A Guide to TracVision LM

owner's manual

- Installation Instructions
- User's Guide
- Technical Manual

Satellite Television

KVH TracVision® LM

TracVision LM Owner's Manual Addendum

(ECO #5846)

The following information applies to Revision J of the TracVision LM Owner's Manual (KVH Part Number 54-0136).

1.2 TracVision LM System Overview

The baseplate connectors have been changed to make installation easier. Figure 1-1 shows the new baseplate connectors and cable routing.

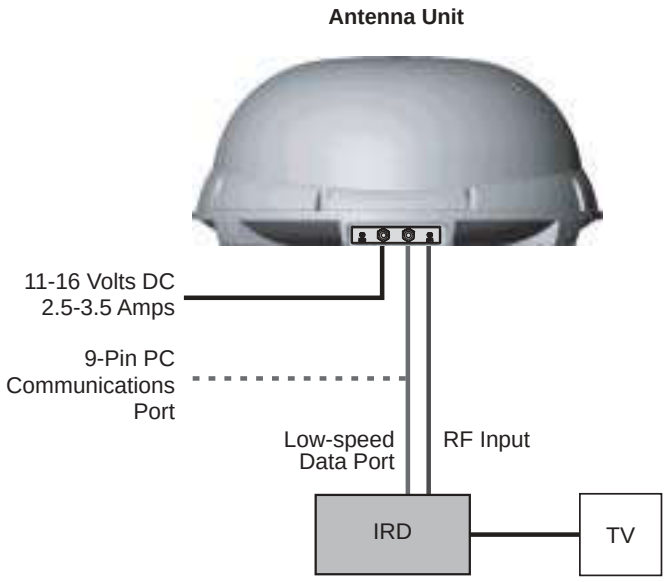


Figure 1-1
TracVision LM Single IRD System Configuration

2.4 Connecting the Antenna Unit

The baseplate connectors have been changed to make installation easier.

TracVision LM Cable Ports

Figure 2-14 shows the antenna unit's exterior baseplate cable ports, consisting of two RF connectors (ports #1 and #4) and two liquid-tight fittings (ports #2 and #3). Figure 2-15 shows the interior baseplate wiring. Refer to these figures when connecting cables to the antenna unit.

Figure 2-14
Cable Port Assignments (Exterior of Baseplate)

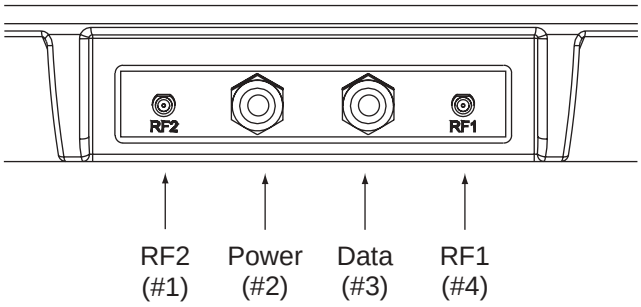
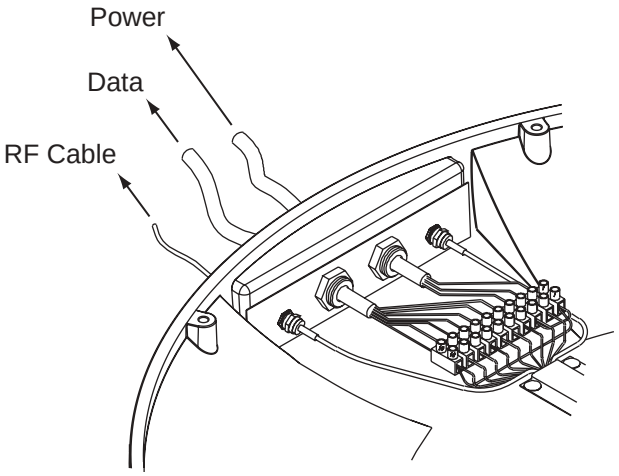


Figure 2-15
Interior Baseplate Wiring



2.4.1 Connecting the Antenna Data Cable to the IRD

The data cable now enters the baseplate through the second liquid-tight fitting (cable port #3). Interior baseplate wiring is unchanged.

TracVision LM Data Cable Wiring Process

1. Feed the cable up to the roof and through the second liquid-tight fitting (#3) as pictured in Figure 2-14.

2.4.2 Connecting the Antenna to Vehicle Power

The power cable now enters the baseplate through the first liquid-tight fitting (cable port #2). Interior baseplate wiring is unchanged.

TracVision LM must be connected to a +12 volt DC, 2.5-3.5 amp power supply to operate. The supplied power cable should be run up to the antenna unit, through the first liquid-tight fitting (#2) as pictured in Figure 2-14, and wired to the terminal connector strip as illustrated in Figure 2-19.

2.4.4 Connecting the Antenna RF Signal Cable to the IRD

You no longer need to insert RF cables into the baseplate; they now simply connect to the exterior baseplate connectors.

When shipped from the factory, the antenna's RF connectors are protected with caps. Leave the cap installed on the RF2 connector unless you are going to connect a second RF cable to the TracVision LM.

The RF signal cable is fitted with an F-type connector at only one end and should be attached to TracVision LM and the IRD as follows:

1. For a single IRD installation, connect the F-connector end of the RF signal cable to the Antenna Unit baseplate connector labeled RF1 (see Figure 2-14). Once the cable is securely connected, loosen the sealing nut at the base of the RF1 connector and tighten it onto the end of the RF cable.
2. Feed the bare end of the RF signal cable through the cable access hole and into the vehicle.
3. Attach the provided F-connector to the end of the RF signal cable inside the vehicle as illustrated in Figure 2-22a-d, using an Augat Snap 'n Seal Crimp/Strip tool to lock the connector on the cable.

   A. Slide compression fitting onto raw cable before beginning connector termination.

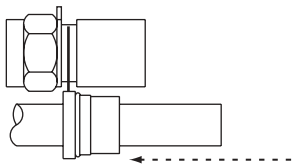
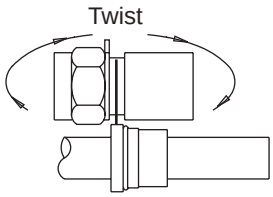


Figure 2-22a-d
Attaching the KVH-provided F-connector to an RF Cable

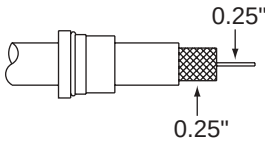
KVH has provided an F-connector for use with the TracVision LM. This connector specifically requires the Augat Snap 'n Seal Crimp/Strip Tool, part number IT1000.

If you do not have this tool, you will need to purchase a silicone-filled, weatherproof F-connector (Radio Shack Part Number 278-236 or equivalent) to use instead.

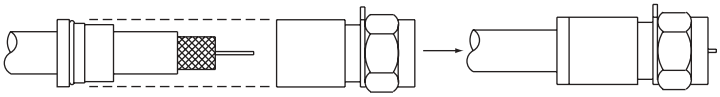
B. Twist and break off connector body.



C. Use Augat tool to strip center conductor and trim back overall jacket. Do not cut through braid.



D. Slide connector body onto the prepared cable. Slide the compression fitting up into the connector body. Use Augat tool to snap on the connector.



4. Attach the cable to the IRD connector labeled SATELLITE IN.

Installing Two IRDs and TVs

To connect a second TV and IRD to the TracVision LM system, you must connect a second RF cable to the Antenna Unit baseplate connector labeled RF2. The other end of the RF cable should be run down into the vehicle and connected directly to the second IRD. The data cable remains connected to the first (master) IRD. Each IRD/TV pair can operate independently of the other, allowing different viewers to watch different channels. However, the master IRD must remain turned on if the second IRD is in use.

TracVision LM Owner's Manual Addendum

(ECO #s 5382, 5410, 5426)

The following information applies to Revision J of the TracVision LM Owner's Manual (KVH Part Number 54-0136).

5.3 Replaceable Parts

Minor changes have been made to simplify the TracVision LM printed circuit board (PCB). Table 5-1 has been updated to include the new part numbers for the PCB and associated fuse. In addition, Figures 5-1 and 5-6 (previously 5-5) have been changed to illustrate the new PCB.

Table 5-1
Field Replaceable Units

Part Name	Part Number
Baseplate Assembly	02-0952
Radome Assembly	02-0953
Power Cable	32-0590-30
RF Cable	32-0589-30
Data Cable	32-0591-30
EchoStar Adapter Unit *	02-0899
CPU PCB	**02-1144-01**
Antenna Gyro	02-1035
Antenna Gyro Gasket	24-0139
System Fuse	**16-0017-3150**
LNB	19-0056

* Optional, purchased separately

*Should the fuse ever need to be replaced, TracVision LM uses a 5x20 mm, **3.15-amp**, 250-volt fast-blow fuse.*

5.4 Field Replaceable Unit Procedures

The elevation axis motor shaft bracket has been redesigned for simplicity, allowing easier access to the PCB. The new configuration requires a revised procedure for removing and replacing the PCB.

Figure 5-1
Antenna, PCB, and Rotating Plate

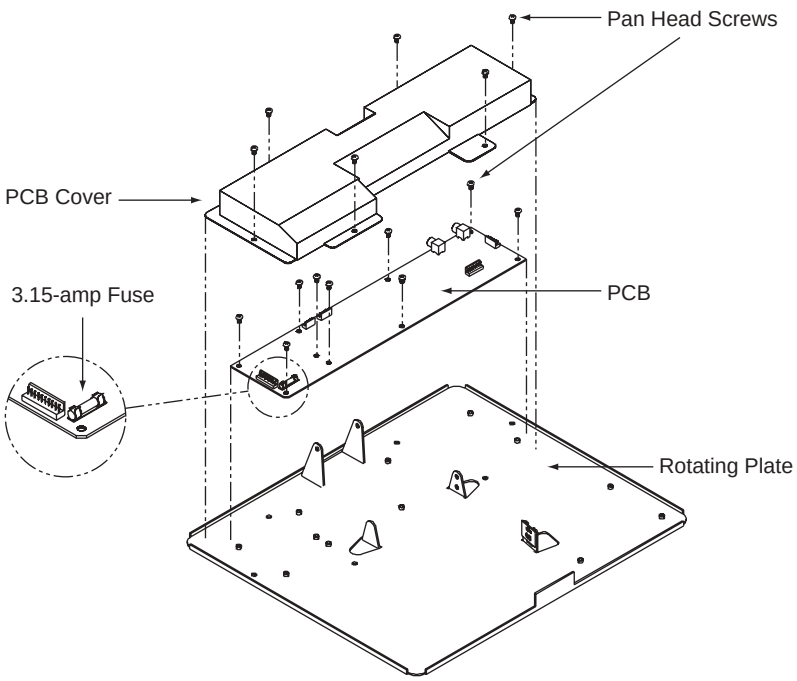
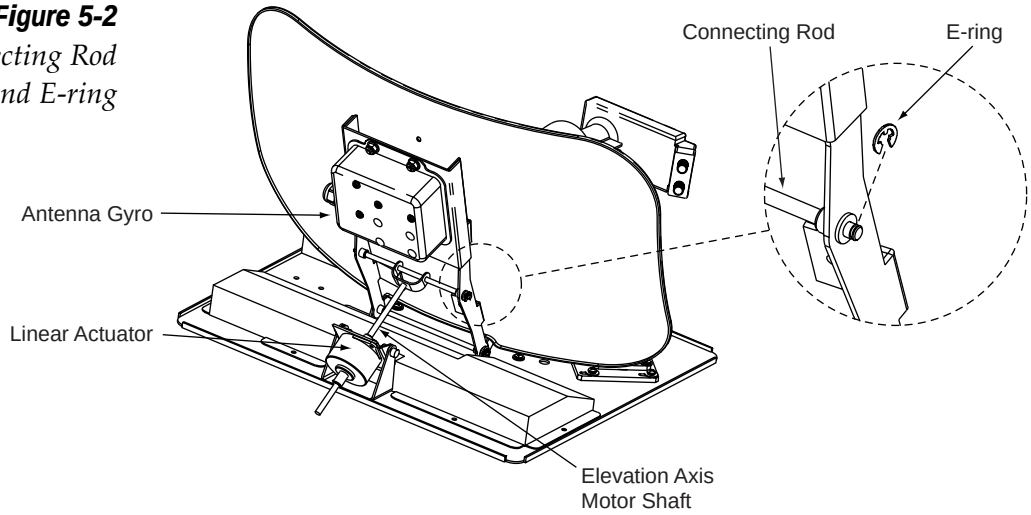


Figure 5-2
Close-up of Connecting Rod and E-ring



When carrying out maintenance on the PCB, be sure to not drop any of the small screws inside the mechanism. If a screw is lost within the baseplate, it must be retrieved to avoid causing any damage when the unit rotates.

5.4.1 PCB Removal and Replacement

Estimated Time to Repair: ½ hour

The microprocessor PCB assembly is protected by a cover fastened to the rotating plate – *Fig. 5-1*. The cover must be removed to gain access to the main power fuse and the PCB assembly.

1. Using needle-nose pliers, remove the E-ring from one end of the connecting rod – *Fig. 5-2*.

2. Remove the connecting rod by sliding it off the bracket.
3. Fully retract the elevation axis motor shaft – *Fig. 5-5*.

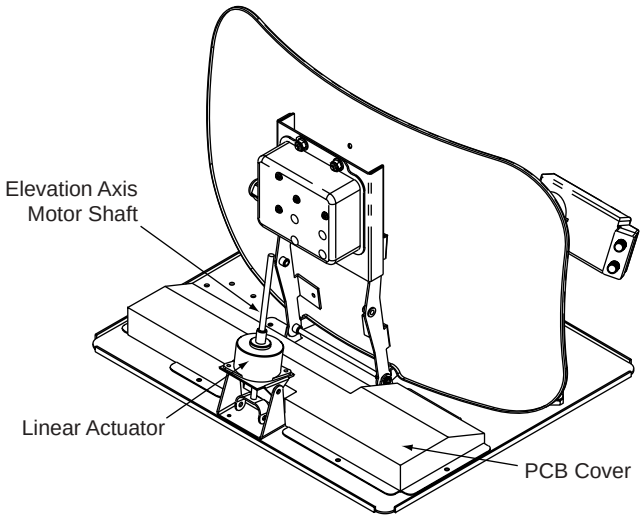
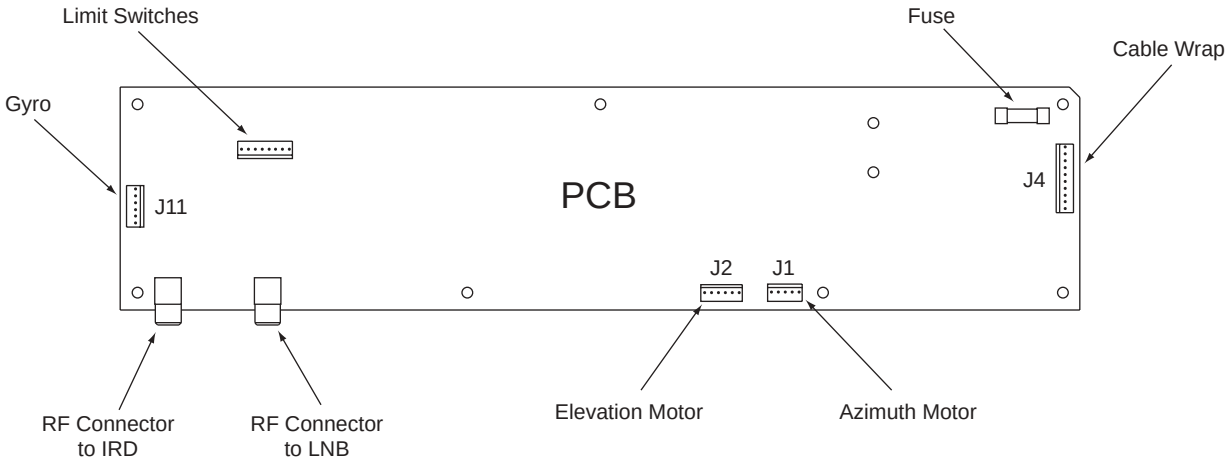


Figure 5-5
Removing the PCB Cover

4. Remove 6 pan head screws from the PCB cover flanges.
5. Remove the PCB cover. To get the necessary clearance, rotate the linear actuator up 90º while lifting the PCB cover – *Fig. 5-5*.
6. Remove cable connectors from PCB. Figure 5-6 illustrates the PCB arrangement and connector locations.

