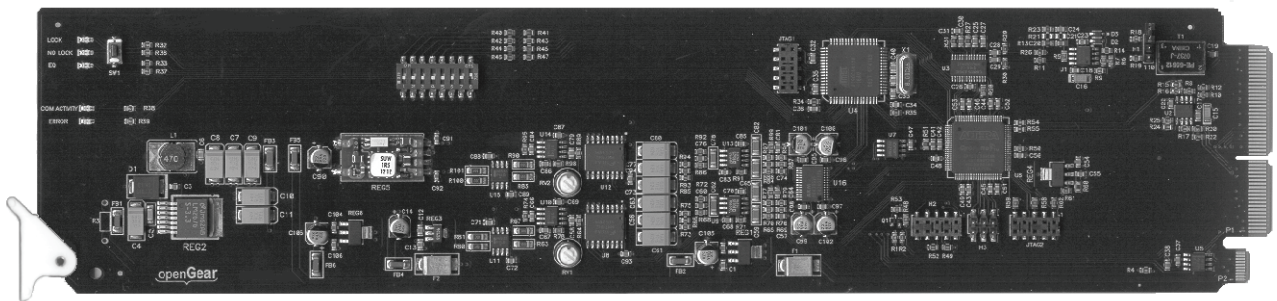


DAC-8416

AES/EBU Digital to Analog Audio Converter

User Manual



DAC-8416 • AES/EBU Digital to Analog Audio Converter User Manual

- Ross Part Number: **8416DR-004-02**
- Release Date: June 18, 2010. Printed in Canada.

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Important Regulatory and Safety Notices

Before using this product and any associated equipment, refer to the “**Important Safety Instructions**” listed below to avoid personnel injury and to prevent product damage.

Products may require specific equipment, and/or installation procedures to be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these specific requirements.

Symbol Meanings



This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.



Warning — The symbol with the word “**Warning**” within the equipment manual indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Caution — The symbol with the word “**Caution**” within the equipment manual indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.



Notice — The symbol with the word “**Notice**” within the equipment manual indicates a situation, which if not avoided, may result in major or minor equipment damage or a situation which could place the equipment in a non-compliant operating state.



ESD Susceptibility — This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.

Important Safety Instructions



Caution — This product is intended to be a component product of the DFR-8300 series frame. Refer to the DFR-8300 series frame User Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as its component products.



Warning — Certain parts of this equipment namely the power supply area still present a safety hazard, with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cards from the chassis' rear appliance connectors before servicing this area.



Warning — Service barriers within this product are intended to protect the operator and service personnel from hazardous voltages. For continued safety, replace all barriers after any servicing.
This product contains safety critical parts, which if incorrectly replaced may present a risk of fire or electrical shock. Components contained within the product's power supplies and power supply area, are not intended to be customer serviced and should be returned to the factory for repair. To reduce the risk of fire, replacement fuses must be the same time and rating. Only use attachments/accessories specified by the manufacturer.

EMC Notices

United States of America FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



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

CANADA

This Class “A” digital apparatus complies with Canadian ICES-003.

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

EUROPE

This equipment is in compliance with the essential requirements and other relevant provisions of **CE Directive 93/68/EEC**.

INTERNATIONAL

This equipment has been tested to **CISPR 22:1997** along with amendments **A1:2000** and **A2:2002**, and found to comply with the limits for a Class A Digital device.



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

Maintenance/User Serviceable Parts

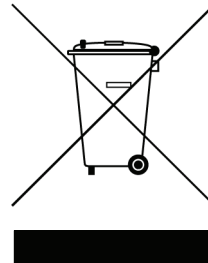
Routine maintenance to this openGear product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the “Contact Us” section on the last page of this manual. All openGear products are covered by a generous 5-year warranty and will be repaired without charge for materials or labor within this period. See the “Warranty and Repair Policy” section in this manual for details.

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

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

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



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

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Introduction

In This Chapter

This chapter contains the following sections:

- Overview
- Functional Block Diagram
- Documentation Terms and Conventions

A Word of Thanks

Congratulations on choosing an openGear DAC-8416 AES/EBU Digital to Analog Audio Converter. Your DAC-8416 is part of a full line of Digital Products within the openGear Terminal Equipment family of products, backed by Ross Video's experience in engineering and design expertise since 1974.

