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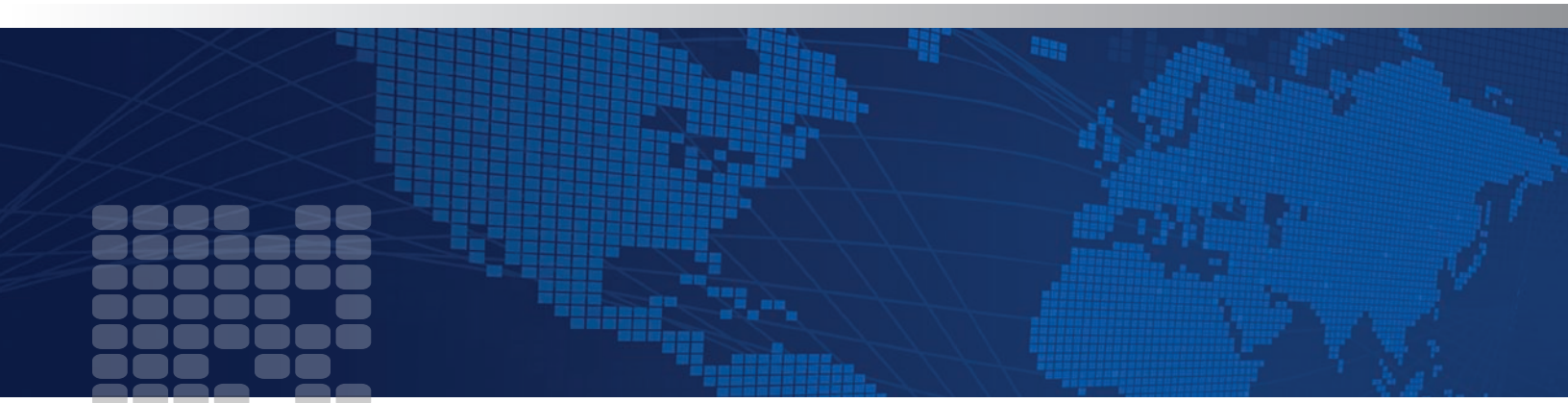
SELENIO



SEL-1DEC1
Universal Decoder

Installation and Operation Manual

Edition B
175-100265-00

SEL-1DEC1
Universal Decoder

Installation and Operation Manual

Edition B
May 2011

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This user guide was created for the Selenio SEL-1DEC1 product.

Publication Date: May 2011

Contents

Preface

Manual Information

Purpose

This manual details the features, installation, operation, maintenance, and specifications for the SEL-1DEC1 Universal Encoder.

Audience

This manual is written for engineers, technicians, and operators responsible for installation, setup, maintenance, and/or operation of the SEL-1DEC1 Universal Encoder.

Revision History

Table 1-1 Revision History of Manual

Edition	Date	Comments
A	March 2011	Initial release
B	May 2011	Modified installation procedure

Writing Conventions

To enhance your understanding, the authors of this manual have adhered to the following text conventions:

Table 1-2 Writing Conventions

Term or Convention	Description
Bold	Indicates dialog boxes, property sheets, fields, buttons, check boxes, list boxes, combo boxes, menus, submenus, windows, lists, and selection names
Italics	Indicates E-mail addresses, the names of books or publications, and the first instances of new terms and specialized words that need emphasis
CAPS	Indicates a specific key on the keyboard, such as ENTER, TAB, CTRL, ALT, or DELETE
Code	Indicates variables or command-line entries, such as a DOS entry or something you type into a field
>	Indicates the direction of navigation through a hierarchy of menus and windows

Table 1-2 Writing Conventions

Term or Convention	Description
hyperlink	Indicates a jump to another location within the electronic document or elsewhere
Internet address	Indicates a jump to a website or URL
	Indicates important information that helps to avoid and troubleshoot problems

Obtaining Documents

Product support documents can be viewed or downloaded from our website. Alternatively, contact your Customer Service representative to request a document.

Unpacking/Shipping Information

Unpacking a Product

This product was carefully inspected, tested, and calibrated before shipment to ensure years of stable and trouble-free service.

1. Check equipment for any visible damage that may have occurred during transit.
2. Confirm that you have received all items listed on the packing list.
3. Contact your dealer if any item on the packing list is missing.
4. Contact the carrier if any item is damaged.
5. Remove all packaging material from the product and its associated components before you install the unit.

   Keep at least one set of original packaging, in the event that you need to return a product for servicing.

Product Servicing

Except for firmware upgrades, SEL-1DEC1 modules are not designed for field servicing. All hardware upgrades, modifications, or repairs require you to return the modules to the Customer Service center.

Returning a Product

In the unlikely event that your product fails to operate properly, please contact Customer Service to obtain a Return Authorization (RA) number, and then send the unit back for servicing.

Keep at least one set of original packaging in the event that a product needs to be returned for service. If the original package is not available, you can supply your own packaging as long as it meets the following criteria:

- The packaging must be able to withstand the product's weight.
- The product must be held rigid within the packaging.
- There must be at least 2 in. (5 cm) of space between the product and the container.
- The corners of the product must be protected.

Ship products back to us for servicing prepaid and, if possible, in the original packaging material. If the product is still within the warranty period, we will return the product prepaid after servicing.

Safety Standards and Compliances

The Selenio series safety manual is shipped in the *Harris Infrastructure and Networking Documentation and Product Resources* DVD, and can be downloaded from our website.

Restriction on Hazardous Substances (RoHS) Compliance

Directive 2002/95/EC—commonly known as the European Union (EU) Restriction on Hazardous Substances (RoHS)—sets limits on the use of certain substances found in electrical and electronic equipment. The intent of this legislation is to reduce the amount of hazardous chemicals that may leach out of landfill sites or otherwise contaminate the environment during end-of-life recycling. The Directive, which took effect on July 1, 2006, refers to the following hazardous substances:

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent Chromium (Cr-V1)
- Polybrominated Biphenyls (PBB)
- Polybrominated Diphenyl Ethers (PBDE)

According to this EU Directive, all products sold in the European Union will be fully RoHS-compliant and "lead-free." (See our website for more information on dates and deadlines for compliance.) Spare parts supplied for the repair and upgrade of equipment sold before July 1, 2006 are exempt from the legislation. Equipment that complies with the EU directive will be marked with a RoHS-compliant emblem, as shown in **Figure P-1**.

Figure P-1 RoHS Compliance Emblem

Waste from Electrical and Electronic Equipment (WEEE) Compliance

The European Union (EU) Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE) deals with the collection, treatment, recovery, and recycling of electrical and electronic waste products. The objective of the WEEE Directive is to assign the responsibility for the disposal of associated hazardous waste to either the producers or users of these products. As of August 13, 2005, the producers or users of these products were required to recycle electrical and electronic equipment at end of its useful life, and may not dispose of the equipment in landfills or by using other unapproved methods. (Some EU member states may have different deadlines.)

In accordance with this EU Directive, companies selling electric or electronic devices in the EU will affix labels indicating that such products must be properly recycled. (See our website for more information on dates and deadlines for compliance.) Contact your local Sales representative for information on returning these products for recycling. Equipment that complies with the EU directive will be marked with a WEEE-compliant emblem, as shown in **Figure P-2**.