*TracVision LM is equipped with a 5x20 mm, **3.15-amp**, 250-volt fast-blow fuse, which is mounted on the PCB. To access and replace the fuse, remove the PCB cover.*

Figure 5-6
PCB Connector Locations – Rear View



When replacing the PCB cover, be careful not to pinch any cables.

7. The PCB is mounted to the rotating plate with 9 pan head screws.
8. Reverse this process to install the replacement PCB. Reinstall all cable connectors removed in Step 6.
9. Carry out all calibration procedures for the antenna gyro and the LNB *(Sections 5.4.2-5.4.3).*

5.4.2 Antenna Gyro Assembly

Estimated Time to Repair: 1 hour

The antenna gyro assembly is mounted on the rear of the antenna reflector bracket with four locking nuts and washers – *Fig. 5-3*. Following the removal and replacement of the antenna gyro assembly, it will be necessary to calibrate the gyro and restart the system. A digital level will be required for the calibration procedure. Directions for removal, replacement, and calibration follow:

Following the removal and replacement of the antenna gyro assembly, it will be necessary to calibrate the gyro and restart the system.

1. Using needle-nose pliers, remove the E-ring from one end of the connecting rod – *Fig. 5-2*.
2. Remove the connecting rod by sliding it off the bracket.
3. Fully retract the elevation axis motor shaft – *Fig. 5-5*.
4. Remove 6 pan head screws from the PCB cover flanges.
5. Remove the PCB cover. To get the necessary clearance, rotate the linear actuator up 90º while lifting the PCB cover – *Fig. 5-5*.
6. Remove the screw and clamp holding the cable to the rotating plate; save the cable clamp for reuse – *Fig. 5-4*.
7. Remove the Molex connector from J11 on the PCB – *Fig. 5-6*.
8. Remove the 4 locking nuts and flat washers and take the antenna gyro off of the bracket.
9. Replacement is the reverse of this procedure.

TracVision LM Owner's Manual Addendum

(ECO #s 5382, 5426)

The following information applies to Revision J of the TracVision LM Owner's Manual (KVH Part Number 54-0136).

5.3 Replaceable Parts

Due to system improvements, the TracVision LM now consumes less power. As a result, the system fuse has been changed from a 4-amp to a 3.15-amp fuse.

Part Name	Part Number
Baseplate Assembly	02-0952
Radome Assembly	02-0953
Power Cable	32-0590-30
RF Cable	32-0589-30
Data Cable	32-0591-30
EchoStar Adapter Unit *	02-0899
CPU PCB	02-1043-01
Antenna Gyro	02-1035
Antenna Gyro Gasket	24-0139
System Fuse	**16-0017-3150**
LNB	19-0056

* Optional, purchased separately

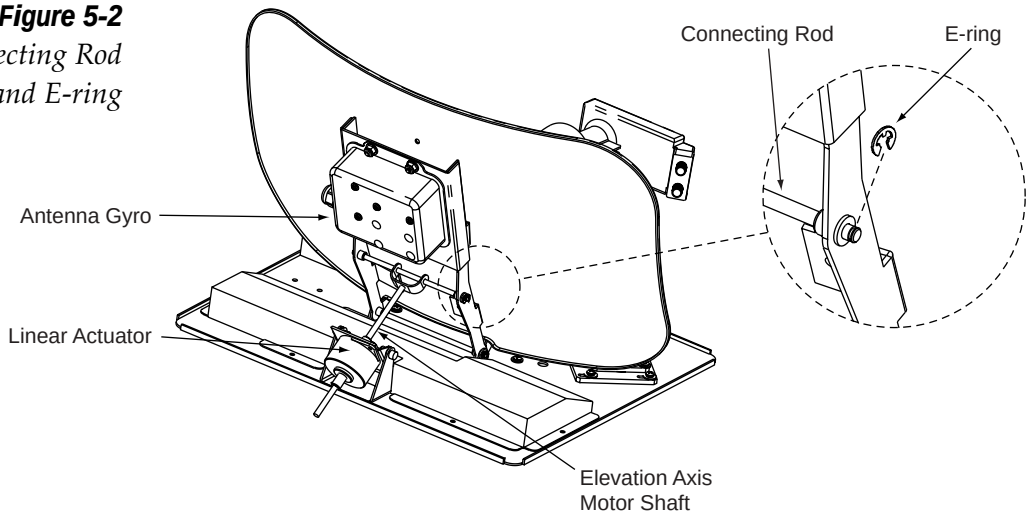
Table 5-1
Field Replaceable Units

*Should the fuse ever need to be replaced, TracVision LM uses a 5x20 mm, **3.15-amp**, 250-volt fast-blow fuse.*

5.4 Field Replaceable Unit Procedures

The elevation axis motor shaft bracket has been redesigned for simplicity, allowing easier access to the printed circuit board (PCB). The new configuration requires a revised procedure for removing and replacing the PCB.

Figure 5-2
Close-up of Connecting Rod and E-ring



5.4.1 PCB Removal and Replacement

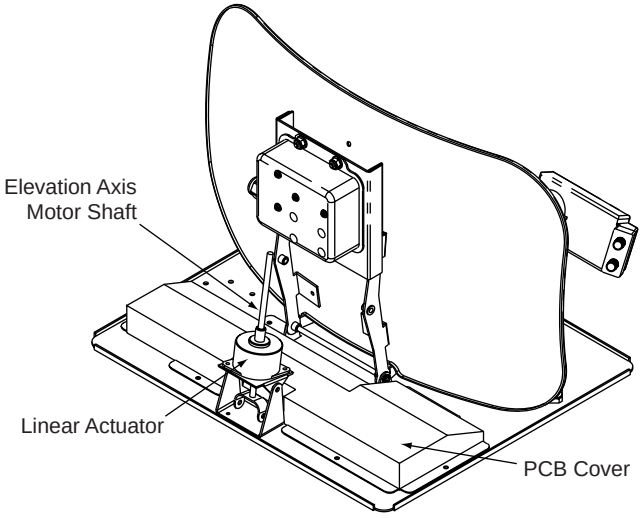
Estimated Time to Repair: ½ hour

When carrying out maintenance on the PCB, be sure to not drop any of the small screws inside the mechanism. If a screw is lost within the baseplate, it must be retrieved to avoid causing any damage when the unit rotates.

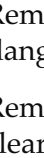
The microprocessor PCB assembly is protected by a cover fastened to the rotating plate – *Fig. 5-1*. The cover must be removed to gain access to the main power fuse and the PCB assembly.

1. Using needle-nose pliers, remove the E-ring from one end of the connecting rod – *Fig. 5-2*.
2. Remove the connecting rod by sliding it off the bracket.
3. Fully retract the elevation axis motor shaft – *Fig. 5-5*.

Figure 5-5
Removing the PCB Cover

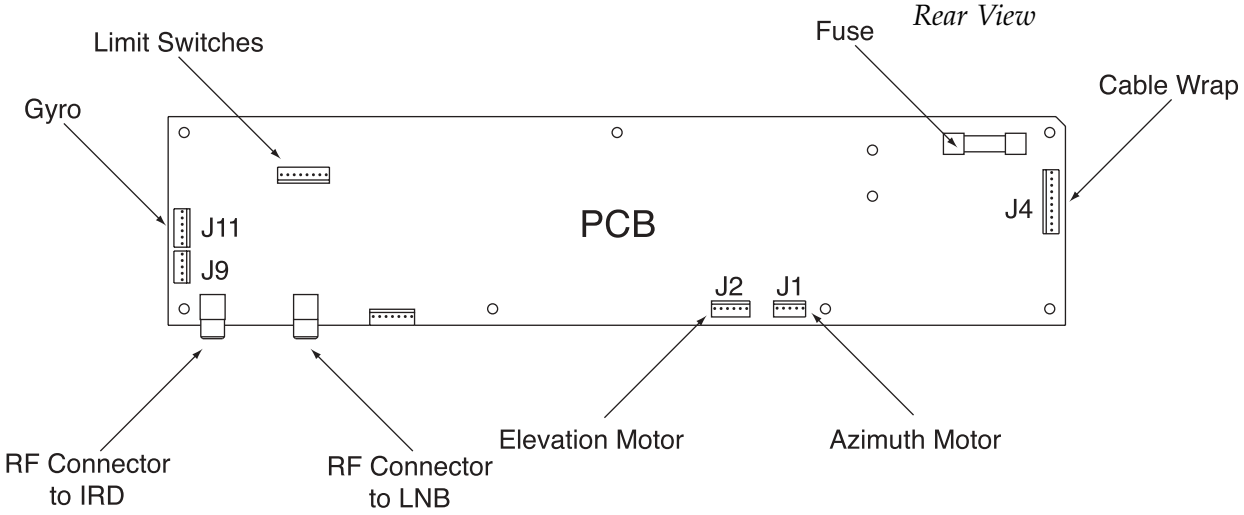


4. Remove 6 pan head screws from the PCB cover flanges.
5. Remove the PCB cover. To get the necessary clearance, rotate the linear actuator up 90° while lifting the PCB cover – *Fig. 5-5*.
6. Remove cable connectors from PCB. Figure 5-6 illustrates the PCB arrangement and connector locations.



*TracVision LM is equipped with a 5x20 mm, **3.15-amp**, 250-volt fast-blow fuse, which is mounted on the PCB. To access and replace the fuse, remove the PCB cover.*

Figure 5-6
PCB Connector Locations – Rear View



7. The PCB is mounted to the rotating plate with 9 pan head screws.
8. Reverse this process to install the replacement PCB. Reinstall all cable connectors removed in Step 6.
9. Carry out all calibration procedures for the antenna gyro and the LNB *(Sections 5.4.2-5.4.3).*

When replacing the PCB cover, be careful not to pinch any cables.

Following the removal and replacement of the antenna gyro assembly, it will be necessary to calibrate the gyro and restart the system.

5.4.2 Antenna Gyro Assembly

Estimated Time to Repair: 1 hour

The antenna gyro assembly is mounted on the rear of the antenna reflector bracket with four locking nuts and washers – *Fig. 5-3*. Following the removal and replacement of the antenna gyro assembly, it will be necessary to calibrate the gyro and restart the system. A digital level will be required for the calibration procedure. Directions for removal, replacement, and calibration follow:

1. Using needle-nose pliers, remove the E-ring from one end of the connecting rod – *Fig. 5-2*.
2. Remove the connecting rod by sliding it off the bracket.
3. Fully retract the elevation axis motor shaft – *Fig. 5-5*.
4. Remove 6 pan head screws from the PCB cover flanges.
5. Remove the PCB cover. To get the necessary clearance, rotate the linear actuator up 90º while lifting the PCB cover – *Fig. 5-5*.
6. Remove the screw and clamp holding the cable to the rotating plate; save the cable clamp for reuse – *Fig. 5-4*.
7. Remove the Molex connector from J11 on the PCB – *Fig. 5-6*.
8. Remove the 4 locking nuts and flat washers and take the antenna gyro off of the bracket.
9. Replacement is the reverse of this procedure.

TracVision LM Owner's Manual Addendum

(ECO #5426)

The following information applies to Revision J of the TracVision LM Owner's Manual (KVH Part Number 54-0136).

5.3 Replaceable Parts

Due to system improvements, the TracVision LM now consumes less power. As a result, the system fuse has been changed from a 4-amp to a 3.15-amp fuse.

Part Name	Part Number
Baseplate Assembly	02-0952
Radome Assembly	02-0953
Power Cable	32-0590-30
RF Cable	32-0589-30
Data Cable	32-0591-30
EchoStar Adapter Unit *	02-0899
CPU PCB	02-1043-01
Antenna Gyro	02-1035
Antenna Gyro Gasket	24-0139
System Fuse	**16-0017-3150**
LNB	19-0056

* Optional, purchased separately

Table 5-1
Field Replaceable Units

*Should the fuse ever need to be replaced, TracVision LM uses a 5x20 mm, **3.15-amp**, 250-volt fast-blow fuse.*

5.4.1 PCB Removal and Replacement

The sidebar note has been changed to indicate the new rating of the fuse.

*TracVision LM is equipped with a 5x20 mm, **3.15-amp**, 250-volt fast-blow fuse, which is mounted on the PCB. To access and replace the fuse, remove the PCB cover.*

Congratulations!

You have selected one of the most advanced land-mobile satellite television tracking systems available today. KVH® Industries' TracVision® LM is designed for use with DIRECTV® and the DISH™ Network. This manual provides instructions on the proper installation, use, and maintenance of your TracVision LM 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 LM Serial Number

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

Direct questions, comments, or suggestions to:

KVH Industries, Inc.
50 Enterprise Center
Middletown, RI 02842 USA
Tel: +1 401 847-3327
Fax: +1 401 849-0045
E-mail: info@kvh.com
Internet: www.kvh.com

Click here to go to our state-of-the-art Customer Support web page – the fastest and easiest way to get all of your questions answered!

ISO 9001 Registered kpmg Quality Registrar The Quality Advantage

KVHI™ NASDAQ LISTED

KVH Part # 54-0136 Rev. J

Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 Digital Satellite Television

The DIRECTV® and DISH™ Network systems transmit digital audio and video data from land-based transmitters to a satellite "parked" above the equator. Each satellite relays the signals in spot beams covering the continental United States and contiguous waters. TracVision LM is designed to identify, lock on to, and track the appropriate satellite, both while your vehicle is at rest and in motion.

1.2 TracVision LM System Overview

Your KVH TracVision LM employs a state-of-the-art actively stabilized antenna system designed for use with Ku Band satellite television reception. This vehicle-referenced stabilization system is enhanced by a conical scan tracking function to detect and lock on to the strongest signal, resulting in the clearest reception possible.

A complete satellite TV system includes the TracVision LM connected to an Integrated Receiver Decoder (IRD), aka a "satellite receiver," and a television set. A desktop or laptop computer is used to conduct diagnostics. The interrelationship of units is illustrated in Figure 1-1. System specifications and a functional block diagram are provided in *Appendices A and B*, respectively.

