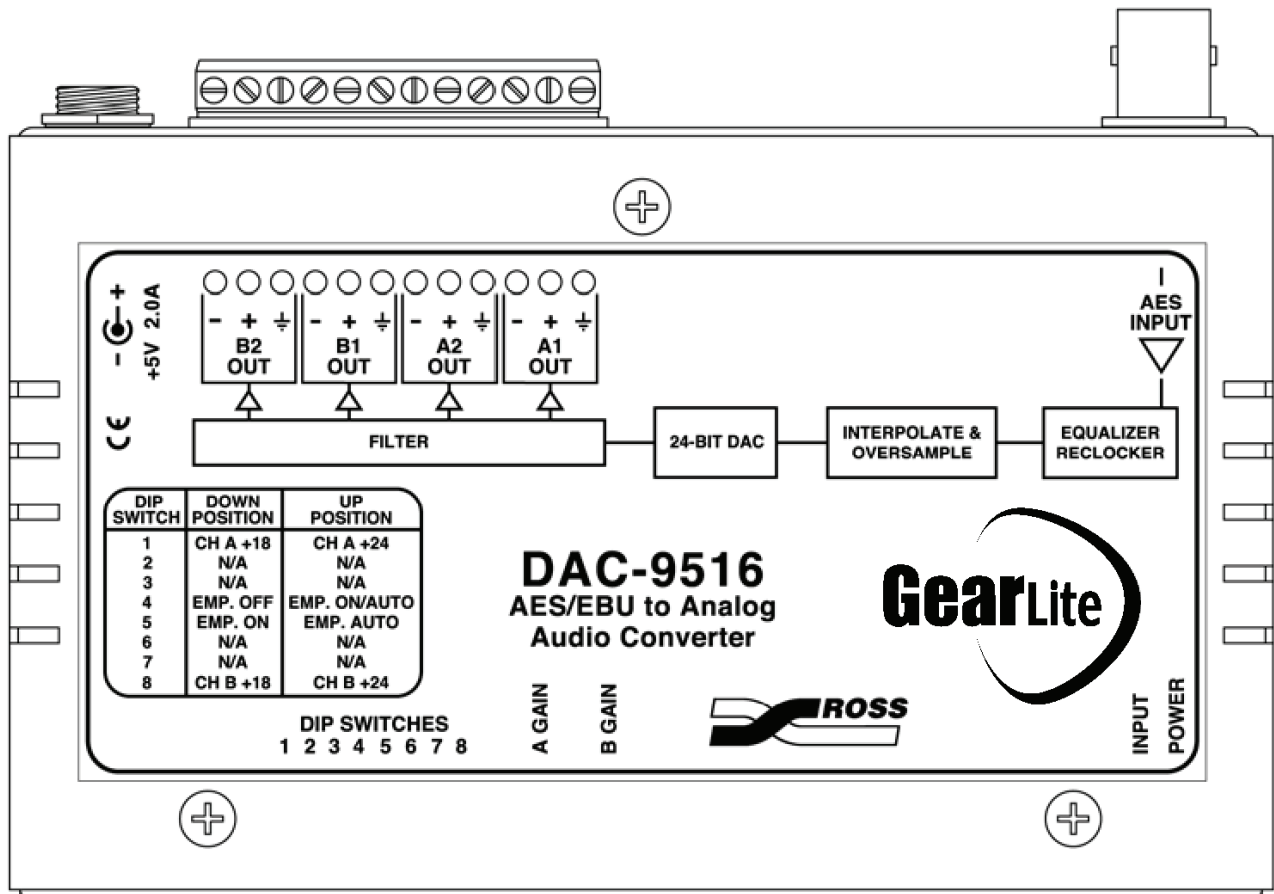




DAC-9516

AES/EBU to Analog Audio Converter

User Manual



DAC-9516 • AES/EBU to Analog Audio Converter User Manual

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Important Regulatory and Safety Notices to Service Personnel

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

Products may require specific equipment, and /or installation procedures 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



Warning

This 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.



Notice

This 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
Suscep-
tibility**

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



Warning

Read these instructions.

Keep these instructions.

Heed all warning.

Follow all instructions.

The safe operation of this product requires that a protective earth connection be provided. A grounding conductor in the equipment's supply cord provides this protective earth. To reduce the risk of electrical shock to the operator and service personnel, this ground conductor must be connected to an earthed ground.

Do not defeat the safety purpose of the grounding-type plug. A grounding type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit in to your outlet, consult an electrician for replacement of the obsolete outlet. Protect the power cord from being walked on or pinching particularly at plugs, convenience receptacles, and point where they exit from the apparatus.

Use only power cords specified for this product and certified for the country of use. Refer to the Product Power Cord Requirement Section that follows.

Indoor Use: “WARNING – TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE”

Do not block ventilation openings. Install in accordance with manufacturer’s instructions.

Do not install near heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

Do not use this apparatus near water.

Only use attachments/accessories specified by the manufacturer.

Unplug this apparatus during lightning storms or when unused for long periods of time.

Clean only with a dry cloth.

To avoid electrical shock, disconnect the A/C power cord before any servicing.

Refer all servicing to qualified personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug damage, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

EMC Notices

US 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 users will be required to correct the interference at their own expense.



