



DAC-9213

Multi-Definition SDI to Analog Component Converter

User Manual



Video Production Technology

DAC-9213 User Manual

- Ross Part Number: **9213DR-004-03**
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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 to avoid personnel injury and to prevent product damage.

Product 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



Protective Earth — *This symbol identifies a Protective Earth (PE) terminal, which is provided for connection of the supply system’s protective earth (green or green/yellow) conductor.*



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.*



Warning Hazardous Voltages — *This symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.*



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



1. **Warning** – Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. 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.
6. 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.



7. **Warning – Indoor Use: WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
8. Do not block ventilation openings. Install in accordance with manufacturer's instructions.
9. Do not install near heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
10. Do not use this apparatus near water.
11. Only use attachments/accessories specified by the manufacturer.
12. Unplug this apparatus during lightning storms or when unused for long periods of time.
13. Clean only with a dry cloth.
14. To avoid electrical shock, disconnect the A/C power cord before any servicing.
15. 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

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 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

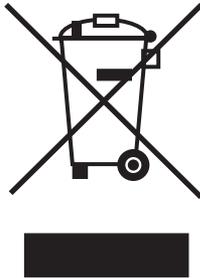
“Contact Us” section on the last page of this manual. All GearLite products are covered by a generous 3-year warranty and will be repaired without charge for materials or labor within this period. See the “Warranty and Repair Policy” section in this manual for details.

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.

Introduction

Overview

The DAC-9213 Multi-Definition SDI to Analog Component Converter is a high-quality signal conversion solution for High Definition (HD) and Standard Definition (SD) SDI signals and part of a growing family of GearLite Multi-Definition (MD) self-contained, small brick format modules.

The DAC-9213 addresses program stream imaging requirements by converting 10bit MD-SDI video to analog component video (multiple formats). The DAC-9213 has a full 10bit data path, with 11bit data processing.

The front panel of the DAC-9213 chassis provides power and status LEDs for visual reference. In addition, user-selectable switch settings are available to select the preferred mode of operation.

The DAC-9213 provides analog conversion of 525i, 625i, 720p, 1080i, and 1080p SDI signals (SMPTE 259M and 292M). Special measures have been taken to ensure excellent return loss at both input and output. This ensures error-free performance with short or long cables.

The DAC-9213 is delivered with a universal power adapter and line cord suitable for the country of use. Various mounting options are included that allow a wide range of installation choices. The DAC-9213 provides a broadcast-quality MD-SDI component monitoring solution in a small, stand-alone package.

Simplified Block Diagram

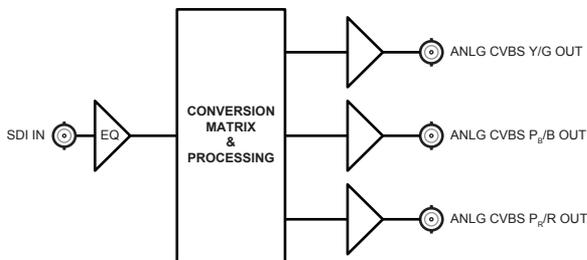


Figure 1 Simplified Block Diagram of DAC-9213 Functions

Features

The DAC-9213 includes the following features:

- HD-SDI and SD-SDI to analog component conversion
- 10bit DAC resolution
- 11bit data processing

- Automatic input cable equalization >300m (>984ft) of Belden 1694A at SD-SDI rates (270Mbps)
- Automatic input cable equalization >100m (>328ft) of Belden 1694A at HD-SDI rates (1.485Gbps)
- Analog component outputs can be set for YP_BP_R or RGB
- LEDs for power and status
- Small brick form factor
- 5V universal adapter with locking DC connector
- 3-year warranty

Installation

Static Discharge

Whenever handling the DAC-9213 and other related equipment, please observe all static discharge precautions as described in the following 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 wearing synthetic fiber clothing. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Unpacking

Unpack each DAC-9213 module you received from the shipping container and check the contents 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 DAC-9213 can be mounted in any convenient location. However, to ensure long life for this product, observe the following precautions and operating requirements:

- Maintain an ambient temperature of 20°C 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 connectors.

Surface Mount Strips

The included VELCRO® brand surface mount 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.

