

JUPITER

Antenna Pointing Guide

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Contents

| Understanding safety alert messages | 5 |
|--|----|
| Messages concerning personal injury | 5 |
| Messages concerning property damage | 5 |
| Safety symbols | 6 |
| Additional symbols | 6 |
| Chapter 1 | |
| Introduction | 7 |
| Scope and audience | 7 |
| Related instructions | 7 |
| Antenna pointing overview | 7 |
| Pointing tools and user interfaces | 8 |
| Entering installation parameters with a smart device | 10 |
| Entering installation parameters with a wired laptop | 11 |
| Chapter 2 | |
| Pointing the antenna by using the DAPT2 | 13 |
| Prerequisites | 13 |
| Entering installation parameters | 13 |
| Pointing | 17 |
| Registration | 19 |
| Troubleshooting | 22 |
| Chapter 3 | |
| Pointing the antenna by using the DAPT3 | 25 |
| Prerequisites | 25 |
| Entering installation parameters | 25 |
| Pointing | 29 |
| Registration | |
| Troubleshooting | 36 |
| Chapter 4 | |
| Pointing the antenna by using a wireless device | 39 |
| Prerequisites | |
| Setting up the Wi-Fi device | |
| Point and activate terminal with wireless device | 40 |
| Acronyms | 45 |
| · · · | |
| Index | 46 |

Understanding safety alert messages

Safety alert messages call attention to potential safety hazards and tell you how to avoid them. These messages are identified by the signal words DANGER, WARNING, CAUTION, or NOTICE, as illustrated below. To avoid possible property damage, personal injury, or in some cases possible death, read and comply with all safety alert messages.

Messages concerning personal injury

The signal words DANGER, WARNING, and CAUTION indicate hazards that could result in personal injury or in some cases death, as explained below. Each of these signal words indicates the severity of the potential hazard.



DANGER indicates a potentially hazardous situation which, if not avoided, *will* result in death or serious injury.



WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

Messages concerning property damage

A NOTICE concerns property damage only.

NOTICE

NOTICE is used for advisory messages concerning possible property damage, product damage or malfunction, data loss, or other unwanted results—but *not* personal injury.

Safety symbols

The generic safety alert symbol



calls attention to a potential personal injury hazard. It appears next to the DANGER, WARNING, and CAUTION signal words as part of the signal word label. Other symbols may appear next to DANGER, WARNING, or CAUTION to indicate a specific type of hazard (for example, fire or electric shock). If other hazard symbols are used in this document they are identified in this section.

Additional symbols

This document uses the following hazard symbols:



Indicates a safety message that concerns a potential electric shock hazard.



Indicates a safety message that concerns a potentially hazardous situation in which you could fall.



Indicates a safety message that concerns a possible fire hazard.



Indicates a safety message that concerns radio frequency (RF) energy.

Chapter 1 Introduction

Scope and audience

This document explains how to point JUPITER system antennas. This document is written for professional installers who have experience with installing and pointing satellite antennas.

Related instructions

This pointing guide discusses antenna pointing only. For antenna installation and mechanical adjustments on the antenna, see the specific installation guide for the antenna you are installing. A Ka-band radio assembly must be installed with the antenna before pointing.

Antenna pointing overview

The antenna pointing procedure is a critical part of the JUPITER antenna installation process. If the satellite antenna is not properly pointed toward the satellite, it cannot communicate with the satellite to its full capacity, resulting in degraded system performance.

The basic requirement when pointing a JUPITER antenna is to accurately aim the antenna at the satellite to within 0.2 dB maximum loss of reception and 0.45 dB maximum loss of transmission. The JUPITER system uses a narrow Ka-band beam which can be sensitive to pointing errors; therefore, it is critical that the antenna is pointed properly and accurately.

NOTICE

To accurately point the antenna, follow the procedures in this manual exactly as they are written.

The antenna pointing process is divided into three tasks:

- Entering installation parameters
- Pointing
- Registration

Under normal conditions and circumstances, a professional installer can perform this process alone.

Pointing tools and user interfaces

Antenna pointing requires the use of several tools, as described below.

Onsite Accelerated Service Installation System (OASIS)

The OASIS app for smart devices (e.g., tablets and smart phones) facilitates the pointing process by walking installers through the onsite installation. OASIS provides a user-friendly, step-by-step process for the installer to follow from site arrival to site departure.

You may use a smart device loaded with the OASIS app, in combination with a wireless router connected to the satellite modem, to point the antenna. This is discussed in the **OASIS User Guide** (1040630-0001)

A smart device with OASIS effectively replaces the laptop, GPS, and DAPT requirements explained in the following subsections. **Hughes recommends you use OASIS to guide you through the install.**

Global positioning system (GPS) receiver

Note: If you have a GPS-enabled smart device with the OASIS app, you do not need a separate GPS unit. The app will automatically acquire your coordinates. If it cannot acquire them, you will need to manually input them. Make sure the GPS on your smart device meets the requirements explained in this subsection. See Entering installation parameters with a smart device on page 10 for more information.

Use a GPS receiver (not supplied) to determine the exact latitude and longitude coordinates of the antenna site. These coordinates are used to determine the correct azimuth and elevation information for the antenna to point at the satellite. Your GPS receiver must be accurate to within 15 m. Most commercially available receivers meet this requirement. Units employing Wide-Area Augmentation System (WAAS) technology provide accuracy to 3 m.

The GPS must display latitude and longitude information in the format

- DD MM.mmm
- where DD = degrees, MM = minutes, and mmm = fractional minutes

The unit must display fractional minutes to three significant digits.

Local user interface (LUI)

The LUI is the satellite modem interface. It is used to enter installation parameters required for pointing the antenna. The LUI also displays the beacon signal strength for monitoring purposes.

Note: The OASIS app comes with its own unique UI that you use enter installation parameters and point the antenna. See the **OASIS User Guide** (1040630-0001).

If you do not have a smart device with OASIS, you must connect your laptop to the satellite modem and use a standard Internet browser (Internet Explorer version 8 or higher, Mozilla Firefox 3.6 or higher, or Google Chrome version 17 or higher) to navigate to the LUI. See Entering installation parameters with a wired laptop on page 11 for more information.

Laptop connected to wireless router

If there is a wireless router present, the installer can use a laptop connected to the router to perform the antenna pointing process. This is discussed in further detail in Chapter 5 – *Pointing the antenna by using a wireless device*.