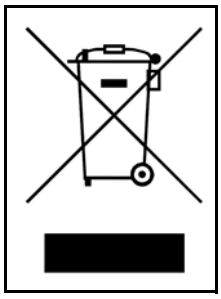

Figure P-2 WEEE Compliance Emblem

Safety Terms and Symbols in this Manual

This product manual uses the following safety terms and symbols to identify certain conditions or practices. See page 16 and the *Safety Instructions and Standards Manual* for more information.

WARNING

Statements identifying conditions or practices that may result in personal injury or loss of life. High voltage is present.

CAUTION

Statements identifying conditions or practices that can result in damage to the equipment or other property.

Installation, Operation, and Specifications

Product Description

The Selenio SEL-1DEC1 decoder applications module is a multi-format video decoder that handles both H.264 and MPEG-2 video streams and their commonly associated audio and meta-data streams.

The SEL-1DEC1 supports all popular video formats from SD through 3G video, and up to eight channels of MPEG-1 layer 2, Dolby® Digital (AC-3), AAC-LC, HE-AAC, Dolby E or SMPTE 302 (uncompressed) audio. Audio outputs are provided as unbalanced AES or embedded audio.

In addition, the SEL-1DEC1 re-inserts VANC and VBI data into the video signal.

Additional audio capability is availability with the optional expansion modules NGOPT-AAEX-AABS (analog audio), NGOPT-DAEX-AESB (balanced AES), and NGOPT-DAEX-AESCS (unbalanced AES).

Main Features

- Supports a single input transport stream from any of the following sources:
  - Over IP using UDP or RTP protocols and SMPTE-2022 error protection
  - DVB-ASI from the rear I/O interface
  - Internal connection from other application modules in the frame
- Supports the decoding of the following Constant Bit Rate and Variable Bit Rate streams:
  - H.264 High Profile @ up to L4.2 (62.5 Mbps max)
  - H.264 Main Profile @ up to L4.2
  - H.264 Baseline Profile @ up to L1.3
  - MPEG-2 422 Profile @ up to High Level (65 Mbps max)
  - MPEG-2 restricted to Main Profile @ up to High Level
- Supports any legal horizontal resolution
- Supports any of the following output video formats:
  - 1080p/59.94, 1080p/50 - SMPTE424/235 Level A and B
  - 1080i/29.97, 1080i/25 - SMPTE292
  - 720p/59.94, 720p/50 - SMPTE292
  - 480i/29.97 - SMPTE259
  - 576i/25 - SMPTE259
- Provides horizontal scaling for streams with reduced horizontal resolution
- Crossconverts the following standards:*

  - SD-SDI (NTSC or PAL) to HD-SDI (1080I, 720P) at the same frame rate as the source maintaining aspect ratio by letter/pillar boxing as necessary.
  - HD-to-SD-SDI at the same frame rate as the source 3, maintaining aspect ratio by letter/pillar boxing as necessary
  - HD-to-HD-SDI (1080I to/from 720P) at the same frame rate as the source
  - When HD/SD-SDI is configured and AFD is present, AFD can further refine scaling
  - Mobile streams (vertical resolution below 480) displayed as either full screen with letter/pillar boxing as necessary, or centered with no vertical scaling
  - 3G-SDI to 1080i or 720p
  - Decoded video can be synchronized to the clock recovered from the input bit stream, or genlocked to the frame reference
- Provides the following audio decoding features:
  - Support for up to 8 audio streams
  - Support for MPEG 1 Layer 2, Dolby Digital (AC-3), AAC-LC, HE-AAC including SBR and Parametric Stereo, SMPTE-302 (AES-3 over MPEG), Dolby E, and pass-through of SMPTE-337 pre-compressed audio streams
- Provides the following VANC processing features:
  - VANC pass-through
  - EIA-608/708 closed captioning
  - AFD
  - SCTE-35 splice points
  - DVITC timecode
  - OP-47 teletext
  - Audio metadata
- Provides the following VBI processing features:
  - EIA-608 closed captioning
  - SMPTE timecode
  - AMOL-48 or AMOL-98
  - VPS
- Provides the following rear I/O connections
  - 1x (High-Density) HD-BNC™ - ASI input
  - 2x (High-Density) HD-BNC - SDI output
  - 2x (High-Density) HD-BNC - ASI loop-through
  - 8 x (High-Density) HD-BNC - Primary AES Audio Outputs
  - Serial audio metadata
  - GPI input and outputs

*The SEL-1DEC1 provides utility-grade format conversion. For professional broadcast-quality post-processing, the SEL-1XD1 and SEL-2XD1 (for conversion), and SEL-1FS1 and SEL-2FS1 (for frame sync) are recommended.

Module Types

Table 1-1 Module Descriptions

Product	Description
SEL-1DEC1-EES	Multi-Standard Decoder hardware; includes single channel of video and four stereo pairs of audio, single back module with (High-Density) HD-BNC connectors for ASI input/outputs, SDI video outputs, AES (unbalanced) outputs, GPI inputs/outputs and serial data (software model key must be selected to enable functions)
SEL-1DEC1-EOS	Multi-Standard Decoder hardware; includes single channel of video and four stereo pairs of audio, single back module with (High-Density) HD-BNC connectors for ASI input, dual SFP output (ordered separately), SDI video out, AES out (unbalanced), GPI in/out and serial data (software model key must be selected to enable functions)

Table 1-2 Module Types

Product	Description
SEL-SK-DE-PRO	Software model key for DEC1 - MPEG-2 4:2:0 and 4:2:2 video profiles, H.264 4:2:0 up to 1080P 3G support
SEL-SK-DE-STD	Software model key for DEC1 - MPEG-2/H.264 4:2:0 video profile

,

Table 1-3 Softkey Options

Product	Description
SELOPT-SK-DE-AUD4	Software keyed option for additional 4 stereo pairs of audio available on-board
SELOPT-SK-DE-BISS	Software keyed option for DVB Fixed-key Scrambling modes BISS-1
SELOPT-SK-DE-DDD	Software keyed option for support of Dolby Digital (AC-3) 5.1 (uses 3 existing stereo pairs of audio)
SELOPT-SK-DE-DED	Software keyed option for support for Dolby E on 4 stereo pairs of audio
SELOPT-SK-DE-S302	Software keyed option to support for up to 8 stereo pairs of SMPTE-302 pass-through audio

Table 1-4 SFP Transmitter Options

Product	Quantity	Description
OP+SFP+TT+13+13	2	1310 nm and 1310 nm wavelength transmitter with pathological support for baseband video
■ OP+SFP+TT+27+29 ■ OP+SFP+TT+31+33 ■ OP+SFP+TT+35+37 ■ OP+SFP+TT+43+45 ■ OP+SFP+TT+47+49 ■ OP+SFP+TT+51+53 ■ OP+SFP+TT+55+57 ■ OP+SFP+TT+59+61	2	Transmitter with pathological support for baseband video in the following wavelength pairs: ■ 1270 and 1290 nm ■ 1310 and 1330 nm ■ 1350 and 1370 nm ■ 1430 and 1450 nm ■ 1470 and 1490 nm ■ 1510 and 1530 nm ■ 1550 and 1570 nm ■ 1590 and 1610 nm

