



**FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC
User Guide**

Thank You for Choosing Ross

You've made a great choice. We expect you will be very happy with your purchase of Ross Technology. Our mission is to:

1. Provide a Superior Customer Experience
 - offer the best product quality and support
2. Make Cool Practical Technology
 - develop great products that customers love

Ross has become well known for the Ross Video Code of Ethics. It guides our interactions and empowers our employees. I hope you enjoy reading it below.

If anything at all with your Ross experience does not live up to your expectations be sure to reach out to us at solutions@rossvideo.com.



David Ross
CEO, Ross Video
dross@rossvideo.com

Ross Video Code of Ethics

Any company is the sum total of the people that make things happen. At Ross, our employees are a special group. Our employees truly care about doing a great job and delivering a high quality customer experience every day. This code of ethics hangs on the wall of all Ross Video locations to guide our behavior:

1. We will always act in our customers' best interest.
2. We will do our best to understand our customers' requirements.
3. We will not ship crap.
4. We will be great to work with.
5. We will do something extra for our customers, as an apology, when something big goes wrong and it's our fault.
6. We will keep our promises.
7. We will treat the competition with respect.
8. We will cooperate with and help other friendly companies.
9. We will go above and beyond in times of crisis. *If there's no one to authorize the required action in times of company or customer crisis - do what you know in your heart is right. (You may rent helicopters if necessary.)*

FDR-9647-LC, FDT-9648-LC, FDB-9649-LC

• User Guide

- Ross Part Number: **9647DR-004-05**
- Release Date: June 6, 2018.

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Patents

Patent numbers US 7,034,886; US 7,508,455; US 7,602,446; US 7,802,802 B2; US 7,834,886; US 7,914,332; US 8,307,284; US 8,407,374 B2; US 8,499,019 B2; US 8,519,949 B2; US 8,743,292 B2; GB 2,419,119 B; GB 2,447,380 B; and other patents pending.

Notice

The material in this manual is furnished for informational use only. It is subject to change without notice and should not be construed as commitment by Ross Video Limited. Ross Video Limited assumes no responsibility or liability for errors or inaccuracies that may appear in this manual.

Safety Notices

Refer to the “**Important Regulatory and Safety Notices**” document that accompanied your product.

Statement of Compliance

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed.

Compliance documentation, such as certification or Declaration of Compliance for the product is available upon request by contacting techsupport@rossvideo.com. Please include the product; model number identifiers and serial number and country that compliance information is needed in request.

EMC Notices

United States of America - FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 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 instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Notice — *Changes or modifications to this equipment not expressly approved by Ross Video Ltd. could void the user's authority to operate this equipment.*

Canada

This Class A device complies with Canadian ICES-003 and part 15 of the FCC Rules.

Cet appareil numérique de la classe “A” est conforme à la norme NMB-003 du Canada.

European Union

This equipment is in compliance with the essential requirements and other relevant provisions established under regulation (EC) No 765/2008 and Decision No 768/2008/EC referred to as the “New Legislative Framework”.



Warning — *This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.*

Australia/New Zealand

This equipment is in compliance with the provisions established under the Radiocommunications Act 1992 and Radiocommunications Labelling (Electromagnetic Compatibility) Notice 2008.

Korea

This equipment is in compliance with the provisions established under the Radio Waves Act.

International

This equipment has been tested under the requirements of CISPR 22:2008 or CISPR 32:2015 and found to comply with the limits for a Class A Digital device.

Notice — *This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.*

Maintenance/User Serviceable Parts

Routine maintenance to this GearLite product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed in the section “**Contacting Technical Support**” on page 8. All GearLite products are covered by a generous 3-year warranty and will be repaired without charge for materials or labor within this period. See the section “**Warranty and Repair**” on page 19 for details.

Environmental Information

The equipment may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration. You can also contact Ross Video for more information on the environmental performances of our products.

