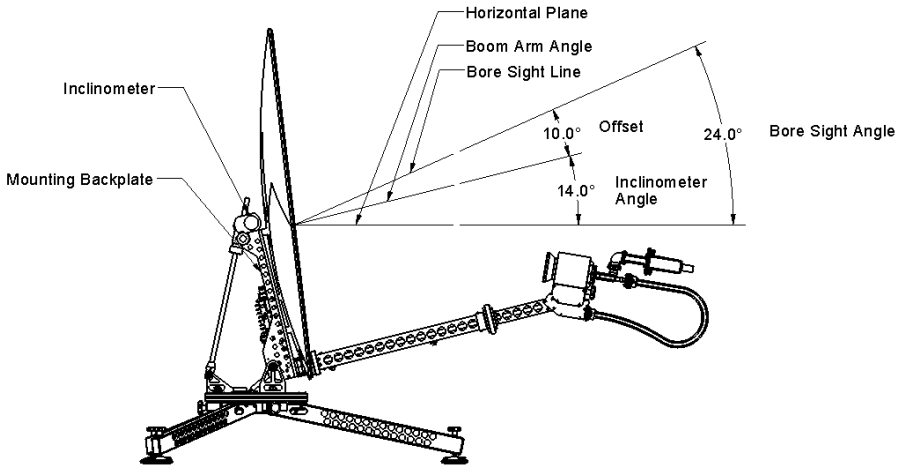
2 *Inclinometer Alignment*

When the Rover is in the orientation with the Boom Arm horizontal, the Bore Sight Angle (actual elevation angle of the dish) is 10°. Therefore, if the inclinometer is aligned with the top edge of the mounting backplate, the true elevation angle is determined by adding 10° to the measured angle.



As an example, in this orientation the Inclinometer will read 14°. The Bore Sight Angle (elevation angle) of the dish is therefore 24°.

Appendix B: Manual Satellite Acquisition



Note: The inclinometer referenced to in this document is a Suunto PM-5/360 Clinometer, as shown below.

Appendix C: Connecting a User Supplied Modem

Appendix C: Connecting a User Supplied Modem

The following signals must be supplied to the BUC by the user supplied modem:

- **Transmit IF (950 - 1700 MHz):** the signal which is to be upconverted, amplified and transmitted to the satellite. This signal may be either a continuous wave (CW) or a modulated signal.
- **10 MHz reference:** provides a reference signal for the Transmitter/ Upconverter.

