TracStar
COBHAM

TracStar i450M
In-Motion Antenna System

Installation & Operation Guide

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About This Guide

About This Guide provides a brief description of the guide's contents, the intended audience of the guide, and the document conventions used throughout this guide.

What's in this Guide?

This guide is organized as follows:

Chapter 1 – Introduction. Provides an overview of the TracStar i450M antenna.

Chapter 2 – Installation. Provides the basic instructions for installing the TracStar i450M antenna and antenna control unit (ACU) in most vehicles,.

Chapter 3 – System Operation. Explains the standard satellite acquisition process.

Chapter 4 – System Configuration. Describes the system settings that can be changed if you want to reconfigure the system for a different network before starting the satellite acquisition.

Chapter 5 – Antenna Control Unit (ACU). This chapter describes the ACU and provides examples of the ACU screens, along with field descriptions of each screen and navigational tips.

Appendix A – Product Specifications. Provides the technical specifications for the TracStar i450M antenna.

Appendix B – Antenna Mounting Dimensions. Provides an illustration of the TracStar i450M antenna mounting dimensions.

Appendix C – ACU Software Upload. Provides the procedures for uploading the software to the ACU.

Appendix D – Fault Indicators. Provides a brief description of the most common fault indicators that may display.

Appendix E – System Options. Provides a list of system options that are used for calibration and troubleshooting procedures.

Glossary. Contains a list of all acronyms and industry terms used in this guide.

Index. Helps you to quickly find topics in this guide.

Audience

This guide is intended for anyone interested in installing and operating the TracStar i450M antenna system.

Document Conventions

This section describes the text formats and graphics that are used in this guide, which are designed to help you quickly understand the information presented.

Text Formats

Table i describes the document conventions used throughout this manual.

Table i. Document Conventions

Convention	Description
ENTER	**Represents a button on the ACU control panel (not to be confused with a key on a keyboard).**
SMALL CAPS	**Indicates a key on a keyboard (e.g., CTRL+BREAK, ENTER).**
Italics	**Emphasizes words (e.g., *Do* change the settings.).**
Boldface	**Indicates text that displays on the ACU display screen (e.g., Highlight SatA on the Select Data screen.).**
ALL CAPS (TYPEWRITER FONT)	**Refers to system text that displays on a window (e.g.,** TSS_MON3.2 **displays on the HyperTerminal window.).**

Warning, Caution, Important, and Note icons

This guide includes warnings, cautions, and informational notes, where appropriate, to point out important or safety-related information.

WARNING: **Indicates the presence of a hazard that could result in personal injury.**

CAUTION: **Indicates the presence of a hazard that could result in corruption of software or damage to equipment or warns about potential problems in the outcome of what you are doing.**

IMPORTANT

Denotes information that TracStar feels is important for product operation.

Emphasizes points or provides reminders.

1 Introduction

This chapter provides a basic introduction to the TracStar i450M antenna system.

Overview

The i450M antenna from TracStar is built to track a single satellite while mounted on a stationary or moving vehicle traveling over improved or unimproved road conditions.

You now have the freedom and flexibility to move quickly *anywhere in the world* using a communications terminal that is very responsive and Internet/Intranet-compatible.

With the TracStar i450M antenna, you can enjoy the same reliable and secure high-speed, IP-based data communication that you may be accustomed to in the office, but now you can experience it while *on the move*.

Features

TracStar Systems acquisition technology closely couples with the satellite modem, thus enhancing the satellite acquisition accuracy and reducing the startup time. The antenna goes directly to the data satellite and, using enhanced communications capability with intelligent modems, is able to acquire, lock, and peak on the specific satellite without the traditional pre-alignment reference satellite stage.

The antenna also provides:

- Three-axis polarization over elevation over azimuth.
- Configuration for operation on most satellites.
- Design capability for simple operation, performing precise antenna-to satellite alignment with the push of a single button.

Each antenna is fully integrated with:

- **An antenna control unit (ACU) with user interface**
- **High-precision motors with optical encoders**
- **A global positioning system (GPS)**
- **Base-angle tilt sensors**
- **Three-axis gyroscopes**

Components

The TracStar i450M antenna system consists of three main components:

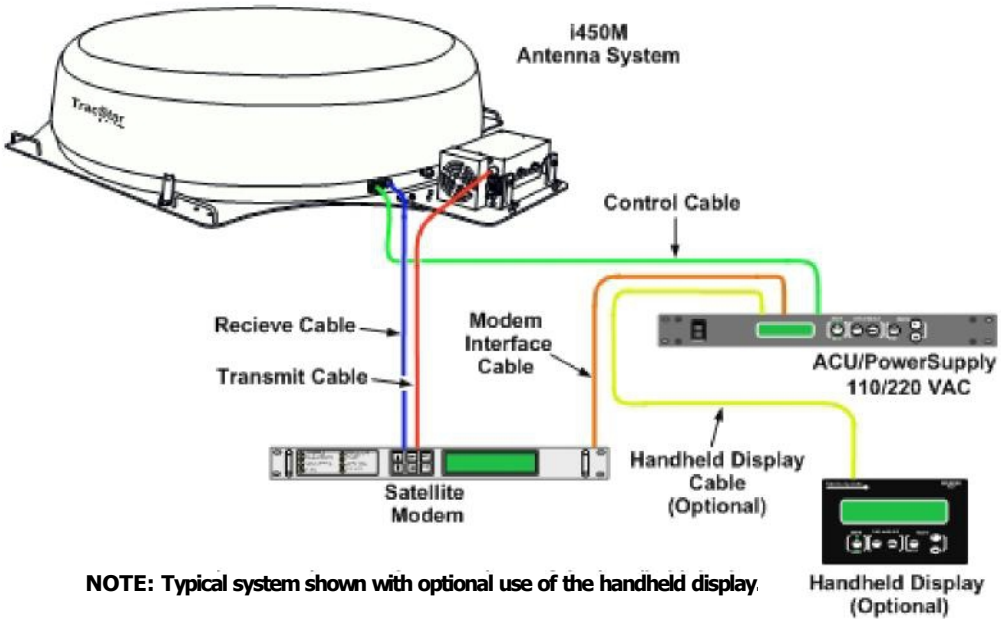
- **Antenna. Located on the roof of the vehicle. The internal operational components are covered with a weather proof dome.**

  To maintain optimum performance of the antenna, it is important to keep the dome clean. Use water and mild soap.

  Application of a commercial car polish may also improve water shedding.

- **ACU. Located in the vehicle. The antenna control unit (ACU)/power supply is used to activate and monitor the system. It is also used to access programming and diagnostic information. (A Handheld Display is also provided that can be used in place of the ACU if there is a need for remote control or monitoring of the system.)**
- **Modem. Located in the vehicle. The modem decodes the satellite signal to ensure the i450M locks onto and tracks the correct satellite. (Modem typically provided by user.)**

Block diagram **Figure 1-1 shows a block diagram of the i450M antenna system.**



Components

Figure 1-1. Antenna System Block Diagram

CAUTION: DC voltage present on wiring. Do not cut, splice, or insert any devices.

IMPORTANT

It is highly recommended that system installation and any subsequent modifications, disassembly, or reassembly be conducted by a factory-authorized representative. Contact TracStar Systems, Inc., for the nearest factory authorized representative.

2 Installation

This chapter provides the basic instructions for installing the TracStar i450M antenna and antenna control unit (ACU) in most vehicles, which involves:

- Unpacking the shipping crate
- Installing the antenna
- Cabling the system

Unpacking the Shipping Crate

Shipping crate contents

Equipment and materials may vary according to the type of modem being used. Be sure to verify the complete shipment of your antenna system, ensuring that nothing was damaged, before beginning the installation.

Table 2-1. TracStar i450M Shipping Crate Contents

IMPORTANT

Be sure to save the shipping crate, packing materials, and shipping restraining screws for the antenna. If the system needs to be returned for maintenance, you will be responsible for proper packing.

Description/Serial Number	Qty	Part Number
i450M antenna	1	106443
i450M Quick Start User Guide	1	MANUAL-450
i450M Installation & Operation Guide	1	OP MANUAL-450
Antenna control unit (ACU)	1	106450-2
Handheld display	1	103086
** System typically ships with one modem interface cable*		

Table 2-1. TracStar i450M Shipping Crate Contents *(Continued)*

Description/Serial Number	Qty	Part Number
Handheld display cable (7 feet)	1	100291
Transmit cable (Tx)-LBand (25 feet)	1	107850
Receive cable (Rx)-LBand (25 feet)	1	107849
Control/power cable (25 feet)	1	106451
Modem interface cable*		
? Comtech CDM – 570L/625	1	100028-9
? iDirect iNFINITY 8000	1	100028-7
? ViaSat ArcLight	1	100028-12
** System typically ships with one modem interface cable*		

Removing the antenna from the shipping crate

WARNING: To avoid bodily injury or damage to antenna or vehicle, always use two or more people to move or lift the i450M antenna.

To remove the antenna from the shipping crate

1 Remove the four lag bolts from the shipping crate lid (one bolt on each side). See Figure 2-1.

Figure 2-1. Shipping Crate Lid Lag Bolt

2 With aid of assistant, remove shipping crate lid from shipping base.

3 Carefully remove hardware shipping box from interior of shipping crate lid. See Figure 2-2.

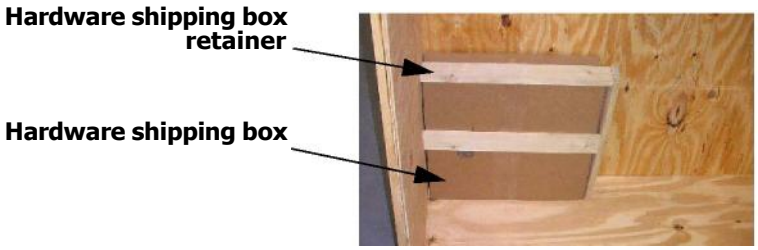


Figure 2-2. Hardware Shipping Box

4 Remove the five (5) shipping retaining bolts: four from each corner on the antenna base plate and one on the BUC mounting plate. See Figure 2-3.

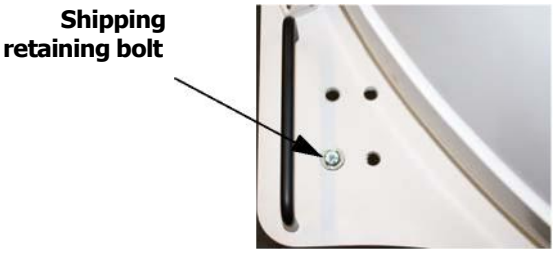


Figure 2-3. Shipping Retaining Bolt

Typical Installation

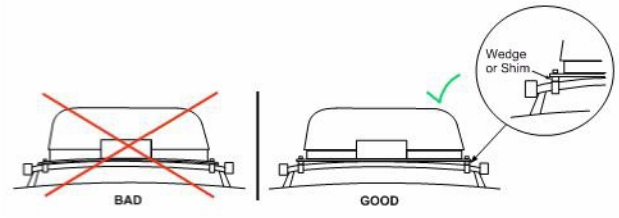
This section describes a typical installation of the i450M antenna onto a vehicle's roof rack. Custom installation should follow similar practice, or call the factory for assistance.

IMPORTANT

Read this manual thoroughly and carefully before attempting to install or operate the TracStar i450M antenna.

WARNING: Verify that the roof rack is in good condition and can support the i450M antenna.

CAUTION: Antenna mounting points *must* distort the base of the antenna. Antenna must be mounted flat to work properly.



To install the antenna to a vehicle roof rack

1 Adjust the roof rack cross bars to line up with the antenna mounting holes.

> Refer to Appendix B, "Antenna Mounting Dimensions" for additional information.

2 With assistance, position the antenna on the vehicle's roof rack. (Make sure the antenna is centered to the vehicle side-to-side.) See Figure 2-4.

Figure 2-4. Roof Rack Mounting

3 Mount the antenna base to the roof rack at each of the six mounting locations (three on each side of the antenna), using two allen head screws and one U-bracket. See Figure 2-5.

Make sure the holes in the U-bracket line up with the holes on the antenna base.

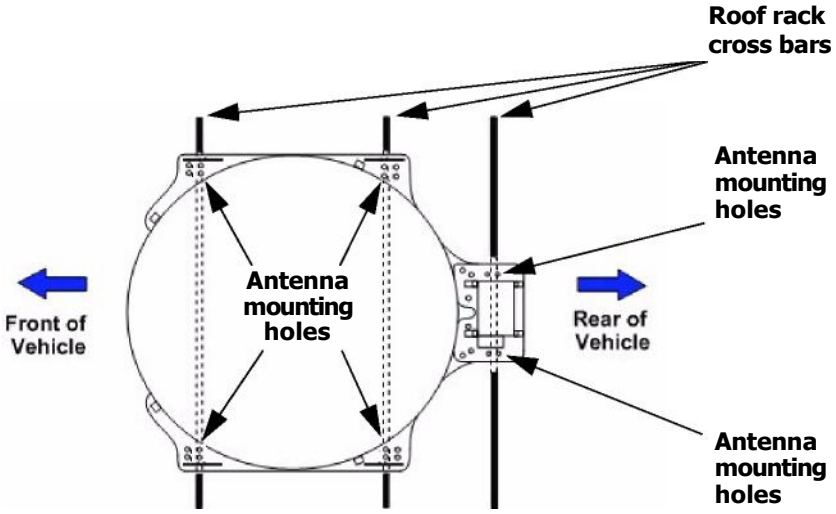


Figure 2-5. Antenna-to-Rack Positioning

IMPORTANT

It is recommended that a low-strength liquid thread lock be applied to the screws before inserting into the U-brackets.

4 Fully tighten the twelve (12) mounting screws with the allen wrench (two screws at each of the six mounting locations). *Do not overtighten.* See Figure 2-6.

Use a nylon and flat metal washer with each mounting screw.

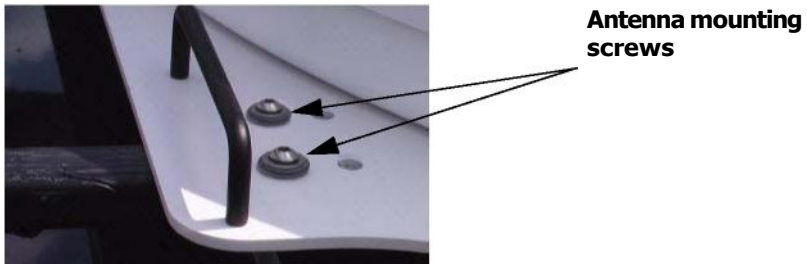


Figure 2-6. Antenna Mounting Screws

5 After the antenna has been installed onto the roof rack and all six brackets have been tightened, complete a thorough inspection of all brackets and screws.

Cabling the System

This section describes the proper method for connecting the transmit, receive, and control/power cables to the antenna, routing the cables from the antenna to the equipment within the vehicle, and then connecting the cables to the ACU and modem.

Connecting cables to antenna

Before you begin

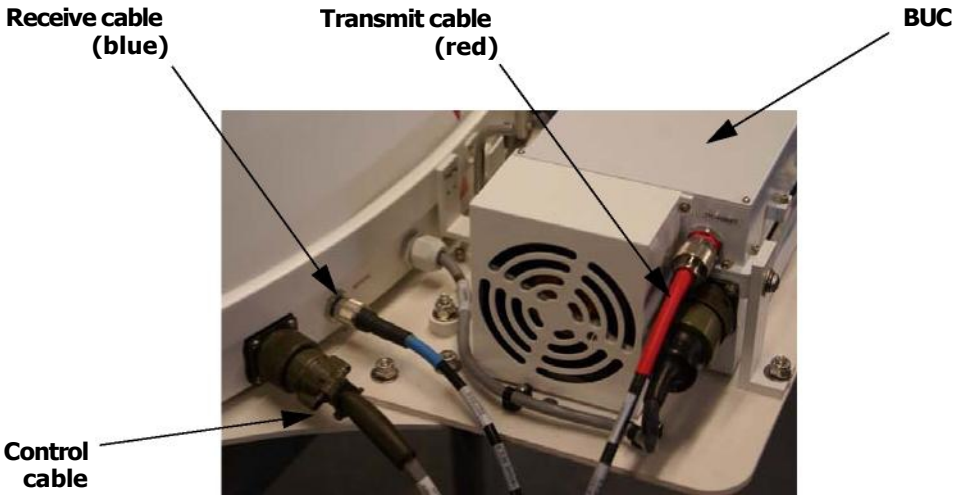
There are three cable connections on the rear of the antenna. The receive and control cables are located on the base of the antenna. The transmit cable is located on the end of the BUC.

► To connect the cables to the antenna

- **Connect one end of the transmit, receive, and control cables to the antenna. Ensure connectors are tight. See Figure 2-7.**

  The connections are weatherized and protected from outside elements.

Figure 2-7. Antenna Cable Connections



Sample routing of antenna cables to vehicle interior

Once you have connected the cables to the antenna, you are ready to route the cables from the antenna to the equipment within the vehicle.

CAUTION: Do not fold or kink the cables. Any bends should be gradual and kept to a minimum to avoid damaging the cables and degrading the satellite signals.

▶ To route the antenna cables to the vehicle interior

1 Open the vehicle's rear hatch and route the cables down the roof rack's side support bar.

2 Continue down the rain channel between the weather stripping and the

IMPORTANT

Avoid sharp bends when routing cables.

outer body of the vehicle to the bottom of the rear hatch. See Figure 2-8.

