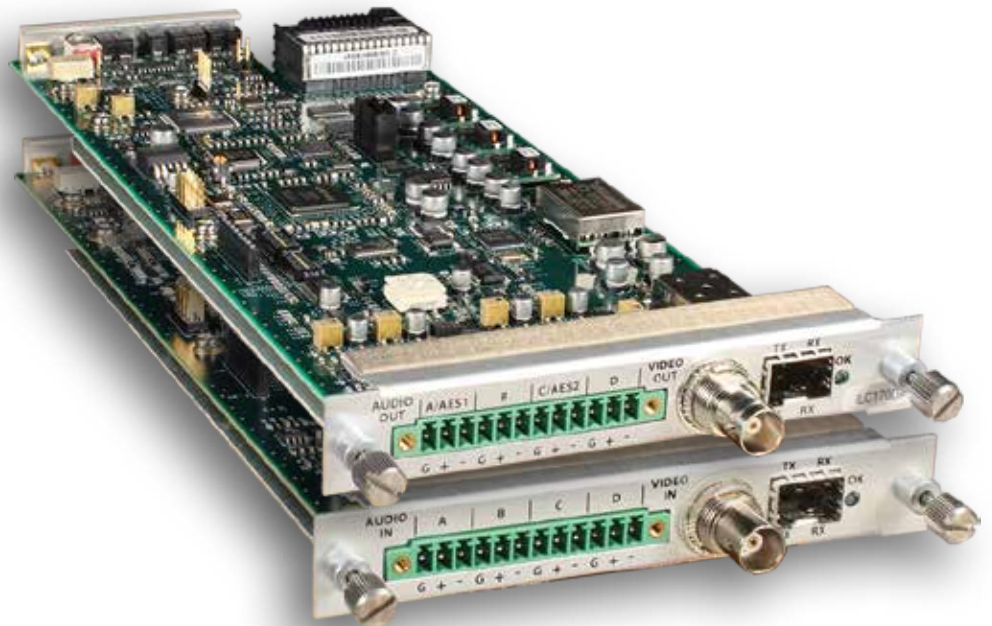




# INFINITYLINK ILC170



**Analog Video and 4 Channel Audio to SD-SDI  
and SD-SDI to Analog Video with 4 Channel Audio  
Installation and Operations Manual**





# **ILC170 Function Modules**

**Analog Video and 4 Channel Audio to SD-SDI  
and SD-SDI to Analog Video with 4 Channel Audio**

## **Installation and Operations Manual**

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A	AR200-006070-C00_A	November, 2016	Initial release.



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# About This Manual

This manual provides instructions for installing, configuring, and operating the ILC170 function modules.

## Audience

This manual is intended for the following trained and qualified service personnel who are responsible for installing and operating the ILC170:

- System installer
- Hardware technician
- System operator

## Related Documentation

The following documentation contains material related to the ILC170 function module:

Document	Provides ...
<i>ILC170AD Data Sheet</i>	Product operating and environmental specifications, and regulatory conformance information.
<i>ILC170DA Data Sheet</i>	Product operating and environmental specifications, and regulatory conformance information.
<i>ILC170AD Quick Start</i>	Product configuration information and descriptions of the front panel status LED operations.
<i>ILC170DA Quick Start</i>	Product configuration information and descriptions of the front panel status LED operations.
<i>InfinityLink IL6000 Chassis Installation and Operations Manual</i>	Overview and installation instructions for the InfinityLink IL6000 chassis options, including the following: <ul style="list-style-type: none"><li>• IL6000 chassis—Installation of this 4-slot chassis, power supplies, and function modules.</li></ul>
<i>InfinityLink IL6000 Media Transport Chassis Data Sheet</i>	Overview of the InfinityLink IL6000 chassis options.
<i>IL Manager Setup and Operations Manual</i>	Overview and operating instructions for the IL Manager element management system.

**Note:** To obtain the latest versions of this manual and the documents listed in this section, go to [www.artel.com](http://www.artel.com).

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# Symbols and Conventions

This manual uses the following symbols and conventions:

## Caution

A caution means that a specific action you take or fail to take could cause harm to the equipment or to the data transmission.



## Warning

A warning describes an action you take or fail to take that could result in death, serious physical injury, or destruction of property.

**Note:** Important related information, reminders, and recommendations.

*Italics*—used for emphasis, for indicating the first occurrence of a new term, and for book titles

1. Numbered list—where the order of the items is important
  - Bulleted list—where the items are of equal importance and their order is unimportant

# Artel Customer Service

You can reach Customer Service by e-mail at [customer care@artel.com](mailto:customer care@artel.com) or by telephone:

In the US call (800) 225-0228, then select 1 for technical support.

Outside the US call (978) 263-5775, then select 1 for technical support.

When requesting assistance, please be ready to provide the following information:

- Your name and telephone number
- Product model and serial number
- Brief description of the problem
- List of symptoms
- Steps you have already taken to try to resolve the problem

## If the product is damaged

If any portion of the unit is damaged, forward an immediate request to the delivering carrier to perform an inspection of the product and to prepare a damage report. Save the container and all packing materials until the contents are verified.

Concurrently, report the nature and extent of the damage to Artel Customer Service so that action can be initiated to either repair or replace the damaged items.

Do not return any items to Artel until you obtain instructions from Customer Service.

Report the problem or deficiency to Customer Service along with the model number and serial number. Upon receipt of this information, Artel will provide service instructions, or a *Return Authorization Number* and shipping information.

# ILC170 Function Modules

**Analog Video and 4 Channel Audio to SD-SDI and  
SD-SDI to Analog Video with 4 Channel Audio**

## Information About the ILC170

**Chassis Compatibility:** IL6000

This manual introduces the ILC170 function modules which are available in the following models:

- ILC170AD—Converts NTSC or PAL analog video and audio to 270 Mb/s Component SD-SDI (SMPTE 259M) with embedded audio. For more information about this module, see the [“Understanding and Using the ILC170AD”](#) section on page 2.
- ILC170DA—Converts optically received 270 Mb/s Component SD-SDI to composite analog video (NTSC or PAL) and de-embeds audio to analog or AES audio digital. This module can also be used to repeat the received optical signal. For more information about this module, see the [“Understanding and Using the ILC170DA”](#) section on page 21.

You can use the modules separately or as a set. When used as a set, these modules ensure full TV-1 RS250-C Short Haul analog performance over a true SMPTE 259M SD-SDI optical transport link.

Provisioning and monitoring of the ILC170 modules is accomplished using DIP switches, LEDs, front panel monitor jack, or Artel’s IL Manager, which is an element management system (for more information, see the *IL Manager Setup and Operations Manual*). The modules also have a set of major and minor alarms for indicating problems related to the power supplies, optics, temperature, and input signals.

Both ILC170 modules can interoperate with other InfinityLink function modules and other SDI optical transmitters and receivers.

# ILC170 Laser Warnings

The SFP module used in the ILC170 has a transmitter that contains a Class 1 laser. You must adhere to the standard safety practices for handling a Class 1 laser product, including the following warning.



## Warning

**Never stare directly into a fiber optic connector.**

**Although the light used in most fiber optic transmissions is not visible to the naked eye, potentially harmful levels of radiation may be present at the optical output ports and unconnected transmit fiber ends.**

**Failure to observe this warning could result in personal injury.**



## Understanding and Using the ILC170AD

The ILC170AD uses advanced high performance 12-bit video processing with adaptive 3D comb filters to convert NTSC-M or PAL-B/G analog composite video into ITU-R BT.601/656 compliant, 525 or 625 line, 4:2:2 component digital video. The ILC170AD converts four channels of analog audio sampled at 48 kHz and then embeds the signals as either 20-bit or 24-bit samples into the digital video per SMPTE 272M for a total of four analog channels. You can insert the audio into any one of the four groups.

Using the backplane to provide jumper-free connections, you can add additional audio channel groups by cascading the ILC170AD digital output into one or more ILC150E audio embedders (see the *ILC150E Function Module Installation and Operations Guide*). This allows up to 16 audio channels (all four SMPTE 272M groups) to be embedded into a single IL6000 4-slot chassis. An SFP installed in the final ILC150E module provides the optical output of the combined signals.

The ILC170AD front panel monitor jack can output either analog or digital video. When set to analog, you can check the incoming analog video for signal level and quality using conventional analog video equipment. Setting the monitor jack to digital enables you to use digital video test equipment to check the converted video in 270 Mb/s SDI format with embedded audio.

The ILC170AD features include the following:

- Single card composite video and analog audio to SDI conversion with optical transmitter (electrical-to-optical)
- Converts composite video (NTSC/PAL) to SDI (SMPTE 259M):
  - Analog composite 75 Ohm video input BNC