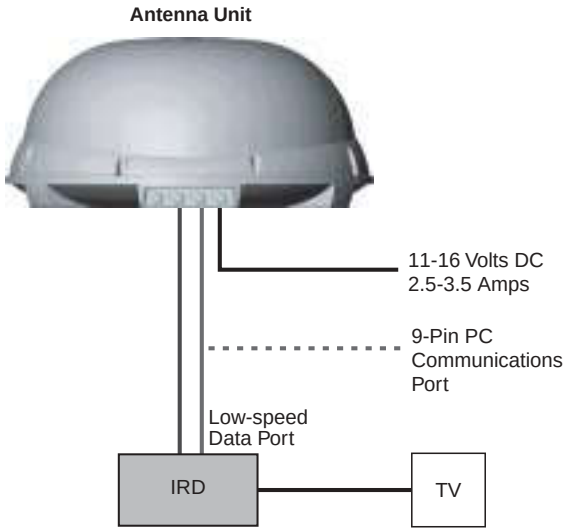
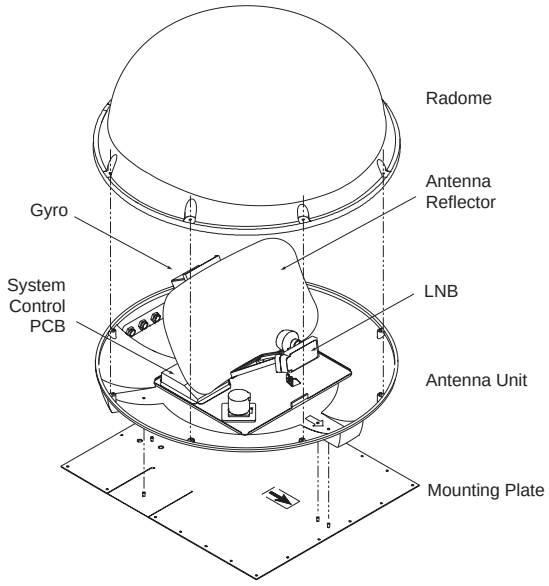


Figure 1-1
TracVision LM Single IRD System Configuration

1.2.1 TracVision LM Components

The Antenna Unit includes the antenna positioning mechanism, signal front end, power supply and control elements. These include antenna drive controls and mechanisms, the cable wrap subassembly, antenna gyro sensor, power conditioning and regulating circuits, and the RF detector. The antenna is a parabolic dish mounting a dual port low noise block (LNB) converter with built-in preamplifier. A molded ABS radome encloses the baseplate and is secured in place with standard fasteners. Liquid-tight (watertight) fittings located on the back of the baseplate join the power, signal, and control cabling from units inside the vehicle.

Figure 1-2
Primary Components of the TracVision LM



Always lift the antenna unit by the gray baseplate and not the radome, antenna reflector, or internal mechanical assemblies.

***NEVER** pick up the unit by the LNB or the gyro!*

On-screen messages are not available with a DISH Network IRD.

For directions on installing a multiswitch with your TracVision LM system, refer to Section 2.4.4, "Connecting the Antenna RF Signal Cable to the IRD."

1.2.2 Integrated Receiver Decoder

The IRD receives satellite signals from the Antenna Unit for signal decoding, processing and channel selection, and sends the signals to the TV set for viewing. Messages are sent from the IRD to the Antenna Unit and messages are received from the Antenna Unit for display on the television screen. 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. Two IRDs may be connected directly to the TracVision LM system. When three or

more IRDs are connected to the same antenna, an active multiswitch must be installed between the Antenna Unit and the IRDs. The multiswitch contains relays that select the proper output from the antenna LNB to send to the IRD. In multiple IRD installations, all IRDs must be for the same satellite television service (i.e., DIRECTV or DISH Network).

1.3 Materials Provided with TracVision LM

Table 1-1 lists the units, cables, and materials packed in the TracVision LM package by name and KVH part number.

Table 1-1
TracVision LM Packing List

Component	KVH Part No.
Antenna Unit (comprising):	01-0225
Baseplate Assembly	02-0952
Radome Assembly	02-0953
RF Cable (30 ft)	32-0589-30
Power Cable (30 ft)	32-0590-30
Data Cable (30 ft)	32-0591-30
IRD Ground Wire (50 ft)	32-0583-50
Mounting Plate	20-0668
Kitpack*	72-0094
Installation and Operation Manual	54-0136

* A complete listing of kitpack contents is provided in *Section 2.1.2, "Kitpack."*

Cables for the TracVision LM are stored beneath the antenna unit during shipping.

1.3.1 Additional Materials Required for TracVision LM Use

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

- Television
- Appropriate IRD for your selected satellite TV service (if using the DISH Network, a Series 4000 or 5000 IRD will be required)
- Optional KVH EchoStar Adapter (for use with the DISH Network service and IRD)

Operation of the DISH Network requires the purchase of an EchoStar IRD Adapter. The adapter is not shipped in the main TracVision LM container. To purchase an EchoStar Adapter, contact KVH or your local KVH dealer and ask for KVH Product Number 02-0899.

2 Installation

2.1 Overview of Installation

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

1. Choose the antenna location.
2. Mount the antenna unit.
3. Connect the antenna unit cables.
4. Connect the antenna unit to the TV IRD.
5. Connect the TV IRD to the TV.

Plan the entire installation before proceeding! Take into account component placement, running cable distances between units, and accessibility to the equipment after installation.

2.1.1 Installation Tools and Materials Required

- Electric drill
- 3/16"-drill bit and 1/2" hole saw and auger bit (5/8" hole saw and auger bit required if installing two RF cables - refer to *Section 2.4.4* for details)
- 1/2"-socket wrench
- #2 Phillips and #0 flat tip screwdrivers
- Augat Snap 'n Seal Crimp/Strip Tool (Part Number IT1000) if using the KVH-provided F-connector
- Silicone sealant or RTV
- Thread locker (as required)
- 7/16"-open end wrench
- Wire strippers
- Adhesive suitable for specific roof construction and materials (e.g., Liquid Nails)
- Rivet Gun and 3/16"-rivets (or other fastener suitable for specific roof construction)
- Terminal crimp tool
- Optional PC with terminal emulation software such as PROCOMM, Windows Terminal, or Windows 95 Hyperterminal.

The product serial number may be found in front of the antenna reflector on the rotating plate as well as on the inside front cover of this manual.

While some DIRECTV IRDs offer on-screen messages, it is recommended that a PC be available for all installations of both DIRECTV and EchoStar.

2.1.2 Kitpack

Table 2-1 lists the materials provided in the TracVision LM kitpack.

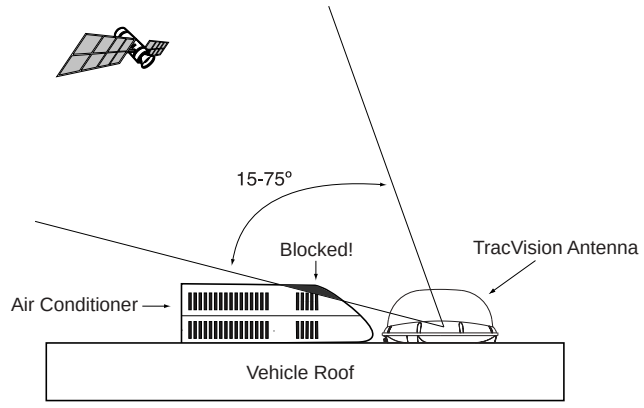
Table 2-1
Kitpack Contents

Part	Qty.	KVH Part No.
Rocker Switch	1	12-0048
Switch Plate	1	20-0685
RF F-Connector	2	23-0170
Terminal Crimp (female)	5	23-0188-03
¼"-20 x ⅝" hex screws	4	14-0250-0010
¼" flat washers	4	14-0251
Tie-wrap	5	22-0013
Flash kit cable and adapter	1	02-1029
Clam Shell Ventilator	1	19-0230

2.2 Choosing the Best Location

- Since the TracVision antenna requires a clear view of the southern sky to receive satellite signals, the ideal antenna site has an unobstructed view of the horizon/satellite all around.
- Keep the antenna clear of any obstructions on the roof (e.g., air conditioners). The antenna requires a 15° to 75° look angle to receive satellite signals.

Figure 2-1
Antenna Blockage

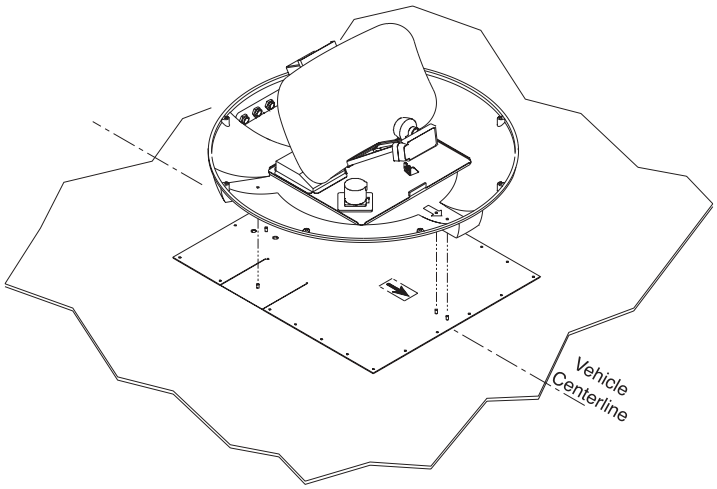


Always lift the antenna unit by the gray baseplate, never by the radome or any portion of the antenna assembly!

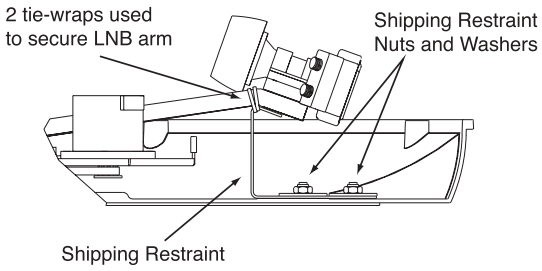
- Consider the location of the antenna relative to the location of any equipment or necessary wiring within the vehicle.
- For best operation, mount the antenna on a horizontal surface.

2.3 Mounting the Antenna Unit

1. Remove antenna unit from shipping container.
2. Remove and save 8 pan head screws and flat washers that hold radome to baseplate. Carefully lift radome straight up until clear of antenna assembly and set aside.
3. Position antenna unit in desired location on the centerline of the vehicle with baseplate and mounting plate arrows facing in the same direction (either forward or backward). The proper orientation is illustrated in Figure 2-2.



4. While baseplate is in place, mark location(s) on roof for cable access to permit convenient cable access to the liquid-tight fittings on the back of the baseplate.
5. Cut tie-wraps holding antenna unit to the forward shipping restraint.



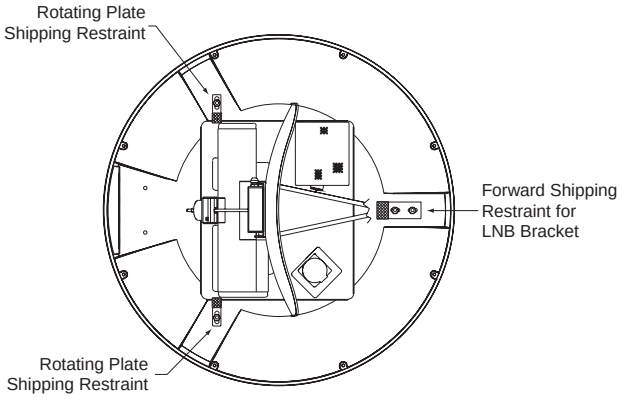
The liquid-tight connectors on TracVision LM may face either forward or backward along the centerline of the vehicle for more convenient installation.

Figure 2-2
Proper Orientation of the Antenna Unit

Figure 2-3
Forward Shipping Restraint (Arranged for Shipping)

6. Remove additional nuts and washers connecting baseplate and shipping restraints to the mounting plate. The positions of all three shipping restraints are pictured in Figure 2-4.

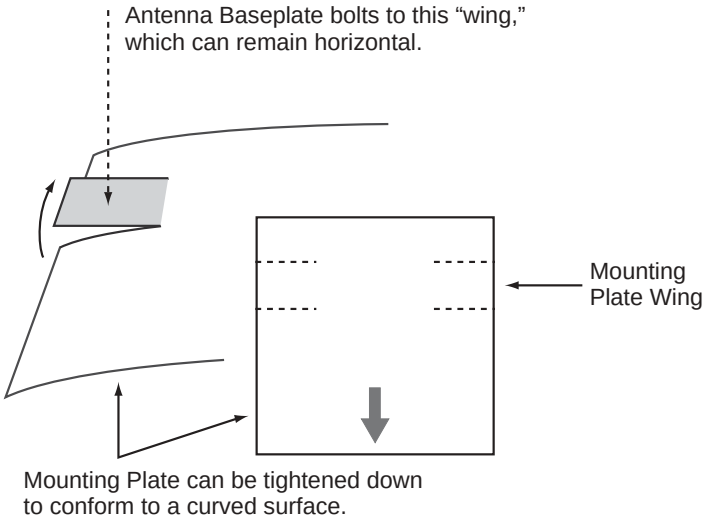
Figure 2-4
TracVision LM Shipping Restraints (Top View, Installed for Shipping)



Do not discard the shipping restraints, washers, or the nuts. They should be saved for future use in case the antenna unit needs to be removed and shipped to another location. Four ¼˝ x ⅝˝ hex head screws have been provided in the kitpack for shipping as the bolts used to hold the shipping restraint during initial shipping are integral parts of the mounting plate.

7. Remove six ¼"-20 hex nuts and washers that secure the Antenna Unit to the mounting plate.
8. Remove antenna unit from mounting plate.
9. The mounting plate allows the antenna unit to be mounted on a curved roof. While the perimeter of the mounting plate is secured to the vehicle with the appropriate fasteners, two flexible wings allow the rear mounting bolts to attach to the antenna baseplate. These may be angled upward to ensure a secure mounting, as shown in Figure 2-5.

Figure 2-5
Mounting the Unit on a Curved Surface



10. Using the mounting plate as a template, drill four 3⁄16" holes through the roof of the vehicle at each of the four corners. Temporarily secure the mounting plate at the corners with rivets or screws.

11. With the corners secured, use the mounting plate as a template to mark and drill the remaining nineteen 3/16" holes through the roof of the vehicle. Remove plate and clean roof surface. The dimensions of the baseplate and locations of the drill holes are shown in Figure 2-6.

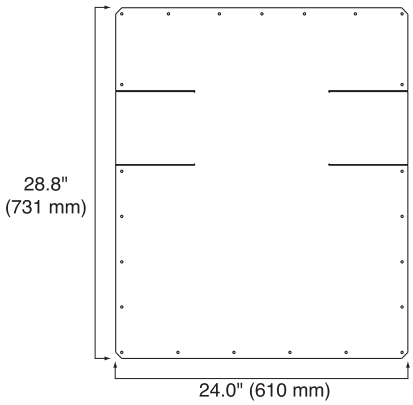


Figure 2-6
Mounting Plate Dimensions

12. Place the construction adhesive over all holes. If using a liquid construction adhesive, apply bead to mounting plate in a zig-zag pattern.

13. Reposition mounting plate over adhesive and attach using 3/16"-diameter rivets (or appropriate fasteners). Seal all rivet heads and edges with silicone.

14. Drill cable access hole(s) in vehicle.

If installing two RF cables, a 5/8" hole will be required. Refer to Section 2.4.4 *for complete details.*

15. When unit is installed with connectors facing the rear of the vehicle, the drain holes are located as shown in Figure 2-7.

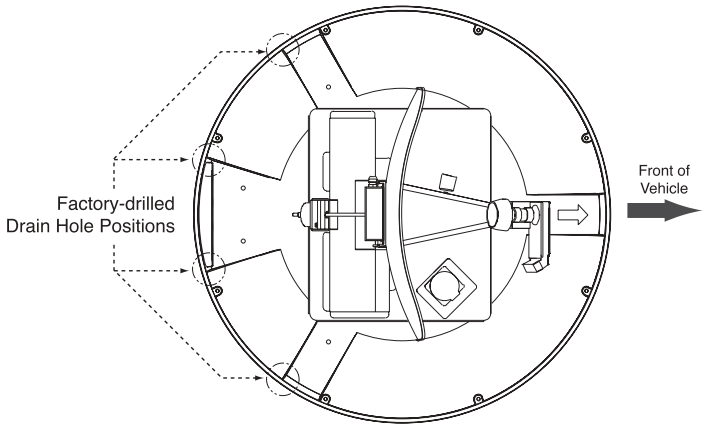
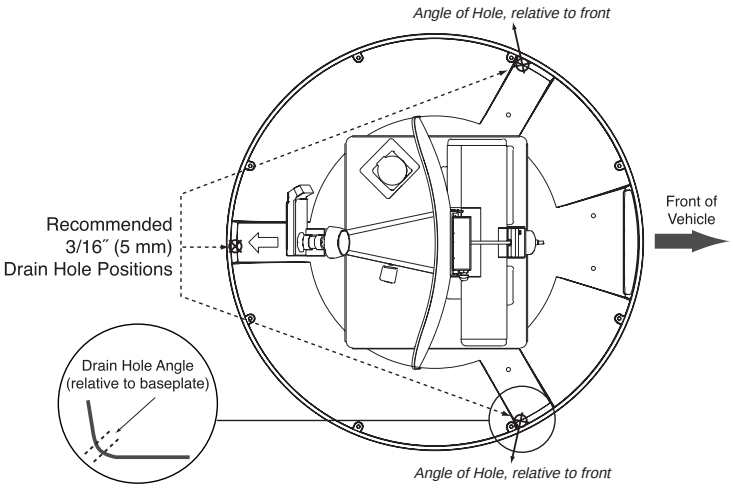


Figure 2-7
Connectors Facing Rear of Vehicle – Factory-drilled Drain Hole Locations

15a. *(Alternate Drain Hole Locations)* If the antenna unit is installed with the connectors facing the front of the vehicle, drill out 3⁄16"-drain holes in rear-facing side of baseplate as illustrated in Figure 2-8. The existing factory-drilled drain holes shown in Figure 2-7 must then be plugged with silicone rubber sealant.

