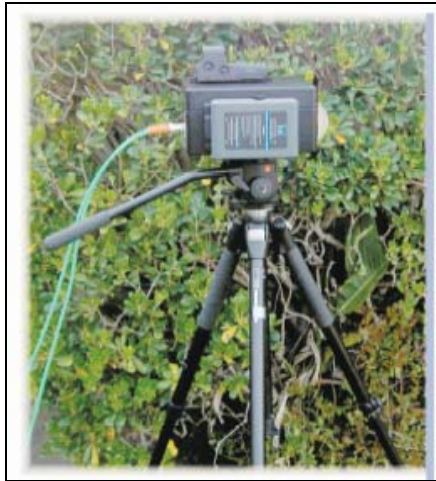


Gigalink HDTV-Link Model 6292-2 Field Installation and Service Manual



THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS. (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRABLE OPERATION.

IF THIS PRODUCT IS SUSPECTED OF CAUSING HARMFUL INTERFERENCE WITH OTHER EQUIPMENT, DISCONTINUE OPERATION IMMEDIATELY AND CONTACT HXI, LLC.



Radiation Exposure Warning

A minimum separation of 34cm (13.5") must be maintained between Transmitter module antenna and any individual to reduce the risk of RF radiation exposure above permissible limits.

THE OPERATOR OF THIS RADIO EQUIPMENT MUST ENSURE THAT THE ANTENNA IS LOCATED OR POINTED SUCH THAT IT DOES NOT EMIT AN RF FIELD IN EXCESS OF FCC LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE).

A MINIMUM SEPARATION OF 34cm (13.5") MUST BE MAINTAINED BETWEEN INDIVIDUALS AND THE TRANSMITTER MODULE ANTENNA.

FCC ID: O2700002-30-30

Gigalink HDTV-Link Model 6292-2 Field Operation and Service Manual

June 2009
Document Number: 6932 Rev. B
Revision: B

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Federal Communications Commission (FCC) Compliance Statement

This equipment is designed to comply with the limits for a Class A digital device, pursuant to Title 47, Volume 1, Part 15.255 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the field installation and service manual, could cause interference with radio communications. Furthermore, any changes or modifications to this equipment without the expressed approval of HXI, LLC are strictly prohibited and would void the user's authority to operate the equipment. Operation is subject to the following two conditions; 1. This device may not cause harmful interference and 2. This device must accept any interference received, including interference that may cause undesired operation. If this product is suspected of causing harmful interference with other equipment, discontinue operation immediately and contact HXI.

The information in this document is subject to change without notice. Although every effort has been made to make this field installation and service manual accurate and complete, HXI, LLC assumes no responsibility for any errors that may appear in this document.

HXI, LLC
22 Parkridge Road
Haverhill, MA 01835
(978) 521-7300

Safety Information



WARNING – Service of this equipment is only permitted by factory-authorized personnel who follow approved servicing procedures.



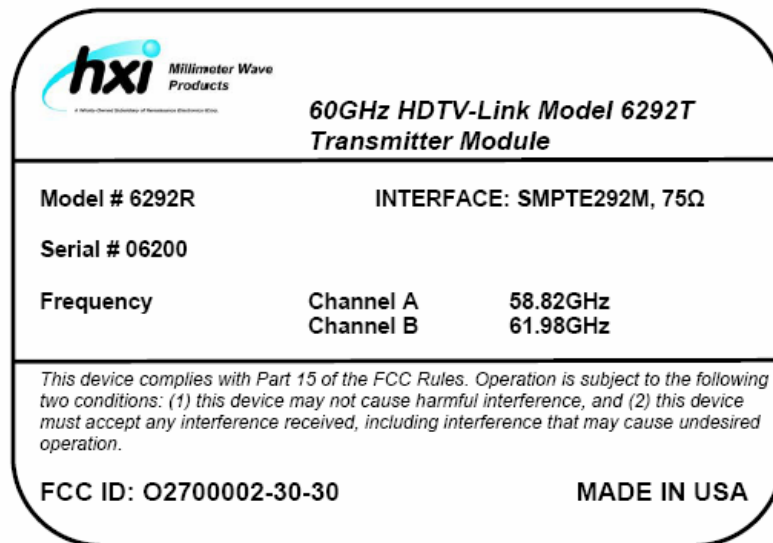
CAUTION – The use of controls or the performance of adjustments or procedures other than those specified herein are a violation of federal law and may result in hazardous radiation exposure.