Notice

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

CANADA

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

Cet appareil numérique de 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

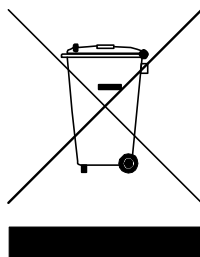
Routine maintenance to this GearLite product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the “Contact Us” section on the last page of this manual. All RossGear GearLite products are covered by a generous 3-year warranty and will be repaired without charge for materials or labor within this period. See the “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 Diagrams
- Features

Overview

The RossGear DAC-9516 AES/EBU to Analog Audio Converter is a broadcast quality modular product used to convert 20 or 24-bit AES-3id (coaxial) signals to balanced analog audio. The DAC-9516 accepts one AES audio signal at 32, 44.1, or 48kHz sample rates, and provides two copies of stereo (A, B) balanced analog audio.

The DAC provides reclocking of the AES stream as well as a state of the art 128X over-sampled Delta Sigma Modulator DAC to convert to analog audio. Following the D-A conversion, the analog audio passes through a very high quality reconstruction filter, which assures low distortion and noise. Two identical copies of the signal are output through a 12-pin screw-type audio terminal block connector. The DAC-9516 provides automatic input cable equalization for lengths up to and beyond 610m (2000 ft.).

The front panel of the DAC-9516 chassis provides the operational controls. Coarse level adjustment headroom switches (18dB or 24dB), and a fine gain adjustment potentiometer (+/-6dB) for each channel, are provided to enable precise matching to your facility's house reference audio level. The DAC-9516 can accommodate any full-scale digital (FSD) level in the -12 to -30dBFS range. Automatic detection of AES/EBU 50/15µs de-emphasis is available for all data rates. In addition, user-selectable settings are available for Emphasis controls. Status indicator LED's provide visual references for the input signal and power supplied to the module.

The DAC-9516 includes a universal power adaptor and line cord suitable for the country of use. Various mounting options are included that enable a wide

range of installation choices. The DAC-9516 provides a flexible high quality AES/EBU conversion solution in a compact, stand-alone package. Designed and manufactured to meet the highest quality broadcast industry standards, the RossGear DAC-9516 is an ideal, cost effective solution for AES/EBU to analog audio conversion.

Functional Block Diagram

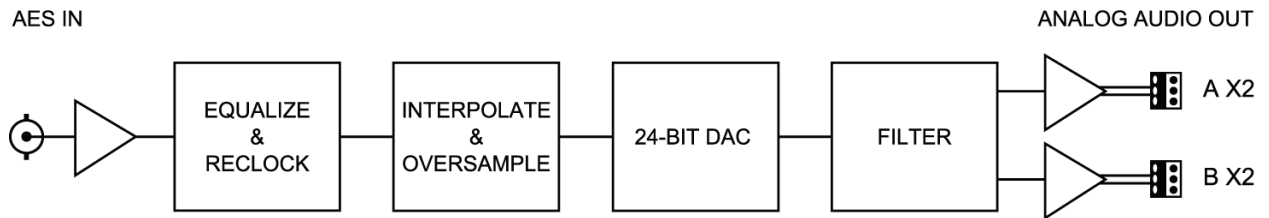


Figure 1. Simplified Block Diagram of DAC-9516 Functions

Features

The DAC-9516 AES/EBU D/A converter provides:

- Supports data rates in the 28 to 50kHz range including 32, 44.1, and 48kHz
- 24-bit DAC resolution
- Reclocking to reduce jitter and noise
- Conformity to AES-3id 1995 and SMPTE 276M
- Adjustable headroom level
- Input range from 100mV to 2.5V p-p
- Two stereo audio output copies
- Terminating input 75 Ohms
- Automatic input cable equalization for > 610m (> 2000 ft.) of Belden 8281
- Visual indicator LEDs for signal presence and power status
- Small brick form factor
- 5V universal adapter with locking DC connector
- 3-year warranty

Installation

In This Chapter

This chapter contains the following sections:

- Static Discharge
- Unpacking
- Mounting and Installation
- Velcro Strips
- Flat Metal Plate
- Non-Slip Pads
- Optional Mounting Accessories

Static Discharge

Whenever handling the DAC-9516 AES/EBU to Analog Audio Converter and other related equipment, please observe all static discharge precautions as described in the following note:



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

Unpacking

Unpack each DAC-9516 module you received from the shipping container and check the contents against the packing list to ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video directly.

Mounting and Installation

The GearLite 9000 series self-contained modules can be mounted in any convenient location. However, to ensure long life for these products, observe the following precautions and operating requirements:

- Maintain an ambient temperature of 20° to 40°C.
- Allow for air circulation around the chassis for convectional cooling.

Many different mounting positions are possible with the included mounting hardware. Some installation options are permanent and require careful consideration of the final positioning before installation. Please note that in some mounting locations, the power adaptor must be affixed in a similar manner as the chassis.

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

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

Velcro Strips

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

Installing Velcro Strips

1. Remove the protective backing film from the adhesive on the bottom of the two mating Velcro strip sets.
2. Adhere the strip sets to the bottom side of the module as shown in Figure 2.