Figure 2-8
Connectors Facing Front of Vehicle – Recommended Drain Hole Locations



You MUST drill out the drain holes as indicated to ensure that any moisture that enters the baseplate is able to drain. Ensure that factory-drilled holes are completely sealed.

16. Place antenna unit on mounting plate and secure using nuts and washers removed in Step 2.

17. For convenient storage, the shipping restraints may be rotated 180˚ and secured to their orginal mounting bolts (see Figures 2-9 through 2-11).

Figure 2-9
Forward Shipping Restraint Storage

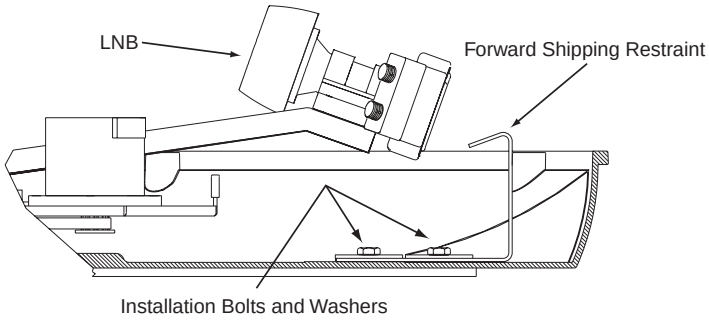
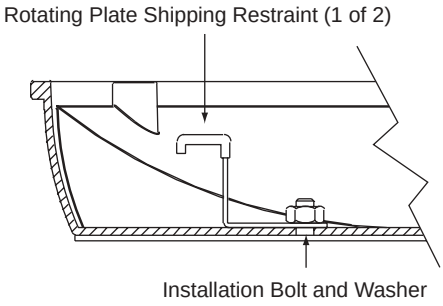


Figure 2-10
Rotating Plate Shipping Restraint Storage



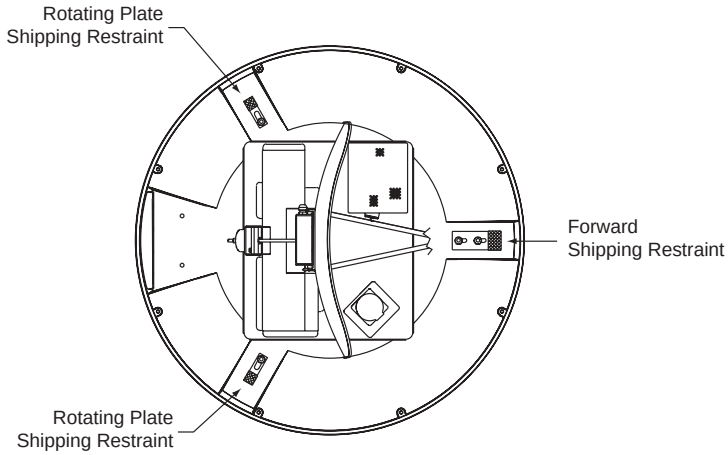


Figure 2-11
TracVision LM Shipping Restraints (Storage Position)

18. Proceed to *Section 2.4, "Connecting the Antenna Unit,"* to wire the TracVision LM system. The radome will be placed back on the baseplate using the hardware removed in Step 2 after wiring and initializing the system.

2.4 Connecting the Antenna Unit

The following sections provide instructions for properly wiring the Antenna Unit to the IRD and to vehicle power.

Tips for Safe and Successful Wiring within the TracVision LM Baseplate

- When attaching cables to the TracVision LM terminal connector strips, make sure the insulation is stripped back approximately ¼". 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.
- After attaching cables within the TracVision LM baseplate, eliminate any unnecessary slack in the cables before tightening the liquid-tight fittings.
- Run the RF signal cable into the baseplate last. It will help keep the power and data cables clear of the antenna and LNB.

DO NOT leave an extra length of cable within the baseplate as a service loop. All service loops should be stored within the vehicle's cable access.

Figure 2-12
Proper Wire-to-Terminal Connection

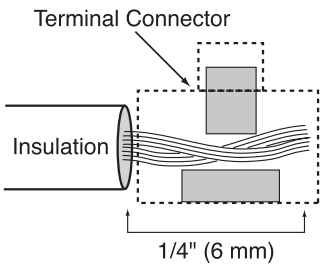
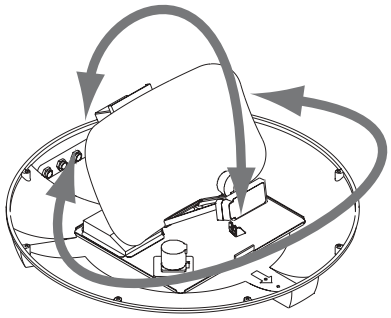


Figure 2-13
Moving the Antenna Reflector

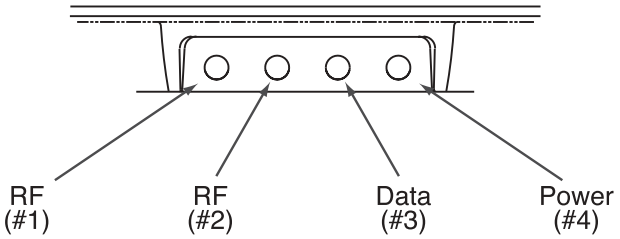


- After hooking up all of the wiring and removing any slack, slowly rotate while raising and lowering the antenna reflector to make certain that the cables are all clear of any moving elements.
- Check to be certain that the elevation axis actuator motor shaft (pictured in *Section 5, Maintenance*, Figure 5-2) clears all cable connections.
- Completely seal all rooftop cable access holes.

TracVision LM Cable Ports

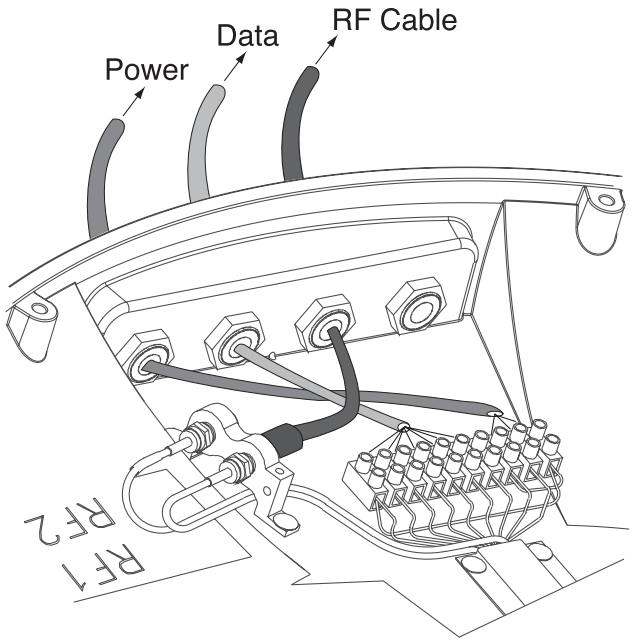
On one side of the baseplate are four liquid-tight fittings (pictured in Figure 2-14), which serve the dual purpose of relieving strain on the cables as well as providing a tight seal around the cable access ports.

Figure 2-14
Cable Port Assignments (Exterior of Baseplate)



When wiring is done properly, the sets of cables will overlap each other, as illustrated in Figure 2-15.

Figure 2-15
Cable Overlap within the TracVision LM Baseplate



2.4.1 Connecting the Antenna Data Cable to the IRD

TracVision LM will not function properly unless you connect the data cable, the procedures for which vary based on your selected satellite TV service. The end of the data cable fitted with two DB9 connectors remains within the vehicle. This will be hooked up to the IRD as discussed later. For your reference, the pin assignments for the data cable DB9 connectors are detailed in *Appendix C*. The other end of the data cable will be attached to the TracVision LM as described in the following section.

TracVision LM Data Cable Wiring Process

1. Feed the cable up to the roof and through the third liquid-tight fitting (#3) from the left as pictured in Figure 2-14.
2. Refer to Figure 2-16 for the proper arrangement of data cable wires within the terminal strip.
3. After connecting the data cable to the TracVision LM, hook up the other end to the IRD as described in the next subsections.

DIRECTV

The data cable for TracVision LM is equipped with a male DB9 (low-speed data port) connector. Connect the DB9 connector on the data cable to the low-speed data port on the back of the IRD.

Wiring to an IRD with a DB15 Connector

Should the IRD only be equipped with a DB15 connector, follow the alternate wiring directions provided in *Appendix C*.

DISH Network

Unlike the DIRECTV IRDs, the EchoStar IRD used with the DISH Network is not equipped with a DB9 connector. As a result, you will need to purchase an EchoStar Adapter (KVH Product Number 02-0899).

The rear of the DISH Network IRD has a port labeled "High Speed Data Port."

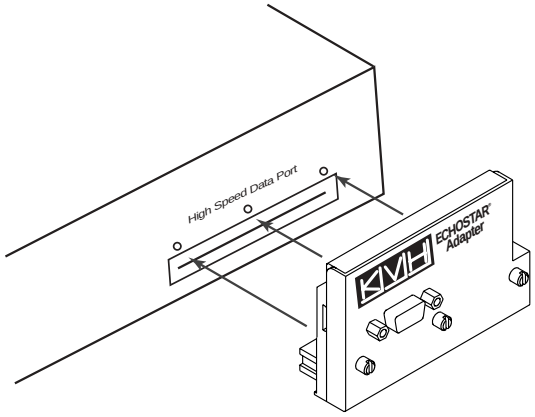
Figure 2-16
Proper Terminal Strip Wiring Arrangement – Data Cable

Shield	1	Grnd
Red	2	+12v DC
Black	3	Grnd
Brown/White	**4**	**RTN**
Orange/White	**5**	**PC_RXD**
White/Orange	**6**	**PC_TXD**
Green/White	**7**	**RTN**
White/Blue	**8**	**IRD_RXD**
Blue/White	**9**	**IRD_TXD**
Shield	**10**	**Grnd**

This port is static-sensitive, so observe the proper precautions. Before starting, make certain that the IRD is not plugged into an AC outlet.

1. Remove the protective metal plate to expose the High Speed Data Port. (Save the screws and plate in the IRD packing material in case the unit must be returned for repairs.)
2. Install the KVH EchoStar Adapter as shown in Figure 2-17. Secure the Adapter to the IRD using the captive screws in the Adapter.

Figure 2-17
EchoStar Adapter Installation



3. Connect the DB9 connector on the data cable to the EchoStar Adapter DB9.

All IRDs are susceptible to AC power fluctuations that can result in the IRD locking up and requiring a reset. Refer to Section 4.2, "IRD Troubleshooting," *for a solution to this issue.*

Commissioning the IRD

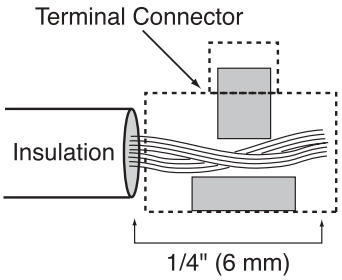
Please refer to the user manual that accompanied your IRD for instructions on properly commissioning the system.

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 D* for complete details.

2.4.2 Connecting the Antenna to Vehicle Power

Figure 2-18
Proper Wire-to-Terminal Connection



Tips for Safe and Successful Wiring within the TracVision LM Baseplate

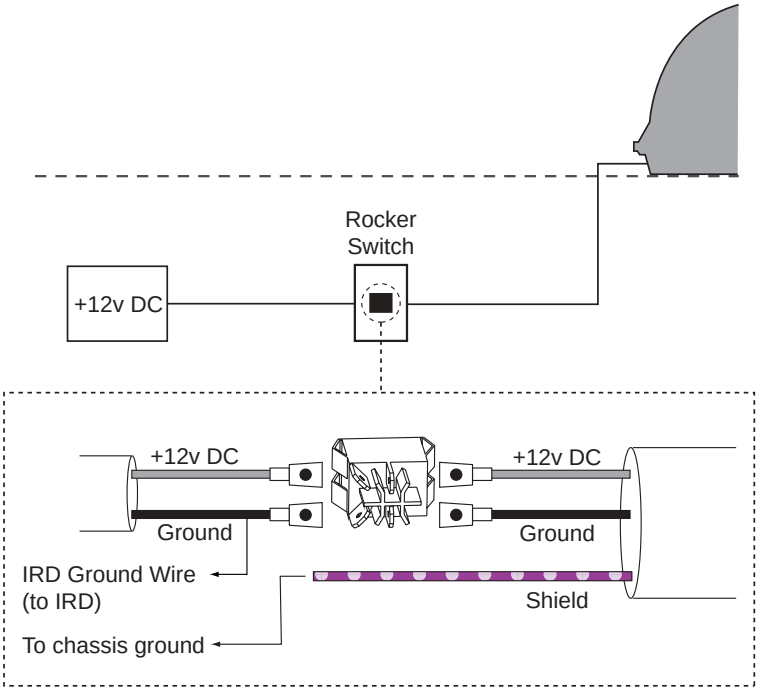
- When attaching cables to the TracVision LM terminal connector strips, make sure the insulation is stripped back approximately ¼". Twist the wires gently to help achieve a good connection. Do not pinch insulation inside the connector.
- After attaching the power and data cables to the appropriate terminal connector strips, tug gently to ensure a firm connection.

- After attaching cables within the TracVision LM baseplate, eliminate any unnecessary slack in the cables before tightening the liquid-tight fittings.

TracVision LM must be connected to a +12 volt DC, 2.5-3.5 amp power supply to operate. The supplied power cable should be run up to the antenna unit, through the far right liquid-tight fitting (#4 – refer to Figure 2-14), and wired to the terminal connector strip as illustrated in Figure 2-19.

TracVision LM comes equipped with a KVH standard 30-foot power cable, a rocker switch, and a switch panel. Power cables of other lengths are also available through KVH distributors.

Figure 2-20 illustrates the internal wiring arrangement for TracVision LM within the vehicle, including the supplied rocker switch. When wiring the rocker switch, it is recommended that the shield wire from the TracVision LM be connected to the chassis ground.



2.4.3 Connecting the IRD Ground Wire

A grounding wire 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, ideally the ground connection at the rocker switch (see Figure 2-20).