RESTRICTION – The HXI Model 6292-2 HDTV-Link System is authorized for outdoor use only. Transmitting from inside a building is prohibited under FCC Part 15.255 (i)

Regulatory Compliance

Each Gigalink Model 6292 HDTV-Link terminal displays a label attesting to FCC Part 15.255 compliance. The terminal labels must be conspicuously visible during system operation. Removal of the terminal labels is prohibited by federal law.



Terminal Regulatory Compliance Label

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1. Introduction

1.1 Purpose

The purpose of this document is to present guidance for the operation, and maintenance of the HXI® Gigalink™ HDTV-Link 6292 system, a high-performance, millimeter wave (MMW) production HDTV Video transport system. The Gigalink HDTV-Link model 6292-2 supports (2) Independent channels of SMPTE-292M providing error free transport at short to medium ranges. This system is designed specifically for portable HDTV production video applications.

This document presents an overview of the Gigalink HDTV-Link Model 6292-2 and its components and includes discussions of system requirements; installation and assembly; alignment; routine maintenance; and troubleshooting. Information relevant to safety is also provided. It is **strongly** recommended that users read this manual in its entirety prior to installation.

1.2 Organization

This field installation and service manual is organized into chapters as follows.

- **Chapter 1, Introduction.** Summarizes the purpose and organization of the document.
- **Chapter 2, System Overview.** Describes system components.
- **Chapter 3, Pre-Deployment Planning.** Outlines planning activities to be completed prior to use, including selecting equipment locations, interface planning design, and terminal alignment.
- **Chapter 4, Setup and Operation.** Provides step-by-step procedures for equipment pointing, power up, and link alignment.
- **Chapter 5, Troubleshooting and Repair.** Provides troubleshooting guidelines.

1.3 Operational Assumptions

This manual has been prepared to permit technicians who have no prior experience with MMW radio equipment to deploy, align, operate, troubleshoot, and maintain Gigalink HDTV-Link system. It is assumed that individuals using this manual are knowledgeable and experienced in the following areas:

- Operation of point to point of wireless systems requiring unobstructed Line of Sight
- HDTV production video equipment, specifically the SMPTE292M protocol and associated 75ohm interfaces
- Basic problem-isolation and troubleshooting skills

1.4 Job Site Safety

Operation of the Gigalink HDTV-Link system may require activities, such operation from elevated locations, which, if done improperly, could pose a safety hazard to the operator. The operator is responsible for compliance with all applicable laws, regulations, and safety practices. Furthermore, in general, employers are responsible for the safety of their employees and must comply with all applicable worker safety regulations, including the need to provide training and personal protective equipment.

1.5 Revisions

Changes to this manual may be made from time to time. When this occurs, these changes will be issued as errata and posted on the HXI support site (www.HXI.com). Customers are advised to check the Web site periodically and prior to installation for applicable errata.

1.6 Technical Assistance

HXI, LLC maintains a technical support staff to answer questions and provide guidance regarding installation and service.

Before calling for support, locate and record the specific model number and four-digit serial number located on the terminal label. Providing this information with the initial contact will help facilitate responsive support.

For calls from the United States and Canada, and international calls the number is 1-(978) 521-7304

On line support is also available at www.hxi.com

2. System Overview

2.1 General Description

The Gigalink HDTV-Link Model 6292 wireless HDTV-Link system operates in the FCC Part 15.255 unlicensed allocation in the frequency range of 57.05 to 64.0 GHz. No Federal Communications Commission (FCC) license or special authorization is required to operate Gigalink systems.

Note: Under no circumstances should the protective covers of the Gigalink transceiver be removed. Any non-authorized removal of the covers or any attempts to change this equipment are strictly prohibited and will void the Gigalink warranty as well as the user's authorization to operate this equipment.

To establish a working link, one Model 6292 transmitter module and one Model 6292 receiver module must be deployed together. Each Gigalink terminal is 12VDC powered, with power provided via XLR4 interface from customer supply or via an optional V-Mounted onboard battery. Gigalink HDTV-Link model 6292-2 Transmitter and receiver terminals are shown in Figure 2-1. System specifications are detailed in Table 2-1

Figure 2-1: HDTV-Link Model 6292



HDTV-Link Model 6292T Transmitter



HDTV-Link Model 6292R Receiver

Note: Figure 2-1 Graphic shows transmit and receive terminals equipped with optional V-Mount battery and alignment sight.