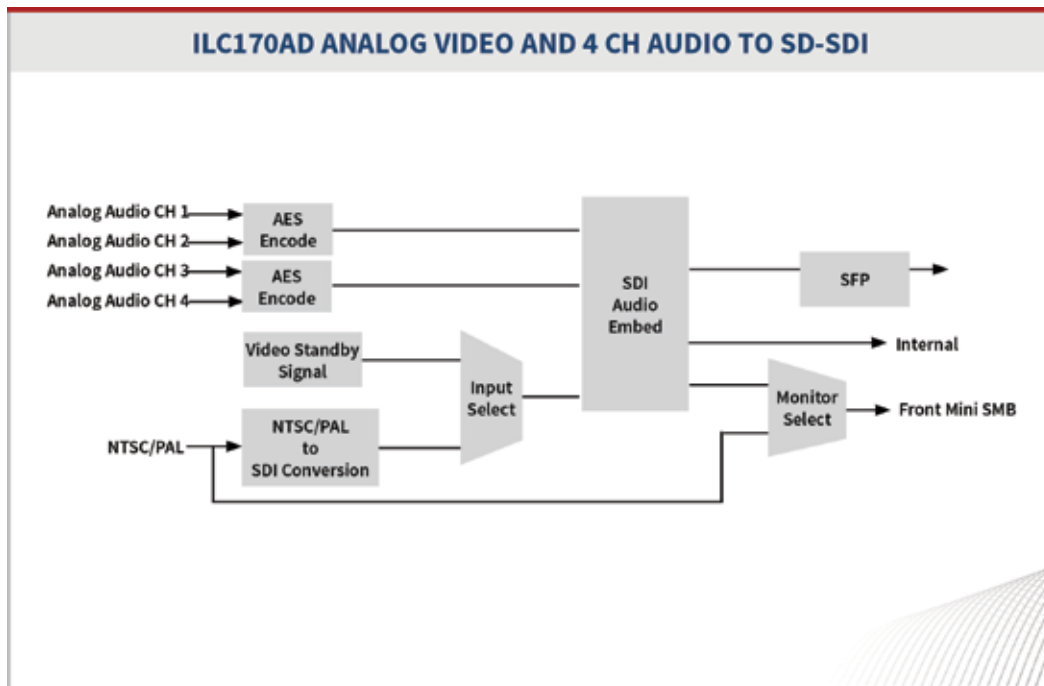
- Automatic NTSC-M or PAL-B/G format detection
- 12-bit video composite to 10-bit component digital processing
- Advanced, adaptive 3D comb filter color separation
- Comprehensive Vertical Blanking Interval (VBI) data handling (Closed Captioning, Vertical Interval Test Signal, Vertical Interval Timecode, ...)
- Adjustable cable equalization for up to 300 meters with automatic or manual gain
- SMPTE 259M SD-SDI 270 Mb/s output
- Converts analog audio to AES and embed into SDI:
  - Balanced 600 Ohm analog audio inputs (4)
  - SMPTE 272M 20 bit or 24 bit, 48 kHz audio embedding
- Use with ILC170DA for optical transport of analog video and audio (exceeds TV-1 and ANSI T1.502 short haul specification)
- Optical transport using industry-standard optics as follows:
  - WDM (1310 nm, 1550 nm)
  - CWDM
  - DWDM per ITU G694.1 Channels 21-60

This section contains the following topics:

- [ILC170AD Functional Description \(page 4\)](#)
- [ILC170AD Overview \(page 6\)](#)
- [Configuring the ILC170AD \(page 7\)](#)
- [Installing the ILC170 Modules and SFP \(page 13\)](#)
- [Cabling the ILC170 Modules \(page 15\)](#)
- [Adjusting the ILC170AD Video Gain and Equalization \(page 16\)](#)
- [Monitoring the ILC170AD Operations \(page 18\)](#)

## ILC170AD Functional Description

This sections provides a functional description of the ILC170AD, including the functional block diagram shown in [Figure 1](#).



**Figure 1. ILC170AD Module Functional Block Diagram**

This sections includes the following topics:

- [Signal Paths \(page 4\)](#)
- [Video Input \(page 5\)](#)
- [Audio Input \(page 5\)](#)
- [Electrical Output \(page 5\)](#)
- [Optical Output \(page 5\)](#)

### Signal Paths

The ILC170AD receives an electrical composite analog video signal (either NTSC or PAL), which it converts to component digital video and then formats it into SDI (SMPTE 259M). The ILC170AD also receives four balanced analog audio signals and converts them into two AES-3 digital audio signals that it embeds into the SDI digital video. The SFP module on the ILC170AD converts the resulting digital video signal to an optical video signal.

In addition to providing the optical SDI signal, the ILC170AD output is available to other cards in the host chassis. For example, you could use the output of the ILC170AD as one of the inputs to a ILC274M multiplexer (see the *ILC274 Function Modules Installation and Operations Guide*).

## Video Input

The ILC170AD accepts video signals through the 75 Ohm BNC connector located on the rear panel of the module. This connector is the only source of analog video for the ILC170AD. When no video is available on the selected input, the ILC170AD enables the standby video generator, which you can configure for one of the following signal types:

- Grey screen at 525 lines (NTSC) or 625 lines (PAL) into which audio can be embedded
- Non-video keepalive

Use the non-video keepalive signal to keep the optical link alive when an application requires that the standby video generator not produce a detectable video signal (you cannot embed audio into the non-video keepalive signal). Other function modules in the host chassis, such as the ILC103A, detect the keep-alive signal and signal that it is intentionally being sent across the optical link. Whenever the ILC170AD transmits the grey screen or the non-video keepalive signal, the TX LED on the front panel illuminates yellow.

## Audio Input

The ILC170AD accepts audio signals through a quad three-pin terminal block that consists of 12 pins. This terminal accepts up to four balanced analog audio signal inputs, each with a positive (+), negative (-), and ground (G) connector. The four balanced analog audio inputs are organized as two stereo pairs; left & right channels. You terminate each input with either a nominal 600 Ohms or a high impedance input (see the [“Configuring Audio Termination with DIP Switch SW4”](#) section on page 11).

The ILC170AD converts the analog signals to digital signals with 24-bit audio A/Ds sampling at a rate of 48 kHz. The digitized signals are then encoded into an AES-3 stream that the ILC170AD embeds into the digital video in either 20-bit or 24-bit format.

An eight-position rotary switch allows you to set the A/D 0 dBFS level from +10 dBm to +24 dBm into 600 Ohms in 2 dB steps (see the [“Configuring Peak Analog Audio Level with Rotary Switch SW6”](#) section on page 12). You can also use Artel’s element management system, IL Manager, to set the 0 dBFS level (see the *IL Manager Installation and Operations Guide*).

## Electrical Output

The ILC170AD outputs a copy of the SDI electrical signal to the backplane for use by other modules in the host chassis.

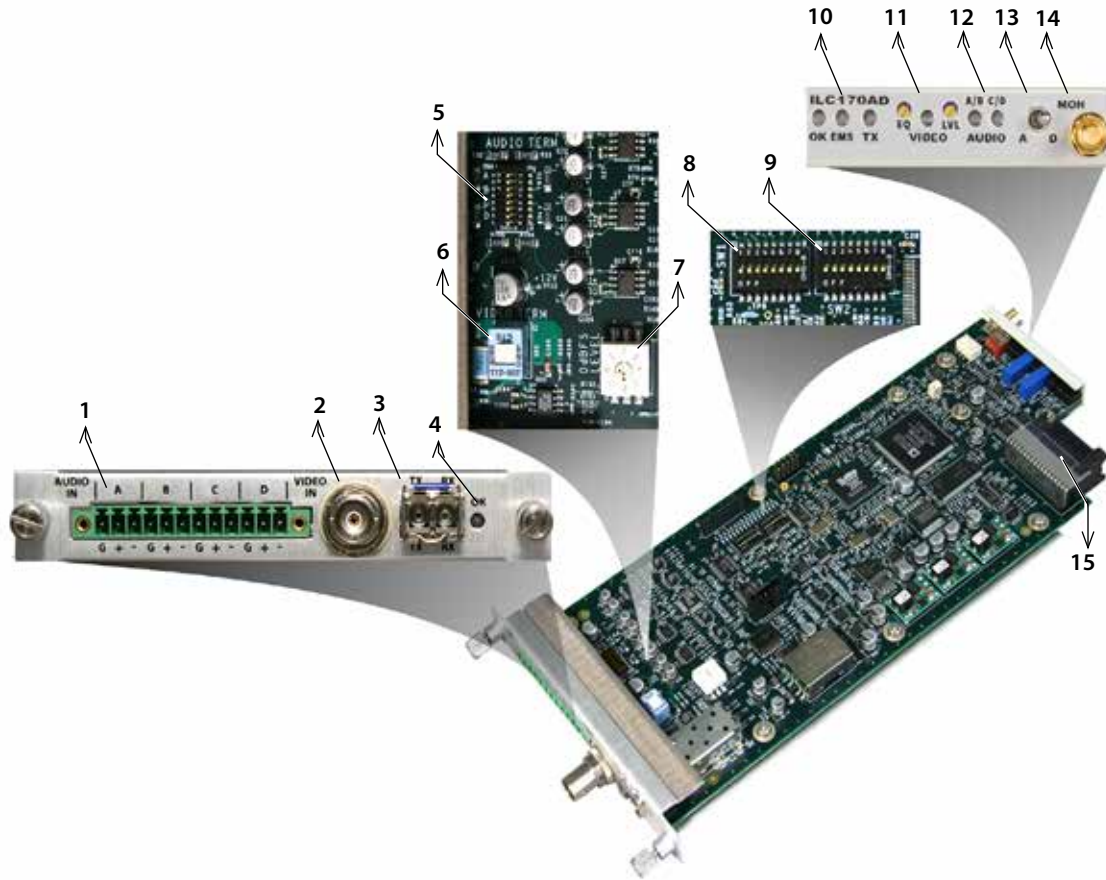
The front-panel monitor jack is a mini 75 Ohm SMB connector that allows you to monitor either the analog composite video input or the ILC170AD SDI digital video output. When adjusting cable equalization, the monitor jack provides a view of the analog video signal.

## Optical Output

A single SFP socket on the ILC170AD provides the optical interface. Optical performance is dependant the quality of your optical fiber and fiber interconnects, and on the selected SFP, which must be specifically qualified by Artel to pass video signals. The SFP modules use LC/PC connectors. Consult Artel for available SFP options.

## ILC170AD Overview

Figure 2 provides a view of the major components of the ILC170AD.



**Figure 2. ILC170AD Module Major Components**

Table 1 describes the components called out in Figure 2.

