



## System Manual

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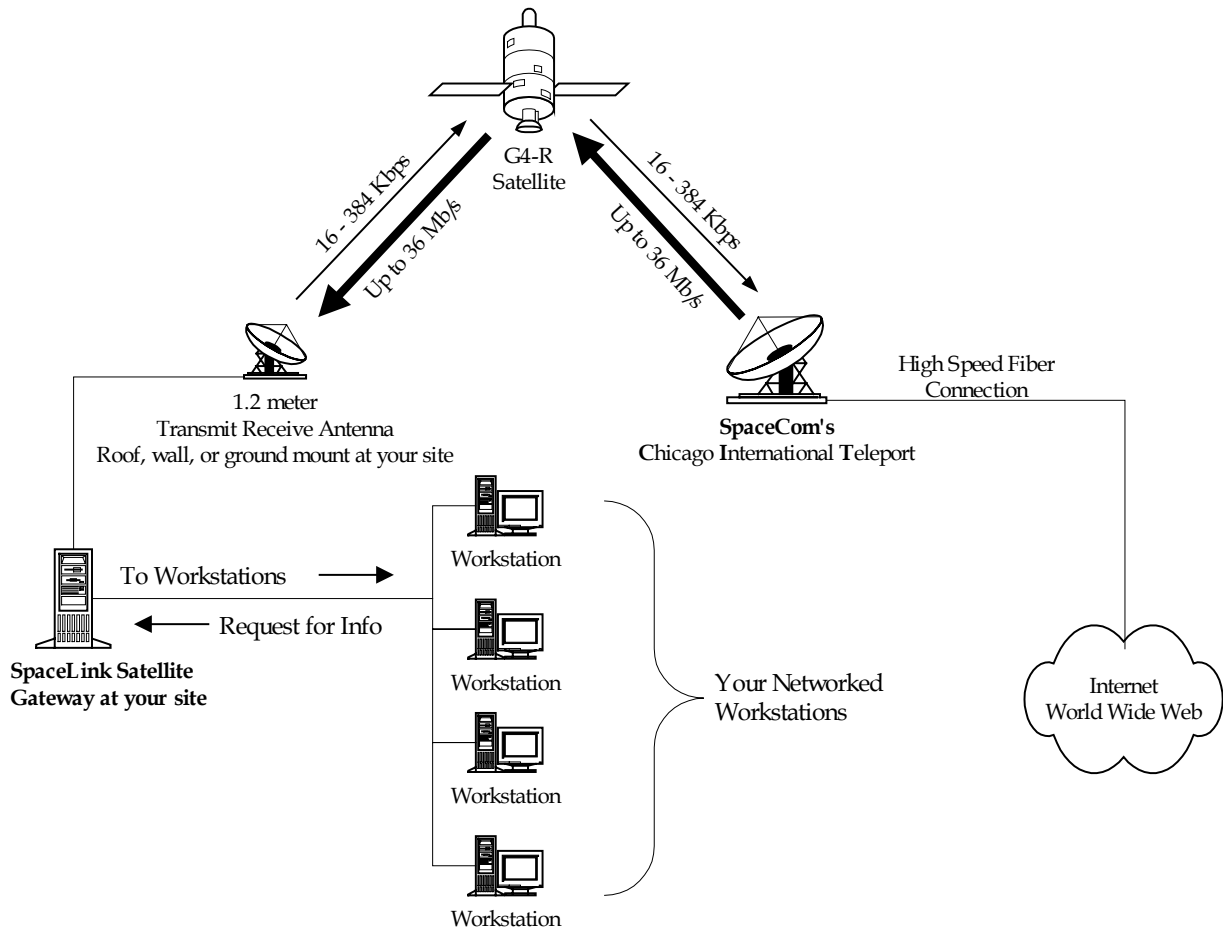
## Purpose of this Document

Welcome!

The purpose of this document is to provide you with essential information you will need to get started with the SpaceLink<sup>®</sup> service. Its scope covers the components of your SpaceLink system as well as installation instructions and troubleshooting tools.

Should you need any assistance call the Chicago Teleport 24 hours a day at 708-534-2400 ext. 1.