DiSEqC Antenna Pointing Tool (DAPT2 or DAPT3)

Note: The Pointing workflow in OASIS effectively replaces the DAPT units. If you are using OASIS, you do not need to use a DAPT. See the **OASIS User Guide** (1040630-0001).

The DAPT2 and DAPT3 are known as two-way digital satellite equipment control (DiSEqC) tools. They both have a large backlit display and three buttons that enable the installer to step through the antenna pointing procedure. The DAPT2 is orange in color and has a built-in audio feature to enhance the pointing process. Figure 1 shows the DAPT2. The DAPT2 is used to point the HT1200.



Figure 1: DAPT2 antenna pointing tool

The DAPT3 is yellow and is seen in Figure 2 on page 10. The DAPT3 is used to point the HT1200 or the HT1300. The DAPT3 must be used for the HT1300.



Figure 2: DAPT3 antenna pointing tool

The three buttons on the DAPT2 and DAPT3 can serve different purposes during different phases of the pointing process. In most cases, however, they function as follows:

- Back (button 1) Used to return to a previous state
- Toggle (button 2) Used to change audio level and contrast
- Advance (button 3) Used to begin a process, proceed to the next state, or respond Yes to a prompt on the DAPT2 or DAPT3 display

Entering installation parameters with a smart device

After completing physical installation of the satellite modem, connect your smart device to the satellite modem via a wireless router by using the OASIS app. The latitude and longitude of the antenna site, and the satellite name, will populate automatically as you proceed through OASIS' step-by-step installation process.

When you reach the Pointing workflow in the app, you will submit the aforementioned parameters and put the satellite modem into pointing mode. See the **OASIS User Guide** (1040630-0001).

NOTICE

Azimuth measurements are calibrated relative to true north, not magnetic north.

Pointing

After acquiring the installation parameters with OASIS, you can begin the process of pointing the antenna at the satellite. Using the proper azimuth, elevation, and tilt coordinates obtained from OASIS, you will point the antenna in the general direction of the satellite to obtain initial acquisition of the satellite signal. See the **OASIS User Guide** (1040630-0001)

NOTICE

Do *not* attempt to point the antenna manually by pulling on the feed support arm. This can cause permanent damage to the antenna. Instead, use the antenna mechanical adjustments.

You may *gently* maneuver the antenna reflector to coarsely point the antenna, but only if the Az/El canister bolts are loose enough so that the reflector rotates easily.

When the demodulator locks onto the satellite beacon signal, the signal quality factor (SQF) of the received signal-to-noise ratio (SNR) pointing signal appears in OASIS as a numerical value from 15 to 255. This value is then used to find the peak signal level. OASIS also displays the target SQF and the maximum SQF attained.

Once the signal level is peaked, you lock the antenna in position.

Registration

After the antenna has been pointed and peaked, you complete the installation process by using the Registration workflow in OASIS to validate and record the pointing measurements. See the **OASIS User Guide** (1040630-0001)

Entering installation parameters with a wired laptop

After completing physical installation of the satellite modem, connect a laptop to the satellite modem and access the LUI using an Internet browser. Enter the satellite and antenna installation parameters. These parameters include:

- Latitude and longitude of the antenna site
- Satellite name

After you submit these parameters, the satellite modem enters pointing mode. In this mode, the LUI displays the calculated azimuth, elevation, tilt angle, and antenna polarization information required for coarse pointing the antenna.

NOTICE

Azimuth measurements are calibrated relative to true north, not magnetic north.

Pointing

After entering the installation parameters, you can begin the process of pointing the antenna at the satellite. Using the proper azimuth, elevation, and tilt coordinates obtained from the LUI, you will point the antenna in the general direction of the satellite to obtain initial acquisition of the satellite signal.



Do *not* attempt to point the antenna manually by pulling on the feed support arm. This can cause permanent damage to the antenna. Instead, use the antenna mechanical adjustments.

You may *gently* maneuver the antenna reflector to coarsely point the antenna, but only if the Az/El canister bolts are loose enough so that the reflector rotates easily.

When the demodulator locks onto the satellite beacon signal, the SQF of the received SNR pointing signal appears on the DAPT2 display as a numerical value from 31 to 255, indicating you are locked onto the correct satellite. This value is then used to find the peak signal level.

After locating the satellite, you use the fine Az/El adjustment mechanism to fine-point the antenna using the DAPT2 or DAPT3. Once the signal level is peaked, you lock the antenna in position.

Registration

After the antenna has been pointed and peaked, you complete the installation process by using the DAPT2 or DAPT3 to validate and record the pointing measurements.

Chapter 2 Pointing the antenna by using the DAPT2

This chapter explains the antenna pointing process using the LUI and the DAPT2.

Prerequisites

Before pointing the antenna, you must:

- 1. Assemble and install the antenna at the selected location following the procedures in the installation guide for the specific antenna model.
- 2. Run the intra-facility link (IFL) cable between the SAT connector on the satellite modem and the IFL connector on the antenna radio

Note: HT1200 antennas use only one IFL cable.

Entering installation parameters

This section explains how to obtain the proper azimuth and elevation coordinates at the customer location to point to the satellite using the LUI.

- 1. Use your GPS receiver to determine the latitude and longitude of the installation site and record them.
 - **Note:** Hughes IDU software does not use negative values to denote south or west. You must specify the hemisphere of the coordinates.

| Latitude: | _Degrees | _Minutes | _Fractional minutes (N/S) |
|------------|----------|----------|---------------------------|
| Longitude: | Degrees | Minutes | Fractional minutes (E/W) |

- 2. Using an Ethernet cable, connect your laptop to the satellite modem LAN port as shown in Figure 3 on page 14.
 - **Note:** The laptop must be connected directly to the satellite modem (with no router between them).