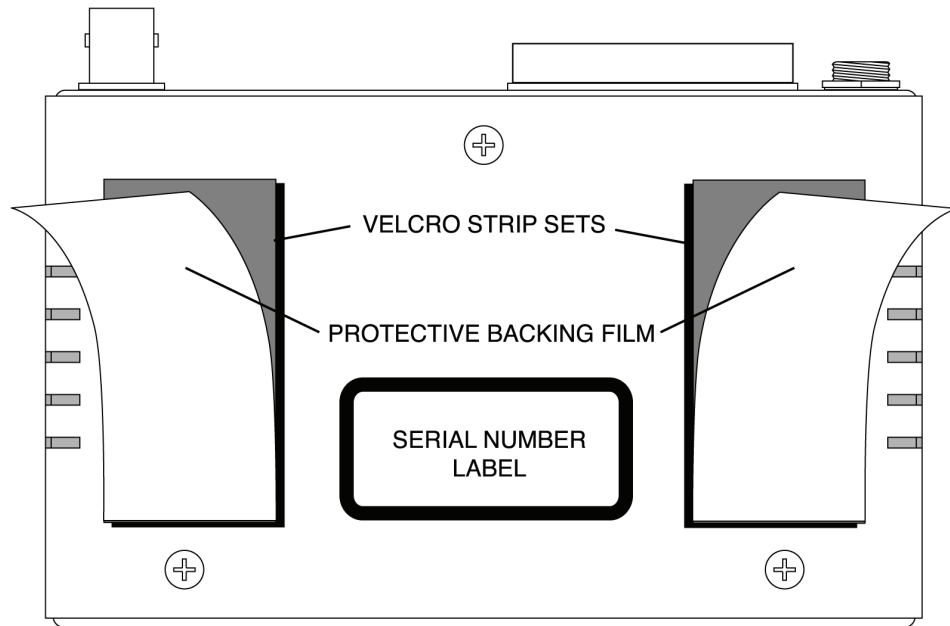


Figure 2. Velcro Installation Option

3. To apply the adhesive Velcro to the mounting location:
 - remove the protective backing film from the top of the adhesive strips
 - press the module into position on the mounting surface
4. To mount the power adaptor, apply the remaining mating Velcro strip set, repeating the previous steps.

Flat Metal Plate

Use the flat metal plate for permanent mounting to a rack, a desk, or any other location where bolts or screws can be applied. Be sure to position the module to allow for operator adjustments, if required.

Installing the Flat Metal Plate

1. Affix the flat metal plate to the bottom of the chassis using the chassis screws as shown in the figure below:

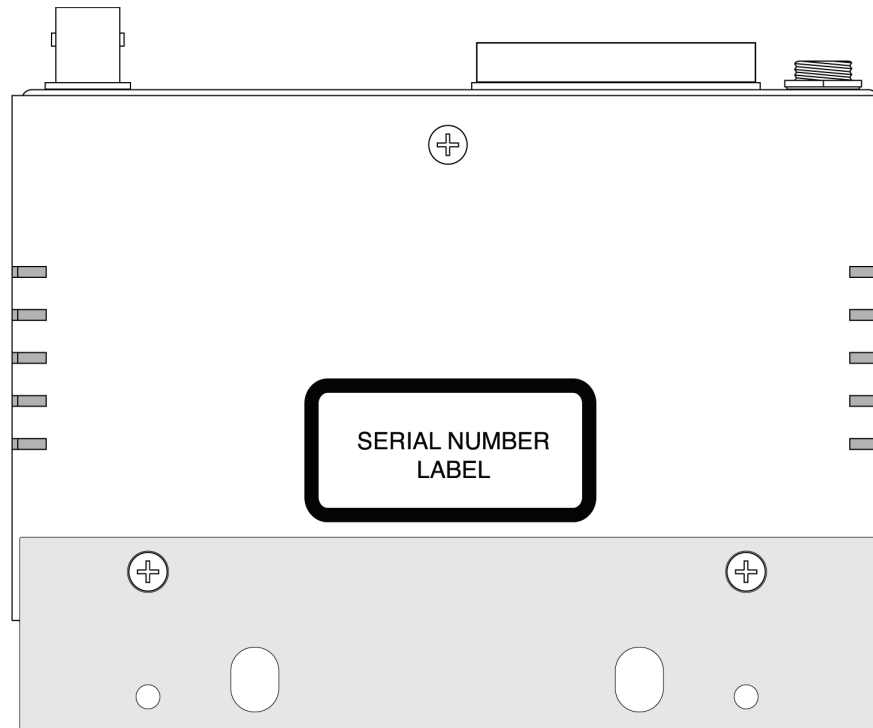


Figure 3. Flat Metal Plate Installation Option

2. Affix the metal plate by the two extended holes to the desired location with customer supplied bolts or screws according to the installation requirements.

Non-Slip Pads

Four non-slip adhesive pads have been supplied for desktop placements. Simply remove the protective backing film from the adhesive and affix one non-slip pad to each of the four corners on the bottom of the chassis. Two pads can be used at the rear of the module to help support it when mounted in the GRF-9000 GearLite Rack Frame (see Optional Mounting Accessories).