# System Overview



# SpaceLink<sup>®</sup> System Components

## **Satellite Antenna**

A satellite antenna is necessary for reception & transmission of data, video, and audio to and from the satellite. To insure optimal performance SpaceCom requires the antenna to be at least 1.2 meters\* in diameter and 2 degree compliant.

Note: SpaceLink<sup>®</sup> uses a Channel Master<sup>®</sup> 123 TX antenna for most sites.

\*Certain areas will require larger antennas for optimal performance. Contact SpaceCom for the specific antenna requirement for your area.

## **Shiron<sup>®</sup> Remote Gateway**

The remote gateway receives a DVB-S signal and transmits an FDMA return link. Its components include a PC based DVB-S receiver, FDMA transmitter, and software.\*

\*An Ethernet hub for distribution to PCs is *not* included.

## **Low Noise Block Downconverters (LNBS)**

The LNB converts the satellite signal into an L-Band signal that is compatible with the Shiron<sup>®</sup> remote gateway.

SpaceCom recommends one of the following types of LNBS:

- Norsat<sup>®</sup> 4508 .8dB Noise figure LNB with +/-500 KHz L.O. stability
- Norsat<sup>®</sup> 4708 .8dB Noise figure LNB with +/-750 KHz L.O. stability

## **Block Upconverter (BUC)**

The BUC converts the L-Band signal from the remote gateway to Ku-Band, and then amplifies the signal.

A typical system with in the Continental United States will require a 1-watt BUC. Contact SpaceCom for specific requirements for your area.

## **Cable Specifications**

The Shiron<sup>®</sup> remote gateway unit requires (2) types of cable to successfully uplink and downlink to the satellite:

## RECEIVE CABLE

RG-6/U, 90% braided shield cable should be used to connect the satellite RF from the LNB into the Shiron® remote gateway. Cable runs over 200 feet are not recommended. If such a run is unavoidable, install a line amplifier (Tru Spec® #LA2150 or equivalent) at the LNB that operates in the 950-1450 MHz range with F-type connectors. The shielded cable lessens signal loss over long distances.

## TRANSMIT CABLE

Times Microwave® LMR-400 with appropriate end connectors (type N), must be utilized between the BUC and the Shiron® remote gateway. Consult SpaceCom for runs over 150 feet. A special line amplifier (VLA) for longer cable lengths can be obtained through SpaceCom Systems.

### ***Receive Line Amplifier***

A line amplifier is used to maintain the received L-Band signal level from the Satellite within operating specifications on cable runs in excess of 200 ft. Outdoor installations require weatherproofing. Verify all line amplifiers operate in the 950-1450 MHz prior to installation. Line amps should be placed first at the LNB and then every 100-150 feet in order to boost the strongest RF signal and least amount of RF noise.

Contact SpaceCom Systems for the recommended line amplifier for your system.

### ***VLA (VSAT Line Amplifier)***

A VLA is used to maintain the transmit L-Band signal level and the 10 MHz reference signal within operating specifications on cable runs in excess of 150 ft. Outdoor installations require weatherproofing of the “N” type connectors. Verify all line amplifiers operate in the 950-1450 MHz prior to installation. Line amps should be placed at the output of the gateway and then every 200 feet in order to maintain the best system performance.

Contact SpaceCom Systems for the recommended quantity of VLA’s for your system.

## Installation Procedures

### ***Site Preparation***

To serve you better, SpaceCom can provide professional installation of the satellite equipment at your chosen location. While the equipment will be capable of providing a broad range of transport capacity, it does necessitate that the end-user provide some room and structure preparation.

We will be shipping a Shiron® remote gateway to be installed into one of your equipment room racks. Adequate aisle space must be provided in order to perform wiring (3’ minimum in front and 2’ minimum to the rear of each equipment rack). Note: the remote gateway unit may be installed on a desktop if a standard equipment rack is not available.

We will also be shipping an antenna to be placed on your roof or other secure location. Ensure antenna location is capable of supporting its own weight plus the weight of up to 500 lbs. of ballast. Additionally, it is necessary to locate the antenna in a place where there is an unobstructed view of the satellite arc.