Figure 2-19
Proper Terminal Strip Wiring Arrangement – Power Cable

Shield	**1**	**Grnd**
Red	**2**	**+12v DC**
Black	**3**	**Grnd**
Brown/White	4	RTN
Orange/White	5	PC_RXD
White/Orange	6	PC_TXD
Green/White	7	RTN
White/Blue	8	IRD_RXD
Blue/White	9	IRD_TXD
Shield	10	Grnd

Figure 2-20
Wiring TracVision LM to Vehicle Power

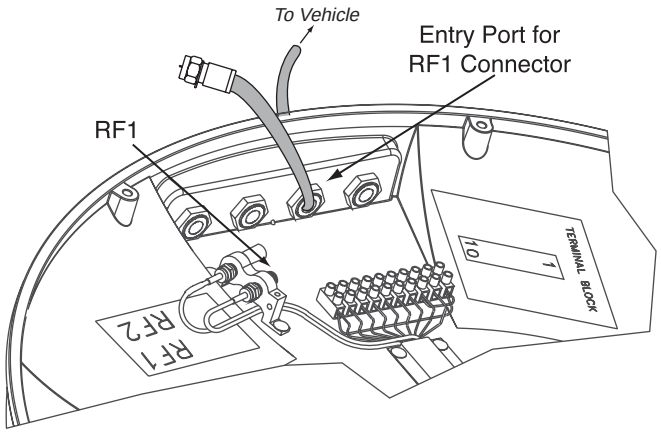
Before connecting the Antenna Unit to vehicle power, remove the appropriate vehicle fuse to prevent a short circuit. Replace the fuse after the connection to vehicle power is complete.

2.4.4 Connecting the Antenna RF Signal Cable to the IRD

The RF signal cable is fitted with an F-type connector at only one end and should be attached to TracVision LM and the IRD as follows:

1. Feed the bare end of the RF signal cable through the #2 liquid-tight fitting at the back of the TracVision LM baseplate and away from the dome, leaving the F-connector inside the TracVision LM baseplate (as pictured in Figure 2-21).

Figure 2-21
Connecting the RF Cable to TracVision LM

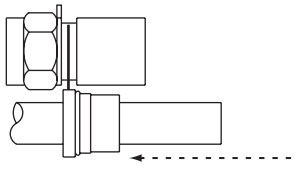


When shipped from the factory, the #1 liquid-tight fitting is sealed with a rubber stopper. Leave the stopper in the fitting unless you are going to be connecting a second RF cable to the TracVision LM.

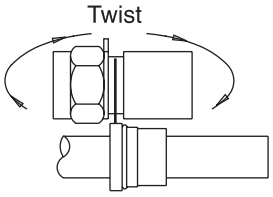
2. For single IRD installation, connect the RF signal cable's F-connector to the plug labeled RF1.
3. Feed the bare end of the RF signal cable and pass through the cable hole drilled earlier and into the vehicle.
4. Attach the provided F-connector to the end of the RF signal cable inside the vessel as illustrated in Figure 2-22a-d, using an Augat Snap 'n Seal Crimp/Strip tool to lock the connector on the cable.

   A. Slide compression fitting onto raw cable before beginning connector termination.

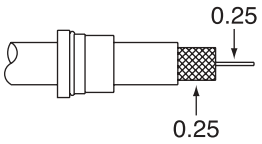
Figure 2-22a-d
Attaching the KVH-provided F-connector to an RF Cable



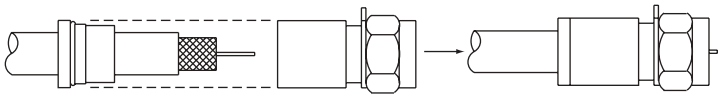
B. Twist and break off connector body.



C. Use Augat tool to strip center conductor and trim back overall jacket. Do not cut through braid.



D. Slide connector body onto the prepared cable. Slide the compression fitting up into the connector body. Use Augat tool to snap on the connector.



5. Attach the cable to the IRD connector labeled SATELLITE IN.

KVH has provided an F-connector for use with the TracVision LM. This connector specifically requires the Augat Snap 'n Seal Crimp/Strip Tool, part number IT1000.

If you do not have this tool, you will need to purchase a silicone-filled, weatherproof F-connector (Radio Shack Part Number 278-236 or equivalent) to use instead.

Installing Two IRDs and TVs

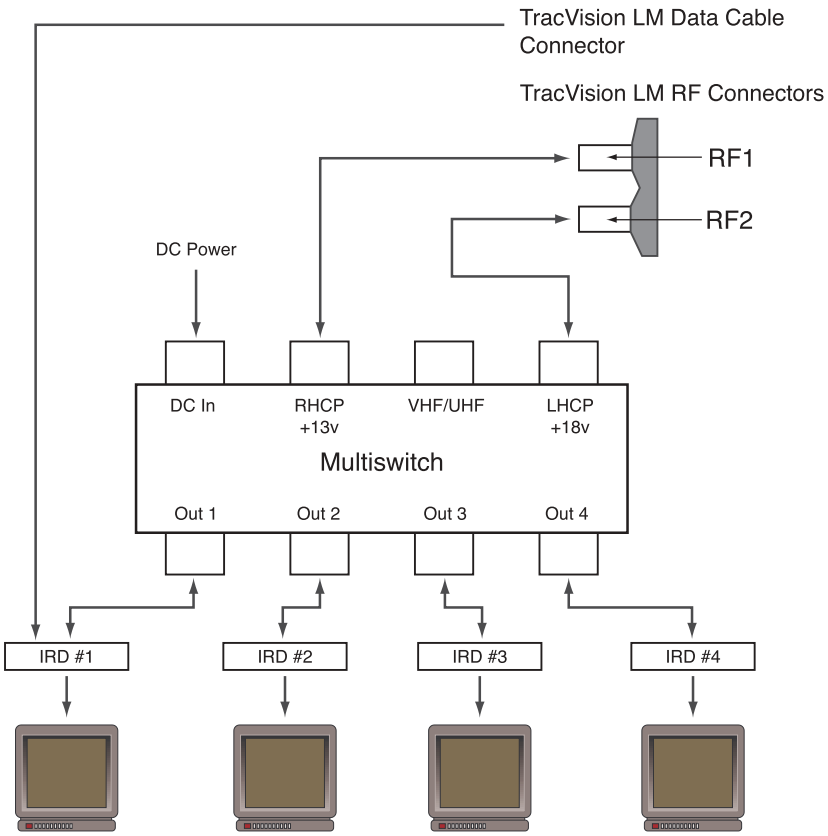
To connect a second TV and IRD to the TracVision LM system, you must connect a second RF cable to the RF2 connector within the Antenna Unit baseplate. The other end of the RF cable should be run down into the vehicle and connected directly to the second IRD. The data cable remains connected to the first (master) IRD. Each IRD/TV pair can operate independently of the other, allowing different viewers to watch different channels. However, the master IRD must remain turned on if the second IRD is in use.

KVH recommends the use of RG-6 or RG-11 (75 ohms) cable for RF wiring. Use of non-RG-6 or RG-11 (75 ohms) cables will result in degraded performance. The KVH warranty does not cover degraded performance due to improper wiring.

Connecting Three or More IRDs and TVs

To install three or more IRD/TV pairs, an active multiswitch (Channel Master model 6214IFD or equivalent) is placed between the Antenna Unit and the IRDs. Figure 2-23 on the following page illustrates typical wiring arrangements for multiple IRDs. If more than four IRDs are required, contact KVH for additional wiring instructions. Mount the multiswitch unit in accordance with the manufacturer's instruction sheet.

Figure 2-23
Installing Three or More IRDs Using an Active Multiswitch



The data cable should be attached to the master IRD. The master IRD must remain on for the secondary IRDs to function properly.

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.
4. Terminate all unused output connectors with 75 ohm DC blocks (Channel Master #7184, Radio Shack #15-1259 or equivalent).

2.5 Checking Out the System

Power up the TracVision LM system and observe messages on your TV screen to verify proper operation. Some messages originate in the IRD, others are generated in the TracVision LM circuits. Be sure that both the Antenna Unit and the IRD are turned on.

Depending on your choice of satellite TV service and IRD, the system may display several text messages on the television screen to aid in monitoring TracVision LM performance. These messages are not displayed when the IRD is displaying the Signal Strength Meter on the TV screen. The messages and their meanings are described in Table 2-2.

Table 2-2
TracVision LM Operational Messages

Message	Definition
KVH TracVision LM	Displays for 5 seconds at startup
Software Version	Current software version Alternates with “KVH TracVision LM”
Initializing	System initializing
Search Mode 1	Antenna Unit in Search Mode 1
Search Mode 2	Antenna Unit in Search Mode 2
Search Mode 3	Antenna Unit in Search Mode 3
Reacquisition	System is reacquiring the satellite
RF Signal Error	RF signal detector has no signal at input
AZ Motor Error	Fault detected in azimuth drive subassembly
EL Motor Error	Fault detected in elevation drive subassembly
Ant Gyro Error	Fault detected in Antenna Gyro assembly or Antenna Gyro failed to initialize properly because the vehicle was turning during the 60-second startup and initialization period following power-up.
Cable Unwrap	System in process of unwrapping cable

The DISH Network and some newer IRDs (e.g., the Sony A50) give priority to internal IRD messages rather than on-screen messages. KVH recommends that the maintenance port must be used to read installation-related messages on a PC.

Differences among IRD data ports may result in different message formats, and some messages may not be displayed on the television screen. DSS messages you may see are listed in Table 2-3.

Table 2-3
DSS On-Screen Messages

Message	Definition
Searching for satellite – please stand by	The IRD is powered up and doesn’t detect the satellite signal.
Searching for program guide – please stand by	The system has found the satellite, but has been turned off for more than approximately four hours. This message appears for about 10 seconds.

Refer to your DSS User’s Manual for specific messages displayed by your system.

2.6 Completing the Installation Process

If the system has initialized properly and is functioning, replace the radome on the baseplate (labels on the sides), securing it with the eight pan head screws and flat washers removed at the start of the installation process.

*If a need does arise to paint the radome, **ONLY use non-metallic automotive paint** to avoid degrading the RF signal strength and the reception quality.*

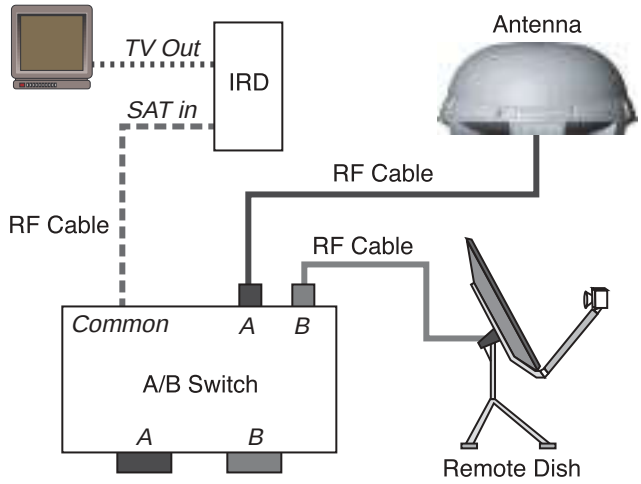
As noted previously, while DIRECTV offers on-screen messages, it is recommended that a PC be available for all installations of both DIRECTV and EchoStar. This will permit the installer to record the TracVision LM startup sequence to verify that the unit is functioning within specified parameters. Baseline startup parameters (with optimal ranges) have been provided in *Appendix E*.

2.7 Configuring TracVision LM for Remote Satellite Dish Operation

In some campground locations, dense foliage will block the satellite signal. In these situations, a remote portable antenna may be the only solution to satellite signal reception.

The wiring option for the remote dish is very simple and should be installed when the TracVision is installed. A high-quality "A/B switch" should be used to change from TracVision to remote antenna operation. The recommended wiring arrangement for remote dish operation is illustrated in Figure 2-24.

Figure 2-24
Remote Dish Wiring Configuration



3 Operation

The TracVision LM system is easy to use. Antenna unit initialization and satellite acquisition is automatic and does not require any operator intervention.

To use the TracVision LM system:

1. Turn on the IRD and the television.
2. Apply operating power to the antenna unit.

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

To allow the TracVision LM antenna gyro to initialize properly, avoid turning the vehicle for 60 seconds after you turn on the TracVision LM antenna unit. If you do turn during the minute following power-up, the antenna could experience an antenna gyro failure (noted as ANT GYRO ERROR in an on-screen message) or have trouble tracking the satellite (noted as REACQUISITION in an on-screen message).

To correct this error, turn off the system for at least 10 seconds and then restart, making sure not to turn during the 60-second startup and initialization process.

As part of the startup process, the TracVision LM system will default to Channel 200, a program directory. This is the system's means of verifying that it has identified and is tracking the correct satellite.

Once Channel 200 appears, wait at least another 30 seconds before changing the channel to ensure that the system has completed its startup routine.

Tips to get the Best Reception with TracVision LM

- A clear line of sight to the satellite helps ensure that the antenna can acquire and track the satellite.
- The antenna unit is designed to turn a full 720˚ before coming to the end of its cable. Should this occur, the system conducts an automated cable unwrap. This involves rotating the dish in the opposite direction. During this process, your transmission will be frozen for approximately 10-15 seconds while the cable unwraps and the antenna reacquires the satellite.
- Passing through tunnels, under highway overpasses, and through dense urban areas can disrupt transmission by denying the antenna a line of sight to the satellite.

The system carries out a number of automated steps at startup. For reference, these steps are outlined in Table 3-1 below.

Table 3-1
TracVision LM Automated Procedures

Step	Actions
Antenna Unit Initialization	The microprocessor circuitry does a basic self-test of the hardware and software associated with the antenna unit. and calibrates the antenna gyro.
IRD Identification	The microprocessor next queries the IRD to determine whether it is a DIRECTV or DISH Network IRD. Based on the IRD type, the system will then set various system variables to ensure that the correct satellite is found during Search Mode.
Satellite RF Threshold	The antenna is pointed at the north, south, east and west horizons to determine the background noise level and to calculate the minimum signal level required for satellite acquisition.
Satellite Search Modes	The system design includes three search modes to acquire the satellite.
Search Mode 1	The antenna makes three complete revolutions at the saved elevation.
Reacquisition Search (Search Mode 2)	The antenna will search in a “window” of 6˚ around the satellite’s last known elevation.
Search Mode 3	The antenna conducts a complete sky search, making continuous revolutions at steadily increasing elevations (from 20˚ to 70˚).
Fine-tuning/Satellite Verification	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 IRD is queried to determine if it can decode the peaked signal. If it is able to decode and lock onto the signal, then the system enters tracking.

Using Your TracVision LM When Parked

When your vehicle is stopped, it is not necessary for the TracVision LM to be turned on. After parking your vehicle and confirming that the antenna is receiving the satellite signal, you may turn off the TracVision LM unit to avoid unnecessary use of power. The antenna will continue to receive the satellite TV signals and relay them to the IRD.

Conical Scan Tracking

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 60-second time-out delay. If the signal is not regained during that time, the antenna reverts to the Reacquisition Search to start looking for the satellite signal.

4 Troubleshooting

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

Table 4-1
Troubleshooting Matrix

SYMPTOM / POSSIBLE CAUSE (AND SOLUTION)	Satellite signal blocked (Section 4.1.1)	Dew or rain pooling on dome (Section 4.1.2)	Outside satellite coverage zone (Section 4.1.3)	Vehicle turning during startup (Section 4.1.4)	Incorrect or loose RF connectors (Section 4.1.5)	Passive multiswitch used (Section 4.1.6)	IRD data port or cable/wiring (Section 4.2.1)	AC power fluctuating (Section 4.2.2)	EchoStar IRD commissioning (Section 4.2.3)	Failed IRD status check (Section 4.2.4)	IRD faulty (Section 4.2.5)	Antenna gyro faulty (Section 4.3)	LNB assembly faulty (Section 4.3)
No IRD status message							X	X		X	X		
No picture on TV set			X		X	X		X		X	X		X
Intermittent picture for short intervals	X		X	X	X	X	X	X			X	X	X
System works at rest but not on the move	X											X	
System will not find satellite	X		X	X	X	X		X	X	X	X		X
Snowy television picture											X		
IRD locks up								X		X			
Picture jumbled, parts missing, freezing		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 LM. The following sections address these issues and potential solutions.