Table 2-1: System Specifications

| RF Parameters | Specification |
|------------------------------------|---|
| Frequency of Operation | FCC Part 15.255, unlicensed 57-64GHz |
| TX Channel Carrier Frequency | Channel A = 58.82GHz, Channel B = 61.98GHz |
| Occupied Spectrum/Channel | 1,700MHz Max. |
| TX Power (each Channel) | 4mW (+6dBm) antenna injection |
| Antenna Gain | +32dBi minimum TX and RX |
| Antenna Beam width (@-3dB) | 5° TX and RX both azimuth and elevation |
| Operating Range (moderate rain) | 10 to 500 meters |
| Interface Parameters | Specification |
| Data Throughput (each Channel) | Full line rate SMPTE292M, SMPTE372M, 4.4.2, 4 protocols |
| Payload Interface (each channel) | SMPTE292M (1.48Gbps) BNC 75Ω |
| Power requirements | Specification |
| DC Power Interface | XLR4 type power connector |
| DC input voltage range | 12 VDC nominal (9.5 VDC to 15 VDC) |
| DC power consumption | Transmitter = 15W, Receiver = 18W |
| Maximum current load | Transmitter = 1.2A, Receiver = 1.5A |
| Mechanical | Specification |
| Transceiver weight | 11lbs (5Kg) |
| Transceiver dimensions (H x W x D) | 9.5"L x 9.5"W x 4.75"H (240mm x 240mm x 120mm) |
| Environmental | Parameter |
| Operating Temperature | 32° F to 122° F (0° C to 60° C) |
| Storage Temperature | -22° F to 185° F (-30° C to 85° C) |
| Humidity | up to 95%, non-condensing |
| Enclosure Rating | IPC67, NEMA |

2.2 Gigalink HDTV-Link Model 6292 Components

Each Gigalink HDTV-Link Model 6292 kit includes transmitter and receiver modules, a user's manual and comes ready for deployment (see Figure 2-1). These components are described in detail in the subsections that follow. The primary components of the Gigalink include:

- Gigalink Transmitter module #6292T
- Gigalink Receiver module #6292R
- HDTV-Link Model 6292 User's Guide document # 6932

2.3 Gigalink HDTV-Link Model 6292 System Architecture

Each full Gigalink HDTV-Link Model 6292 System consists of (1) transmitter and (1) receiver module that must be aligned with each other during operation to maintain maximum signal strength for error-free wireless connectivity. The receiver module is equipped with a receive level Bar Graph indicator to simplify terminal alignment

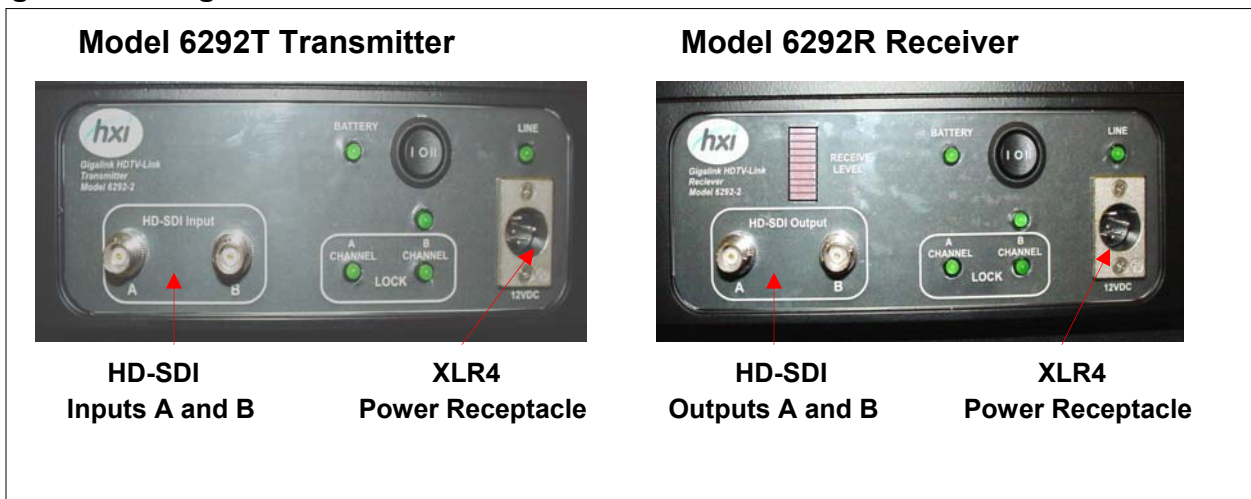
Each Model 6292 system (link) is shipped as a matched transmitter/receiver pair. Each link is 100% operationally tested with operating parameters recorded and kept on file at the HXI manufacturing facility. Terminal pairing is accomplished through a simple serial number format with the transmitter module identified by an even 4-digit serial number with the next, higher, odd, number in sequence to identify its paired receiver module.