Company Address

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Website: <http://www.rossvideo.com>

Introduction

This guide covers the installation, configuration, and use of the FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC. The following chapters are included:

- “**Introduction**” summarizes the guide and provides important terms, and conventions.
- “**Before You Begin**” provides an overview of the features of the FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC.
- “**FDR-9647-LC**” provides an overview of the FDR-9647-LC hardware components and features.
- “**FDT-9648-LC**” presents information on the FDT-9648-LC hardware components and features.
- “**FDB-9649-LC**” presents information on the FDB-9649-LC hardware components and features.
- “**Physical Installation**” provides instructions for the basic physical installation of a module into your system.
- “**Warranty and Repair**” provides information on the warranty and repair policy for your FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC.
- “**Technical Specifications**” provides the technical specifications for your FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC.

Documentation Conventions

Special text formats are used in this guide to identify parts of the user interface, text that a user must enter, or a sequence of menus and sub-menus that must be followed to reach a particular command.

Interface Elements

Bold text is used to identify a user interface element such as a dialog box, menu item, or button. For example:

In the **Edit** dialog, click **Apply**.

User Entered Text

Courier text is used to identify text that a user must enter. For example:

In the **Language** box, enter **English**.

Referenced Guides

Italic text is used to identify the titles of referenced guides, manuals, or documents. For example:

For more information, refer to the *DAC-9516 User Manual*.

Menu Sequences

Menu arrows are used in procedures to identify a sequence of menu items that you must follow. For example, if a step reads “**File > Save As**,” you would select the **File** menu and then select **Save As**.

Important Instructions

Star icons are used to identify important instructions or features. For example:

- ★ Contact your IT department before connecting to your facility network to ensure that there are no conflicts. They will provide you with an appropriate value for the IP Address, Subnet Mask, and Gateway for your module.

Contacting Technical Support

At Ross Video, we take pride in the quality of our products, but if problems occur, help is as close as the nearest telephone.

Our 24-hour Hot Line service ensures you have access to technical expertise around the clock. After-sales service and technical support is provided directly by Ross Video personnel. During business hours (Eastern Time), technical support personnel are available by telephone. After hours and on weekends, a direct emergency technical support phone line is available. If the technical support person who is on call does not answer this line immediately, a voice message can be left and the call will be returned shortly. This team of highly trained staff is available to react to any problem and to do whatever is necessary to ensure customer satisfaction.

- **Technical Support:** (+1) 613-652-4886
- **After Hours Emergency:** (+1) 613-349-0006
- **E-mail:** techsupport@rossvideo.com
- **Website:** <http://www.rossvideo.com>

Before You Begin

If you have questions pertaining to the operation of your GearLite module, contact us at the numbers listed in the section **“Contacting Technical Support”** on page 8. Our technical staff is always available for consultation, training, or service.

Overview

The Dual Channel Fiber Receivers/Transmitters are high-quality signal conversion solutions within the family of GearLite compact, self-contained modular products.

A universal power adapter and line cord, suitable for the country of use, is supplied with each module. Various mounting options are included that enable a wide range of installation choices.

There are four connections on each module, the designation of each is dependent on the module you are using.

Features

Each module includes the following standard features:

- Supports major SDI formats up to 1080p 60Hz
- Supports DVB-ASI (EN 50083-9)
- Supports single-mode fiber
- Re-clocking on all outputs at 270Mbps, 1.483Gbps, 1.485Gbps, 2.967Gbps, and 2.970Gbps
- Input status indicator LEDs
- Small brick form factor
- 5V universal adapter with locking DC connector
- 3-year warranty

FDR-9647-LC Features

In addition to the standard features, the FDR-9647-LC also includes:

- Two BNC jacks for SDI outputs
- Two LC/UPC PIN connectors for fiber optic inputs

FDT-9648-LC Features

In addition to the standard features, the FDT-9648-LC also includes:

- Two BNC jacks for SDI inputs
- Two LC/UPC PIN connectors for fiber optic outputs

FDB-9649-LC Features

In addition to the standard features, the FDB-9649-LC also includes:

- One BNC jack for an SDI input
- One BNC jack for an SDI output
- One LC/UPC PIN connector for fiber optic input
- One LC/UPC PIN connector for fiber optic output

FDR-9647-LC

This chapter presents information on the FDR-9647-LC hardware components and features.

Overview

The FDR-9647-LC is a fiber optic receiver to SDI converter capable of equalizing all common serial digital signals. Each channel of the module equalizes the incoming SDI signal. Each channel of the module provides one output each.

