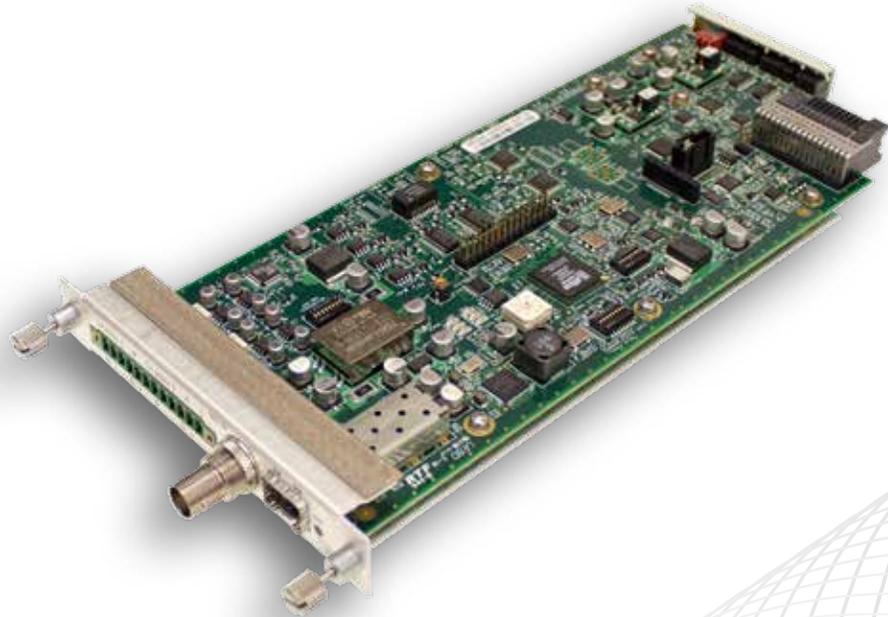




DIGILINK DLC150E FUNCTION MODULE



**SDI/SDTI 4-Channel Analog/
Digital AES Audio Embed and
Optical Transmitter**

**Installation and Operations
Manual**



DLC150E Function Module

**SDI/SDTI 4 Channel Analog/Digital AES Audio Embed
and Optical Transmitter**

Installation and Operations Manual

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Revision history for the *DLC150E Function Module Installation and Operations Manual*.

Revision History			
Revision	Document Number	Date	Reason for Change
A	AR200-008050-C00_K	January, 2012	Initial release.
B	AR200-008050-C00_L	February, 2016	Updated Artel logo.
C	AR200-008050-C00_M	December, 2016	Updated images and copy.



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About This Manual

This manual provides instructions for installing, configuring, and operating the DLC150E function module.

Audience

This manual is intended for the following trained and qualified service personnel who are responsible for installing and operating the DLC150E:

- System installer
- Hardware technician
- System operator

Related Documentation

The following documentation contains material related to the DLC150E function module:

Document	Provides . . .
<i>DLC150E Data Sheet</i>	Product operating and environmental specifications, and regulatory conformance information.
<i>DLC150E Quick Start</i>	Product configuration information and descriptions of the front panel status LED operations.
<i>DigiLink Media Transport Platform Chassis Data Sheet</i>	Overview and installation instructions for the DigiLink media transport platform chassis options, including the following: <ul style="list-style-type: none">• DL4360x chassis—Installation of this 12-slot chassis, power supplies, switch module, and function modules.• DL4300 chassis—Installation of this 12-slot chassis, power supplies, and function modules.• DL4000 chassis—Installation of this 4-slot chassis, power supplies, and function modules.
<i>DigiLink Media Transport Platform Chassis Data Sheet</i>	Overview of the DigiLink media transport platform.
<i>DigiLink Manager Setup and Operations Manual</i>	Overview and operating instructions for the DL Manager element management system.

Note: To obtain the latest versions of this guide and the documents listed in this section, go to www.artel.com.

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 customercare@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.

DLC150E Function Module

SDI/SDTI 4 Channel Analog/Digital AES Audio Embed and Optical Transmitter

Information About the DLC150E

Chassis Compatibility: DL4360x, DL4300, DL4000, or DL4100

This manual introduces the DLC150E function module (DLC150E), which is a flexible audio embedder and video transport module that can embed analog or AES audio into SDI and SDTI as well as transport all standard 270 Mb/s digital formats.

When operating in *analog mode*, the DLC150E can embed (per SMPTE 272M) two analog stereo pairs (one to four analog signals) in SD-SDI (SMPTE 259M) or SDTI (SMPTE 305M). Features of the analog embedding include:

- 20- or 24-bit sampling at 48 kHz
- Switch-selectable 600 Ohm balanced input impedance and high-impedance balanced input using 3-position terminal blocks
- 0dBFS (full scale volume at the edge of clipping) switch adjustable from +10 dBm to +24 dBm in 2 dB steps (into 600 Ohms)
- Switch-selectable target group (0, 1, 2, or 3) within the SDI or SDTI
- Switch-selectable option to not embed if audio is present in the target group

When operating in *digital mode*, the DLC150E can embed (per SMPTE 272M) two AES-3 digital audio streams (two stereo pairs) in SD-SDI (SMPTE 259M) or SDTI (SMPTE 305M). Features of the digital embedding include:

