

# A Guide to TracVision 4 owner's manual



Satellite Television

**KWH TracVision<sup>®</sup> 4**

# Congratulations!

You have selected one of the most advanced mobile satellite tracking systems available today. The KVH TracVision® 4 offers stable, reliable tracking of virtually any DVB-compatible satellite system. This manual provides detailed instructions on the proper installation, use, and maintenance of your TracVision 4 system.

Throughout this manual, important information is marked for your attention by these icons:



A helpful tip that either directs you to a related area within the manual or offers suggestions on getting the highest quality out of your system.



An alert to important information regarding procedures, product specifications, or product use.



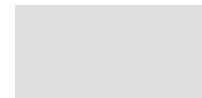
Information about installation, maintenance, troubleshooting, or other mechanical issues.



An electrical safety warning to help identify electrical issues that can be a hazard to either this KVH product or a user.



## TracVision 4 Serial Number



*This serial number will be required for all troubleshooting or service calls made regarding this product.*

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# 1 Introduction

## 1.1 The Digital Satellite System

Your new TracVision 4 satellite antenna is fully compatible with the Digital Video Broadcasting (DVB) satellites, which use the international standard for digital TV transmissions, and with the DIRECTV® DSS satellites. As a result, you will be able to receive and decode signals from either DIRECTV, The DISH™ Network, or ExpressVu with the proper programming and hardware (e.g., the Integrated Receiver Decoder [IRD] for your selected service).

TracVision 4's default satellite setting is to acquire, track, and receive signals from DIRECTV's DSS 101 satellite. However, TracVision 4's software is preprogrammed with the satellite locations and transponder information for the following North American satellites:

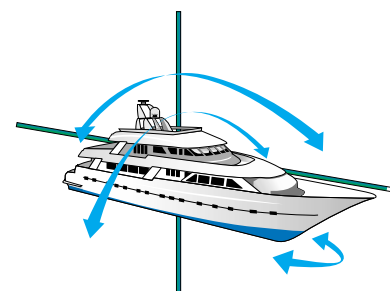
- DSS 101° W
- DSS 110° W\*
- DSS 119° W
- EchoStar 61° W
- EchoStar 110° W
- EchoStar 118° W
- EchoStar 119° W
- EchoStar 148° W
- ExpressVu

\* Contact KVH or DIRECTV for complete details on tracking and receiving signals from DSS 110.

## 1.2 TracVision 4 System Overview

Your KVH TracVision 4 employs a state-of-the-art actively stabilized antenna system. Once the satellite is acquired, the antenna gyro continuously measures the heading, pitch, and roll of your vessel and transmits commands to the antenna motors to keep the antenna pointed at the satellite at all times. This active stabilization is enhanced by a conical scan tracking function to detect and lock onto the strongest signal, resulting in the clearest reception possible. System specifications have been provided in *Appendix A*.

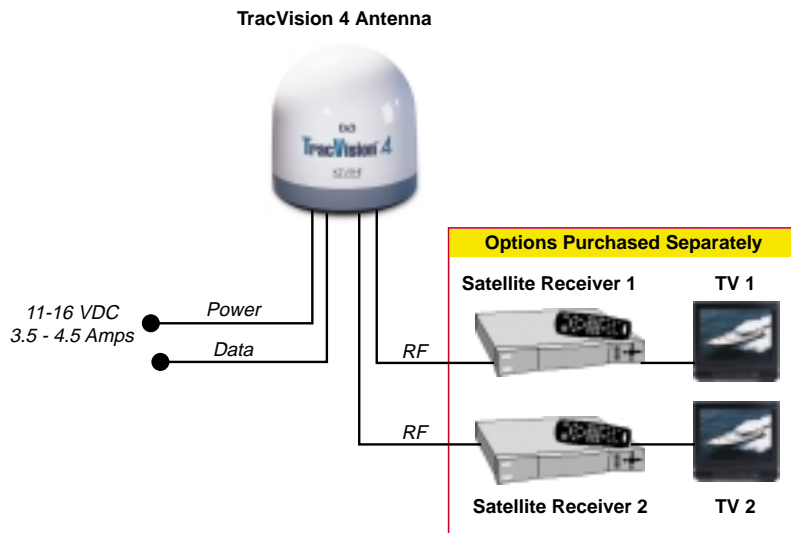
**Figure 1-1**  
TracVision Measures and Compensates for Vessel Motion





To complete your satellite TV system, you will need an Integrated Receiver Decoder (IRD) (a.k.a. “satellite receiver”), and a television set. A desktop or laptop computer is recommended during installation and to conduct diagnostics. The interrelationship of units is illustrated in Figure 1-2.

**Figure 1-2**  
TracVision 4 System Configuration



### 1.2.1 The TracVision 4 Antenna Unit

**Figure 1-3**  
TracVision 4 Antenna Unit



The Antenna Unit includes the antenna positioning mechanism, signal front end, power supply, and control elements. A molded ABS radome encloses the baseplate and is secured in place with flat head machine screws. Weathertight connectors located on the underside of the baseplate join the power, signal, and control cabling from below-decks units. A compression seal keeps moisture away from the connectors.

### 1.2.2 Integrated Receiver Decoder (IRD)

The IRD (purchased separately) receives satellite signals from the Antenna Unit for signal processing and channel selection, and sends the signals to the TV set for viewing. The IRD also provides the interface for the user to activate authorization for reception. Please refer to the User’s Manual provided with your selected IRD for complete operating instructions. Multiple IRDs may be connected to the Antenna Unit to provide satellite signals to a number of TV sets.

## 1.3 Materials Provided With TracVision 4 System

Table 1-1 lists the components and materials in the TracVision 4 shipping carton.

Component	KVH Part No.
Antenna Unit	01-0234-01
Installation Kitpack	72-0099
Data Cable	32-0619-50
PC Cable	32-0628-06
Power Cable	32-0510-50
RF Cable	32-0417-50
IRD Ground Wire	32-0583-50
Switchplate	02-1023

**Table 1-1**

*TracVision 4 System Components*

### 1.3.1 Additional Materials Required for TracVision 4 Use

To make full use of your new TracVision 4 and receive satellite TV while on the water, you will need to provide/purchase the following:

- Television,
- Appropriate IRD for your selected satellite TV service, and
- Sealing materials to weatherproof cable holes.



*DIRECTV subscribers in certain regions of the United States will require a DSS Plus™ IRD to receive both satellite and local channels. Check with DIRECTV for regional requirements.*



## 2 Installation

TracVision 4 is designed for simple installation and setup. Just follow these easy steps:

Step	Refer to Section...
1. Choose the hardware locations	2.1
2. Mount the Antenna Unit	2.2
4. Wire system components	2.3
5. Select active satellite	2.4
6. Check out system	2.5

### Materials and Equipment Required for Installation

- Electric drill
- 3/8" (10 mm) drill bits and 3" (80 mm) hole saw
- Socket wrenches
- Flat tip and Phillips screwdrivers
- RG-6 (75 ohms) cable for a second RF Signal Cable (if necessary)
- Light hammer; center punch; adhesive tape; scribe or pencil
- Power cable to connect ship's power to switchplate
- Terminal lug crimping tool; wire strippers
- A PC with terminal emulation software such as PROCOMM, Windows Terminal, or Windows 95/98 Hyperterminal.

### Below-decks Cable Lengths

The major considerations in locating the below-decks equipment are accessibility and cable lengths between units. Lengths of these cables are as follows:

Cable (Function)	KVH Part #	Length
Data Cable (IRD to Antenna Unit)	32-0619-50	15 m (50 ft)
Power Cable (Power to Antenna Unit)	32-0510-50	15 m (50 ft)
RF Cable (Antenna to IRD)	32-0417-50	15 m (50 ft)
IRD Ground Wire	32-0583-50	15 m (50 ft)

**Table 2-1**

*Installation Process*



*Plan the entire installation before proceeding! Take into account antenna unit placement, running cable distances between units, and accessibility to the equipment after installation. Cable lengths are detailed in Table 2-2.*



*KVH recommends the use of RG-6 (75 ohms) cable for RF wiring. Use of non-RG-6 (75 ohms) cables will result in degraded performance. The KVH warranty does not cover degraded performance due to improper wiring.*

**Table 2-2**

*Lengths of Provided Below-decks Cables*

## 2.1 Choosing the Best Location and Getting the Best Reception



*The Antenna Unit should not be too high off the water (a height above the waterline no more than half the vessel length).*



*The radome exterior is treated with a special finish selected for compatibility with the dome material and transparency to the satellite signals. Application of additional paints or finishes WILL degrade performance, potentially beyond acceptable limits.*

There are several factors to consider when choosing the respective locations of the TracVision 4 antenna unit.

- The ideal antenna site has a clear view of the horizon/satellite all around.
- Tracking errors will be reduced if the antenna forward arrow is aligned as closely as possible with the vessel's centerline.
- Place the Antenna Unit as close to the intersection of the vessel's fore-and-aft centerline and midships.
- Keep the antenna out of line with nearby radars, as their energy levels may overload the antenna front-end circuits. If necessary, position the Antenna Unit so it is at least four feet (1.2 meters) above or below the level of the radar.
- Make sure that the mounting surface is rigid so that it cannot flex when the vessel vibrates. If necessary, add a strength member to the mounting site to stiffen it.

## 2.2 Installing the Antenna Unit

Specifics of installation will vary with vessel design but the following procedures are applicable in most situations and will result in a secure and effective installation. Table 2-3 lists the components provided in the Antenna Unit Installation kitpack.

**Table 2-3**  
*Antenna Unit Kitpack Contents*

<b>Part</b>	<b>Qty.</b>
1/4-20 hex screws	4
1/4 flat washers	8
1/4-20 self-locking nuts	4
Plastic screw covers	6
Antenna base seal gasket	1
Tie-wraps	2
Core clamp	1

### Tips for Successful Antenna Unit Placement and Mounting

- The mounting surface should be essentially flat, free of vibration and flexing, and strong enough to carry the complete assembly (30 lbs/13.6 kg).
- The antenna unit need not be located exactly on the vessel's fore-and-aft axis, but its centerline reference MUST be parallel to it.
- Be sure to account for the radome height and the base dimensions, illustrated in Figures 2-1 and 2-2 respectively.

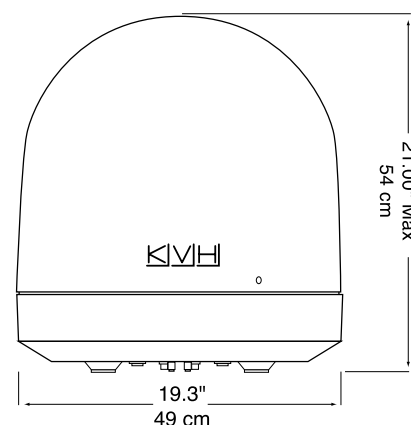


Always lift the antenna unit by the gray baseplate structure, not the radome. Also be careful not to strike the exposed connectors extending from the bottom of the baseplate or allow them to carry the weight of the antenna unit.

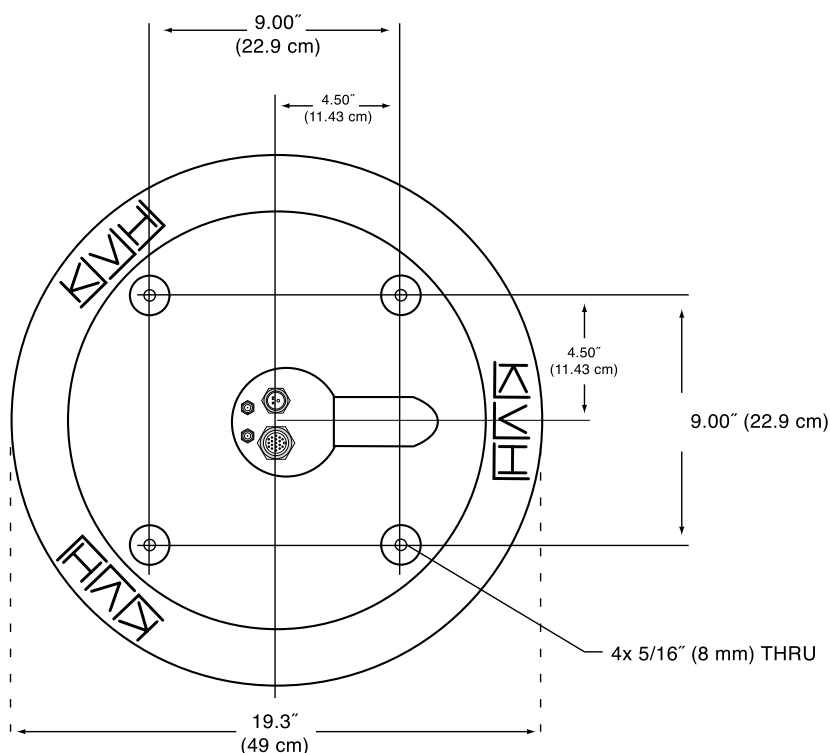
### Antenna Unit Mounting Procedure

1. Using the base dimensions presented in Figure 2-2 or the template provided in *Appendix B*, lay out the four mounting bolt holes. Check the layout of the baseplate to ensure that it is parallel with the vessel's fore/aft axis.
2. Drill four 3/8" (10 mm) bolt holes. Mark a 3" (80 mm) diameter circle in the center of the pattern and cut out to make a passage for the cables to connect to the baseplate. Smooth the edges of the hole to protect the cables.