The FDR-9647-LC provides the ability to transport digital video baseband signals over a fiber optic link, allowing for longer transport distances. The SDI output is re-clocked providing excellent jitter and return loss specifications.

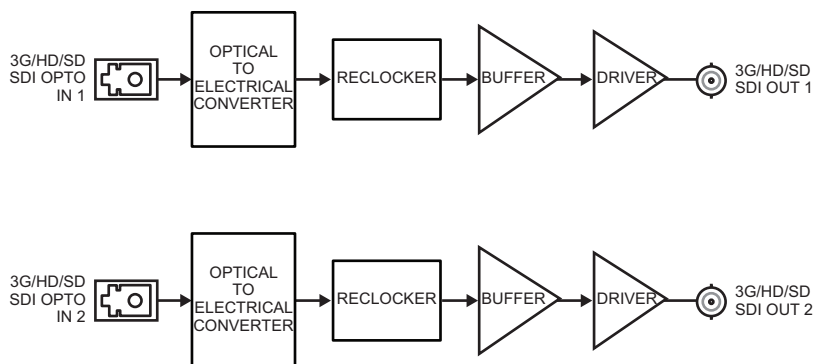


Figure 3.1 Simplified Block Diagram of FDR-9647-LC Functions

Faceplate Overview

The chassis faceplate provides a silk-screen map of the connections available. **Figure 3.2** illustrates the FDR-9647-LC faceplate label.

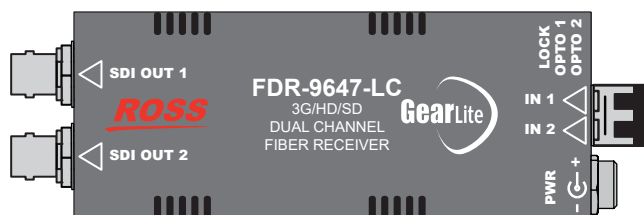


Figure 3.2 FDR-9647-LC — Faceplate Label

POWER Connection

The FDR-9647-LC includes a standard miniature power jack (center pin positive) that connects to the PS-9000 power supply. (Figure 3.3)

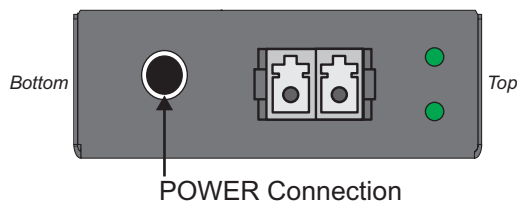


Figure 3.3 FDR-9647-LC (Right Side) — PWR Connection

Fiber Optic Inputs

The FDR-9647-LC provides two fiber optic inputs. (**Figure 3.4**)

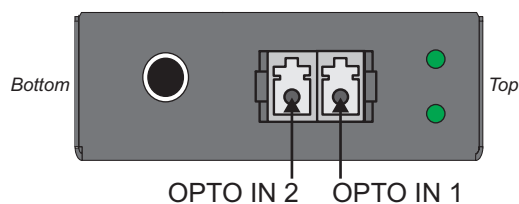


Figure 3.4 FDR-9647-LC (Right) — Fiber Optic Inputs

OPTO Status LEDs

The FDR-9647-LC includes two LEDs that display the status of the fiber optic input signal activity. These LEDs are located near the fiber optic connectors. (**Figure 3.5**)

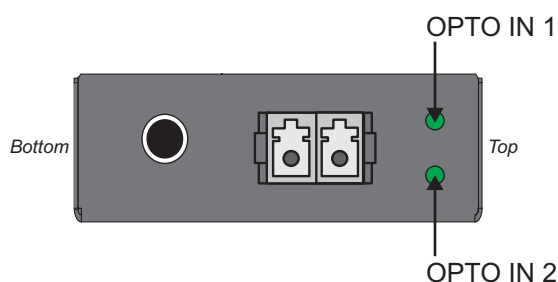


Figure 3.5 FDR-9647-LC (Right) — Fiber Optic Status LEDs

Table 3.1 describes the behavior of the OPTO 1 and OPTO 2 LEDs.