4.1.1 Satellite Signal Blocked

Satellite signals can be blocked or degraded by trees and branches, buildings, mountains, overpasses, or equipment on the vehicle itself. Refer to *Section 2.2, "Choosing the Best Location,"* to make certain that the TracVision LM unit is in the optimal location. Simply moving the vehicle to clear an external obstruction will also restore signal quality.

4.1.2 Dew or Rain Pooling on Dome

Dew or rain can occasionally pool on the top of the radome. While this moisture will usually be dispersed when the vehicle is in motion, it can disrupt the signal while the vehicle is at rest. This issue can be minimized with two approaches:

1. Spray the dome with hosed water to remove the dew from the dome surface.
2. Periodically apply liquid dish detergent to the dome surface. Wipe the full-strength detergent on the dome and allow it to dry. This treatment will provide a film that will help moisture bead up and roll off the dome.

For your convenience, KVH provides links to several web sites that offer satellite coverage information. Simply go to our web site at www.kvh.com/footprint/index.html.

4.1.3 Outside Satellite Coverage Zone

TracVision LM will provide outstanding reception throughout the entire coverage area for your satellite television service of choice. However, signal quality can be degraded as you approach the fringe coverage areas (e.g., Northern Maine). Refer to your satellite television service manual to check the viable coverage area.

4.1.4 Vehicle Turning During Startup

On-screen messages are not available with the DISH Network and some newer IRDs (e.g., the Sony A50).

At times, an on-screen message may display ANT GYRO ERROR (antenna gyro error) while the system has trouble finding the satellite and tracking performance is reduced.

The most common cause of this error is the vehicle turning during the 60-second startup and initialization sequence that occurs immediately after turning on the power to the TracVision LM unit. If the vehicle is turning, the antenna gyro records that variable motion as "standing still" which causes the antenna to track improperly. To solve this problem, turn TracVision LM off

for at least 10 seconds. Turn the system back on, making certain that the vehicle is either motionless or travelling in a straight line for the 60 seconds immediately following power-up.

4.1.5 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 2.4.4, "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 E.

4.1.6 Passive Multiswitch Used

An active multiswitch must always be used to connect the TracVision LM system to three or more IRDs. Refer to *Section 2.4.4, "Connecting the Antenna RF Signal Cable to the IRD"* for directions on proper multiswitch/multiple IRD cabling.

4.2 IRD Troubleshooting

The IRD that was provided with your satellite television service may also be the cause of less-than-ideal operation.

4.2.1 IRD Data Port or Cable/Wiring

Refer to *Section 2.4.1, "Connecting the Antenna Unit Data Cable to the IRD"* and your IRD user manual to confirm that the IRD is properly connected to the Antenna Unit and the television.

4.2.2 AC Power Fluctuating

If the system periodically displays a picture for less than one minute, then enters Search Mode 1, the IRD data port may be locked up as the result of power fluctuations and will require a reset. This can be verified by hooking up a PC to the data port and checking for error messages. Reset must be done by:

1. Completely shutting down DC power to the antenna.
2. Remove the AC source, either at the breaker or by unplugging the IRD.
3. Wait at least 10 seconds before restoring power first to the IRD and then to the antenna.

The long-term fix, typically done at original system installation, is to install an Uninterruptible Power Supply (like those available for use with computer systems) on the IRD. Be sure to specify a UPS with adequate available current for all devices attached to it. (An IRD draws approximately 200 watts.)

4.2.3 EchoStar IRD Commissioning Check

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 D* provides the manual satellite acquisition and commissioning procedure.

4.2.4 Failed IRD Status Check

As detailed in *Appendix E*, TracVision LM completes a detailed startup routine whenever it is turned on. One of the the first checks is the IRD status test. As noted in the typical startup cycles, the expectation is that the IRD and its communications link to TracVision LM will pass this test. There are, however, two alternate results, each indicating a slightly different problem.

Test Result: NONE

If the system tests achieves a result of **NONE**, there is no communication at all between the antenna unit and the IRD.

Solution

Check to be certain the IRD and TracVision LM are connected properly at the low-speed data port. Refer to *Section 2.4, "Connecting the Antenna Unit,"* for correct Antenna Unit to IRD wiring procedures and diagrams. After verifying the connection, cycle the power on and off and review the startup test results.

Test Result: UNKNOWN

In the instance of a result of **UNKNOWN**, a communications link exists, but the data received by the antenna unit is garbled and unrecognizable.

Solution

As with a result of **NONE**, first check to be certain the IRD and TracVision LM are connected properly at the low-speed data port. Refer to *Section 2.4, "Connecting the Antenna Unit,"* for correct Antenna Unit to IRD wiring procedures and diagrams. After verifying the connection, cycle the power on and off and review

the startup test results. If this does not initially succeed, refer to *Section 4.2.2, AC Power Fluctuating* and follow the IRD reset procedure.

4.2.5 IRD Faulty

In the case of a faulty IRD, refer to your IRD user manual for service, replacement, and warranty information.

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 LM antenna gyro or the LNB.

4.4 Computer Diagnostics

TracVision LM has been designed to provide diagnostic readouts viewed on the TV screen (DSS only) or on a personal computer having an RS-232 serial communication port. If you are unable to isolate a system problem with the foregoing troubleshooting tools, set up for computer diagnostics as described below. System problems will most likely be found somewhere through the diagnostic readouts.

Most terminal emulation programs have a parameter for local character echo. Select this parameter to see what is being typed without any system delay.

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

1. Connect one end of the PC cable to the female DB9 connector on the end of the data cable. 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 LM 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.

4.5 Maintenance Port Parser Commands

TracVision LM system parser commands are detailed in *Appendix F*.

5 Maintenance

5.1 Warranty/Service Information

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.

The serial number of your TracVision LM will be required during any troubleshooting or service calls. You will find the serial number on the inside front cover of this manual as well as in front of the antenna reflector on the rotating plate.

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 LM requires minimal preventive maintenance. The following tasks are sufficient to maintain peak performance.

Monthly

- Wash the exterior of the radome and baseplate assembly with fresh water; a mild detergent may be added to remove grime. Do not spray the radome directly with high-pressure water.
- Do not apply abrasive cleaners or volatile solvents such as acetone to the ABS radome.

Annually

- Remove the radome and examine the interior of the Antenna Unit for signs of corrosion, loose connections, or frayed or broken wires.
- Visually inspect the elevation drive shaft to be certain that it moves easily and is clear of grit and debris. Clean and lubricate as required.

5.3 Replaceable Parts

To help us continually improve the quality and reliability of our systems, please return any failed component to KVH after you receive your replacement part.

TracVision LM 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 LM dealer/installer first. Have the Antenna Unit serial number ready with a list of the trouble symptoms. 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 units that can be serviced in the field are listed in Table 5-1. These parts may be obtained from any KVH authorized dealer/installer.

Table 5-1
Field Replaceable Units

Part Name	Part Number
Baseplate Assembly	02-0952
Radome Assembly	02-0953
Power Cable	32-0590-30
RF Cable	32-0589-30
Data Cable	32-0591-30
EchoStar Adapter Unit *	02-0899
CPU PCB	02-1043-01
Antenna Gyro	02-1035
Antenna Gyro Gasket	24-0139
System Fuse	16-0017-4000
LNB	19-0056

* Optional, purchased separately

Should the fuse ever need to be replaced, TracVision LM uses a 5x20mm, 4-amp, 250-volt fast-blow fuse.

It is recommended that all other technical difficulties be resolved by returning the TracVision LM unit to an authorized service provider.

5.4 Field Replaceable Unit Procedures

The following subsections provide detailed procedures for repairing or swapping out field replaceable units. The procedures refer to labeled items presented on the following isometric diagrams, which are based on KVH assembly drawings.

Always lift the antenna unit by the gray baseplate, never by the radome or any portion of the antenna assembly!

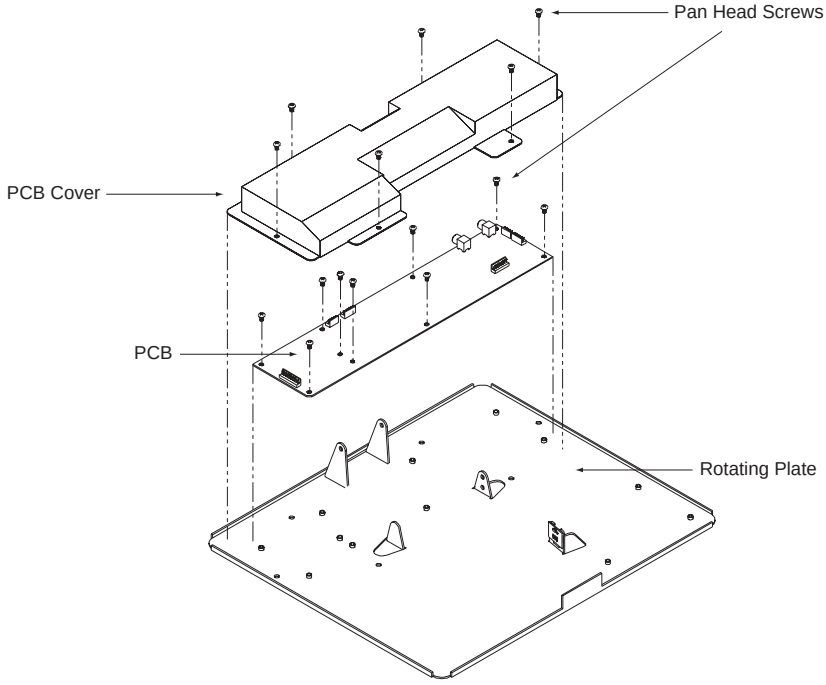


Figure 5-1
Antenna, PCB, and Rotating Plate

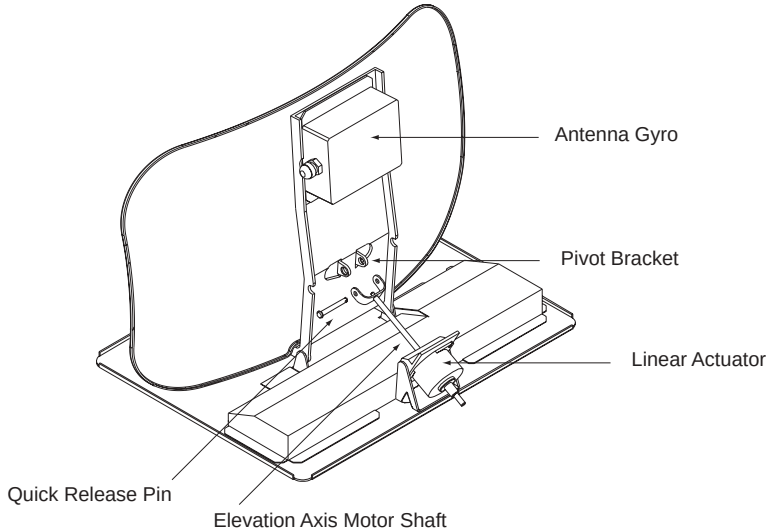


Figure 5-2
Close-up of Linear Actuator, Pivot Bracket, and Pin

Figure 5-3
Antenna Assembly

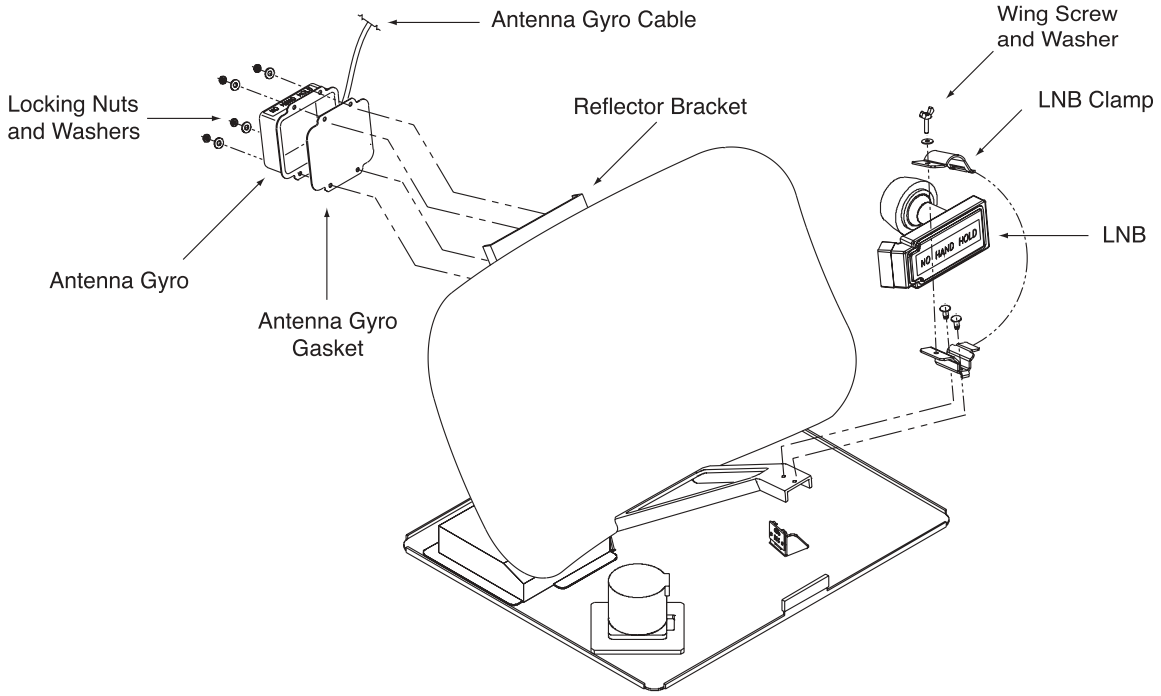
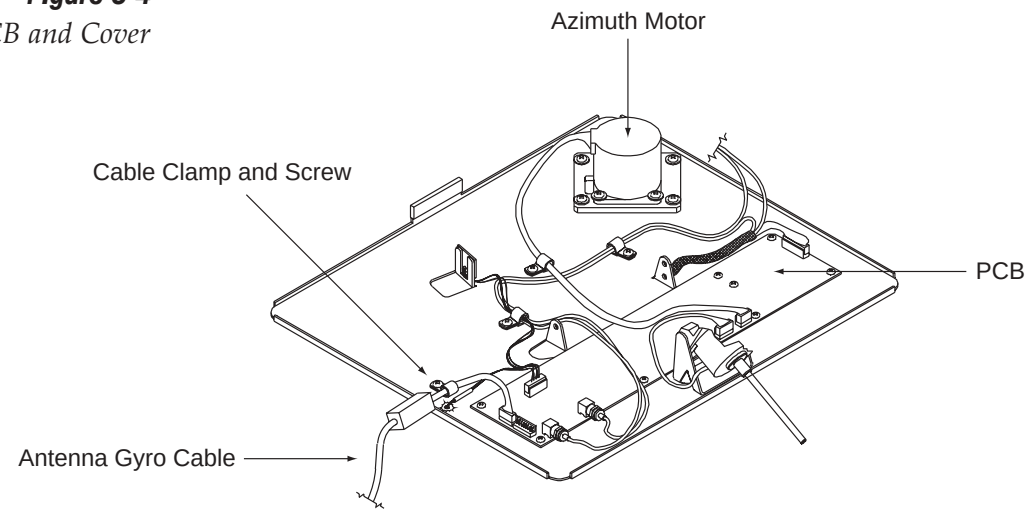


Figure 5-4
Close-up of PCB and Cover



5.4.1 PCB Removal and Replacement

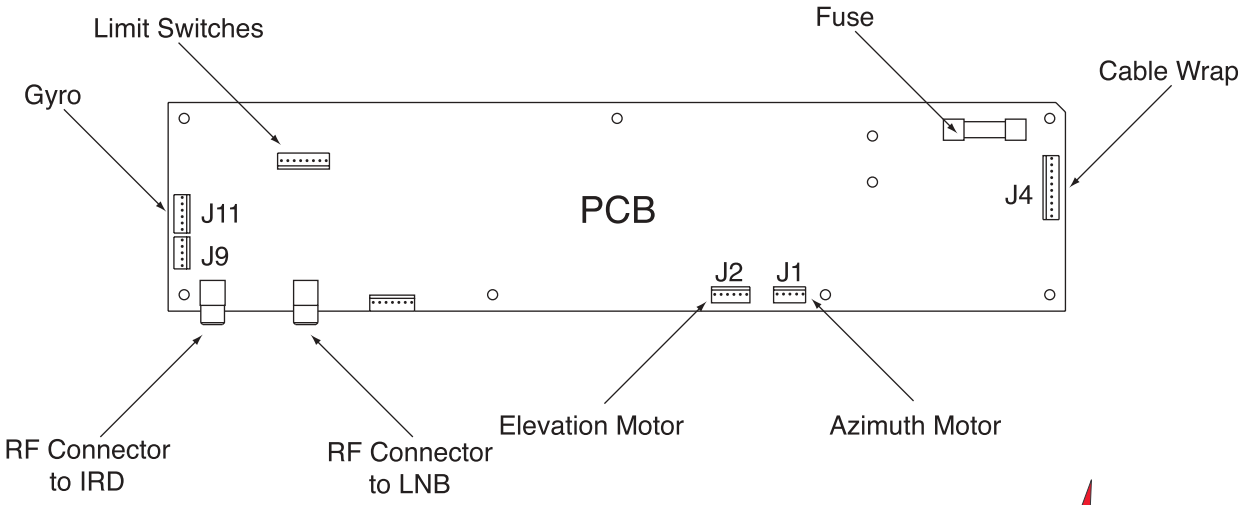
Estimated Time to Repair: ½ hour

The microprocessor PCB assembly is protected by a cover fastened to the rotating plate – *Fig. 5-1*. The cover must be removed to gain access to the main power fuse and the PCB assembly.