To avoid confusion, we have provided the following checklist of items:

#### EQUIPMENT ROOM REQUIREMENTS:

Ensure that the room where the equipment will be located provides a clean, dry, well ventilated, secure and construction free environment readied with:

- an ambient temperature range of 50 to 85 degrees Fahrenheit,
- a maximum rate of air temperature change less than fifteen (15) degrees per hour
- relative humidity should be between twenty percent (20%) and fifty percent (50%).
- continuous air cycling
- (5) rack units of vertical rack space in a standard 19 inch equipment rack, and one (1) 110V AC, 10 AMP outlet in the rack

Explanatory notes follow:

Climate control: Continuous air cycling is advantageous. The air handling equipment to maintain the desired temperature/humidity ranges should be designed to keep the equipment free of contaminants and particle matter. Avoid the presence of fibrous material and gaseous elements in the equipment room.

Electrostatic discharge: It is desirable that no carpeting be allowed in front or behind the equipment rack containing the remote gateway. This will help prevent the build-up of electrostatic discharge into the equipment when walking across the floor and touching the equipment.

AC Outlet: Provide a standard 110V AC outlet in the rack that installers can use to power the remote gateway unit.

#### ROOF REQUIREMENTS:

Ensure that the place where the antenna will be located provides a clean, flat, secure and construction free environment readied with:

- easily assessable point-of-entry for two (2) coaxial cables, or similar location that installer can create a point-of-entry,
- secure access to the antenna from unauthorized personnel
- a surface, for the antenna, capable of supporting up to 700 pounds displaced over an approximate 4' x 4' area,
- one (1) 110V AC, 10 AMP outlet near the roof to be used temporarily during the installation process
- unobstructed view to the south

Explanatory notes follow:

Coaxial cable entrance: Provide a clear path or empty conduit run [two (2) inch minimum diameter] from the point-of-entry to the base of the antenna. If a conduit is needed and it exceeds 100 feet', provide a pull box every 50' or for every set of two (2) 90-degree bends. Pull ropes must be in any new conduit, regardless of conduit length.

Rooftop security: Due to the potential for the remote gateway antenna to create harmful non-ionizing radio frequency (RF) radiation to humans, antenna must be placed in a controlled area whereby restricting human access to the physical air space between the antenna reflector and the output of the RF amplifier.

Roof support: The antenna mounting structure is a 4' x 4'' frame. Sand bags, concrete bags, cement blocks, etc. will be used to provide ballast. The ballast will be distributed over the frame.

Power outlet: A spectrum analyzer and satellite receiver will require (1) 110V AC power source to be used temporarily during the antenna alignment process.

Antenna location: The antenna must have a clear line of sight to the south. There should not be any trees, buildings or other types of obstruction that could interfere in the antenna's ability to receive the satellite signal.

### ***SpaceLink® System Setup***

Step 1. Verify all necessary components are on site. See page 5.

Step 2. Assemble and anchor the antenna per Channel Master's instructions.

Step 3. Install the remote gateway in the equipment rack or on the desk top. **Do not connect the BUC or LNB to the remote gateway until the alignment procedure is completed.**

Step 4. Connect the RG-6 cable, with F-type connectors, to the LNB.

Step 5. Align the antenna. Connect the output from the LNB to your spectrum analyzer or DVB satellite receiver using the receive cable.

The SpaceLink® signal is currently on the Galaxy IVR satellite located at 99 degrees west. You will need to know the satellite coordinates (azimuth, elevation, and polarity) for your specific downlink in order to complete the alignment procedure. SpaceCom has provided a useful utility for calculating coordinates on the SpaceCom website at [www.spacecom.com](http://www.spacecom.com). There are two separate versions of the utility for calculating alignment coordinates:

*Version 1* of the utility is for customers who already have the longitude and latitude coordinates for their site and need the azimuth, elevation and polarity coordinates for locating Galaxy IVR. You will need to select horizontal for polarity. The utility will provide all 3 measurements (azimuth, elevation, and polarity) for Galaxy IVR.

*Version 2* of the utility is for customers who DO NOT know their longitude and latitude coordinates for their site and need the azimuth, elevation, and polarity coordinates for locating Galaxy IVR. The utility will provide all 3 measurements (azimuth, elevation, and polarity) for Galaxy IVR. However, it will be necessary to add 90 degrees to the polarity calculation if the number is less than zero and subtract 90 degrees from the polarity calculation if the number is greater than zero. (The utility uses downlink polarization and the 90 degree correction is for uplink polarity).