You will be pleased at how easily your new DAC-8416 fits into your overall working environment. Equally pleasing is the product quality, reliability and functionality. Thank you for joining the group of worldwide satisfied Ross Video customers!

Should you have a question pertaining to the installation or operation of your DAC-8416, please contact us at the numbers listed on the back cover of this manual. Our technical support staff is always available for consultation, training, or service.

Overview

The DAC-8416 AES/EBU Digital to Analog Audio Converter provides a digital to analog audio conversion along with AES/EBU signal distribution.

The DAC-8416 supports audio sampling frequencies from 30kHz to 192kHz. It converts the incoming AES/EBU digital audio signal to a stereo analog audio signal using 24bit conversion technology.

Cable equalization and reclocking techniques enable the DAC-8416 to recover the incoming digital audio signal reliably.

The DAC-8416 is fully compliant with all openGear technical specifications and supports remote monitoring via the DashBoard™ Control System.

Features

The following features make the DAC-8416 best solution for AES/EBU digital to analog audio conversion:

- Converts AES/EBU digital to analog audio while providing AES/EBU signal distribution
- Cable equalization and data reclocking on the incoming AES/EBU signal
- 24bit technology provides the highest quality
- Reports status and configuration remotely via the DashBoard Control System™
- Fits DFR-8300 series frames
- Fully compliant with openGear specifications
- 5-year transferable warranty

Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the DAC-8416.

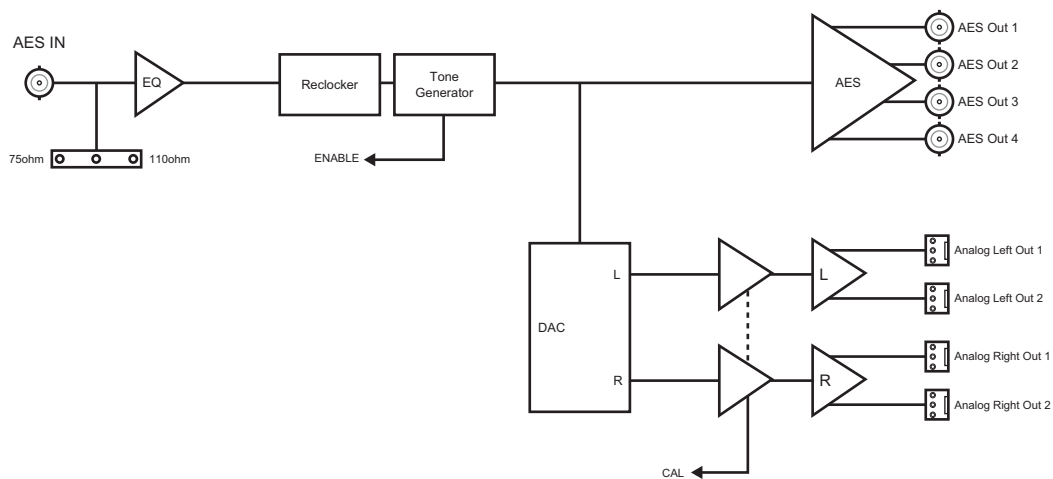


Figure 1.1 DAC-8416 — Simplified Block Diagram

Documentation Terms and Conventions

The following terms and conventions are used throughout this manual:

- “**Frame**” refers to DFR-8300 series frame that houses the DAC-8416 card, as well as any openGear frames.
- All references to the **DFR-8300 series frame** also includes all version of the 10-slot (DFR-8310 series) and 20-slot (DFR-8321 series) frames and any available options unless otherwise noted.
- “**Operator**” and “**User**” refer to the person who uses DAC-8416.
- “**Board**”, and “**Card**” refer to openGear terminal devices within openGear frames, including all components and switches.
- “**System**” and “**Video system**” refer to the mix of interconnected production and terminal equipment in your environment.
- “**DashBoard**” refers to the DashBoard Control System™.
- The “**Operating Tips**” and “**Note**” boxes are used throughout this manual to provide additional user information.

Installation

In This Chapter

This chapter provides instructions for installing the Rear Module(s) for the DAC-8416, installing the card into the frame, cabling details, and updating the card software.