Optional Mounting Accessories

Ross Video is committed to providing practical solutions for the needs of your high-quality broadcast facility. The following products may be ordered separately to expand your installation options. Refer to Chapter 6, “**Ordering Information**” for details.

BPM-9000

The BPM-9000 Angle Mounting Bracket enables a single GearLite module to be installed in positions not possible with the flat metal plate. The installer must provide screws or bolts for installing in the desired location. The bracket has a 90° angle.

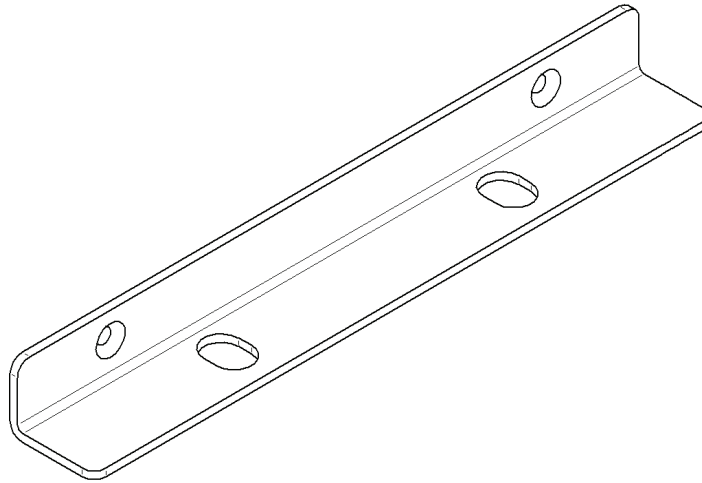


Figure 4. BMP-9000 90° Mounting Bracket

GRF-9000

The GRF-9000 GearLite Rack Frame is a rack mounting frame system for GearLite modules. The mounting system provides convenient organization for up to nine GearLite modules in only a 2RU space.

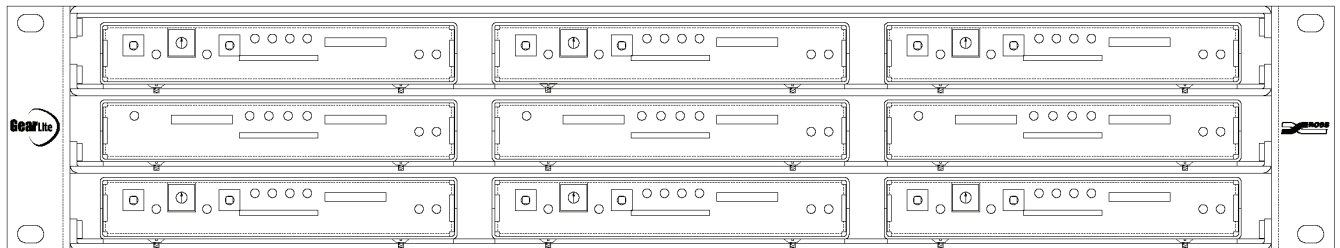


Figure 5. GRF-9000 with Nine GearLite Modules Installed

The flat metal plate and small plastic label (see Figure 6) included with every GearLite module are used to mount a module into the GRF-9000. Complete instructions are included in the GRF-9000 User Manual.