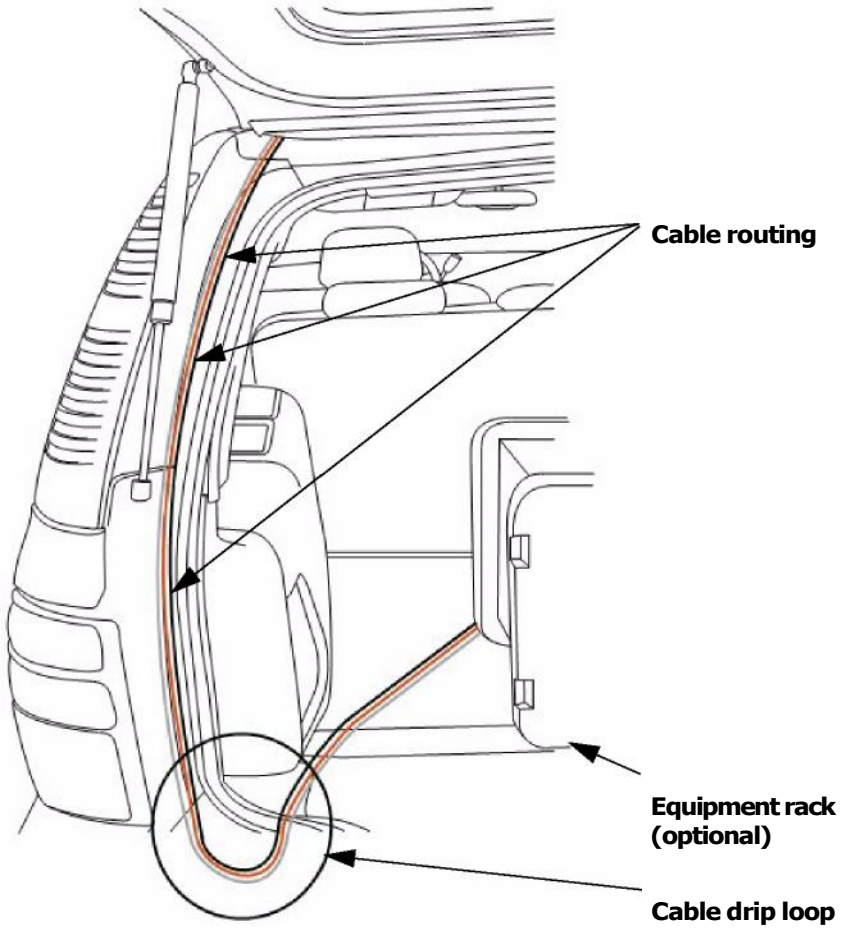


Figure 2-8. Cable Routing to Vehicle Interior

3 Use tie wraps to secure the cables to the roof rack cross bars after the cables have been routed from the antenna to the ACU inside the vehicle. See Figure 2-9.

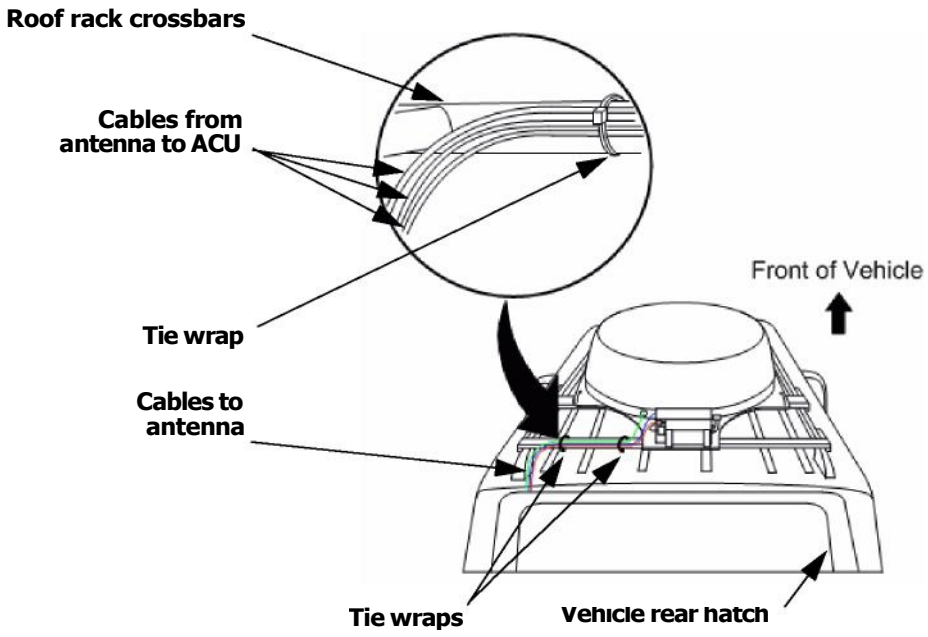


Figure 2-9. Securing Cables to the Roof Rack with Tie Wraps

4 At the bottom of the rear hatch, create a drip loop in the cable to help prevent water from entering the vehicle. See Figure 2-10.

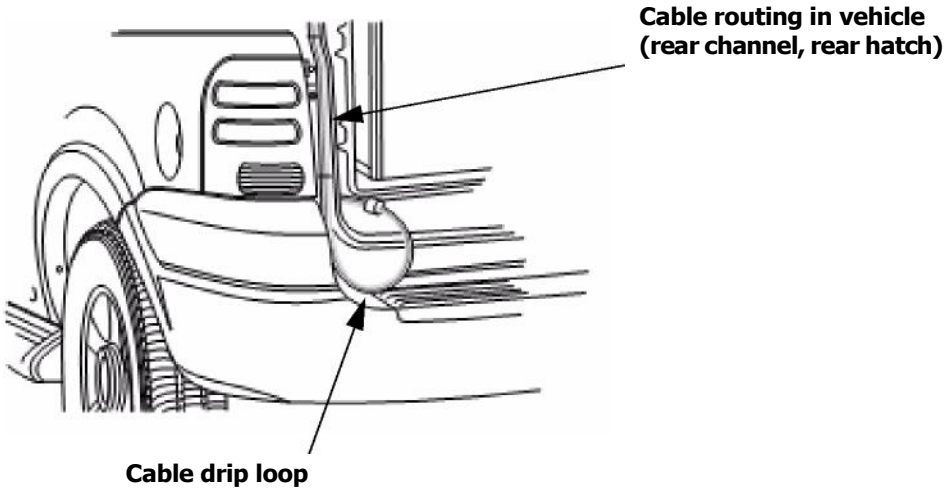


Figure 2-10. Cable Drip Loop

5 Route the cables into the vehicle to the desired location at the equipment rack.

6 Close the rear hatch carefully.

> **IMPORTANT**
>
> Inspect the cables to make certain that they are not bent, pinched, or damaged.

Connecting antenna cables to the ACU and modem

This section describes the proper connection of the i450M antenna to the ACU and modem.

▶ To connect the antenna cables to the ACU and modem

CAUTION: Power off all equipment before connecting or disconnecting any cables from equipment.

1 Connect the *Rx* cable from the antenna to the receive port on the modem.

2 Connect the *Tx* cable to the transmit port on the modem.

3 Connect the control cable to the ACU.

4 Connect the modem interface cable from the ACU to the modem.

Figure 2-11 shows the cable connections for the different modem types.

CAUTION: Be sure the cables connecting the antenna to the ACU are connected properly.

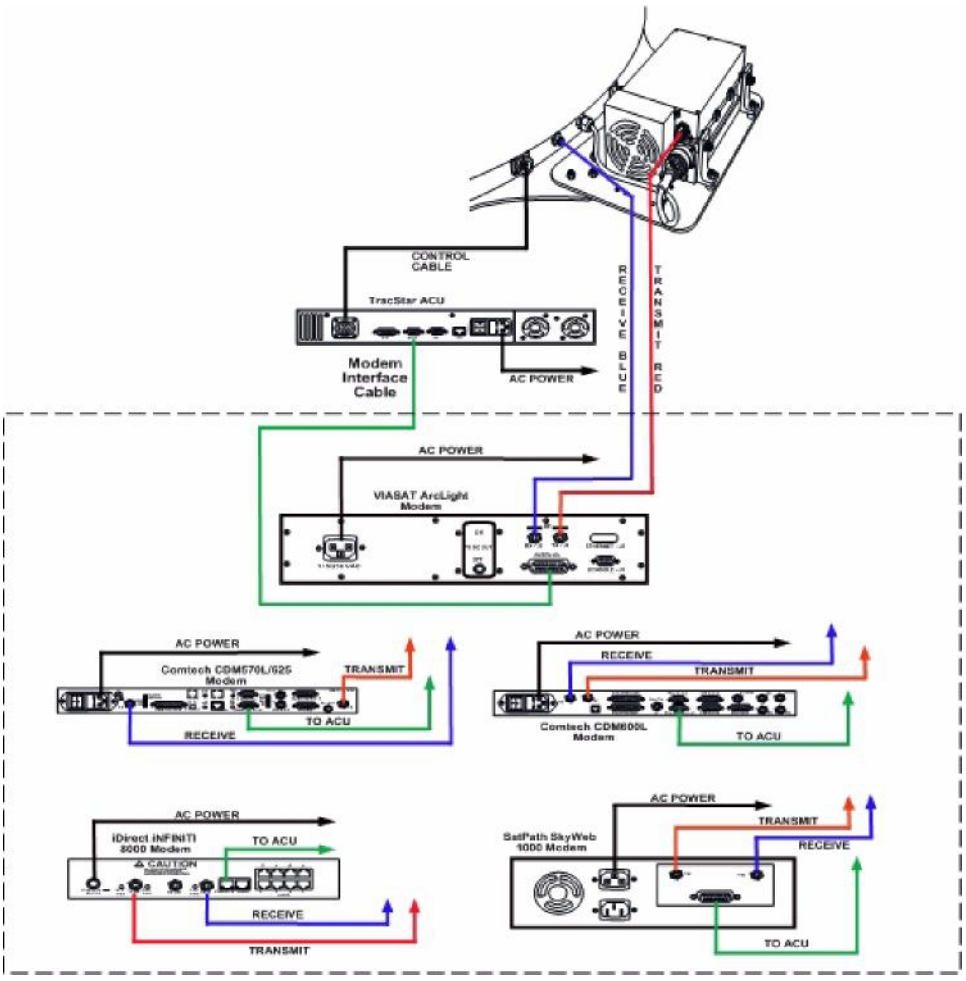


Figure 2-11. ACU and Modem Cable Connections – Supported Modem Types

3 System Operation

This chapter describes how to perform a standard satellite acquisition using the TracStar i450M antenna system.

Standard Satellite Acquisition Process

Upon power up of the system, the following sequence takes place:

- The system first loads a communication monitor program and displays MONITOR CHECK PLEASE WAIT while loading.
- The system then loads the operating software and displays LOADING PLEASE WAIT.
- The READY screen displays after the software load has completed.
- Press RUN to start the standard satellite acquisition process.
- The system performs a self-calibration of all three axes (Azimuth, Elevation, and Polarity).
- The system acquires GPS for high-precision geographic location information.
- Using GPS and other internal sensors, the system determines if it is *stationary* or *in-motion*.
- If the system determines that it is:

  Stationary the polarization offset and the elevation look angle to the desired satellite is calculated, based on geographic information from the GPS data. The system then sets the polarization offset and adjusts the elevation look angle to the required settings and performs an azimuth sweep while looking for satellite frequency energy. If energy is detected, the system will pause for a moment to allow the modem to acquire the desired network. If there is no network indication from the modem, the system will continue the azimuth sweep until the network satellite is found.

- *Initially*, the polarization offset and both azimuth and elevation angles can be calculated, based on geographic information from the GPS. The system then sets the polarization offset and adjusts the elevation look angle to the required settings and performs a 12-degree azimuth sweep around the calculated azimuth value until the system receives a network indication from the modem.

Turning on the System

Turning on the TracStar i450M antenna system involves powering up the antenna control unit (ACU) and the modem.

▶ **To turn on the system**

1 Power on the ACU.

> There are two power buttons on the ACU: one on the front and one on the rear of the unit. Both switches need to be in the *on* position for power to be supplied to the antenna system.

The ACU displays the READY screen (with the STOP LED selected). See Figure 3-1.

Figure 3-1. Ready Screen

2 Power on the modem.

3 Do one of the following:

- If the system has been configured for the desired network, see "Starting the Satellite Acquisition" on page 3-3. (You do not need to change the user settings.)
- If you want to reconfigure the system for a different network, see Chapter 4, "System Configuration" on page 4-1, before starting the satellite acquisition.

Starting the Satellite Acquisition

The system has a self-calibration and startup routine. User intervention is not required after the initiation of this process. Under normal operating conditions, the system determines its absolute location and then finds and locks onto the desired data satellite.

If the system has been configured for the desired network, you *do not* need to change the user settings and are ready to start the satellite acquisition.

> To reconfigure the system for a different network, see Chapter 4, "System Configuration" on page 4-1.

Before you begin

You start the satellite acquisition from the READY screen.

> If the Modem communications indicator on the READY screen displays waitMODEM instead of IDLE, you may have to reboot the system.

► To start the satellite acquisition

1 From the READY screen, press RUN to start the satellite acquisition.

The system is active and has started the acquisition. See Figure 3-2.

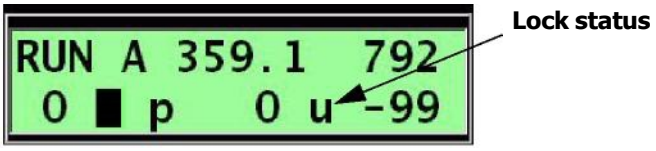


Figure 3-2. Run Screen: Unlocked

When the system locates the desired data satellite, the antenna locks onto the selected satellite. See Figure 3-3.

> A satellite lock is indicated on the display screen with an uppercase L in the lower right corner, followed by the reported signal strength from the modem. (This number reads in dB with no decimal point.) In Figure 3-3 the $E_{b/N0}$ is indicated as 11.2dB.

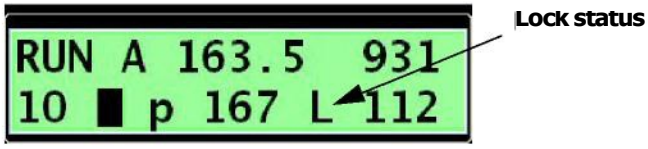


Figure 3-3. Run Screen: Locked

Once the system reads *Idle*, it automatically switches to tracking mode.

2 If the system has not acquired the data satellite after several attempts, or several minutes have passed and no lock indication is present on the display, do the following:

- **Turn off power and check cable and power connections to all equipment, being careful to observe all warnings.**
- **Ensure that the satellite modem is connected and configured properly for the desired data carrier. Re-apply power.**
- **Ensure there is a clear, unobstructed view toward the satellite, relative to the system position.**
- **Change the scan velocity to a lower number to slow the system sweep speed. Change only the first number (lower number equals slower speed). See "Viewing or changing scan velocity" on page 4-4.**

4 System Configuration

This chapter describes the following system settings that can be changed if you want to reconfigure the system for a different network before starting the satellite acquisition:

- Downlink polarity
- Modem type
- Data satellite information

> If the system has been configured for the desired network, see "Starting the Satellite Acquisition" on page 3-3. (You do not need to change the user settings.)

This chapter also provides the procedures for viewing the above system settings.

System backup

> **IMPORTANT**
>
> Before you can change any of the system settings, you must change the Tech Setup code to 13. This enables the system settings to be edited. See "Viewing or Changing the Tech Setup Code" on page 4-1.

If you change any of the system settings, you should perform a system backup. See "Backing Up System Settings" on page 4-10.

Viewing or Changing the Tech Setup Code

You view or change the Tech Setup code on the Tech Setup Screen. You cannot change most system settings unless you change the Tech Setup code to 13 (enable mode). Some parameters require other code values to allow modifications.

▶ To view or change the Tech Setup code

1 From the READY screen (with the STOP LED selected), press MAIN until the TECH SETUP screen is displayed.

Code 0 is highlighted. See Figure 4-1.

Figure 4-1. Tech Setup Screen – Code 0 Selected

2 Press + or - to set the desired code, and press ENTER to save your change.

AUTO 7 is highlighted. See Figure 4-2. (*Do not change this number.*)

Figure 4-2. Tech Setup Screen – Auto 7 Selected

3 Do one of the following:

If you want to view or change...	then go to...
downlink polarity	"Viewing or Changing Downlink Polarity or Modem Type" on page 4-3.
modem type	"Viewing or Changing Downlink Polarity or Modem Type" on page 4-3.
data satellite information	"Viewing or Changing Data Satellite Information" on page 4-7.
scan velocity	"Viewing or changing scan velocity" on page 4-4.

Viewing or Changing Downlink Polarity or Modem Type

The Modem screen enables you to view or change downlink polarity and modem type. You can change one or both.

> **IMPORTANT**
>
> If you change the modem type, the following settings *must* be changed: Scan velocity (changed on the diagnostic 'J' screen); azimuth track (changed on the diagnostic 'V' screen); and elevation track (changed on the diagnostic 'W' screen). Instructions are provided in this section.

▶ **To view or change the downlink polarity or modem type**

1 If you have not changed the Tech Setup code to 13 (enable mode), then go to "Viewing or Changing the Tech Setup Code" on page 4-1.

2 From the TECH SETUP screen, press to display the Modem screen.
The downlink polarity setting is highlighted. See Figure 4-3.

Figure 4-3. Modem Screen – Downlink Polarity Selected

3 Press or to change between HorzDN and VerDN.

4 Press (+ / - / ENTER) to save your change.
The modem type is highlighted. See Figure 4-4.

Figure 4-4. Modem Screen – Modem Type Selected

5 Press + or - to change to the desired modem type.

> If you change the modem type, you may have to reboot the system before starting the satellite acquisition (that is, if the READY screen displays waitMODEM instead of IDLE, meaning no modem communications exist).

6 Press ENTER to save your change.

> **IMPORTANT**
>
> When changing between iNFINITI96 and iNFINITI48, the system must be rebooted. Power off the system for approximately 5 seconds and re-apply power.

7 If you changed the modem type, then you *must* change the settings associated with the selected modem type. Go to "Viewing or Changing Modem Type Settings" on page 4-4.

8 If you did not change the modem type, then do one of the following:

If you want to...	then go to...
view or change the data satellite information	"Viewing or Changing Data Satellite Information" on page 4-7.
start the satellite acquisition	"Starting the Satellite Acquisition" on page 3-3.

Viewing or Changing Modem Type Settings

If you changed the modem type, you must change the following settings associated with the selected modem type:

- Scan velocity
- Azimuth track
- Elevation track

These procedures are provided in this section.

Viewing or changing scan velocity

If you changed the modem type, you *must* change the scan velocity (SV) settings.

The scan velocity may also be lowered to slow system sweep speed during the satellite acquisition. Change only the first number (lower number equals slower speed).

You view or change scan velocity settings on the diagnostic 'J' screen.

▶ **To view or change scan velocity settings**

1 Press MAIN until the DIAG screen is displayed. See Figure 4-5.

Figure 4-5. DIAG Screen

2 Press until the 'J' screen is displayed. See Figure 4-6.

> The screens display in alpha order.