**Figure 2-1**  
Antenna Unit Elevation and Baseplate Diameter

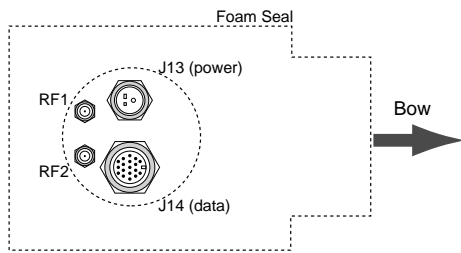


**Figure 2-2**  
Antenna Unit Base Dimensions

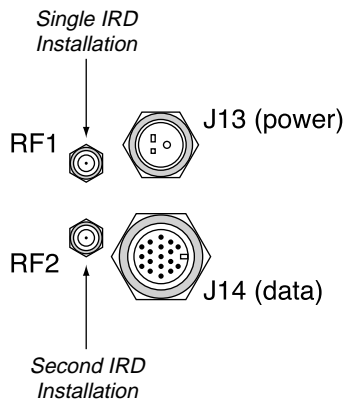


A template of the baseplate mounting holes has been provided in *Appendix B*.

**Figure 2-3**  
Baseplate/Foam Seal Orientation  
(Bottom View)



**Figure 2-4**  
Baseplate Connector Assignments



The foam shipping restraint must be removed before power is applied. Save the foam for reuse and be sure to install it whenever the Antenna Unit is moved from place to place. See Section 5.8, "Preparation for Shipment," for instructions on preparing for shipment.

3. Place the foam seal in position on the mounting surface with the hole centered over the cable access cutout and the paper backing on the bottom. Do not remove the paper backing at this time. Align the seal with the vessel's fore-and-aft line and the small end pointed forward as shown in Figure 2-3. Scribe a line all around the seal.
4. Remove and save the three screws holding the radome to the baseplate. Carefully lift the radome straight up until clear of the antenna assembly and set it aside in a safe place.
5. Position the baseplate assembly in place over the mounting holes and cable access. Ensure that all holes line up and that the connectors are centered over the cable access. Make any necessary adjustments before seating the foam seal in place permanently.
6. Clean the surface where the foam seal will be placed. Remove the paper backing from the foam seal to expose the contact cement. Lay the foam seal in place, adhesive side down, and press down firmly to bring the adhesive into full contact along the bottom.
7. Bring the Data Cable, RF Cable(s), and Power Cable up through the access hole and connect them to the baseplate. Turn the connectors down securely, but don't use excessive force; finger-tight is sufficient. Figure 2-4 illustrates the connector assignments.

*Do not* use teflon gel on the cable fittings as it reduces signal strength at higher frequencies.

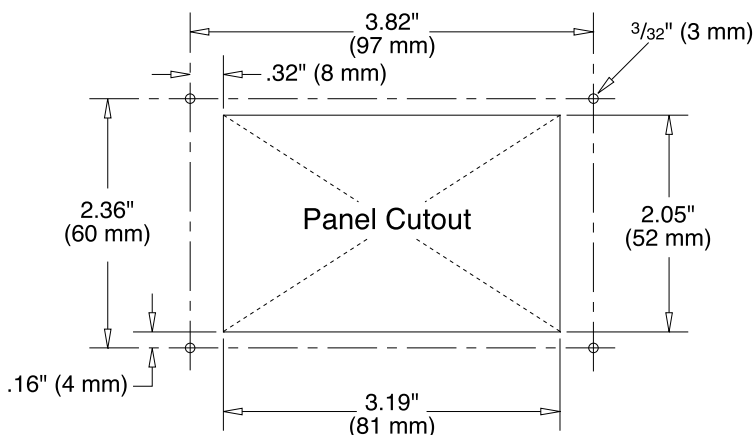
8. Remove the foam shipping restraint from the Antenna Unit.
9. Place the baseplate over the holes drilled in the foundation. Rotate the azimuth mechanism plate to expose each mounting hole. When rotating the azimuth mechanism by hand, go slowly. Hitting the stops with excessive force will damage the azimuth limit switch.
10. Place a flat washer from the kitpack on a bolt and insert the bolt into its hole *from above*.

11. Apply a flat washer and lock nut from underneath.
12. Tighten securely until the foam seal is compressed as far as it will go and all four feet are bottomed against the mounting surface, as illustrated in Figure 2-5.
13. Replace the radome over the baseplate. Align the radome screw holes with the nut holders, insert the screws and tighten. Install a protective plastic screw cap from the kitpack over each screw. Several spare protective caps are provided.

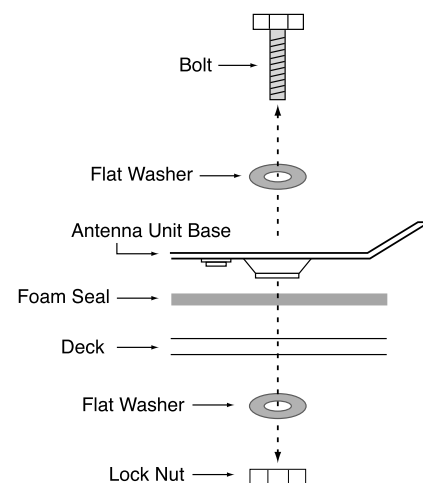
## 2.3 Wiring the TracVision 4 System

A switchplate has been provided to serve as the hub of the TracVision 4 wiring (with the exception of the RF cable, which will be connected to the IRD). This switchplate includes an ON/OFF switch and a DB9 maintenance port for easy access to the Antenna Unit's software and diagnostics. Follow these steps to begin the wiring process.

1. Select a location to mount the TracVision 4 switchplate. It should be flat and within reach of the cables connected to the Antenna Unit.
2. Create a panel cutout in the mounting surface. Figure 2-6 illustrates the mounting dimensions and a template has been provided in *Appendix C*.



**Figure 2-5**  
Bolting the Antenna Unit to the Deck (Side View)



**Figure 2-6**  
Switchplate Panel Cutout Dimensions



A full-scale panel cutout template has been provided in *Appendix C*.

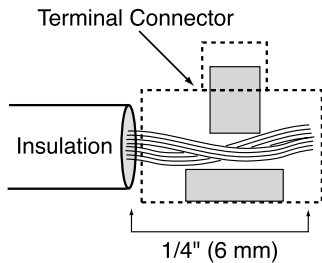
3. Run the Antenna power and data cables from the Antenna Unit and out through the panel cutout.
4. Run a cable from ship's power (11-16 Vdc) through the panel cutout.



You are now ready to wire the TracVision 4 system to the switchplate connectors and ship's power.

**Figure 2-7**

*Correctly Securing Wires within the Switchplate Connectors*



**Tips for Safe and Successful Wiring**

- When attaching cables to the TracVision 4 switchplate connectors, make sure the insulation is stripped back approximately 3/16". Twist the wires gently to help achieve a good connection. Do not pinch insulation inside the connector.
- After attaching the power and data cables to the appropriate terminal connector strips, tug gently to ensure a firm connection.

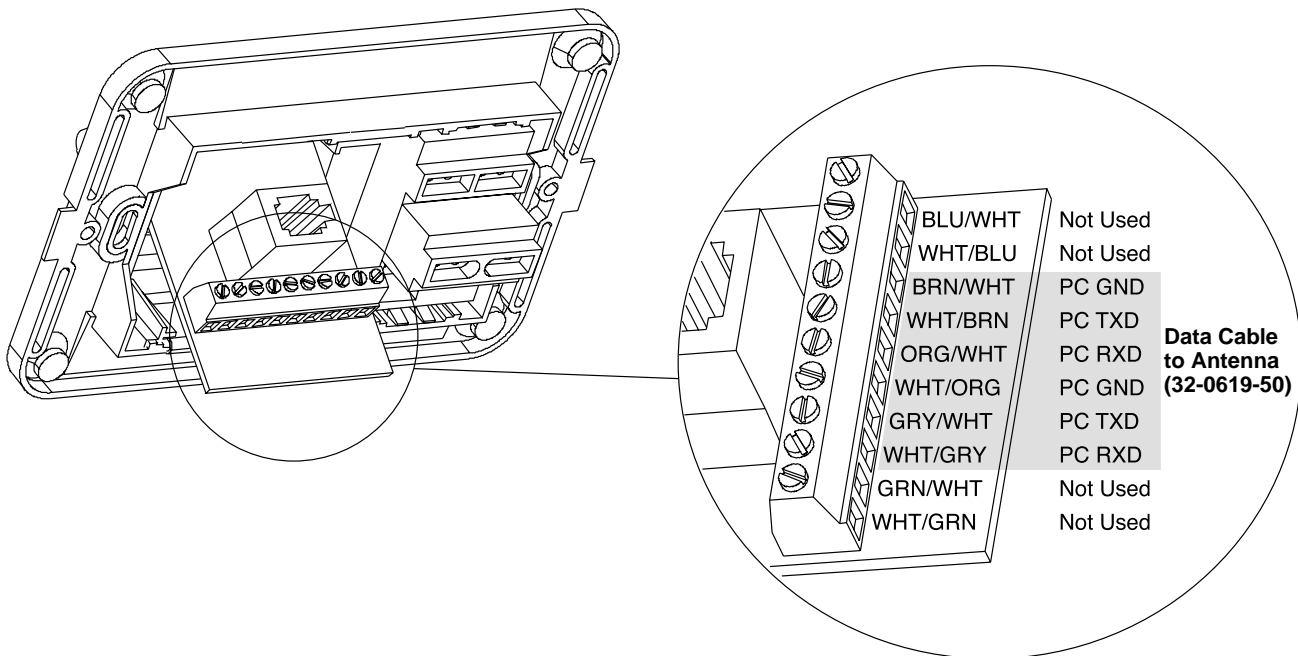
**2.3.1 Wiring the Antenna Unit Data Cable**

Find the TracVision 4 data cable (cable #32-0619-50) where it comes through the panel cutout made earlier. Wire the data cable to the switchplate connectors as indicated in Figure 2-8. The connector board is etched with the same wire color identification to make the wiring process easier.

A comprehensive wiring diagram for the TracVision 4 system has been provided in *Appendix D*.

**Figure 2-8**

*Data Cable Wiring Arrangement*

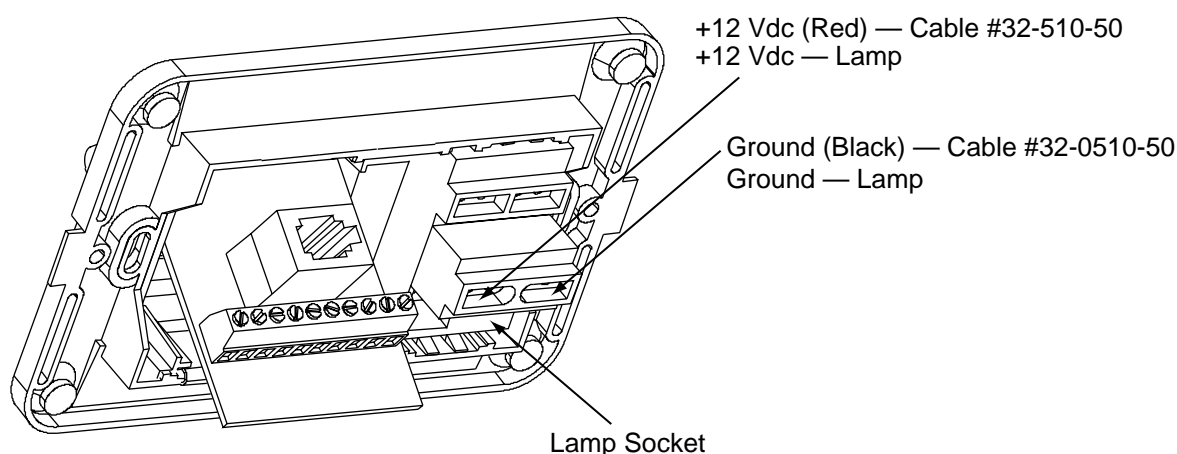


### 2.3.2 Wiring the Antenna Unit Power Cable

Find the TracVision 4 power cable (cable #32-0510-50) where it comes through the panel cutout made earlier. Wire the antenna unit power cable to the switchplate connectors as indicated in Figure 2-9. After wiring the power cable, connect the power indicator lamp, also as noted in Figure 2-9. After both the power cable and lamp are properly wired, carefully insert the lamp into its socket immediately below the switchplate connectors.

**Figure 2-9**

*Wiring the Antenna Unit Power Cable and Indicator Lamp*

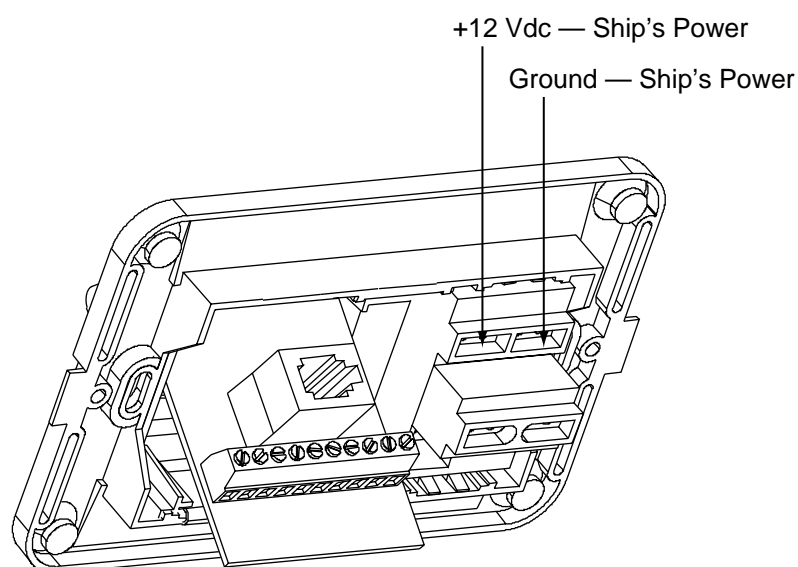


### 2.3.3 Connecting to Ship's Power

After completely wiring the indicator lamp and the data and antenna cables, you must connect the switchplate to ship's power as pictured in Figure 2-10.