Figure 3: Connecting the installer laptop to the satellite modem (HT1200)

- 3. On your laptop, open an Internet browser. Supported browsers are listed in Local user interface (LUI) on page 8.
- 4. Type 192.168.0.1 in the browser address bar and press Enter.
- 5. At the LUI System Control Center home page, click the small icon near the upper right of the screen, as shown in Figure 4 (grayed out letter "i").

| luchoo Not | SAN: | ESN:10000276 | Diagno | ostic Code:Not Available |
|--------------------|--|-------------------------------------|----------------|--------------------------|
| augnesivel. | HT1200 System C | ontrol Contor | | |
| | Your built-in diagnostic system for settings. | or viewing performance sta | itistics, gett | ing help and configuring |
| Home | HELP | Dat | a Allowa | nce Status |
| Connectivity Test | | | AnyTi | me |
| | Welcome to HughesNet | Data Allowance | ок | |
| Built-In Self Test | Additional Premium Services | Data Allowance Remaining | 34.5 GB | Bonus |
| Help | | AnyTime Data Allowance | 34.5 GB | 34.5 AnyTime Bonds GB |
| | | AnyTime Data Allowance Remaining | 34.5 GB | |
| | | Bonus Bytes | Unlimited | 17.2 |
| | | Bonus Bytes Remaining | Unlimited | GB |
| | | Token Bytes Available | 0 MB | 34.5 GB |
| | | Allowance Resets in 7 | days, 6 hr | Remain |

Figure 4: Icon to Advanced Pages from System Control Center

The Advanced Configuration and Statistics screen appears, as shown in Figure 5.

| HUGHES. Ar EchoBtar Company | HT1200 Advanced ESN:10756036 SW Version :5.0.0.40 (M) 08/3 | Configuration a Diagr 31/2015 14:08:59 | And Statistics C SAI:0(0x0) nostic Code:Not Available | |
|--|---|---|--|---|
| Auto Refresh 🚺 🔻 | System State Code | UpTime 0.00 | e (d.h:m:s) :03:21 | Available Memory 71092 KB |
| + General + Web Acceleration | LAN (eth0) | | Sb | cStatus |
| Diagnostics Logs Installation Enterprise options | Interface State Rx. Packets Rx. Bytes Tx. Packets Tx. Bytes | Up 1G FD 2648 329102 3293 1978822 | Installation Status First Registration Most Recent Registration SBC State Code | Initial 2015-08-31 13:40:24 2015-08-31 13:40:24 22.1.1 |
| | Satellite (sat) Rx Packets Rx Bytes Tx Packets Tx Bytes | 0 0 0 | Association State IPGW ID Association Time CMM Timeouts Keep Alive Timeouts Association State Code FAP State Code ROHC Profiles | CREATING_IPGW_POOL N/A 0 21.1.1 24.1.2 NONE |
| | @2015 HU | OHES | | |

Figure 5: Advanced Configuration and Statistics Installation screen

- 6. From the Advanced Menu (in the left panel), select Installation > Install.
- 7. The HT1200 Terminal Installation screen shown in Figure 6 opens.
- 8. Enter the site latitude and longitude (obtained from your GPS).

| 1. Input Params | 2. Pointing | 3. Registration |
|-------------------------|-------------|---------------------------|
| RE-INSTALL | | |
| Latitude (DD MM.MMM): | | 39 ° 10.420000 North 💌 |
| Longitude (DDD MM.MMM): | | 77 14.510000 West 💌 |
| Satellite : | | AMC-15-MIS Beam Override |
| Advanced : | | AMC-15-MIS |
| | Submit | |

Figure 6: Input parameters

- 9. Select *EchoStar-XVII* from the drop-down menu, as shown in Figure 6.
- 10. Click **Submit**. The satellite modem saves the information and enters pointing mode.
- 11. The Pointing Info screen appears on the installer laptop, as shown in Figure 7 on page 16.
- **Note:** If you modify any existing parameters, the modem reboots, and the Terminal Pointing Info screen will appear following the reboot. To return to the Input Parameters screen at any time, click **Re-Install**.

| 1. Input Params | | 2. Pointing | | 3. Registrat | ion | |
|---|----------------------------------|------------------------------|------|--------------|-------------|------|
| RE-INSTALL NEXT >> Hide SQF Gra | ph | | | | | |
| SBC State: 22.2.2 (Pointing In Progress - | Outroute locked) | | | | | |
| Azimuth Elevation | 230.421 ° 36.305 ° | Max S | QF | | Current SQF | |
| Antenna Tilt Uplink Pol Beam Selected | 29.752 ° Left-Hand (LH) 42 | 10 | 5 | | 97 | |
| Outroute ID | 1 | | | | | |
| | Outroute | SQF over the last one minute | | | | |
| 180 | | | | | | 1 |
| 144- | | | | | | |
| 126- | | | | | | |
| 90- | | | | | ~ | |
| 72- | | | | | | |
| 54- | | | | | | |
| 18- | | | | | | |
| 0s -6s -12s | -18s -24s | -30s -36s | -42s | -48s | -54s | -60s |
| 1 | | © 2012 HUGHES | | | | |

Figure 7: Pointing Info Screen

- 12. Make a note of the following values shown on this screen. You will need this information to point the antenna and complete the installation.
 - Azimuth
 - Elevation
 - Antenna tilt (0.74 m antennas only)
 - ODU polarization setting (LHCP, RHCP, HLP, VLP)
 - **Note:** This is the true polarization setting. Ensure that the polarizer on the radio matches this setting.

Pointing

This section describes each phase of the pointing process and the messages that appear on the DAPT2 or DAPT3 display screens during the procedure. At the radio, install the DAPT2 in line on the IFL cable as shown in Figure 8.

1. Connect the cables to the DAPT2 in accordance with the connector labels on the DAPT2 rear panel (not shown).



Figure 8: Installing the DAPT2

When connected properly, the DAPT2 powers up automatically and the IFL voltage on the LCD display, as shown below.

Note: The voltage reading shown below is only an example. Actual voltage may vary but should be greater than 40 VDC. If the voltage is too low, the IDU LUI will display a state code of 2.1.2.



When you press the **Advance** (3) button, the DAPT2 briefly displays the current software version, as shown below.

Note: You may see a different release number.



After a few seconds, the following message appears briefly while the measured IFL voltage is transferred to the satellite modem:



After a few seconds, the following message appears on the DAPT2 screen.



2. Press the Advance (3) button.

When the satellite modem receives the voltage response message, it advances to the *pointing* state, during which the antenna can be coarse and fine-pointed.

Upon entering the pointing state, the DAPT2 display reads:



The highest recorded SQF value is on the left and the current SQF reading is on the right.

NOTICE

A SQF value of 31 or greater indicates acquisition of the correct satellite beacon.

 Wait for the SQF reading to settle on a value then use the appropriately sized wrench for the specific antenna to adjust the antenna azimuth and elevation. See the guide specific to the antenna you are installing for in-depth instructions about making these adjustments.

Continue until you achieve the highest possible SQF value.

Note: The tone from the DAPT2 will be louder and the cadence will quicken as the beacon is acquired.