- 110 Ohm balanced impedance AES-3 audio stream interface (3-position terminal block)
- Support for synchronous (48 kHz) and asynchronous (32.0 kHz, 44.1 kHz, 48 kHz) streams
- Switch-selectable target group (0, 1, 2, 3) within the SDI or SDTI
- Switch-selectable option to not embed if audio is present in the target group

Additional features of the DLC150E include:

- Transport of all 270 Mb/s digital video signals including SD-SDI (SMPTE 259M), SDTI (SMPTE 305M), DVB-ASI (no audio embedding)
- Automatic detection of signal types that can be embedded
- Jitter cleanup of SD-SDI and SDTI
- Cable equalization up to 300 m (Belden 8281 or equivalent)
- EDH checking and generation for SD-SDI and SDTI

- Standby Video Generator that allows audio to be delivered in an SDI grey field when input video is lost
- Selectable non-video keep-alive signal that maintains link operation while allowing downstream equipment to detect loss of signal when input video is lost

The DLC150E can be cascaded using the backplane inputs and outputs for multi-group embedding.

The DLC150E uses industry standard 1310 nm, 1550 nm, and CWDM Small Form Factor Pluggable (SFP) optics. You provision and monitor the DLC150E using onboard switches, status indicators, front panel monitor jack, or Artel's DL Manager, which is an element management system (for more information, see the *DL Manager Setup and Operations Manual*).

DLC150E Laser Warnings

The SFP module used in the DLC150E 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.

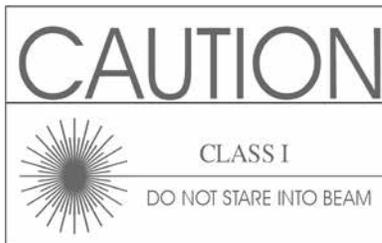


Warning

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.



DLC150E Module Functional Description

This section provides a functional description of the DLC150E. [Figure 1](#) shows the functional block diagram for the DLC150E.

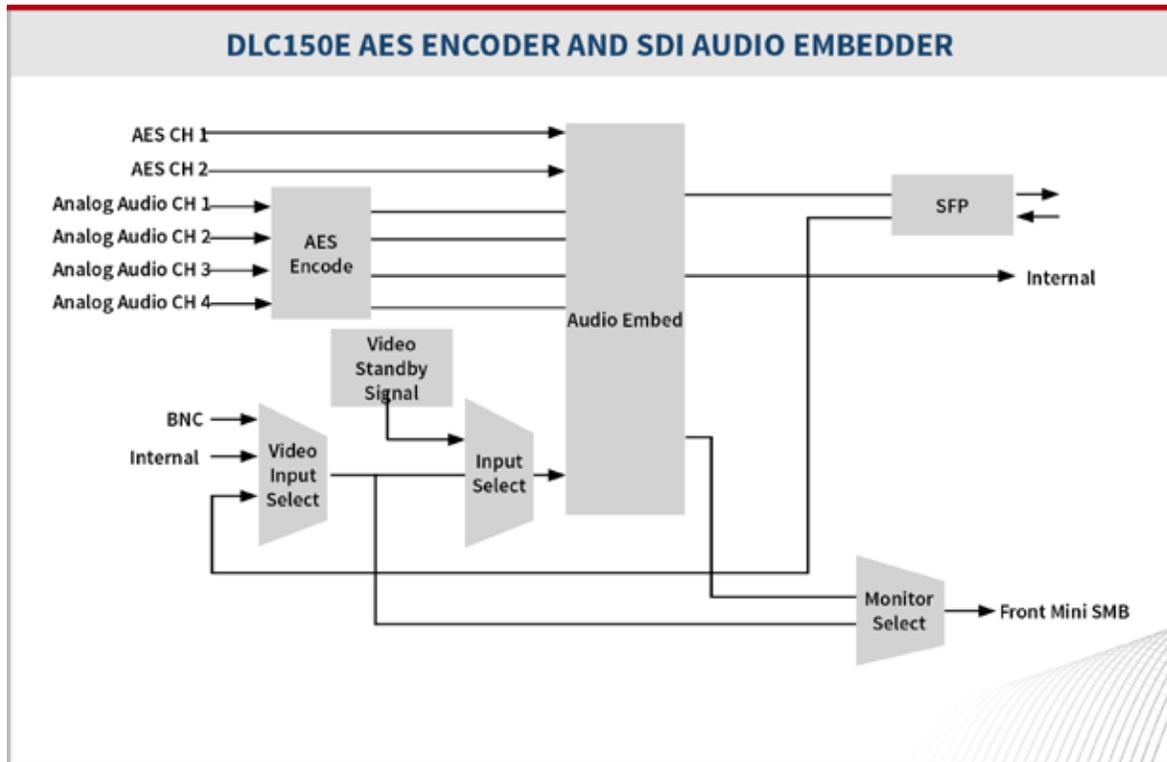


Figure 1. DLC150E Module Functional Block Diagram

This section contains the following topics:

- [Video Signal Paths \(page 3\)](#)
- [Audio Signal Paths \(page 4\)](#)
- [Electrical Outputs \(page 4\)](#)
- [Optical Inputs and Outputs \(page 4\)](#)

Video Signal Paths

The DLC150E accepts digital video signals from the following sources:

- 75 Ohm BNC connector—Located on the rear panel of the module, this is the most commonly used input.
- Another function module in the host chassis—Signals from other modules in the chassis can be received through the backplane.
- Optical input—The optical input of the DLC150E.