**Figure 2-10**

*Wiring the Switchplate to Ship's Power*



**Power supplied to the TracVision 4 MUST NOT exceed 16 Vdc or the TracVision power supply will suffer serious damage!**

If there is a need to extend the Antenna Unit-to-ship's power cable, refer to the following tips:

- The Antenna Unit power cable connector on the baseplate cannot accept cables larger than 14 AWG (1.5 mm<sup>2</sup>).
- If the cable is longer than 15 m (50 ft), be sure to verify the voltage at the antenna to ensure that there is sufficient power to drive the antenna under load (11-16 Vdc). If not, carefully increase the voltage to the Antenna Unit to compensate for any drop in power over the length of the cable and ensure that the voltage reaching the Antenna Unit is between 11 and 16 Vdc.

### 2.3.4 IRD Ground Cable

A grounding wire (cable #32-0583-50) has been provided to connect your IRD to a suitable ground and protect the system. Attach the grounding wire to any suitable screw on the rear panel of the IRD with a good contact with the IRD chassis. The other end should be connected to a suitable ground, such as the ship's power ground wire connected to the switchplate.

### 2.3.5 Installing the Switchplate

After completing the switchplate wiring process, you must install the switchplate itself. This process, detailed in the following steps, is illustrated in Figure 2-11.

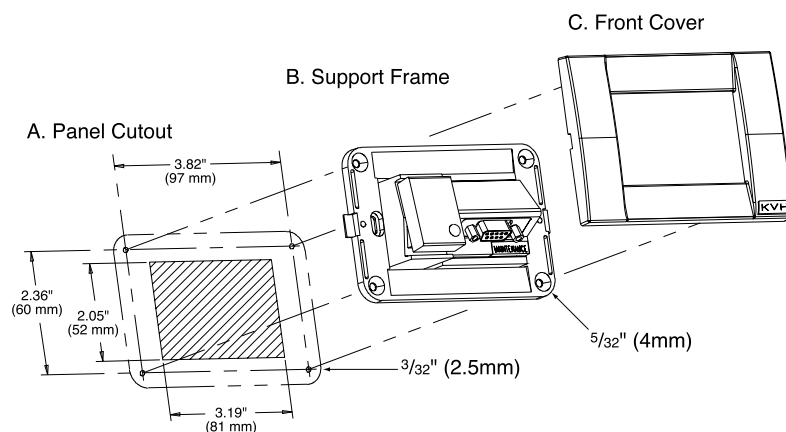
1. Drill four  $\frac{5}{32}$ " (4mm) holes in the support frame.
2. Fit the switchplate assembly and support frame into the panel cutout made in Step 2 in Section 2.3 and flush to the mounting surface.

**Figure 2-11**

*Mounting the Switchplate Support Frame and Front Cover*



Before securing the switchplate to the mounting surface, be sure to strain relieve the wires connecting to the switchplate connectors. Several tie-wraps have been provided to aid in strain relieving the wires.



2. Drill four  $\frac{3}{32}$ " (2.5mm) holes in the mounting surface using the countersunk holes in the support frame as the template. Secure the support frame and switchplate assembly to the mounting surface using the four #6 self-cutting screws.
3. Snap the front cover into place to cover the screws and support frame.

### 2.3.6 Connecting the Antenna RF Signal Cable to the IRD

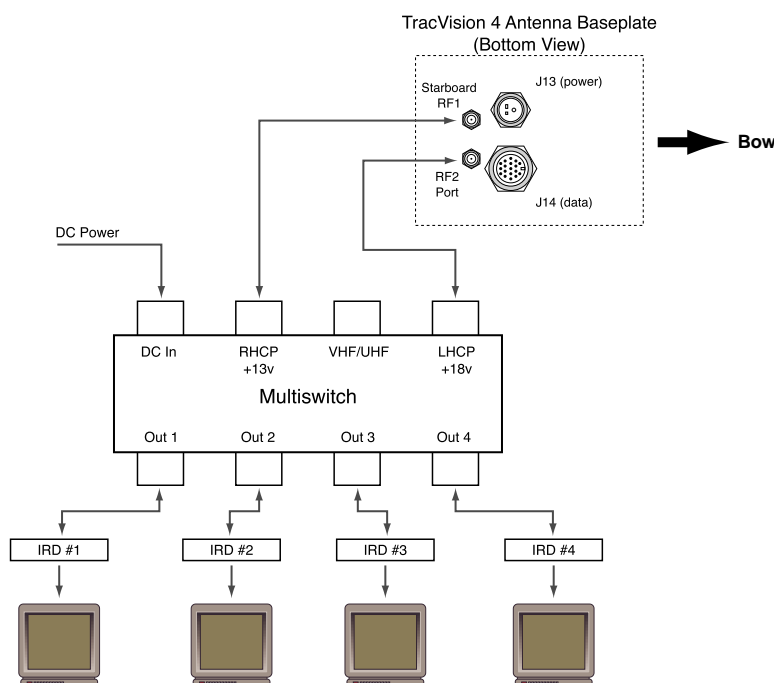
The RF signal cable (cable #32-0417-50) is fitted with F-type connectors. One end should be connected to the plug labeled "RF1" on the base of the TracVision 4 system and the other to the IRD plug labeled "LNB" or "ANT/SAT." If a second IRD is to be hooked up to the TracVision 4 antenna unit, the RF cable for the second IRD should be connected to the plug labeled "RF2" while the other end is connected to the IRD plug labeled "LNB" or "ANT/SAT" on the second IRD.



*For single IRD installations, the RF cable is connected to the RF1 plug on the base of the antenna. If a second IRD is added, the additional RF cable connects to the RF2 plug.*

#### Multiswitch Installation (Three or More IRDs)

For multiple IRD/TV installations, an active multiswitch (Channel Master model 6214IFD or equivalent) is placed between the Antenna Unit and the IRDs. Figure 2-12 illustrates typical wiring arrangements for multiple IRDs. Mount the multiswitch unit in accordance with the manufacturer's instruction sheet.



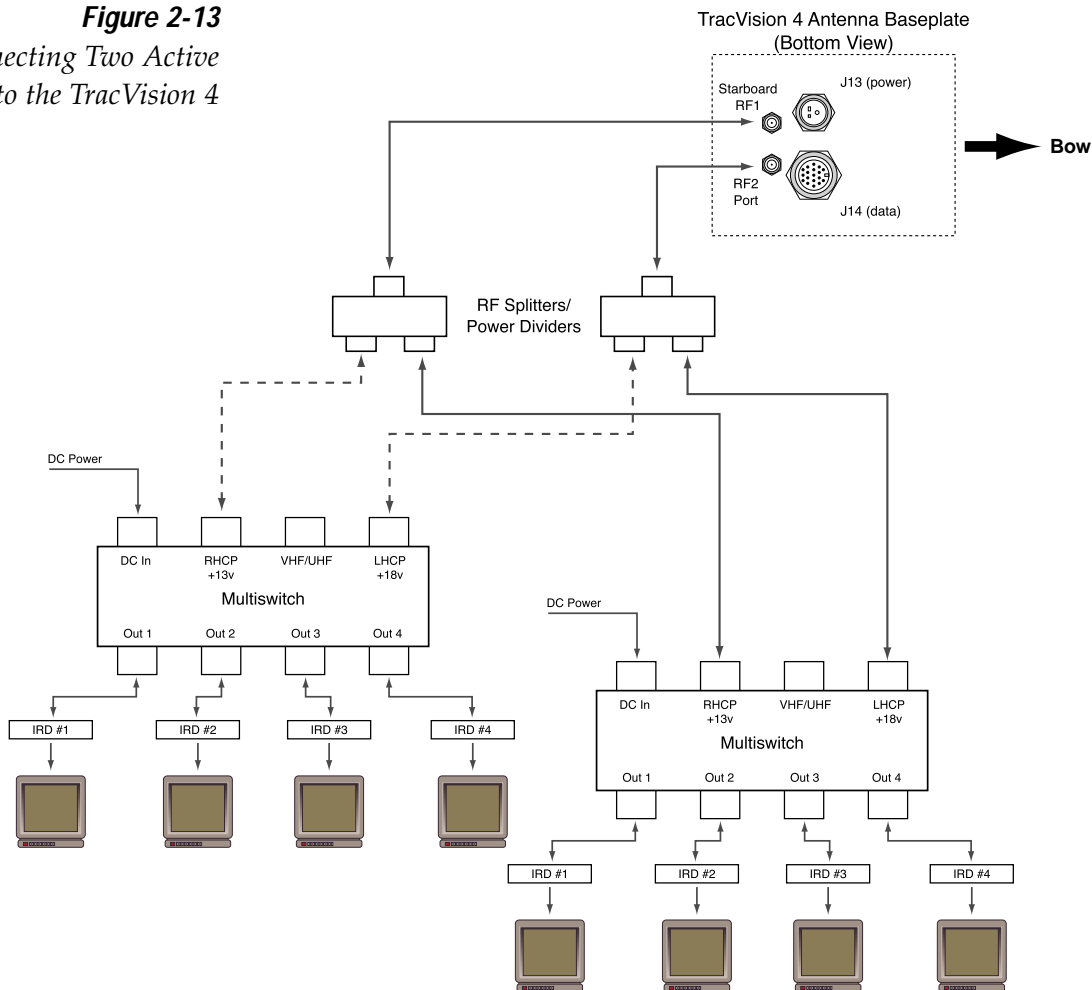
**Figure 2-12**  
*Connecting Multiple IRDs using an Active Multiswitch*

1. Connect the RF cable tagged "RF1" to the multiswitch input labeled "LNB RHCP +13V".
2. Connect a second RF cable to the multiswitch input labeled "LNB LHCP +18V".
3. Connect the multiswitch outputs to individual IRD inputs. Use RG-6 cable terminated with F-type connectors for all RF connections. Terminate all unused output connectors with 75 ohm DC blocks (Channel Master #7184, Radio Shack #15-1259 or equivalent).

### Multiple Multiswitch Installation

If there is a need for more than four IRDs, it is possible to carry out a multiple multiswitch installation, as illustrated in Figure 2-13.

**Figure 2-13**  
Connecting Two Active Multiswitches to the TracVision 4



## Commissioning the IRD

Please refer to the user manual that accompanied your IRD for instructions on properly commissioning the system.

### EchoStar Commissioning Issues

EchoStar IRDs that have not been commissioned within several months of manufacture require additional steps to complete the process. Refer to *Appendix E* for complete details.

## 2.4 Selecting the Active Satellite

As noted previously, TracVision 4 can track a variety of DVB-compatible and DSS satellites. The system contains a preprogrammed library of North American satellites. It also has two open slots that you may use to program two additional satellites of your choice. Two of these satellites may be selected to reside in the system's active memory as Satellites A and B. Once this is done, a simple command via the maintenance port will tell the antenna to track one or the other, making it easy to switch between the satellites of your choice. Table 2-4 provides a grid of possible North American satellite pairs.

**Table 2-4**  
North American Satellite Pairs

	DSS_101	DSS_110	DSS_119	Echo_61	Echo_110	Echo_119	Echo_148	Expressvu
DSS_101			✓					
DSS_110*								
DSS_119	✓							
Echo_61					✓	✓		✓
Echo_110				✓		✓	✓	✓
Echo_119				✓	✓		✓	✓
Echo_148						✓		
Expressvu					✓	✓		✓

\* Contact KVH or DIRECTV for complete details on tracking and receiving signals from DSS\_110.

The satellites listed in TracVision 4's preprogrammed satellite library will be sufficient for most North American users.

However, if you wish to install one or two user-defined satellites, proceed to *Section 2.4.2, "Programming User-defined Satellites."*

After configuring the user-defined satellites, return to the satellite installation process in *Section 2.4.1, "Installing Your Selected Satellites."*

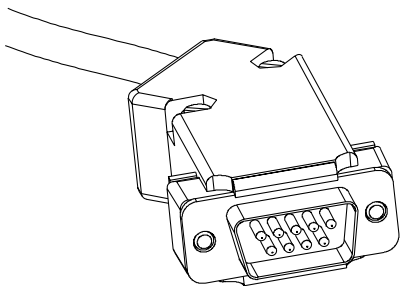
## 2.4.1 Installing Your Selected satellites

When you first connect to the system, it is programmed with the factory default satellite assignment: DIRECTV's DSS 101 satellite. Should you wish to track a different satellite (either from the satellite library or a user-defined satellite), you must instruct the antenna which satellite will be the active satellite of choice.

### Connecting to the TracVision 4 Maintenance Port

To do so, it is necessary to connect a PC to the terminal maintenance port. The diagnostics procedure requires terminal emulation software such as PROCOMM, Windows Terminal, or Windows 95/98 Hyperterminal. Use the settings appropriate to your application.

**Figure 2-14**  
PC DB9 Connector



1. Connect one end of the PC cable to the DB9 connector on the switchplate. Connect the other end to the serial port on the PC (a 9-pin/25-pin connector adapter may be needed for some PCs).
2. Open the terminal emulation software and establish the following settings:
  - 9600 baud
  - no parity
  - 8 data bits
  - 1 start bit
  - 1 stop bit
  - no flow control
3. Apply power to the TracVision 4 system and allow the system to complete full initialization. Data should be scrolling on the PC display to identify any system problems detected. If no data is seen, recheck your connections and the terminal software setup.