To install the Surface Mount Strips

1. Remove the **Protective Backing Film** from the adhesive on the bottom of the two VELCRO® brand **Surface Mount Strips**.
2. Adhere the **Surface Mount Strips** to the bottom side of the chassis. (**Figure 2**)

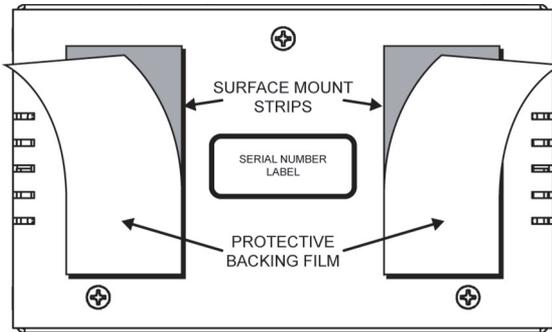


Figure 2 Surface Mount Installation Option

3. Remove the **Protective Backing Film** from the other side of the VELCRO® brand **Surface Mount Strips**.
4. Press the chassis into position on the surface you want to mount it to.



Operating Tip — An additional VELCRO® brand **Surface Mount Strip** is available to mount the power adapter.

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.

Optional Mounting Accessories

Ross Video is committed to providing practical solutions for the needs of your high-quality broadcast facility.

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.

To install the Flat Metal Plate

1. Remove the **2** screws from the bottom of the chassis.
2. Install the **Flat Metal Plate** onto the bottom of the chassis (**Figure 3**) using the screws provided in the Mounting Kit. Do not use the screws removed during **Step 1**.

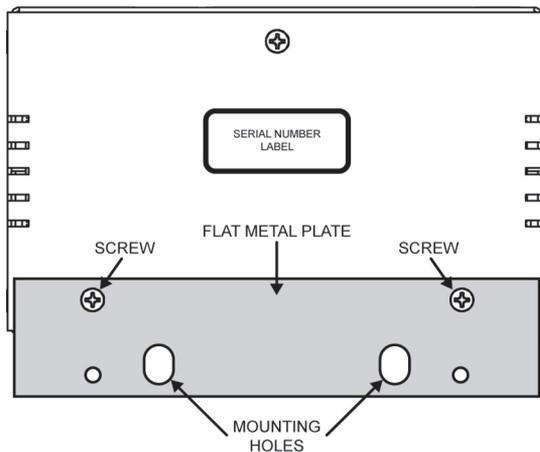


Figure 3 Flat Metal Plate Installation Option

3. Install the chassis in the desired location using the **Mounting Holes** on the **Flat Metal Plate**. Mounting screws are not provided by Ross Video.

Angle Mounting Bracket

The Angle Mounting Bracket (**Figure 4**) allows a single GearLite module to be installed in positions not possible with the flat metal plate. The bracket has a 90° angle. Mounting screws are not provided by Ross Video.

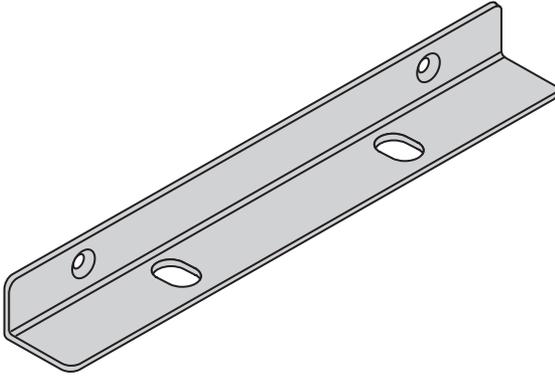


Figure 4 *Angle Mounting Bracket*

Setup



Note — Throughout this chapter, the term *SDI* is used universally to indicate either *SD-SDI* or *HD-SDI* signals.

Power Adapter 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-9213. The DAC-9213 has a standard miniature power jack (center pin positive).

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-9213 is supplied



Caution — Use of improper adaptors may damage the DAC-9213 and will void the warranty.

Installations outside of North America using line voltages of 200-240V require a plug, certified for the country of use, to be installed on the supplied line cord. Refer to the section “**Important Regulatory and Safety Notices to Service Personnel**” at the front of this manual for details.

Cable Connections Overview

Connect the cables to the DAC-9213 according to the designations indicated on the chassis label and **Figure 5**. The input is internally terminated at 75ohm. It is not necessary to terminate unused outputs.