NOTICE

Do *not* attempt to point the antenna manually by pulling on the feed support arm. This can cause permanent damage to the antenna. Instead, use the antenna mechanical adjustments.

You may *gently* maneuver the antenna reflector to coarsely point the antenna, but only if the Az/El canister bolts are loose enough so that the reflector rotates easily.

- 4. When the signals are peaked, tighten the azimuth and elevation bolts completely.
 - **Note:** Because slight movement of the antenna occurs during lockdown, always measure the signal peak value after locking down the antenna.

Registration

1. Press **Advance** (3) for Yes or **Toggle** (2) to return to pointing validation mode. If you press **Advance** (3), the DAPT2 prompts you for confirmation that you want to save the results, with the message:



- Note: Do not disconnect the DAPT2 until the IFL voltage disappears. Disconnecting the DAPT2 prematurely could cause a loss of all stored data, invalidating the entire pointing process. It could also cause the satellite modem to crash.
- 2. Press **Advance** (3) to save the pointing validation results, or **Back** (1) to return to the previous state.



If you press Toggle (2), the DAPT2 display reads:



This indicates that you have completed the pointing process successfully. The DAPT2 displays this message for approximately 10 seconds and then displays the IFL voltage to indicate that the pointing process has finished.

- **Note:** Do not disconnect the DAPT2 until the IFL voltage disappears. Disconnecting the DAPT2 prematurely could cause a loss of all stored data, invalidating the entire process.
- 3. When the IFL voltage appears, disconnect the DAPT2 and reconnect the IFL cable directly to the radio.
- 4. Weatherproof all outdoor cable connections with dielectric grease. Depending on your installation environment, weatherproofing tape may also be needed, as shown in Figure 10 on page 21.

Note: If you use any cable ties, they must be resistant to ultraviolet rays.

NOTICE

Hughes connectors, in conjunction with the dielectric grease on the F-connector threads, provide weatherproofing for outdoor connections. These connectors should be used in new installations, upgrades, and any repairs.

Outdoor connectors on radios and ground blocks that are in areas with corrosive environments (e.g. salt air) may need additional weatherproofing, such as weatherproofing tape or a weather boot filled with dielectric grease.



Figure 9: Hughes-approved IFL cable connector



Figure 10: Hughes-approved IFL cable connector with additional weatherproofing This completes the pointing process.

Troubleshooting

The procedures in this chapter outlined the basic pointing process. Should the DAPT2 display an error message, or if you receive unexpected results, use the information in Table 1 to help you diagnose and resolve the problem. If following the outlined procedures does not resolve the problem, contact Installer Support.

| Symptom | Indication | Correction action |
|--|--|--|
| Blank screen during the pointing procedure after COMM Startup message | Satellite modem may still be reading the ODU file. | Wait for 90 seconds for screen message to reappear. |
| Permanent COMM Startup message | Satellite modem is not in pointing mode. Advance button was been pressed before submitting the installation parameters. | At the LUI, verify that the satellite modem is in pointing mode (refer to Figure 7 on page 16). If the satellite modem is not in pointing mode, repeat the process explained in Entering installation parameters on page 13. If the DAPT2 does not display the SQF reading (SQF<>sqf) after a few seconds, press Advance. |
| Permanent Logging VoltMeas message | Cables on the DAPT2 are not connected properly. | Reconnect the cables to the DAPT2 in accordance with the connector labels on the DAPT2 rear panel. |
| Permanent Switch IFL Cable message | The satellite modem cable is connected to the LNB side of the DAPT2 | Reconnect the cables to the DAPT2 in accordance with the connector labels on the DAPT2 rear panel. |
| SQF does not go higher than 31 | Circular polarization setting is incorrect. | Set the polarization to LHCP or RHCP, as indicated on the Terminal Pointing Info screen (Setting for ODU Polarization). |
| | Installation parameters incorrect. | Go to Modify Installation Parameters under Advanced Configuration and Statistics and use the Installation Reference Sheet to make the appropriate corrections. |
| | No RX cable connected between DAPT2 and LNB, or bad cable used. | Connect/replace the RX cable between DAPT2 and LNB. |

Table 1: DAPT2 display messages

| Symptom | Indication | Correction action |
|-----------------------|---|---|
| Low SQF indication | Incorrect installation parameters entered. | If incorrect parameters were entered, the modem could be installed in the wrong downlink cell. Go to Modify Installation Parameters under <i>Advanced Configuration</i> <i>and Statistics</i> and use the Installation Reference Sheet to make the appropriate corrections. |
| | SQF is between 0–29: Antenna not correctly pointed. | Repoint the antenna to achieve the highest SQF value. |
| | SQF stuck at 30: Wrong carrier | Choose the correct carrier on the IDU LUI. |

Chapter 3 Pointing the antenna by using the DAPT3

This chapter explains the antenna pointing process using the LUI and the DAPT3. DAPT3 has an additional feature of measuring power on the IFL line which allows the modem to perform cable calibration for dual IFL linear HT1300 terminals.

Prerequisites

Before pointing the antenna, you must perform the following steps:

- 1. Assemble and install the antenna at the selected location following the procedures in the installation guide for the specific antenna model.
- 2. Run the intra-facility link (IFL) cable between the SAT connector on the satellite modem and the IFL connector on the antenna radio.

Entering installation parameters

This section explains how to obtain the proper azimuth and elevation coordinates at the customer location to point to the satellite using the LUI.

- 1. Use your GPS receiver to determine the latitude and longitude of the installation site and record them.
 - **Note:** Hughes IDU software does not use negative values to denote south or west. You must specify the hemisphere of the coordinates.

| Latitude: | Degrees | Minutes | Fractional minutes (N/S) |
|------------|---------|---------|--------------------------|
| Longitude: | Degrees | Minutes | Fractional minutes (E/W) |

2. Using an Ethernet cable, connect your laptop to the satellite modem LAN port, as shown in Figure 3 on page 14.



Figure 11: Connecting the installer laptop to the satellite modem (HT1300)

- 3. On your laptop, open a web browser. Supported browsers are listed in Local user interface (LUI) on page 8.
- 4. Type 192.168.0.1 in the browser address bar and press Enter.
- 5. At the LUI System Control Center home page, click the small icon near the upper right of the screen, as shown in Figure 12 (grayed out letter "i").

| <u>s</u> | r <u>stem Status</u> | System Information | | |
|----------------|----------------------|-----------------------|----------------|---------------------|
| SAN:SiVsatSAN3 | ESN:2107403 | Diagnostic Code:0000- | 0000-0000-0000 | Advanced pages icon |
| | | | | |