Once you obtain the coordinates for locating Galaxy IVR proceed with the aligning the 3 axes (azimuth, elevation, and polarity) on the satellite antenna:

Azimuth and elevation: Use a spectrum analyzer to peak the antenna on either the SpaceLink<sup>®</sup> carrier or to a HITS (Headend In The Sky) digital video carrier. Or use a commercial DVB type receiver to peak the antenna on a HITS carrier. Frequencies for locating the SpaceLink<sup>®</sup> signal on Galaxy IVR (99 degrees) are as follows:

<u>Service</u>	<u>Transponder</u>	<u>Polarity</u>	<u>L-band Modulation Center Freq</u>
<i>SpaceLink</i>	<i>24 H</i>	<i>Horizontal</i>	<i>1428</i>
<i>HITS</i>	<i>22 H</i>	<i>Horizontal</i>	<i>1390.0</i>

Polarity: Make the appropriate polarity setting with the feedhorn assembly and proceed with the next step.

Step 6. Connect the Times Microwave<sup>®</sup> cable from the BUC to the Shiron<sup>®</sup> remote gateway unit. Times Microwave<sup>®</sup> cable, LMR-400, with appropriate end connectors, must be utilized between the BUC and the Shiron<sup>®</sup> remote gateway. Consult SpaceCom for instructions for installing the end connectors.

Step 7. Call the Chicago Teleport Hub at 708-534-2400 ext. 1 and inform them that you are activating your Gateway and need to perform a cross poll procedure. You will need to provide the IP address and the Shiron<sup>®</sup> remote gateway ID number. This information is found on the side or front of the remote gateway. Keep this information for future reference.

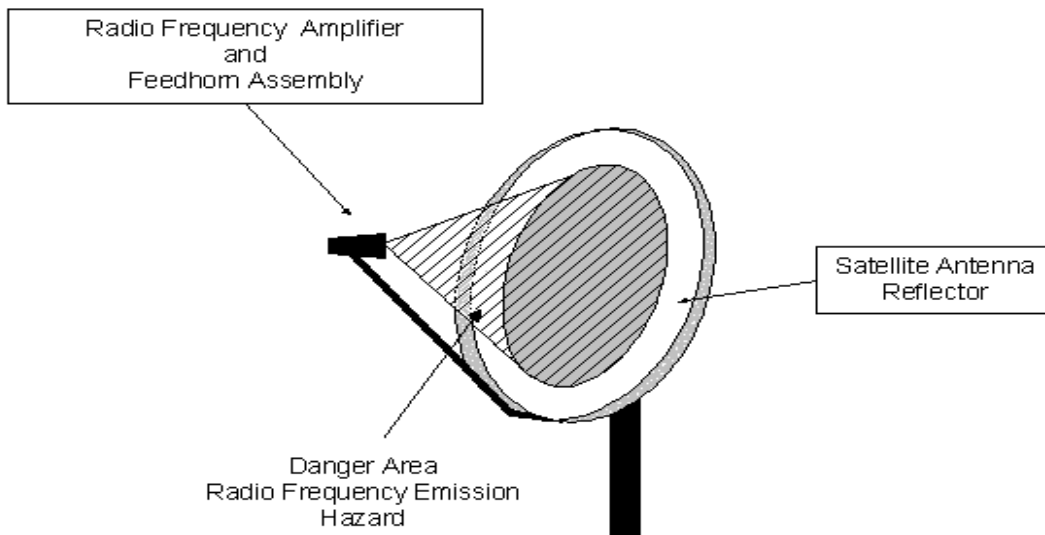
**Note: SpaceCom requires each SpaceLink<sup>®</sup> downlink to perform the cross poll verification procedure\* with the Chicago Teleport Hub and the satellite provider after the alignment process is completed. There are no exceptions.**

\*A spectrum analyzer is necessary to effectively perform this procedure.

## Safety

Due to the potential for satellite transmissions from a remote gateway to create harmful non-ionization radio frequency radiation to humans, the end user accepts sole responsibility for placement of antenna into a controlled area. Human access to the physical air space between the antenna reflector and the output of the RF amplifiers should be restricted.