Front Module

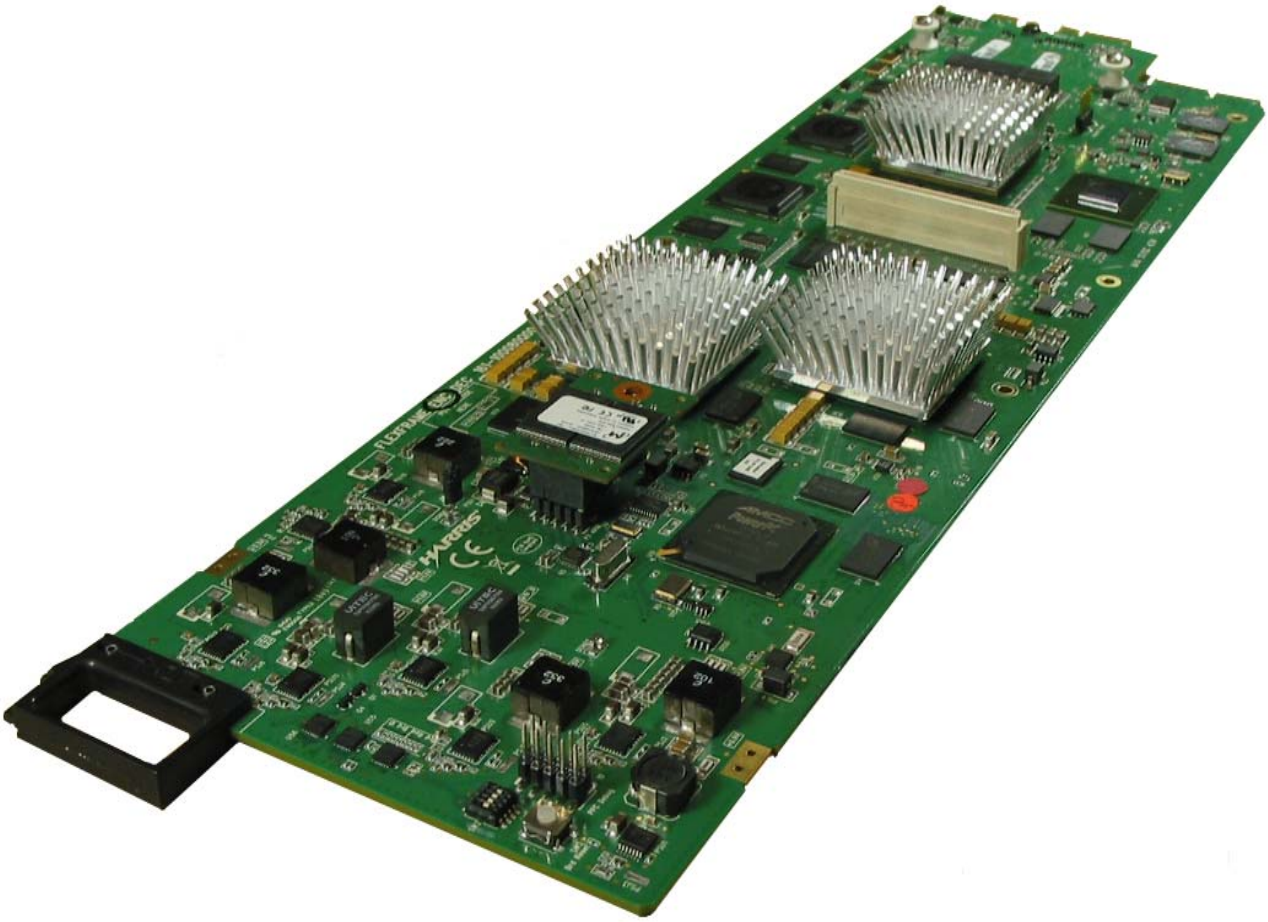

Figure 1-1 SEL-1DEC1 Front Module

Back Modules

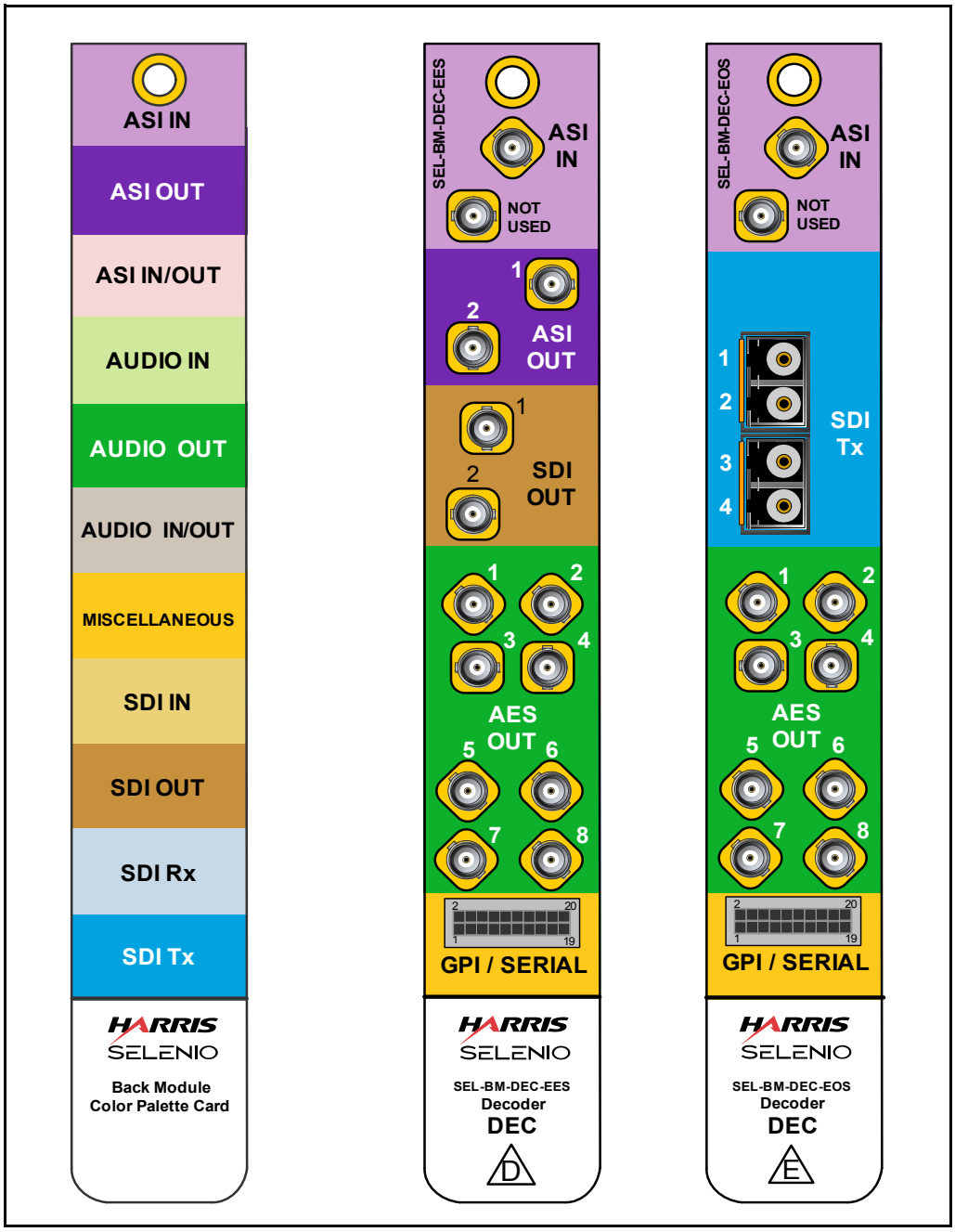

Figure 1-2 Selenio Color Scheme and Decoder Back Modules

Pinouts

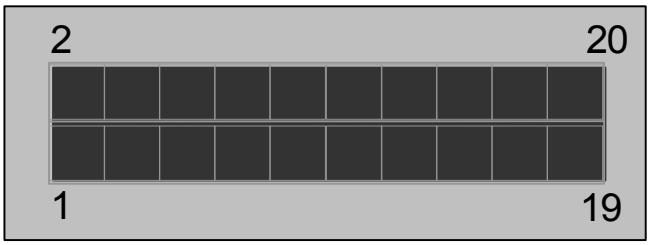

Figure 1-3 GPI/Serial Connector Pinouts

Table 1-5 GPI/Serial Pinouts

Pin	Function
1	GPI Out 1
2	GPI Out 2
3	GPI Out 3
4	GPI Out 4
5	GPI In 1
6	GPI In 2
7	GPI In 3
8	GPI In 4
9	D-Ground
10	D-Ground
11	RS-422 Port 2 Rx+
12	RS-422 Port 2 Rx- (RS-232 Port 2 Rx)
13	RS-422 Port 2 Tx+
14	RS-422 Port 2 TX- (RS-232 Port 2 Tx)
15	D-Ground
16	D-Ground
17	RS-422Port 1 Rx+
18	RS-422 Port 1 Rx- (RS-232 Port 1 Rx)
19	RS-422Port 1 Tx+
20	RS-422 Port 1 Tx- (RS-232 Port 1 Tx)

Signal Flow

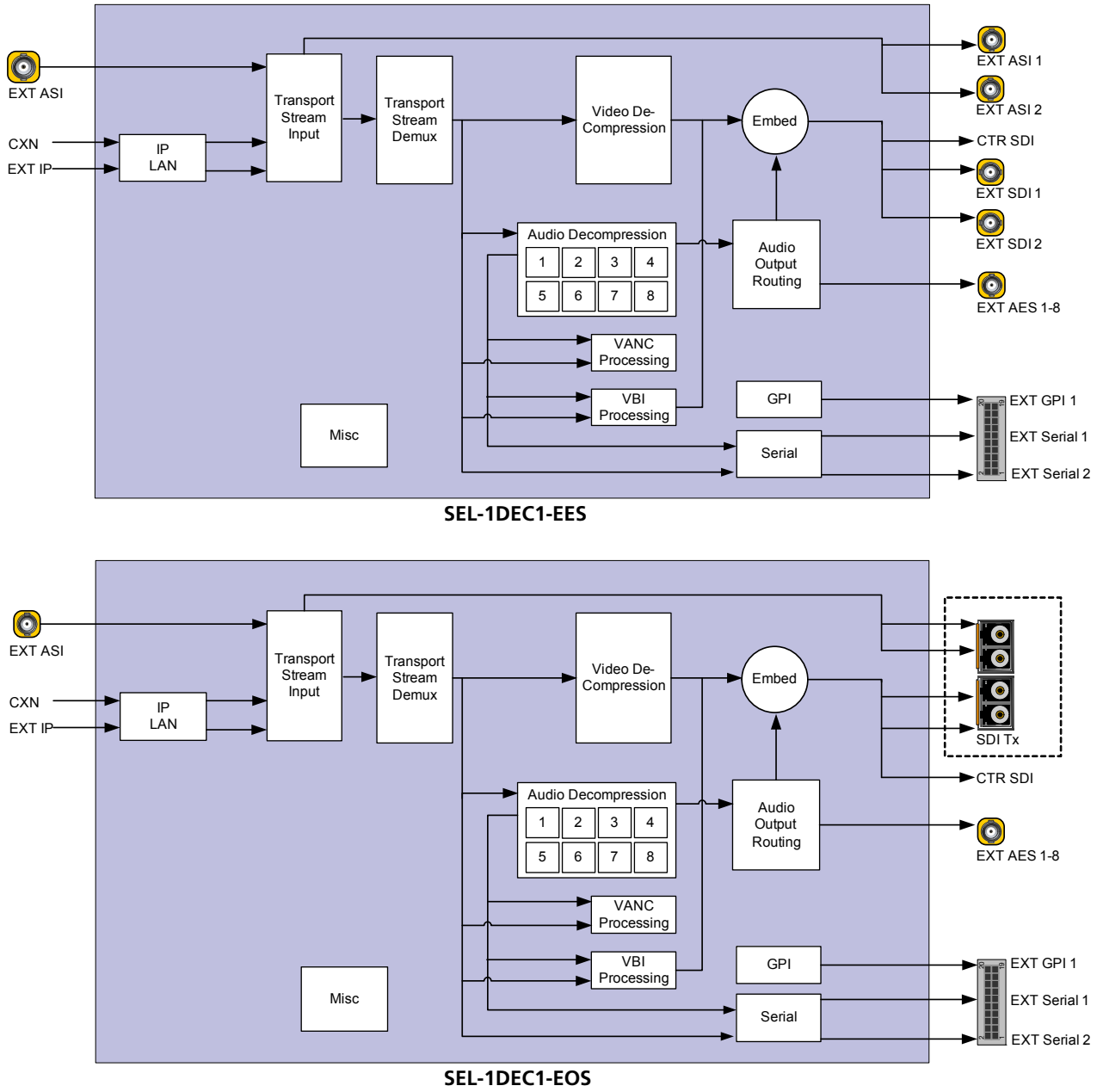

Figure 1-4 SEL-1DEC1-EES and SEL-1DEC1-EOS Signal Flow

Installing SEL-1DEC1 Modules