Table 3.1 OPTO 1 and OPTO 2 LEDs

Status	Description
OPTO 1	
Green	When lit green, this LED indicates a valid video signal on the OPTO IN 1 port
Red	When lit red, this LED indicates an invalid video signal on the OPTO IN 1 port
OPTO 2	
Green	When lit green, this LED indicates a valid video signal on the OPTO IN 2 port
Red	When lit red, this LED indicates an invalid video signal on the OPTO IN 2 port

SDI Connections

The provides a BNC for one SDI input and one BNC for the SDI output. (**Figure 3.6**)

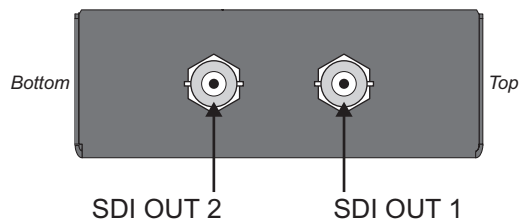


Figure 3.6 FDR-9647-LC (Left) — SDI Connections

FDT-9648-LC

This chapter presents information on the FDT-9648-LC hardware components and features.

Overview

The FDT-9648-LC is an SDI to fiber optic converter capable of equalizing and re-clocking all common serial digital signals. Each channel of the module equalizes the incoming SDI signal, re-clocks the signal with automatic rate detection for all popular data rates. Each channel is fully independent and can run at different data rates.

The FDT-9648-LC provides the ability to transport digital video baseband signals over a fiber optic link, allowing for longer transport distances. SDI outputs are re-clocked providing excellent jitter and return loss specifications.

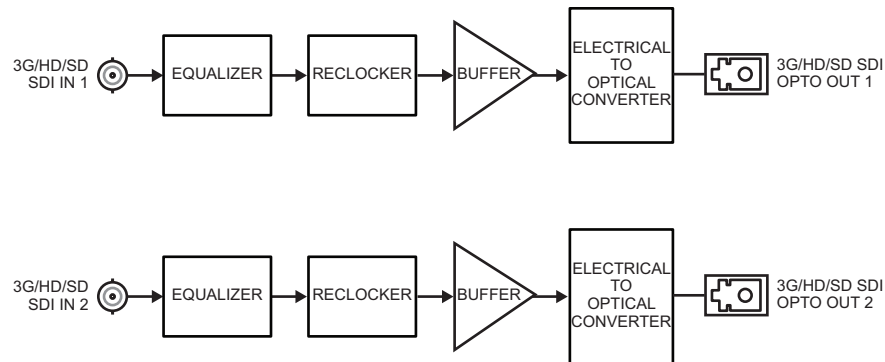


Figure 4.1 Simplified Block Diagram of FDT-9648-LC Functions

Faceplate Overview

The chassis faceplate provides a silk-screen map of the connections available. **Figure 4.2** illustrates the FDT-9648-LC faceplate label.

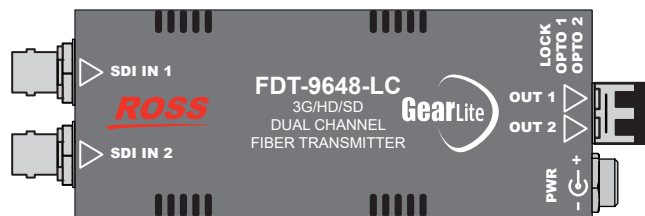


Figure 4.2 FDT-9648-LC — Faceplate Label

POWER Connection

Each module has a standard miniature power jack (center pin positive) that connects to the PS-9000 power supply. This PWR jack is in the same location on each module regardless of the module type. (**Figure 4.3**)

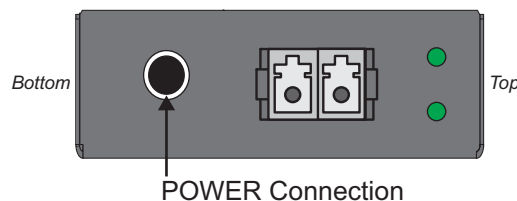


Figure 4.3 FDT-9648-LC (Right Side) — PWR Connection

Fiber Optic Outputs

The FDT-9648-LC provides two fiber optic outputs. (**Figure 4.4**)