Figure 12: Icon to Advanced Pages from System Control Center

The Advanced Configuration and Statistics screen appears, as shown in Figure 13.

| HUGHES. Ar Echolitar Company | HT1300 Advanced : ESN:10756036 SW Version :5.0.0.40 (M) 08/3 | Configuration a Diagn 1/2015 14:08:59 | and Statistics C SAI:0(0x0) nostic Code:Not Available | |
|---|---|---|---|----------------------------------|
| Auto Refresh 🚺 🔻 | System State Code | UpTime 0.00 | e (d.htmts) :03:21 | Available Memory 71092 KB |
| Advanced Menu + General | | | | |
| Vveb Acceleration Disgregation | LAN (ethO) | | 56 | ocstatus |
| - Diagnostics | Interface State | Up 1 G FD | Installation Status | Initial |
| Logs Installation | Rx Packets | 2648 | First Registration | 2015-08-31 13:40:24 |
| Enternrise ontions | Rx Bytes | 329102 | Most Recent Registration | 2015-08-31 13:40:24 |
| Enterprise options | Tx Packets | 3293 | SBC State Code | 22.1.1 |
| | Tx Bytes | 1978822 | ٨٥ | ociation |
| | Satellite (sat) | | Accoriation State | |
| | Px Packets | | Association state | CREATING_IFGW_FOOL |
| | RX Packets RX Rites | 0 | Association Time | N/A |
| | Tx Packate | 0 | CMM Timeouts | 0 |
| | TX Putes | 0 | Keep Alive Timeouts | ° 0 |
| | TX Bytes | 0 | Association State Code | 21.1.1 |
| | | | EAR State Code | 2412 |
| | | | ROHC Profiles | NONE |
| | @2015 HI IG | HES | ROHC Profiles | |

Figure 13: Advanced Configuration and Statistics Installation screen

- 6. From the Advanced Menu (in the left panel), select Installation > Install.
- 7. The HT1300 Input Params screen opens (shown in Figure 14).

| 1. Input Params | 2. Pointing | 3. Registration | | | | | |
|--|---|--|--|--|--|--|--|
| RE-INSTALL | | | | | | | |
| SBC State: 22.1.1 (Waiting for installation parameters or terminal swap information) | | | | | | | |
| Current Tuning Status | Locked Satelite / Beam ID / Outroute Number | Galaxy-17 / 13 / 0 | | | | | |
| Latitude (DD MM.MMM): | | 39 10.000000 North • | | | | | |
| Longitude (DDD MM.MMM): | | 77 14.000000 West • | | | | | |
| Satellite : | | Galaxy-17 Beam Override | | | | | |
| Advanced : | | User Beam: 🔹 | | | | | |
| BUC/LNB: | | Model : odu_ACTOX6_LNB_UNI • | | | | | |
| ODU Reference Voltage [24V DC]: | | TX IFL Voltage | | | | | |
| Cable Calibration: | | Calibrate Cable Loss | | | | | |
| Calibration Type : | | Calibration Type Automatic Manual: 5.8 dB | | | | | |
| Initial Ranging Attenuation Adjustment: | | Optional- | | | | | |
| | Submit | | | | | | |

Figure 14: Input Params screen

- 8. Enter the site latitude and longitude GPS values.
- 9. Select the appropriate satellite from the drop-down menu.
- 10. Select the appropriate model for the BUC/LNB.
- 11. Check the *Enable TX Voltage* checkbox if you will use the DAPT3 during the install. If you put the IDU into pointing mode without checking this box, the DAPT3 will not power on and you will not be able to successfully complete the modem registration process.
- 12. For installations where the BUC uses an external power supply, you still need to initially check this box in order to use the DAPT3. But in this case, once you have completed the cable calibration and acquired the pointing parameters (as described in the next section, Pointing on page 29), you will need to return to the modem and reinstall with the TX voltage disabled (leaving the *Enable TX Voltage checkbox* unchecked). For the Calibration Type, select *Automatic* or *Manual*.
- 13. If you chose *Automatic*, continue to step 17. If you chose *Manual*, proceed to step 14.
- 14. Type the cable loss (measured in dBs) in the field next to the Manual radio button. The value cannot be higher than 18.
- 15. Click **Submit**. The satellite modem saves the information and enters into the pointing mode.
- 16. The Pointing Info screen appears on the installer laptop, as shown in Figure 7 on page 16.
 - **Note:** If you modify any existing parameters, the modem reboots, and the Terminal Pointing screen will appear following the reboot. To return to the Input Parameters screen at any time, click **Re-Install**.

| 1. Input Params | 2. Pointing | | 3. Registration | | |
|--|--|------------|-----------------|--|--|
| RE-INSTALL NEXT >> Hide SQF Graph | | | | | |
| SBC State: 22.2.2 (Pointing In Progress - Outroute I | ocked) | | | | |
| Satellite Name Azimuth Elevation | EchoStar-XVII 215.194 ° 42.831 ° | Max SQF | Current SQF | | |
| Antenna Tilt Uplink Pol Beam Selected Outroute ID | 25.412 ° Right-Hand (RH) 39 1 | 133 | 133 | | |
| | Outroute SQF over the last | one minute | | | |
| 144 | | | | | |
| 126- | | | | | |
| 72 | | | | | |
| 54 | | | | | |

Figure 15: Pointing Info screen

- 17. Make a note of the following values shown on this screen. You will need this information to point the antenna and complete the installation.
 - Azimuth
 - Elevation
 - Antenna tilt (0.74 m antennas only)
 - ODU polarization setting (LHCP, RHCP, HLP, VLP)
 - **Note:** This is the true polarization setting. Ensure that the polarizer on the radio matches this setting.

Pointing

This section describes each phase of the pointing process and the messages that appear on the DAPT3 display screen during the procedure.

1. You must connect the transmit IFL cable to the IDU side of the DAPT3. The LNB side should remain open.



Figure 16: Installing the DAPT3

- 2. When connected properly, the DAPT3 powers up automatically and the IFL voltage on the LCD display, as shown below.
 - **Note:** The voltage reading shown below is only an example. Actual voltage may vary but should be greater than 22 VDC. If the voltage is too low, the IDU LUI will display a state code of 2.1.2



3. When you press the **Advance** (3) button, the DAPT3 briefly displays the current software version, as shown below.

Note: You may see a different release number.