You can insert a Selenio module into a frame with the power supply turned on or off. Follow this procedure:

1. Remove a blank back module from the frame, saving the blank back modules and their captive screws for future configurations.
2. Attach the new back module to the empty slot, using the mounting screws provided.

   Align the back module's pin into the guide hole, and ensure that the EMI gaskets separating the back modules remain in place during the installation. The EMI gaskets fit tightly. To ease the installation of back modules, gradually press each back module into place from the left side to the right side.

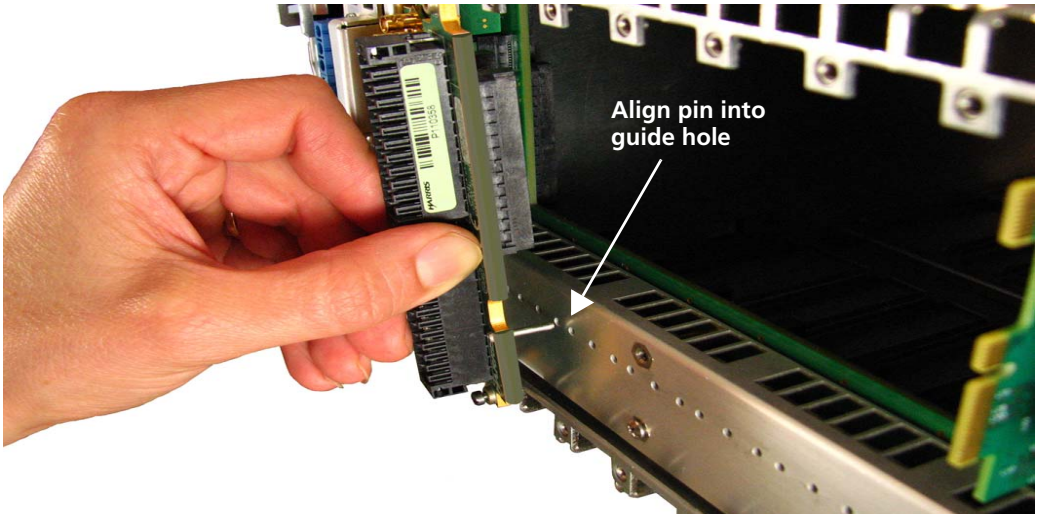

Figure 1-5 Installing Back Modules

3. Apply labels to the back module, if these are supplied separately.
4. Print out this page and write down the placement of the back modules in the diagram below (back modules appear on the reverse side when viewed from the front).