**Table 1. ILC170AD Elements**

Item	ILC170AD Element	for details, see...
1	Rear panel quad three-pin terminal block for audio input (an audio connector is provided that enables screw-on cable connections).	<a href="#">Cabling the Audio Connections (page 16)</a>
2	Rear panel BNC connector for analog video input.	<a href="#">Cabling the Electrical Video Connections (page 16)</a>
3	Rear panel SFP socket for the transmit (TX) optical connection.	<a href="#">Cabling the Optical Video Connections (page 16)</a>
4	Rear panel alarm indicator LED (OK).	<a href="#">Understanding the ILC170AD Status LEDs (page 18)</a>



**Table 1. ILC170AD Elements (Continued)**

Item	ILC170AD Element	for details, see...
5	Audio termination DIP switch SW4.	<a href="#">Configuring Audio Termination with DIP Switch SW4 (page 11)</a>
6	Video termination switch SW5.	<a href="#">Configuring Analog Video Termination with Slide Switch SW5 (page 11)</a>
7	Peak audio level rotary switch SW6.	<a href="#">Configuring Peak Analog Audio Level with Rotary Switch SW6 (page 12)</a>
8	Video control switch SW1.	<a href="#">Configuring Video Functions with DIP Switch SW1 (page 8)</a>
9	Audio control switch SW2.	<a href="#">Configuring Audio Characteristics with DIP Switch SW2 (page 9)</a>
10	Front panel status LEDs: <ul style="list-style-type: none"> <li>• OK—Alarm indicator.</li> <li>• EMS—Element management system indicator.</li> <li>• TX—Transmit signal indicator.</li> </ul>	<a href="#">Understanding the ILC170AD Status LEDs (page 18)</a>
11	Front panel manual cable equalization (EQ) and level (LVL) adjustments.	<a href="#">Adjusting the ILC170AD Video Gain and Equalization (page 16)</a>
12	Front panel audio status LEDs: <ul style="list-style-type: none"> <li>• AUDIO A/B—Analog audio signal indicator for Channel A and Channel B.</li> <li>• AUDIO C/D—Analog audio signal indicator for Channel C and Channel D.</li> </ul>	<a href="#">Understanding the ILC170AD Status LEDs (page 18)</a>
13	Front panel Monitor Source Select switch: <ul style="list-style-type: none"> <li>• A—Analog video input signal.</li> <li>• D—SDI output signal after audio embedding.</li> </ul>	<a href="#">Using the ILC170AD Monitor Jack (page 20)</a>
14	Front panel monitor mini 75 Ohm SMB output jack (MON).	
15	Backplane connector—Provides power to the module, allows the module to share signals with other function modules, and is used for alarm and management signals.	N/A

## Configuring the ILC170AD

This section describes how to configure the operation of the ILC170AD. You must configure the module while it is out of the host chassis because the configuration DIP switches are mounted to the top of the module PCB.

DIP switches SW1, SW2, and SW4, slide switch SW5, and rotary switch SW6 are located on top of the ILC170AD PCB (see [Figure 15](#)) and determine the operating configuration of the ILC170AD as follows.

- Switch SW1—Controls various video functions, such as the video characteristics (AGC, pedestal, standby signal type, and line rate) and the loss of video alarm.

- Switch SW2—Enables audio embedding and controls various audio characteristics (such as the destination group), the SFP alarm enable, 20- or 24-bit audio resolution, and the EMS enable.
- Switch SW4—Controls the termination of the analog audio input signals.
- Switch SW5—Controls the termination of the analog video input signal.
- Switch SW6—Controls the peak analog audio level that the ILC170AD can manage without clipping.

Artel ships the ILC170AD configured as follows:

- Analog audio source with 600 Ohm termination
- Analog video source with 75 Ohm termination
- Automatic gain control enabled
- Analog video pedestal enabled
- 24-bit audio resolution, +20 dBm (600 Ohms) peak audio level without clipping
- Audio embed enabled into destination group #1
- Analog video enabled through the BNC connector
- SDI grey field, at the NTSC rate, enabled if no video is present
- Audio mode set to 24 bits
- Alarm enabled for no SFP present
- Alarm disabled for no video present
- EMS override enabled (IL Manager can change the ILC170AD configuration)

This section contains the following topics:

- [Configuring Video Functions with DIP Switch SW1 \(page 8\)](#)
- [Configuring Audio Characteristics with DIP Switch SW2 \(page 9\)](#)
- [Configuring Audio Termination with DIP Switch SW4 \(page 11\)](#)
- [Configuring Analog Video Termination with Slide Switch SW5 \(page 11\)](#)
- [Configuring Peak Analog Audio Level with Rotary Switch SW6 \(page 12\)](#)

### **Configuring Video Functions with DIP Switch SW1**

Switch SW1 controls the various video functions of the ILC170AD, such as the video AGC, pedestal, and the standby signal type. This switch also enables or disables the loss of video alarm function.

[Figure 3](#) shows the ILC170AD configuration switch SW1 located on top of the PCB.



**Figure 3. ILC170AD Configuration Switch SW1**

Table 2 describes the DIP switch SW1 configuration options. The factory-set configuration settings are shown in bold type.

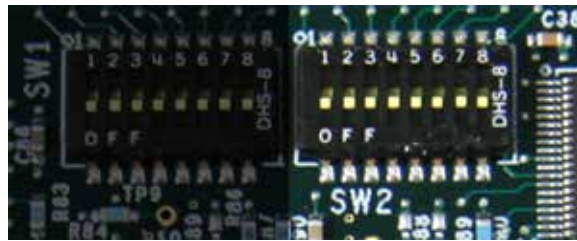
**Table 2. DIP Switch SW1 Settings**

Function	Selected Operation	Position							
		S1	S2	S3	S4	S5	S6	S7	S8
Pedestal ON	Enabled	<b>ON</b>							
	Disabled	OFF							
Video AGC	Enabled		<b>ON</b>						
	Disabled		OFF						
Reserved	Must be ON			<b>ON</b>					
Reserved	Must be ON				<b>ON</b>				
Reserved	Must be ON					<b>ON</b>			
Standby Signal	SDI Grey screen						<b>ON</b>		
	Non-video keepalive						OFF		
SDI grey field standby signal	525 lines (NTCSC)							<b>ON</b>	
	625 lines (PAL)							OFF	
Alarm on Loss of Video	Disabled								<b>ON</b>
	Enabled								OFF

### Configuring Audio Characteristics with DIP Switch SW2

Switch SW2 enables audio embedding and controls the various audio characteristics of the ILC170AD, such as the destination group and audio resolution. This switch also enables the EMS override and SFP alarm functions.

Figure 4 shows the ILC170AD configuration switch SW2 located on top of the PCB.



**Figure 4. ILC170AD Configuration Switch SW2**

Table 3 describes the DIP switch SW2 configuration options. The factory-set configuration settings are shown in bold type.

**Table 3. DIP Switch SW2 Settings**

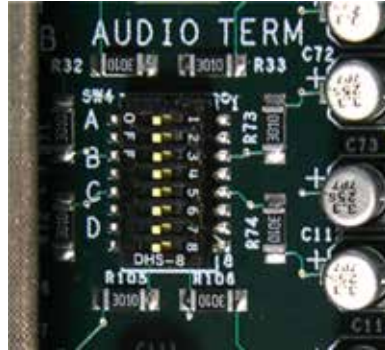
Function	Selected Operation	Position							
		S1	S2	S3	S4	S5	S6	S7	S8
Audio Embed	Enabled	<b>ON</b>							
	Disabled	OFF							
Reserved	Must be ON		<b>ON</b>						
Audio Destination	Group 1			<b>ON</b>	<b>ON</b>				
	Group 2			OFF	ON				
	Group 3			ON	OFF				
	Group 4			OFF	OFF				
Audio Mode	24 bits					<b>ON</b>			
	20 bits					OFF			
Reserved	Must be ON						<b>ON</b>		
SFP Alarms	Enabled							<b>ON</b>	
	Disabled							OFF	
EMS Override	Enabled: IL Manager can change the ILC170AD module configuration.								<b>ON</b>
	Disabled: IL Manager cannot change the ILC170AD module configuration. <sup>1</sup>								OFF

1. If the module is operating in EMS Override mode, as indicated by a green OK LED on the front panel, then the EMS Override DIP switch has no effect until you use IL Manager to take the module out of override mode and set it to local mode (see the *IL Manager Setup and Operations Guide*).

### Configuring Audio Termination with DIP Switch SW4

Switch SW4 sets the termination of the analog audio input signals to either 600 Ohms or high impedance.

Figure 5 shows the ILC170AD configuration switch SW4 located on top of the PCB.



**Figure 5. ILC170AD Configuration Switch SW4**

Table 4 describes the DIP switch SW4 configuration options. The factory-set configuration settings are shown in bold type.

**Table 4. DIP Switch SW4 Settings**

Function	Selected Operation	Position							
		S1	S2	S3	S4	S5	S6	S7	S8
Audio A	600 Ohms	<b>ON</b>							
	High-Z	OFF							
Reserved	Must be ON		<b>ON</b>						
Audio B	600 Ohms			<b>ON</b>					
	High-Z			OFF					
Reserved	Must be ON				<b>ON</b>				
Audio C	600 Ohms					<b>ON</b>			
	High-Z					OFF			
Reserved	Must be ON						<b>ON</b>		
Audio D	600 Ohms								<b>ON</b>
	High-Z								OFF
Reserved	Must be ON								<b>ON</b>

### Configuring Analog Video Termination with Slide Switch SW5

Slide switch SW5 sets the termination of the ILC170AD analog video input signal to either 75 Ohms or high impedance.

Figure 6 shows the ILC170AD configuration switch SW5 located on top of the PCB.



**Figure 6. ILC170AD Configuration Switch SW5**

The possible settings for SW5 are as follows with the factory-set configuration setting shown in bold type:

- **ON**—75 Ohms
- OFF—High impedance

### Configuring Peak Analog Audio Level with Rotary Switch SW6

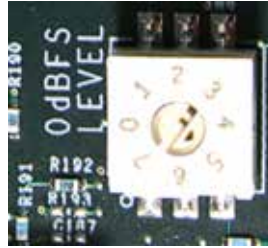
Rotary switch SW6 controls the peak analog audio level that the ILC170AD can manage without clipping. The peak audio level is referred to as 0 dB Full Scale (0dBFS). The information that follows provides an understanding of the 0dBFS concept and how you can adjust for it on the ILC170AD.