## Installing the Satellite of Choice

Once the data connection has been made between the PC and the TracVision 4, you must assign the satellites you wish to have in the satellite pair. On the maintenance screen, put the antenna in Idle Mode by typing **HALT**, then enter the SATINSTALL command:

Command:	<b>SATINSTALL,&lt;sat_a_name&gt;,&lt;sat_b_name&gt;&lt;cr&gt;</b>
Where:	<p>&lt;sat_a_name&gt; = the name of your choice for Satellite A</p> <p>&lt;sat_b_name&gt; = the name of your choice for Satellite B</p>

Table 2-5 lists the assigned names for satellites that are in the preprogrammed North American satellite library. If you do not wish to assign a pair of satellites, enter **None** as the name of Satellite B.

After you have assigned satellites as Satellites A and B, the final step is to tell the antenna which of the two satellites it should acquire and track. To do so, enter the Satellite Selection parser command as follows:

Command:	<b>@L,x&lt;cr&gt;</b>
Where:	x = A or B (one of your selected satellites as defined during the SATINSTALL process)

Choosing A or B will assign the antenna to acquire and track that installed satellite. To complete the process, type **ZAP<cr>** to restart the system.

## 2.4.2 Programming User-defined Satellites

The TracVision 4 satellite library has two open slots that you may use to program two user-defined satellites in case you want to install/watch a satellite that is not in the KVH predefined list. To configure a user satellite, the system must first be in Idle Mode (by typing **HALT**) and then information about the satellite must be provided, including:

- Satellite name
- Satellite position (longitude)

**Table 2-5**

*Installation Names: North American Satellites*

Satellite	Install Name
DSS 101° W	DSS_101
DSS 110° W	DSS_110
DSS 119° W	DSS_119
EchoStar 61° W	Echo_61
EchoStar 110° W	Echo_110
EchoStar 119° W	Echo_119
EchoStar 148° W	Echo_148
Expressvu	Expressvu
User-defined 1	USER1*
User-defined 2	USER2*
None	None

*\* USER1 and USER2 will only be available if one or two user-defined satellites have been added to the library as detailed in Section 2.4.2, "Programming User-defined Satellites."*



- Transponder information for each of the following polarizations/frequencies:
  - vertical high
  - vertical low
  - horizontal high
  - horizontal low
- Transponder information includes:
  - frequency
  - symbol rate
  - FEC code, and
  - network ID (in hexadecimal format)

This information can be obtained for your satellite service provider or on a number of sites on the Internet, such as *www.satcodx.com*.

### Entering User-defined Satellite Data

Once the link between the PC and the TracVision 4 is established as described in *Section 2.4, "Selecting the Active Satellite,"* it is necessary to provide initial longitude data regarding the user-defined satellite. To do so, enter the SATCONFIG parser command via PC as follows:

Command:	<b>SATCONFIG,USERX,YYY,Z,D,L&lt;cr&gt;</b>
Where:	X = 1 or 2 (satellite alternative) YYY = longitude (0-180) Z = E (East) or W (West) D = decoding type (0=test, 1=DSS-A, 2=DSS-B, 3=DVB) L = LNB polarization (C=circular, L=linear)
Function:	configures one of the user-configurable satellites with the longitude provided
Response:	if valid entry, echoes the input data if invalid entry, returns error message

After entering the SATCONFIG command, you must turn on the DEBUG mode by typing **@DEBUGON**.

Following the entry of the SATCONFIG and DEBUGON commands, enter the satellite transponder information via PC as follows:

Command:	<b>@SATCONFIG,X,N,F,S,C,ID,P,B,D&lt;cr&gt;</b>
Where:	<p>@SATCONFIG = directs data to the RF Board</p> <p>X = satellite location A or B</p> <p>N = satellite table # (98 &amp; 99 are slots for user-configured satellites)</p> <p>F = frequency in MHz (either 00000 or a range from 10700 - 12700)</p> <p>S = the satellite transponder symbol rate in Mbit/second (01000 - 30000)</p> <p>C = the FEC code (e.g., 12, 23, 34, 56, 67, 78)</p> <p>ID = the satellite network ID in hexadecimal format (0x####)</p> <p>P = the LNB polarization (v=vertical, h=horizontal)</p> <p>B = the LNB down conversion frequency (l=low, h=high)</p> <p>D = decoding type (0=test, 1=DSS-A, 2=DSS-B, 3=DVB)</p>

This information has to be entered for each of the four transponder categories:

- vertical high
- vertical low
- horizontal high
- horizontal low

TracVision 4 requires that the data fields for all four transponder categories be provided. If the selected satellite does not have information for one or more of the transponder categories, default information should be entered in the fields as follows:

Transponder Data	Default Value
Frequency	00000
Symbol Rate	27500
FEC Code	the same value as provided for those transponders with data
Network ID	0x0000
Polarity and Band	whichever combinations are not already provided

After entering this information, it is necessary to save these settings. To do so, type:

**@SAVE,A** (or B if this data is for Satellite 2)

**@DEBUGOFF**

After completing this process, restart the system by either cycling power or typing **ZAP** in the maintenance screen.

One of your user-defined satellite options has now been added to the TracVision 4 satellite library. This option will now be available the next time the SATINSTALL command is given.

### **An Example of Configuring a User-defined Satellite**

The following is an example of configuring the fictional YOURSAT 101 as the USER1 configured satellite. Prior to configuring this satellite or any others, be certain to get the most up-to-date information from one of the sources previously discussed.

#### **Yoursat 101 at 7 West, DVB decoder, Linear Polarization LNB**

<i>Horizontal High</i>	
Frequency	11.966 GHz
Symbol Rate	27500
FEC Code	3/4
Network ID	2048 (dec) = 0x0800
<i>Vertical High</i>	
Frequency	11.823 GHz
Symbol Rate	27500
FEC Code	3/4
Network ID	2048(dec) = 0x0800
<i>Vertical Low</i>	
No Data Listed	
<i>Horizontal Low</i>	
No Data Listed	

Based on this information, the data entered via the PC would look like this, assuming that YOURSAT 101 would be Satellite 1:

```
SATCONFIG,USER1,7,W,3,L
@DEBUGON
@SATCONFIG,A,98,11966,27500,34,0x0800,H,H
@SATCONFIG,A,98,11823,27500,34,0x0800,V,H
@SATCONFIG,A,98,00000,27500,34,0x0000,V,L
@SATCONFIG,A,98,00000,27500,34,0x0000,H,L
@SAVE,A
@DEBUGOFF
ZAP
```

## 2.5 Checking Out the System

To complete the TracVision 4 installation, it will be necessary to verify that the system functions properly. Critical to ensuring that the system is configured and operating properly is to check the system startup routine to ensure that the system is operating within normal parameters.

1. Connect a PC to the maintenance port and startup the system as instructed in *Section 2.4, "Selecting the Active Satellite."*
2. Allow the system to fully initialize. Review the startup data and make sure that no system errors have been reported. A representative startup sequence has been provided in *Appendix F*.
4. After completing the review of the startup and operational routines, shut down the system.

### Completing the Installation Process

1. Refer to your satellite programming guide. Select several channels from your active satellite service to confirm that the system is receiving and decoding the signals properly.
2. Fill out and submit the warranty card to KVH.



## 3 Antenna Unit Operation

The TracVision 4 system is easy to use. Antenna Unit initialization and satellite acquisition is automatic and does not require operator intervention.

To start up the TracVision 4 system:

1. Turn on the IRD and the television receiver.
2. Turn on the Antenna Unit.

Refer to your IRD user manual for complete operating instructions for the IRD.

### Tips to Get the Best Reception with TracVision 4

- A clear line of sight to the satellite is required to ensure that the antenna can acquire and track the satellite.
- The Antenna Unit is designed to rotate a full 720° before coming to the end of its cable. If it does so, the system conducts an automated cable unwrap. This involves rotating the dish in the opposite direction. During this process, your television transmission will be frozen momentarily while the cable unwraps and the antenna reacquires the satellite.

### Automated Operations

The system carries out a number of automated steps at startup. For reference, these steps are:

1. *Antenna Unit Initialization* – The microprocessor circuitry does a basic self-test of the hardware and software associated with the antenna unit.
2. *Satellite Search Modes* – The system loads the previously stored satellite location. If there is no previously stored satellite location (as with a new installation), a default position is loaded. The system then begins a set of Search Modes to find the satellite. The default position may be modified via the maintenance port.



*To minimize the time it takes the antenna to acquire the satellite, do not change the channel during the startup process or cable unwrap.*

3. *Fine-tuning/Satellite* – When a signal is detected, the antenna interrupts the search mode and begins a procedure to fine-tune the position for maximum signal strength. When the signal peak is found, the RF circuitry verifies the ID of the acquired satellite. If the ID is correct, the system enters tracking mode; if it is wrong, it resumes the search. Once the satellite has been acquired, the system updates the satellite location stored in memory.

## 3.1 Watching Your Selected Satellites

TracVision 4 can have a pair of satellites installed, either one of which can be the active satellite selection. There are several methods to select whether your TracVision 4 will track Satellite A or B based upon your location and selected satellite service.

### Maintenance Port Switch

As described in *Section 2.4, "Selecting the Active Satellite,"* the maintenance port is used to tell the Antenna Unit which satellite it should acquire and track. To make the antenna track either Satellite A or B, first connect the PC to the maintenance port as described in Section 2.4. Once the data connection is made, enter the Satellite Selection parser command as follows:

Command:            **@L,x<cr>**

Where:	x = A or B (one of your selected satellites as defined during the SATINSTALL process)
--------	---

Choosing A or B will assign the antenna to acquire and track that installed satellite.

### DIRECTV Satellite Subscribers

DIRECTV subscribers in certain regions of the United States will require a DSS Plus™ IRD to receive both satellite and local channels. Check with DIRECTV for regional requirements. The DSS Plus IRD allows you to switch channels using the remote control. If you are a DIRECTV subscriber, but do not have a DSS Plus IRD, use the maintenance port switching option previously described.

## EchoStar and Expressvu Satellite Subscribers

EchoStar and Expressvu subscribers will need to use the maintenance port switching method.

### 3.1.1 Watching TV Underway and at Rest

TracVision 4 is designed to operate as efficiently and as reliably as possible both when your vessel is underway and at rest (e.g., at the dock).

#### “Instant On” Operation

As part of its operation, TracVision 4 routinely saves the satellite position to memory and retains it when the system is turned off. When TracVision 4 is powered up, the system looks at the satellite’s last saved position. If the vessel has not changed its location, the antenna will immediately acquire the satellite and receive the signal without initializing the antenna.

If the antenna has acquired the satellite through the “Instant On” feature, then once the vessel begins to move, the Antenna Unit will quickly carry out its normal initialization routine to prepare for active tracking, resulting in a brief (~30 seconds) freeze in the satellite signal and image. As soon as initialization is complete, satellite tracking will resume and the television image will be restored.

#### Conical Scan Tracking While Underway

The antenna control unit generates a conical scanning function to maintain peak signal strength to the receiver and to update the satellite’s position. When conical scan tracking is active, the antenna moves continually with a circular motion to sweep across the satellite’s peak signal. The signal strength is then fed back to the control circuits to keep coming back to the direction of the strongest signal. If the satellite signal is lost while the system is in conical scan track mode, the control software imposes a 30-second time-out delay. If the signal is not regained during that time, the antenna reverts to the set of Search Modes to start looking for the satellite signal. This is an automatic process that does not require user intervention.



### **Sleep Mode**

When the vessel has come to a stop and holds its position for any extended period of time, the Antenna Unit enters Sleep Mode, which turns off the conical scan tracking thereby reducing any motor noise the antenna may be making. As soon as the vessel moves, Sleep Mode will automatically be turned off and the system will begin tracking the satellite again.

# 4 Troubleshooting

The troubleshooting matrix shown in Figure 4-1 identifies some trouble symptoms, their possible causes, and reference to troubleshooting solutions.

**Figure 4-1**  
Troubleshooting Matrix

SYMPTOM	POSSIBLE CAUSE (AND SOLUTION)									
	Blown fuse, low power, or wiring (Section 4.1.1)	Satellite signal blocked (Section 4.1.2)	Outside satellite coverage zone (Section 4.1.3)	Radar interference (Section 4.1.4)	Vessel turning during startup (Section 4.1.5)	Incorrect or loose RF connectors (Section 4.1.6)	Passive multiswitch used (Section 4.1.6)	EchoStar IRD commissioning (Section 4.2)	Antenna gyro faulty (Section 4.3)	LNB assembly faulty (Section 4.3)
Antenna non-functional	X									
No picture on TV set		X			X	X				X
Intermittent picture for short intervals		X	X	X	X	X	X		X	X
System works at dock but not underway	X							X		
System will not find satellite		X	X	X	X	X	X			X
Snowy television picture				X						

## 4.1 Causes and Remedies for Common Operational Issues

There are a number of common issues that can affect the signal reception quality or the operation of the TracVision 4. The following sections address these issues and potential solutions.

### 4.1.1 Blown Fuse, Low Power, or Wiring

If the Antenna Unit is installed but entirely non-responsive, there are three key factors to check as part of the troubleshooting process:

1. Blown Fuse – The Antenna Unit is equipped with a fuse mounted on its CPU Board. If this fuse has blown or been broken, the Antenna Unit will not operate. Refer to *Section 5.4, "PCB Removal and Replacement,"* for details on the fuse location and how to access the CPU Board.
2. Low Power – If the power cable from the Antenna Unit to the power source is more than 15 m (50 ft), the power levels can decrease over the course of the cable, resulting in a voltage level at the Antenna Unit that is too low to power the system. Refer to *Section 2.3.3, "Connecting to Ship's Power,"* for details on supplying adequate power to the Antenna Unit.
3. Wiring – If the system has been improperly wired, it will prevent the Antenna Unit from operating correctly. Refer to *Section 2.3, "Wiring the TracVision 4 System,"* for complete system wiring information.