You select the digital video source using either the module switches or the management card software. When no video is available on the selected input, the DLC150E enables the standby video generator, which you can configure for one of the following signal types:

- Grey screen into which audio can be embedded
- 525 lines (NTSC)
- 625 lines (PAL)
- 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. This signal is detected by other host chassis modules, such as the DLC103A, so that they can signal that a keepalive signal is intentionally being sent across the optical link. Whenever the DLC150E is transmitting the grey screen or the non-video keepalive signal, the TX LED on the front panel illuminates amber.

When the DLC150E detects that the selected digital video signal is SDI or SDTI, it passes the signal through the Embed and EDH logic. Otherwise, the DLC150E passes the digital video signal directly to the electrical-to-optical circuits.

Audio Signal Paths

The DLC150E accepts audio signals through a quad three-pin terminal block consisting of 12 pins. This terminal accepts up to four balanced audio signals inputs, each with a +, -, and ground. The DLC150E samples each of the four analog audio signals and converts them to digital. The digitized signals are then paired and encoded into an AES-3 stream that the DLC150E embeds into the digital video.

AES-3 digital audio is supplied to the DLC150E using only two of the four balanced inputs (channels A and C). If the digital audio is asynchronous, the DLC150E matches its rate to the digital video stream and then embeds the audio into the digital video.

Electrical Outputs

The DLC150E makes the electrical signal available through the backplane for possible 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 DLC150E output or the selected digital video input.

Optical Inputs and Outputs

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

Overview of the DLC150E Module

This section provides an overview of the components that make up the DLC150E. [Figure 2](#) provides a view of the major components of the DLC150E.

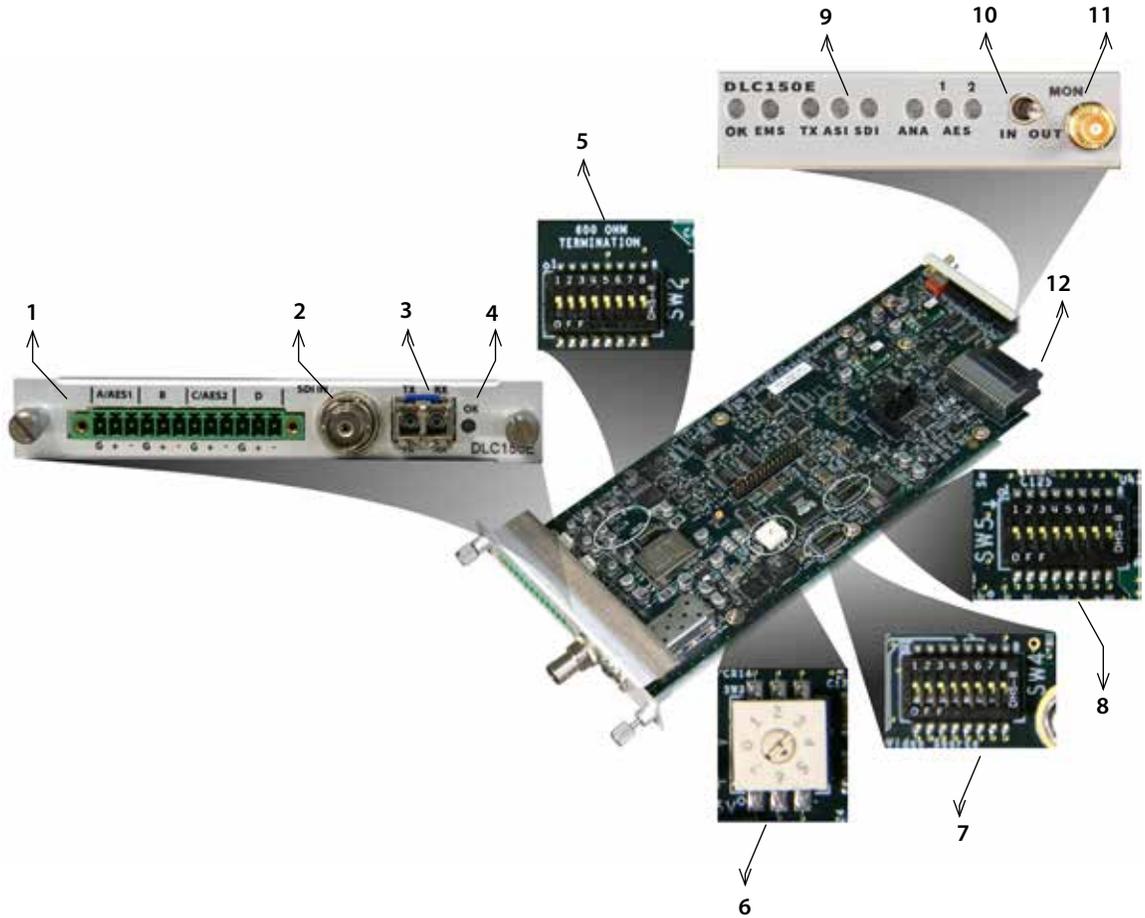


Figure 2. DLC150E Module Major Components

[Table 1](#) describes the components called out in [Figure 2](#).