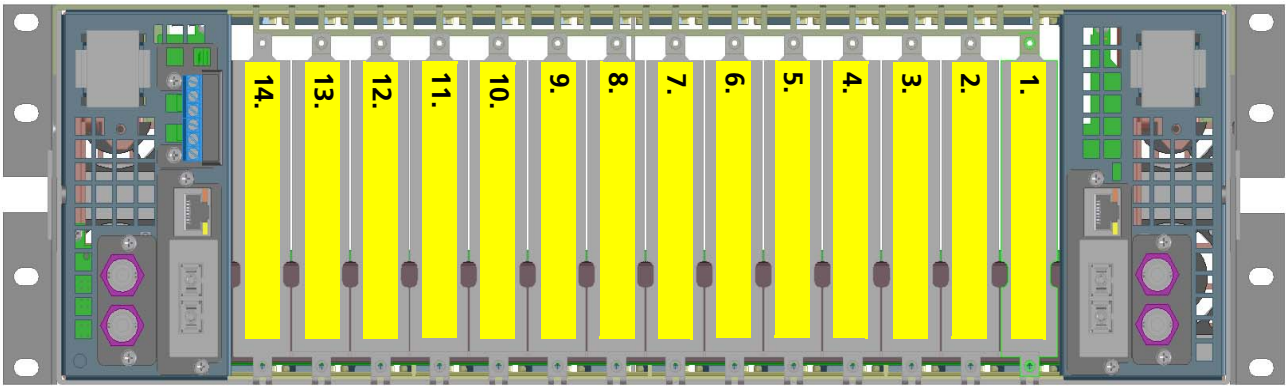

Figure 1-6. Writing Space for Identifying Back Modules

CAUTION:
Do not mix and match back and front modules. The front module must mate with a back module of the same product.

5 Open the front panel and then slide the correct front modules into the slots that match the back modules.

6 Push the module until it seats properly, ensuring the edge of the module is flush with the edge of the module guides, and the square extractor handle clicks into its slot.

7 Install the remaining back and front modules, make all of the necessary rear connections, and then close the front panel.

CAUTION:
To prevent overheating during frame operation, keep the front panel closed and all back module slots covered.

Removing Selenio Modules

Front Module

To remove a front module from a Selenio frame, follow this procedure:

1 Open the front panel.

2 Grasp the extractor handle on the module, pulling down slightly.

3 Using the handle, slide the module out of its slot.

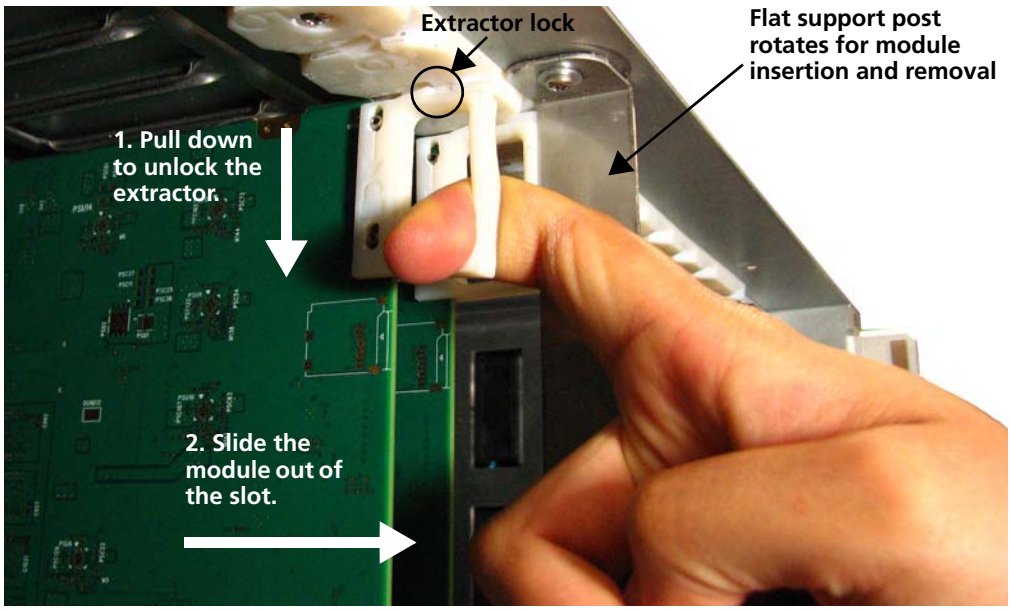

Figure 1-7 Removing a Front Module

4 Close the front panel to ensure proper frame ventilation.

Back Module

To remove a back module from a Selenio frame, you must first remove the front module. Then unscrew the back module, and pull it straight out. Cover the opening with a blank back module to ensure proper frame ventilation.

Powering Up a Module

The SEL-1DEC1 is ready for use when its parameters appear in the Selenio UI. The power consumption of an SEL-1DEC1 module is approximately 35 W.

Upgrading Module Firmware

All module firmware upgrades are activated in the frame controller section of the Selenio user interface. Follow this path to find the appropriate parameters: **Configuration > Frame Controller > Configuration** tab > **Upgrade Firmware**.

See the Selenio frame manual for information on how to upgrade module firmware.

In the unlikely event of an upgrade failure for the SEL-1DEC1, use the Upgrade Failure Instructions of this manual.

Upgrade Failure Instructions

The SEL-1DEC1 includes one user-configurable DIP switch array (**SW1**), located at the card edge next to the extractor. In normal operation, all four switches are in the **Off** position, set closest to the card edge. In the unlikely event of corrupted software, you may need to temporarily change the setting of **Switch 1** for the failsafe mode override. You would be alerted to this problem if a **System Recovery Upgrade Required** fault was triggered after an upgrade, and the module had finished rebooting.

If a **System Recovery Upgrade Required** fault is triggered, you should first try using the alternate firmware (see **Activating Alternate Firmware** in the Selenio frame manual) and then attempt the upgrade again. If this second attempt fails, follow these steps to activate the failsafe mode:

1 Remove the SEL-1DEC1 module from the frame and then push **Switch 1** to the **On** position.

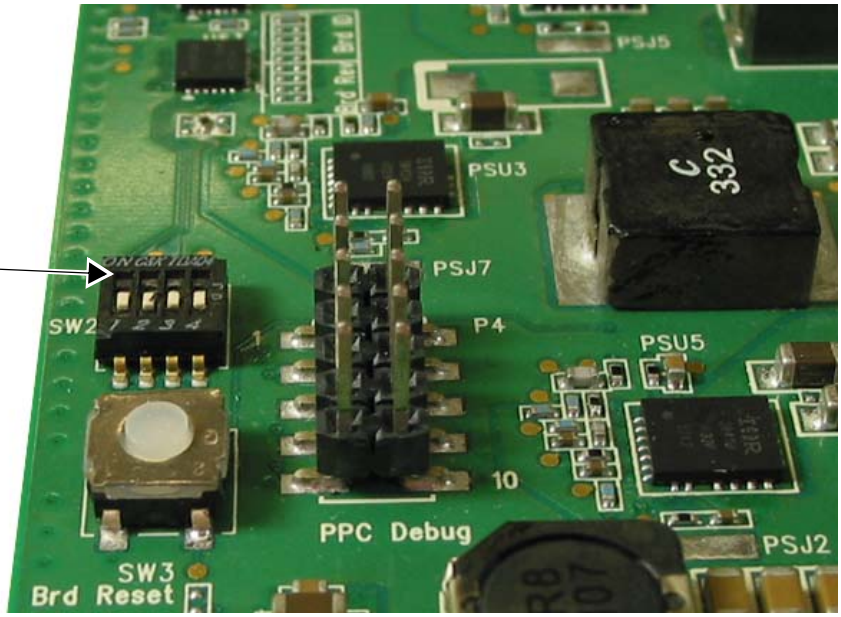

Figure 1-8 DIP Switch Setting for Failsafe Mode

2 Reinsert the module.

3 Install the new module software using the Selenio user interface.

4 Remove the module, and then return **Switch 1** to the **Off** position.

5 Reinsert the module.

The module is now running the new software.