When analog audio is converted to digital, the audio is represented by a series of binary values. The highest signal that can be represented occurs when the values are either all zeros or all ones. Attempting to exceed these values causes the audio waveform to be clipped and distorted. The maximum level is called full scale and all audio levels can be described as levels below the full-scale value. If the signal is just at full scale, it is called 0 dBFS. A normal operating level might be -18 dBFS or 18 dB below clipping.

The rotary switch on the ILC170AD allows the input analog voltage level to be matched to the correct digital level. This switch setting is expressed as the peak audio input in dBm (into 600 Ohms) required to reach 0 dBFS. If the peak program level in a typical installation is defined as +20 dBm, then when the switch is set to position 5, a tone at the +20 dBm peak level is converted to a digital signal at 0 dBFS.

When set to embed analog audio, the AUDIO A/B and AUDIO C/D LEDs on the ILC170AD front panel represent the audio status for channels A and B and channels C and D. Normally, these LEDs should be green. If the peak level reaches to between -6dBFS and -1dBFS, the LEDs will turn yellow (or flash yellow). If they flash red repeatedly, the audio peak level is higher than -1dBFS, and the audio program is risking, or experiencing, clipping.

Figure 7 shows the ILC170AD configuration switch SW6 located on top of the PCB.



**Figure 7. ILC170AD Configuration Switch SW6**

**Note:** When using the ILC170AD with the ILC170DA, set the peak audio level rotary switches on both function modules to the same setting to achieve unity gain.

The rotary switch is calibrated with the input terminated in 600 Ohms. [Table 5](#) describes the rotary switch SW6 configuration options.

**Table 5. Rotary Switch SW6 Settings**

Position	Peak Audio Level	Position	Peak Audio Level
0	+10 dBm	4	+18 dBm
1	+12 dBm	<b>5</b>	<b>+20 dBm (default)</b>
2	+14 dBm	6	+22 dBm
3	+16 dBm	7	+24 dBm

## Installing the ILC170 Modules and SFP

The ILC170 and associated SFP are hot swappable, enabling you to safely install them while power is applied to the host chassis. Use the information that this section contains to install either a ILC170AD or a ILC170DA module. Before you install either module type, see the ILC170 data sheet for a detailed description of the product specifications including environmental requirements that you must adhere to when installing the modules.

To install a ILC170 in the host chassis (see [Figure 8](#)), perform the following steps:

1. From the back of the chassis, remove the two screws that secure the blank tray to one of the unused function module slots (if necessary). Use any available function module slot.
2. Slide the ILC170 into the slot using the printed circuit board guide rails located on both sides of the slot.
3. Push the ILC170 in until it is firmly seated into the backplane and flush with the chassis.
4. Tighten the two mounting screws that secure the module to the chassis.

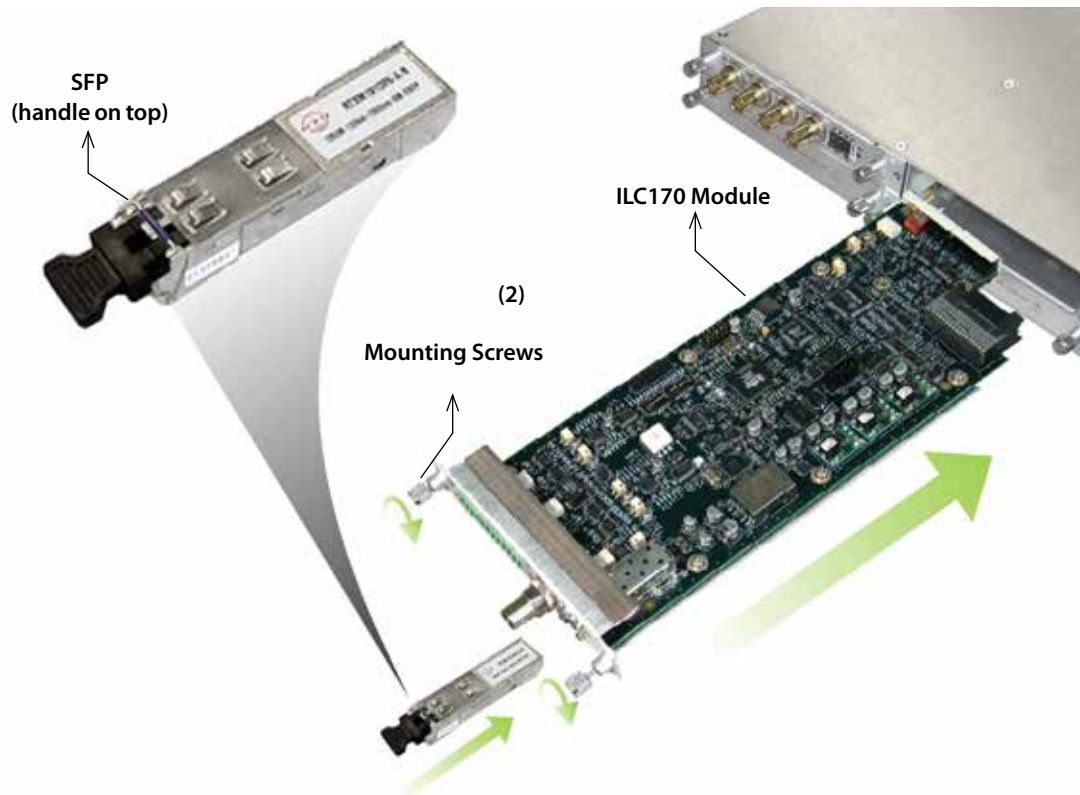
**Note:** Failure to properly secure the ILC170 to the chassis with the two mounting screws can result in disconnecting the module from the backplane when you attach a cable to the monitor jack located on the front panel.

5. Install the SFP into the ILC170 (handle on top as shown in [Figure 8](#)). Push the SFP into the socket located on the right side of the function module until it is firmly seated into the socket.

**Note:** (ILC170AD only) When the “SFP missing” alarm is enabled and you do not install an SFP, the TX status LED located on the ILC170AD front panel flashes. See [Table 6](#) for other LED status indications.

**Note:** (ILC170DA only) When the video source is set to “SFP optical receiver” and you do not install an SFP, the RX status LED located on the ILC170DA front panel flashes. See [Table 11](#) for other LED status indications.

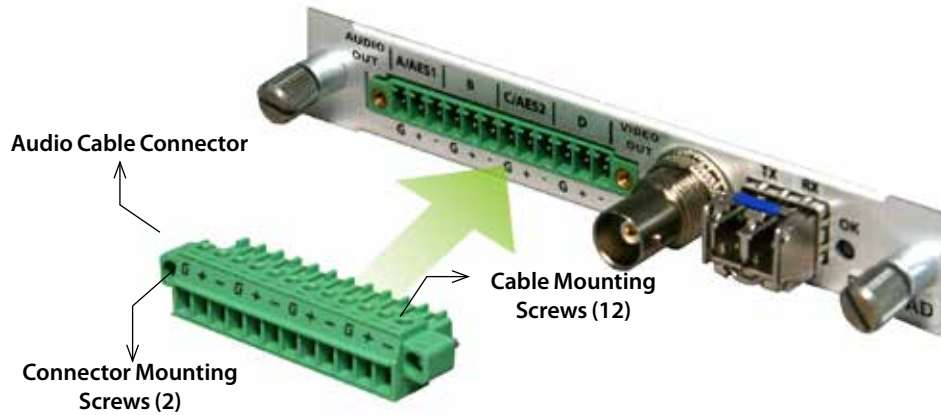
6. Repeat this procedure for each ILC170 module that you are installing in the host chassis.



**Figure 8.** ILC170 Module and SFP Installation



7. Insert the audio cable connector into the module's cable connector as shown in [Figure 9](#).



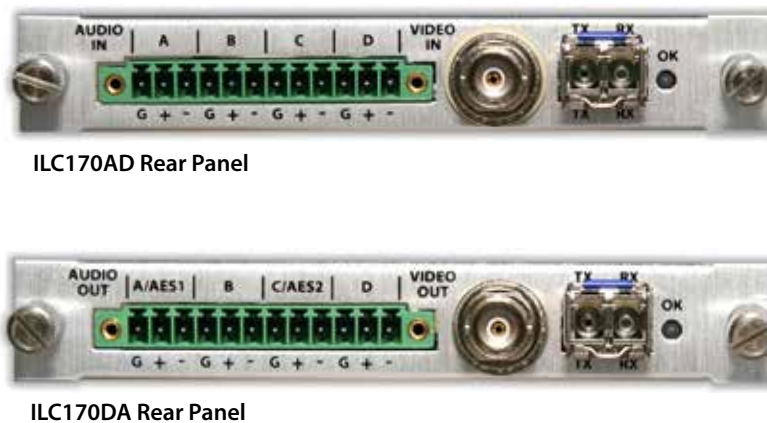
**Figure 9. ILC170 Audio Cable Connector**

8. Secure the audio cable connector to the module using the two connector mounting screws.
9. Use the cable mounting screws to secure the audio cable connections described in the [“Cabling the Audio Connections”](#) section on page 16.

**Note:** Insert a blank tray in any unused chassis module slots to maintain proper ventilation.

### Cabling the ILC170 Modules

The ILC170 allows you to transmit and receive signals over electrical and fiber optic cable connections. The cabling configuration that you use depends on your application. You can have electrical in and out, optical in and out, or any combination of the two. Use the information that this section contains to cable either a ILC170AD or a ILC170DA module. The electrical and optical connectors are located on the rear panel of the ILC170 (see [Figure 10](#)).



**Figure 10. ILC170 Electrical and Optical Connectors**

**Note:** When handling fiber optic cables, adhere to the standard safety practices for handling a Class 1 laser product (see “[ILC170 Laser Warnings](#)” section on page 2).

This section contains the following topics:

- [Cabling the Audio Connections \(page 16\)](#)
- [Cabling the Electrical Video Connections \(page 16\)](#)
- [Cabling the Optical Video Connections \(page 16\)](#)

### **Cabling the Audio Connections**

Use the cable mounting screws on the audio connector (see [Figure 9](#)) to secure the audio cable connections described in this section.