Figure 4-6. J Screen

3 Use the +, -, and ENTER buttons to adjust scan velocity settings to match the desired modem type.

Table 4-1. Scan Velocity Settings

Modem	SV
Comtech CDM570L/625	4.60
ViaSat ArcLight	6.00
iDirect iNFINITI 8000	2.40
Settings are subject to change without notice.	

4 If you changed the modem type, continue to "Viewing or changing azimuth track settings" on page 4-6.

5 If you lowered scan velocity to slow system sweep speed during the satellite acquisition, return to "Starting the Satellite Acquisition" on page 3-3.

Viewing or changing azimuth track settings

If you changed the modem type, you must change the azimuth track settings.

You view or change azimuth track settings on the diagnostic 'V' screen.

▶ To view or change azimuth track settings

1 From the DIAG screen, press until the 'V' screen is displayed. See Figure 4-7.

Figure 4-7. V Screen

2 Use the ⊕, ◯, and ENTER buttons to adjust the azimuth track settings to match desired modem type.

Table 4-2. Azimuth Track Settings

Modem	Atka	b	Atkc	d
Comtech CDM570L/625	80	50	6	40
ViaSat ArcLight	100	50	10	20
iDirect iNFINITI 8000	40	50	6	20
Settings are subject to change without notice.				

3 Continue to "Viewing or changing elevation track settings" on page 4-6.

Viewing or changing elevation track settings

If you changed the modem type, you must change the elevation track settings.

You view or change elevation track settings on the diagnostic 'W' screen.

▶ To view or change elevation track settings

1 From the DIAG screen, press → until the 'W' screen is displayed. See Figure 4-8.

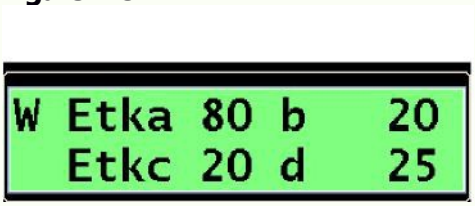


Figure 4-8. W Screen

2 Use the ⊕, ⊖, and ENTER buttons to adjust the elevation track settings to match desired modem type.

Table 4-3. Elevation Track Settings

Modem	Etka	b	Etkc	d
Comtech CDM570L/625	80	20	20	25
ViaSat ArcLight	80	0	20	0
iDirect iNFINITI 8000	80	20	20	25
Settings are subject to change without notice.				

3 Do one of the following:

If you want to...	then go to...
view or change the data satellite information	"Viewing or Changing Data Satellite Information" on page 4-7.
start the satellite acquisition	"Starting the Satellite Acquisition" on page 3-3.

Viewing or Changing Data Satellite Information

The system allows two data satellite locations to be stored and acquires the satellite selected as SatA or SatB.

You can select one of the two pre-programmed data satellites (SatA or SatB) as well as change the data satellite orbital location.

You view or change data satellite information on the SELECT DATA screen.

To view or change data satellite information

1 From the READY screen (with the STOP LED selected), press → until the SELECT DATA screen is displayed.

SatA or SatB is highlighted. See Figure 4-9.

Figure 4-9. Select Data Screen – Satellite Selected

2 Do one of the following:

If you want to...	then go to...
select a pre-programmed data satellite	"Selecting the data satellite" on page 4-8.
change the data satellite orbital location	"Changing data satellite orbital location" on page 4-9.

Selecting the data satellite

You can select one of the two pre-programmed data satellites (SatA or SatB) on the SELECT DATA screen.

To select a data satellite

1 From the SELECT DATA screen, highlight SatA or SatB. See Figure 4-10.

Figure 4-10. Select Data Screen – Satellite Selected

2 Use + or - to change between satellites.

3 After changing the selection, press ENTER to store the satellite selection.

The system is set to acquire the selected satellite.

In Figure 4-11 data satellite A is set for 72.0 W, and data satellite B is set for 74.0 W. The system is set to acquire SatB.

Figure 4-11. Select Data Screen – Satellite Selected Example

4 Do one of the following:

If you want to...	then go to...
change the data satellite orbital location	"Changing data satellite orbital location" on page 4-9.
start the satellite acquisition	"Starting the Satellite Acquisition" on page 3-3.

Changing data satellite orbital location

You can change the orbital location of a stored data satellite on the SELECT DATA screen.

▶ **To change the data satellite orbital location**

1 From the SELECT DATA screen, highlight the data satellite orbital location you want to change. See Figure 4-12.

Figure 4-12. Select Data Screen – Data Satellite Orbital Location Selected

2 Press + or - to change the value to the data satellite orbital slot in degrees.

West longitude is entered as a positive number, and East longitude is entered as a negative number. See Figure 4-13.

3 Press ENTER to save your change.

In Figure 4-13 data satellite A is set for 83.0 W, and data satellite B is set for 110.0 E. The system is set to acquire SatA.

Figure 4-13. Select Data Screen – Data Satellite Orbital Location Example

4 If you want to start the satellite acquisition, then go to "Starting the Satellite Acquisition" on page 3-3.

Backing Up System Settings

When you change a system parameter and press ENTER, the system stores the settings to *firmware*. To commit these changes to long-term backup storage, you must save them to Electrically Erasable Programmable Read-Only Memory (EEPROM), as described in this section.

To backup your system settings

1 Be sure the Tech Setup code is 13 (edit mode). See "Viewing or Changing the Tech Setup Code" on page 4-1 for instructions.

2 From the TECH SETUP screen, press → until the SET TEST screen is displayed.

The *Test* field is highlighted. See Figure 4-14.

Figure 4-14. Set Test Screen – Test Field Selected

3 Press + or - to change the value to EEP SAVE.

4 Press ENTER to save your change.

The *User confirmation* field is highlighted. See Figure 4-15.

Figure 4-15. Set Test Screen – User Confirmation Field Selected

5 Press + or - to change the value to RUN NOW.

6 Press ENTER to save your change. (RUN NOW confirms that the selected test [EEP SAVE] will be *runnow*)

The system displays EEPROM SAVE while the operation is in progress. See Figure 4-16.

Figure 4-16. EEPROM SAVE – In Progress

IMPORTANT

Do not power off the system during this process until OPER DONE displays, indicating that the backup is complete.

OPER DONE displays when the settings are saved to EEPROM. See Figure 4-17.

Figure 4-17. Oper Done Screen

5 Antenna Control Unit (ACU)

This chapter describes the ACU and provides examples of the ACU screens, along with field descriptions (if applicable). Screen navigational tips are also provided.

ACU Control Panel

The TracStar i450M ACU supplies the power and commands required to operate the TracStar i450M antenna. It is also used to access programming and diagnostic information.

> A *Hadship* is also provided that can be used in place of the ACU display if there is a need for remote control or monitoring of the system.

Figure 5-1 shows the front control panel of the TracStar i450M ACU.

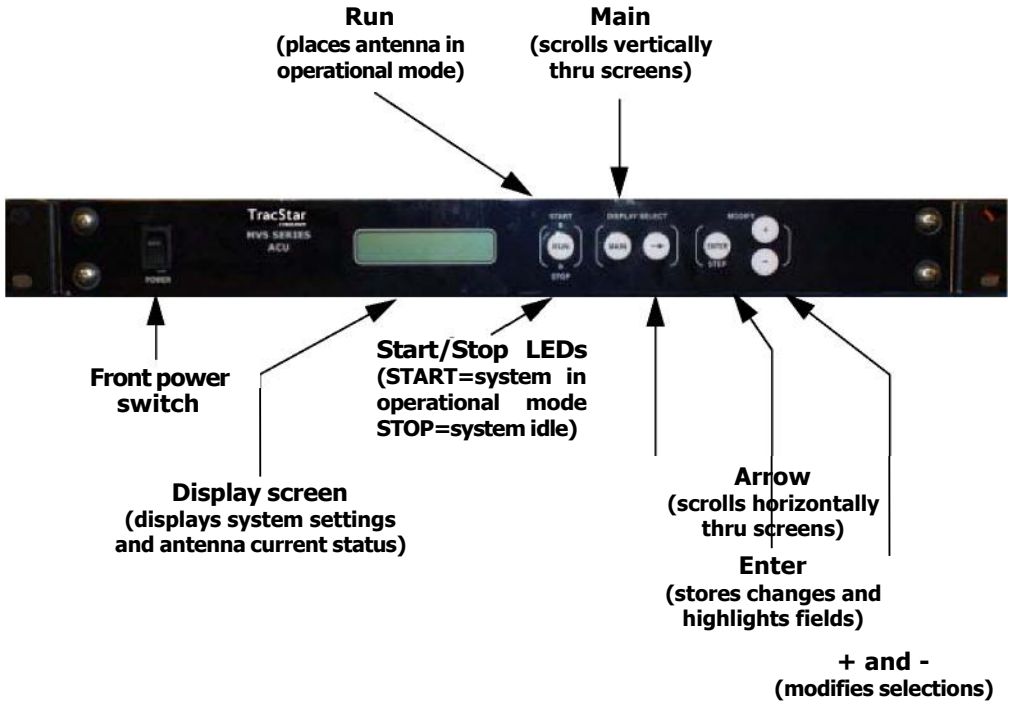


Figure 5-1. TracStar i450M ACU Control Panel

ACU Rear Panel

Figure 5-2 shows the rear panel of the TracStar i450M ACU.

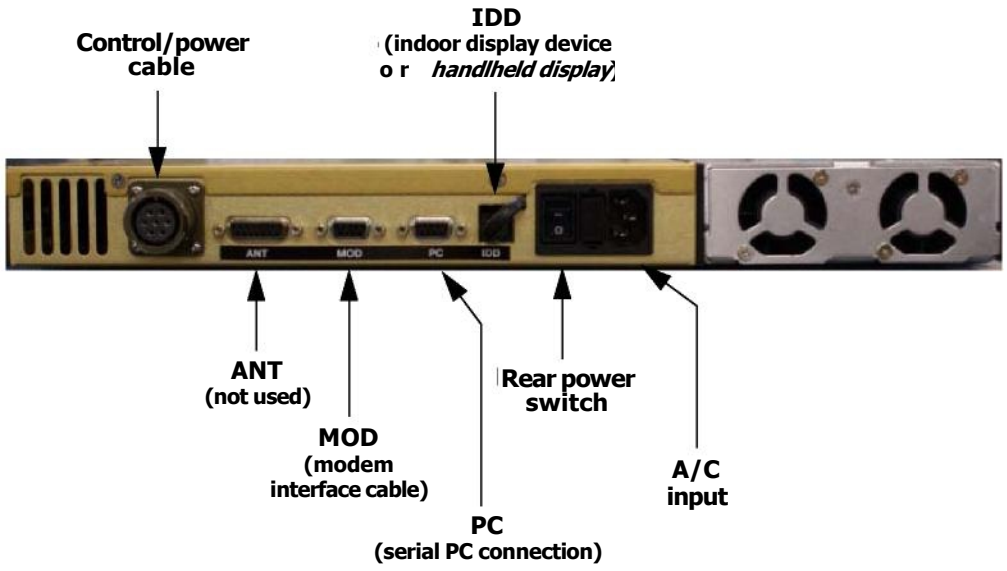


Figure 5-2. TracStar i450M ACU Rear Panel

> .**You can only activate the ACU display *or* the Handheld display—you cannot activate both at the same time.**

ACU Screen Display

There are four main groupings of screens involved in operating the ACU:

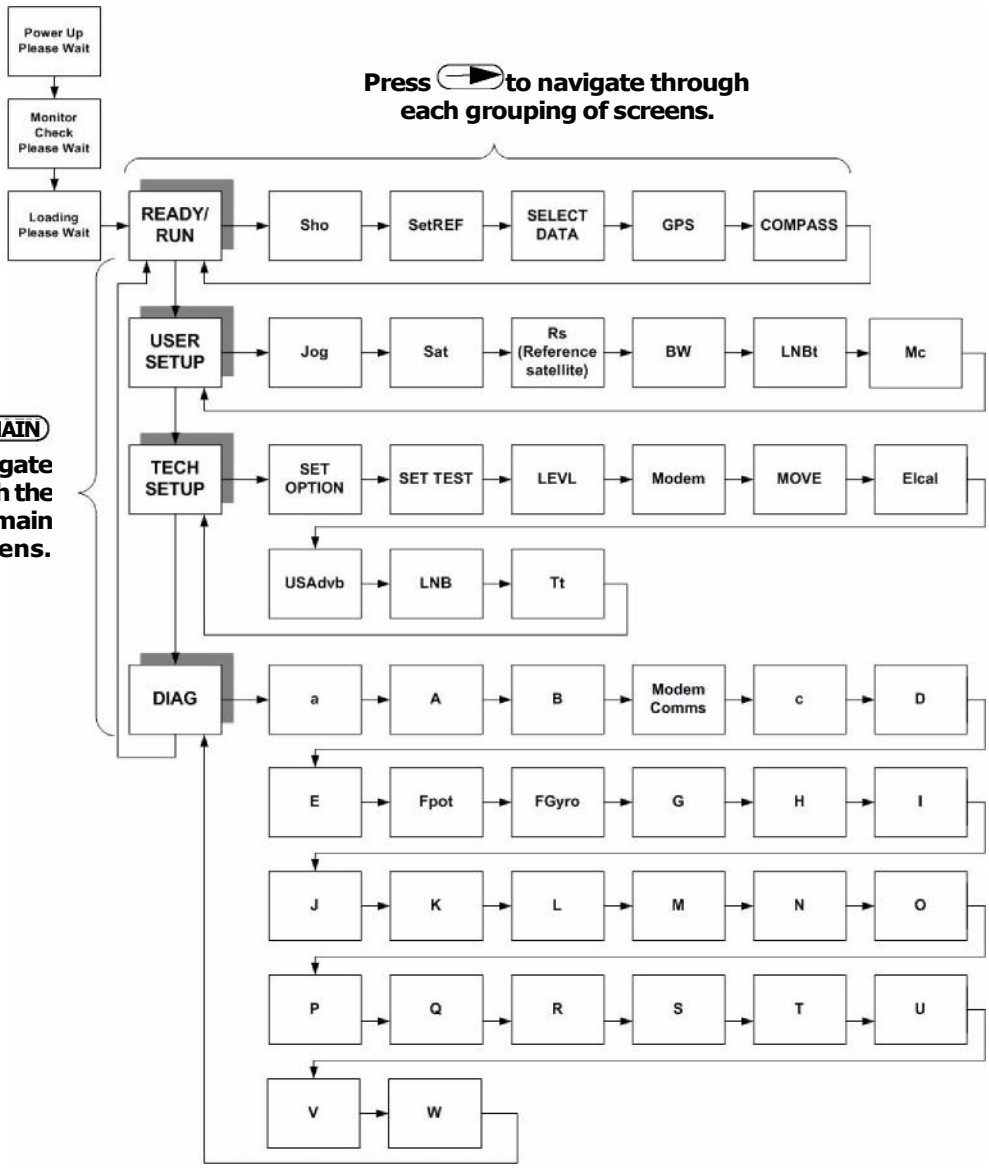
- **Ready/Run**
- **User Setup**
- **Tech Setup**
- **Diagnostics**

The screens are accessed on the ACU display screen, and each main screen has a grouping of associated screens, as shown in the screen layout in Figure 5-3.

> .**See "ACU Screen Navigation Tips" on page 5-4 for basic instructions on how to navigate among and within the ACU screens using the buttons on the front control panel.**

Figure 5-3. ACU Screen Display L0

ACU Screen Navigation Tips



asic instructions for navigating through the ACU screens and describes the buttons used to do the navigation.

Button functions

The following table describes the functions of the buttons on the ACU control panel used to navigate through the ACU screens.

Press this button...	To...
MAIN	move vertically through the four main screens: ? Ready/Run ? User Setup ? Tech Setup ? Diagnostics *Regardless of what operation displays on the ACU display screen, you can always return to the READY/RUN screen by pressing MAIN until READY/RUN displays.*
	move horizontally through a main function's group of screens.
ENTER	store a field change or switch between fields on a screen. *pressing ENTER on the last value entered before moving to the next screen; otherwise, the new value will not be stored.*
+ or -	modify values or settings for a highlighted field on a screen.

Blinking bars

Blinking bars ( ) may display on some screens, which indicate a highlighted field. If you change a field's value (using + or -), the blinking bars change to ?, –?– , or ?> (or a variation thereof) to indicate that the value has changed but has not been stored. You must press ENTER to store the change.

See "Backing Up System Settings" on page 4-10 to commit these changes to long-term backup storage.

Ready/Run Mode (READY and RUN Screens)

Figure 5-4 shows the flow of the READY and RUN screens.

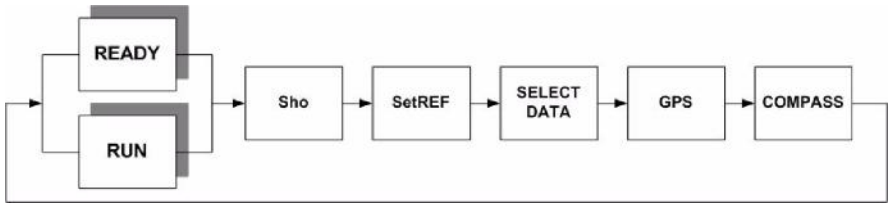


Figure 5-4. Ready/Run Screen Flow

Ready mode (READY Screen)

READY is the main or default screen and is displayed once the system is powered up. It displays the selected data satellite and orbital position (in degrees longitude). See Figure 5-5.

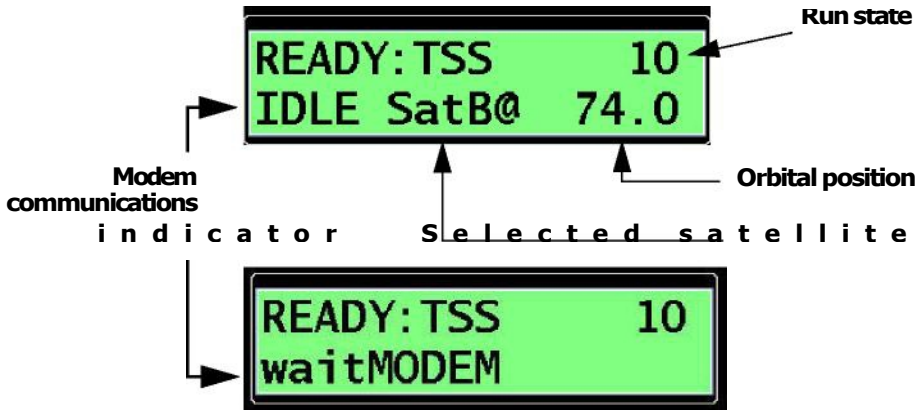


Figure 5-5. Ready Screen

Table 5-1. Ready Screen – Field Descriptions

Field	Description	Values
Run state	Indicates the antenna state.	10 = Idle
Modem communications indicator	Indicates whether the ACU is communicating with the modem.	IDLE = Modem communications exist; system is in standby. waitMODEM = No modem communications exist or the modem has not completed the boot process.