IP LAN

The SEL-1DEC1 IP LAN communicates with external IP networks via the Data ports on the primary and secondary frame controller. If your decoder will use data ethernet from external sources, you will need to set the primary and secondary IP addresses for the decoder; these IP addresses will be unique to this decoder module.

When you are setting the IP address of the decoder, you must click **Apply** to enable the new addresses. There are no default IP addresses for the decoder module.

Transport Stream Input

The transport stream input signal can originate from either external ASI connections, an internal IP network (**CXN**) or external ethernet (**Ext IP**).

Set the multicast group parameters and IP addresses in this section. To enable the external ethernet as a source, you must enter the primary and secondary IP addresses.

Transport Stream Demux

PIDS

Under most conditions, you will decode by **Program Number.** This ensures that the correct video and audio streams are decoded as the *encoder* defined them. However, in certain applications, video, audio and data PIDs can be manually entered. Ensure that you take great care when making manual entries to these fields.

BISS

The Basic Interoperable Scrambling System is controlled with these three parameters:

- Clear Session Word
- Encrypted Session Word
- Injected Identifier

Using the different parameters, the SEL-1DEC1 can operate in either the **Clear Session Word** mode, or the **Encrypted Session Word** mode.

Clear Session Word Mode

To use this lower-security mode, make an entry in the **Clear Session Word** field, using a 16-character, hexadecimal string (upper-case and lower-case letters allowed), such as **0a3b5c7d9e1fe345**. This will be the same string used by the upstream encoder. Once you enter the correct hexidecimal string, the BISS is automatically enabled. In this mode, the **Encrypted Session Word** and **Injected Identifier** fields should be left blank.

Encrypted Session Word

This higher-security mode requires both an **Encrypted Session Word** and **Injected Identifier** (the **Clear Session Word** field is left blank). Typically, the **Injected Identifier** value is always left the same; the **Encrypted Session Word** uses the unique string of the upstream encoder.

Note: *The BISS hexadecimal strings do not require an* ***0x*** *prefix.*

Status

These parameters provide information about the settings you have made to all of the **Transport Stream Demux** values.

Video Decompression

ARC Control

Use this parameter to set the aspect ratio for the output video. The SEL-1DEC1 decoder provides a small number of ARC settings to accommodate different sources. For more complex aspect ratio conversions, the Selenio XD1 or another ARC processor may be required. The decoder's ARC control parameter includes the following output options:

- 4:3
- 16:9

The **4:3** and **16:9** settings display the signal at their respective values, regardless of the source aspect ratio.

AFD

The SEL-1DEC1 passes through AFD and VI data, without altering the output signal or changing its aspect ratio. (However, some monitors may detect the AFD or VI and change the monitor image accordingly.)

If your **ARC Control** configuration settings conflict with the instructions encoded on the AFD or VI, the configuration settings take precedence.

No Input Action

When the decoder detects a missing or damaged transport stream input, the **No Input Action** parameter sets the output to either **Black** (with sync), **Still** frame (the last full frame of video), or **No Sync.** The default setting is **Black**.

The **No Sync** option effectively turns off the **SDI Out** ports, and is used so that the down stream video detects no sync. If you use this setting, ensure that your downstream equipment has failover capability to switch to an alternate source.

Audio Decompression

Metadata for Audio

All of the parameters in **Metadata Audio x** and **Status x** are read-only, displaying information about the incoming eight channels of audio.

Under the **General** heading, you can select the **Mode**, **Reference Lock Mode, Delay** (also known as lip sync delay), and **Passthrough** settings. For the **Reference Lock Mode**, you can either skip or use the **SRC**.

The **Passthrough** parameter enables or disables the decoding of Dolby Digital (AC-3) signals. When the parameter is enabled, the decoder passes compressed audio through to its digital and embedded outputs, as recommended by IEC-61937. When the **Passthrough** parameter is disabled, the decoder decompresses the audio and provides it to its digital, embedded, and audio outputs.

VANC Processing

The **RDD-11** option enables passthrough mode of ancillary data carried in an RDD-11 stream. Similarly, the **SMPTE-2038** option enables passthrough mode of ancillary data carried on an SMPTE-2038 stream.

Use the **Captions Line** parameter to set the output line for closed captioning data. You can use any line between **7** and **41**, or **568** to **583** (default setting is **9**). Similarly, you can use any of these lines for the following options:

- **KLV Line** (default is **15**)
- **Digital VITC Line** (default is **10**)
- **AFD Line** (default is **11**)
- **OP-47 Line** (default is **15**)
- **SCTE-104 Line** (default is **Disable**)

The **Video Index** (VI) parameter enables or disables the re-insertion of VI information in the output signal. The VI signal originates in the incoming transport stream; as with AFD, the SEL-1DEC1 does not alter the VI signal. When the transport stream carries aspect ratio information, the decoder can use that information to insert video index information into the output signal. Video index information is inserted on VBI line 14 for 525 formats or line 11 for 625 formats.

VBI Processing

The VBI controls provide many options for **Field 1 Line 6** through **Line 23** and **Field 2 Line 5** through **Line 22**. In many cases you should set the VBI lines to **Passthrough**, allowing the encoder input to pass out the decoder. However, if you need to overwrite a specific line, a variety of typical test patterns are available as options.

Audio Output Routing

Use the options in this section to set the sources of the AES and embedded group pair outputs.

GPI

The SEL-1DEC1 decoder offers four GPI outputs, each with identical options. The **In-Network Splice** option triggers a local insert (commercial, for example) during a network feed to a station; The **Out-Network Splice** option performs the same task using reverse polarity. If you select **Trigger Splice**, the GPIs will be activated by single pulses.

Open and **Close** set the state of the **GPI Out**.

Miscellaneous

Set the identifying module name in the **Name** parameter.

Laser Safety for Fiber Optic Back Modules

WARNING!
Use of controls, adjustments, and procedures other than those specified in this document may result in hazardous laser radiation exposure.

Optical fiber telecommunication systems use semiconductor laser transmitters that emit infrared light that is normally not visible to the human eye. Although a conventional laser produces a small beam of light, the power density is very high, and it can damage your eyes.

If a beam of laser light enters the eye, the eye magnifies and focuses the energy on the retina. The energy that reaches the retina can be as much as 100,000 times more than at the cornea and, as a result, it can burn the retina.

Laser transmission products are classified in four major groups (Class 1, 2, 3, and 4), according to their emissions and potential for causing injury. Fiber optic transmitter modules in this series are designated Class 1.