The following topics are discussed:

- Before You Begin
- Installing the DAC-8416
- Cabling for the DAC-8416

Before You Begin

Before proceeding with the instructions in this chapter, ensure that your DFR-8300 series frame is properly installed according to the instructions in the ***DFR-8300 Series User Manual***.

Static Discharge

Whenever handling the DAC-8416 and other related equipment, please observe all static discharge precautions as described in the note:



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

Unpacking

Unpack each DAC-8416 you received from the shipping container and ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video directly.

Installing the DAC-8416

This section outlines how to install a Rear Module in a DFR-8300 series frame. The same procedure applies regardless of the frame or card type. However, the specific Rear Module you need to install depends on the frame you are using.

Rear Modules for the DAC-8416

The Rear Module for the DAC-8416 depends on the openGear frame you are installing the card into.

- **DFR-8310 series frame** — When installing the DAC-8416 in the DFR-8310 series frames, the **8310AR-036** Rear Module is required. The DAC-8416 is not compatible with the DFR-8310-BNC frame.
- **DFR-8321 series frame** — When installing the DAC-8416 in the DFR-8321 series frames, a Full Rear Module (**8320AR-036**) or a Split Rear Module (**8320AR-039**) can be used. Note that the available cable designations differ between the type of module used. Refer to the section “**DFR-8321 Series Frame Cabling Overview**” on page 2-5 for details.

Installing a Rear Module

If the Rear Module is already installed, proceed to the section “**Installing the DAC-8416**” on page 2-4.

Use the following procedure to install a Rear Module in your DFR-8300 series frame:

1. Locate the card frame slots on the rear of the frame.
2. Remove the Blank Plate from the slot you have chosen for the DAC-8416 installation. If there is no Blank Plate installed, proceed to the next step.
3. Install the bottom of the Rear Module in the **Module Seating Slot** at the base of the frame’s back plane. (**Figure 2.1**)

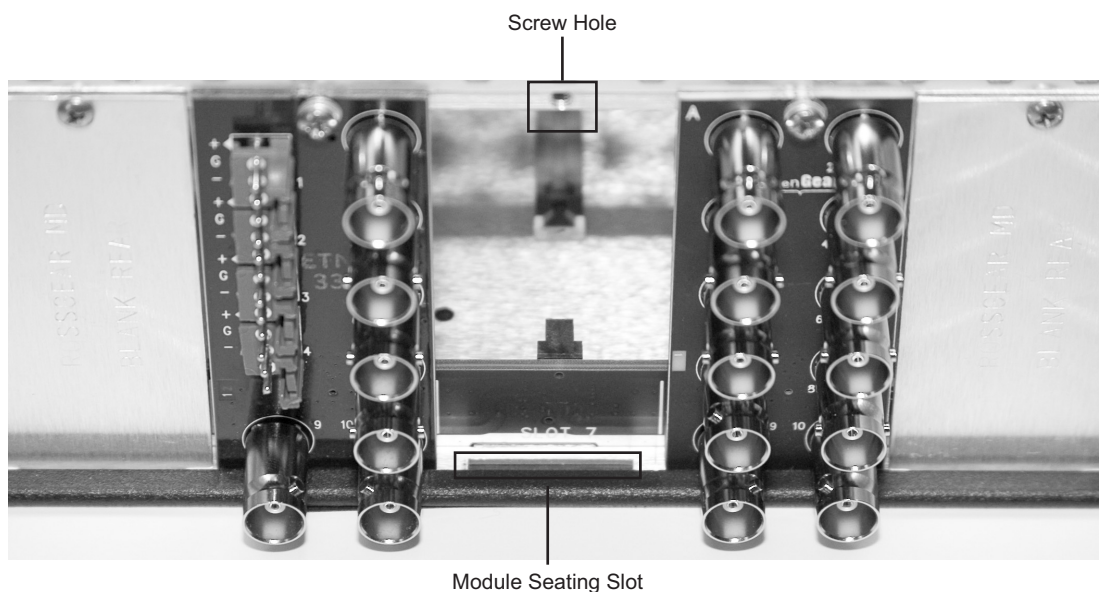


Figure 2.1 Rear Module Installation in a DFR-8310 Series Frame (DAC-8416 not shown)

4. Align the top hole of the Rear Module with the screw on the top-edge of the frame back plane.
5. Using a Phillips screwdriver and the supplied screw, fasten the Rear Module to the back plane of the frame. Do not over tighten.
6. Ensure proper frame cooling and ventilation by having all rear frame slots covered with Rear Modules or Blank Plates.