Table 5-1. Ready Screen – Field Descriptions

Field	Description	Values
Selected satellite	Indicates the data satellite selected.	SatA SatB
Orbital position	Indicates the orbital position of the selected data satellite in degrees longitude.	-180 – +180 *Positive degrees indicate West longitude; negative degrees indicate East longitude.*

Run mode (RUN Screen)

The RUN screen displays when you have activated the system and the antenna is either scanning for or tracking a satellite. It shows the angles for azimuth, elevation, polarity, and heading.

> The RUN screen only displays when the system is in run mode.

Figure 5-6. Run Screen

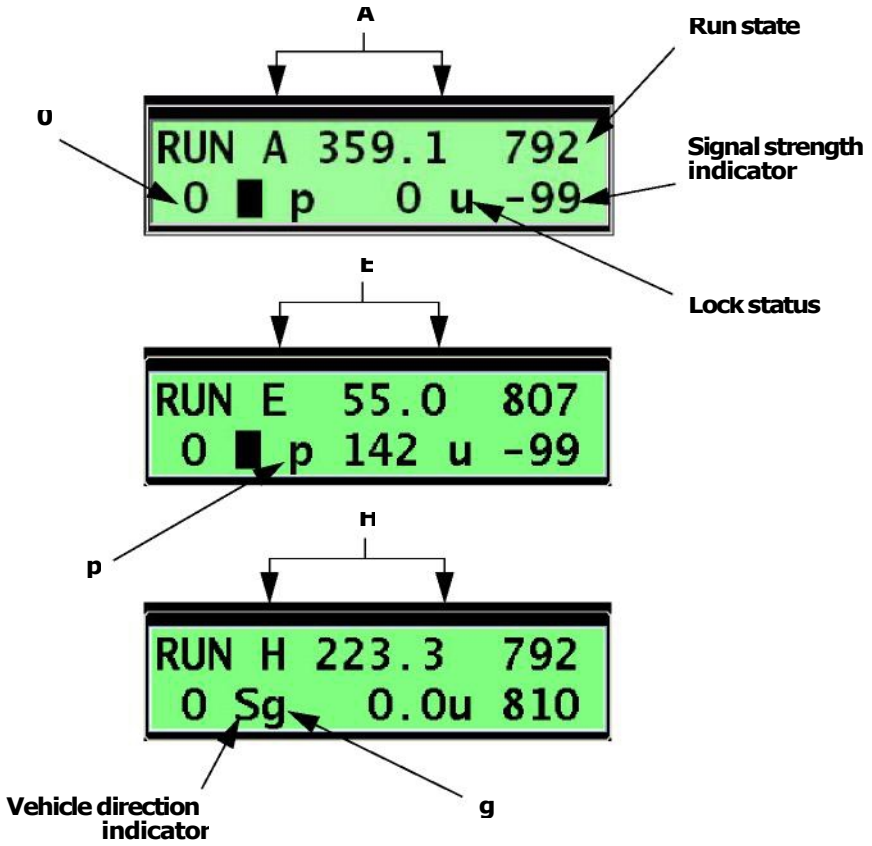


Table 5-2. Run Screen – Field Descriptions

Field	Description	Values
A	Azimuth position of the antenna.	0–360.
E	Elevation position of the antenna.	20–70.
H	Direction that the base of the antenna is pointing.	0–360°
Run state	Indicates the antenna state.	10 = Unit is powered on and ready. 792–796 =Adjusting gyro biases. 801 =Antenna calibration. 804 = Pole motors and elevation motors are moving to the calculated position based on satellite selection. 807 = Satellite search/scan. 901–902 = Antenna calibration when vehicle is in motion. 911–912 = Antenna detected a signal during search. Antenna will now do wider scans on azimuth to verify lock, increasing scan width by 50% on every pass. (Scan width [sw] is set on the diagnostic 'J' screen.) 931/B70–74 = Antenna is locked onto satellite and peaking. 941–942 = Antenna was already locked onto satellite and is now unlocked. Antenna will now do wider scans to lock on again, increasing scan width by 10% on every pass. (Scan width [sw] is set on the diagnostic 'J' screen.)
0	*Used for factory diagnostics.*	— —
Vehicle direction indicator	Indicates vehicle direction based on GPS readings.	S = Stationary F = Forward (current direction of vehicle) R = Reverse (current direction of vehicle) f = Forward (last direction of vehicle)
g	GPS heading	0–360.
p	Pedestal azimuth position in relation to the pedestal.	0–360.

Table 5-2. Run Screen – Field Descriptions

Field	Description	Values
Lock status	Indicates whether the antenna has locked onto a satellite.	u = Unlocked L = Locked x = No communication with modem
Signal strength indicator	Indicates the filtered value of actual signal strength from the modem.	-99 – +1600 *Values are in dB with no decimal (e.g., 1200 = 12.00 dB).*

Azimuth indication

Azimuth position is indicated in degrees. If the system is in jog mode or if it is in acquisition mode but has not yet acquired a satellite, azimuth is indicated as degrees with the front of the antenna as being 0 and the rear being 180°. After the system has acquired a satellite, azimuth is indicated as degrees with North being 0 and South being 180°.

Show Run Values (Sho Screen)

The Sho screen shows the angles for azimuth, elevation, and heading, regardless of whether the unit is in ready or run mode.

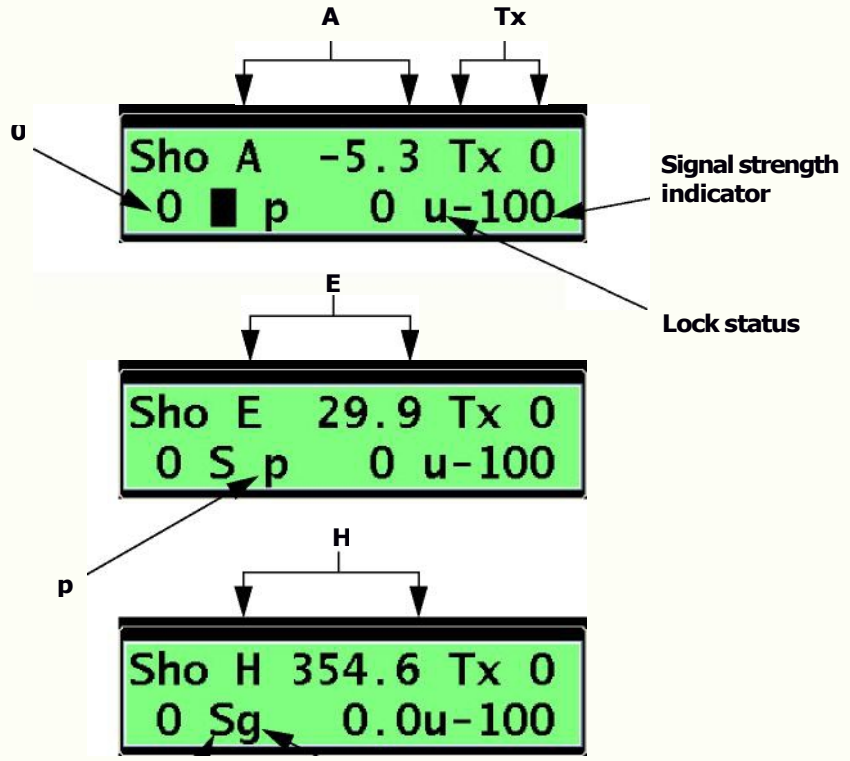


Figure 5-7. Sho Screen

Table 5-3. Sho Screen – Field Descriptions

Field	Description	Values
A	Azimuth position of the antenna.	0–360
E	Elevation position of the antenna.	20–70
H	Direction that the base of the antenna is pointing.	0–360
Tx	Transmit inhibit message, which indicates whether the last message sent to modem was online or offline.	6–8 = go online 2–4 = go offline
0	*Used for factory diagnostics.*	— —

Table 5-3. Sho Screen – Field Descriptions

Field	Description	Values
Vehicle direction indicator	Indicates vehicle direction based on GPS readings.	S = Stationary F = Forward (current direction of vehicle) R = Reverse (current direction of vehicle) f = Forward (last direction of vehicle) r = Reverse (last direction of vehicle)
g	GPS heading	0–360
p	Pedestal azimuth position in relation to the pedestal.	0–360
Lock status	Indicates whether the antenna has locked onto a satellite.	u = Unlocked L = Locked x = No communication with modem
Signal strength indicator	Indicates signal strength.	-99 – +1600 *Values are in dB with no decimal (e.g., 1200 = 12.00 dB).*

Azimuth indication

Azimuth position is indicated in degrees. If the system is in jog mode or if it is in acquisition mode but has not yet acquired a satellite, azimuth is indicated as degrees with the front of the antenna as being 0 and the rear being 180°. After the system has acquired a satellite, azimuth is indicated as degrees with North being 0 and South being 180°.

Set reference satellite (SetREF Screen)

This feature is not currently used.

Figure 5-8. SetRef Screen

Select data satellite (SELECT DATA Screen)

The SELECT DATA screen allows you to select one of the two pre-programmed data satellites (SatA or SatB) as well as change the data satellite orbital location.

> **For procedural information on selecting a data satellite or changing the data satellite orbital location, see "Viewing or Changing Data Satellite Information" on page 4-7.**

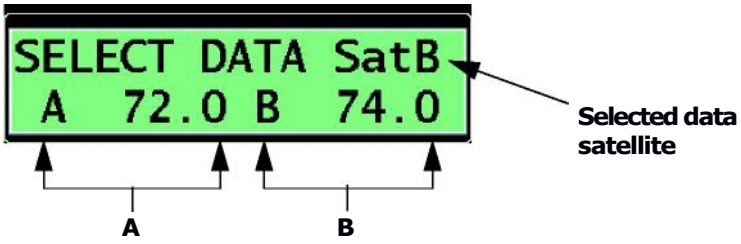


Figure 5-9. Select Data Screen

In Figure 5-9 data satellite A is set for 72.0 W, and data satellite B is set for 74.0 W. The system is set to acquire SatB.

Table 5-4. Select Data Screen – Field Descriptions

Field	Description	Values
Selected data satellite	Indicates the data satellite acquired by the system.	SatA SatB
A	Current longitude position of SatA.	-180 – +180 *Positive is West longitude; negative is East longitude.*
B	Current longitude position of SatB.	-180 – +180 *Positive is West longitude; negative is East longitude.*

GPS mode (GPS Screen)

The antenna system has an integrated GPS to aid in satellite acquisition. The GPS screen allows you to select between the built-in GPS (default) or manually input GPS coordinates (in case the GPS is unavailable). Power cycling the unit resets to default conditions.

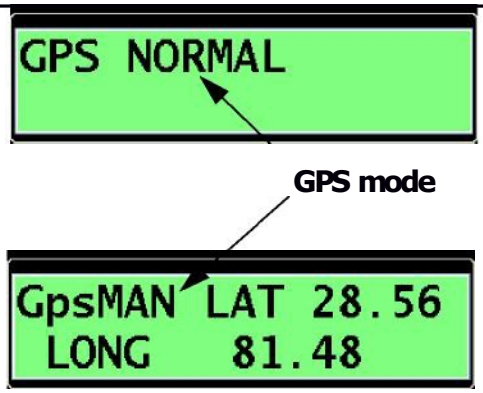


Figure 5-10. GPS Screen

Table 5-5. GPS Screen – Field Descriptions

Field	Description	Values
GPS mode	Indicates automatic or manual GPS coordinates.	NORMAL = Automatic MAN = Manual input
LAT*	Current latitude position.	-90 – +90 *Equator is 0; Positive number is North latitude; negative is South latitude.*
LONG*	Current longitude position.	-180 – +180 *Positive number is West longitude; negative is East longitude.*
** Coordinates are entered in degrees and decimals of degrees (versus minutes and seconds).*		

Manual compass input (COMPASS Screen)

This feature is not currently used.

Figure 5-11. Compass Screen

User Setup (USER SETUP Screen)

User Setup contains several interactive and setup screens, including antenna jog control and satellite parameter setup.

Figure 5-12 shows the flow of the User Setup screens.

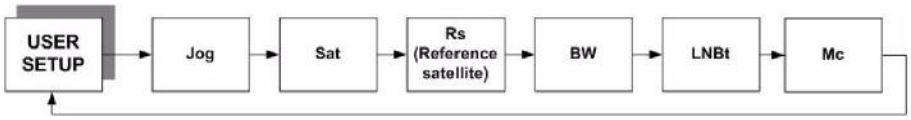


Figure 5-12. User Setup Screen Flow

The USER SETUP screen displays the antenna serial number and the software version. See Figure 5-13.

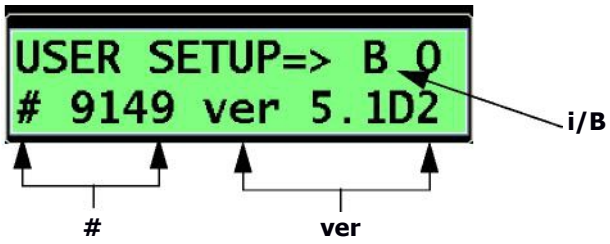


Figure 5-13. User Setup Screen

Table 5-6. User Setup Screen – Field Descriptions

Field	Description	Values
i/B	*Used for factory diagnostics.*	i b
#	Serial number of the antenna unit.	Factory set.
ver	TracStar i450M software version.	Factory set.

Antenna jog control (Jog Screen)

The Jog screen enables you to manually position the antenna in the azimuth, elevation, and polarization axes.

.If you are manually positioning the antenna, you must press RUN to activate the antenna motors. The START LED light blinks when the motors are enabled.

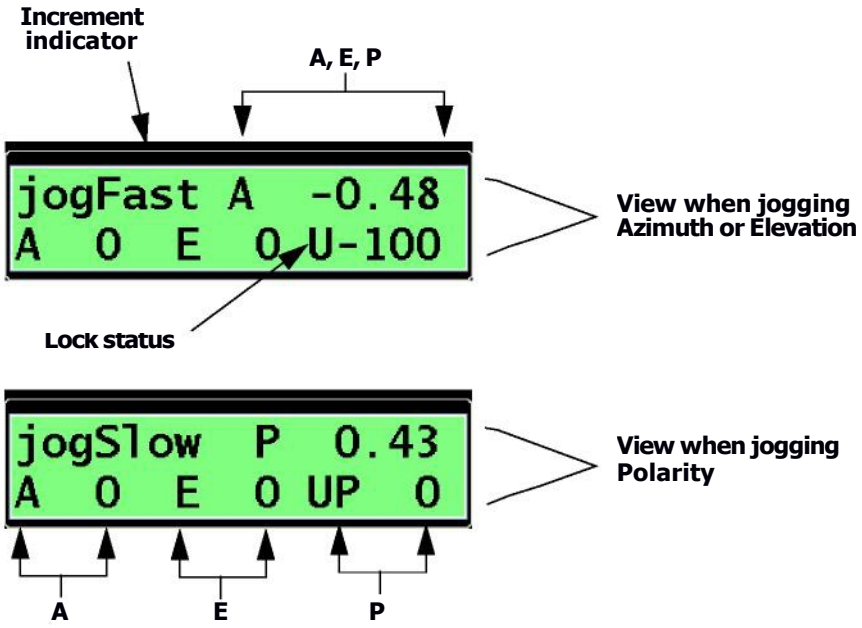


Figure 5-14. Jog Screen

Table 5-7. Jog Screen – Field Descriptions

Field	Description	Values
Increment indicator	Indicates fast or slow antenna jog increments.	Fast (1° steps) Slow (0.2° steps)
A (line 1)	Azimuth position of the antenna (current antenna position).	0–360°
E (line 1)	Elevation position of the antenna (current antenna position).	20–70°
P (line 1)	Polarization position of the antenna (current antenna position).	-90 to +90°
A (line 2)	Azimuth jog step increment.	-99 – +99
E (line 2)	Elevation jog step increment.	-99 – +99
P (line 2)	Polarization jog step increment.	-99 – +99
Lock status	Indicates whether the antenna has locked onto a satellite.	u = Unlocked L = Locked

Satellite parameters (Sat Screen)

This feature is not currently used.

Figure 5-15. Sat Screen

Reference satellite (Rs Screen)

This feature is not currently used.

Figure 5-16. Rs Screen

BW Screen

This feature is not currently used.

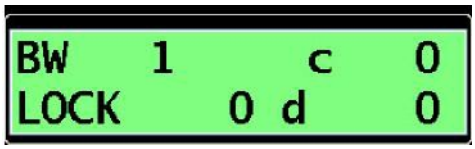


Figure 5-17. BW Screen

Lock method (LNBt Screen)

> This feature is not currently used.

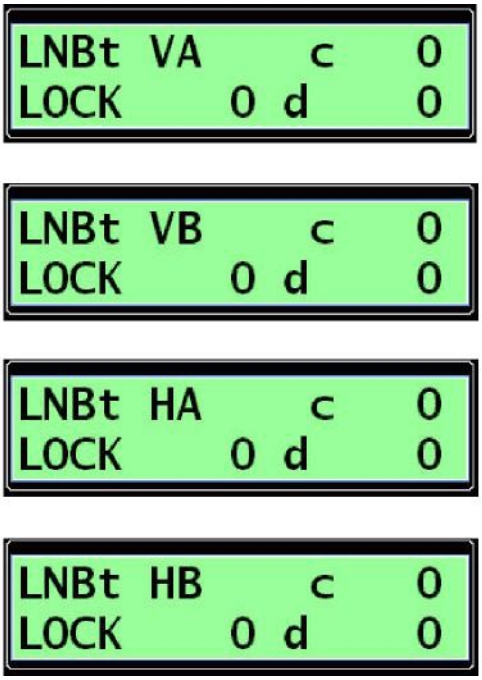


Figure 5-18. LNBt Screen

Communications monitor (Mc Screen)

The Mc screen is used for factory debugging.