Table 1. DLC150E Elements

Item	DLC150E Element	for details, see...
1	Quad three-pin terminal block for audio input (audio connector provided that enables screw-on cable connections).	Cabling the Audio Connections (page 15)
2	BNC connector for digital video input.	Cabling the Electrical Video Connections (page 16)
3	SFP socket for the following optical connections: <ul style="list-style-type: none"> • TX—Transmit • RX—Receive 	Cabling the Optical Video Connections (page 16)

Table 1. DLC150E Elements (Continued)

Item	DLC150E Element	for details, see...
4	Rear panel alarm indicator LED (OK).	Understanding the Status LEDs (page 17)
5	SW2—Termination DIP switch.	Configuring DIP Switch SW2 (page 7)
6	SW3—Analog audio rotary switch.	Configuring Rotary Switch SW3 (page 12)
7	SW5—Signal source DIP switch.	Configuring DIP Switch SW4 (page 9)
8	SW5—Module control DIP switch.	Configuring DIP Switch SW5 (page 10)
9	Front panel status LEDs: <ul style="list-style-type: none"> • OK—Alarm indicator • EMS—Element Management System indicator • TX—Transmit signal indicator • ASI—ASI signal status indicator • SDI—SDI signal indicator • ANA—Audio embedding mode indicator • AES—AES signal indicators for inputs 1 (Channel A) and 2 (Channel B) 	Understanding the Status LEDs (page 17)
10	Front panel Monitor Source Select switch: <ul style="list-style-type: none"> • IN—SDI input signal before audio embedding • OUT—SDI output signal after audio embedding 	Using the Monitor Jack (page 20)
11	Front panel monitor mini 75 Ohm SMB output jack.	
12	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 DLC150E Module

This section describes how to configure the operation of the DLC150E. You must configure the module while it is out of the host chassis because the configuration switches are mounted to the top of the module PCB.

The following set of switches control the operating configuration of the DLC150E:

- DIP switch SW2—Controls the termination of the analog audio inputs.
- DIP switch SW4—Controls the signal source selection for the digital video, type of audio, and destination group for the embedding.
- DIP switch SW5—Controls multiple module operating states, including conditional embedding, non-video keepalive signal, line rate for the standby video pattern, digital audio rate converter operation, optional alarm suppression for an uninstalled SFP, and EMS control mode
- Rotary switch SW3—Controls the peak analog audio level that can be handled without clipping.

See [Figure 2](#) for switch locations.

Artel ships the DLC150E configured as follows:

- Analog audio mode set to 24 bits.
- Analog audio source with 600 Ohm termination
- +20 dB peak audio level without clipping
- Asynchronous audio embed into destination group #1
- Digital video enabled through the BNC connector
- SDI grey field enabled if no video is present at the NTSC rate
- Alarm enabled if no SFP is present
- EMS override enabled (DL Manager can change the DLC150E configuration)

Note: In addition to the configuration information contained in the section, the DLC150E has a switch legend located on the bottom of the module that can be used to configure the switches.

This section contains the following topics:

- [Configuring DIP Switch SW2 \(page 7\)](#)
- [Configuring DIP Switch SW4 \(page 9\)](#)
- [Configuring DIP Switch SW5 \(page 10\)](#)
- [Configuring Rotary Switch SW3 \(page 12\)](#)

Configuring DIP Switch SW2

DIP Switch SW2 (see [Figure 3](#)) controls the termination of the analog audio inputs.

Note: DIP switch SW2 affects analog audio signal termination only. When you provision the DLC150E AES-3 audio, the termination is automatically set to 110 Ohms.

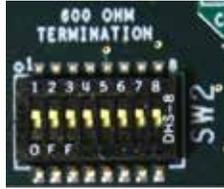


Figure 3. DLC150E Configuration Switch SW2

Table 2 describes the DIP switch SW2 configuration options. The factory-set configuration settings are shown in bold type.

Table 2. DIP Switch SW2 Settings

Function	Selected Operation	Position							
		S1	S2	S3	S4	S5	S6	S7	S8
Channel D termination setting	High impedance input	OFF							
	Terminated in 600 Ohms	ON							
Reserved	N/A (must be ON)		ON						
Channel C termination setting	High impedance input			OFF					
	Terminated in 600 Ohms			ON					
Reserved	N/A (must be ON)				ON				
Channel B termination setting	High impedance input					OFF			
	Terminated in 600 Ohms					ON			
Reserved	N/A (must be ON)						ON		
Channel A termination setting	High impedance input							OFF	
	Terminated in 600 Ohms							ON	
Reserved	N/A (must be ON)								ON

Configuring DIP Switch SW4

Switch SW4 (see [Figure 4](#)) controls the signal source selection for the digital video, the type of audio, audio sampling mode, and destination group for the embedding.