### 4.1.2 Satellite Signal Blocked

Satellite signals can be blocked or degraded by buildings, other vessels, or equipment on the vessel itself. Refer to *Section 2.1, "Choosing the Best Location and Getting the Best Reception,"* to make certain that the TracVision 4 unit is in the optimal location.

### 4.1.3 Outside Satellite Coverage Zone

TracVision 4 will provide outstanding reception within the 18" (45 cm) antenna coverage area for your satellite television service of choice. However, signal quality can be degraded as you approach the fringe coverage areas. Refer to your satellite television service manual to check the viable coverage area for a 18" (45 cm) antenna.

## 4.1.4 Radar Interference

The energy levels radiated by radar units can overload the antenna front-end circuits. Refer to *Section 2.1, "Choosing the Best Location and Getting the Best Reception,"* to make certain that the TracVision 4 unit is in the optimal location with regard to your radar unit.

## 4.1.5 Vessel Turning During Startup

If the vessel turns during the 60-second startup and initialization sequence that occurs immediately after turning on the power to the TracVision 4 unit, the antenna gyro will record that variable motion as "standing still." This may cause the antenna to track improperly. To solve this problem, turn TracVision 4 off for at least 10 seconds. Turn the system back on, making certain that the vessel is either motionless or travelling in a straight line for the 60 seconds immediately following power-up.

## 4.1.6 Incorrect or Loose RF Connectors

As part of preventive maintenance (described in *Section 5, "Maintenance,"*) KVH recommends checking the Antenna Unit cable connections. A loose RF connector can reduce the signal quality. Refer to *Section 2.3.5, "Connecting the Antenna RF Signal Cable to the IRD"* for directions on proper Antenna Unit to RF cabling.



*Baseline RF levels are included as part of the startup sequence provided in Appendix F.*

## 4.1.7 Using a Passive Multiswitch

An active multiswitch must always be used to connect the TracVision 4 system to multiple IRDs. Refer to *Section 2.3.5, "Connecting the Antenna RF Signal Cable to the IRD"* for directions on proper multiswitch/multiple IRD cabling.

## 4.2 EchoStar IRD Commissioning

If you have purchased a DISH Network system, there is a chance that your EchoStar IRD will fail to acquire the satellite when you first activate it. This has been known to happen in IRDs that have not been commissioned within several months of their manufacture. *Appendix E* provides the manual satellite acquisition and commissioning procedure.

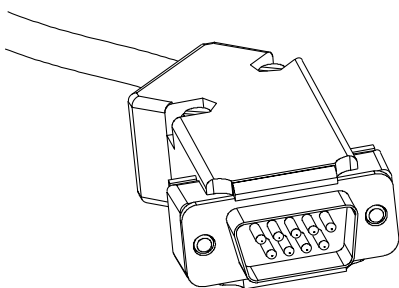
## 4.3 Antenna Gyro and LNB Faults

*Section 5, "Maintenance,"* provides detailed instructions for authorized service personnel who may be required to replace the TracVision 4 antenna gyro or the LNB.

## 4.4 Computer Diagnostics

TracVision 4 has been designed to provide diagnostic readouts viewed on a personal computer having an RS-232 serial communication port. If you are unable to isolate a system problem, set up for computer diagnostics as described below. System problems will most likely be found somewhere through the diagnostic readouts.

**Figure 4-2**  
DB9 Connector



The diagnostics procedure requires terminal emulation software such as PROCOMM, Windows Terminal, or Windows 95/98 Hyperterminal. Use the settings appropriate to your application.

1. Connect one end of the PC cable to the DB9 connector on the switchplate. Connect the other end to the serial port on the PC (a 9-pin/25-pin connector adapter may be needed for some PCs).
2. Open the terminal emulation software and establish the following settings:
  - 9600 baud
  - no parity
  - 8 data bits
  - 1 start bit
  - 1 stop bit
  - no flow control

3. Apply power to the TracVision 4 system and allow the system to complete full initialization. Data should be scrolling on the PC display to identify any system problems detected. If no data is seen, recheck your connections and the terminal software setup.
4. After completing the diagnostic, shut down the system.

## 4.5 Maintenance Port Parser Commands

TracVision 4 system parser commands are detailed in *Appendix G*.



## 5 Maintenance

The following sections provide details on preventive maintenance and field replaceable units and parts for the TracVision 4 antenna unit.



*The serial number for your TracVision 4 will be required during any service or calls. You will find the serial number on the inside front cover of this manual.*

### 5.1 Warranty/Service Information

KVH Industries, Inc. warrants TracVision 4 against defects in materials and workmanship for a period of two years and labor for a period of one year from the date of original retail purchase by the original purchaser. Labor is only warranted if the TracVision 4 was installed by an authorized KVH dealer. It is the customer's responsibility to verify the date of purchase by returning the warranty card included with the product to KVH within 30 days of purchase, or by providing a copy of a dated sales receipt for the KVH product under warranty with the warranty claim. If this date cannot be verified, the warranty period will begin 30 days after the date of manufacture of the original product purchased.

For additional information on KVH warranty, repair, and liability policies, please refer to the complete warranty statement provided at the conclusion of this manual.

### 5.2 Preventive Maintenance

TracVision 4 requires minimal preventive maintenance. The following routine housekeeping chores are sufficient to maintain peak performance.

#### Monthly

Wash the exterior of the radome and baseplate assembly with fresh water to remove salt deposits; a mild detergent may be added to remove grime.

- Use caution when spraying the radome directly with high-pressure water from a hose.
- Do not apply abrasive cleaners or volatile solvents such as acetone to the ABS radome.



- Check all connectors at the Antenna Baseplate. Remove connectors and examine for signs of corrosion; clean as needed.

**Semi-Annually**

- Remove the radome and examine the interior of the Antenna Unit for signs of corrosion, loose connections, or frayed or broken wires.

## 5.3 TracVision 4 Field Replaceable Units



*TracVision 4 components receive power from multiple sources. Do not open any electrical assemblies or attempt servicing until IRD power and vessel input power are disconnected.*

The TracVision 4 has been designed with durability and low maintenance in mind. If you experience an operating problem or otherwise require technical assistance, contact your local authorized TracVision 4 dealer/installer first. If an authorized dealer/installer is not located nearby, contact the factory directly at the telephone, facsimile, or e-mail listings inside the front cover.

Replacement part numbers for field replaceable units (FRUs) that can be serviced in the field are listed in Table 5-1. These parts may be obtained from any KVH authorized dealer/installer or may be ordered directly from KVH.

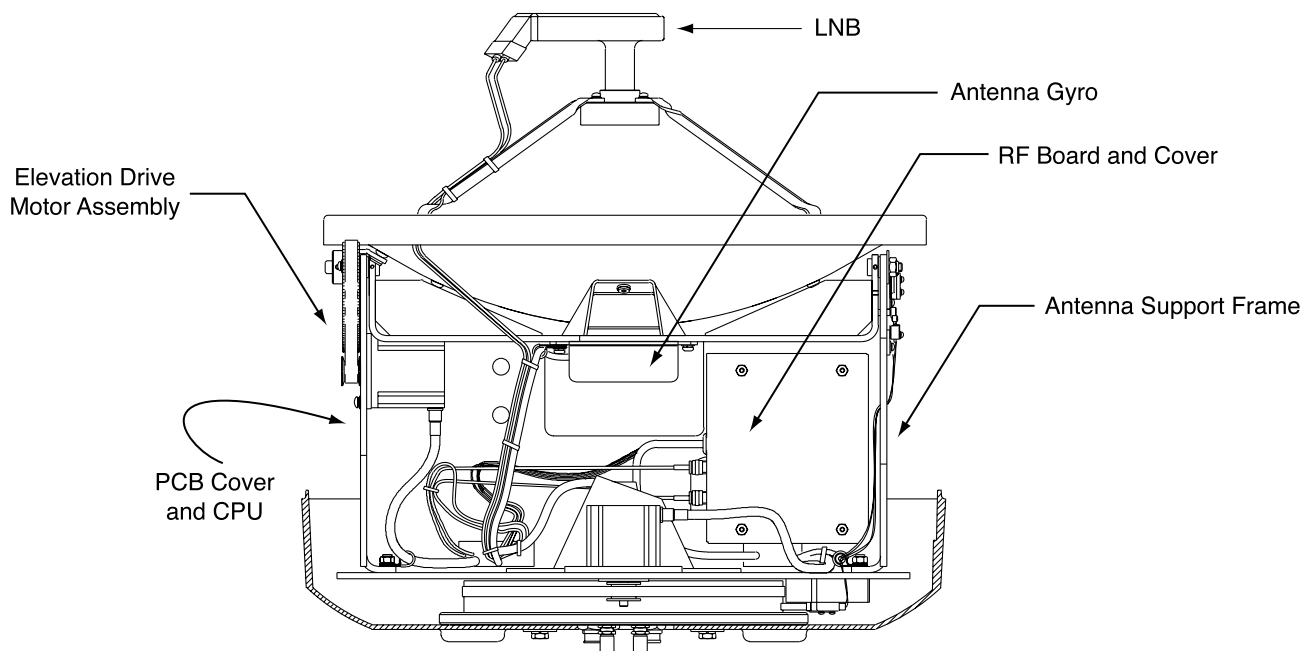
**Table 5-1**  
*TracVision 4 Field Replaceable Units*

<b>FRU</b>	<b>Part Number</b>
Radome	02-0925-04
CPU	02-0992
RF Detector PCB	02-1017-02
Antenna Gyro Sensor	02-1035
Antenna Gyro Gasket	24-0139
Elevation Drive Belt	24-0105-83
LNB Assembly	02-0932
Data Cable	32-0619-50
PC Cable	32-0628-06
Power Cable	32-0510-50
RF Cable	32-0417-50
IRD Ground Wire	32-0583-50
CPU Fuse	16-0017-4000

The Antenna Unit printed circuit boards, Antenna LNB, elevation stepping motor, and elevation drive belt may be removed and replaced on site using common hand tools. Other TracVision 4 service must be done by your authorized dealer/installer or at the factory. Evidence of tampering with or unauthorized repairs will void the warranty. The following are step-by-step procedures for removing and replacing those components that may be serviced.

Figure 5-1 depicts the location of a number of components within the TracVision 4 Antenna Unit.

**Figure 5-1**  
TracVision 4 Antenna Unit  
(Baseplate Cut Away)



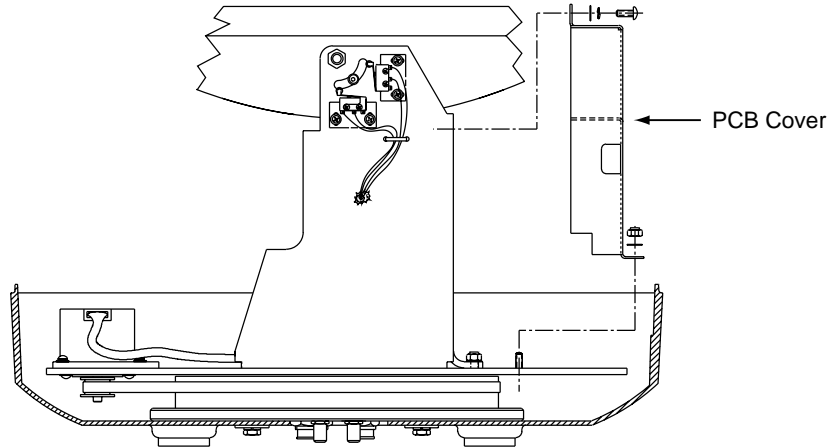
## 5.4 PCB Removal and Replacement

The printed circuit boards (PCBs) are protected by a cover fastened to the antenna support frame. The cover must be removed to gain access to the main power fuse and the PCB assemblies discussed below. Refer to Figure 5-2 on the following page; remove (3) nuts and washers from the bottom flange and (4) screws, nuts and washers from the upper flange. Remove the cover and set aside with the fasteners.

**Figure 5-2**  
PCB Cover Plate Removal

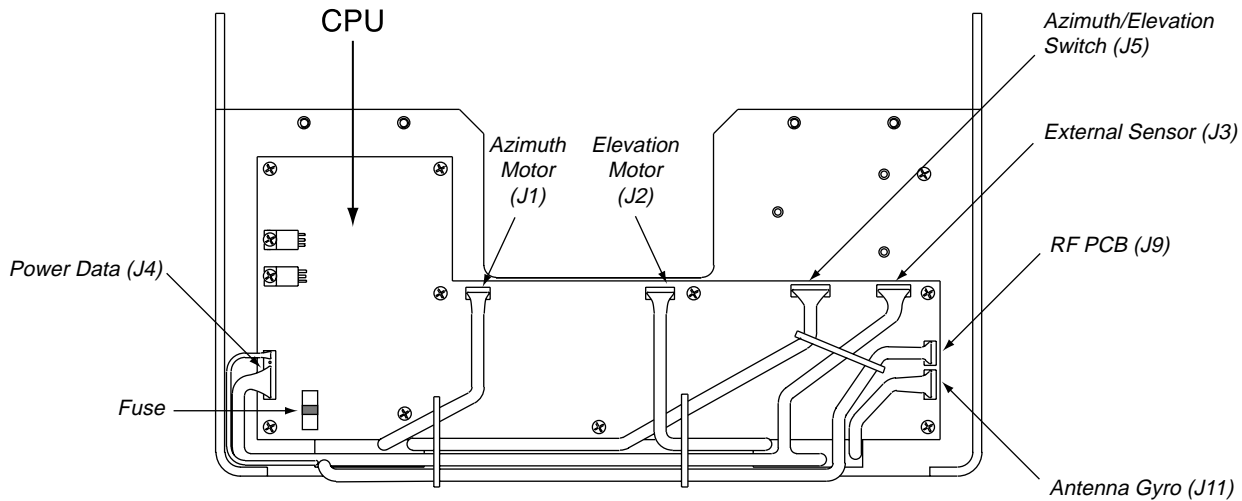


The PCB cover fits snugly over the PCB. When removing or replacing the cover, take care to ensure that the cover does not dislodge any of the Molex connectors as this will cause system errors and improper operation.