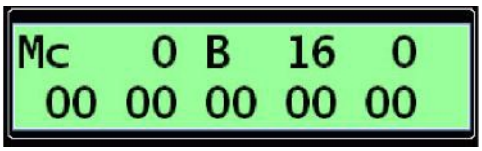


Figure 5-19. Mc Screen

Tech Setup (TECH SETUP Screen)

Tech Setup contains several interactive setup screens and provides the ability to enable/disable various sensors and motor drives. The Tech Setup screens are password-protected to prevent inadvertent or undesirable changes.

CAUTION: Antennas are typically shipped fully configured. Changing data in the ACU may render the antenna inoperable. Change ACU settings with caution.

Figure 5-20 shows the flow of the Tech Setup screens.

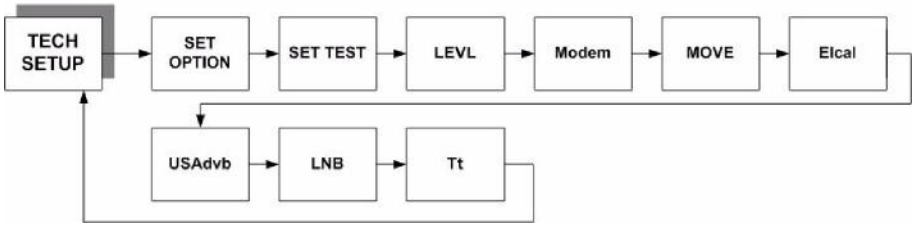


Figure 5-20. Tech Setup Screen Flow

The TECH SETUP screen enables the user to enter various codes, which unlock other features in the Tech Setup and User Setup screens. See Figure 5-21.

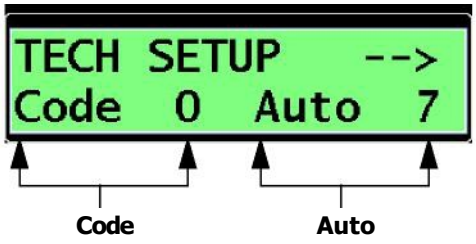


Figure 5-21. Tech Setup Screen

Table 5-8. Tech Setup Screen – Field Descriptions

Field	Description	Values
Code	Tech setup code.	0–60 *Must be set to 13 to change most system parameters.*
Auto	*For factory use only.*	7

IMPORTANT

If you want to change most system settings (such as data satellite information or scan velocity), you must change Code 0 to Code 13 (enable mode) on the TECH SETUP screen. See "Viewing or Changing the Tech Setup Code" on page 4-1.

Set Option (SET OPTION Screen)

The SET OPTION screen is used for special functions by factory personnel.

.This screen is enabled only when Code 13 is set on the TECH SETUP screen. See "Viewing or Changing the Tech Setup Code" on page 4-1 for procedural information.

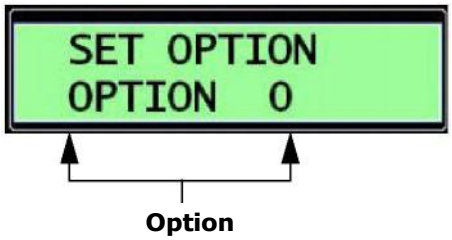


Figure 5-22. Set Option Screen (Enable Mode)

Table 5-9. Set Option Screen – Field Descriptions

Field	Description	Values
Option	Used for calibration and troubleshooting procedures	*For a list of system options, see Appendix E, "System Options".*

Set Test (SET TEST Screen)

Several test functions are available in Set Test.

.This screen is enabled only when Code 13 is set on the TECH SETUP screen. See "Viewing or Changing the Tech Setup Code" on page 4-1 for procedural information.

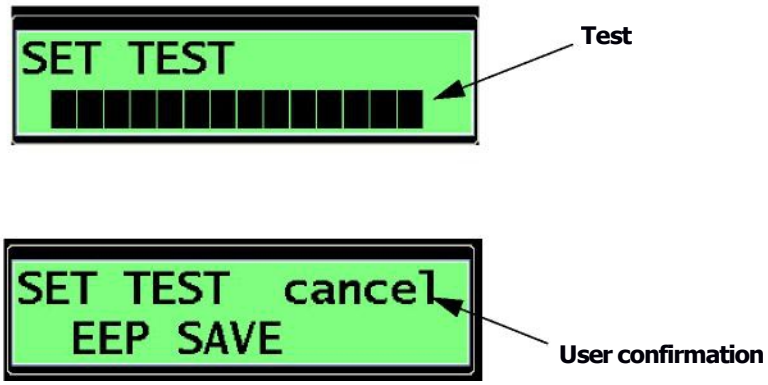


Figure 5-23. Set Test Screen

Table 5-10. Set Test Screen – Field Descriptions

Field	Description	Values
Test	Indicates test functions to be performed.	NONE SET PAZO (Not used) POLE TEST MECH CAL = Mechanical self-calibration of antenna. USA REF SETUP (Not used) CLEAR REF DATA (Not used) SCAN FREQ (Not used) SCAN Sky (Not used) EEP SAVE = Saves memory to EEPROM (Electrically Erasable Programmable Read-Only Memory). SHOW MOVEs = Pre-programmed motion exercise. *The above tests do not have input parameters—they are RUN or NOT RUN as a standard factory setup under direction of factory personnel.*
User confirmation	Confirms whether the selected test should be *canceled* or *run now*	cancel RUN NOW

Level/Gyro/Motor control (LEVL Screen)

The LEVL screen allows you to turn off the base-level sensors and the azimuth, elevation, and polarization motors. It also allows you to disable the internal gyroscopes.

> .You would normally only use this screen in a troubleshooting situation.

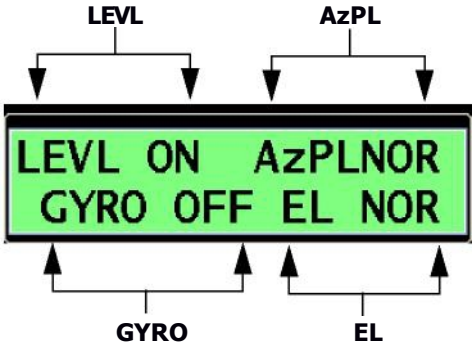


Figure 5-24. LEVL Screen

Table 5-11. LEVL Screen – Field Descriptions

Field	Description	Values
LEVL	Base-level sensor.	ON OFF
GYRO	Not applicable to this antenna. Gyros are always active and cannot be disabled.	OFF
AzPL	Azimuth and polarization motor.	NOR = Normal DIS = Disabled
EL	Elevation motor.	NOR = Normal DIS = Disabled

Downlink polarity and modem type (Modem Screen)

The Modem screen enables you to change downlink polarity and modem type. You can change one or both.

> See "Viewing or Changing Downlink Polarity or Modem Type" on page 4-3 for procedural information.

IMPORTANT

To change downlink polarity and modem type, you need to set the system to Code 13 on the TECH SETUP screen. See "Viewing or Changing the Tech Setup Code" on page 4-1.

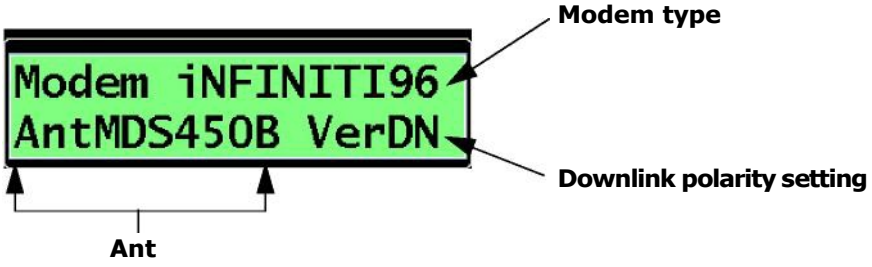


Figure 5-25. Modem Screen

Table 5-12. Modem Screen – Field Descriptions

Field	Description	Values
Modem type	Supported modem types.	None ComTech iNFINITI48 iNFINITI96 ComTech562
Ant	Supported antenna types.	MDS450 MDS450B If your antenna is: ? IMVS450 (side pod unit), then your antenna type is MDS450. ? i450M or IMVS450M (external BUC unit), then your antenna type is MDS450B.
Downlink polarity setting	Indicates the receive polarization for the antenna.	HorzDN = horizontal downlink VerDN = vertical downlink

Safety features (MOVE Screen)

All safety features for the TracStar i450M system are preset by TracStar and cannot be changed.

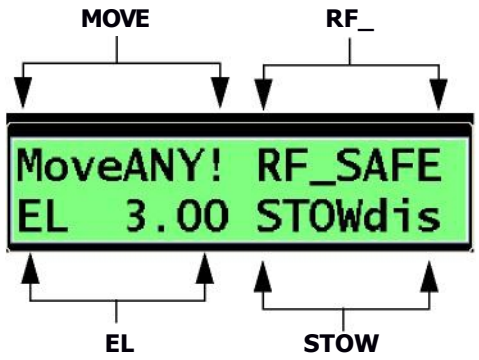


Figure 5-26. Move Screen

Elevation calibration setting (Elcal Screen)

The Elcal screen shows the elevation calibration point as set by the factory.

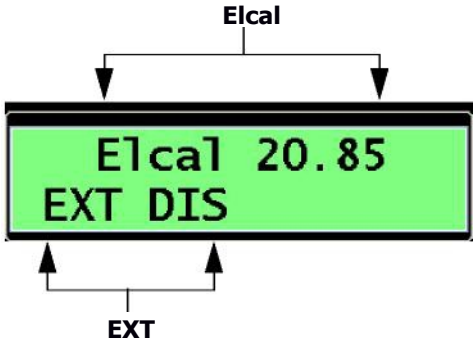


Figure 5-27. Elcal Screen

Table 5-13. Elcal Screen – Field Descriptions

Field	Description	Values
Elcal	Elevation calibration offset.	18–24 (typically)
EXT	External disable.	*Not used.*

Tuner Frequency Setup (USAdvb Screen)

This feature is not currently used.

Figure 5-28. USAdvb Screen

Signal detector settings (LNB Screen)

The TracStar i450M system has a built-in RF signal strength detector. The amount of satellite frequency energy received by the system is converted to a three-digit no. that can be viewed on this page.

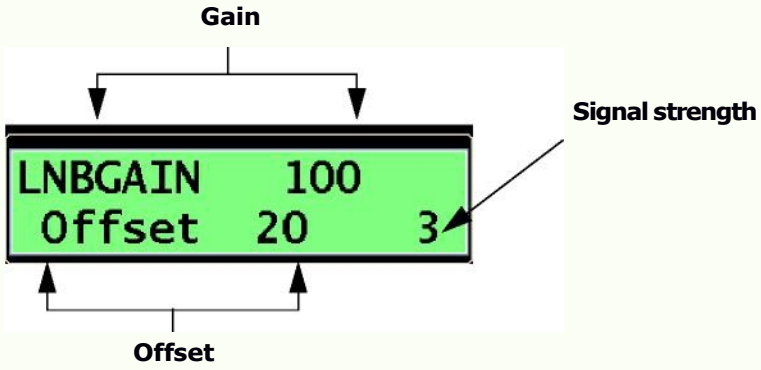


Figure 5-29. LNB Screen

Table 5-14. LNB Screen – Field Descriptions

Field	Description	Values
Gain	Adjust the gain of the LNB as seen by the i450M signal strength detector.	100 (nominal setting)
Offset	LNB noise offset as seen by the i450M signal strength detector.	20
Signal strength	Received signal strength as seen by the internal i450M signal strength detector.	0–200

Factory test (Tt Screen)

The Tt screen is a factory test screen.

CAUTION: These values are set by the factory—do not change. Changing these settings will cause the unit to function erratically or not at all.

Figure 5-30. Tt Screen

Diagnostics (DIAG Screen)

Diagnostics includes information on antenna pointing angles, level sensor readings, GPS data, and other system information.

Figure 5-31 shows the flow of the Diagnostics screens.

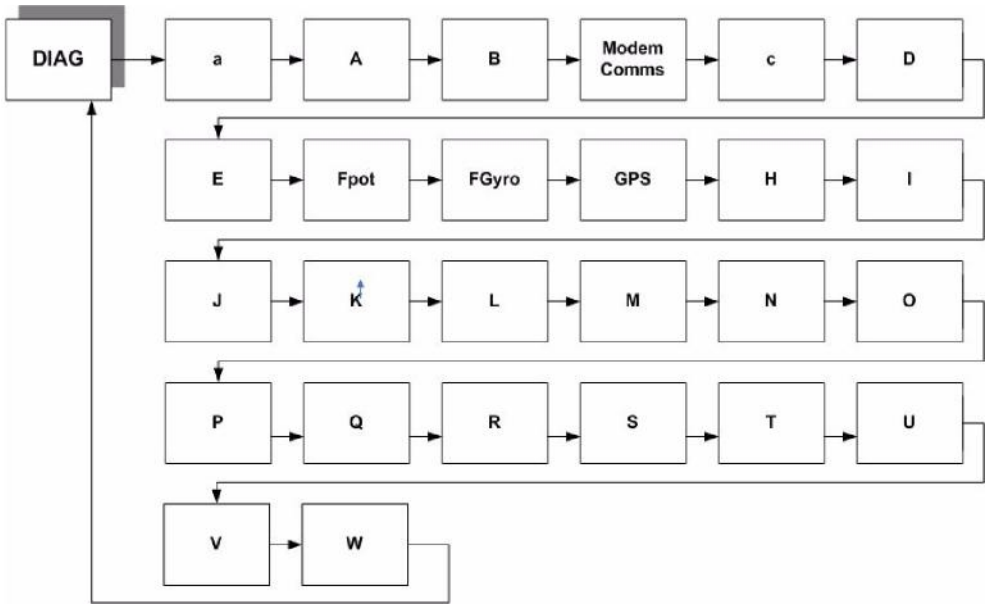


Figure 5-31. Diagnostics Screen Flow

The main diagnostic screen (DIAG) indicates the tracking state of the antenna, vehicle direction, and modem communications state. It also allows you to set system variables, which are further defined on the diagnostics screens described in this section.

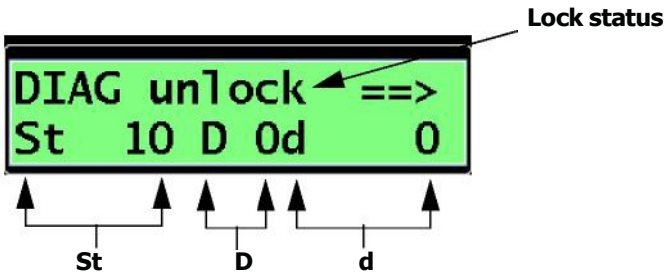


Figure 5-32. Diag Screen

Table 5-15. Diag Screen – Field Descriptions

Field	Description	Values
Lock status	Indicates whether the antenna has locked onto a satellite.	unlock LOCKED waitMODEM = No communication with modem (or modem has not completed boot process)
St	State of the antenna.	10 = Unit is powered on and ready. 792–796 =Adjusting gyro biases. 801 =Antenna calibration. 804 = Pole motors and elevation motors are moving to the calculated position based on satellite selection. 807 = Satellite search/scan. 901–902 = Antenna calibration when vehicle is in motion. 911–912 = Antenna detected a signal during search. Antenna will now do wider scans on azimuth to verify lock, increasing scan width by 50% on every pass. (Scan width [sw] is set on the diagnostic 'J' screen.) 931/B70–74 = Antenna is locked onto satellite and peaking. 941–942 = Antenna was already locked onto satellite and is now unlocked. Antenna will now do wider scans to lock on again, increasing scan width by 10% on every pass. (Scan width [sw] is set on the diagnostic 'J' screen.)
D	Direction of the vehicle based on GPS readings.	0 = Stationary 1 = Forward motion
d	*For factory use only.*	—

Signal strength (a Screen)

The diagnostic 'a' screen displays the reported $_{Eb/N0}$ from the modem as well as elevation tracking information.

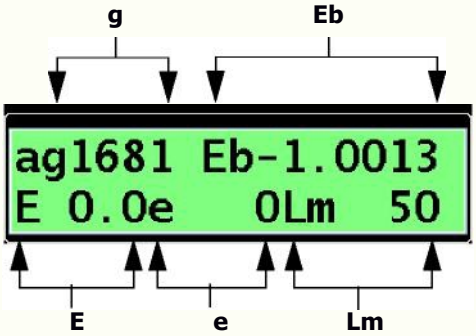


Figure 5-33. Diagnostic 'a' Screen

Table 5-16. Diagnostic 'a' Screen – Field Descriptions

Field	Description	Values
g	Signal quality from the in-built tuner.	*For factory use only.*
Eb	Indicates $E_{b/N0}$ or signal strength value. $E_{b/N0}$ is reported by the modem; signal strength is determined by the onboard tuner.	-99 – +99
E	Indicates the total value of correction in elevation from the calibration point when tracking (in degrees).	≤ 2.0 *If > 2.0, then make adjustments on the Elcal screen. See "Elevation calibration setting (Elcal Screen)" on page 5-23.*
e	Indicates the steering value in elevation from step track. This adjusts the E value.	+ value = If elevation is being commanded to raise. - value = If elevation is being commanded to lower.
Lm	Indicates the value used to determine whether vehicle is stationary.	*Values less than 100 indicate stationary.*

Azimuth and elevation (A Screen)

The diagnostic 'A' screen indicates the azimuth and elevation angles of the antenna.

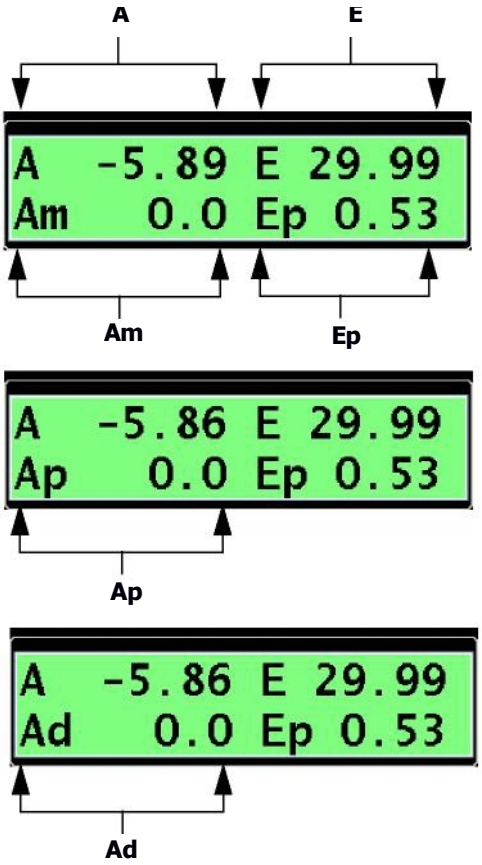


Figure 5-34. Diagnostic 'A' Screen

Line 1 shows the antenna azimuth A and elevation E angles. Azimuth is relative to the earth when locked onto a satellite. Before locking onto a satellite, the azimuth angles are referenced to the antenna base with the front of the antenna being 0°. Elevation angles are always referenced to the horizon being 0°.