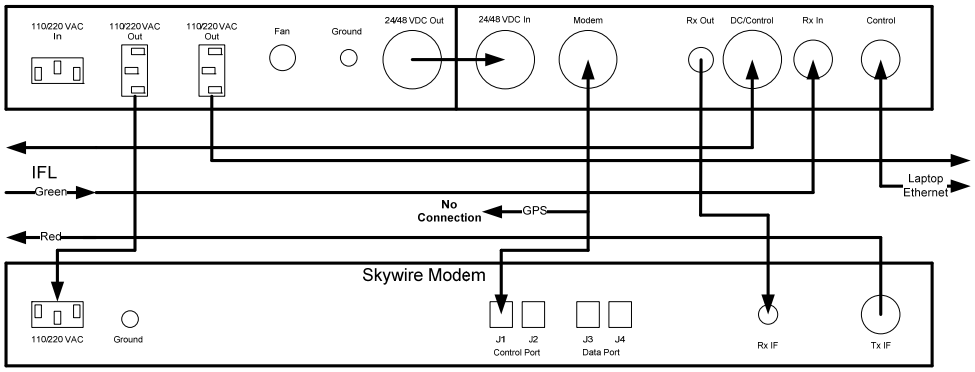


Figure 40: Skywire modem connection to BaseBand

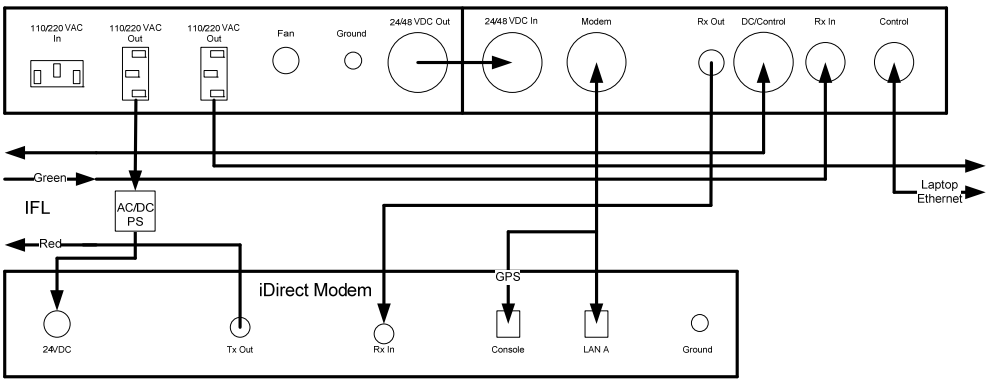


Figure 41: iDirect modem connection to BaseBand

Appendix C: Connecting a User Supplied Modem

1. Connect the N-type cable (blue) to the Tx Monitor connector on the BaseBand and connect the other end of the cable to the modem Tx port.
2. Connect the N-type cable (yellow) to the Rx Out connector on the BaseBand and connect the other end to the modem Rx port.
3. Connect the flying Ethernet lead to the modem's Traffic Ethernet port.
4. Connect the RS232 cable to the Baseband RS232 port and connect the other end of the cable to the modem M&C (Remote Control).

Appendix D: Configuring for Extended Band

Appendix D: Configuring for Extended Band

The 1081XRT Selectable BUC is configurable to operate in Standard Band (14.00 to 14.50 GHz) or Extended Band (13.75 to 14.50 GHz) mode. The factory default setting is Extended Band, unless otherwise requested.

FIGURE 1
Foil on BUC

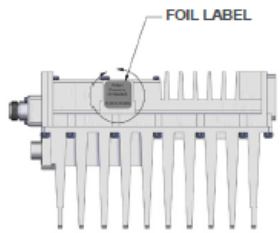


FIGURE 2
Sealing Screw Removal

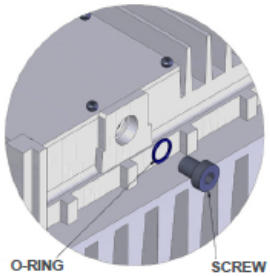
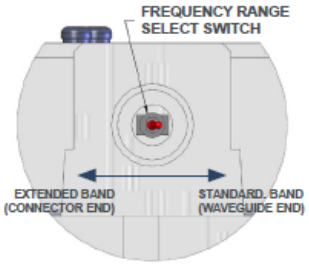


FIGURE 3
Frequency Selection



Important: Disconnect the BUC from the Power Supply and Modem.

1. Orient the BUC as shown in Figure 1 and remove the Square Foil Label indicating the current frequency range.
2. Remove the Sealing Screw (Figure 2) using a 5mm Hex Wrench. Loosen the screw by rotating the wrench counter clock-wise. Set the screw aside.
3. There is a Sealing O-Ring (Figure 2) seated in a groove on the BUC to prevent moisture and contaminants from entering the housing. IMPORTANT: Do not lose or damage the O-Ring. Carefully remove the O-Ring and set it aside with the screw.
4. Using a slender pen, flip the Frequency Select Switch (Figure 3) towards the:
   a. Waveguide Output Flange to set the BUC in Standard Band Mode (14.00 to 14.50 GHz)
   b. Input Signal Connector (N-Connector) to set the BUC in Extended Band Mode (13.75 to 14.50 GHz)
5. Slide the O-Ring onto the screw and start threading the screw into the BUC housing BY HAND to ensure the screw doesn't cross-thread. Ensure the O-Ring is NOT pinched between the housing and screw. Tighten the bolt to 2.5 Nm (22 lbs-in). **Important**: Do not overtighten the screw.
6. Apply a new foil label indicating the current frequency range over the sealing screw recess.