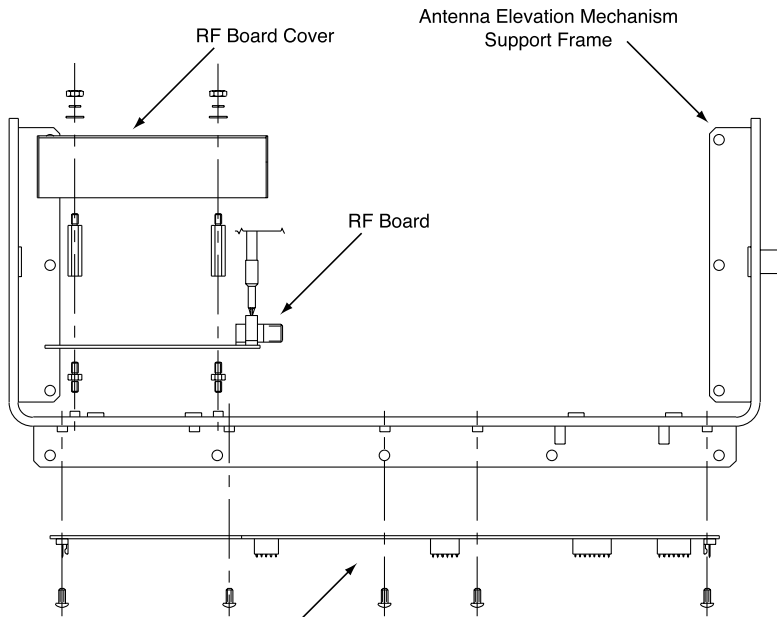
The PCBs are mounted to the antenna elevation mechanism support frame with machine screws and are interconnected by means of keyed Molex connectors. Figure 5-3 shows the PCB arrangement, connector locations, and functions while Figure 5-4 on the next page shows how the printed circuit boards are mounted to the support frame.

**Figure 5-3**  
PCB Connector Locations  
(Rear View)



### 5.4.1 CPU Board

1. Remove the seven Molex connectors from the CPU.
2. Remove eleven #6-32 x 3/8" machine screws, lockwashers and flat washers from the PCB.
3. Remove the assembly from the main support.



**Figure 5-4**  
PCB Mounting (Top View)

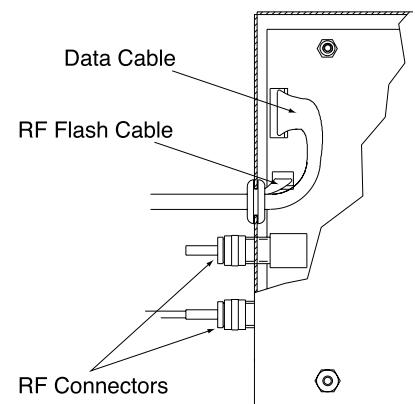
4. Installation of the replacement assembly is the reverse of this. Reinstall all Molex connectors removed in Step 1.
5. Calibrate the Gyro and LNB as described in Sections 5.5 and 5.7.

### 5.4.2 RF Detector

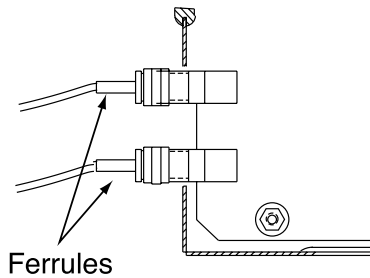
The RF Detector receives operating voltages from both the CPU board and the IRD (via the RF cable). Ensure that *all* power (including the IRD) is turned off before proceeding.

1. Use a  $\frac{5}{16}$ " (8 mm) socket to remove the four nuts and washers securing the RF Board cover. Set the hardware and cover aside.
2. Cut the tie-wrap securing the Data and RF Flash cables (pictured in Figure 5-5) to the RF Board.
3. Unplug the Data and RF Flash cables from the RF Board.
4. Observe which RF cable is attached to the top RF connector. If the top RF cable is not already marked with yellow tape, add a piece of tape or some identifying mark so that the RF cables can be plugged into the proper RF connectors on the new RF Board.

**Figure 5-5**  
Data and RF Flash Cables

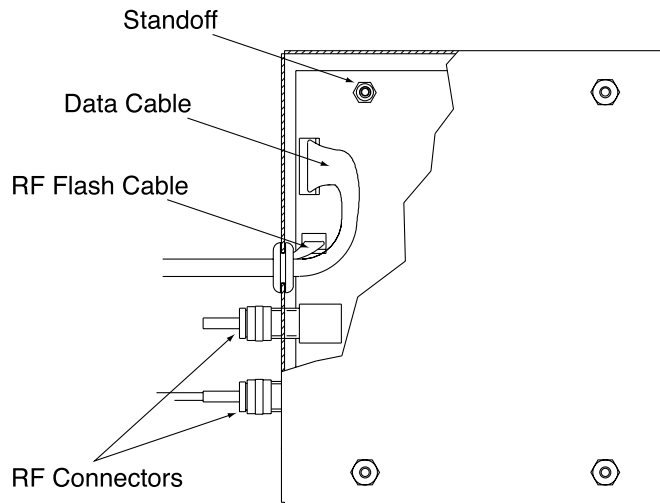


**Figure 5-6**  
RF Cable Ferrules



*Failure to hold the ferrules tightly while loosening the RF connectors can result in damage to the cables and reduce the signal quality.*

**Figure 5-7**  
New RF Board Installation



5. Remove the two RF cables from the RF connectors with a  $\frac{7}{16}$ " (12 mm) wrench. Hold the RF connector ferrule while loosening the connectors to avoid excess stress on or twisting of the cables. Refer to Figure 5-6.
6. Remove the four  $1\frac{1}{16}$ " standoffs with a  $\frac{1}{4}$ " (7 mm) nut driver/socket and set aside.
7. Remove the RF Board and discard.
8. Install the new RF Board, making certain to align the Board so that the RF Connectors are facing to the inside. Figure 5-7 illustrates the alignment of the new RF Board, the standoffs, cables, and cover.
9. Apply a drop of Loctite to one end of the four  $1\frac{1}{16}$ " standoffs. Install the four standoffs, Loctite-applied end facing the RF Board, using the nut driver to tighten securely.

10. Reattach the RF cables, making certain that the RF cable originally attached to the top RF connector on the old RF Board is connected to the top RF connector on the new RF Board.
11. Attach the Data and RF Flash cables to the RF Board.
12. Insert the split rubber grommet surrounding the Data and RF Flash cables into the small slot on the new RF Board cover.
13. Secure the RF Board cover using the nuts and washers removed in Step 1.

## 5.5 Antenna Gyro Assembly

1. Remove the printed circuit board (PCB) cover, illustrated in Figure 5-2, using a #2 Phillips screwdriver and a  $\frac{3}{8}$ " (10 mm) nut driver/socket.
2. Use the  $\frac{3}{8}$ " (10 mm) nut driver/socket to remove the four nuts and washers securing the Antenna Gyro to the Antenna Reflector. The nut on the bottom right also secures another P-clip to the Antenna Reflector. Set the nuts and washers aside.
3. Disconnect the 7-pin Molex connector from the PCB. Place the old Antenna Gyro assembly aside.
4. Attach the 7-pin Molex to the new Antenna Gyro assembly.
5. Replace the antenna gyro gasket.
6. Use the nuts removed in Step 2 to attach the new Antenna Gyro to the Antenna Reflector. The bottom right nut should be used to secure the P-clip on the Antenna Gyro Cable. The Antenna Gyro should be oriented so that the cable extends from the top of the gyro.
7. Carefully move reflector through its range of motion to ensure that the cable moves freely between the elevation mechanism and the lower assembly. Adjust the Antenna Gyro cable as necessary to ensure proper motion. Also ensure that the cables to the RF PCB do not interfere with the Gyro motion.



*Make sure the cable jacket passes through the PCB access slot to protect the wires from the edge of the PCB frame.*

### Antenna Gyro Calibration

1. With the PC connected to the maintenance port, apply power to the antenna unit.
2. Type **HALT<cr>** while the system is performing the limit switch initialization routine. The system will complete the initialization function by finding the azimuth and elevation switch limits and then go to the home position. Record the 8-digital serial number that was displayed in the startup message.
3. Type **DEBUGON<cr>** to enter Debug Mode.
4. Type **DEBUGON<cr>** to enter Debug Mode.



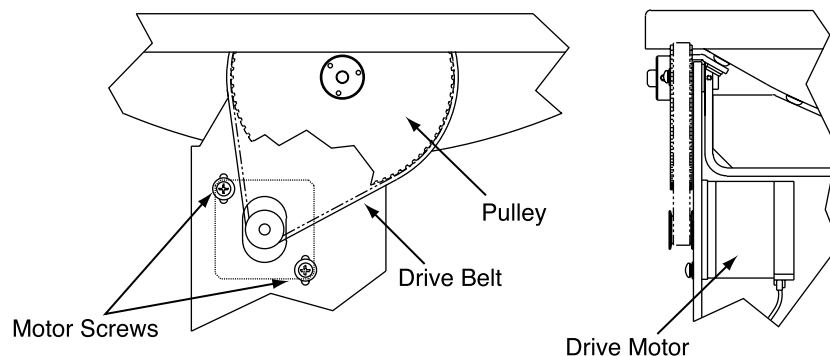
Refer to Section 2.4, "Checking Out the System" for complete details in connecting a PC to the system via the maintenance port.

5. Type **=CALAZ<cr>**. Verify that the Antenna Gyro Azimuth scale factor is between 0.000800 and 0.001200.
6. Type **=CALEL<cr>**. Verify that the Antenna Gyro Elevation scale factor is between 0.000800 and 0.001200.
7. Type **ZAP<cr>**.
8. Type **HALT<cr>** while the system is performing the limit switch initialization routine. The system will complete the initialization function by finding the azimuth and elevation switch limits and then go to the home position.
9. Verify that the response has the correct parameters.
10. Type **ZAP** to restart/reinitialize the system.

## 5.6 Elevation Motor and Belt Replacement

The elevation motor is mounted to the inside of the elevation drive assembly support frame. Machine screw/washer sets hold the drive motor in proper position to maintain proper tension on the toothed drive belt. When adjusting belt tension or changing the belt, do not remove the screws from the motor side, only loosen the external screws on the belt side. Figure 5-8 on the following page shows the arrangement of motor, drive belt, and antenna pulley.

**Figure 5-8**  
Elevation Drive Mechanism



### 5.6.1 Drive Belt Removal and Replacement

1. Loosen (2) #8-32 x 5/8" screws until the motor is free to move upward. Raise the motor to the top of the slots and retighten the screws to hold it there.
2. Roll the belt over the motor hub while slowly moving the antenna reflector through its vertical travel. Work the belt out from between the antenna pulley and reflector.
3. Carefully work the new belt in between the antenna pulley and the reflector. Ensure that the teeth are on the inside of the belt. Feed the belt over the motor hub. Once the belt is in place, work it back and forth to ensure that the belt is aligned and the teeth are engaged with the motor pulley.
4. Gently press downward on the motor hub until the drive belt is at proper tension. Adjust the belt tension for a maximum of  $\frac{1}{8}$ " (3 mm) deflection with moderate finger pressure between the motor and antenna pulley. Some readjustment may be necessary if the belt tension results in excessive antenna reflector vibration.
5. Tighten the holding screws.

### 5.6.2 Elevation Drive Motor Removal and Replacement

1. Remove the Elevation Motor Molex connector from the PCB (illustrated in Figure 5-8). Feed the drive motor cable through the cutout to the front of the elevation drive assembly support frame.
2. Remove the two machine screws and washers holding the motor in position. Withdraw the motor from the elongated slots.
3. Remove (2) screws from the tapped motor mounting plate and transfer the plate and screws to the replacement motor. Apply a drop of thread-locking compound (e.g., Loctite 425 or equivalent) where each screw protrudes from the plate.





The short screw must go in the upper left hole on the motor flange (as viewed from the motor housing end with the cable extending down). Refer to Figure 5-8 for proper screw location.

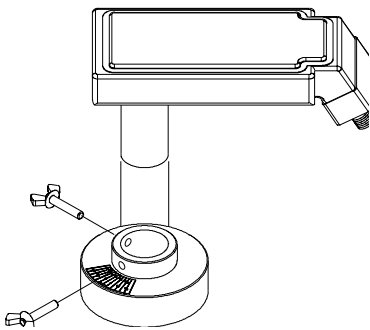


Excessive belt tension may result in antenna reflector vibration.

4. Install the new motor with the open holes in the motor mounting plate behind the slots in the frame and the motor connector facing down, as shown in Figure 5-5. Reinstall the machine screws and washers but do not tighten.
5. Raise the motor and work the toothed drive belt over the outer lip of the hub. Press down gently on the motor body while rotating the antenna reflector up and down to ensure free movement.
6. Adjust the belt tension for a maximum of  $\frac{1}{8}$ " (3 mm) deflection with moderate finger pressure between the hub and gear. Some readjustment may be necessary if the belt tension results in excessive antenna reflector vibration.
7. Reconnect the Elevation Motor Molex connector to the PCB.

## 5.7 Antenna LNB Replacement

**Figure 5-9**  
LNB Removal and Alignment



The LNB assembly receives preamplifier operating power from the IRD via the RF Detector PCB. Be certain that the IRD is turned off or disconnected from its power source before removing or reconnecting the LNB.