Line 2 indicates the azimuth and elevation angles, relative to the pedestal coordinates.

Table 5-17. Diagnostic 'A' Screen – Field Descriptions

Field	Description	Values
A	Antenna azimuth angle.	0–360°
E	Antenna elevation angle.	20–70°
Am	Azimuth position according to motor encoder.	0–360°
Ep	Elevation angle correction due to base tilt.	-12 – +12

Table 5-17. Diagnostic 'A' Screen – Field Descriptions

Field	Description	Values
Ap	Azimuth position according to optical encoder in base.	0–360°
Ad	Angle difference between Am and Ap.	-1 – +1

Gyro bias and polarity angle offset (B Screen)

The diagnostic 'B' screen displays the gyro bias settings and polarization angle of the antenna.

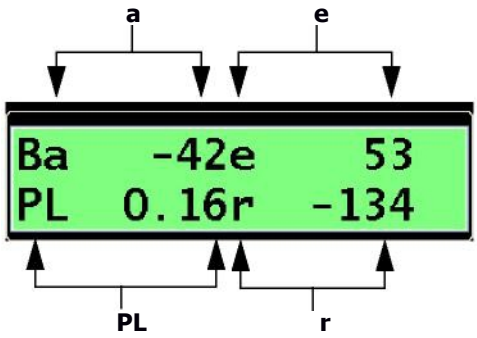


Figure 5-35. Diagnostic 'B' Screen

Table 5-18. Diagnostic 'B' Screen – Field Descriptions

Field	Description	Values
a	Bias value of the azimuth gyro.	-2000 – +2000
e	Bias value of the elevation gyro.	-2000 – +2000
PL	Calculated polarization offset in degrees from current position to the selected data satellite.	-90 – +90
r	Bias value of the Roll gyro.	-2000 – +2000

Modem Communications (Modem Communications Screen)

The diagnostic Modem Communications screen displays the last test string received from the modem (therefore, the screen display varies) or indicates that no communication with modem exists.

Figure 5-36. Diagnostic Modem Communications Screen

Table 5-19. Diagnostic Modem Communications Screen – Field Descriptions

Field	Description	Values
Communications string	Displays the last reply received from the modem.	NONE = No communication with modem. [*text string*] = Last text string received from modem.
Command counter	Increments one digit for each reply received from the modem.	1–5 *This field displays only when communication with modem exists.*

Modem communications monitor (c Screen)

The diagnostic 'c' screen displays the number of modem messages received on the serial port when connected to modems capable of two-way communication.

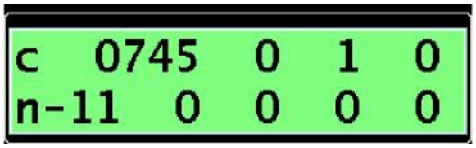


Figure 5-37. Diagnostic 'c' Screen

Table 5-20. Diagnostic 'c' Screen – Field Descriptions

Field	Description	Values
[*all fields*]	*For factory use only.*	—

Factory diagnostics (D Screen)

> This feature is not currently used.

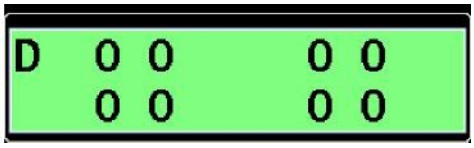


Figure 5-38. Diagnostic 'D' Screen

Base tilt angle (E Screen)

The values on the diagnostic 'E' screen are the pedestal base tilt angles as measured by the tilt sensors.

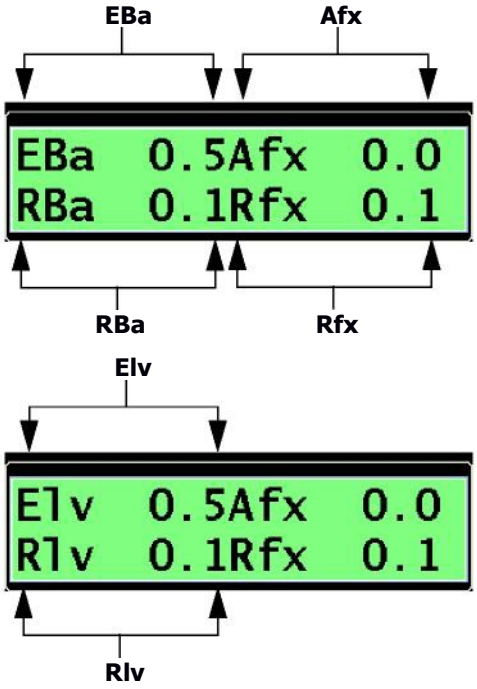


Figure 5-39. Diagnostic 'E' Screen

Table 5-21. Diagnostic 'E' Screen – Field Descriptions

Field	Description	Values
EBa	Calculated elevation base angle.	-12 – +12
Afx	Azimuth adjustment due to base tilt.	-12 – +12
RBa	Calculated roll base angle.	-12 – +12
Rfx	Roll adjustment due to base tilt.	-12 – +12
Elv	Elevation base angle reading from the inclinometer.	-12 – +12
Rlv	Roll base angle reading from the inclinometer.	-12 – +12

Inclinometer values (Fpot Screen)

The diagnostic Fpot screen displays real-time digitized readings from the elevation and roll inclinometers.

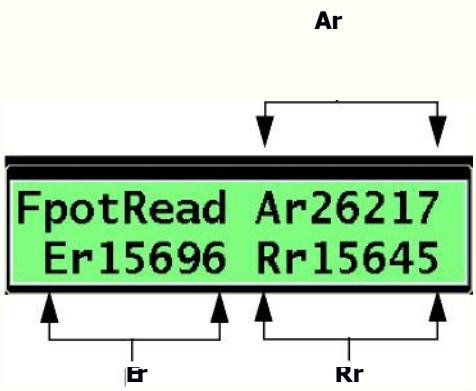


Figure 5-40. Diagnostic Fpot Screen

Table 5-22. Diagnostic Fpot Screen – Field Descriptions

Field	Description	Values
Ar	*Not used.*	—
Er	Elevation reading.	13,000 – 18,000
Rr	Roll reading.	13,000 – 18,000

Gyroscope readings (FGyro Screen)

The diagnostic FGyro screen displays the output from the three-axis gyroscope sub-assembly.

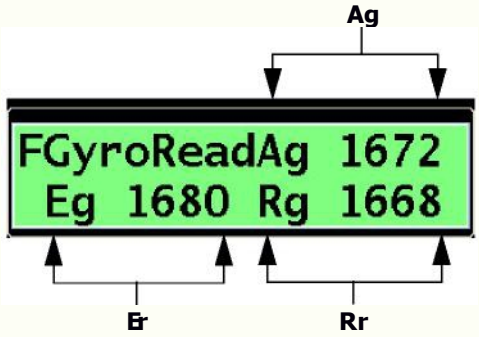


Figure 5-41. Diagnostic FGyro Screen

Table 5-23. Diagnostic FGyro Screen – Field Descriptions

Field	Description	Values
Ag	Azimuth gyro.	0–3000 *Near 1650 when stationary.*
Eg	Elevation gyro.	0–3000 *Near 1650 when stationary.*
Rg	Roll gyro.	0–3000 *Near 1650 when stationary.*

GPS position data (G Screen)

The diagnostic 'G' screen provides the GPS position data and status. For GPS to work, you have to have a minimum of three signals.

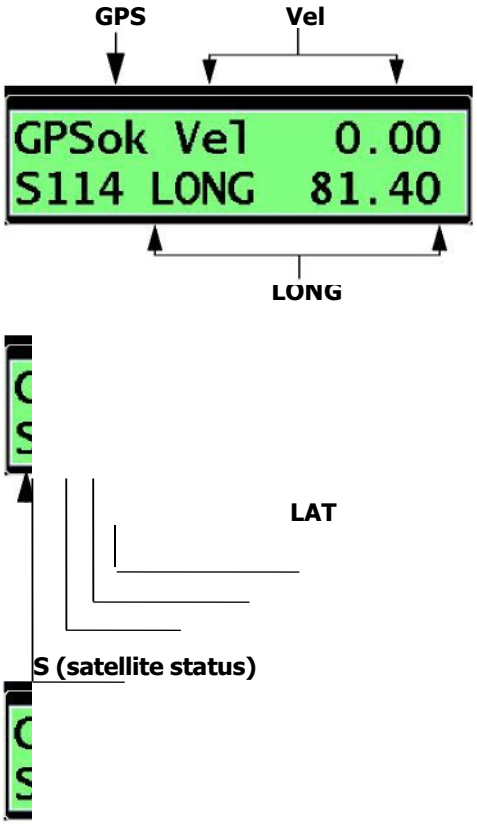


Figure 5-42. Diagnostic 'G' Screen

Table 5-24. Diagnostic 'G' Screen – Field Descriptions

Field	Description	Values
GPS	Indicates current GPS status.	?? = GPS position not found ok = GPS position locked
Vel	Indicates vehicle velocity in knots.	0.00–100.00

Table 5-24. Diagnostic 'G' Screen – Field Descriptions

Field	Description	Values
S[*xyz*]	GPS satellite status.	xyz, where: ? *x* indicates GPS lock status: -- *1* or 0 = unlocked (no current valid GPS location) -- 1 = currently locked ? *y* indicates GPS lock status since last power up: -- 0 = not received -- 1 = received ? *z* indicates the number of GPS satellites currently being received.
LAT	Indicates current latitude of the system.	-90 – +90°
LONG	Indicates current longitude of the system.	-180 – +180°
HEAD	Indicates current GPS heading when the vehicle is in motion.	0–360°

Inclinometer calibration value (H Screen)

The diagnostic 'H' screen displays the center value for the elevation and roll inclinometers.

CAUTION: Do not change without assistance from factory personnel.

Ac

Figure 5-43. Diagnostic 'H' Screen

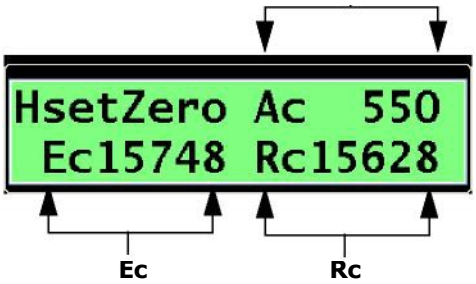


Table 5-25. Diagnostic 'H' Screen – Field Descriptions

Field	Description	Values
Ac	*Not used.*	—
Ec	Elevation inclinometer calibration setting at 0° base angle.	15,000–16,500
Rc	Roll inclinometer calibration setting at 0° base angle.	15,000–16,500

Attitude offset settings (I Screen)

> This feature is not currently used.

Figure 5-44. Diagnostic 'I' Screen

Scan width and scan velocity (J Screen)

The diagnostic 'J' screen allows you to set the width of the azimuth scan used during the initial satellite acquisition as well as set the azimuth scan velocity.

> See "Viewing or changing scan velocity" on page 4-4 for procedural information.

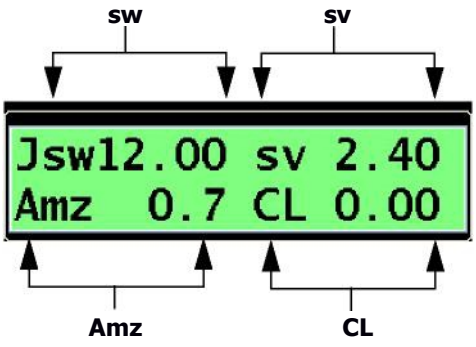


Figure 5-45. Diagnostic 'J' Screen

Table 5-26. Diagnostic 'J' Screen – Field Descriptions

Field	Description	Values
sw	Scan width in degrees when near target satellite.	12.00–15.00 (typical)
sv	Scan velocity.	*See "Viewing or changing scan velocity" on page 4-4 to adjust scan velocity settings to match the desired modem type.*
Amz	Azimuth offset added to compensate for offset in vehicle to-antenna installation.	0–5
CL	*For factory use in initial calibration.*	— — *Refer to the "TracStar On-the Move Calibration and Road Test Procedure" (Doc. No. PI-710-030).*

Gyro temperature (K Screen)

The diagnostic 'K' screen displays the temperature inside the gyro sub assembly.

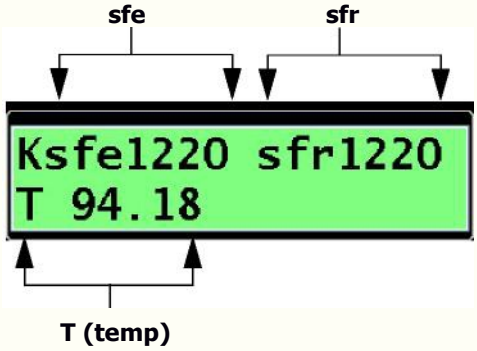


Figure 5-46. Diagnostic 'K' Screen

Table 5-27. Diagnostic 'K' Screen – Field Descriptions

Field	Description	Values
sfe	Scale factor elevation.	*Not used.*
sfr	Scale factor roll.	*Not used.*
T	Gyro temp in degrees fahrenheit.	-20 – +122°

Azimuth motor commands (L Screen)

The diagnostic 'L' screen displays real-time azimuth motor commands.

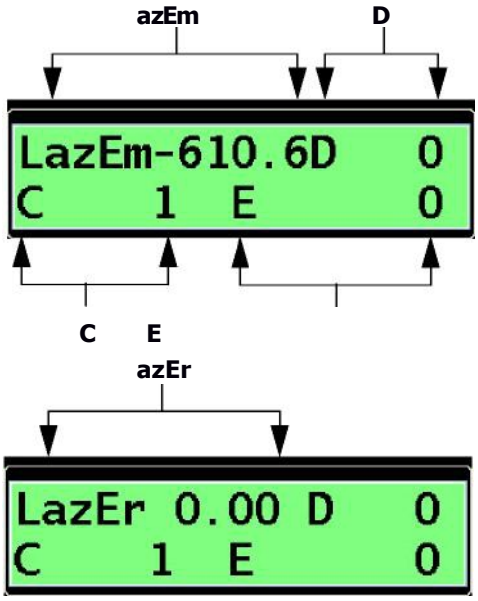


Figure 5-47. Diagnostic 'L' Screen

Table 5-28. Diagnostic 'L' Screen – Field Descriptions

Field	Description	Values
azEM	Azimuth motor position.	.09 – +.1
azEr	Servo position error.	-.04 – +.03
D	DAC value.	-120 – +120
C	Current value.	-100 – +100
E	Encoder counts.	-999,999 – +999,999

Elevation motor commands (M Screen)

The diagnostic 'M' screen displays real-time elevation motor commands.

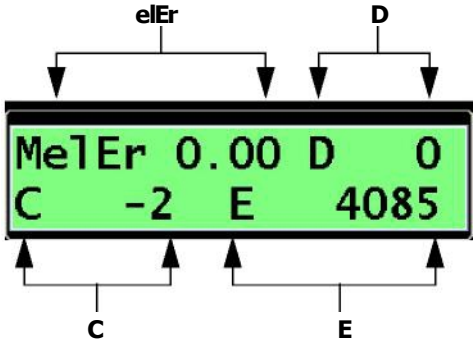


Figure 5-48. Diagnostic 'M' Screen

Table 5-29. Diagnostic 'M' Screen – Field Descriptions

Field	Description	Values
elEr	Servo position error.	-.1 – +.18
D	DAC value.	-120 – +120
C	Current value.	-100 – +100
E	Encoder counts.	0–9999

Polarizer motor commands (N Screen)

The polarization motor commands are issued by the polarizer motor microcontroller and are not displayed here.

Figure 5-49. Diagnostic 'N' Screen

Azimuth encoder scale factor (O Screen)

The diagnostic 'O' screen displays azimuth encoder motor scale factors.

CAUTION: Do not change without assistance from factory personnel.

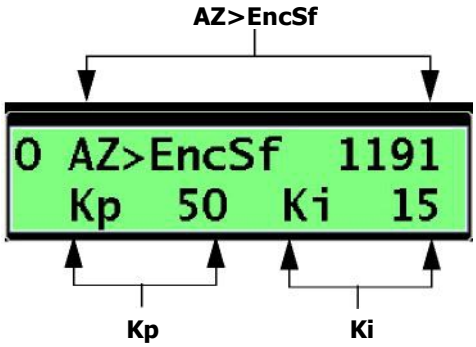


Figure 5-50. Diagnostic 'O' Screen

Table 5-30. Diagnostic 'O' Screen – Field Descriptions

Field	Description	Values
AZ>EncSf	Azimuth encoder scale factor.	1191
Kp	Servo loop data.	50
Ki	Servo loop data.	15

Azimuth servo parameters (P Screen)

The diagnostic 'P' screen displays the azimuth servo parameters.

CAUTION: Do not change without assistance from factory personnel.

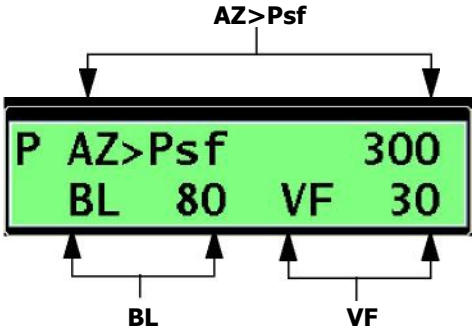


Figure 5-51. Diagnostic 'P' Screen

Table 5-31. Diagnostic 'P' Screen – Field Descriptions

Field	Description	Values
AZ>Psf	Azimuth pot scale factor.	300
BL	Servo parameters.	80
VF	Servo parameters.	30

Elevation encoder scale factor (Q Screen)

The diagnostic 'Q' screen displays the elevation encoder scale factor.

CAUTION: Do not change without assistance from factory personnel.