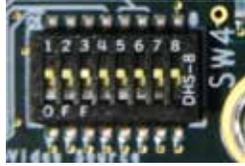


Figure 4. DLC150E Configuration Switch SW4

[Table 3](#) describes the DIP switch SW4 configuration options. The factory-set configuration settings are shown in bold type.

Table 3. DIP Switch SW4 Settings

Function	Selected Operation	Position							
		S1	S2	S3	S4	S5	S6	S7	S8
Video Source	Backplane 1	OFF	OFF	OFF					
	Backplane 2	ON	OFF	OFF					
	Backplane 3	OFF	ON	OFF					
	Backplane 4	ON	ON	OFF					
	Reserved	OFF	OFF	ON					
	Reserved	ON	OFF	ON					
	SFP Optical Receiver	OFF	ON	ON					
	SDI BNC Input	ON	ON	ON					
Audio Source	Analog				ON				
	AES-3 Digital				Off				
Analog Audio Mode	24 bits					ON			
	20 bits					OFF			
SMPTE-259 Destination Group	Group 1						ON	ON	
	Group 2						OFF	ON	
	Group 3						ON	OFF	
	Group 4						OFF	OFF	
Reserved	N/A (must be ON)								ON

Configuring DIP Switch SW5

Switch SW5 (see [Figure 5](#)) controls several module modes including conditional embedding, standby video pattern or the non-video keep-alive signal, line rate for the standby video pattern, digital audio rate converter operation, optional alarm suppression for an uninstalled SFP, and EMS control mode.

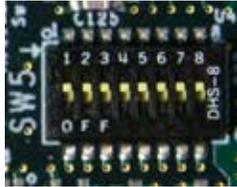


Figure 5. DLC150E Configuration Switch SW5

This section contains the following topics:

- [Understanding Conditional and Unconditional Audio Embedding \(page 10\)](#)
- [Understanding DIP Switch SW5 Configuration Options \(page 10\)](#)

Understanding Conditional and Unconditional Audio Embedding

If the incoming SDI has audio embedded in it already, the DLC150E provides the option of over-writing the embedded audio. Switches S1 and S2 of DIP switch SW5 control this feature.

The default setting with S1 and S2 both set to ON selects *conditional embedding*. The DLC150E embeds audio into the group selected by SW4 only if there is no audio already present in the group. If the SDI contains embedded audio when it is applied to the DLC150E, it passes through for transmission unaltered. If there is no embedded audio present, the DLC150E embeds the local audio as configured.

Setting S1 to ON and S2 to OFF selects *unconditional embedding*. The DLC150E always embeds audio into the group selected by SW4 even if audio is already embedded in the group. If there is audio in the selected group, it is over written. Audio in other groups are not affected.

When the audio applied to the DLC150E must always be embedded, then use unconditional embedding with S1 set to ON and S2 set to OFF to insure that the program audio is not replaced by previously embedded audio. However, when it is unknown if the incoming video might contain embedded audio or not, you can use the conditional mode to allow the DLC150E to automatically embed or not embed depending on the video content.

Understanding DIP Switch SW5 Configuration Options

[Table 4](#) describes the DIP switch SW5 configuration options. The factory-set configuration settings are shown in bold type.

Table 4. DIP Switch SW5 Settings

Function	Selected Operation	Position							
		S1	S2	S3	S4	S5	S6	S7	S8
Audio Embedding Operating Mode	No audio embedding; pass the group as is.	OFF	OFF						
	Unconditionally embed audio into the audio group position specified by the destination audio group switches (SW4: S6 and S7).	ON	OFF						
	Reserved.	OFF	ON						
	Embed audio into the audio group position specified by the destination audio group switches (SW4: S6 and S7) only when audio not present in the incoming video stream.	ON	ON						
Standby Video Generator Output (when the selected input has no digital video)	Non-video keepalive signal.	-	-	OFF					
	SDI grey field.	-	-	ON					
SDI Grey Field Line Rate	PAL rate of 625 lines at 25 frames per second.	-	-	-	OFF				
	NTSC rate of 525 lines at 30 frames per second.	-	-	-	ON				
Rate Converter Audio Format	Enabled for 48 kHz AES-3 audio that has been synchronized (genlocked) to the digital video.	-	-	-		OFF			
	Enabled for asynchronous audio.	-	-	-	-	ON			
Transmitter and SFP Alarm Enable	Optical transmitter is disabled and the major alarm for a missing SFP is disabled. The alarm disable is used when more than one audio group is being embedded and a DLC150E is feeding the result of its embedding into a second DLC150E across the backplane.	-	-	-	-	-	OFF		
	Optical transmitter is enabled and the major alarm for a missing SFP is enabled.	-	-	-	-	-	ON		

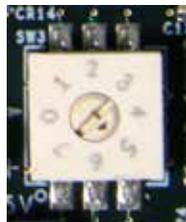
Table 4. DIP Switch SW5 Settings (Continued)

Function	Selected Operation	Position								
		S1	S2	S3	S4	S5	S6	S7	S8	
Reserved	N/A (must be ON)	-	-	-	-	-	-	-	ON	
EMS Override	Enabled: DL Manager can change the DLC150E module configuration.	-	-	-	-	-	-	-	-	ON
	Disabled: DL Manager cannot change the DLC150E module configuration. ¹	-	-	-	-	-	-	-	-	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 DL Manager to take the module out of override mode and set it to local mode (see the *DL Manager Setup and Operations Guide*).