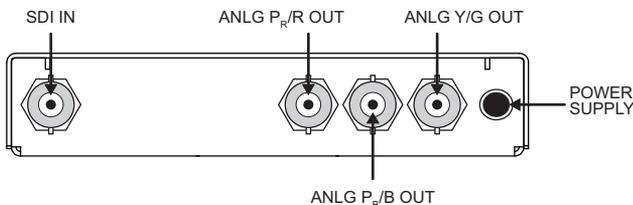


Figure 5 DAC-9213 Connections



Note — For cabling convenience, a 3-BNC molded analog output cable is available from Ross Video. For monitors with RCA inputs, Ross Video also has available RCA to BNC adapters. Contact your GearLite sales representative for cable ordering details.

Status and Selection LEDs

The front edge of the DAC-9213 has four LED indicators that display the status of the input signals, and indicate menu function and configuration selections. (Figure 6)

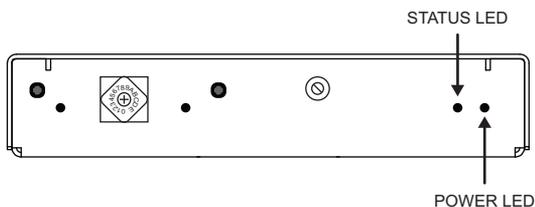


Figure 6 DAC-9213 Front Edge Status Indicator LEDs

Table 1 describes the status LEDs available on the DAC-9213.

Table 1 Status LED Descriptions

LED	Color	Function
POWER	Green	When lit, this LED indicates that the DAC-9213 is powered on.
	Off	When unlit, this LED indicates a loss of power to the DAC-9213.
STATUS	Green	When lit, this LED indicates a valid ^a input signal is present and no errors are detected. The DAC-9213 is functioning correctly.
	Flashing Green	When flashing green, this LED indicates an input signal problem or an inconsistency between the SDI input standard and the selected output format.
	Off	When unlit, this LED indicates a loss of power to the DAC-9213.
UP	Yellow	For menu items that have multiple selections, these LEDs will be in a state as indicated in the Function Setup and Configuration Menu.
DOWN	Yellow	

a.*A valid signal is defined as any analog composite video signal standard input into the DAC-9213, which matches the setting of the Video Standard that has been selected in the Function Setup and Configuration Menu. In other words, if the converter is in its default state for NTSC (525/60) video, then only an NTSC (525/60) composite video signal input will cause the OK LED to be lit. Any other analog composite video signal, of a different standard (PAL-B, PAL-M, PAL N), that is input into the converter will be invalid.

Configuration

Use the **Function Select** switch and the **Down** and **Up** buttons to configure the DAC-9213 to convert analog video signals to SDI. Settings are described in the section “**Function Setup and Configuration Menus**” on page 14. Refer to **Figure 7** for switch and button locations.

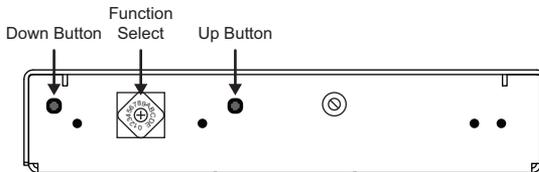


Figure 7 DAC-9213 Switch and Button Locations

General Operating Rules

Please note the following important operating rules for the DAC-9213:

- For each of the supported Video Standards (NTSC / PAL-B / PAL-M / PAL-N) the card stores the default video settings independently in non-volatile memory.
- The module always powers-up in the last configuration used.
- Always check to see that the input **OK** LED is lit. If not, check that the inputs are valid and the correct Video Standard has been selected from the **Function** menu.

Function Selection

The factory-set default modes of operation are as follows:

- Input Video Standard = Auto Detect
- Output Video Format = YP_BP_R, N10 (no setup)

In general only the Output Video Format needs to be set as desired. The default Auto-Detect input setting is extremely versatile. However, fixed mode settings are provided for user convenience.

Function Setup and Configuration Menus

A single press of the **Down** and **Up** buttons is a “momentary” click of the button unless indicated by “(h)”.