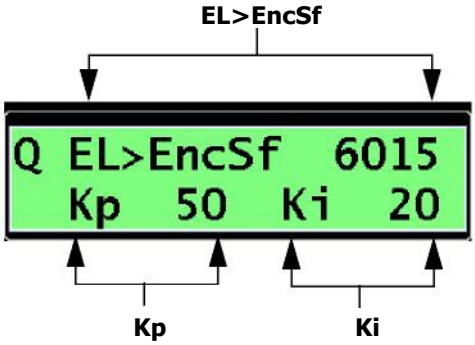


Figure 5-52. Diagnostic 'Q' Screen

Table 5-32. Diagnostic 'Q' Screen – Field Descriptions

Field	Description	Values
EL>EncSf	Elevation encoder scale factor.	6015
Kp	Servo loop data.	50
Ki	Servo loop data.	20

Elevation servo parameters (R Screen)

The diagnostic 'R' screen displays the elevation servo parameters.

CAUTION: Do not change without assistance from factory personnel.

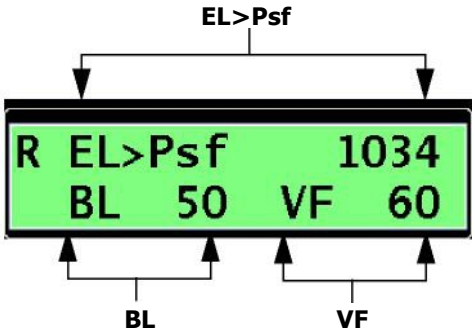


Figure 5-53. Diagnostic 'R' Screen

Table 5-33. Diagnostic 'R' Screen – Field Descriptions

Field	Description	Values
EL>Psf	Elevation pot scale factor.	1034
BL	Servo parameters.	50
VF	Servo parameters.	60

Polarizer calibration values (S Screen)

The diagnostic 'S' screen displays the polarizer calibration settings for both the transmit and receive polarizers.

CAUTION: Do not change without assistance from factory personnel.

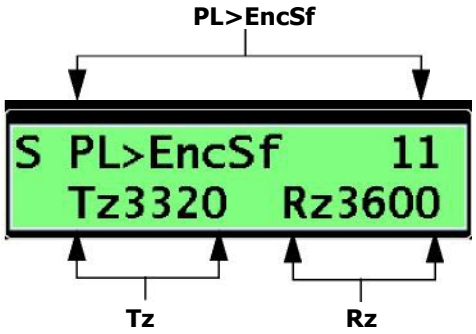


Figure 5-54. Diagnostic 'S' Screen

Table 5-34. Diagnostic 'S' Screen – Field Descriptions

Field	Description	Values
PL>EncSf	Polarizer encoder scale factor.	*Not used.*
Tz	Offset value to calibrate transmit polarizer to 0° polarization offset.	0–5000 *To adjust the transmit polarizer for cross-pol isolation, refer to the "TracStar On-the-Move Calibration and Road Test Procedure" (Doc. No. PI-710-030).*
Rz	Offset value to calibrate receive polarizer to 0° polarization offset.	0–5000

Polarizer scale factor (T Screen)

The diagnostic 'T' screen displays the encoder scale factors for both the transmit and receive polarizers.

CAUTION: Do not change without assistance from factory personnel.

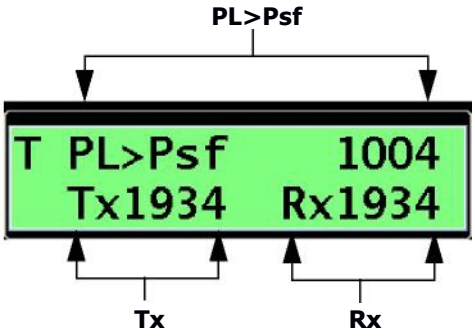


Figure 5-55. Diagnostic 'T' Screen

Table 5-35. Diagnostic 'T' Screen – Field Descriptions

Field	Description	Values
PL>PsF	Polarizer pot scale factor.	*Not used.*
Tx	Transmit polarizer scale factor.	1934
Rx	Receive polarizer scale factor.	1934

Unused (U Screen)

> This feature is not currently used.

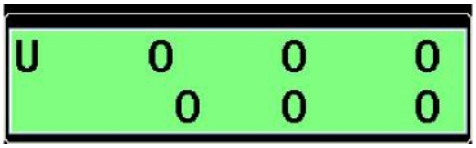


Figure 5-56. Diagnostic 'U' Screen

Azimuth tracking parameters (V Screen)

The diagnostic 'V' screen is used to set azimuth track parameters.

> See "Viewing or changing azimuth track settings" on page 4-6 for procedural information.

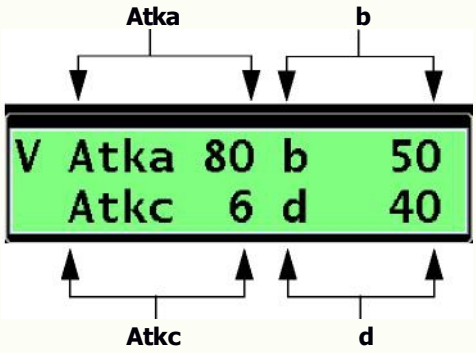


Figure 5-57. Diagnostic 'V' Screen

Table 5-36. Diagnostic 'V' Screen – Field Descriptions

Field	Description	Values
Atka	Gain.	40–100
b	Integrator gain.	50
Atkc	Integrator reset.	6–10
d	Reset for position adjustment.	20–40

Elevation tracking parameters (W Screen)

The diagnostic 'W' screen is used to set elevation track parameters.

See "Viewing or changing elevation track settings" on page 4-6 for procedural information.

Etka b

Figure 5-58. Diagnostic 'W' Screen

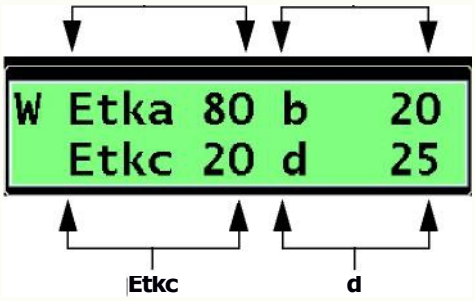


Table 5-37. Diagnostic 'W' Screen – Field Descriptions

Field	Description	Values
Etka	Gain.	80–100
b	Intergrator gain.	0–20
Etkc	Intergrator reset.	20
d	Delay time for box step.	0–50

A Product Specifications

Table A-1 provides the technical specifications for the TracStar i450M antenna.

Table A-1. TracStar i450M Technical Specifications

REFLECTOR/PEDESTAL	
? **Size** ? **Mount geometry** ? **Polarization**	? **45cm elliptical equivalent** ? **Elevation over azimuth** ? **Linear phase shift**
TRAVEL	
? **Azimuth** ? **Elevation** ? **Polarization**	? **360° continuous** ? **20–70°** ? **±95°**
TRACKING	
? **Acceleration** ? **Velocity** ? **Meets FCC Part 25.222**	? **>200°/s2** ? **>100°/s**
INTERFACES	
? **RF** ? **ACU** ? **Power** ? **Graphic**	? **Tx/Rx 50 ohms at 950–2150 MHz** ? **25 ft. cable with connectors** ? **110-230 VAC, 50/60 Hz, 500 watts (typical)** ? **2-line menu display**
Note: Specifications are subject to change without notice.	

Table A-1. TracStar i450M Technical Specifications (Continued)

ANTENNA CHARACTERISTICS	
? **Transmit frequency (14.0–14.5 GHz)**	? **35.5 dBi**
? **Receive frequency (10.95–12.75 GHz)**	? **31.5 dBi**
? **EIRP (typical with radome)**	
-- 25W BUC	**-- 46.5 dBw**
-- 40W BUC	**-- 48.6 dBw**
-- 80W BUC	**-- 51.6 dBw**
? **G/T (typical with radome)**	? **11.5 dB/K**
SYSTEM PERFORMANCE	
? **Transmit**	? **Up to 4 Mbps**
? **Receive**	? **Up to 45 Mbps**
	Data rate performance is a function of the satellite link (Beam EIRP & G/T) and modem configuration.
? **FCC**	? **13.5 dBw/4 Khz**
? **ITU**	? **19.5 dBw/4 Khz**
	Maximum EIRP density allowed without waivers.
WEIGHTS & MEASURES	
? **Antenna system -- Weight (BUC included) -- Dimensions**	**-- 142 lbs (64.4kg) -- 54.2 x 45.0 X 11.8 in (137.71 x 114.3 x 30.2 cm)**
? **Handheld display unit -- Weight -- Dimensions**	**-- 0.5 lbs (.22kg) -- 5 1/2"W x 3 1/4"D x 1 3/8"H (114.3 x 29.2 cm)**
? **ACU (1RU rack mount) -- Weight -- Dimensions**	**-- 8.0 lbs (3.6kg) -- 19.0"W x 8.0"D x 1.75"H (48.2 x 34.2 x 4.4 cm)**
ENVIRONMENTAL	
? **Wind**	? **100 mph (153 Kph)**
? **Temperature**	
-- Operational	**-- -30°C to +50°C**
-- Non-operational	**-- -40°C to +50°C**
? **Humidity**	? **100% at -30°C to +30°C**
? **Altitude**	? **15,000′**
? **Rain**	? **2"/hr at 40 mph**
? **Shock and vibration**	? **MIL-STD-810F**
Note: Specifications are subject to change without notice.	

B Antenna Mounting Diagram

Figure B-1 is an illustration of the TracStar i450M antenna mounting dimensions.

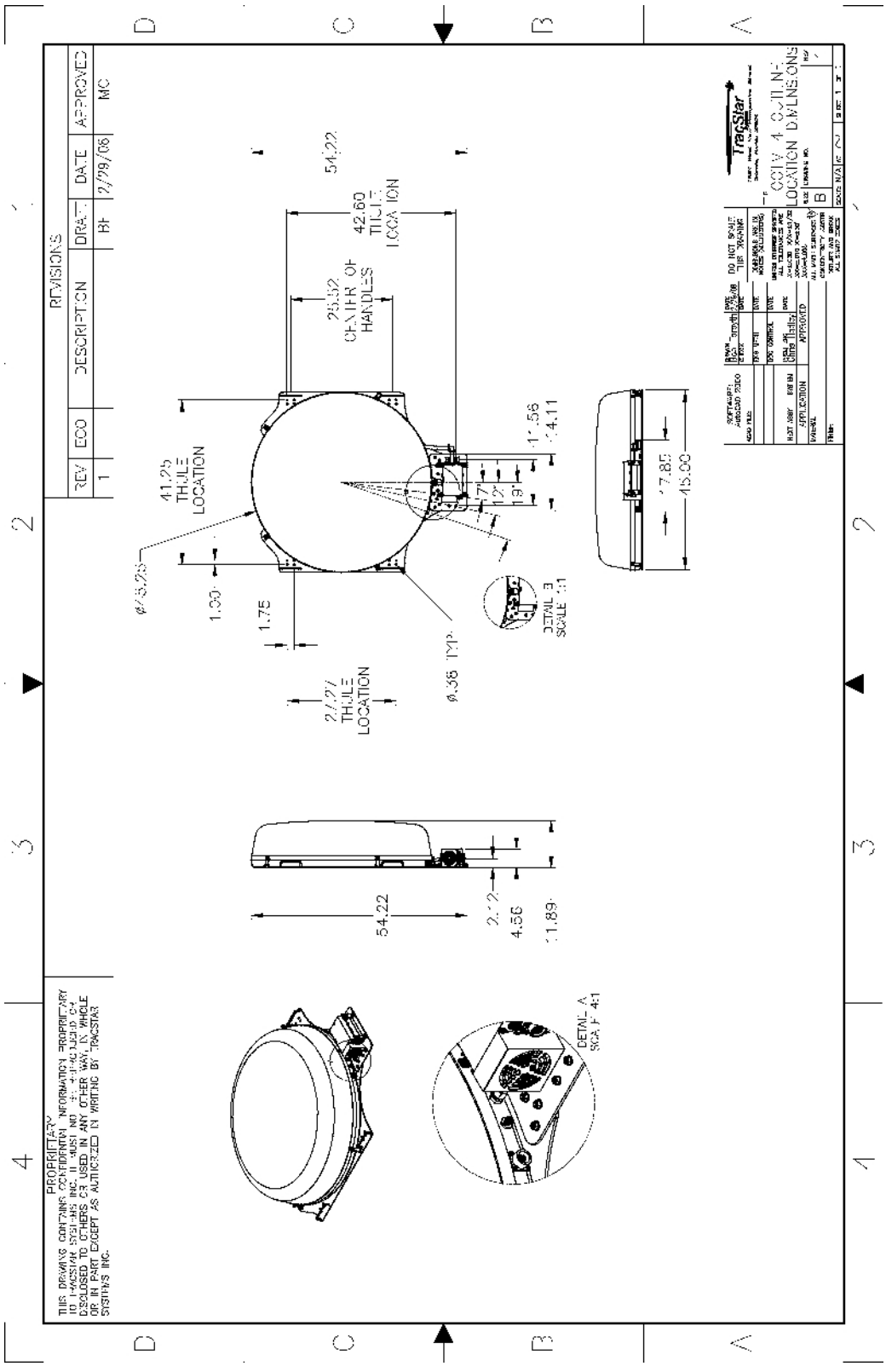


Figure B-1. TracStar i450M Antenna Mounting Dimensions

C ACU Software Upload

This appendix provides the procedure for uploading software to the ACU.

Before you begin

Before you can load software to the ACU, you must stop the ACU automatic boot process, which is done through the PC port on the ACU.

Stopping the ACU Automatic Boot Process

When you turn on the ACU to upload software, it automatically begins to load the current operating software. Therefore, you must stop the load or *init* process in order to upload software.

► **To stop the ACU automatic boot process**

1 Disconnect the modem from the ACU.

2 Connect a straight-through DB-9 cable from the serial port of your PC to the PC port of the ACU.

3 Start HyperTerminal (or other *terminal* communications program).

4 From the File menu, select Properties.

The Properties window displays. See Figure C-2.

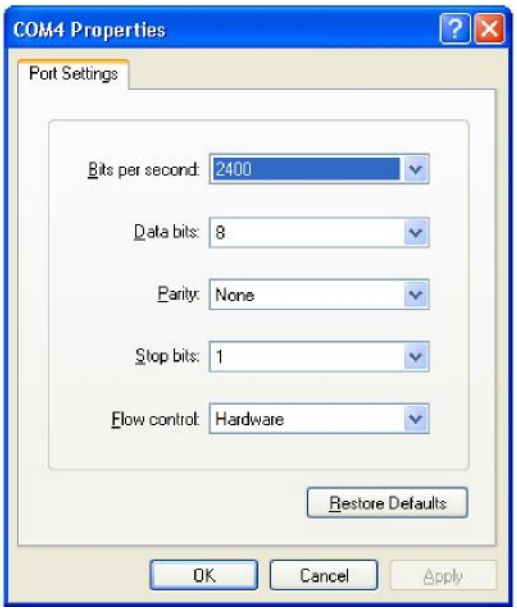


Figure C-2. Properties Window

5 Change the Port Settings as follows:

- **Bits per second:** 38400 **(baud)**
- **Data bits:** 8
- **Parity:** NONE
- **Stop bits:** 1
- **Flow control:** NONE

6 Click OK to save the settings.

> **Before you turn on the ACU in the next step, be prepared to press CTRL+BREAK several times (while on the HyperTerminal window) until the boot process is successfully stopped; otherwise, you will have to turn off the ACU and start again.**

7 Turn on the ACU and *immediately* start pressing CTRL+BREAK (on the HyperTerminal window) as the system is powering up (that is, while Monitor Check Please Wait displays on the ACU).

Characters display (similar to QMQQMM]5=9.2**) on the HyperTerminal window during this process, indicating a connection to the ACU. See Figure C-3.**

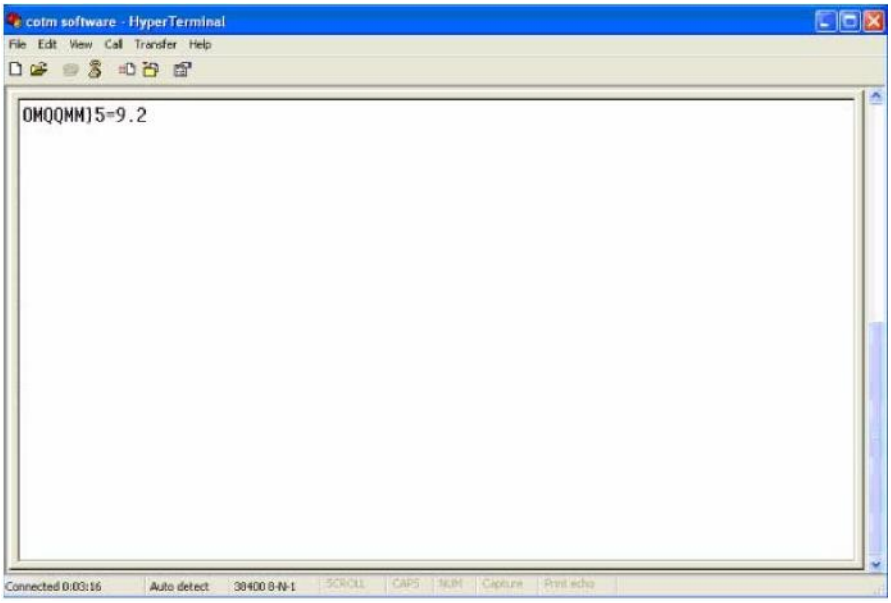


Figure C-3. HyperTerminal Window – Successful Connection to ACU

8 Continue to press CTRL+BREAK until TSS_MON3.2 **displays on the HyperTerminal window, indicating that the ACU boot process has been stopped.**

9 Do one of the following:

? **If** TSS_MON3.2 **does not display, turn off the ACU power and start again. (Return to Step 7.)**

> **You may want to verify that your Port settings are correct in Step 5.**

? **Press ENTER a few more times to confirm that the boot process was successfully stopped. See Figure C-4.**

The characters TSS_MON3.2 **continue to display every time you press ENTER. See Figure C-4.**

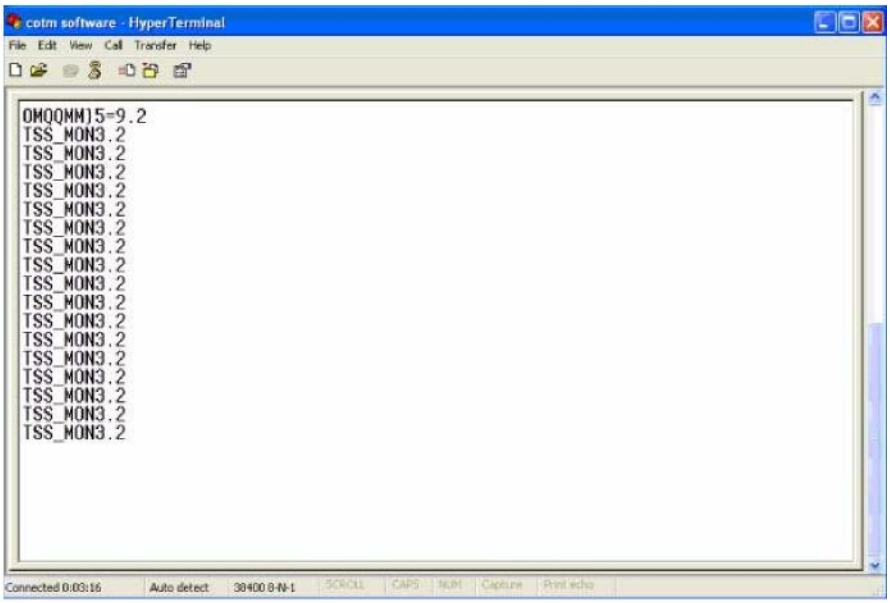


Figure C-4. HyperTerminal Window – Boot Process Stopped

10 Continue to "Loading the Software" in the next section.

Loading the Software

After you have successfully stopped the automatic boot process of the ACU, you are ready to load the software to the ACU.