Configuring Rotary Switch SW3

Rotary switch SW3 (see [Figure 6](#)) controls the peak audio level that can be handled without clipping. The peak audio level is referred to as 0 dB Full Scale (0dBFS). The rotary switch is calibrated with the input terminated in 600 Ohms.

**Figure 6. DLC150E Configuration Rotary Switch SW3**

This section contains the following topics:

- [Understanding 0 dBFS \(page 12\)](#)
- [Understanding Rotary Switch SW3 Configuration Options \(page 13\)](#)

Understanding 0 dBFS

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 -10 dBFS or 10 dB below clipping.

The SW3 rotary switch on the DLC150E 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 required to reach 0 dBFS. If the peak program level in a typical installation is defined as +18 dBm, then when the switch is set to position 4, a tone at the +18 dBm peak level is converted to a digital signal at 0 dBFS. If the signal level exceeds the 0 dBFS setting (even briefly) the appropriate front panel LED flashes red.

When set to convert analog audio, the ANA LED is green and the 1 and 2 LEDs represent the audio status for channels A and B (1) and channels C and D (2). Normally, these LEDs should be green. If they flash red repeatedly, the audio peak level is higher than the setting of the rotary switch SW3.

Understanding Rotary Switch SW3 Configuration Options

Table 5 describes the rotary switch SW3 configuration options. The factory-set configuration setting is shown in bold type.

Table 5. Rotary Switch SW3 Settings

Position	Peak Audio Level	Position	Peak Audio Level
0	+10 dBm	4	+18 dBm
1	+12 dBm	5	+20 dBm
2	+14 dBm	6	+22 dBm
3	+16 dBm	7	+24 dBm

Installing the DLC150E Module, SFP, and Audio Connector

The DLC150E and associated SFP are hot swappable, enabling you to safely install them while power is applied to the host chassis. Before you install the DLC150E, see the DLC150E data sheet for a detailed description of the module specifications including environmental requirements that you must adhere to when installing the module.

To install the DLC150E in the host chassis (see [Figure 7](#)), 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 DLC150E into the slot using the printed circuit board guide rails on either side of the slot.
3. Push the DLC150E 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 DLC150E 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 connector located on the front panel.

5. Install the SFP in the DLC150E (handle on top as shown in [Figure 7](#)). Push the SFP into the socket located on the right side of the function module until it is firmly seated into the socket.

Note: When you do not install an SFP, the TX LED located on the DLC150E front panel will flash. See [Table 6](#) for other LED status indications.