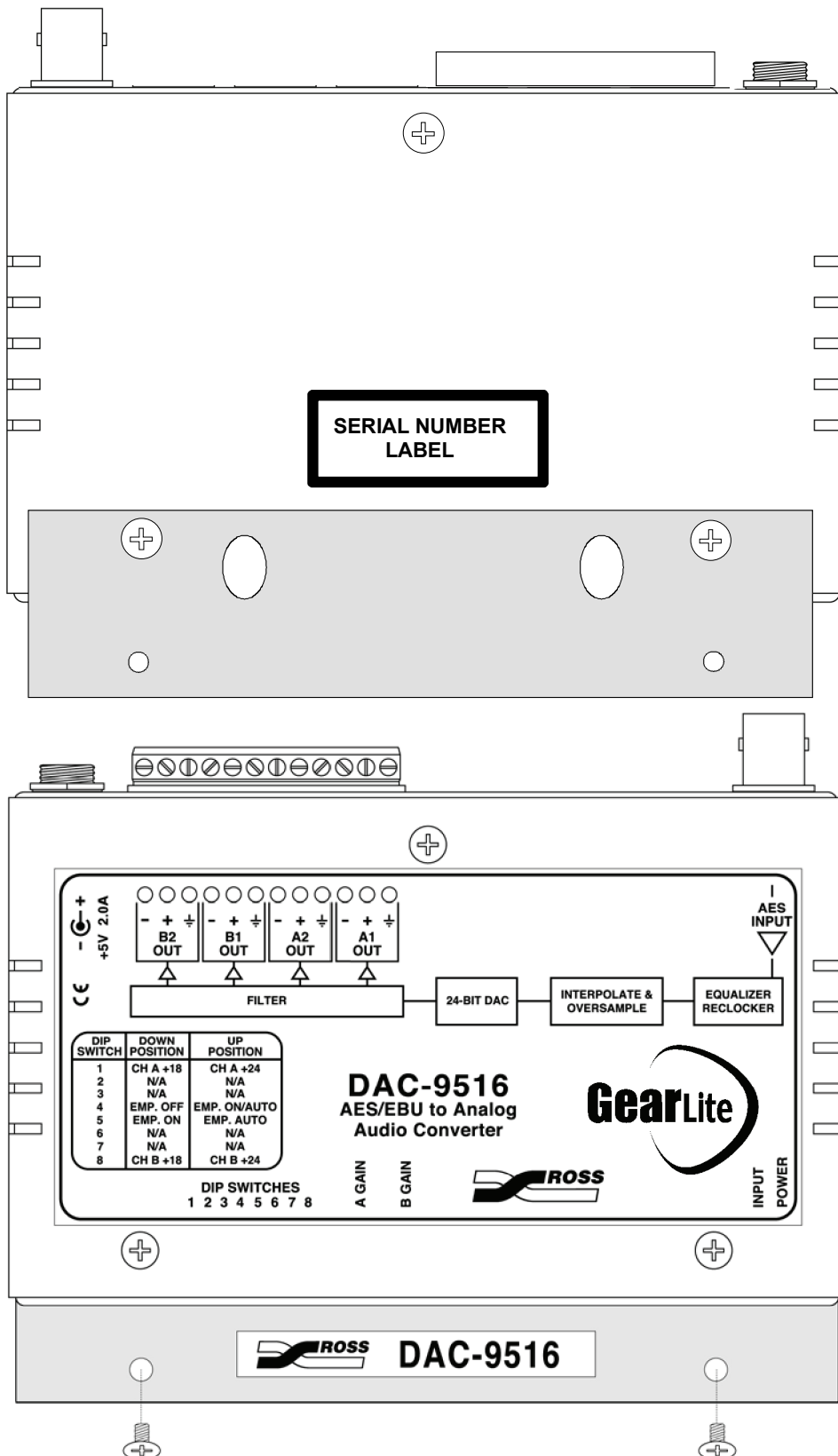


Figure 6. Flat Metal Plate and Label Positions for GRF-9000 Mounting

Setup

In This Chapter

This chapter provides details of all operating modes and features.

The following topics are discussed:

- Cable Connections
- DIP Switch Setup
- Potentiometers
- I/O Connectors
- Audio Levels
- LEDs

Cable Connections

The DAC-9516 has the following cable connections as shown in Figure 7 and 8:

- 1 AES BNC input
- 2 balanced analog audio outputs (positive, negative, and ground terminals for each channel) on a 12-pin terminal block
- 1 power supply input