**Note:** (ILC170DA only) When you provision the ILC170DA to provide digital AES-3 audio, only two of the four outputs are used; stereo pair #1 is supplied to channel A and AES stereo pair #2 is supplied to channel C.

### **Cabling the Electrical Video Connections**

To connect to the BNC connector on the ILC170AD and ILC170DA, use a high quality 75 Ohm precision video coax cable, such as Belden 1694A or Belden 8281 cable.

### **Cabling the Optical Video Connections**

Use a single mode fiber when connecting to the LC connectors of the ILC170AD and ILC170DA SFPs.

To cable the optical connections, perform the following tasks:

1. Remove the SFP safety plug that protects the TX and RX ports. Cover any unused optical port to keep the port clean.
2. Cable the optical connections as follows:
  - Receive signal—Connect the fiber optic cable between the source device’s optical transmit connector and the SFP receive optical connector (RX) on the ILC170DA.
  - Transmit signal—Connect the fiber optic cable between the destination device’s optical receive connector and the SFP transmit optical connector (TX) on the ILC170AD or ILC170DA.

## **Adjusting the ILC170AD Video Gain and Equalization**

The ILC170AD allows you to adjust the video gain and equalization of the video signal using the potentiometers located on the front panel (see [Figure 11](#)) as follows:

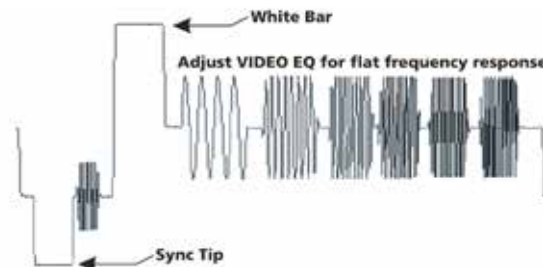
- Video Equalization (EQ)—Equalizes the input signal coming into the VIDEO INPUT BNC connector. The cable should be a Belden 8281, Belden 1694A or equivalent, which can be equalized for up to 300 m (984 ft). When the VIDEO EQ potentiometer is turned full counterclockwise, the gain is flat (i.e. there is no equalization).
- Video Level (LVL)—Adjusts the input level of an analog video signal by  $\pm 3$  dB for 100 IRE.



**Figure 11. ILC170AD Video Gain and Equalization Potentiometers**

To adjust the video gain and cable equalization, perform the following tasks:

1. Connect the source video cable to the video input BNC connector (VIDEO IN) located on the rear panel.
2. Connect a test pattern generator with a multi-burst test pattern to the source end of the video cable. [Figure 12](#) illustrates a multi-burst video test pattern.
3. Connect a calibrated video waveform monitor or vector scope terminated with 75  $\Omega$  to the monitor jack (MON) located on the front panel.
4. Set the monitor source select switch located on the front panel to analog video (A).
5. Set the cable equalization by turning the EQ potentiometer until the signal attains a flat frequency response (the frequency bursts are of the same amplitude as shown in [Figure 12](#)). Adjust the EQ potentiometer as follows:
  - Decrease the amount of cable equalization—Turn the potentiometer counterclockwise.
  - Increase the amount of cable equalization—Turn the potentiometer clockwise.
 If cable equalization is not required, skip ahead to Step 6.
6. Adjust the video input level by turning the LVL potentiometer until you achieve a 1 V peak-to-peak difference from the sync tip to the white bar as measured from the video monitor jack (MON). Adjust the LVL potentiometer as follows:
  - Increase the signal level—Turn the VIDEO LVL potentiometer clockwise.
  - Decrease the signal level—Turn the LVL potentiometer counterclockwise.



**Figure 12. Multi-Burst Video Test Pattern**

## Monitoring the ILC170AD Operations

You monitor the operation of the ILC170AD using the status LEDs and monitor jack located on the front panel of the modules (see [Figure 13](#)).



**Figure 13. ILC170AD Status LEDs and Monitor Jack**

**Note:** You can also use Artel’s element management system, IL Manager, to monitor the module operations (see the *IL Manager Setup and Operations Manual*).

This section contains the following topics:

- [Understanding the ILC170AD Status LEDs \(page 18\)](#)
- [Using the ILC170AD Monitor Jack \(page 20\)](#)

### Understanding the ILC170AD Status LEDs

[Table 6](#) describes the different states of the ILC170AD status LEDs as shown in [Figure 13](#).

**Table 6. ILC170AD Status LEDs**

LED	Indicates ...	State	Description	Alarms	Action
OK (also located on the rear panel (see <a href="#">Figure 10</a> ))	The ILC170AD status	Off	If power is applied to the system, an internal fault with the ILC170AD may exist.	None	Replace the ILC170AD.
		Green	Normal operation.	None	Check other Status LEDs.
		Yellow	If no other status LEDs indicate a minor alarm, then a temperature alarm is indicated.	Minor	Check for adequate inlet and exhaust airflow.
		Red	Major alarm exists that requires immediate attention. TX status LED may provide fault information. If not, the alarm may be the result of an internal error.	Major	Address the problem indicated by the TX status LED if one exists. If not, replace the ILC170AD.

**Table 6. ILC170AD Status LEDs (Continued)**

LED	Indicates ...	State	Description	Alarms	Action
EMS	Element management system, IL Manager, operating status	Off	The ILC170AD module is in local mode and its configuration is controlled by the onboard configuration switches.	None	None.
		Green	The ILC170AD module is in remote mode and the configuration has been set by IL Manager. When in remote mode, the actual configuration of the module will likely not match the settings of the configuration switches and changing the configuration switches will have no effect on the module operation.	None	None.
TX	Transmitter status	Off	Transmitter is disabled. The ILC170AD is being used to feed another module through the chassis backplane.	None	None.
		Green	Normal operation (input signal is present).	None	None.
		Yellow	The ILC170AD cannot detect a video input signal and is transmitting the standby signal. Either an SDI grey screen or a non-video keep-alive signal is transmitted as the standby signal according to the setting of switches S6 and S7 of DIP switch SW1.	None	Check input signal.
		Red (flashing)	No optical SFP is installed or an optical SFP TX fault exists.	Major	Install an SFP or replace the existing SFP.
VIDEO	Video signal status	Off	No video input detected.	None or Major <sup>1</sup>	Check input signal.
		Green	Video input detected.	None	None.
		Yellow	Video overload.	None	Check input signal.
		Red (solid)	Major alarm condition exists because ILC170AD is unable to convert the analog video.	Major	Check the input signal.

**Table 6. ILC170AD Status LEDs (Continued)**

LED	Indicates ...	State	Description	Alarms	Action
AUDIO A/B	Audio signal status for A and B channels	Off	Embedding disabled (SW2, switch S1 is off). See the <a href="#">“Configuring Audio Characteristics with DIP Switch SW2”</a> section on page 9.	None	None.
		Green	Normal operation.	None	None.
		Yellow	Embedding enabled and the audio peak is between -6 dBFS and -1 dBFS.	None	None.
		Red	Embedding enabled and the audio peak is greater than -1 dBFS (overload).	None	Check the input signal source.
AUDIO C/D	Audio signal status for C and D channels	Off	Embedding disabled (SW2, switch S1 is off). See the <a href="#">“Configuring Audio Characteristics with DIP Switch SW2”</a> section on page 9.	None	None.
		Green	Normal operation.	None	None.
		Yellow	Embedding enabled and the audio peak is between -6 dBFS and -1 dBFS.	None	None.
		Red	Embedding enabled and the audio peak is greater than -1 dBFS (overload).	None	Check the input signal source.

1. Loss of video will be a major alarm condition if the Video Loss alarm is enabled (SW1, switch S8 is OFF).

### Using the ILC170AD Monitor Jack

The front panel monitor jack can be set to output either the input analog video or the output digital video (including embedded audio). When the output is set to analog, you can monitor the incoming analog video signal for signal level and quality using conventional analog video equipment. When the output is set to digital, you can monitor the converted video in 270 Mb/s SDI format with embedded audio using digital video test equipment.

To connect a monitor to the ILC170AD, perform the following steps:

1. Connect the monitor cable between the monitor and the mini 75 Ohm SMB monitor jack (MON) located on the ILC170AD front panel (see [Figure 13](#)).
2. Switch the monitor select switch to the desired position:
  - A—Display the analog video source that the ILC170AD is receiving.
  - D—Display the digital video that the ILC170AD is transmitting.

# Understanding and Using the ILC170DA

The ILC170DA module uses advanced video and audio processing for exceptionally high quality conversion of SD-SDI (SMPTE 259M) to composite video and analog audio. It accepts a 270 Mb/s 525/625 line SDI input from either the optical SFP receiver or the backplane and then converts the SDI input to composite analog video and analog audio signals. You can also provision the ILC170DA to supply the electrical version of the received digital video signal in place of the composite analog video. In this application, the ILC170DA can convert both SDI and DVB-ASI from optical to electrical (conversion to analog video can only be accomplished with an SDI input). The ILC170DA can also be provisioned to supply AES-3 digital audio in place of the analog audio.

The ILC170DA provides its received optical signal to the host chassis backplane for additional channel groups to be processed by other cards in the chassis. Audio embedded per SMPTE 272M levels A, B, and C can be extracted as either four balanced analog audio channels or two stereo AES digital audio streams.

The ILC170DA front panel monitor jack can output either analog or digital video. When set to digital, you can check the received video that is in 270 Mb/s SDI format with embedded audio using digital video test equipment. Setting the monitor jack to output analog video enables you to use conventional analog video equipment to check the converted analog video for signal level and quality.