A depiction of this harmful area is provided below.



Examples of this restricted area include but are not limited to a minimum of a six (6) foot barrier around such antenna or limited access on the roof of a building. In addition customer should comply with FCC satellite transmission procedures including the responsibility for posting suitable RF warnings signs at the antenna site.

## Troubleshooting

In the event you experience Internet connectivity problems, check the following conditions then contact SpaceCom for further assistance.

### ***Ping Test***

You can open a DOS window and type the following “ping -t 63.161.90.1” and press enter. This routine will ping the router at the NOC to test whether the remote gateway is transmitting. The unit should be able to ping successfully to the hub at the Chicago Teleport. Please contact the Chicago teleport for any assistance. Important Note: do not leave this test running upon completion of the troubleshooting.

### ***Verify cable connections***

Verify that both transmit and receive cables are firmly connected to the remote gateway as well as the BUC and LNB.

### ***Confirming the Configuration settings***

The Shiron<sup>®</sup> remote gateway has been shipped to you pre-configured and ready for installation. In the event that you begin to experience problems with Internet connectivity, you should verify the configuration parameters with SpaceCom Systems.

You will need the following information (located on the left side of the remote gateway) before you proceed:

RNMA ID Number

Host Name/ Remote Gateway Name

Transmit IP Address and transmit subnet range

Remote Gateway LAN IP address and subnet IP Address Range (dependent upon the number of IP addresses needed to be connected to the remote gateway, IP address is 2<sup>nd</sup> address in the subnet)

Primary DNS server IP Address

The secondary DNS server IP Address (if applicable)

MAC Address

## Contacting SpaceCom

Should you need to contact SpaceCom Systems for technical support, assistance with identifying the IP addresses for your system, or to notify us that you are activating your Gateway, contact the Chicago International Teleport (NOC):

**(708) 534-2400.**

The NOC is staffed 24 hours a day 7 days a week.

Please have the necessary information available located on the side or front of the remote gateway.

## SpaceLink<sup>®</sup> Technical Specifications

### **System**

Network Type:	Two Way, One-Way, Interactive, Star Topology
Data Transmit Protocols:	TCP/IP, UDP/IP and Multicast
RF Range:	Ku-Band
IP Application Support:	All IP Applications

*FORWARD LINK (Outbound)*

Transmitted Signal: Standard DVB-S/MPEG-2, Broadcast  
Access: TDM  
Broadband Data Rate: 1.5 to 45 Ms/s, up to 72 Mb/s for code rate 7/8,  
up to 62.2 Mb/s for code rate 3/4 up to 41.5 Mb/s  
for code rate 1/2

*RETURN LINK (Inbound)*

Transmitted Signal: FDMA, IP Protocol  
Access: DAMA & Bandwidth On Demand  
Data Rate: 16 kb/s to 384 kb/s in 16 Kb/s increments  
Operating System: Windows NT

**Hub**

*IP ENCAPSULATOR*

Input Interface: Ethernet 10/100BaseT (Auto-detect)  
Transmission Protocol: DVB-S/MPEG-2, Broadcast

*MODULATOR*

Modulation: QPSK (as per DVB-S)  
Coding: RS (204, 188) and Convolutional (as per DVB-S)

*RECEIVER*

If Range: 950-1525 MHz  
Access: FDMA  
Modulation: QPSK (SQRT Raised Cosine alpha=0.35)  
Decoding: Convolutional Code 3/4 Viterbi Decoding  
Channel rate: 16-256 Ks/s  
Information Rate: 16-384 Kb/s  
Input L-Band Signal Level: -65 to -35 dBm  
Max Composite: 0 dBm or +47 dBc  
AC Power: 95 to 260VAC, 50/60 Hz  
Mechanical Installation: 19" Racks

**Remote Gateway**

*INDOOR UNIT*

Ac Power: 95-260 VAC, 50/60 Hz, 150 Watts  
LAN Interface: Ethernet (IEEE 802.3)  
Operating System: Windows NT  
L-Band Input Connector: F-Connector, 75 Ohm  
L-Band Output Connector: N-type, 50 Ohm  
Dimensions: 19" x 17.4" x 7" (W x D x H)