This completes the procedure for installing a Rear Module in your DFR-8300 series frame.

Installing the DAC-8416

Use the following procedure to install the DAC-8416 in a DFR-8300 series frame:

1. Locate the Rear Module you installed in the procedure “**Installing a Rear Module**” on page 2-3.



Note — When using the DAC-8416 with the **8320AR-036** Rear Module, ensure that the card is installed in an even numbered slot (2, 4, 6 etc.) for a maximum of 10 cards in the DFR-8321 series frames.

2. Hold the card by the edges and carefully align the card-edges with the slots in the frame.
3. Fully insert the card into the frame until the rear connection plus is properly seated in the Rear Module.
4. Verify whether your Rear Module Label is self-adhesive by checking the back of the label for a thin wax sheet. You must remove the wax sheet before affixing the label.
5. Affix the supplied Rear Module Label, as per the included instructions, to the BNC area of the Rear Module.

This completes the procedure for installing the DAC-8416 in a DFR-8300 series frame.

Cabling for the DAC-8416

This section provides information for connecting cables to the installed Rear Modules on the DFR-8300 series frames. Connect the input and output cables according to the following sections.

DFR-8310 Series Frame Cabling Overview

In the DFR-8310 series frames, the DAC-8416 is used with the following Rear Module:

- **8310AR-036** Rear Module — Each card occupies one slot and provides one AES input, four AES outputs, and four analog outputs. (**Figure 2.2**)

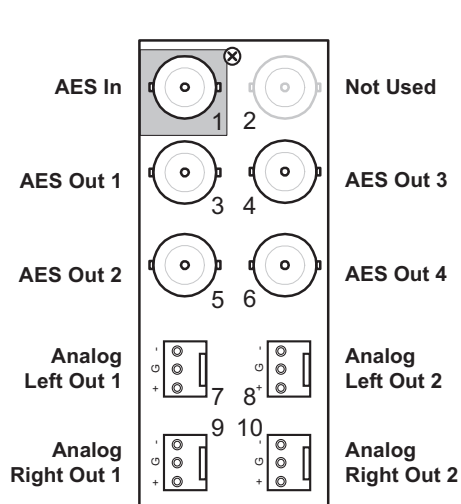


Figure 2.2 Cable Connections for the 8310AR-036 and 8320AR-036 Rear Modules

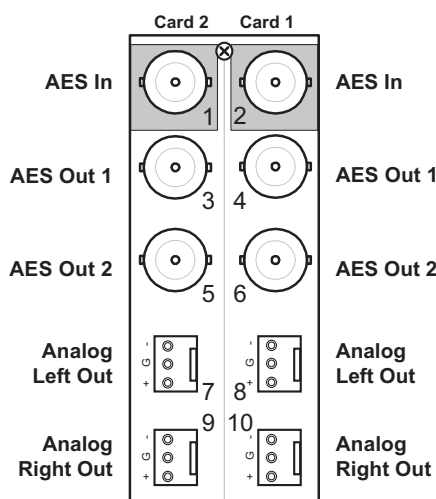


Figure 2.3 Cable Connections for the 8320AR-039 Rear Module

DFR-8321 Series Frame Cabling Overview

In the DFR-8321 series frames, the DAC-8416 is used with the following Rear Modules:

- **8320AR-036** Full Rear Module — Each card occupies one slot and provides one AES input, four AES outputs, and four analog outputs. (**Figure 2.2**) Ensure that the DAC-8416 card is installed in an even slot number.
- **8320AR-039** Split Rear Module — Each card occupies one slot and provides four outputs. Note that each Split Rear Module provides connections for two cards. (**Figure 2.3**)

User Controls

In This Chapter

This chapter provides a general overview of the user controls available on the DAC-8416.