Table Legend

- + Press the **Up** button from the default position
- Press the **Down** button from the default position
- (h) Hold **Up** or **Down** button for 2-3 seconds for faster adjustment or special function
- * Factory default state
- Lit LED display
- Unlit LED display
- ☼ Flashing LED display

Table 2 Function Setup and Configuration Menu

Function Selection Switch Position	Function Menu	Up/Down Buttons Mode Selection Menu	LED Display	
			DOWN	UP
0	Operation	Buttons perform no action	●	●
1	Input Video Standard	525i +	●	☼
		625i +	○	☼
		720p +	●	○
		1080psf 23.98Hz, 1080psf 24Hz +	○	○
		1080i 50Hz +	○	●
		1080i 59.94Hz 1080i 60Hz +	☼	○
		Auto detect*	☼	●
2	Output Video Format	RGB (NTSC Related) +		
		RGB (MII) +		
		RGB N10 (No setup) +		
		Y/P _B /P _R N10 (No setup)*		

Table 2 Function Setup and Configuration Menu

Function Selection Switch Position	Function Menu	Up/Down Buttons Mode Selection Menu	LED Display	
			DOWN	UP
3	Output Video Level	Max. Gain + (h)	●	☀
		Gain between Unity and Max. + (h)	●	◯
		Unity*	◯	◯
		Gain between Min. and Unity – (h)	◯	●
		Min. Gain – (h)	☀	●
4	Force Mono	On + (h)	●	☀
		Off*	☀	●
5	Setup On	On*	●	☀
		Off –	☀	●
6	Syncon All	On +	●	☀
		Off*	☀	●
7	Disable Auto Mute	On +	●	☀
		Off*	☀	●
8	Not implemented			
9	Not implemented			
A	Not implemented			
B	Not implemented			
C	Not implemented			
D	Not implemented			
E	Not implemented			
F	Default Set	Reset all user settings to Factory Default state (Unity) + (h)	See Notes	

Function Menu Notes

Some of the menu items in **Table 2** are explained here in further detail as follows:

Operation

In this menu position, the **Down** and **Up** buttons are disabled.

Input Video Standard

Use this menu item to select the video standard that matches the incoming SDI signal's video standard.

In Auto Detect mode, the module will attempt to detect any of the supported incoming High Definition or Standard Definition SDI video standards. Refer to **Table 3** for supported standards. When a supported standard is detected, the appropriate analog output format is selected. If the module is unable to determine the input standard, the **STATUS LED** will flash and the module will mute the analog outputs.



Note — If *Disable Auto Mute* is set to *On* with an input/output mismatch, the DAC-9213 will output an invalid signal and the **STATUS LED** will flash.

Output Video Format

Use this menu to select the output component video format. Note that not all output formats support all SDI input signal standards. For example, RGB (NTSC Related) is only supported on 525i. Refer to **Table 3** for a complete list of supported formats vs. input standards.

Table 3 Supported Formats and Input Standards

Digital Input Standard	Signal	Analog Output Format			
		RGB			Y _P B _P R
		SMPTE/EBU N10	MII	NTSC Related	SMPTE/EBU N10
525i	Y/G (setup)	0 to 700mV	0 to 700mV (54 to 700mV)	0 to 714mV (54 to 714mV)	0 to 700mV
	P _B /B (setup)	0 to 700mV	0 to 700mV (54 to 700mV)	0 to 714mV (54 to 714mV)	-350mV to +350mV
	P _R /R (setup)	0 to 700mV	0 to 700mV (54 to 700mV)	0 to 714mV (54 to 714mV)	-350mV to +350mV
	Sync	0 to -300mV	0 to -300mV	0 to -286mV	0 to -300mV

Table 3 Supported Formats and Input Standards

Digital Input Standard	Signal	Analog Output Format			
		RGB			YP _B P _R
		SMPTE/EBU N10	MII	NTSC Related	SMPTE/EBU N10
625i	Y/G	0 to 700mV			0 to 700mV
	P _B P _R /RB	0 to 700mV			-350mV to +350mV
	Sync	0 to -300mV			0 to -300mV
HD (1080i, 720p)	Y/G	0 to 700mV			0 to 700mV
	P _B P _R /RB	0 to 700mV			-350mV to +350mV
	Sync	-300mV to +300mV			-300mV to +300mV

Output Video Level

Use this menu to adjust the component video output level by up to $\pm 25\%$. This setting affects all input standards and output formats. Pressing, or holding, the Up button will increase the output video level on all three analog output signals. Pressing, or holding, the Down button will decrease the output levels. This menu has a 2 button quick default to unity, the default value. Press both Up and Down buttons at the same time and hold for three seconds.