2.4 Maintaining Terminal Pairing

Because each system is tested and shipped as a “Link”, the original terminal pairing must be preserved to establish and maintain traceability back to the original production acceptance test results and recorded performance data. While pairing any Model 6292 transmitter with any model 6292 receiver will result in an operational link such mixing of pairs will leave the link operation unsupported by HXI technical support from lack of reference data.

All malfunctioning or defective systems should be replaced as links not as individual modules. If a system is believed to be defective HXI Technical support should be contacted for assistance and if necessary an RMA# for return/replacement of the defective equipment.

Figure 2-3: Gigalink HDTV-Link Model 6292 Interfaces



3. Pre-operational Planning

3.1 Pre-deployment Survey

It is recommended that users perform an onsite survey and complete pre-installation planning prior to actual operation of the Gigalink HDTV system. Pre-operational planning tasks include:

- Selecting appropriate locations for all equipment based on the location criteria (see Section 3.1)
- Identifying and locating (as necessary) a suitable mounting structure (i.e. tripod) for each terminal
- Locate necessary services (e.g., power source and cabling) that will be required prior to the operation
- Obtaining any necessary permissions and verify regulatory and safety compliance.
- Verifying the type and configuration of any equipment to be used with the Gigalink HDTV-Link system
- Determining the best terminal locations to provide unobstructed “Line of Sight” and minimum separation of personnel from the transmit module antenna.
- Identifying additional tools and equipment, if any, that will be needed to support equipment installation

It is also recommended that installers prepare sketches that show where all system components will be located and how cables will be routed between components.

Pre-deployment planning is essential to avoid unanticipated problems and failures in system operation during actual operation.



Radiation Exposure Warning

A minimum separation of 34cm (13.5”) must be maintained between Transmitter module antenna and any individual to reduce the risk of RF radiation exposure above permissible limits.

3.2 Location Criteria

Considerations for locating the Gigalink HDTV system include the following:

- **Line of Sight.** The location of the transceiver must have an unobstructed line of sight to the opposite end of the link. Potential obstructions include but are not limited to the following:
 - **Onsite Obstructions.** The transmitter and receiver modules should be sufficiently high and at a location such that the line of sight will not be compromised by conditions or activities beyond the control of the operator. At a minimum, the line of sight should clear the edge of any vertical and horizontal obstructions or areas occupied by people by no less than 8'. Possible obstructions include Foliage, Vehicles, or personnel moving through the RF Path.
 - **Obstructions across the RF Link.** The line of sight across the RF Path must clear all intervening obstacles. Any even a partial blockage of the RF signal may render the wireless link inoperable.
- **Mounting Surface.** Each Gigalink Model 6292 transmitter and receiver terminal are designed to be mounted to a standard tripod system. The tripods used must be sturdy enough to support the weight of each terminal and stable enough to prevent terminal movement during normal operation.
- **Environmental Conditions.** The Gigalink Model 6292 terminals are weatherproof but not watertight. The terminals must be located away from standing water, severe rain splash, or snow buildup.
- **Regulatory Compliance and Permissions.** The selected transceiver location must comply with all applicable regulatory and zoning requirements as well as rules and restrictions imposed by the location owner or manager.