Precautions for Enclosed Systems

In its normal operating mode, an optical fiber communication system is totally enclosed and presents no risk of eye injury. However, if the fiber optic cables that interconnect various components of an optical fiber disconnect or break, you may be exposed to laser emissions. Also, technicians may be exposed to laser emissions during installation and servicing.

Unlike some other laser designs, semiconductor lasers have a highly divergent beam that decreases rapidly with distance. The greater the distance, the less energy will enter the eye, and the less potential risk for eye injury.

WARNING!
Eye damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe is used to stare at the energized fiber end.

Under normal operating conditions, optical fiber telecommunication systems are completely enclosed; nonetheless, observe the following precautions:

1. Do not stare into optical connectors or broken fibers.
2. Ensure technicians have satisfactorily completed an approved training course before performing installation or maintenance.
3. Ensure there are appropriate warning labels near the optical ports of the modules.

Precautions for Unenclosed Systems

During service, maintenance, or restoration, an optical fiber telecommunication system is considered unenclosed. Under these conditions, follow the practices described below.

CAUTION!
Only authorized, trained personnel shall be permitted to do service, maintenance, and restoration.

1. Avoid exposing the eye to emissions from unterminated, energized optical connectors at close distances.

2 Ensure that only authorized, trained personnel use optical test equipment during installation or servicing.

3 Turn off all laser sources before scanning a fiber with an optical test set.

4 Keep all unauthorized personnel away from the immediate area of the optical fiber systems during installation and service.

For guidance on the safe use of optical fiber communication systems in the workplace, consult *ANSI Z136.2, American National Standard for Safe Use of Lasers* in the U.S. or outside the U.S., *IEC-60825, Part 2*.

Label

The label shown in **Figure 1-9** is applicable to Class 1 laser products.

Figure 1-9 Label for Class 1 Laser Products

Inspecting and Cleaning Fiber Optic Connections

When connecting fibers to a back module, ensure that you do not touch the end of the fiber, or allow it to become dirty. Small amounts of microscopic dust or other contaminants can seriously impair or disable a fiber optic network. If you touch the end of a fiber prior to connecting it to the back module, or otherwise allow it to become dirty, you must carefully inspect and clean the connection.

Table 1-6 lists some typical contaminants of a fiber optic connection.

Table 1-6 Typical Contaminants

Contaminant	Comments
Dust particle, 1 micron	Can block up to 1% of the light transmission, creating a loss of 0.05 dB
Dust particle, 9 microns	Although microscopic, the particle can completely block the fiber core
Human hair	Typically 50 to 75 microns in diameter
Oil	Frequently caused by touching
Film residues	Can accumulate from vapors or smoke
Powdery coatings	Can be left behind after water or other solvents evaporate

Important Points

- Before you begin cleaning, always inspect the fiber connections.
- Inspect and clean both fiber ends every time you make a connection.
- Keep a protective cap on unplugged fiber connectors.
- Do not touch the end of a fiber.
- Store unused protective caps in a clean resealable container, located nearby for easy access.
- Do not reuse cleaning tissues or swabs.
- Do not allow alcohol or another wet cleaning agent to dry on a fiber end.
- Never touch the dispenser tip of an alcohol bottle or any clean portion of a tissue or swab.
- Use care when handling the fiber; do not twist or pull.
- Keep your cleaning fluids away from open flame or spark.

Figure 1-10 describes the acceptable limits of defects in a fiber connection.

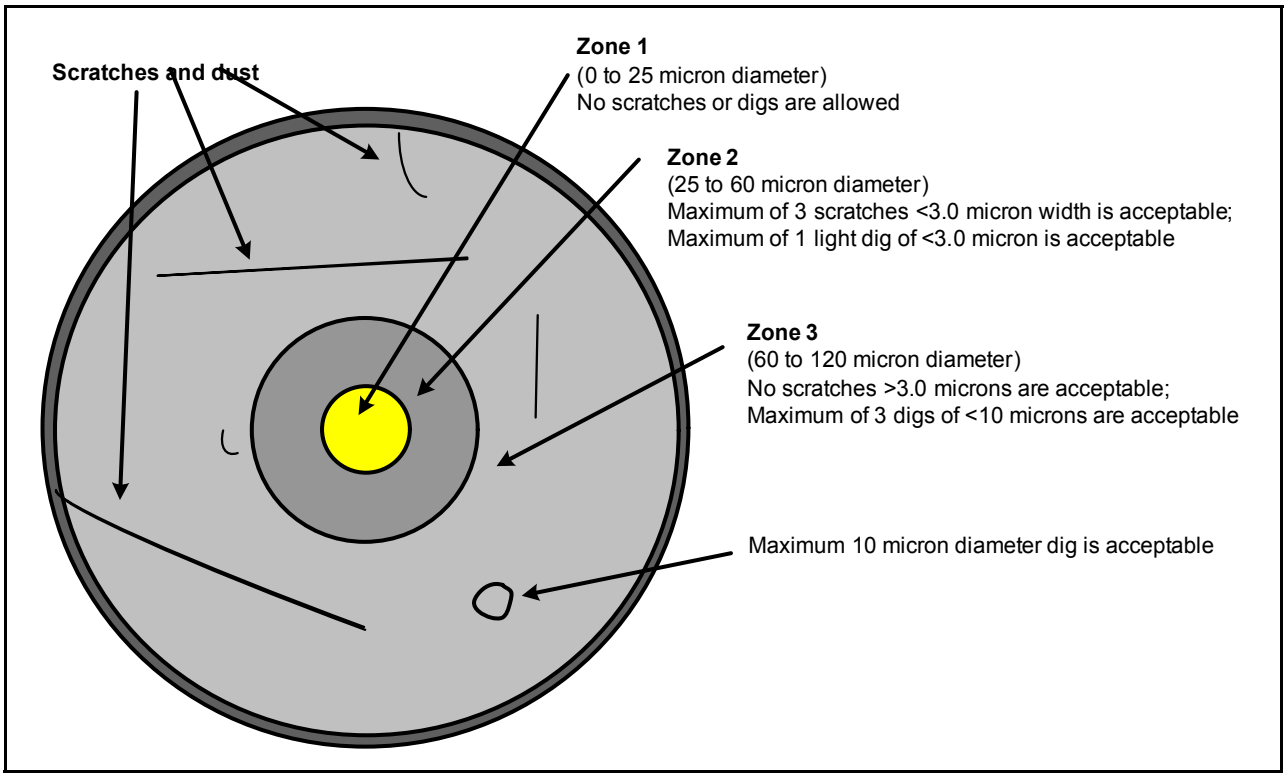

Figure 1-10. Fiber Optic Cross-Section

Inspection and Cleaning Procedure

Inspection

To inspect and clean the fibers, follow these steps:

1 Ensure the fiber is not "live."

WARNING!
Eye damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe is used to stare at an energized fiber end.

2 Inspect the fiber endface with a fiberscope.

3 If the fiber endface is clean, return to the installation instructions; if the connector is dirty, proceed to the dry cleaning instructions below.

Dry Cleaning

If you are using cartridge- or pocket-style dry cleaning tools, follow the manufacturer's directions. If you are using lint-free wipes, follow these steps:

1 Fold the lint-free wipe four to eight times into a square, taking care to avoid touching the cleaning surface of the wipe.

2 Lightly wipe the fiber tip in the central portion of the lint-free wipe.

Do not scrub the fiber. Excessive rubbing will leave scratches.