4. After a few seconds, the checking hardware message appears briefly while the hardware connection is checked.



5. If the display shows Connect DAPT3+, this means that you have the wrong DAPT connected and need to connect the yellow DAPT3. If you have the correct DAPT, you will not see this message.



6. This message will display momentarily while the DAPT is measuring the cable loss.



- 7. If this is the first time calibrating, you will not see this CableCal Skipped message. Go to step 9.
- 8. If the calibration has been done previously, this will display. If you would like to calibrate the cable loss again, go to the Input Params screen on your computer and check the *Calibrate Cable Loss* checkbox, as seen in Figure 17.



Cable Calibration:

🗹 Calibrate Cable Loss

Figure 17: Calibrate Cable Loss

9. This screen will display throughout the progress of calibration.



10. This screen will display while the values of the measured calibration loss is validated.

Important: This value cannot be higher than 18.



11. If the measurement is valid, the next step will be step 12. If the cable loss value is too high, this screen will be displayed. Review the cable requirements specification to ensure the cable you are using is the correct length.



12. When the measure calibration loss is valid, the screen will display CableCal Done.



13. Logging VoltMeas will display momentarily while the voltage is recorded.



14. After a few seconds, the Logging Done message appears.



15. Press the Advance (3) button.

When the satellite modem receives the voltage response message, it advances to the pointing state, during which the antenna can be coarse and fine-pointed.

Upon entering the pointing state, the DAPT3 display reads:



The highest recorded SQF value is on the left and the current SQF reading is on the right.

NOTICE

A SQF value of 31 or greater indicates acquisition of the correct satellite beacon.

16. Wait for the SQF reading to settle on a value then use the appropriately sized wrench for the specific antenna to adjust the antenna azimuth and elevation. See the guide specific to the antenna you are installing for in-depth instructions about making these adjustments.

Continue until you achieve the highest possible SQF value.

Note: The tone from the DAPT3 will be louder and the cadence will quicken as the beacon is acquired.

NOTICE

Do *not* attempt to point the antenna manually by pulling on the feed support arm. This can cause permanent damage to the antenna. Instead, use the antenna mechanical adjustments.

You may *gently* maneuver the antenna reflector to coarsely point the antenna, but only if the Az/El canister bolts are loose enough so that the reflector rotates easily.

- 17. When the signals are peaked, tighten the azimuth and elevation bolts completely.
 - **Note:** Because slight movement of the antenna occurs during lockdown, always measure the signal peak value after locking down the antenna.

Registration

- Important: If the BUC uses an external power supply, at this point you *must* reinstall the modem with the *Enable TX Voltage* checkbox unchecked on the input parameters screen. See step 11 of Entering installation parameters on page 28. Once you have reinstalled the modem, proceed to step 3. If the BUC does not use an external power supply, continue to step 1.
- 1. Press **Advance** (3) for Yes or **Toggle** (2) to return to pointing validation mode. If you press **Advance** (3), the DAPT3 prompts you for confirmation that you want to save the results, with the message:



- **Note:** Do not disconnect the DAPT3 until instructed to do so. Disconnecting the DAPT3 prematurely could cause a loss of all stores data, invalidating the entire pointing process. It could also cause the satellite router to crash.
- 2. Press **Advance** (3) to save the pointing validation results, or **Back** (1) to return to the previous state.



If you press Toggle (2), the DAPT3 display reads:



This indicates that you have completed the pointing process successfully. The DAPT3 displays this message for approximately 10 seconds and then displays the IFL voltage to indicate that the pointing process has finished.

- **Note:** Do not disconnect the DAPT3 until the IFL voltage disappears. Disconnecting the DAPT3 prematurely could cause a loss of all stored data, invalidating the entire process.
- 3. Disconnect the DAPT3.
- Ensure the *TX IFL Voltage* field on the satellite modem's registration screen (Figure 18 on page 33) displays the correct value – either *On* or *Off* – depending on the type of installation you are performing.

| | 1. Input Params 2. Pointing | | Ig | 3. Registration | |
|-------------|-------------------------------------|---------------|---------------------------|-----------------|--|
| RE-INSTALL | . RE-REGISTER | | | | |
| BC State: | : 0.0.0 (Fully operational) | | | | |
| K IFL Volta | ge [24V DC] | On | | | |
| anged Rate | e | OQPSK 512 1/2 | Ranging Sessions | 3 | |
| inimum / T | arget (dB) | 4.0/6.0 | Initial / Final EsNo (dB) | 18.0 / 5.9 | |
| Ra | nging Successful | | | Done | |
| P Re | gistration Successful | | | Done | |
| As As | sociated with Network [jweipgw01] | | | Done | |
| / Co | onfiguration Downloaded | | | Done | |
| / Ins | stallation Completed !!! [SAI 8534] | | | Done | |

Figure 18: TX IFL voltage on satellite modem registration screen

- 5. Reconnect the IFL cable directly to the radio.
- Weatherproof all outdoor cable connections with dielectric grease. Depending on your installation environment, weatherproofing tape may also be needed, as shown in Figure 20 on page 35.

Note: If you use any cable ties, they must be resistant to ultraviolet rays.

NOTICE

Hughes connectors, in conjunction with the dielectric grease, provide weatherproofing for outdoor connections. These connectors should be used in new installations, upgrades, and any repairs.

You may further protect radio connectors by wrapping them with weatherproofing tape, such as GB Electronics silicone tape, or by covering them with a weather boot that has been filled with dielectric grease. This extra weatherproofing may be needed in areas with high salt air exposure.



Figure 19: Hughes-approved IFL cable connector



Figure 20: Hughes-approved IFL cable connector with additional weatherproofing This completes the pointing process.