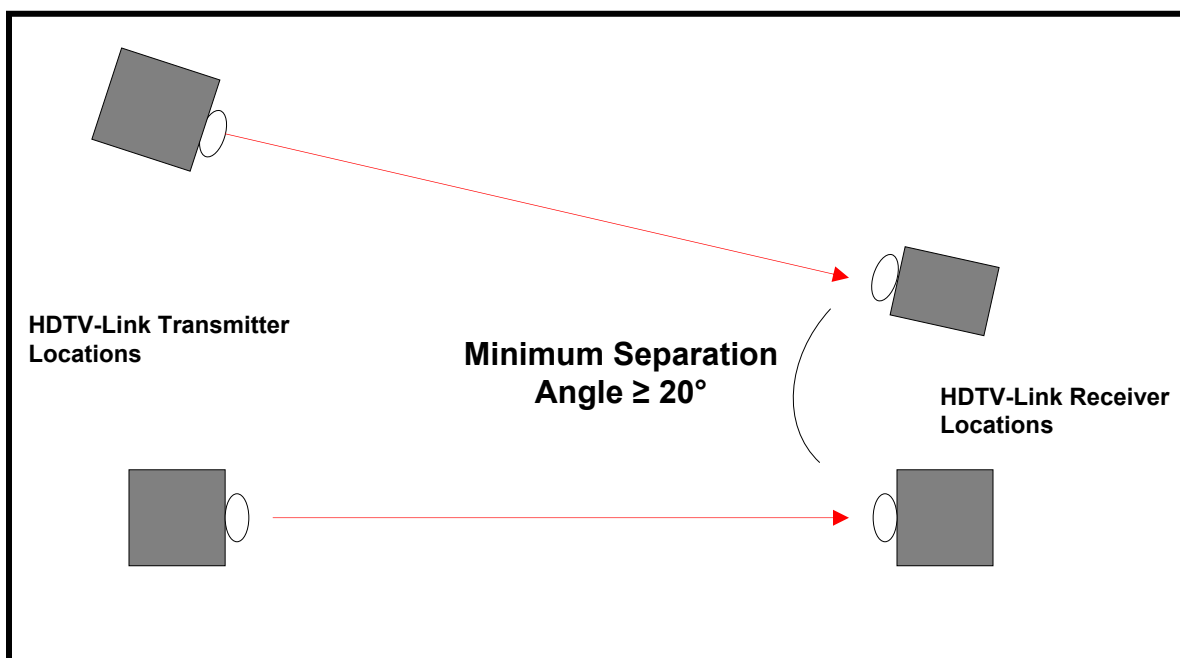
| |
|---|
| <p>Note: The user is responsible for identifying and complying with all applicable regulatory, zoning, or other restrictions and obtaining the necessary permissions from the appropriate authorities and facility management prior to installation.</p> |
|---|

3.3 Interference Planning for Co-located Links

When more than (1) Gigalink HDTV-Link are deployed in the same general area, care must be taken to prevent RF interference between links. It is especially important to provide adequate physical or angular separation of the received signal paths at the receiver terminal locations.

Figure 3.1 provides a guide of how to configure receive terminal locations to avoid RF interference between co-located links.

Figure 3.1 Locating HDTV-Link terminals for Interference mitigation



4. Setup and Operation

4.1 Deploying the Transmitter and Receiver

The HDTV-Link transmitter terminal should be deployed near the associated video production equipment (Camera) and the HDTV-Link receiver located near the Video editing facility.

Both Terminals should be attached to suitable mounts or tripods based on earlier survey instructions and aligned with the antennas facing in the direction of the opposing terminal. Rough terminal alignment can be accomplished by sighting along the screws located on the top of the terminal housing or by using the optional alignment scope.

4.2 Applying terminal power

Before applying power to the Gigalink HDTV-Link terminal, make sure the terminal power switch is in the center “off” position.

12VDC terminal power is applied to the standard XLR4 Power connector receptacle located on the right back-side of the terminal housing. The power cable should be inserted until the locking tab engages. When power is present at the XLR4 connector receptacle, the Red Line Power LED will light.

With power present to the HDTV-Link Terminal, the terminal power switch can be toggled to the right to power the terminal on. When terminal power is on, the center red LED will illuminate.

4.3 Power Indicators

Each Gigalink HDTV-Link terminal is equipped with (3) power indicators, one for line power, one for terminal power and one for optional On-Board battery power.

Figure 4.1 Power Indicators



4.4 Terminal Alignment

In order to establish a reliable RF link, both HDTV-Link transmitter and receiver terminals must be precisely aligned. The HDTV-Link receiver terminal is equipped a Bar Graph display to confirm terminal alignment and signal strength.