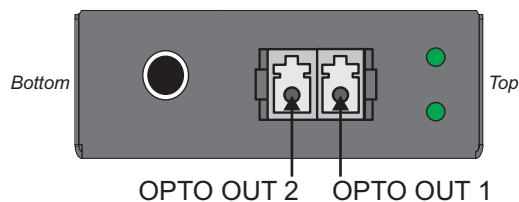


Figure 4.4 FDT-9648-LC (Right) — Fiber Optic Outputs

SDI Connections

The provides two BNCs for two SDI inputs. (**Figure 4.5**)

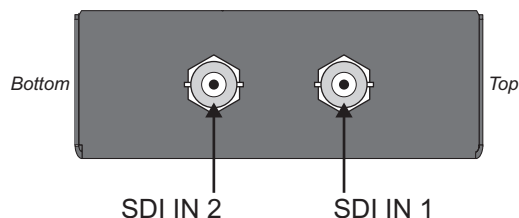


Figure 4.5 FDT-9648-LC (Left) — SDI Connections

SDI Status LEDs

The FDT-9648-LC includes two LEDs that display the status of the SDI input signal activity. These LEDs are located near the fiber optic connectors. (**Figure 4.6**)

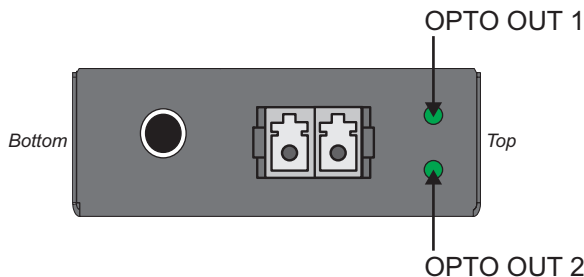


Figure 4.6 FDT-9648-LC (Right) — SDI Input Status LEDs

Table 4.1 describes the behavior of the SDI IN 1 and SDI IN 2 LEDs.

Table 4.1 SDI IN 1 and SDI IN 2 LEDs

Status	Description
SDI IN 1	
Green	When lit green, this LED indicates there is a valid SDI signal on the SDI IN 1 BNC.
Red	When lit red, this LED indicates there is an invalid SDI signal on the SDI IN 1 BNC.
SDI IN 2	
Green	When lit green, this LED indicates there is a valid SDI signal on the SDI IN 2 BNC.
Red	When lit red, this LED indicates there is an invalid SDI signal on the SDI IN 2 BNC.

FDB-9649-LC

This chapter presents information on the FDB-9649-LC hardware components and features.

Overview

The FDB-9649-LC provides one fiber optic receiver to SDI converter capable of equalizing all common serial digital signals and one SDI to fiber optic converter capable of equalizing and re-clocking all common serial digital signals.

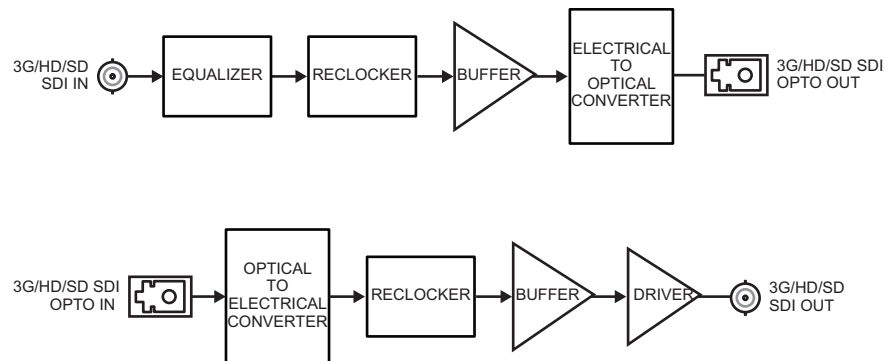


Figure 5.1 Simplified Block Diagram of FDB-9649-LC Functions

Faceplate Overview

The chassis faceplate provides a silk-screen map of the connections available. **Figure 5.2** illustrates the FDB-9649-LC faceplate label.