The following topics are discussed:

- Card Overview
- Control and Monitoring Features

Card Overview

This section provides a general overview of the DAC-8416 components. For information on the LEDs available on the card-edge, refer to the section “**Control and Monitoring Features**” on page 3-4.

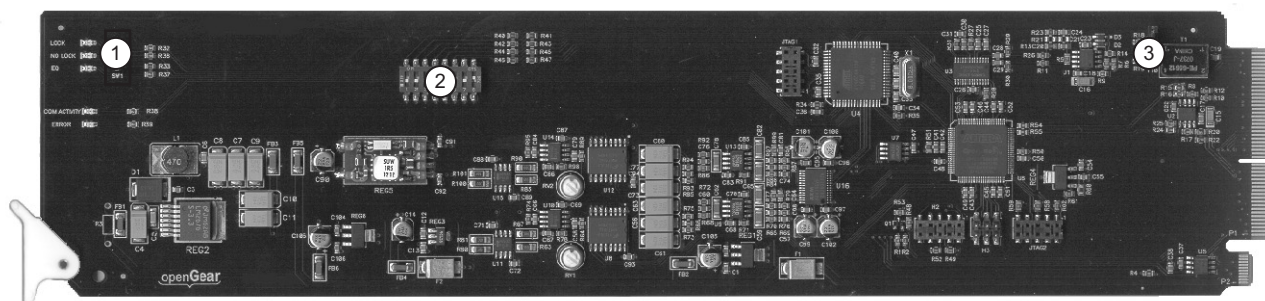


Figure 3.1 DAC-8416 — Components

1) EQ Switch (SW1)

2) DIP Switches

3) Input Impedance (H1)

1. EQ Switch (SW1)

Use **SW1** to insert the cable equalizer into the incoming AES/EBU signal. The DAC-8416 can recover digital audio signals conforming to AES/EBU specifications and transmitted over 75ohm, coaxial cable, up to 600m (2000ft) long without equalization. For cable lengths in excess of 600 metres, we recommend that the input equalization be activated. Note that switching the EQ in and out can cause audible artefacts.

- Pressing **SW1** enables this feature. The yellow **EQ** LED is lit.
- While **SW1** is activated, pressing it again will disable the EQ and the yellow **EQ** LED will go off.

2. DIP Switches

Eight DIP Switches are provided on the card surface to configure the tone generator, remote control, and analog output levels. Refer to the section “**Configuring the DIP Switches**” on page 3-3 for details on using the DIP Switches.

3. Input Impedance (H1)

Use **H1** to select the input Z value. It is factory set to 75ohm.

Configuring the DIP Switches

This section provides a brief summary of the DIP Switches of the DAC-8416. Refer to **Figure 3.1** for the DIP Switch locations. **Figure 3.2** shows all the DIP Switches in the **OFF** position.

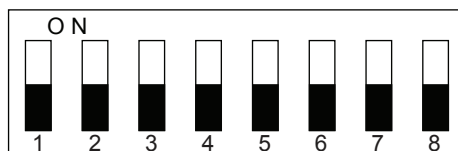


Figure 3.2 DIP Switches — OFF Position

CAL0, CAL1 (DIP SW1 and SW2)

Use **SW1** and **SW2** in combination to select the analog output level of the DAC-8416. The CAL0 Switch (**SW1**) and CAL1 Switch (**SW2**) are used to select the analog output level. Table 1 lists the combinations of DIP Switch settings for **SW1** and **SW2**.

Table 3.1 Setting DIP SW1 and SW2

SW1	SW2	Description
ON	ON	Reserved for future use
ON	OFF	-12dBFS/+4dBu
OFF	ON	-18dBFS/+4dBu
OFF	OFF	-20dBFS/+4dBu

Tone Generator (DIP SW3)

Use **SW3** to enable the Tone Generator feature of the DAC-8416. This feature requires an input signal for reference. The tone is set to 1kHz when the input sample rate is 48K, 2KHz at 96K, and 4KHz at 192K. Set **SW3** as follows:

- **ON** — Select this setting to enable the Tone Generator feature.
- **OFF** — Select this setting to disable the Tone Generator feature. This is the default setting.