The ILC170DA features include the following:

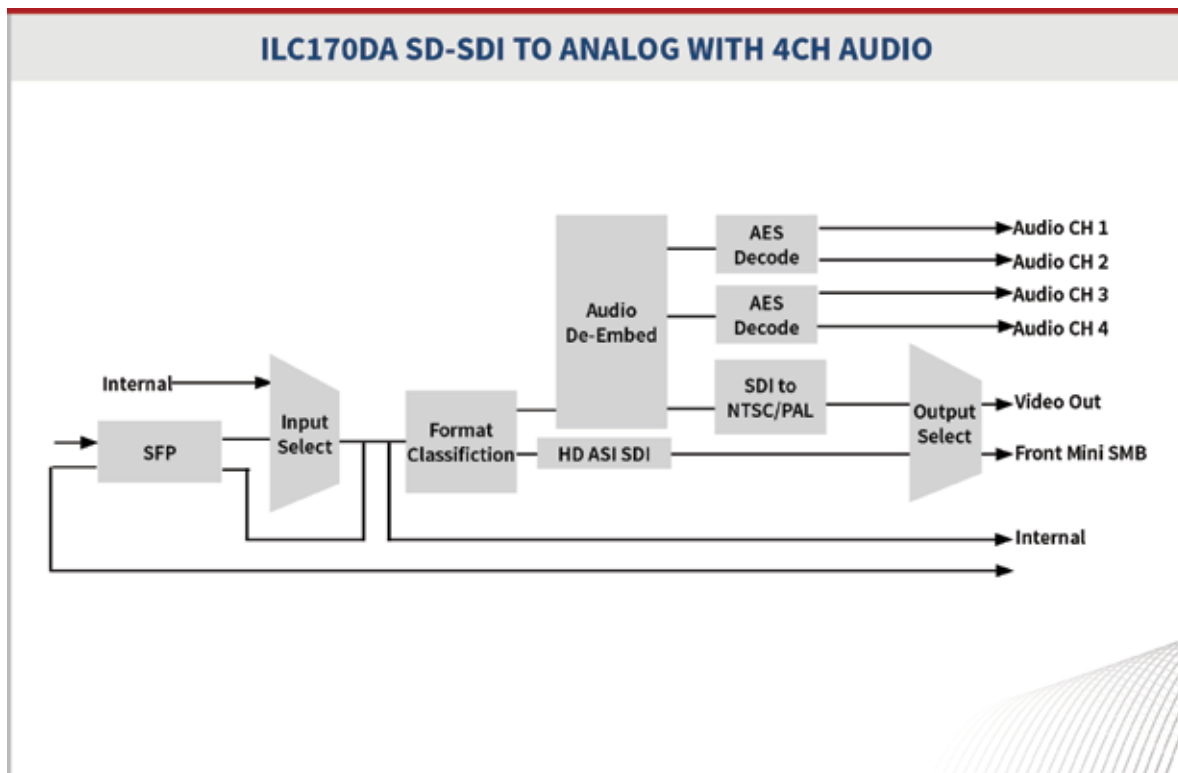
- Single card optical SDI conversion to composite video and analog audio (optical-to-electrical) with optical re-transmission (optical-to-optical repeater)
- Convert SD-SDI (SMPTE 259M) to composite video:
  - NTSC/PAL (based on SDI content)
  - Analog composite 75 Ohm video output BNC
  - 10-bit component digital 525/625 line to NTSC-M or PAL-B/G conversion
  - Composite 12-bit processing converts SDI component video to analog composite video
- Convert SDI to analog or AES-3 audio:
  - SMPTE 272M-ABC audio de-embedding with 20- or 24-bit audio conversion
  - Balanced analog audio outputs (4)
  - Balanced AES audio outputs (2)
- Multiple output options as follows:
  - Composite video or SDI (electrical)
  - Optical repeat of received SDI (drop and continue)
- Use with ILC170AD for optical transport of analog video and audio (exceeds TV-1 and ANSI T1.502 short haul specifications)
- Optical transport using industry-standard optics as follows:
  - WDM (1310 nm, 1550 nm)
  - CWDM
  - DWDM per ITU G694.1 channels 21-60

This section contains the following topics:

- [ILC170DA Functional Description \(page 22\)](#)
- [ILC170DA Overview \(page 24\)](#)
- [Configuring the ILC170DA \(page 26\)](#)
- [Installing and Cabling the ILC170DA \(page 30\)](#)
- [Monitoring the ILC170DA Operations \(page 30\)](#)

## ILC170DA Functional Description

This section provides a functional description of the ILC170DA, including the functional block diagram shown in [Figure 14](#). The ILC170DA converts a single optical SDI signal into one electrical analog video signal and four electrical analog audio signals. Optionally, the ILC170DA can be provisioned to return the audio signal from the optical SDI signal as two of AES-3 stereo pairs. The ILC170DA can also be provisioned to deliver the electrical video signal as a digital video SDI signal.



**Figure 14. ILC170DA Module Functional Block Diagram**

This section contains the following topics:

- [Signal Paths \(page 23\)](#)
- [Optical Video Input and Output \(page 23\)](#)
- [Electrical Video Input \(page 23\)](#)



- [Electrical Video Output \(page 23\)](#)
- [Audio Output \(page 23\)](#)

### Signal Paths

Typically, the ILC170DA receives an optical SDI signal through an SFP that it then converts to an electrical SDI signal. The ILC170DA then converts the digital video in the electrical SDI signal to analog video and makes it available through the BNC connector on the back of the module. The ILC170DA also extracts the embedded audio signals from the electrical SDI signal and converts them into four analog audio signals or two AES-3 stereo pairs.

The ILC170DA can also receive its input from another function module in the host chassis (for example, a ILC274).

### Optical Video Input and Output

The ILC170DA receives the optical SDI signal through an SFP installed in the SFP socket. Optical performance is dependent on the selected SFP module, which must be specifically qualified by Artel to pass the video SDI pathological patterns. The SFP modules use LC/PC connectors. Consult Artel for available SFP options.

The ILC170DA can repeat the received optical SDI signal and transmit the repeated signal through the SFP. This feature provides a “drop-and-continue” capability.

### Electrical Video Input

The ILC170DA can receive an electrical SDI signal from another function module in the host chassis through the backplane. You select the video source using either the module switches or the element management system (EMS) IL Manager (see the *IL Manager Setup and Operations Manual*).

### Electrical Video Output

The ILC170DA provides the following electrical video outputs:

- 75 Ohm BNC connector—Provides the converted analog video output. Located on the rear panel of the module, this connector is also used for video output when you provision the ILC170DA to supply a digital video output.
- Backplane connector—Provides a copy of the SDI electrical signal through the backplane for use by other function modules in the host chassis.
- Monitor jack—Allows you to monitor either the ILC170DA analog output or the digital video input using the front panel mini 75 Ohm SMB connector.

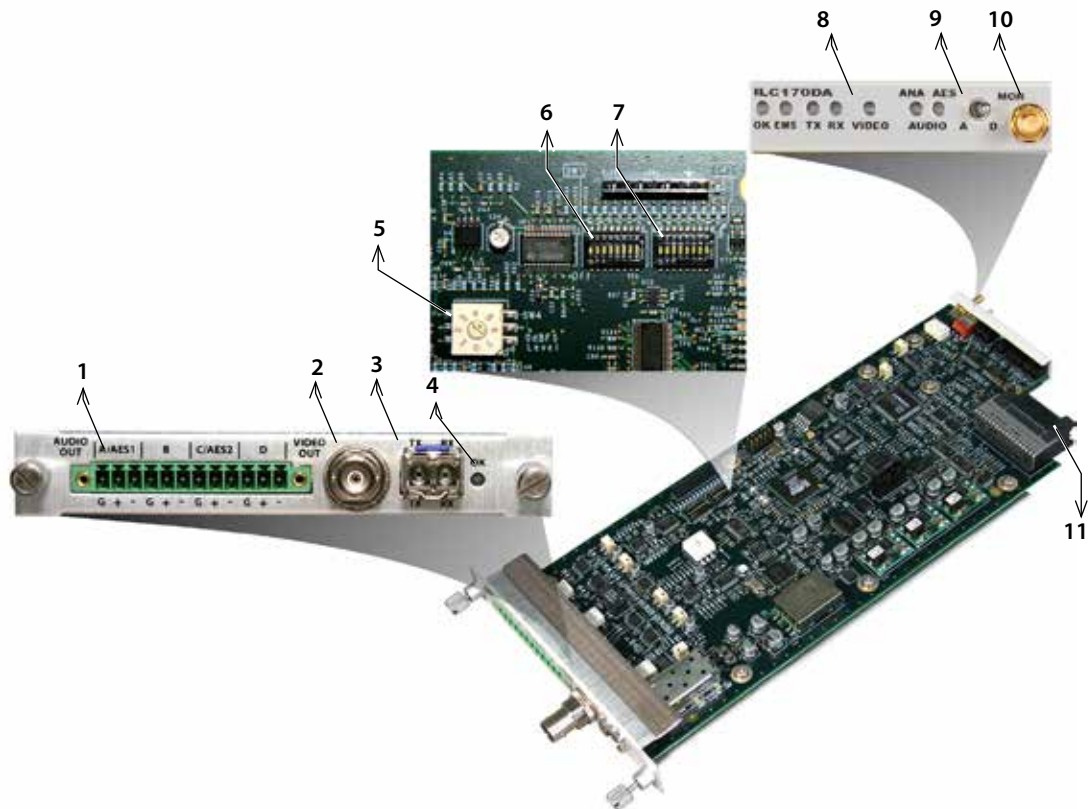
### Audio Output

The ILC170DA provides audio output signals through a quad three-pin terminal block consisting of 12 pins. This terminal provides four balanced audio signal outputs, each with a positive (+), negative (-), and ground (G) connector. The four analog balanced audio outputs are organized as two stereo pairs; left & right channels. You provision all of the ILC170DA audio output channels to be either analog or AES. When you provision the ILC170DA to supply digital AES-3 audio, only two of the four outputs are used; stereo pair #1 is supplied to channel A and AES stereo pair #2 is supplied to channel C.

The the ILC170DA decodes the analog outputs from 20-bit or 24-bit audio embedded in the SDI at a sampling rate of 48 kHz. An eight-position miniature rotary switch SW4 allows you to set the A/D 0 dBFS level from +10 dBm to +24 dBm into 600 Ohms in 2 dB steps. The 0 dBFS level switch setting is available to the optional EMS, which can override the switch setting.