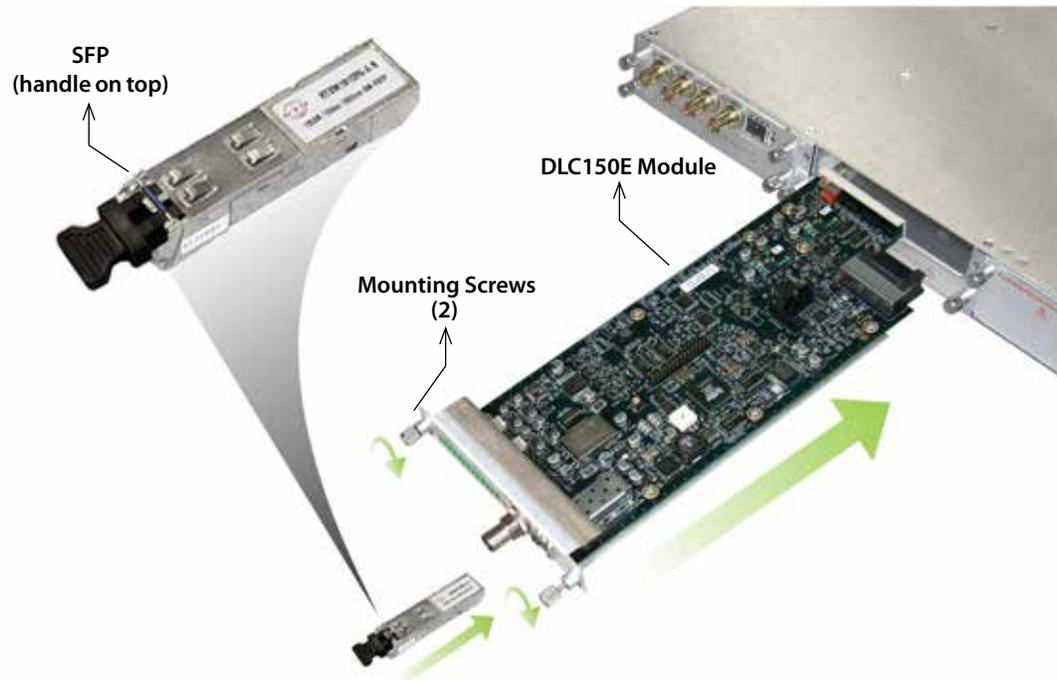


Figure 7. DLC150E Module and SFP Installation

6. Insert the audio cable connector into the module's cable connector as shown in [Figure 8](#).

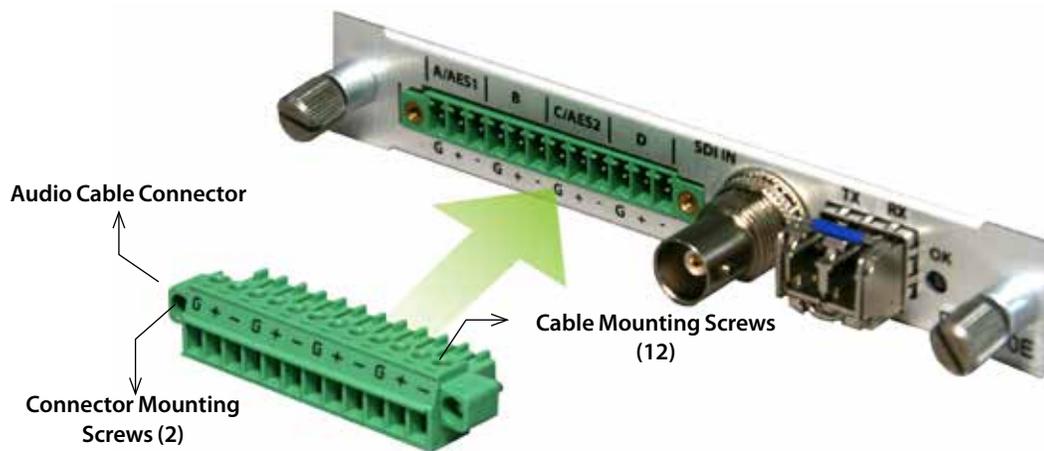


Figure 8. DLC150E Audio Cable Connector

7. Secure the audio cable connector to the module using the two connector mounting screws.

8. Use the cable mounting screws to secure the audio cable connections described in the [“Cabling the Audio Connections”](#) section on page 15.

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

Cabling the DLC150E Module

The DLC150E can 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. The electrical and optical connectors are located on the rear panel of the DLC150E (see [Figure 9](#)).



Figure 9. DLC150E Audio, Electrical, and SFP Optical Connectors

Note: When handling fiber optic cables, adhere to the standard safety practices for handling a Class 1 laser product (see “[DLC150E Laser Warnings](#)” section on page 2).

This section contains the following topics:

- [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 8](#)) to secure the audio cable connections described in this section.

You can insert four balanced analog audio sources or two AES3 formatted digital sources into the user-selected audio group of the SMPTE259M ancillary data space.

The four analog balanced audio inputs are organized as two stereo pairs (left & right channels). Analog inputs are digitized with 20- or 24-bit audio A/Ds sampling at a rate of 48 kHz. The input impedance can be either a nominal 600 Ohm or a high impedance input. DIP switch SW2 permits each channel input to be terminated into 600 Ohms.

The eight-position miniature rotary switch SW3, which is mounted on the module PCB, 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 monitoring processor and it has the ability to override this switch setting.

When AES3 digital audio is used, AES #1 is connected to channel A and AES #2 to channel C of the audio input connector. Switch S4 of DIP switch SW4 selects either analog or AES input format. All channels must be either analog or AES.

When switch S5 of DIP switch SW5 is set to ON, the AES digital audio is sample-rate converted to 48 kHz and synchronized to the SDI video input. Acceptable audio sample rates include 32 kHz, 44.1 kHz, and 48 kHz. This is the default setting and should be used for all normal audio applications, even when the incoming rate is already 48 kHz. When the scan converters are disabled, you are responsible for synchronizing the AES and video input streams together.

When switch S5 of DIP switch SW5 is set to OFF, the AES digital audio bypasses the sample-rate convert and is directly embedded to the SDI video input. In this configuration, the audio must be 48 kHz and synchronized to the SDI video. This setting is provided for special applications in which the AES is used for multi-channel audio.

Cabling the Electrical Video Connections

To connect to the BNC connector on the DLC150E, use a high quality 75 Ohm precision video coax cable, such as Belden 1694A cable.

Cabling the Optical Video Connections

Use a single mode fiber when connecting to the LC connectors of the DLC150E SFP.

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 DLC150E.
 - Transmit signal—Connect the fiber optic cable between the destination device's optical receive connector and the SFP transmit optical connector (TX) on the DLC150E.

Monitoring the DLC150E Module Operation

This section describes how to monitor the DLC150E operations using the front panel LEDs and the monitor jack (see [Figure 10](#)).



Figure 10. DLC150E Status LEDs and Monitor Connector

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

This section contains the following topics:

- [Understanding the Status LEDs \(page 17\)](#)
- [Using the Monitor Jack \(page 20\)](#)

Understanding the Status LEDs

[Table 6](#) describes the different states of the DLC150E status LEDs as shown in [Figure 10](#).

Table 6. DLC150E Status LEDs

LED	Indicates ...	State	Description	Alarms	Action
OK (also located on the rear panel (see Figure 9))	DLC150E module status	Off	If power is applied to the system, an internal fault with the DLC150E may exist.	None	Replace the DLC150E.
		Green	Normal operation.	None	None.
		Yellow	If no other status LEDs indicate a minor alarm, then a temperature alarm condition may exist.	Minor	Check the following: <ul style="list-style-type: none"> • Problem causing an RX alarm • Adequate inlet and exhaust airflow.
		Red	TX may provide fault information or there may be an internal error.	Major	Address indicated TX error or replace the DLC150E.