1. Remove the quick release pin from the pivot bracket – *Fig. 5-2*.
2. Remove the elevation axis motor shaft from the linear actuator – *Fig. 5-2*.
3. Remove 6 pan head screws from the PCB cover flanges. Remove the PCB cover – *Fig. 5-1*.
4. Remove cable connectors from PCB. Figure 5-5 illustrates the PCB arrangement and connector locations.

When carrying out maintenance on the PCB, be sure to not drop any of the small screws inside the mechanism. If a screw is lost within the baseplate, it must be retrieved to avoid causing any damage when the unit rotates.

Figure 5-5
PCB Connector Locations – Rear View



5. The PCB is mounted to the rotating plate with 9 pan head screws.
6. Reverse this process to install the replacement PCB. Reinstall all cable connectors removed in Step 4.
7. Carry out all calibration procedures for the antenna gyro and the LNB *(Sections 5.4.2-5.4.3).*

TracVision LM is equipped with a 5x220 mm, 4-amp, 250 volt fast-blow fuse, which is mounted on the PCB. To access and replace the fuse, remove the PCB cover.

5.4.2 Antenna Gyro Assembly

Estimated Time to Repair: 1 hour

Following the removal and replacement of the antenna gyro assembly, it will be necessary to calibrate the gyro and restart the system.

The antenna gyro assembly is mounted on the rear of the antenna reflector bracket with four locking nuts and washers – *Fig. 5-3*. Following the removal and replacement of the antenna gyro assembly, it will be necessary to calibrate the gyro and restart the system. A digital level will be required for the calibration procedure. Directions for removal, replacement, and calibration follow:

1. Remove the quick release pin from the pivot bracket – *Fig. 5-2*.
2. Remove the elevation axis motor shaft from the linear actuator – *Fig. 5-2*.
3. Remove 6 pan head screws from the PCB cover flanges. Remove the PCB cover – *Fig. 5-1*.
4. Remove the screw and clamp holding the cable to the rotating plate; save the cable clamp for reuse – *Fig. 5-4*.
5. Remove the Molex connector from J11 on the CPU board – *Fig. 5-5.*
6. Remove the 4 locking nuts and flat washers and take the antenna gyro off of the bracket.
7. Remove the antenna gyro gasket.
8. Replacement is the reverse of this procedure.

Antenna Gyro Calibration

1. Connect a PC to the communications port as described in *Section 4.4, "Computer Diagnostics."*
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.
3. Type **DEBUGON<cr>** to enter Debug Mode.
4. Type **EL,300<cr>**.
5. Place the digital level on the top of the antenna gyro housing. Measure and record the Antenna Gyro Angle using the digital level.

6. Type **=CALUP,XX.X<cr>**, where **XX.X** is the digital level reading obtained in Step 5.
7. Type **TRKANG<cr>** and observe the following message on the PC screen:

   AZ xxx.xx EL yy.yy
8. Verify that the elevation (yy.yy) is within 0.5˚ of the value entered in Step 6 + 15˚ (e.g., the digital level reading was 12˚; the elevation value should be in the range of 26.5˚-27.5˚).
9. Type **=CALAZ<cr>**. Verify that the Antenna Gyro Azimuth scale factor is between -0.00090 and -0.00110.
10. Type **=CALEL<cr>**. Verify that the Antenna Gyro Elevation scale factor is between 0.00090 and 0.00110.
11. Type **ZAP** to restart/reinitialize the system.

5.4.3 Antenna LNB Replacement

Estimated Time to Repair: ½ hour

The LNB receives preamplifier operating power from the IRD via the PCB – *Figs. 5-3 and 5-4*. Be certain that the IRD is disconnected from its power source before removing or reconnecting the LNB.

1. Disconnect both RF coaxial connectors at the LNB.
2. Remove the wing screw and washer from the LNB clamp – *Fig. 5-3*.
3. Remove the top of the LNB clamp – *Fig. 5-3*.
4. Remove the LNB.
5. Replacement is the reverse of this procedure. Check the rotation to ensure that the LNB is not striking any wires or the baseplate.

When replacing the LNB, make certain to restore it to its original orientation, as shown in Figure 5-3.

Antenna LNB Normalization and Stability Test

1. Type **HALT<cr>** to put the system into Idle Mode.
2. Type **DEBUGON<cr>** to put the system into Debug Mode.

The CALLNB Function requires the antenna to be pointed directly at the satellite peak before performing this routine. Using the FINDSAT command will ensure that the antenna is receiving the strongest possible signal.

3. Type **FINDSAT<cr>** to begin the automatic signal peaking process. Wait until the antenna peaks the satellite signal and is motionless. The screen will display **FINDSAT:PASS**.
4. Type **=CALLNB<cr>** to start the LNB Normalization Function.

   Note: The CALLNB Function requires the antenna to be pointed directly at the satellite peak before performing this routine.
5. The system must respond with the following message: **CALLNB: PASS**. If the system displays **CALLNB: FAIL**, return to step 1 and retry the procedure, making sure to achieve the highest possible RF signal peak.
6. Record the Cold Sky Average and the RFGAIN value reported in step 5.
7. Type **ZAP<cr>**. The system will re-initialize using the new RFGAIN and RFOFFSET scale factors displayed following step 5.
8. Wait for the system to perform the background noise calculation. Read the Average Noise Level value from the messages transmitted out the maintenance port. This value must be greater than 300 and less than 1300. An example of the message sequence and format is as follows:

   *** Averaging Background Noise ***

   Average Noise Level = 750

   Noise Threshold = 1450
9. Wait for the system to search for, find the satellite, enter Tracking Mode and track the satellite for a minimum of 30 seconds. Record the average RF signal value reported from the +POS: AZ, EL, RF messages. An example of the message sequence and format is as follows:

   +POS: 154.5 33.2 2521
10. The RF signal values while tracking shall be greater than 2000 and less than 3000.

5.4.4 EchoStar Adapter Replacement

Estimated Time to Repair: ½ hour

Use the following procedure to replace the EchoStar Adapter:

1. Remove power from Antenna and unplug IRD from AC power.
2. Observe static precautions.
3. Unscrew and remove DB9 cable connector from the Adapter.
4. Unscrew thumbscrews securing Adapter to IRD.
5. Carefully remove Adapter from IRD card edge.
6. Install new Adapter on the IRD card edge. Secure the Adapter and reinstall cable.

5.5 Preparation for Shipment

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

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

1. Rotate the antenna unit so that the LNB is facing forward (away from the liquid-tight fittings).
2. Attach the three restraints to the baseplate using the 1/4"-20 x 5/8" long hex screws and washers (provided as part of the kitpack), and nuts (removed from shipping restraint during installation) as pictured in Figure 5-6.

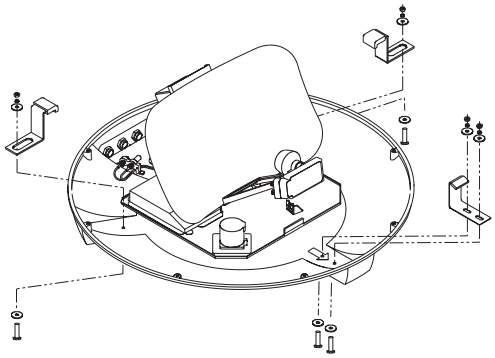
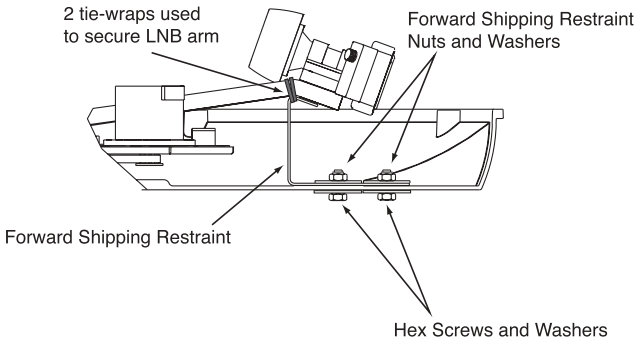


Figure 5-6
Attaching the Shipping Restraints to the Antenna Baseplate

3. Place the antenna bracket on the forward shipping restraint.

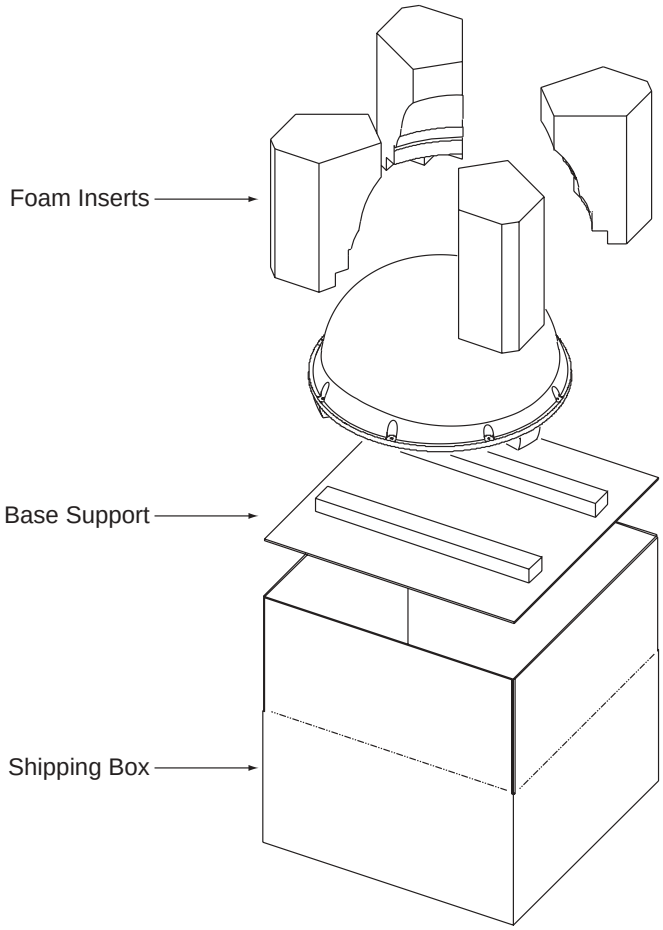
4. Secure the forward restraint and bracket by wrapping two tie-wraps around the bend in the forward restraint and the antenna bracket (at the end of the LNB bracket).

Figure 5-7
Securing the Forward Shipping Restraint



5. Place the entire Antenna Unit into its shipping containing using the original packaging material, as illustrated in Figure 5-8.

Figure 5-8
Repackaging the TracVision LM



Appendix A
System Specifications

Physical Characteristics

Power	11-16 volts DC @ 2.5 amps nominal, 3.5 amps peak
Dimensions/Weight	32" (81 cm) wide x 14.8" (38 cm) high, 33 lbs (15 kg)
LNB	Dual Output
Tracking	Better than 30˚/sec
Maintenance Port	9600 bps, 8,N,1,EIA, RS232

Pointing System

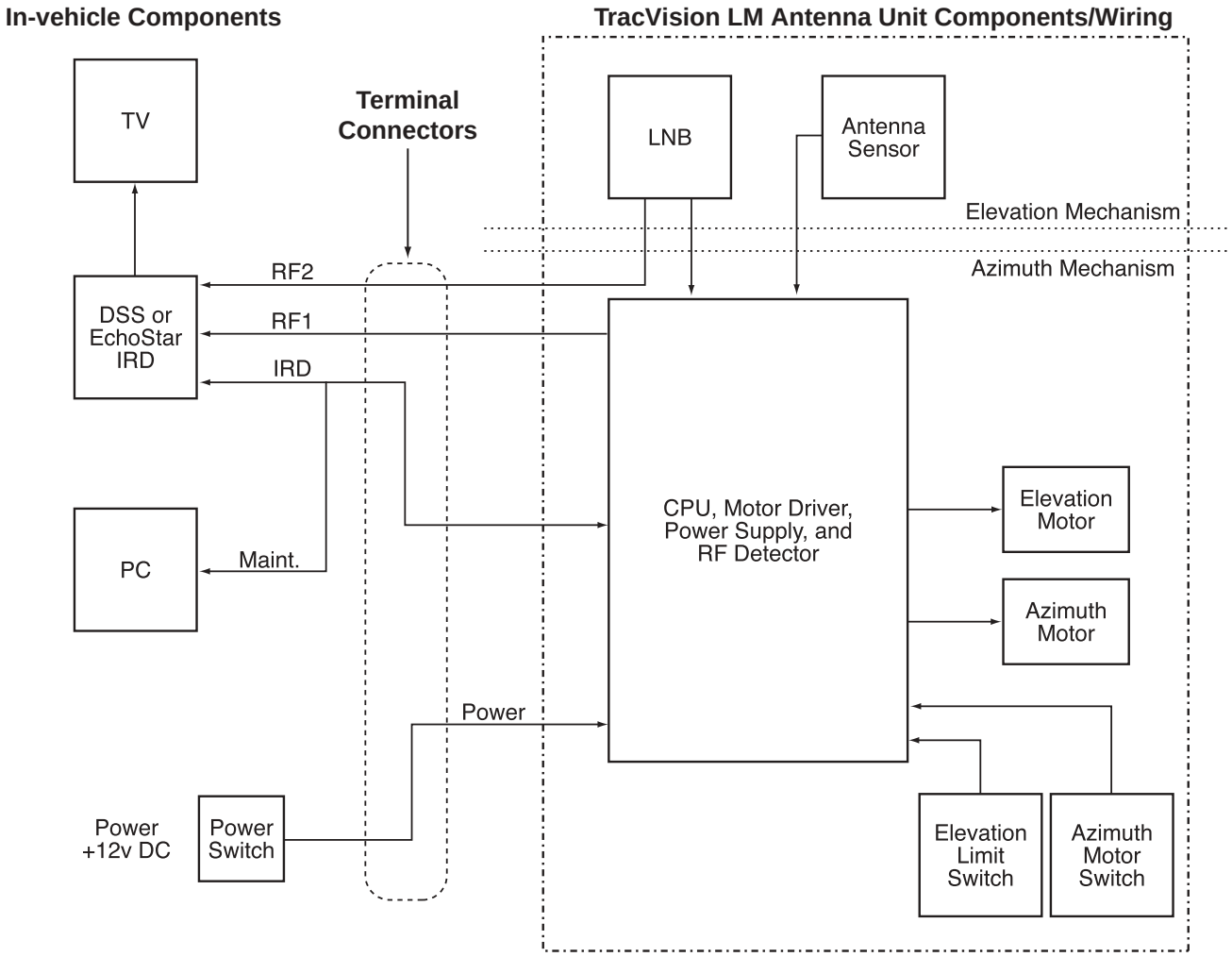
Elevation Range	15˚ to 75˚
Azimuth Range	720˚
Position Repeatability	0.1˚

Environmental

Operating Temperature	-25˚C to +55˚C
Storage Temperature	-40˚C to +85˚C
Humidity	to 100 percent

Table A-1
TracVision LM System Specifications

Appendix B
Functional Block Diagram



Cable Assignments

RF1.....RF Cable (32-0589-30)
RF2.....Owner-provided RG-6 or RG-11 (75 ohms) cable
IRD/Maint.....Data Cable (32-0591-30)
Power.....Power Cable (32-0590-30)

Appendix C
Data Cable Wiring

C.1 Wiring TracVision LM to a 15-pin Data Connector

In some instances, the IRD provided with a satellite TV service may be equipped with a 15-pin connector (DB15 wide-band data port), rather than a 9-pin connector (DB9 low-speed data port). There are two methods that will allow a TracVision LM system to function through a DB15 port.