## ILC170DA Overview

Figure 15 provides a view of the major components of the ILC170DA.



**Figure 15. ILC170DA Module Major Components**

Table 7 describes the components called out in Figure 15.

**Table 7. ILC170DA Elements**

Item	ILC170DA Element	for details, see...
1	Rear panel quad three-pin terminal block for audio output (an audio connector is provided that enables screw-on cable connections).	<a href="#">Cabling the Audio Connections (page 16)</a>
2	Rear panel BNC connector for video output.	<a href="#">Cabling the Electrical Video Connections (page 16)</a>

**Table 7. ILC170DA Elements (Continued)**

Item	ILC170DA Element	for details, see...
3	Rear panel SFP socket for the following optical connections: <ul style="list-style-type: none"> <li>• TX—Transmit</li> <li>• RX—Receive</li> </ul>	<a href="#">Cabling the Optical Video Connections (page 16)</a>
4	Rear panel alarm indicator LED (OK)	<a href="#">Understanding the ILC170DA Status LEDs (page 31)</a>
5	Peak audio level rotary switch SW4	<a href="#">Configuring Peak Analog Audio Level with Rotary Switch SW4 (page 29)</a>
6	Video control switch SW1	<a href="#">Configuring Video Functions with DIP Switch SW1 (page 26)</a>
7	Audio control switch SW2	<a href="#">Configuring Audio Characteristics with DIP Switch SW2 (page 28)</a>
8	Front panel status LEDs: <ul style="list-style-type: none"> <li>• OK—Alarm indicator</li> <li>• EMS—Element Management System indicator</li> <li>• TX—Transmit signal indicator</li> <li>• RX—Receive signal indicator</li> <li>• VIDEO—Video signal indicator</li> <li>• ANA—Analog audio signal indicator</li> <li>• AES—AES signal indicator</li> </ul>	<a href="#">Understanding the ILC170DA Status LEDs (page 31)</a>
9	Front panel monitor Channel Select switch: <ul style="list-style-type: none"> <li>• A—SDI input signal</li> <li>• D—Analog video output signal</li> </ul>	<a href="#">Using the ILC170DA Monitor Jack (page 34)</a>
10	Front panel monitor mini 75 Ohm SMB output jack (MON).	
11	Backplane connector—Provides power to the module, allows the module to share signals with other function modules, and is used for alarm and management signals.	N/A

## Configuring the ILC170DA

This section describes how to configure the operation of the ILC170DA. You must configure the module while it is out of the host chassis because the configuration DIP switches are mounted to the top of the module PCB.

DIP switches SW1, SW2, and rotary switch SW4 located on top of the ILC170DA PCB (see [Figure 15](#) for switch locations), determine the operating configuration of the ILC170DA as follows:

- Switch SW1—Controls various video functions of the ILC170DA, such as source selection (SFP, backplane), video characteristics (pedestal) and the loss of video alarm.
- Switch SW2—Controls various audio characteristics of the ILC170DA (enable, format, and source group), determines if the ILC170DA acts as a repeater, and enables the EMS override function.
- Switch SW4—Controls the peak analog audio level that the ILC170DA produces.

Artel ships the ILC170DA configured as follows:

- Video source is optical SDI from the SFP
- Analog video pedestal enabled
- Analog video enabled through the BNC connector
- Alarm disabled for no video present
- Analog audio output
- +20 dBm (600 Ohms) peak audio level
- Audio de-embed enabled from group #1
- Optical repeating disabled
- EMS override enabled (IL Manager can change the ILC170DA configuration)

**Note:** In addition to the configuration information contained in the section, the ILC170DA has a switch legend located on the bottom of the module that you use to configure the switches.

This section contains the following topics:

- [Configuring Video Functions with DIP Switch SW1 \(page 26\)](#)
- [Configuring Audio Characteristics with DIP Switch SW2 \(page 28\)](#)
- [Configuring Peak Analog Audio Level with Rotary Switch SW4 \(page 29\)](#)

### Configuring Video Functions with DIP Switch SW1

Switch SW1 controls various video functions of the ILC170DA, such as the source selection and video characteristics, including pedestal and the analog/digital video output. This switch also enables the loss of video alarm function.

[Figure 16](#) shows the ILC170DA configuration switch SW1 located on top of the PCB.



**Figure 16. ILC170DA Configuration Switch SW1**

Table 8 describes the DIP switch SW1 configuration options. The factory-set configuration settings are shown in bold type.

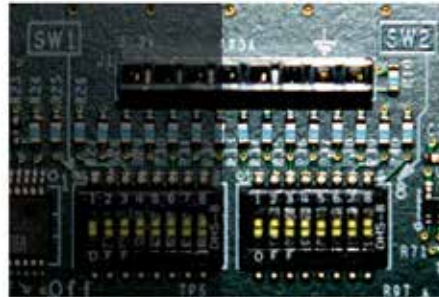
**Table 8. DIP Switch SW1 Settings**

Function	Selected Operation	Position							
		S1	S2	S3	S4	S5	S6	S7	S8
Pedestal ON	Enabled	<b>ON</b>							
	Disabled	OFF							
Video output format (at the BNC)	Analog		<b>ON</b>						
	SDI		OFF						
Video Source	SFP optical receiver			<b>ON</b>	<b>ON</b>	<b>ON</b>			
	Backplane 1 (SDI)			OFF	OFF	OFF			
	Backplane 2 (SDI)			OFF	ON	OFF			
	Backplane 3 (SDI)			OFF	OFF	ON			
	Backplane 4 (SDI)			OFF	ON	ON			
	Reserved			ON	OFF	OFF			
	Reserved			ON	ON	OFF			
	Reserved			ON	OFF	ON			
Reserved	Must be ON						<b>ON</b>		
Reserved	Must be ON							<b>ON</b>	
Video loss alarm	Disabled								<b>ON</b>
	Enabled								OFF

### Configuring Audio Characteristics with DIP Switch SW2

Switch SW2 enables audio output and controls various audio characteristics of the ILC170DA, such as audio output format and the audio source group selection. This switch also enables the optical repeater and EMS override functions.

Figure 17 shows the ILC170DA configuration switch SW2 located on top of the PCB.



**Figure 17. ILC170DA Configuration Switch SW2**

Table 9 describes the DIP switch SW2 configuration options. The factory-set configuration settings are shown in bold type.

**Table 9. DIP Switch SW2 Settings**

Function	Selected Operation	Position							
		S1	S2	S3	S4	S5	S6	S7	S8
Audio output	Enabled	<b>ON</b>							
	Disabled	OFF							
Audio output format	Analog		<b>ON</b>						
	AES-3		OFF						
Audio Source	Group 1			<b>ON</b>	<b>ON</b>				
	Group 2			OFF	ON				
	Group 3			ON	OFF				
	Group 4			OFF	OFF				
Reserved	Must be ON					<b>ON</b>			
Reserved	Must be ON						<b>ON</b>		
Optical repeater disable	Disabled							<b>ON</b>	
	Enabled							OFF	

**Table 9. DIP Switch SW2 Settings (Continued)**

Function	Selected Operation	Position								
		S1	S2	S3	S4	S5	S6	S7	S8	
EMS override	Enabled: IL Manager can change the ILC170DA module configuration.									<b>ON</b>
	Disabled: IL Manager cannot change the ILC170DA module configuration. <sup>1</sup>									OFF

1. If the module is operating in EMS Override mode, as indicated by a green OK LED on the front panel, then the EMS Override DIP switch has no effect until you use IL Manager to take the module out of override mode and set it to local mode (see the *IL Manager Setup and Operations Guide*).

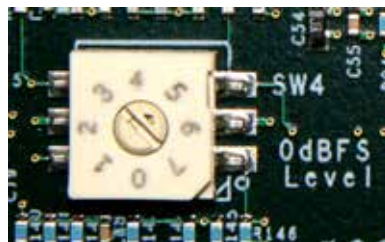
### Configuring Peak Analog Audio Level with Rotary Switch SW4

Rotary switch SW4 controls the peak analog audio level that will be produced by the ILC170DA. The peak audio level is referred to as 0 dB Full Scale (0 dBFS). The information that follows provides an understanding of the 0 dBFS concept and how you can adjust for it on the ILC170DA.

When analog audio is converted to digital, the audio is represented by a series of binary values. The highest signal that can be represented occurs when the values are either all zeros or all ones. Attempting to exceed these values causes the audio waveform to be clipped and distorted. The maximum level is called Full-Scale and all audio levels can be described as levels below the full-scale value. If the signal is just at full scale, it is called 0 dBFS. A normal operating level might be -18 dBFS, or 18 dB below clipping.

The SW4 rotary switch on the ILC170DA allows the output analog voltage level to be matched to the correct digital level. This switch setting is expressed as the peak audio output in dBm (into 600 Ohms) required to reproduce 0 dBFS. If the peak program level in a typical installation is defined as +20 dBm, then when the switch is set to position 5, a tone at the maximum digital value is converted to an analog signal at +20 dBm.

Figure 18 shows the ILC170DA configuration switch SW4 located on top of the PCB.


**Figure 18. ILC170DA Configuration Switch SW4**

**Note:** When using the ILC170DA with the ILC170AD, set the peak audio level rotary switches on both function modules to the same setting to achieve unity gain.

The rotary switch is calibrated with the input terminated in 600 Ohms. [Table 10](#) describes the rotary switch SW4 configuration options.

**Table 10. Rotary Switch SW4 Settings**

Position	Peak Audio Level	Position	Peak Audio Level
0	+10 dBm	4	+18 dBm
1	+12 dBm	<b>5</b>	<b>+20 dBm (default)</b>
2	+14 dBm	6	+22 dBm
3	+16 dBm	7	+24 dBm

## Installing and Cabling the ILC170DA

Follow the instructions located in the following sections to install and cable the ILC170DA:

- [Installing the ILC170 Modules and SFP \(page 13\)](#)
- [Cabling the ILC170 Modules \(page 15\)](#)

## Monitoring the ILC170DA Operations

This section describes how to monitor the ILC170DA operations using the front panel LEDs and the monitor (see [Figure 19](#)).