*TRANSMITTER*

IF Range:	L-band (950-1525 MHz)
Access:	FDMA, DAMA & Bandwidth On Demand
Modulation:	QPSK (SQRT Raised Cosine, alpha=0.35
Coding:	Convolutional, $\frac{3}{4}$
Channel Rate:	16-256 Ks/s
Information Rate:	16-384 Kb/s in 16 kb/s Increment
Signal Level:	-35 to -3 dBm
Data Interface Input/Output:	Ethernet, 10/100BaseT, Auto detect

**RECEIVER**

Data Throughput per Terminal:	15 Mb/s
IF Range:	L-band (950-2150 MHz) Access DVB-S
Modulation:	QPSK (as per DVB-S)
Signal Level:	-65 to -35 dBm

**OUTDOOR UNIT**

RF Frequency Band:	Ku-Band
Transmit Level:	Ku-Band: $\frac{1}{2}$ , 1, or 2 Watt (Higher Power Available)
Receiver:	Low Cost Standard TVRO LNB
Power Supply:	24 VDC, Supplied via RF cable
Frequency Reference:	10 MHz, Supplied via RF cable

**Environmental Conditions (Hub & Remote Units)**

**INDOOR UNIT**

Operating Temperature:	<b>32 TO 104 F</b>
Storage Temperature:	-13 to 185 F
Humidity:	5% to 95% Non-Condensing
Altitude:	Up to 10,000 Feet

**OUTDOOR UNIT**

Operating Temperature	-40 to 122 F
Storage Temperature:	-40 to 158 F
Relative Humidity	Up to 100%
Altitude:	Up to 10,000 Feet

## Limited Warranty

SpaceCom will provide all necessary gateway equipment and software. Hardware obtained from vendors other than SpaceCom should have written approval prior to installation/use into the SpaceLink® system. Customer shall bear the risk and liabilities associated with the use of non-compliant remote gateway equipment and software.

The Warranty Period for all Gateway Equipment supplied by SpaceCom shall be the period of the original manufacturer's warranty which manufacturer's warranty shall pass-through on the date the applicable equipment is delivered to the carrier for delivery to the Customer. Copies of such warranties are available upon Customer's purchase of the equipment or upon Customer's request from SpaceCom for prior review. Any requirements of the applicable manufacturer's warranty are Customer's obligation. This warranty applies to the Shiron® remote gateway unit, LNB, and BUC.

THE LIMITED WARRANTY, DESCRIBED ABOVE, IS THE ONLY WARRANTY MADE ON THE GATEWAY EQUIPMENT. SPACECOM EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. SPACECOM DISCLAIMS ANY WARRANTIES TO CUSTOMER'S END USERS OR OTHER THIRD PARTIES.

Limitation of Liability. SPACECOM SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL OR EXEMPLARY DAMAGES SUFFERED BY CUSTOMER AND/OR ANY END USER, RELATED TO OR ARISING OUT OF THIS AGREEMENT, THE TRANSACTIONS CONTEMPLATED HEREBY, THE USE OR INABILITY TO USE THE GATEWAY EQUIPMENT, INTEGRATION OF THE GATEWAY EQUIPMENT WITH EQUIPMENT NOT PROVIDED BY SPACECOM, AND/OR LOSS OF GOODWILL OR PROFITS, EVEN IF SPACECOM HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BOTH PARTIES AGREE THAT THE PRICE OF THE GATEWAY EQUIPMENT REFLECTS THE ALLOCATION OF RISK, WARRANTY AND LIMITATION OF LIABILITY PROVISIONS HEREIN.

Channel Master<sup>®</sup> equipment is warranted to be free from defects in material and workmanship under normal use and service. CHANNEL MASTER shall replace defective equipment, at no charge, or at its option, refund the purchase price, if the equipment is returned to CHANNEL MASTER not more than twelve (12) months after shipment.\* Removal or reinstallation of equipment and its transportation shall not be the cost of CHANNEL MASTER except CHANNEL MASTER shall return repaired or replaced equipment freight prepaid. See Limited Twelve (12) Month Warranty page in the Installation and Assembly Manual provided with a CHANNEL MASTER antenna.

## Statement of Compliance

Standards Compliance: FCC, CE, UL

Standards Conform: DVB-S, IESS-308, ETSI TBR 28