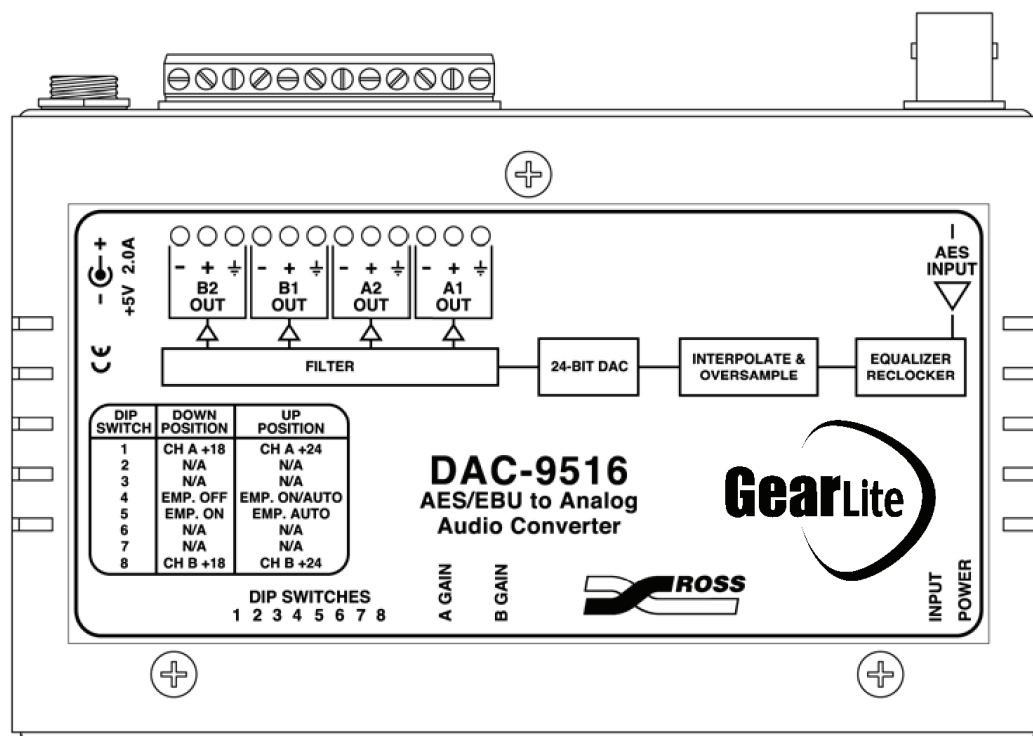


Figure 7. DAC-9516 Cable Connections Indicator Label

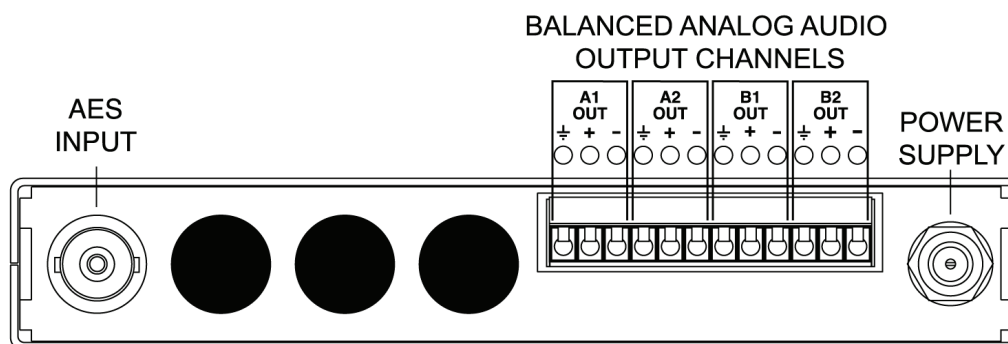


Figure 8. DAC-9516 Rear Edge Connections

AES Input Cable Connection

Connect the AES/EBU input cable to the DAC-9516 according to the designation indicated on the chassis label. The input is internally terminated at 75 Ohms.

The DAC-9516 can accommodate any full-scale digital (FSD) level in the -12 to -30dBFS range. It should be noted that although the DAC-9516 may be configured with -30dBFS headroom, a maximum analog audio output of the card (+27dBu) should be observed to prevent clipping of the signal.

Analog Audio Output Connections

On the rear edge of the DAC-9516 there is a removable 12-pin audio terminal block which has slots for the positive, negative, and grounded wires of two pairs of balanced analog audio cables. Use the following steps to wire the cables to the connector:

1. Gently pull the block from the unit.
2. Following the diagram on the top of the unit, insert an analog audio wire into the designated polarity slot on the block.
3. Use a tweaker screwdriver to tighten the slot's connector clamp on the block.
4. Repeat steps 2 and 3 for each wire on each input.
5. Once the cables have been wired to the block, insert the block back onto the unit so that the slotted tongues fit in the grooved side on the block socket.

Power Adaptor and Supply

Connect the PS-9000 power adaptor to the power supply connector. The PS-9000 provides up to 2A of regulated +5V DC (5%). The DC power cord has a locking connector that securely fastens into the power supply DC jack on the DAC-9516. The DAC-9516 has a standard miniature power jack (center pin positive). See Figure 8.

If using an adaptor other than the PS-9000, ensure that:

- the polarity is correct
- the voltage is +5V DC regulated to 5%
- sufficient current for the DAC-9516 is supplied



Notice

Use of improper adaptors may damage the DAC-9516 and will void the warranty.

Installations outside of North America using line voltages of 200 – 240 Volts require a plug, certified for the country of use, to be installed on the supplied line cord.

See the Important Regulatory and Safety Notices section at the beginning of this manual for details.

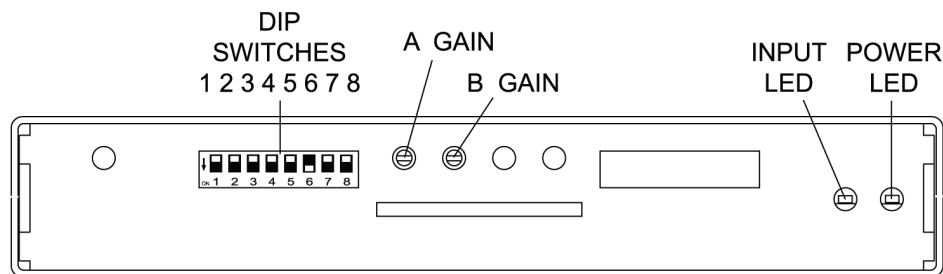


Figure 9. DAC-9516 Front Edge User Controls

DIP Switch Setup

Using the DIP switches shown in Figure 9 and the following table and discussion, configure the various parameters of the DAC-9516 for your requirements.

Table 1. Dip Switch Positions

Switch Number	Down Position (Near Number)	Up Position
1	Channel A Headroom Adj. +18dBu	Channel A Headroom Adj. +24dBu
2	N/A	N/A
3	N/A	N/A
4	Emphasis Off	Emphasis On/Auto
5	Emphasis On	Emphasis Auto
6	N/A	N/A
7	N/A	N/A
8	Channel B Headroom Adj. +18dBu	Channel B Headroom Adj. +24dBu

Headroom Select

There are two copies of the analog stereo signal output from the 12-pin connector. Each output consists of an A and B channel (Left & Right). To adjust the output level, select the approximate FSD level (18dB or 24dB) using the headroom DIP switches (A Level and B Level) and then turn the potentiometers (A GAIN and B GAIN) to trim the FSD level (± 6 dB) to your installation's standard.

- 24dB or 18dB Switch selectable for AES A and AES B
- ± 6 dB continuous adjustment for AES A and AES B

De-Emphasis Select

Set the Emphasis DIP switches as follows, based on your requirements:

- Off – No de-emphasis filtering.
- Auto – 50/15 μ s de-emphasis curve applied according to:
 1. the current sampling rate, and
 2. the AES Professional Channel Status Bits.
- On – Forced de-emphasis according to current sampling rate.