With both transmitter and receiver terminals powered on, slowly adjust alignment both vertically and horizontally until the receiver Signal Bar Graph display reaches the highest level. It is recommended that two operators work together by incrementally adjusting each side until the maximum receive level is achieved.

The use of 2-way radios or cell phones will make this task easier. Figure 4.2 shows the operation of the Receive level Bar Graph Indicator.

Figure 4.2 Receive Level Indicator



Low Indicated Receive level



High Indicated Receive Level

4.5 Connecting Video Services

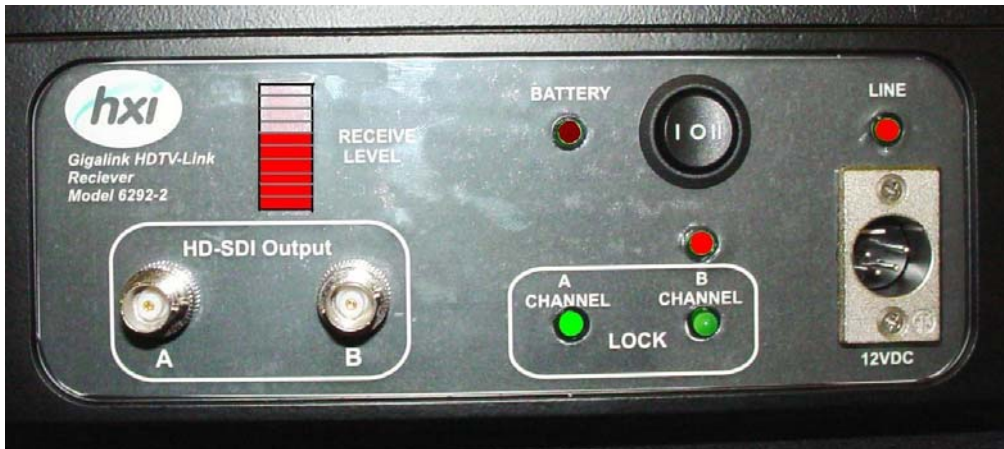
The Gigalink HDTV-Link Model 6292 is equipped to transport (2) independent feeds of SMPTE292M composite Video/audio. Channels A and B can be operated independently or together as necessary with no degradation to signal quality.

Two BNC connectors interface with the Video feed cable (Transmitter) or supply the Video feed cable on the receiver side. All interfaces comply with the SMPTE 75Ω Coaxial cable standard for maximum cable length if Belden Type 1694A cable is used.

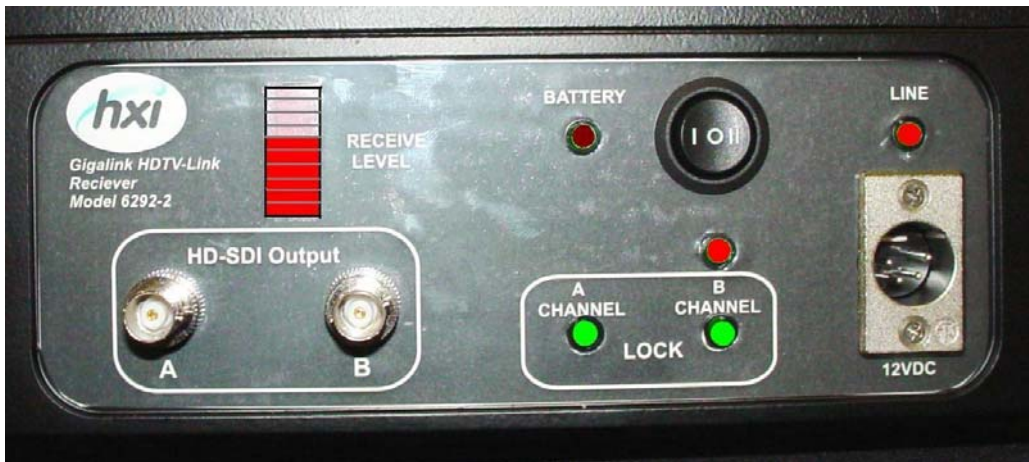
4.6 Video Activity Indicators

Both the Transmitter and receiver Module are equipped with Video Activity Indicators to show active interfaces. Active interfaces are indicated by a lighted LED above the interface connector. Figure 4.3 depicts normal operation of the Video Activity Indicators.

Figure 4.3 Video Activity Indicators



Channel "A" Active, Channel "B" Inactive



Channel "A" and Channel "B" Active