Splicing a DB15 Connector to the Data Cable

It is possible to splice a DB15 connector to the TracVision LM data cable after removing the male DB9 connector. The alternate wiring arrangement is as follows:

DB9 Pin	Wire Color	Function	DB15 Pin
2	Blue/White	TXD	14
3	White/Blue	RXD	6
5	Green/White	GND	7

Table C-1
Alternate Wiring Arrangement for TracVision LM Data Cable to DB15 (15-wire) Connector

Creating a DB9-to-DB15 Adapter

It is also possible to construct a DB9-to-DB15 adapter that will remove the need to cut and splice the data cable. When constructing such an adapter, follow the DB9-to-DB15 pin arrangement detailed in Table C-1.

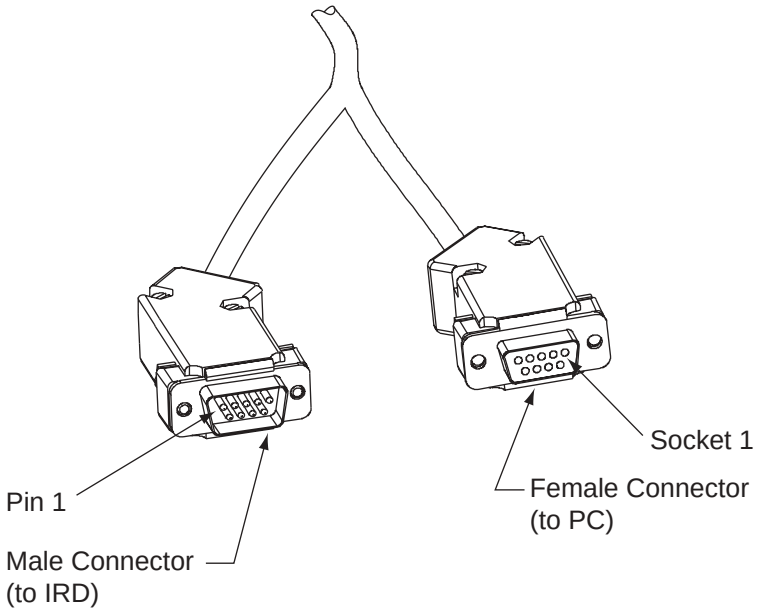
C.2 DB9 Data Connector Pin Assignments

During the troubleshooting or maintenance process, it may be necessary to check the DB9 data connectors to ensure that it is operating properly. With that in mind, Figure C-1 and Table C-2 detail the pin assignments for both the male and female DB9 connectors.

Table C-2
DB9 Pin Functions and Color Code

From Connector	Wire Color	Function
Male Connector Pin 2	Blu/Wht	DSSTXD
Male Connector Pin 3	Wht/Blu	DSSRXD
Male Connector Pin 5	Grn/Wht	DSSGND
Female Connector Socket 2	Org/Wht	PCRXD
Female Connector Socket 3	Wht/Org	PCTXD
Female Connector Socket 5	Brn/Wht	PCGND

Figure C-1
DB9 Male and Female Connector Arrangement



Appendix D
EchoStar IRD 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.

It will be necessary to have a PC available to complete the manual acquisition and commissioning procedure.

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 LM.
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.

    - 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.

18. Turn the TracVision LM off and then on. The EchoStar IRD will now communicate with the TracVision LM system. To verify this, monitor data port information. The following message will appear.

    *** Initializing IRD ***

    IRD STATUS: PASS ECHO

The Signal Strength Meter is located on the bottom of the "Point Dish and Signal Strength" screen. This Signal Strength Meter is Red in color, and turns Green when the proper satellite is located.

Turning the IRD off with the remote puts IRD in standby mode. Turning the IRD off from the front panel shuts IRD off.

Appendix E
Startup Data Sequence

The data on the following pages presents the standard startup data sequence registered by the TracVision LM when using DIRECTV or EchoStar IRDs. This sequence can be recorded using the data port and a PC.

Typical Startup Sequence and Ranges: DSS (DIRECTV)

?PGM ----------Indicates presence of bootloader program
KVH TracVision LM Rev X - Version X.XX - Serial number XXXXXXXX
Limit Switch Test
Limit Switch Status:**PASS**---------- Pass is expected result
*** Initializing IRD ***
IRD STATUS: **PASS DSS** ---------- **PASS** expected. If **NONE** or **UNKNOWN**, See Section 4.
Saved Sat Pos: **EL = 36.5** -------- Last known elevation to valid Satellite lock
*** Initializing Rate Bias ***
+POS: 45.0 45.9 548
VEL_INDEX: **Az = 1996, El = 2182** –- Expected range is 1700-2300
RATE BIAS: PASS ---------- Az & El values above are within valid ranges
*** Averaging Background Noise ***
+POS: 45.0 22.5 356
+POS: 135.0 20.0 362
+POS: 311.8 20.0 355
Average Noise Level = 381 -------- Normal range is 250-700
Noise Threshold = 859 ---------- Normal range is 700-1400
Saved Sat Pos: EL = 36.5
*** Entering Search Mode 1 ***
+POS: 27.0 20.1 354
+POS: 79.9 36.4 341
Satellite Found: AZ = 62.26, EL = 36.50, RF = 1300
+POS: 53.6 36.5 449
*** Entering Tracking ***
+POS: 61.8 36.5 1260
+POS: 62.2 36.3 1346
+POS: 64.0 36.5 1716
***** Entering Satellite Check ***** - Confirming proper Satellite lock
+POS: 64.3 36.1 1747
Satellite Located
IRD Signal Quality = 54
+POS: **66.1** 35.6 1522 ---------- Antenna position relative to front of vehicle
+POS: 66.3 **36.5** 1429 ---------- Antenna elevation
+POS: 64.6 35.5 **1749** ---------- Current **RF** signal level: should be approximately 500 counts
IRD Signal Quality = 58 higher than reported noise threshold
+POS: 66.2 36.1 1467
+POS: 64.5 35.8 1757

Typical Startup Sequence and Ranges: EchoStar (DISH Network)

?PGM ---------- Indicates presence of bootloader program
KVH TracVision LM Rev X - Version X.XX - Serial number XXXXXXXX

```
Limit Switch Test
Limit Switch Status: PASS ----------- Pass is expected result
*** Initializing IRD ***
IRD STATUS: PASS  ECHO -------------- PASS expected. If NONE or UNKNOWN, see Section 4
Saved Sat Pos: EL = 22.0 ------------ Last known elevation to valid Satellite lock
*** Initializing Rate Bias ***
+POS:  45.0  45.9  545
VEL_INDEX: Az = 2000, El = 2184 ----- Expected range is 1700-2300
RATE BIAS: PASS --------------------- Az & el values above are within valid ranges
*** Averaging Background Noise ***
+POS:  45.0  22.5  363
+POS: 135.0  20.0  364
+POS: 311.8  20.0  358
Average Noise Level = 383 ----------- Normal range is 250-700
Noise Threshold =  862 -------------- Normal range is 700-1400
Saved Sat Pos: EL = 22.0
*** Entering Search Mode 1 ***
+POS:  27.0  20.1  361
+POS:  79.9  22.0  647
Satellite Found: AZ =  84.82, EL =  22.00, RF =  942
+POS:  82.8  22.0 1383
*** Entering Tracking ***
+POS:  85.7  23.5  924
+POS:  84.9  24.2 1178
*** Entering Satellite Check *** ---- Confirming proper Satellite lock
+POS:  84.6  24.4 1267
Satellite Located ------------------- Validation of proper Satellite
+POS:  84.8  24.4 1248 -------------- Antenna position relative to front of vehicle
+POS:  84.4  24.9 1318 -------------- Antenna elevation
+POS:  85.1  24.5 1139 -------------- Current RF level: should be approximately 500 counts
+POS:  83.9  25.4 1345                 higher than reported noise threshold
IRD Signal Quality = 45
+POS:  84.1  25.2 1346
+POS:  84.2  23.6 1419
+POS:  84.2  25.1 1336
IRD Signal Quality = 55
+POS:  84.0  23.7 1488
+POS:  84.5  24.8 1300
+POS:  83.7  23.8 1516
IRD Signal Quality = 67
+POS:  84.6  24.5 1265
+POS:  83.5  24.0 1545
```

Appendix F
Maintenance Port Parser Commands

TracVision LM 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**.

F.1 System Commands

Table F-1
System Commands

Software Version	
Function	reports software version
Command	**VERSION**
Argument	none
Response	KVH TVLM Version XX.XX

System Status Report	
Function:	reports general system status
Command:	**STATUS**
Argument:	none
Response:	system status string, (TBD)

Initialize the System	
Function:	initializes the system (perform a soft reset)
Command:	**ZAP**
Argument:	none
Response:	echoes the command, then reinitializes the system

F.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 F-2
Manual Positioning Commands

Help on Parser Commands	
Function:	lists parser commands
Command:	**HELP**
Argument:	none
Response:	print a list of all parser commands

Azimuth Angle	
Function:	commands a manual azimuth angle that the mechanism moves to
Command:	**AZ,xxxx** (range is 0000-3599)
Argument:	desired azimuth angle of the mechanism relative to vehicle reference, or baseplate fwd, 000˚-359.9˚(vehicle-referenced)
Response:	echoes the command; mechanism moves at a fixed velocity

Elevation Angle	
Function:	commands a manual elevation angle that the mechanism moves to
Command:	**EL,xxx** (range is 100-700)
Argument:	desired elevation angle of the mechanism relative to up, or external sensor attitude reference, 10.0˚-70.0˚
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:	**6**
Argument:	none
Response:	echoes the command

Azimuth CCW Step

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

Elevation UP Step

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

Elevation DOWN Step

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

F.3 Operational Commands

Idle Mode

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

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:	**WRAPANGLE,xxxx**
Argument:	the desired cable wrap angle setting
Response:	Wrap Angle = xxxf

Table F-3
Operational Commands

F.4 Tracking and Conscan Commands

Table F-4
Tracking and Conscan Commands

Report Target Location

Function:	reports the target (satellite) location in the Earth frame and uses the saved satellite position
Command:	**TGTLOCATION**
Argument:	none
Response:	Target Location = E XXX, A XXXX

Report RF Signal Strength

Function:	reports the modified signal strength from the RF power detector circuit, and applies the RF gain and offset computed during LNB calibration
Command:	**SIGLEVEL**
Argument:	none
Response:	Signal Strength = XXXX

Report IRD Signal Quality

Function:	reports the signal strength from the IRD; it uses the last received signal quality and initiates a new signal quality request command from the IRD
Command:	**SIGQUALITY**
Argument:	none
Response:	Stale Signal Quality = XX

Report IRD Type

Function:	reports the IRD connection type as DSS, EchoStar, untested, or none
Command:	**IRDTYPE**
Argument:	none
Responses:	IRD type has not been tested yet. IRD type is Echostar. IRD type is DSS. IRD type cannot be determined.

KVH Industries Limited Warranty
TracVision LM

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.

If you discover a defect, KVH will, at its option, repair, replace or refund the purchase price of the product at no charge to you, provided you return it during the warranty period, transportation charges prepaid, to the factory direct. Please attach your name, address, telephone number, a description of the problem and a copy of the bill of sale or sales receipt as proof of date of original retail purchase, to each product returned to warranty service. Alternatively, you may bring the product to an Authorized KVH TracVision Dealer for repair. If the product was installed by an Authorized KVH TracVision Dealer (identified with the KVH Authorized TracVision dealer list), KVH will cover the dealers' labor charges for warranty repairs, provided the dealer contacts KVH for pre-approval of the charges.

This Limited Warranty does not apply if the product has been damaged by accident, abuse, misuse or misapplication or has been modified without the written permission of KVH; if any KVH serial number has been removed or defaced; or if any factory-sealed part of the system has been opened without authorization.

Return Authorization

A Return Material Authorization is required prior to returning the product to KVH Industries. Please call our Technical Support Department at (401) 847-3327 or send an e-mail to techs@kvh.com to obtain the RMA number. Write the number in large, clear characters on the outside of the box. To avoid confusion and misunderstandings, shipments without an RMA number clearly visible on the outside box will be refused and returned to you at your expense. If possible, use the original box and packing material to protect the equipment from damage in shipment. KVH assumes no responsibility for warranty shipments from the customer to the factory if not shipped in the manner prescribed above.

THE EXPRESS WARRANTIES SET FORTH ABOVE ARE THE ONLY WARRANTIES GIVEN BY KVH WITH RESPECT TO ANY PRODUCT FURNISHED HEREUNDER; KVH MAKES NO OTHER WARRANTIES, EXPRESS, IMPLIED OR ARISING BY CUSTOM OR TRADE USAGE, AND SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. SAID EXPRESS WARRANTIES SHALL NOT BE ENLARGED OR OTHERWISE AFFECTED BY TECHNICAL OR OTHER ADVICE OR SERVICE PROVIDED BY KVH IN CONNECTION WITH ANY PRODUCT.

KVH's liability in contract, tort or otherwise arising out of or in connection with any product shall not exceed the price paid for the product. IN NO EVENT SHALL KVH BE LIABLE FOR SPECIAL, PUNITIVE, INCIDENTAL, TORT OR CONSEQUENTIAL DAMAGES OR LOST PROFITS OR GOODWILL (INCLUDING ANY DAMAGES RESULTING FROM LOSS OF USE, DELAY IN DELIVERY OR OTHERWISE) ARISING OUT OF OR IN CONNECTION WITH THE PERFORMANCE OR USE OR POSSESSION OF ANY PRODUCT, OR ANY OTHER OBLIGATIONS RELATING TO THE PRODUCT, EVEN IF KVH HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

If any implied warranty, including implied warranties of merchantability and fitness for a particular purpose, cannot be excluded under applicable law, then such implied warranty shall be limited in duration to ONE (1) YEAR from the date of the original retail purchase of this product by the original purchaser.

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

TVLM O/M Cover 5/01

KVH Industries, Inc.
50 Enterprise Center Middletown, RI 02842 U.S.A.
Phone: (401) 847-3327 Fax: (401) 849-0045
E-Mail: info@kvh.com Internet: www.kvh.com

KVH Europe A/S
Ved Klaedebo 12 2970 Hoersholm Denmark
Phone: +45 45 160 180 Fax: +45 45 867 077
E-Mail: info@kvh.dk Internet: www.kvh.com