Troubleshooting

The procedures in this chapter outlined the basic pointing process. Should the DAPT3 display an error message, or if you receive unexpected results, use the information in Table 2 to help you diagnose and resolve the problem. If following the outlined procedures does not resolve the problem, contact Installer Support.

| Symptom | Indication | Correction action |
|--|--|--|
| Blank screen during the pointing procedure after COMM Startup message | Satellite modem may still be reading the ODU file. | Wait for 90 seconds for screen message to reappear. |
| Permanent COMM Startup message | Satellite modem is not in pointing mode. Advance button was been pressed before submitting the installation parameters. | At the LUI, verify that the satellite modem is in pointing mode (refer to Figure 7 on page 16). If the satellite modem is not in pointing mode, repeat the process explained in Entering installation parameters on page 25. If the DAPT3 does not display the SQF reading (SQF<>sqf) after a few seconds, press Advance. |
| Permanent Logging VoltMeas message | Cables on the DAPT3 are not connected properly. | Reconnect the cables to the DAPT3 in accordance with the connector labels on the DAPT3 rear panel. |
| Permanent Switch IFL Cable message | The satellite modem cable is connected to the LNB side of the DAPT3 | Reconnect the cables to the DAPT3 in accordance with the connector labels on the DAPT3 rear panel. |
| SQF does not go higher than 1 | • Circular polarization setting is incorrect. | Set the polarization to LHCP or RHCP, as indicated on the Terminal Pointing Info screen (Setting for ODU Polarization). |
| | Installation parameters incorrect. | Go to Modify Installation Parameters under <i>Advanced Configuration and Statistics</i> and use the Installation Reference Sheet to make the appropriate corrections. |
| | No RX cable connected between DAPT3 and LNB, or bad cable used. | Connect/replace the RX cable between DAPT3 and LNB. |
| | [For HT1300 only] DAPT3 in RX IFL path. RX IFL has a direct connection to the LNB. | Remove DAPT3 from RX IFL. |
| | [For HT1200 and HT1100] Modem cannot talk to the radio (status code 3.1.1) | Verify the modem is connected to the ODU. |

Table 2: DAPT3 display messages

| Symptom | Indication | Correction action |
|-----------------------|---|---|
| Low SQF indication | Incorrect installation parameters entered. | If incorrect parameters were entered, the modem could be installed in the wrong downlink cell. Go to Modify Installation Parameters under <i>Advanced Configuration</i> <i>and Statistics</i> and use the Installation Reference Sheet to make the appropriate corrections. |
| | SQF is between 0–29: Antenna not correctly pointed. | Repoint the antenna to achieve the highest SQF value. |
| | SQF stuck at 30: Wrong carrier. | Choose the correct carrier on the IDU LUI. |

Chapter 4 Pointing the antenna by using a wireless device

This chapter describes an alternate method of pointing the antenna using a wireless device (phone, tablet, or laptop) connected to the satellite modem through a wireless router (Wi-Fi).

Prerequisites

The instructions provided are specifically for the Netgear N150 Wireless Router model WNR1000v2. The default settings were used and should work with most routers. You may need to consult your router manufacturer if you cannot access the modem. Hughes provides a list of recommended routers on the Installer Portal.

Perform the following steps to set up the wireless router to work with the satellite modem and a wireless laptop or smart mobile device. Do not use the Netgear setup disk. The initial setup must be performed on a computer with an Ethernet port so the wireless router can be wired to the computer. This process only needs to be performed once. After the process is complete, the Netgear router can be used with any smart wireless device or wireless laptop.

Setting up the Wi-Fi device

- 1. Plug the wireless router into power.
- 2. Plug in an Ethernet cable from any LAN port to the Ethernet port on a laptop or computer, as shown in Figure 21.



Figure 21: Ethernet connection to wireless router

- 3. Access the wireless router's built-in web server by entering 10.0.0.1 in the URL field of an Internet browser on your laptop.
- 4. Log in to the Netgear router with the following credentials:

Username: admin Password: password

Note: Other routers may use different values.

- 5. Click Wireless Settings on the left side of screen.
- 6. Change SSID to HughesOasis.
- 7. Click **Apply**. The router may ask you to enter your username and password again. Use the same as above and click **OK**.
- 8. Disconnect the Ethernet cable from the laptop.

Point and activate terminal with wireless device

1. Plug the Ethernet cable from the satellite modem into the WAN port on wireless router, as shown in Figure 22.



Figure 22: Connecting the satellite modem and Wi-Fi router

- 2. Plug in the power cord of the Wi-Fi router.
- 3. On your wireless device, search for available Wi-Fi signals.
- 4. Continue with Chapter 3 or Chapter 4, depending on the DAPT version being used.
- 5. Launch an Internet browser on the wireless device and enter 192.168.0.1 in URL field. The System Control Center (SCC) should now be displayed, as shown in Figure 23 on page 41.
- 6. Click the Information icon on the right side of the **System Information** link.

| HughesNet | SAN: | ESN:10000276 | Diagno | ostic Code:Not Available |
|--------------------|---|---|----------------|--------------------------|
| 0 | HT1200 System C Your built-in diagnostic system for settings. | ontrol Center or viewing performance sta | itistics, gett | ing help and configuring |
| Home | HELP | Dat | a Allowa | nce Status |
| Connectivity Test | | | AnyTi | me |
| | Welcome to HughesNet | Data Allowance | ок | |
| Built-In Self Test | Additional Premium Services | Status | 245.00 | |
| | Customer Care | Remaining | 34.5 GB | Bonus |
| Help | | AnyTime Data Allowance | 34.5 GB | GB Bytes |
| | | AnyTime Data Allowance Remaining | 34.5 GB | |
| | | Bonus Bytes | Unlimited | 17.2 |
| | | Bonus Bytes Remaining | Unlimited | 68 |
| | | Token Bytes Available | 0 MB | 34.5 GB 11-11-11-11 |
| | | Allowance Resets in 7 | days, 6 hr | Remain Unlimited |

Figure 23: Icon to installation screen from System Control Center

7. On Advanced Configuration and Statistics page, click Installation > Install.

| | | ESN:10756036 | onfiguration a | SAI:0(0x0) | | |
|--------------------------------|---|-----------------------|--------------------------|--------------------------|------------------------------|--|
| HUGHES. An EchoStar Company | SW Version :5.0.0.40 (M) Diagnos 08/31/2015 14:08:59 | | ostic Code:Not Available | | | |
| Auto Refresh 0 • | System | State Code .] .] | UpTime 0.00 | e (d.h:m:s) :03:21 | Available Memory 71092 KB | |
| General Web Acceleration | LAN (eth0) | | | SbcStatus | | |
| + Diagnostics | Interface State | | Lin 1 G ED | Installation Status | Initial | |
| + Logs | Rx Packets | | 2648 | First Registration | 2015-08-31 13:40:24 | |
| + Installation | Rx Bytes | | 329102 | Most Recent Registration | 2015-08-31 13:40:24 | |
| Enterprise options | Tx Packets | | 3293 | SBC State Code | 22.1.1 | |
| | Tx Bytes | | 1978822 | Ass | ociation | |
| | | Satellite (sat) | | Association State | CREATING IPOW POOL | |
| | Rx Packets | | 0 | IPGW ID | | |
| | Rx Bytes | | 0 | Association Time | N/A | |
| | Tx Packets | | 0 | CMM Timeouts | 0 | |
| | Tx Bytes | | 0 | Keep Alive Timeouts | 0 | |
| | | | | Association State Code | 21.1.1 | |
| | | | | FAP State Code | 24.1.2 | |
| | | | | | | |



8. The Input Params screen will be shown (Figure 25). Enter latitude, longitude, select EchoStar-XVII, and click **Submit**.