1. Disconnect both RF coaxial connectors at the LNB. Loosen (2) allen set screws on the throat of the choke feed until the LNB is free to slide out. Withdraw the LNB.
2. Insert the replacement LNB as far as it will go. Be sure that it bottoms in the feedhorn. Be careful not to puncture or dislodge the plastic seal covering the LNB throat. Orient the LNB to align with the strut holding the pair of RF cables.
3. Apply a small amount of thread-locking compound (Loctite 425 or equivalent) to the allen screw threads and tighten the screws to secure the LNB in position.

## 5.8 Preparation for Shipment

If it is necessary to repack the Antenna Unit for shipment, the shipping restraint removed during installation must be replaced. Follow these steps to reinstall the restraint.

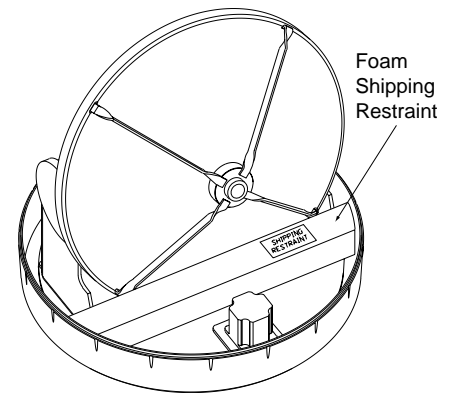
1. Rotate the azimuth mechanism slowly to find the limit switch stop. The front of the antenna should be facing the forward arrow.
2. Rotate the azimuth mechanism 180° in the opposite direction to ensure that the mechanism is not resting on the limit switch stop.
3. Pivot the reflector edge to its lowest position as shown in Figure 5-10.
4. Place the foam shipping restraint, label side up, between the reflector and the azimuth motor, as illustrated in Figure 5-10. The reflector should now be captured behind the restraint.
5. Pack the TracVision 4 unit in its original package.
6. As detailed in the warranty accompanying this product and printed on the last page of this manual, a Return Material Authorization (RMA) number is required prior to the return of the TracVision 4 system to KVH. Contact the KVH Technical Support Department at +1 401 847-3327 or via email at [techs@kvh.com](mailto:techs@kvh.com) to obtain the RMA number. Please review your warranty to familiarize yourself with all requirements, liabilities, and policies.



*When rotating the azimuth mechanism by hand, go slowly! Hitting the mechanical stops with excessive force will damage the azimuth limit switch.*

**Figure 5-10**

*Shipping Restraint Placement*





# Appendix A

## System Specifications

### A.1 Antenna Specifications

#### Physical Characteristics

Antenna Unit	53 cm (21") h x 49 cm (19.2") d; 13.6 kg (30 lbs)
Operating temperature	-25° to +55° C (-13° to +130° F)
Storage temperature	-40° to +85° C (-40° to +185° F)
Humidity	to 100% non-condensing

**Table A-1**

*TracVision 4 Antenna  
Physical Specifications*

#### Input Power

Input	11–16v DC @ 3.5 amps nominal (4.5 amps peak)
-------	---

**Table A-2**

*TracVision 4 Power Specifications*

#### Antenna System Performance

Minimum EIRP	50-51 dB
Elevation range	20° - 85°
Azimuth range	720°
Pitch/roll range	±15°
Pitch/roll rate	45°/second
Turn rate	45°/second
Yaw	±90° in 10 seconds
Tracking rate	30° per second
Position repeatability	0.1°
Surge/sway/heave	±0.2 G
Shock	20 G, 11 msec
Vibration	0.9 G rms over 5-33 Hz

**Table A-3**

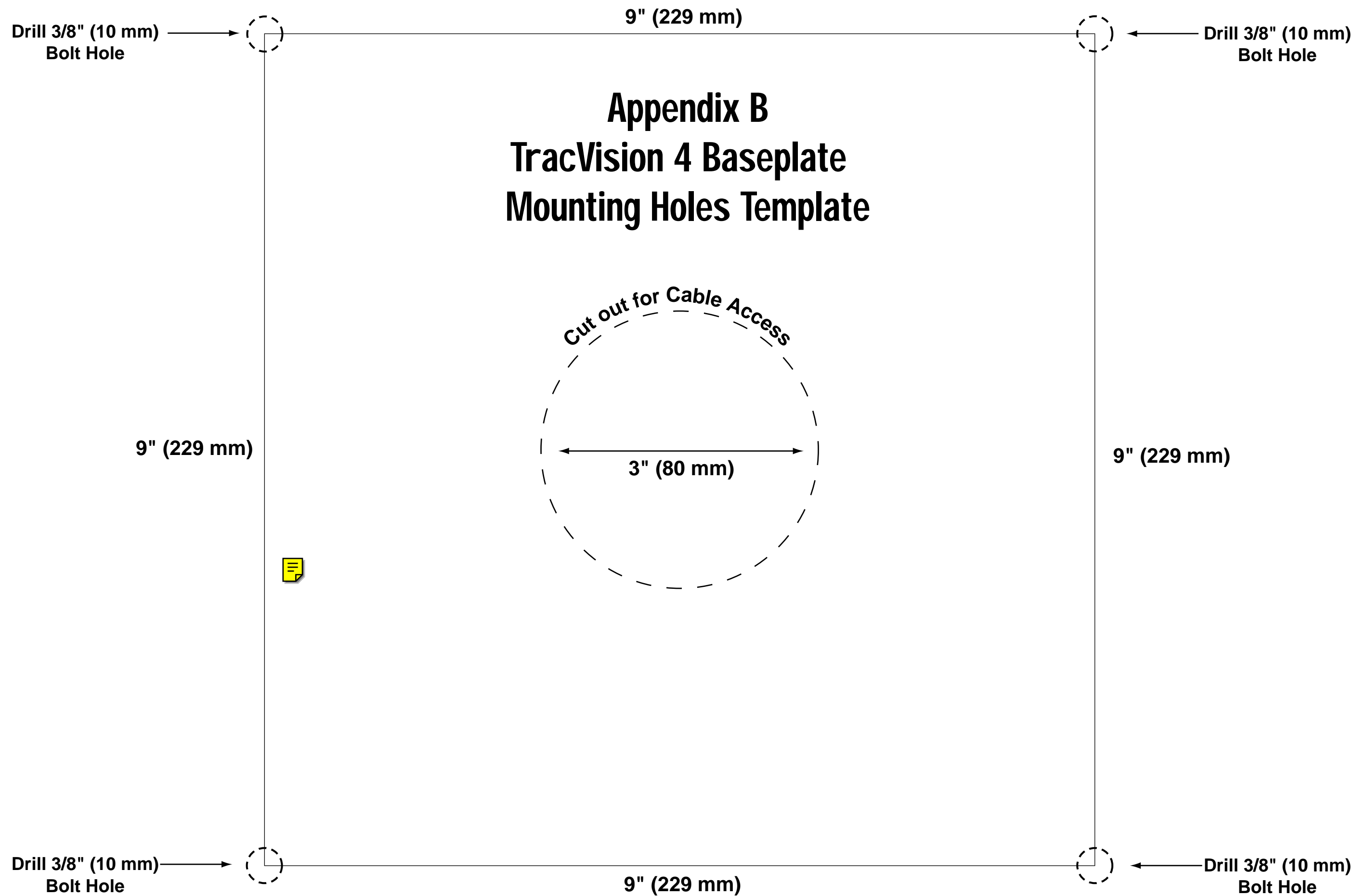
*TracVision 4 Performance  
Specifications*



# Appendix B

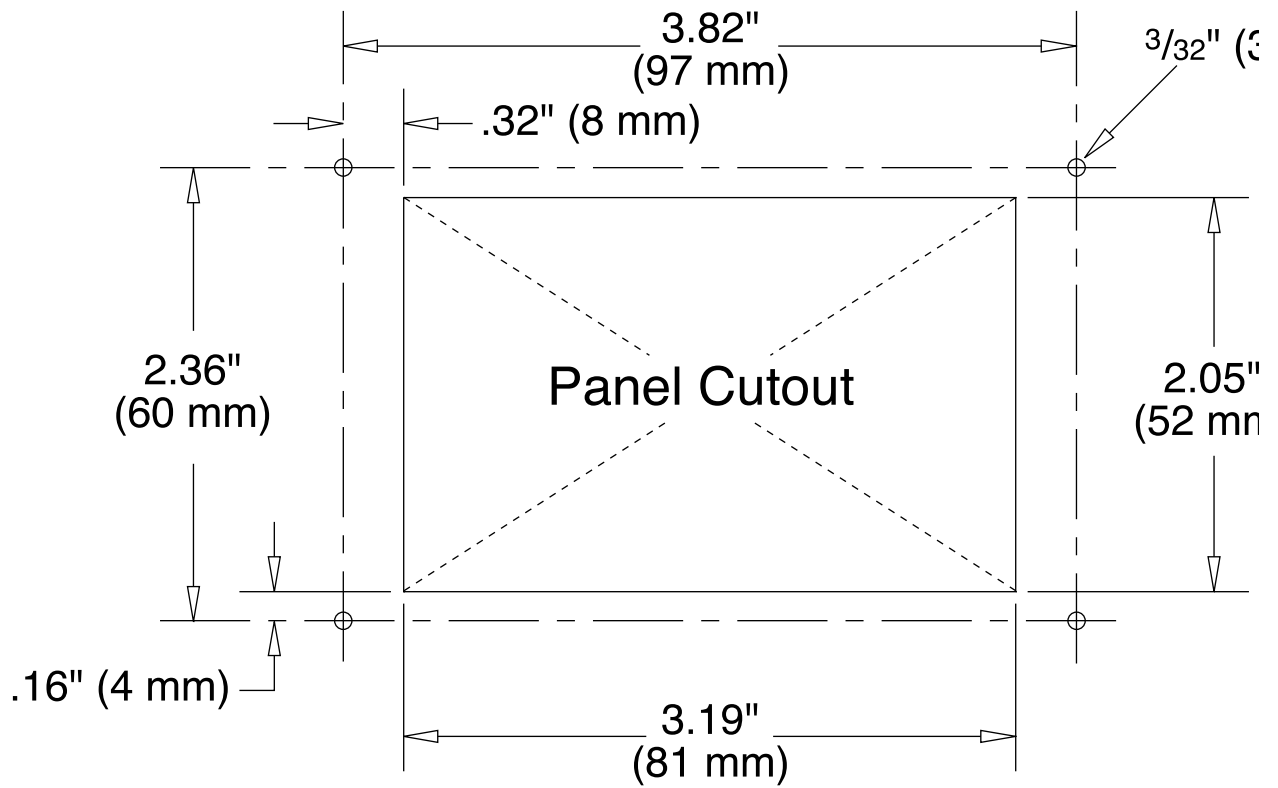
## TracVision 4 Baseplate Mounting Holes Template

A template for the four mounting holes is presented on the following page.



# Appendix C

## Switchplate Panel Cutout Template







# **Appendix D**

## **Comprehensive TracVision 4**

### **Wiring Diagram**

The comprehensive TracVision 4 wiring diagram is unavailable in PDF format. If you require a copy of this wiring diagram, please contact KVH Technical Support at +1 401 847-3327 or via email at [techs@kvh.com](mailto:techs@kvh.com). A copy of the diagram can be mailed or faxed to you upon request.



# Appendix E

## EchoStar Commissioning Procedure

If you have purchased a DISH Network system, there is a chance that your EchoStar IRD will fail to acquire the satellite when you first activate it. This has been known to happen in IRDs that have not been commissioned within several months of their manufacture. The following process is a manual method of acquiring the satellite for the first time so that the IRD can download the most up-to-date satellite and programming data, allowing it to automatically acquire the satellite from then on.

Please refer to your EchoStar IRD user manual for complete instructions on the IRD, the remote control, and the command screens.

### Manual Satellite Acquisition and IRD Commissioning

1. Turn on TV and EchoStar IRD.
2. Using EchoStar remote, press MENU.
  - The Main Menu will come up on the Screen.
3. Select #6, System Setup.
4. Select #1, Installation.
5. Select #1, Point Dish/Signal.
  - The Signal Strength Screen will appear.
6. Using remote, select the zip code box on the screen, and input the local zip code.
  - The screen will show you the Azimuth and Elevation to the satellite. Write this down.
7. Connect a PC to the data port.
8. Turn on the TracVision 4.
9. Type **HALT <CR>** after receiving the message  
\*\*\* Entering Search Mode 1 \*\*\*.

10. Type in the elevation that you obtained in step 6.
  - Type **EL,xxx<CR>**.  
(e.g., Elevation of 30.2° = EL,302<CR>)
11. Using a compass, take a bearing on an object that is approximately on the azimuth obtained in step 6.
12. Type in an azimuth that points the antenna in the direction of the object selected in step 11.
  - Type **AZ,xxxx<CR>**.  
(e.g., Azimuth of 233° = AZ,2330<CR>)
  - Valid azimuth range is 0-360° (0000-3600)
13. Check to see if there is signal strength on the Signal Meter Screen.
14. Move antenna counter-clockwise in 5° increments, until signal strength is acquired. If you do not find satellite, point the antenna at the object selected in step 11 and move antenna clockwise in 5° increments until signal strength is acquired.
15. Once satellite is found, fine tune azimuth in 1° increments for maximum signal strength.
16. Fine tune in elevation in 1° increments for maximum signal strength.
17. Once the satellite is found, turn the EchoStar IRD off, using the power button on the infrared remote. Do not turn off the IRD using the front panel. Leave IRD in standby mode for approximately 5 minutes. The IRD will now download new software from the satellite.
18. To verify that the IRD has been updated, put the IRD into the Signal Strength Screen mode, and three satellite options will appear on the left side of the screen: 61.5° West, 119° West, 148° West. Your EchoStar IRD is now updated.