Force Mono

Use this menu to blank the P_B and P_R component output signals. This option has no function in RGB format. Note that if the DAC-9213 is setup in RGB mode, and Force Mono is enabled, then the module is switched to YP_BP_R mode, the P_B and P_R channels will be blanked (i.e. the module *remembers* option settings even though they may not affect the current operating mode).

Setup On

Use this menu to control the blanking level of RGB signals in 525i mode only. Setup is only valid in the 525i RGB (MII) and 525i RGB (NTSC Related) output formats.

Sync On All

Use this menu to enable horizontal synchronization pulses (bi-level sync or tri-level sync), on all three RGB signals (Sync On All is set to On) or just on the Green channel (Sync On All is set to Off).



Note — This setting has no effect on YP_BP_R signals.

Disable Auto Mute

Use this menu to disable automatic muting of the analog outputs when a standard mismatch occurs. When automatic muting is enabled (Disable Auto Mute = Off) the DAC-9213 will automatically mute the analog outputs when the input video standard selected by the user differs from the video standard detected at the SDI input.



Note — *If Disable Auto Mute is set to On with an input/output mismatch, the DAC-9213 will output an invalid signal and the STATUS LED will flash.*

Default Set

Use this menu item to reset all user settings to the factory defaults. Holding down the **Up** button for three seconds will reset the user settings to the default values given in **Table 2** on page 15.

When selecting this option, the state of the **UP** LED will indicate if any settings are not in their default states.

- If the **UP** LED is flashing, it indicates there is at least one user setting that is not in its default state.
- If the **UP** LED is lit solid, the user settings are in default state.

Specifications

Specifications are subject to change without notification.

Table 4 DAC-9213 — Technical Specifications

Category	Parameter	Specification
Serial Digital Video Input	Number of Inputs	1
	Signal Standards Supported	SMPTE 259M (270Mbps) SMPTE 292M (1.4835Gbps, 1.485Gbps)
	Signal Formats Supported	SD: 525i 5994Hz, 525i 60Hz, 625i 50Hz
		HD: 720p 59.94Hz, 720p 60Hz, 1080psf 23.98Hz, 1080psf 24Hz, 1080i 50Hz, 1080i 59.94Hz, 1080i 60Hz
	Input Impedance	75ohm terminating
	Return Loss	>20dB to 270MHz >15dB to 1.485GHz
	Equalization (using Belden 1694A cable)	>300m @ 270Mbps >100m @ 1.485Gbps
Analog Component Output	Number of Outputs	3
	Video	Component Analog Video Y _P B _P R or RGB
	Supported Video Levels	Y _P B _P R: SMPTE RGB: SMPTE, MII, Betacam
	Output Impedance	75ohm
	Output Return Loss	>45dB to 6MHz >28dB to 30MHz
	DC Offset for RGB or Component Video	<±50mV
	Frequency Response	±0.5dB to 20MHz ±1.0dB to 30MHz
	Group Delay	SD: <20ns to 6MHz HD: <6ns to 30MHz

Table 4 DAC-9213 — Technical Specifications

Category	Parameter	Specification
Analog Composite Output	Outputs Short Circuit Protected	Yes
	RMS Noise (unweighted)	SD: <-55dB, 0-6.0MHz
Power	Required Voltage	+5V DC
	Current Consumption	<750mA typical
	Total Power	<3.75W typical
Other	Thermal Environment	20°C to 40°C (68°F to 104°F), ambient, non-condensing
	Dimensions (approx.)	13cm x 9.5cm x 2.5cm (5" x 4" x 1")
	Weight (approx.)	326g (11.5oz)

Service Information

Warranty and Repair Policy

The GearLite DAC-9213 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 GearLite DAC-9213 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 GearLite DAC-9213 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 DAC-9213 User Manual provides all pertinent information for the safe installation and operation of your GearLite Product. Ross Video policy dictates that all repairs to the GearLite DAC-9213 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 GearLite DAC-9213, 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 GearLite DAC-9213. 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.



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

Technical Support

Telephone: +1 613 • 652 • 4886
After Hours Emergency: +1 613 • 349 • 0006
Email: techsupport@rossvideo.com

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