Table 6. DLC150E Status LEDs (Continued)

LED	Indicates ...	State	Description	Alarms	Action
EMS	Element management system, DL Manager, operating state	Off	The DLC150E module is in local mode and its configuration is controlled by the onboard configuration switches.	None	None.
		Green	The DLC150E module is in remote mode and the configuration has been set by DL 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 DLC150E is using the backplane to provide a feed to another chassis module.	None	None.
		Green	Normal operation (input signal is present).	None	None.
		Yellow	No video input signal is detected. The DLC150E is transmitting the standby signal; either a grey screen or a non-video keepalive signal as determined by SW5, S3.	Major	Check input signal.
		Red (flashing)	SFP is not installed or an SFP TX alarm exists. SW5, S6 must be ON to receive this alarm condition.	Major	Install an SFP or replace the existing SFP.
ASI	DVB-ASI Signal Status	Off	No DVB-ASI video input signal detected.	None	None.
		Green	DVB-ASI video input signal detected, embedding is disabled.	None	None.
		Red (flashing)	DVB-ASI video out-of-rate signal detected ($> \pm 100\text{ppm}$ from 270Mb/s)	None	Check input signal.

Table 6. DLC150E Status LEDs (Continued)

LED	Indicates ...	State	Description	Alarms	Action
SDI	SDI Signal Status	Off	No SDI video input detected.	None	None.
		Green	SDI video input detected and embedding is enabled.	None	None.
		Yellow	SDI input EDH errors detected.	None	Check input signal.
		Yellow (flashing)	SDI input EDA errors detected.	None	Check input signal.
		Red (flashing)	SDI video out-of-rate signal detected ($> \pm 100$ ppm from 270 Mb/s)	None	Check input signal.
ANA	Embedding Mode	Off	AES-3 audio embedding selected.	None	None.
		Green	Analog audio embedding selected.	None	None.
AES1/AES2	Embedding status:				
	AES3-formatted audio	Off	Embedding disabled (SW5, switches 1 and 2 are off).	None	None.
		Green	Normal operation. AES signal present (1 for channel A, 2 for channel C).	None	None.
		Yellow	No AES signal detected (1 for channel A, 2 for channel C).	None	Check audio input signal.
		Yellow (flashing)	CRC error detected in the AES stream (1 for channel A, 2 for channel C).	None	Check audio input signal.
		Red	Audio group in use and embedding disabled (SW5, switches 1 and 2 are on).	None	Check audio input signal.
	Analog audio embedding selected (ANA is green)	Off	Embedding disabled (SW5, switches 1 and 2 are off).	None	None.
		Green	Normal operation.	None	None.
		Red (flashing)	Analog audio overload (1 for channel A or B, 2 for channel C or D).	None	Check audio input signal.
		Red	Audio group in use and embedding disabled (SW5, switches 1 and 2 are on)	None	Check audio input signal.

Using the Monitor Jack

To connect a monitor the DLC150E to view the transmit and receive signals, perform the following steps:

1. Connect the monitor cable between the monitor and the mini 75 Ohm SMB monitor jack (MON) located on the DLC150E front panel (see [Figure 10](#)).
2. Switch the monitor select switch to the desired position:
 - IN—View the digital video source
 - OUT—View the digital video that the DLC150E is transmitting

Removing the SFP and DLC150E Module

You can safely remove either the SFP from the DLC150E or the DLC150E from the host chassis while power is applied to the module.

This section contains the following topics:

- [Removing the SFP \(page 20\)](#)
- [Removing the DLC150E Module \(page 21\)](#)

Removing the SFP

To remove the SFP from the DLC150E, 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 DLC150E.
3. Using the SFP handle, pull the SFP out of the DLC150E.

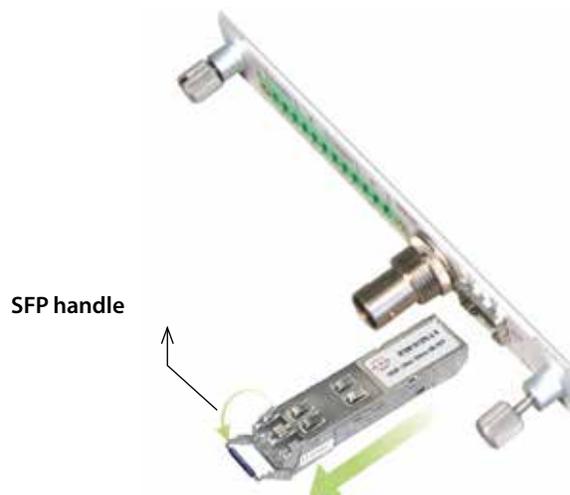


Figure 11. Removing the SFP

Removing the DLC150E Module

To remove the DLC150E from the host chassis, perform the following steps:

1. Remove the fiber optic cable from the SFP.
2. Remove the coaxial cable from the BNC connectors.
3. Remove the audio terminal block.
4. Loosen the two mounting screws that secure the DLC150E to the chassis.
5. Using the two mounting screws, pull the DLC150E out of the 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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