# Appendix F

## Startup Data Sequences

The data on the following pages presents a sample startup data sequence registered by the TracVision 4 when receiving signals from DIRECT, The DISH Network, or ExpressVu. This sequence may vary based on the software version loaded onto the TracVision 4 system. This data can be recorded using the data port and a PC.

```
?PGM
TracVision G4 Controller Rev C - Version 3.02 - Serial number 12345678
RF: ZAP
*** Initializing RF Controller ***
RF: S,A,V,U,V
RF: SATINSTALL,55,C,57,C
RF: SATCONFIG
RF: F,A,12368,20000,67,0X0000,V,U,2-----Satellite configuration data, Satellite A
RF: F,A,12368,20000,67,0X0000,V,U,2
RF: F,A,12238,20000,67,0X0000,H,U,2
RF: F,A,12238,20000,67,0X0000,H,U,2
RF: F,B,12374,20000,34,0X1004,V,U,3-----Satellite configuration data, Satellite B
RF: F,B,12374,20000,34,0X1004,V,U,3
RF: F,B,12381,20000,34,0X1004,H,U,3
RF: F,B,12381,20000,34,0X1004,H,U,3
RF: RF PCB Version 2.0
RF: I,0,49268,00000,00800,0
RF COMM: PASS-----PASS is expected
Limit Switch Test
Limit Switch Status: PASS-----PASS is expected
*** Initializing Ext Sensor ***
RF: S,A,H,U,V
.=h,0.S.=h,1
RF: S,A,H,U,V
ES Status Timeout
.=h,0.S.=h,1
RF: S,A,V,U,V
ES Status Timeout
.=h,0.S.=h,1
ES Status Timeout
Running Sensorless. No Ext Sensor Detected ---Configuring for sensorless operation
*** Initializing Antenna ***
***No GPS - Default Used*** -----Accessing default location based on sat install
GPS: DSS_101 AZ = 220.8, EL = 33.4 -----Default satellite position based on sat install
*** Initializing Rate Bias ***
GPS: DSS_119 AZ = 238.9, EL = 22.1
RF: S,A,H,U,V
```

```
RF: S,A,H,U,V
A/D: 2084 2069 125
RF: S,A,H,U,V
RF: S,A,H,U,V
A/D: 2077 2072 121
Gyro Bias: Az = 2088.73, El = 2079.39 ----Expected range is 1700-2300
Gyro Uncertainty: Az = 0.59, El = 0.76
*** Entering Search Mode 1A ***
RATE BIAS: PASS-----PASS is expected
Searching for DSS_101, Threshold = 1000
RF: S,A,V,U,V
+POS: 126.8 33.3 498
RF: Freeze DAC = 1574
RF: S,A,V,U,V
+POS: 156.6 33.3 343
Satellite Found: AZ = 118.5, EL = 33.3, RF = 1935
*** Entering Tracking ***
RF: S,A,H,U,V
+POS: 113.2 34.1 464
*** Network ID Check ***
+POS: 118.8 33.1 2625
+POS: 118.3 32.1 2642
RF: Y,0X0000
*** Tracking DSS_101 ***
RF: S,A,H,U,V
RF: AGCON
RF: AGC=51788
+POS: 117.9 32.2 2603
+POS: 118.9 32.6 2594
Saved Sat Pos: AZ = 118.1, EL = 32.4
RF: AGC=51748
+POS: 117.7 32.4 2616
RF: AGC=51776
+POS: 118.7 32.7 2612
Saved Sat Pos: AZ = 117.7, EL = 32.5
RF: AGC=51759
Conscan=>sleep: sat in 2 deg window.
+POS: 118.1 32.4 2631
+POS: 118.3 32.4 2609
RF: AGC=51756
Sleeping
New Gyro Bias: Az = 2088.73 EL = 2079.39
Old Gyro Bias: Az = 2088.73 EL = 2079.39
+POS: 118.3 32.4 2624
+POS: 118.3 32.4 2610
RF: AGC=51759
Gyro Bias Trim: AZ = 2089.457, EL = 2078.936 ---Gyro bias correction
Drift OR = 1.0697e+00
Sleep: will now detect window exit.
```

# Appendix G

## Maintenance Port Parser Commands

TracVision 4 system parser commands are parsed when the system receives an ASCII carriage return (Hex 0D). An ASCII line feed (Hex 0A) is permitted but is ignored in any transmitted command. All system responses are terminated with an ASCII carriage return followed by a line feed and ending with either an acknowledge character (ASCII > (Hex 3E)) or a not-acknowledge character (ASCII ? (Hex 3F)). The parser commands are shown below in boldface capital letters but they are not case-sensitive. In most cases the command is responded to with an echo; that is, if you type **ZAP**, for example, and press "ENTER" the response will be the command you have entered. For other commands the response is specific for each command, such as **VERSION**, **STATUS** or **HELP**.

### G.1 System Commands

#### Software Version

Function:	reports software version and system type
Command:	<b>VERSION</b>
Argument:	none
Response:	KVH TV4 Version XX.XX

**Table G-1**  
*System Commands*

#### System Status Report

Function:	reports general system status
Command:	<b>STATUS</b>
Argument:	none
Response:	system status string

#### Initialize the System

Function:	initializes the system (perform a soft reset)
Command:	<b>ZAP</b>
Argument:	none
Response:	echoes the command, then reinitializes the system



**Help on Parser Commands**

Function:	lists parser commands
Command:	<b>HELP</b>
Argument:	none
Response:	print a list of all parser commands

## G.2 Manual Positioning Commands

To execute the following commands, first put the Antenna Unit in idle mode by typing **HALT** and pressing "ENTER." Positioning commands may be entered after the antenna comes to rest.

**Table G-2**  
*Manual Positioning Commands*

**Azimuth Angle**

Function:	commands a manual azimuth angle that the mechanism moves to
Command:	<b>AZ,xxxx</b> (range is 0000-3599)
Argument:	desired azimuth angle of the mechanism relative to external magnetic reference, or baseplate fwd, 000°-359.9°
Response:	echoes the command; mechanism moves at a fixed velocity

**Elevation Angle**

Function:	commands a manual elevation angle that the mechanism moves to
Command:	<b>EL,xxx</b> (range is 100-850)
Argument:	desired elevation angle of the mechanism relative to up, 10.0°-85.0°
Response:	echoes the command; mechanism moves at a fixed velocity

**Azimuth CW Step**

Function:	commands a 0.1 deg CW manual step in azimuth angle
Command:	<b>6</b>
Argument:	none
Response:	echoes the command

**Azimuth CCW Step**

Function:	commands a 0.1 deg CCW manual step in azimuth angle
Command:	<b>4</b>
Argument:	none
Response:	echoes the command

**Elevation UP Step**

Function:	commands a 0.1 deg UP manual step in elevation angle
Command:	<b>8</b>
Argument:	none
Response:	echoes the command

**Elevation DOWN Step**

Function:	commands a 0.1 deg DOWN manual step in elevation angle
Command:	<b>2</b>
Argument:	none
Response:	echoes the command

## G.3 Operational Commands

**Tracking Mode**

Function:	starts active tracking of the satellite
Command:	<b>TRACK</b>
Argument:	none
Response:	echoes the command

**Idle Mode**

Function:	halts active tracking and conical scan, then enters idle mode
Command:	<b>HALT</b>
Argument:	none
Response:	echoes the command

**Table G-3**  
*Operational Commands*

**Current Cable Wrap Angle**

Function:	sets or reports current cable wrap angle, defined as 0° (CCW limit) to 700° (CW limit); the value is expressed as 0000-7000 with an implied decimal
Command:	<b>WRAPANGLE,xxxx</b>
Argument:	the desired cable wrap angle setting
Response:	Wrap Angle = xxxx

## G.4 Tracking and Conical Scan Commands

**Table G-4**  
*Tracking and Conical Scan Commands*

**Target Location**

Function:	reports the target location in antenna frame. Data format is E#### for elevation in degrees 000-900 and A##### for azimuth in degrees 0000-3599 with implied decimals
Command:	<b>TGTLOCATION</b>
Argument:	none
Response:	Target Location=    A = E###, A##### B = E###, A#####

**Analog Signal Strength Report**

Function:	reports signal strength from RF detector circuit in A/D counts (000-FFF Hex)
Command:	<b>SIGLEVEL</b>
Argument:	none
Response:	Signal Strength = xxxx

## G.5 RF Board Commands

### Serial Communications, Status/Polarization Report, Tone Changes

**Table G-5**

*RF Board Commands*

Function:	start serial communications, reports status & polarization/tone changes
Command:	<b>@S</b>
Response:	S,s,p,b,m <cr> every 5 seconds until ><cr>is returned from system software
Where:	s = Satellite (a = Primary, b = Secondary) p = Polarization (v = Vertical, h = Horizontal, x = No LNB Power) b = Band (h = High Band, l = Low band, u = USA) m = Mode (v = Valid, i = Invalid)*

\* The Mode bit is used to evaluate the Satellite, Polarization, & Band combination vs. the Frequency/Symbol Rate/FEC currently in RAM. This bit will be set to invalid if the Frequency for the selected combination is set to 0x0000; otherwise it will be set to valid. For example the Mode bit will be set to invalid when the frequency is set to 00000 to indicate that there is not a frequency to track for the LNB tone and voltage setting.

### Report RF Tracking Parameters

Function:	reports all RF tracking parameters for primary & secondary satellites*
Command:	<b>@SATCONFIG</b>
Response:	F,x,ffff,S,C,ID,P,B,D <cr>
Where:	x = Satellite (a = Primary, b = Secondary) ffff = Frequency in MHz (00000 and 10700 to 12700) S = Symbol rate in Mbit/Sec (1000 to 30000) C = FEC code rate (valid rates = 12, 23, 34, 56, 67, 78) ID = Satellite Network ID in hexadecimal format (valid range = 0x0000 to 0xffff hex) P = LNB Polarization (v = Vertical, h = Horizontal) B = the LNB down conversion frequency (l=low, h=high) D = decoding type (0=test, 1=DSS-A, 2=DSS-B, 3=DVB)

\* This command dumps all eight combinations of the Satellite /Freq/Sym/FEC/ID/POL/Band currently stored in RAM.

**Set RF Tracking Parameters**

Function:	sets RF tracking parameter
Command:	<b>@SATCONFIG,X,N,F,S,C,ID,P,B,D&lt;cr&gt;</b>
Response:	Echoes the input data
Where:	<p>@SATCONFIG = directs data to the RF Board</p> <p>X = satellite location A or B</p> <p>N = satellite table # (98 &amp; 99 are slots for user-configured satellites)</p> <p>F = frequency in MHz (either 00000 or a range from 10700 - 12700)</p> <p>S = the satellite transponder symbol rate in Mbit/second (01000 - 30000)</p> <p>C = the FEC code (e.g., 12, 23, 34, 56, 67, 78)</p> <p>ID = the satellite network ID in hexadecimal format (0x####)</p> <p>P = the LNB polarization (v=vertical, h=horizontal)</p> <p>B = the LNB down conversion frequency (l=low, h=high)</p> <p>D = decoding type (0=test, 1=DSS-A, 2=DSS-B, 3=DVB)</p>

**ID Match/Decoded Network ID**

Function:	report ID match and decoded network ID
Command:	<b>@CHECKID</b>
Response:	Y,0X#### N,0X####
Where:	<p>Y = yes</p> <p>N = no</p> <p>0X#### = network ID</p>

## G.6 Installation Commands

*Table G-6  
Installation Commands*

**Set/Report GPS Position**

Function:	reports or sets default GPS position
Command:	<b>GPS&lt;cr&gt; GPS,XX,D,YYY,E</b>
Response:	GPS = XXD YYYY<cr> GPS: XXD YYYY
Where:	<p>XX = latitude (0-90)</p> <p>D = S (South) or N (North)</p> <p>YYY = longitude (0-180)</p> <p>E = E (East) or W (West)</p>

## G.7 Debug Commands

### Report Offset Angles

Function:	reports system offset angles
Command:	<b>OFFSETS</b> <b>OFFSETS,XXXXX,YYYY</b>
Response:	Offsets= XXXXX.X XXXXX.X
Where:	X = new azimuth offset (-1800 - 1800) Y = new elevation angle (-450 - 450)

**Table G-7**  
*Debug Commands*

### Applies Default Values to Default Satellites

Function:	updates the default satellites to the default values
Command:	<b>SATPAIR,X</b>
Response:	displays numerous frequency commands and reports "Satellite Installation Complete"
Where:	X = 0 (satellites default to Astra & Hotbird) or X = 1 (satellites default to Expressvu and EchoStar 119) or X = 2 (DSS 101 and DSS 119)

### Report Last Satellite Tracked/Update Value

Function:	reports the last satellite tracked or updates the last tracked satellite to the value input if it is different from the current value
Command:	<b>LASTSAT</b> <b>LASTSAT,X</b>
Response:	Last = <sat_name>
Where:	X = A (updates to satellite A) or X = B (updates to satellite B)



# KVH Industries Limited Warranty

## TracVision 4

### Limited Warranty on Hardware

KVH Industries, Inc. warrants the KVH product purchased against defects in materials for a period of TWO (2) years and against labor costs for a period of ONE (1) year from the date of original retail purchase by the original purchaser. It is the customer's responsibility to verify the date of purchase by returning the warranty card included with the product to KVH within 30 days of purchase, or by providing a copy of a dated sales receipt for the KVH product under warranty with the warranty claim. If this date cannot be verified, the warranty period will begin 30 days after the date of manufacture of the original product purchased.

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