**Figure 19. ILC170DA Status LEDs and Monitor Connector**

**Note:** You can also use Artel's element management system, IL Manager, to monitor the module operations (see the *IL Manager Setup and Operations Manual*).

This section contains the following topics:

- [Understanding the ILC170DA Status LEDs \(page 31\)](#)
- [Using the ILC170DA Monitor Jack \(page 34\)](#)



## Understanding the ILC170DA Status LEDs

Table 11 describes the different states of the ILC170DA status LEDs as shown in Figure 19.

**Table 11. ILC170DA Status LEDs**

LED	Indicates . . .	State	Description	Alarms	Action
OK (also located on the rear panel (see Figure 10))	The ILC170DA status	Off	If power is applied to the system, an internal fault with the ILC170DA may exist.	None	Replace the ILC170DA.
		Green	Normal operation.	None	None.
		Yellow	RX status LED may provide fault information. If no other status LEDs indicate a minor alarm, then a temperature alarm is indicated.	Minor	Address the problem indicated by the RX status LED if one exists. If not, check that there is adequate inlet and exhaust airflow.
		Red	Major alarm exists and requires immediate attention. TX, RX, or VIDEO status LEDs may provide more information on the fault. The alarm may also be the result of an internal error.	Major	Address the problem indicated by the TX, RX, or VIDEO status LEDs if one exists. If not, replace the ILC170DA.
EMS	Element Management System status	Off	The ILC170DA module is in local mode and its configuration is controlled by the onboard configuration switches.	None	None.
		Green	The ILC170DA module is in remote mode and the configuration has been set by the EMS. When in remote mode, the actual configuration of the module will likely not match the settings of the configuration switches and changing the configuration switches will have no effect on the module operation.	None	None.

Table 11. ILC170DA Status LEDs (Continued)

LED	Indicates ...	State	Description	Alarms	Action
TX	Transmitter status	Off	Transmitter is disabled. The ILC170DA is not being used to repeat the received optical signal.	None	None.
		Green	Normal operation (input signal is present). The ILC170DA is being used to repeat the received optical signal.	None	None.
		Yellow	The ILC170DA cannot detect an optical video input signal to repeat and is transmitting the non-video keep-alive standby signal.	None	Check the optical input signal.
		Red (flashing) <sup>1</sup>	Major alarm condition exists because no optical SFP is installed or an optical SFP TX fault exists.	None or major <sup>2</sup>	Install an SFP or replace the existing SFP.
RX	Receiver status	OFF	Video input from the backplane (not the SFP) selected.	None	None.
		Green	Normal operation (optical video signal is detected).	None	None.
		Yellow	Non-video keep-alive signal is being received.	Minor	Check the module transmitting the source signal (for example, a ILC170AD).
		Yellow (flashing)	Receive optical power is high.	Minor	Check the input signal level and install an attenuator if required.
		Red (flashing) <sup>1</sup>	Major alarm condition exists because of low optical receive power or because no SFP is installed.	None or major <sup>2</sup>	Check the received optical power, install the missing SFP, or replace the existing SFP.

Table 11. ILC170DA Status LEDs (Continued)

LED	Indicates ...	State	Description	Alarms	Action
VIDEO	Video Signal Status	Off	No video input detected.	None or major <sup>2</sup>	Check input signal.
		Green	Video input detected.	None	None.
		Yellow	ASI signal present on the BNC output; the output is selected for SDI and the received digital video signal is DVB-ASI.	None	None.
		Red (solid)	Input video is outside the $\pm 100$ ppm range, or non-SDI video signal in analog mode.	None or major <sup>2</sup>	Check the input signal.
AUDIO ANA	Analog audio signal status	Off	Analog audio de-embedding is disabled (SW2, switch S1 is OFF and/or SW2, switch S2 is OFF). See the <a href="#">"Configuring Audio Characteristics with DIP Switch SW2"</a> section on page 28	None	None.
		Green	Analog audio de-embedding is enabled and a valid signal is present.	None	None.
		Yellow	Analog audio de-embedding is enabled and errors are detected in the embedded audio signals.	None	Check the input signal source.
		Red	Analog audio de-embedding is enabled and no audio program is detected in the selected group.	None	Check the input signal source and provisioning of SW2, switch S3 and SW2, switch S4. See the <a href="#">"Configuring Audio Characteristics with DIP Switch SW2"</a> section on page 28

**Table 11. ILC170DA Status LEDs (Continued)**

LED	Indicates ...	State	Description	Alarms	Action
AUDIO AES	AES audio signal status	Off	AES audio de-embedding is disabled (SW2, switch S1 is OFF and/or SW2, switch S2 is ON). See the <a href="#">“Configuring Audio Characteristics with DIP Switch SW2”</a> section on page 28.	None	None.
		Green	AES audio de-embedding is enabled and a valid signal is present.	None	None.
		Yellow	AES audio de-embedding is enabled and errors are detected in the embedded audio signals.	None	Check the input signal source.
		Red	AES audio de-embedding is enabled and no audio program is detected in the selected group.	None	Check the input signal source and provisioning of SW2, switches S3 and S4. See the <a href="#">“Configuring Audio Characteristics with DIP Switch SW2”</a> section on page 28.

1. Loss of video will be a major alarm if the “Video Loss Alarm” is enabled (SW2, switch S8 is OFF).
2. The “Missing SFP” alarm is enabled if the SFP optical receiver is selected (SW2, switches S3, S4, and S5 are ON) or the optical repeater is enabled (SW3, switch S7 is OFF).

### Using the ILC170DA Monitor Jack

The front panel monitor jack can be set to output either the input digital video (including embedded audio) or the output analog video. When the output is set to digital, you can monitor the incoming digital video in 270 Mb/s SDI format with embedded audio for signal level and quality using digital video test equipment. When the output is set to analog, you can monitor the converted video using conventional analog video equipment.

To connect a monitor to the ILC170DA, perform the following steps:

1. Connect the monitor cable between the monitor and the mini 75 Ohm SMB monitor jack (MON) located on the ILC170DA front panel (see [Figure 19](#)).
2. Switch the monitor select switch to the desired position:
  - D—Display the digital video that the ILC170DA is receiving.
  - A—Display the analog video output that the ILC170DA is transmitting.

# Removing the SFP, Audio Cable, and ILC170 Module

You can safely remove either the SFP or audio cable connector from the ILC170, or the ILC170 from the host chassis while power is applied to the module.

This section contains the following topics:

- [Removing the SFP \(page 35\)](#)
- [Removing the Audio Cable Connector \(page 35\)](#)
- [Removing the ILC170 Module \(page 36\)](#)

## Removing the SFP

To remove the SFP from the ILC170 (see [Figure 20](#)), perform the following steps:

1. Remove the fiber optic cables from the SFP.
2. Pull down on the SFP handle to dislodge the SFP from the ILC170.
3. Using the SFP handle, pull the SFP out of the ILC170.



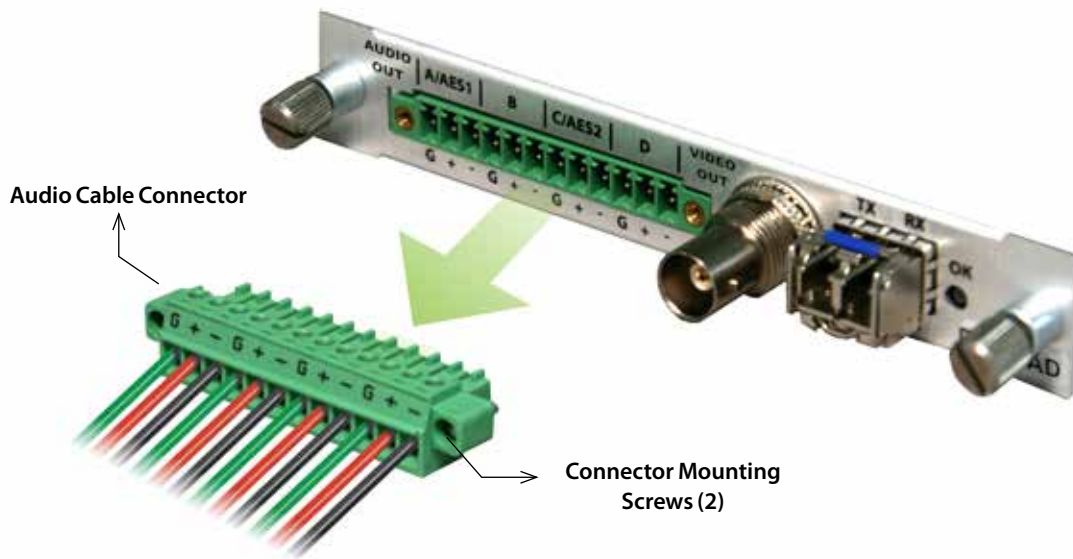
**Figure 20.** Removing the SFP

## Removing the Audio Cable Connector

The audio cable connector enables you to easily remove the audio cables from the module without having to remove each cable. This enables you to swap out the ILC170 without having to rewire the audio cable connections.

To remove the audio cable connector from the ILC170 (see [Figure 21](#)), perform the following steps:

1. Loosen the two screws that secure the cable connector to the ILC170.
2. Remove cable connector from the ILC170.



**Figure 21. Removing the Audio Cable Connector**

## Removing the ILC170 Module

To remove the ILC170 from the host chassis, perform the following steps:

1. Remove the fiber optic cables from the ILC170 module SFP.
2. Remove the coaxial cables from the BNC connector.
3. Remove the audio cable connector (see the [“Removing the Audio Cable Connector”](#) section on page 35).
4. Loosen the two mounting screws that secure the ILC170 to the host chassis.
5. Using the two mounting screws, pull the ILC170 out of the host chassis.

### Caution

To avoid problems associated with overheating, do not leave a function module slot open when power is applied to the chassis. Every module slot must contain a module or blank tray to ensure proper ventilation when power is applied.



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