Note: Lat/Long must be determined with an onsite GPS device. Do not use any map-generated GPS location.

| 👷 Favorites 🖉 HT1000 Terminal Installation | 🟠 = 🔂 = 🖂 🖶 = Page = Safety = Tools = 🌘 | | | |
|--|---|------------------------------|--|--|
| 1. Input Params | 2. Pointing | 3. Registration | | |
| RE-INSTALL | | | | |
| Latitude (DD MMI.MMM): | | 39 10.420000 North 💌 | | |
| Longitude (DDD MM.MMM): | | 77 14.510000 West 💌 | | |
| Satellite : | | AMC-15-MIS 💌 🖾 Beam Override | | |
| Advanced : | | AMC-15-MIS | | |
| | Submit | | | |

Figure 25: Input Params tab

9. On the Pointing tab (Figure 26), note the azimuth, elevation, and antenna tilt. Confirm the uplink polarization (Uplink Pol) settings.

The screen shows the Max SQF on left and the Current SQF on right.

| HT1000 Terminal Ins | tallatic × | | | | | | | |
|---------------------|--------------------|----------------------|----------------|------------------------|---------------|-----------|-------------|-------|
| ← → C 🗋 ww | w.systemcontrolcen | ter.com/install.html | | | | | | ය 🚨 🔧 |
| | 1. Input Para | ms | | 2. Pointing | | 3. Re | gistration | |
| RE-INSTALL | NEXT >> Hide | SQF Graph | | The share of the | | | | |
| SBC State: 22.2.2 | (Pointing In Proc | aress - Outroute lo | ocked) | | | | | |
| | | | | | | | | |
| Azimuth | | | 230.421 ° | | Max SQF | | Current SQF | |
| Antenna Tilt | | | 29.752 ° | | 405 | | 07 | |
| Uplink Pol | | | Left-Hand (LH) | | 105 | | 97 | |
| Outroute ID | | | 42 | | | | | |
| | | | | | | | | |
| 180- | | | Ou | troute SQF over the la | st one minute | | | - |
| 162 | | | | | | | | |
| 144 | | | | | | | | |
| 100 | | | | | | | | |
| 120- | | | | | | | | |
| | | | \sim | ~~~~ | | | ~~ | |
| 70 | | | | | | | | |
| 12- | | | | | | | | |
| 54- | | | | | | | | |
| 36- | | | | | | | | |
| 18- | | | | | | | | |
| 0s | -6s | -12s | -18s -24s | s -30s | -36s | -42s -48s | -54s | -60s |
| | | | | © 2012 HUGHES | | | | + |
| 1 | | | | | | | | |

Figure 26: Pointing tab

10. Wait for the SQF reading to settle on a value; then use the appropriate size wrench for the antenna to adjust the antenna azimuth and elevation. Adjust until you achieve the highest possible SQF value as shown in **Error! Reference** source not found. on page **Error! Bookmark not defined.**.

- 11. When the signals are peaked, tighten the azimuth and elevation bolts completely.
 - **Note:** Because of the slight movement of the antenna that occurs during lockdown, always measure the signal peak value after locking down the antenna.
- 12. Click **NEXT** to continue. The next processes will include registration, association, and configuration. These steps are covered in the *HT1200 Satellite Modem Installation Guide* (1040071-0001).
- 13. Weatherproof all outdoor cable connections with dielectric grease. Depending on your installation environment, weatherproofing tape may also be needed, as shown in Figure 28 on page 44.

Note: If you use any cable ties, they must be resistant to ultraviolet rays.

NOTICE

Hughes connectors, in conjunction with the dielectric grease, provide weatherproofing for outdoor connections. These connectors should be used in new installations, upgrades, and any repairs.

You may further protect radio connectors by wrapping them with weatherproofing tape, such as GB Electronics silicone tape, or by covering them with a full-length weather boot that has been filled with dielectric grease. This extra weatherproofing may be needed in areas with high salt air exposure.



Figure 27: Hughes-approved IFL cable connector



Figure 28: Hughes-approved IFL cable connector with additional weatherproofing This completes the pointing process.

44 Chapter 4 • Pointing the antenna by using a wireless device 1039429-0001 Revision D

Acronyms

D

 $\mathsf{DAPT}-\mathsf{DiSEqC}\ \text{antenna}\ \mathsf{pointing}\ \mathsf{tool}$

dB – decibel

DiSEqC – Digital satellite equipment control

F

FSB – Field service bulletin

G

GPS – Global positioning system

I

IDU – Indoor unit

IFL – Intra-facility link

L

 $\mathsf{LAN}-\mathsf{Local}\ area\ network$

LCD – Liquid crystal display

LHCP – Left-hand circular polarization

LUI – Local user interface

0

OASIS – Onsite Accelerated Service Installation System

R

RHCP – Right-hand circular polarization

S

SNR – Signal-to-noise ratio

 $\mathsf{SQF}-\mathsf{Signal}\ \mathsf{quality}\ \mathsf{factor}$

W

WAAS – Wide-area augmentation system

Index

A

Azimuth

adjusting 18, 32 determining coordinates 13, 25

В

Beacon lock 12

С

Cables

approved types and maximum lengths 13, 25 IFL 13, 19, 25, 33 Cell selection 23, 37 Coarse pointing overview 7 procedure 17, 29

D

DAPT buttons 10 description 9 error messages 22, 36 installing 17

E

Elevation adjusting 18, 32 determining coordinates 13, 25

F

Filters, pointing selecting 18, 32

G

GPS description 8 using 13, 25

Ι

IFL cables 13, 19, 25, 33 voltage 17, 29 Initial satellite acquisition 12 Installation parameters, entering 11, 13, 25, See also LUI

K

Ka-band antenna 7

L

LUI

accessing 13, 25 description 8 display 14–16, 14–16

Ρ

Pointing coarse 17, 29 requirements 7 validation 40–44 Pointing mode 11

S

Satellite acquisition 12 Satellite modem 18, 31 V

Validation 19–21