Default DIP Switch/Memory (DIP SW7)

Use **SW7** to enable or disable the parameters set by the DIP Switches on the DAC-8416. Set **SW7** as follows:

- **ON** — Select this setting to retrieve the DAC-8416 parameters from the non-volatile memory. The DIP Switch settings are ignored.
- **OFF** — Select this setting to enable the DAC-8416 to retrieve parameters from the DIP Switches.

DashBoard Disable (DIP SW8)

Use **SW8** to disable remote control of the DAC-8416 from DashBoard. Set **SW8** as follows:

- **ON** — Select this setting to disable remote control from DashBoard. The parameters and settings cannot be changed via DashBoard and must be changed using the card-edge controls. You can still monitor the status of the card using DashBoard.
- **OFF** — Select this setting to control the DAC-8416 exclusively from DashBoard. The card-edge controls are ignored.

Control and Monitoring Features

This section provides information on the LEDs for the DAC-8416. Refer to **Figure 3.3** for the location of the LEDs.

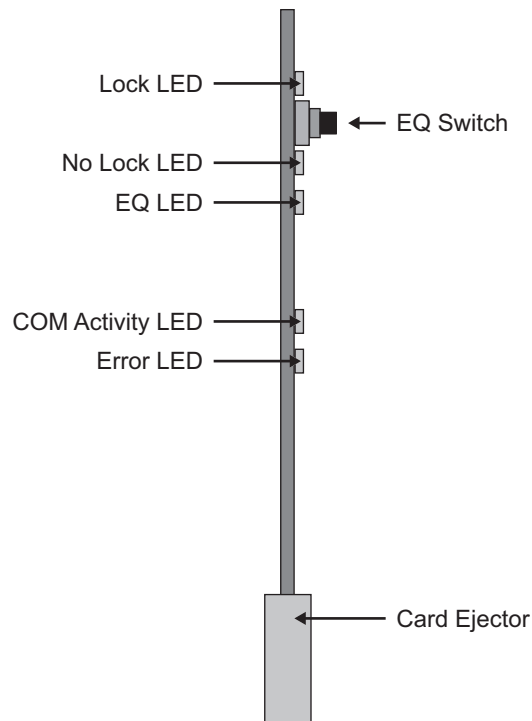


Figure 3.3 DAC-8416 Card-edge LEDs

Status LEDs on the DAC-8416

The front-edge of the DAC-8416 has LED indicators for communication activity. Basic LED displays and descriptions are provided in **Table 3.2**.

Table 3.2 LEDs on the DAC-8416

LED	Color	Display and Description
Lock	Green	When lit, this LED indicates a valid AES/EBU input signal.
No Lock	Red	When lit, this LED indicates the absence of a valid AES/EBU input signal.
EQ	Yellow	When lit, this LED indicates that the cable EQ has been enabled by pressing SW1 or that feature has been enabled through DashBoard.
COM Activity	Green	When lit, this LED indicates that the DAC-8416 is communicating with DashBoard.
Error	Red	When lit, this LED indicates an error in the communication between DashBoard and the DAC-8416.

Menus

In This Chapter

This chapter provides a summary of the menus available for the DAC-8416.

The following topics are discussed:

- DashBoard Menus for the DAC-8416

DashBoard Menus for the DAC-8416

This section briefly summarizes the menus, items, and parameters available from the DashBoard Control System™ for the DAC-8416. Parameters marked with an asterisk (*) are the factory default values.

The DashBoard Control System™ enables you to monitor and control openGear frames and cards from a computer. DashBoard communicates with other cards in the DFR-8300 series frame through the Network Controller Card.

Status Tab

Table 4.1 summarizes the **Status** tab parameters available in DashBoard for the DAC-8416. The **Status** tabs provide read-only information such as software revision issue, fan door status, and power consumption.

Table 4.1 Status Tab Items

Menu	Item	Parameters	Description
Card Info (Read-only)	Product	DAC-8416	
	Supplier	Ross Video Ltd.	
	Software Rev	##.##	Indicates the software version
Card Status (Read-only)	Card Status	Green	OK
		Yellow	No reference detected
		Red	AES Input unlocked
	AES Input	Unlocked	
		Locked	

Configuration Menus

Table 4.2 summarizes the **Configuration Menu** options available in DashBoard.