► To load the software

1 On the HyperTerminal window, press L (upper case only).

The message SEND FILE USING YMODEM–G **or** YMODEM **displays on the HyperTerminal window.**

2 From the HyperTerminal menu, select Transfer > Send File.

The Send File window displays. See Figure C-5.

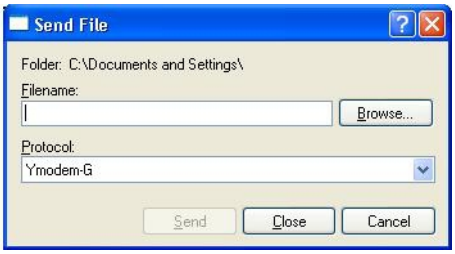


Figure C-5. Send File Window

3 On the Send File window, do the following:

- **Enter the software Filename (e.g.,** MAIN51D2.HEX**), or browse for the location of the Filename.**
- **From the Protocol drop-down list, select** YMODEM–G**.**
- **Click Send.**

The software uploading starts and the Ymodem-G file send window displays, showing the progress. See Figure C-6.

Figure C-6. Ymodem-G File Send Window

CAUTION: Do not power anything off or disrupt this connection or the system may become inoperable.

When the file upload is complete, the Sending Files window displays. See Figure C-7.

Figure C-7. Sending Files Window

4 Click OK to confirm that the software upload is complete.

DONE **displays in the HyperTerminal window, and the ACU system will continue to boot normally. See Figure C-8.**

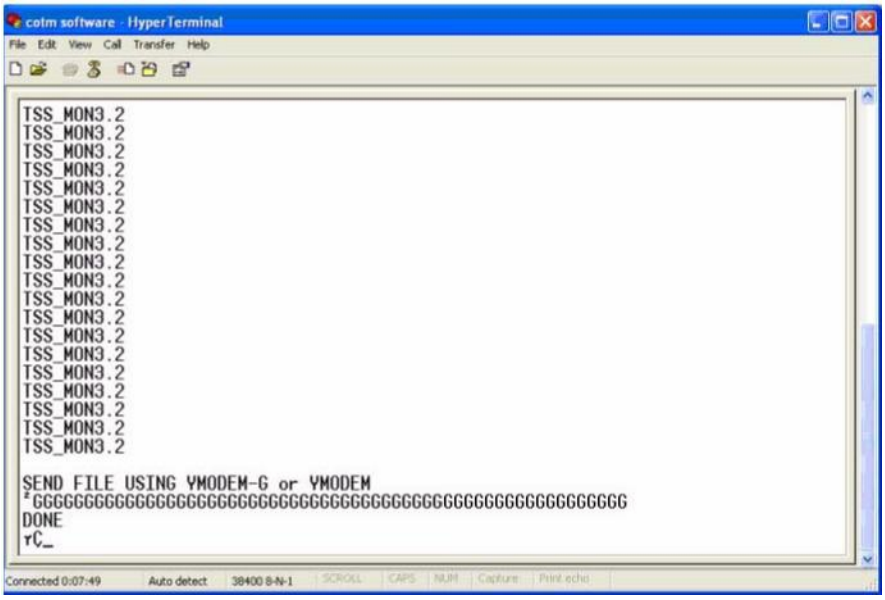


Figure C-8. HyperTerminal Window – Software Upload Done

D Fault Indicators

This appendix provides a brief description of the most common fault indicators that may display.

AZ Gyro error. No reading from the AZ Gyro.

EL cal error. A problem occurred during EL calibration. This could be the EL limit switch, the EL motor, the EL motor encoder, or any of the associated wiring. It could also indicate a CPU fault.

AZ cal error. A problem occurred during AZ calibration. This could be the AZ optical encoder, the AZ motor, the AZ motor encoder, the AZ drive servo, or any of the associated wiring. It could also indicate a CPU fault.

AZ fault. The system is not responding to commands to move the system in azimuth. This could be the AZ optical encoder, the AZ motor, the AZ motor encoder, the AZ drive servo, or any of the associated wiring. It could also indicate a CPU fault.

Waiting Log On (iDirect Infinti Series). The TracStar controller is trying to log into the iDirect modem when iDirect modem is selected. Make sure the DB9-RJ45 cable is in place between the controller and the modem, as this serves as the communication link.

E System Options

This appendix provides a list of system options that can be set from the Tech Setup >Set option screen. These options are used for calibration and troubleshooting procedures.

See "Set Option (SET OPTION Screen)" on page 5-19 for more information.

Table E-2 lists *some* but not *all* system options.

CAUTION: Setting some system options can cause the system to become inoperable. Exercise great caution when entering option codes, and if there are any questions, contact TracStar for assistance.

Table E-2. System Options

Option	Function	Comments
05	Modem status = Locked (to simulate the modem)	
06	Send offline message to the modem (transmit disable)	*Not applicable for ComTech modems.*
07	Send online message to the modem (transmit enable)	*Not applicable for ComTech modems.*
13	Enable polarizer motors in the idle mode	
20	Re-initialize battery-backed RAM parameters	
26	Send GPS information to the modem	*Not applicable for ComTech modems.*
31	Level offset calibration	
32	Level calibration	

Table E-2. System Options (Continued)

Option	Function	Comments
33	Turn on polarizer during cross-pol tests	
39	Calibrate the polarizer motors	

Glossary

This section contains a list of all acronyms and industry terms used in this guide.

A

ACU

See *antenna control unit (ACU)*.

antenna control unit (ACU)

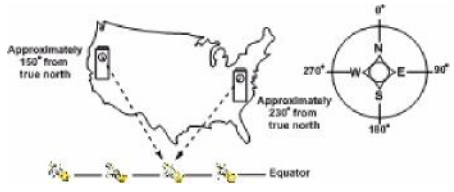
Controls the system and supplies the power and commands required to operate the TracStar i450M antenna.

AZ

See *azimuth (AZ)*.

azimuth (AZ)

Azimuth angle in degrees measured clockwise from true north, not magnetic north.



B

Block up converter (BUC)

Converts an L-band input to the satellite frequency and amplifies the RF power.

BUC

See *Block up converter (BUC)*.

C

COTM

Communications on the move.

D

DAC

See *digital-to-analog converter (DAC)*.

dB

Logarithmic unit of measurement that expresses the magnitude of a physical quantity (usually power or intensity) relative to a specified or implied reference level.

dBm

Abbreviation for the power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW).

dBW

(Decibel watt) Unit for the measurement of the strength of a signal expressed in decibels relative to one watt.

digital-to-analog converter (DAC)

Device for converting a digital (usually binary) code to an analog signal.

E

E_b/N_0

Energy per bit to noise power spectral density ratio. It is the measure of signal-to-noise ratio for a digital communication system.

Electrically Erasable Programmable Read-Only Memory (EEPROM)

Type of non-volatile memory used in computers and other electronic devices to store small amounts of data that must be saved when power is removed (for example, calibration tables or device configuration).

EEPROM

See *Electrically Erasable Programmable Read-Only Memory (EEPROM)*.

Effective Isotropically radiated power (EIRP)

Measure of the effective power emitted by a transmitter, or a measure of the signal strength received on Earth from a satellite.

EIRP

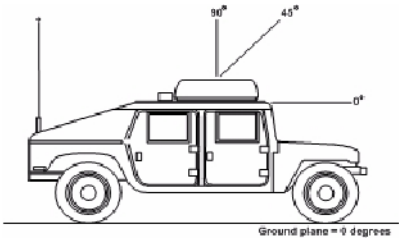
See *Effective Isotropically radiated power (EIRP)*.

EL

See *Elevation (EL)*.

Elevation (EL)

Elevation angle in degrees measured from the horizon in an upward angle.



F

FCC

See *Federal Communications Commission (FCC)*.

Federal Communications Commission (FCC)

Independent government agency that regulates interstate and international communications by radio and television and wire and cable and satellite.

G

G/T

See *gain-to-noise temperature (G/T)*.

gain-to-noise temperature (G/T)

Measure of the receiving ability of an antenna/LNA (low noise amplifier) combination.

global positioning system (GPS)

Global Navigation Satellite System (GNSS) developed by the United States Department of Defense. GPS is a widely used aid to navigation worldwide. It uses satellite technology to enable a terrestrial terminal to determine its position on the Earth in latitude and longitude.

GPS

See *global positioning system (GPS)*.

I

International Telecommunication Union (ITU)

United Nations organization that coordinates use of the electromagnetic spectrum and creation of technical standards for telecommunication and radio communication equipment.

ITU

See *International Telecommunication Union (ITU)*.

L

L-band

RF signals in the frequency range of approximately 950 MHz to 1450 MHz.

LNB

See *Low noise block down converter (LNB)*.

Low noise block down converter (LNB)

Converts satellite frequency to an L-band signal and amplifies the RF power.

N

NOC

Network operations center.

P

POL

Polarization angle in degrees measured from vertical.

R

Radio Frequency (RF)

Frequency or rate of oscillation within the range of about 3 Hz to 300 GHz.

RF

See *Radio Frequency (RF)*.

Rx

Receive.

T

Tx

Transmit.

V

Very small aperture terminal

Two-way satellite ground station with a dish antenna that is smaller than 3 meters. Data rates typically range from narrowband up to 4 Mbit/s. VSATs access satellites in geosynchronous orbit to relay data from small remote earth stations (terminals) to other terminals (in mesh configurations) or master earth station *hubs* (in star configurations).

VSAT

See *Very small aperture terminal*.

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TracStar i450M Installation & Operation Guide (v1.0)
February 2009
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REVISIONS					
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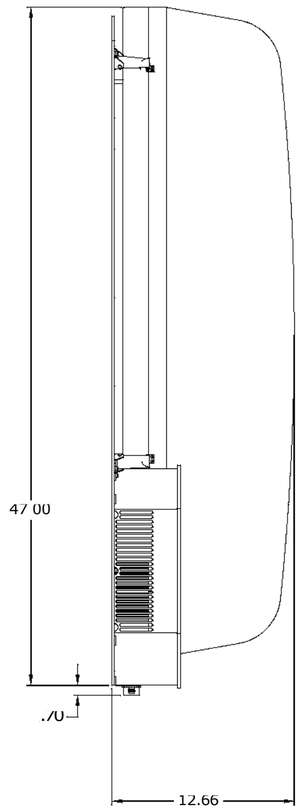
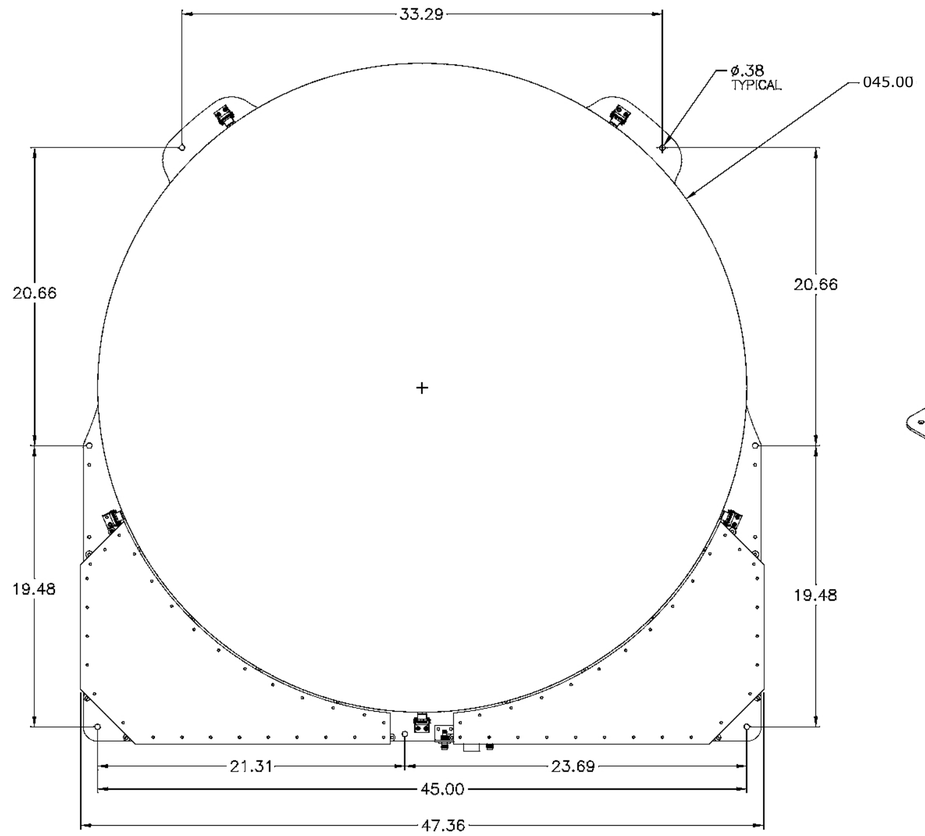
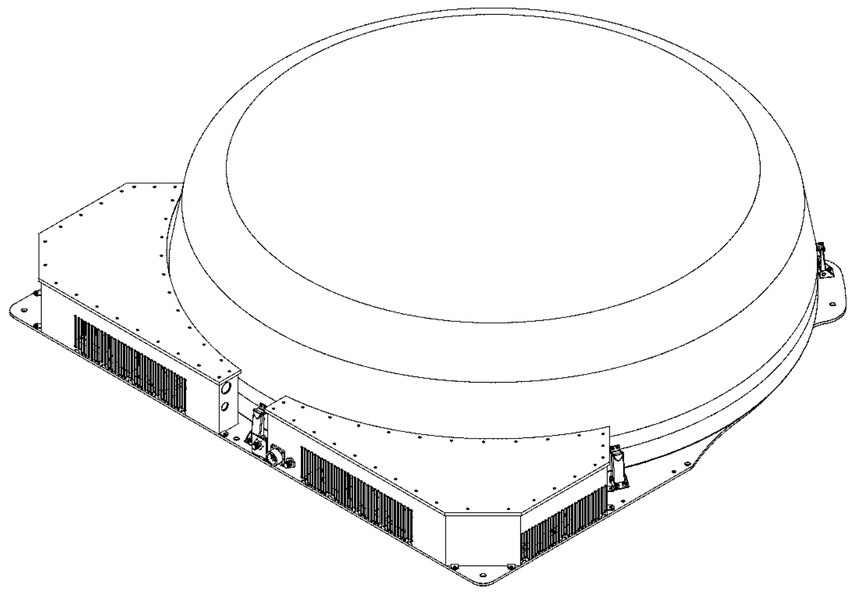
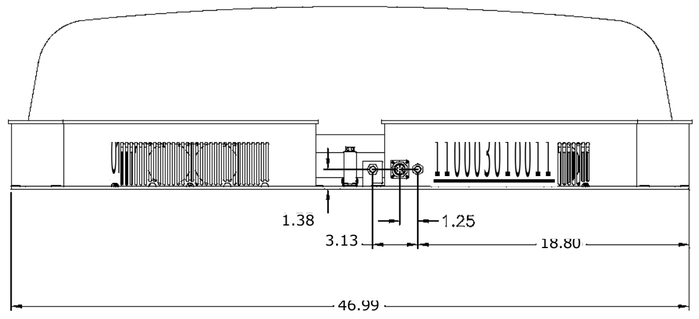
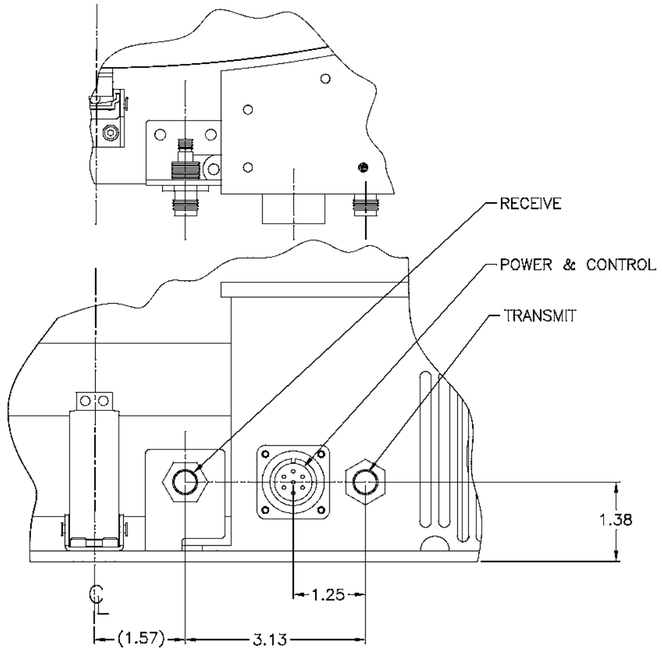






ISOMETRIC VIEW





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TracStar
1984 West New ampshire Street
Orlando, ROMs 32804

TITLE: COTM CONNECTION LOCATIONS

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