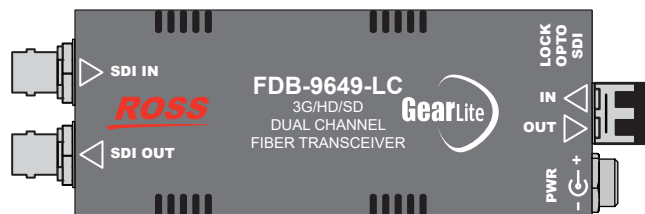


Figure 5.2 FDB-9649-LC — Faceplate Label

POWER Connection

The FDB-9649-LC has a standard miniature power jack (center pin positive) that connects to the PS-9000 power supply. This PWR jack is in the same location on each module regardless of the module type. (**Figure 5.3**)

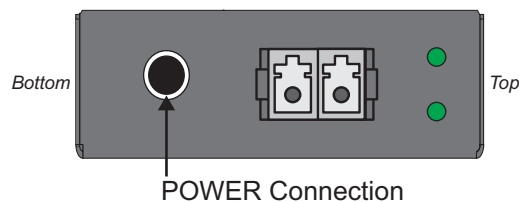


Figure 5.3 FDB-9649-LC (Right Side) — PWR Connection

SDI Connections

The FDB-9649-LC provides one BNC for the SDI input and one BNC for the SDI output. (**Figure 5.4**)

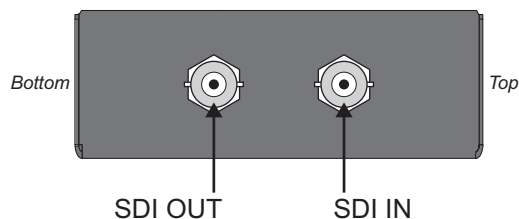


Figure 5.4 FDB-9649-LC (Right) — SDI Connections

Fiber Optic Connections

The FDB-9649-LC provides one fiber optic input and one fiber optic output. (**Figure 5.4**)

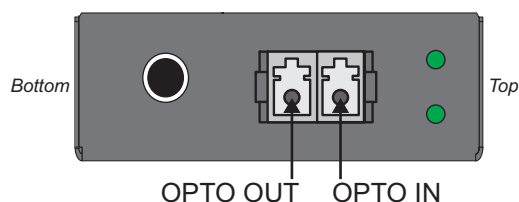


Figure 5.5 FDB-9649-LC (Bottom) — Fiber Optic Connections

Input Status LEDs

The FDB-9649-LC includes two LEDs that display the status of the SDI input signal activity and the status of the OPTO input signal activity. These LEDs are located near the fiber optic connectors. (**Figure 5.6**)

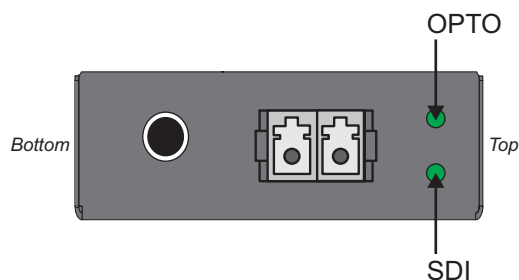


Figure 5.6 FDB-9649-LC (Right) — OPTO Status LEDs

Table 5.1 describes the behavior of the OPTO and SDI LEDs.

Table 5.1 SDI IN 1 and SDI IN 2 LEDs

Status		Description
OPTO		
Green		When lit green, this LED indicates there is a valid video signal on the OPTO IN port.
Red		When lit red, this LED indicates there is an invalid fiber optic input signal.
SDI		
Green		When lit green, this LED indicates there is a valid SDI input signal on the SDI IN BNC.
Red		When lit red, this LED indicates there is an invalid SDI input signal.

Physical Installation

If you have questions pertaining to the installation of FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC, please contact us at the numbers listed in the section “**Contacting Technical Support**” on page 8. Our technical staff is always available for consultation, training, or service.

For More Information on...

- the technical specifications for each module, refer to the chapter “**Technical Specifications**” on page 21.

Static Discharge

Throughout this chapter, please heed the following cautionary note:



ESD Susceptibility — *Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas and when synthetic fiber clothing is worn. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Mounting and Installation

The module can be mounted in any convenient location. However, to ensure long life for this product, observe the following precautions and operating requirements:

- Maintain an ambient temperature of 20° to 40°C (68°F – 104°F).
- Allow for air circulation around the chassis for convectional cooling.

Many different mounting positions are possible with the included mounting hardware. Some installation options are permanent and require careful consideration of the final positioning before installation.

★ In some mounting locations, the power adapter must be affixed in a similar manner as the chassis.