Table 4.2 Configuration Menu Items

Tab Title	Item	Parameters	Description
Card Settings	EQ	Disabled	The cable EQ is disabled
		Enabled	The cable EQ is enabled
	Analog Output Calibration	-20dBFS/+4dBu	User selected gain level
		-18dBFS/+4dBu	
		-12dBFS/+4dBu	
	Tone Generator	Disabled	The card does not generate a tone
		Enabled	The card generates -20dBFS line up tone
	Settings	Save	Saves the parameters

Specifications

In This Chapter

This chapter provides technical specifications on the DAC-8416. Note that technical specifications are subject to change without notice.

The following topics are discussed:

- Technical Specifications

Technical Specifications

This section provides technical information for the DAC-8416.

Table 5.1 DAC-8416 Technical Specifications

Category	Parameter	Specification
Digital Input	Resolution	24bit
	Input Level	0.2-7 Vp-p
	Impedance (transformer balanced)	75ohm, 110ohm
	Sampling Frequency Range ^a	30kHz to 192 kHz
Digital Output	Resolution	24bit
	Output Level	1Vp-p nominal
	Impedance	75ohm unbalanced
	Sampling Frequency Range	30kHz to 192kHz
	Jitter	<5ns
Analog (fs=48kHz, 0dBFS = +24dBu)	Maximum Output Level	+24dBu
	Frequency Response	0.2dB, 20Hz to 20kHz
	Noise (unweighted)	84dBu, 20Hz to 20kHz
	THD+N	<0.01%
	Stereo Separation	95dB, 20Hz to 20kHz
	Output Impedance	60ohm balanced
Power	Requires (maximum)	+12V, 4 Watts

- a. While audio sample frequency rates less than 30kHz may still function, they are not recommended.

Service Information

In This Chapter

This chapter contains the following sections:

- Troubleshooting Checklist
- Warranty and Repair Policy

Troubleshooting Checklist

Routine maintenance to this openGear product is not required. In the event of problems with your DAC-8416, the following basic troubleshooting checklist may help identify the source of the problem. If the frame still does not appear to be working properly after checking all possible causes, please contact your openGear products distributor, or the Technical Support department at the numbers listed under the “**Contact Us**” section.

1. **Visual Review** — Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the card, the frame, and any associated peripheral equipment for signs of trouble.
2. **Power Check** — Check the power indicator LED on the distribution frame front panel for the presence of power. If the power LED is not illuminated, verify that the power cable is connected to a power source and that power is available at the power main. Confirm that the power supplies are fully seated in their slots. If the power LED is still not illuminated, replace the power supply with one that is verified to work.
3. **Re-seat the Card in the Frame** — Eject the card and reinsert it in the frame.
4. **Check Control Settings** — Refer to the Installation and Operation sections of the manual and verify all user-adjustable component settings.
5. **Input Signal Status** — Verify that source equipment is operating correctly and that a valid signal is being supplied.
6. **Output Signal Path** — Verify that destination equipment is operating correctly and receiving a valid signal.
7. **Unit Exchange** — Exchanging a suspect unit with a unit that is known to be working correctly is an efficient method for localizing problems to individual units.

Warranty and Repair Policy

The DAC-8416 is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of FIVE (5) years from the date of shipment from our factory. In the event that your DAC-8416 proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this DAC-8416 has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the FIVE (5) year warranty period.

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

This DAC-8416 User Manual provides all pertinent information for the safe installation and operation of your openGear Product. Ross Video policy dictates that all repairs to the DAC-8416 are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your DAC-8416, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your DAC-8416. If required, a temporary replacement frame will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

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

Notes:

Notes:

Contact Us

Contact our friendly and professional support representatives for the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

PHONE	General Business Office and Technical Support	613 • 652 • 4886
	After Hours Emergency	613 • 349 • 0006
	Fax	613 • 652 • 4425
E-MAIL	General Information	solutions@rossvideo.com
	Technical Support	techsupport@rossvideo.com
POSTAL SERVICE	Ross Video Limited	8 John Street, Iroquois, Ontario, Canada K0E 1K0
	Ross Video Incorporated	P.O. Box 880, Ogdensburg, New York, USA 13669-0880

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