3 Repeat the wiping action on another clean section of the wipe or a new wipe.

4 Inspect the connector again with the fiberscope.

5 If the connection is clean, return to the installation steps; if the connector is still dirty, proceed to the wet cleaning instructions.

Wet Cleaning

Using 99.8% isopropyl alcohol and lint-free wipes, follow these steps to wet clean the fiber:

1 Fold the wipe into a square, about 4 to 8 layers thick.

2 Moisten one section of the lint-free wipe with one drop of 99.8% alcohol, ensuring that a portion of the wipe remains dry.

3 Lightly wipe the fiber end in the alcohol-moistened portion of the lint-free wipe.

4 Immediately repeat the wiping action on the dry section of the wipe, removing any residual alcohol.

5 Inspect the fiber endface again, and if necessary, repeat the wet cleaning with another clean section of the lint-free wipe.

CAUTION!
Do not scrub the fiber. Excessive rubbing will leave scratches.

6 Dry clean any remaining residue, and then inspect the connector again.

7 If the contamination persists, repeat the dry and wet cleaning procedure until the endface is clean.

If the fiber end still remains dirty after repeated cleaning attempts, call Customer Service for further instructions; if the fiber end is clean, return to the installation instructions.

Specifications

AES Output Specifications

Table 1-7 Unbalanced AES Output Specifications

Item	Specification
Standard	AES 3, SMPTE 276M
Type	Unbalanced, AC coupled
Connector	(High-Density) HD-BNC
Impedance	75Ω
Return Loss	>25 dB, 0.1 to 6 MHz
Signal Amplitude	1.0 V pk-to-pk @ 10% into 75Ω load
Audio Rate	48 kHz
Rise and Fall Time	30 ns to 44 ns (10% to 90%)
Bits	24, 20 or 16
Channel Status and User Bit	Maintained, but professional mode, 48 kHz

ASI Input Specifications

Table 1-8 ASI Input Specifications

Item	Specification
Number of Inputs	1
Standard	EN 50083-9
Connector	(High-Density) HD-BNC
Data Rate	0-210 Mb/s
Min. Sensitivity	200 mV
Max. Input Voltage	88 mV (pk-pk)
Min. Discrete Connector Return Loss	-15 dB (0.3 MHz -1 GHz)

SDI Output Specifications

Table 1-9 3 Gbs/ HD-SDI Output

Item	Specification
Number of Outputs	2
Standard	SMPTE 424M
Connector	(High-Density) HD-BNC
Impedance	75Ω
Return Loss	TBD, typical, from 5 MHz to 3 GHz
Signal Level	800 mV ±10%
DC Offset	0.0 V ±0.5 V
Rise and Fall Time	<135 ps (20% to 80%), no differ by more than 50 ps
Overshoot	<10% of amplitude
Jitter	■ Timing jitter: 2 UI pk-to-pk ■ Alignment jitter: 0.3 UI pk-to-pk

Table 1-10 1.5 Gb/s HD-SDI Output

Item	Specification
Number of Outputs	2
Standard	SMPTE 292M (1.485, 1.485/1.001 Gb/s)
Connector	(High-Density) HD-BNC
Impedance	75Ω
Return Loss	>15 dB, typical, from 5 MHz to 1485 MHz
Signal Level	800 mV ±10%
DC Offset	0.0 V ±0.5 V
Rise and Fall Time	<270 ps (20% to 80%)
Overshoot	<10% of amplitude (all outputs terminated)
Jitter	■ Timing jitter: <1 UI pk-to-pk ■ Alignment jitter: <0.2 UI pk-to-pk

Table 1-11 SD-SDI Output

Item	Specification
Number of Outputs	2
Standard	SMPTE 259M-C (270 Mb/s, 525/625 component video)
Connector	(High-Density) HD-BNC
Impedance	75Ω
Return Loss	>15 dB, typical, from 5 MHz to 270 MHz
Signal Level	800 mV ±10%
DC Offset	0.0 V ±0.5 V
Rise and Fall Time	400 to 1500 ps (20% to 80%)
Overshoot	<10% of amplitude (all outputs terminated)
Jitter	<0.2 UI pk-pk

Table 1-12 ASI Output

Item	Specification
Number of Outputs	2
Standard	EN 50083-9
Connector	(High-Density) HD-BNC
Data Rate	0-210 Mb/s
Output Voltage	800 mV 10% (pk-pk)
Clock Rate	270 MHz ±100 ppm
Deterministic Jitter	10% (pk-to-pk)
Random Jitter	8% (pk-to-pk)
Max. Rise and Fall Time	1.2 ns (20-80%)

Table 1-13 OP+SFP+TT+1313 SFP Transmitter Specifications

Item	Minimum	Typical	Maximum	Note
Number of LC connector outputs			2X2	
Standards	■ 3G: SMPTE 424M ■ HD: SMPTE 292M ■ SD: SMPTE 259M			
Peak wavelength	1280 nm	1310 nm	1340 nm	Measured at 25°C
Spectrum width (RMS)	-	1.5 nm	3 nm	
Average output power	-5 dBm	-2 dBm	0 dBm	
Optical rise/fall time (3G HD-SDI)	-	105/120 ps	165/180 ps	
Extinction ratio	7 dB	-	-	
Jitter	-	45 ps	70 ps	3 Gb/s Pathological
	-	60 ps	100 ps	1.5 Gb/s Pathological
	-	110 ps	180 ps	270 MHz Pathological
Laser safety level	Class 1			

Table 1-14 OP+SFP+TT+27+29 to OP+SFP+TT+59+61 SFP Transmitter Specifications

Item	Minimum	Typical	Maximum	Note
Number of LC connector outputs			2X2	
Standards	■ 3G: SMPTE 424M ■ HD: SMPTE 292M ■ SD: SMPTE 259M			
Peak wavelength	**Minimum**	**Typical**	**Maximum**	**Note**
OP+SFP+TT+27+29	■ 1264.5, 1284.5	■ 1270, 1290	■ 1277.5 1297.5	nm
OP+SFP+TT+31+33	■ 1304.5, 1324.5	■ 1310, 1330	■ 1317.5 1337.5	nm
OP+SFP+TT+35+37	■ 1344.5, 1364.5	■ 1350, 1370	■ 1357.5 1377.5	nm
OP+SFP+TT+43+45	■ 1424.5, 1444.5	■ 1430, 1450	■ 1437.5 1457.5	nm
OP+SFP+TT+47+49	■ 1464.5, 1484.5	■ 1470, 1490	■ 1477.5 1497.5	nm
OP+SFP+TT+51+53	■ 1504.5, 1524.5	■ 1510, 1530	■ 1517.5 1537.5	nm
OP+SFP+TT+55+57	■ 1544.5, 1564.5	■ 1550, 1570	■ 1557.5 1577.5	nm
OP+SFP+TT+59+61	■ 1584.5, 1604.5	■ 1590, 1610	■ 1597.5 1617.5	nm
Spectrum width (RMS)	--	--	1 nm	-20 dB width
Optical transmit power	0	--	4	dBm (coupled into a 9/125 µm single mode fiber)
Optical rise/fall time	--	--	■ 135 ps (3, SMPTE 424M) ■ 270 ps (3, SMPTE 292M) ■ 800 ps (3, SMPTE 344M) ■ 1.5 ns (3, SMPTE 259M)	
Extinction ratio	5	7.5	--	dB
Laser safety level	Class 1			

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