Other possible options include the use of adhesive magnetic sheets (not included) affixed to the chassis and the power adapter, for removable mounting on metal cabinets etc.

Cable ties may be necessary in some applications to relieve strain on the mounting hardware and the connectors.

Surface Mount Strips

The included VELCRO® brand surface mount strips allow the GearLite module and power supply to be affixed to a permanent location during use and easily removed for adjustments. Carefully consider the installation location before proceeding; the adhesive is very aggressive and is not easily removed. The adhesive will cure fully in 24 hours.

To install the Surface Mount Strips

1. Remove the **Protective Backing Film** from the adhesive on the bottom of the two VELCRO® brand **Surface Mount Strips**.
- ★ A third VELCRO® brand **Surface Mount Strip** is available to mount the power adapter.
2. Adhere the **Surface Mount Strips** to the bottom side of the chassis **Figure 6.1**.

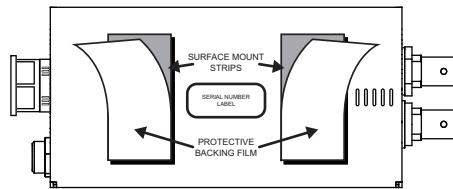


Figure 6.1 Surface Mount Installation Option

3. Remove the **Protective Backing Film** from the other side of the VELCRO® brand **Surface Mount Strips**.
4. Press the chassis into position on the surface you want to mount it to.

Non-Slip Pads

Four non-slip adhesive pads have been supplied for desktop placements. Simply remove the protective backing film from the adhesive and affix one non-slip pad to each of the four corners on the bottom of the chassis.

Warranty and Repair

The FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of **THREE (3)** years from the date of delivery to the customer. In the event that your RossGear FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the **THREE (3)** year warranty period.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC User Manual provides all pertinent information for the safe installation and operation of your RossGear Product. Ross Video policy dictates that all repairs to the FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC. If required, a temporary replacement module will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

The Ross Video Technical Support Department will continue to provide advice on any product manufactured by Ross Video Limited, beyond the warranty period without charge, for the life of the equipment.

Technical Specifications

This chapter provides technical information for the FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC.

★ Specifications are subject to change without notice.

SDI Inputs/Outputs

Table 8.1 Technical Specifications — SDI Inputs/Outputs

Item	Specifications
Standards Accommodated	SMPTE 259M
	SMPTE 292M
	SMPTE 424M
	DVB-ASI (EN 50083-9)
Input Voltage	800mV, nominal
SDI Data Rates	270Mbps
	1.5Mbps
	3Gbps
Impedance	75ohm
Input Cable Equalization	SD: 100m
	HD: 100m
	3G: 80m
Return Loss	-12dB (all formats)

Fiber Optic Inputs/Outputs

Table 8.2 Technical Specifications — Fiber Optic Inputs/Outputs

Item	Specifications
Standards Accommodated	SMPTE 259M
	SMPTE 292M
	SMPTE 424M
	DVB-ASI (EN 50083-9)
Operating Wavelength Range	1310nm
Input Power Operating Range (Color Bars)	-3dBm to -19dBm @ 270Mbps and 1.5Gbps
	-3dBm to -18dBm @ 2.97Gbps
Input Power Operating Range (Pathological)	-3dBm to -18dBm @ 270Mbps and 1.5Gbps
	-3dBm to -17dBm @ 2.97Gbps
Receiver Overload	At values above -3dBm
Output Center Wavelength	+/- 20nm
Output Power	-7dBm to -2dBm

Table 8.2 Technical Specifications — Fiber Optic Inputs/Outputs

Item	Specifications
Output Laser Type	Fabry-Perot (FP)
Connector Types	Single mode, LC-UPC PIN

Power

Table 8.3 Technical Specifications — Power

Item	Specifications
Required Voltage	+5v DC
Power Consumption	5W

Environment

Table 8.4 Technical Specifications — Environment

Item	Specifications
Thermal Environment	0°C to 40°C (32°F to 104°F) ambient, non-condensing

Dimensions

Table 8.5 Technical Specifications — Dimensions

Item	Specifications
Physical Dimensions	13cm x 4cm x 2cm (5.25" x 1.75" x 0.75")
Weight	170g (6oz)