Table 2. Emphasis Selection on DIP Switch

Switch 4	Switch 5	Emphasis
Up	Up	Auto
Up	Down	On
Down	Up or Down	Off

Potentiometers

There are two copies of the analog stereo signal output from the 12-pin connector. Each output consists of an A and B channel (Left & Right). To adjust the output level, select the approximate FSD level (18dB or 24dB) using the headroom DIP switches (A Level and B Level) and then turn the potentiometers (A Gain and B Gain) to trim the FSD level ($\pm$ 6dB) to your installation's standard.

Table 3. DAC-8516 Potentiometer Adjustments

Potentiometer	Label Designation	Description / Function
RV1	A Gain	Used to set fine level adjustment for A channel
RV2	B Gain	Used to set fine level adjustment for B channel

I/O Connectors

Table 4 indicates the pin numbering and function of the analog connectors as are also shown on the label of the DAC-9516 in Figure 9.

Table 4. DAC-9516 I/O Connectors

	Outputs												Input
Connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 11	Pin 12	BNC
Signal	B2 -	B2 +	GND	B1 -	B1 +	GND	A2 -	A2 +	GND	A1 -	A1 +	GND	AES

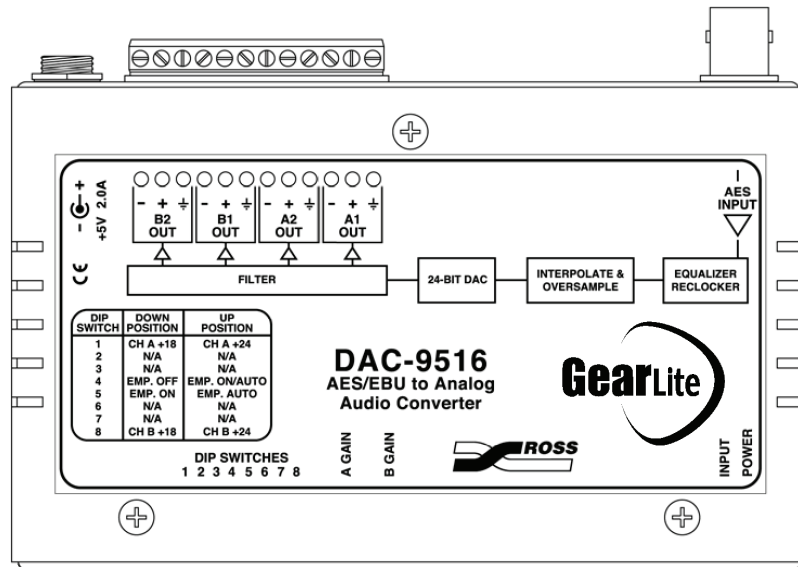


Figure 9. DAC-9516 I/O Connections

LEDs

The front panel of the module has LEDs (Input and Power) that display the status of the input signals and indicate whether the device is on or off. The module is operating correctly when the Input and Power LEDs are lit.

The LED displays are described in the following table:

Table 5. Selection and Status LED Descriptions

LED	Display	Status Description
Input	Green	The AES input is present and valid.
Power	Green	The unit has power.

Audio Levels

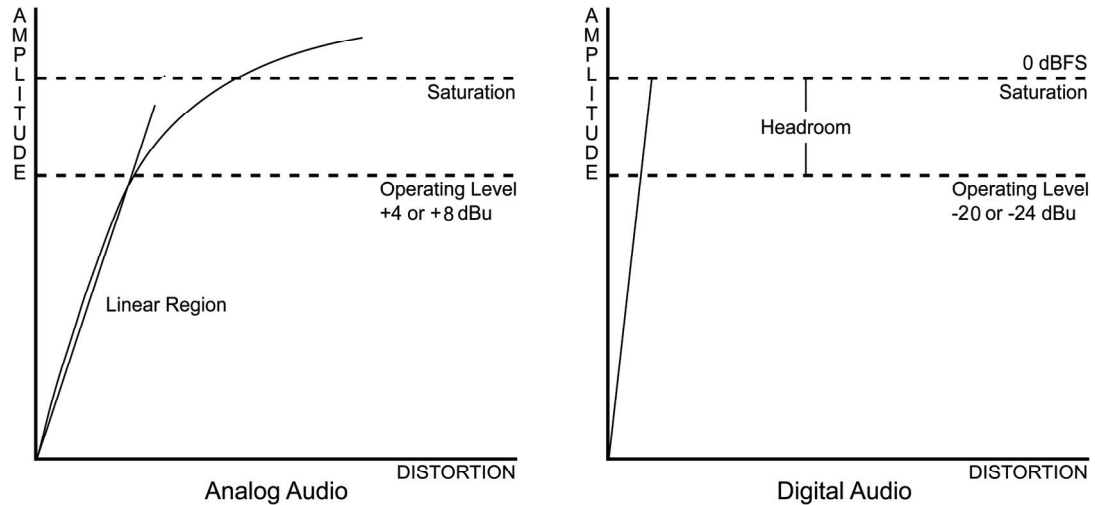


Figure 9. Graphs of Amplitude vs. Distortion

The preceding graphs of amplitude vs. distortion for analog and digital audio equipment show that digital audio does not gradually degrade (become more distorted) as the amplitude increases. Likewise, the digital audio signal does not exist above 0dBFS. For these reasons, the interface between existing analog house reference standards and digital audio standards are as shown in the following table:

Table 6. Analog House Reference and Digital Audio Interface

Reference	Headroom	Max. Input Level	Application
0dBu	14dB	+14dBu	AES/EBU for Audio Production
+4dBu	20dB	+24dBu	AES/EBU for Audio Production
+8dBu	20dB	+26dBu	AES/EBU for 525 Video
+4dBu	18dB	+22dBu	AES/EBU for 625 Video
+4dBu	22dB	+26dBu	AES/EBU for 625 Video

The coarse input level headroom adjustment is made with the 'A Level' and 'B Level' switches. These switches put the available headroom of the D/A Converter in the +18dBFS or +24dBFS range.

The fine input level, headroom adjustment is made using the 'A Gain' (RV1) and 'B Gain' (RV2) potentiometers. These pots provide ± 6 dB adjustment on the +18dBFS and +24dBFS switch settings. Using these adjustments, the total headroom is adjustable over the -12dBFS to -30dBFS range.

This means that for a -20dBFS input, the analog outputs may be set to -8dBu to $+10\text{dBu}$. Likewise, for a -18dBFS input, the output may be set anywhere in the range of -6dBu to $+12\text{dBu}$. Keep in mind that the maximum output level (1% THD+N) is 27dBu (@ 1kHz).

Specifications

In This Chapter

This chapter contains the Technical Specifications table.

Technical Specifications

Table 7. DAC-9516 Technical Specifications

Category	Parameter		Specification
AES/EBU Input	Number of Inputs		1 AES-3id (SMPTE 276M)
	Connector		BNC
	Sampling Rates		32kHz, 44.1kHz, 48kHz
	Input Impedance		75Ω terminating
	Input Return Loss		< -38dB (0.1 to 6MHz)
	Input Level	Minimum	100 mV
Maximum (continuous)		2.5V p-p	
Analog Audio Outputs	Number of Outputs		2 balanced stereo pair copies (A1 & B1, A2 & B2 via removable terminal block strip)
	Connectors		12-pin screw-type terminal block strip
	Output Impedance		66Ω
	Maximum Output Level		+27dBu into 10kΩ

Category	Parameter	Specification
Performance	Quantization	8 to 24 bits
	Frequency Response	20Hz - 20kHz ± 0.2 dB @ Fs = 48kHz
	Signal to Noise Ratio	> 100dB (22Hz - 20kHz AES 17 filter) 48kHz - 20dBFS
	THD	< 0.01% > 100dB @ -20dBFS
	IMD	< 0.002% SMPTE/4:1
	Nominal Analog Output Levels	-8dBu to +10dBu for -20dBFS
	Crosstalk	< -98dB to 20kHz
	Audio Delay	0.7ms (AES In to Analog Audio Out)
Power	Required Voltage	+5V DC (5% regulation)
	Power Consumption	< 3.4W typical
Other	Thermal Environment	20 – 40°C (68 – 104°F) ambient, non-condensing
	Warranty	3-year transferable

Specifications are subject to change without notification.

Service Information

In This Chapter

This chapter contains Warranty and Repair Policy information.

Warranty and Repair Policy

The RossGear DAC-9516 is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of **THREE (3)** years from the date of delivery to the customer. In the event that your RossGear DAC-9516 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 RossGear DAC-9516 has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the **THREE (3)** year warranty period.

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

This RossGear DAC-9516 AES/EBU to Analog Audio Converter User Manual of our Digital Products line provides all pertinent information for the safe installation and operation of your RossGear Product. Ross Video policy dictates that all repairs to the RossGear DAC-9516 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 RossGear DAC-9516, 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 RossGear DAC-9516. If required, a temporary replacement module will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

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

Ordering Information

In This Chapter

This chapter contains ordering information for the DAC-9516 and related products.

DAC-9516 and Related Products

Standard Equipment

- **DAC-9516**, AES/EBU to Analog Audio Converter, including:
 - one User Manual
 - an installation kit with various mounting hardware
 - one **PS-9000** 5V Universal Power Adaptor and line cord (pre-packaged for the country of use)

Optional Equipment

- **9516DR-004**, additional User Manual
- **PS-9000** additional 5V Universal Power Adaptor and line cord (pre-packaged for the country of use)
- **BPM-9000**, 90° Angle Mounting Bracket
(90° angle metal mounting bracket for rack and desk installation)
- **GRF-9000**, GearLite Rack Frame (Front)
(Front of rack frame for mounting up to nine GearLite modules in 2RU space)

Your **DAC-9516 AES/EBU to Analog Audio Converter** is part of the GearLite line of the RossGEAR family of products. Ross Video Limited offers a full line of RossGEAR digital terminal equipment including distribution, conversion, monitoring, synchronizers, encoders, decoders, amplifiers, keyers, switchers, as well as analog audio and video products.

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

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