

# 9021

**Standard Definition A/D Analog  
Composite, Y/C or Component to 10-bit  
SDI**

## Owner's Manual



9021-OM  
Version: 1.0



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## 9021 • Standard Definition A/D Analog Composite, Y/C or Component to 10-bit SDI Owner's Manual

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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 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



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 openGear™ frame. Refer to the openGear™ frame Owner’s Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as it’s 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 cords 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.

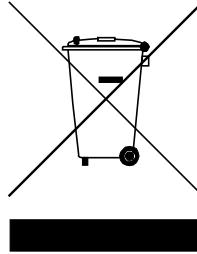
To reduce the risk of fire, replacement fuses must be the same type and rating. Only use attachments/accessories specified by the manufacturer.

## 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, Cobalt Digital 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 Cobalt Digital for more information on the environmental performances of our products.

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# Introduction

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## In This Chapter

This chapter includes the following sections:

- A Word of Thanks
- Overview
- Functional Block Diagram
- Supported Audio and Video Formats
- Documentation Terms

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## A Word of Thanks

Congratulations on choosing the openGear™ **Standard Definition A/D Analog Composite, Y/C or Component to 10-bit SDI**. The 9021 is part of a full line of modular conversion gear for broadcast TV environments. The Cobalt Digital openGear™ line includes video decoders and encoders, audio embedders and de-embedders, distribution amplifiers, format converters, and much more. Cobalt openGear™ modular conversion gear will meet your signal conversion needs now and well into the future.

Should you have questions pertaining to the installation or operation of your 9021, please contact us at the numbers listed on the back cover of this manual. We are happy to help with any questions regarding this or any other openGear™ card.

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## Overview

The 9021 is a high quality full 10-bit analog to digital decoder for converting 525 and 625 line, analog composite, Y/C and component signals (YPbPr) to 270 Mb 4:2:2 SDI (SMPTE 259M compliant) output with SMPTE EDH. The user can select four different Y-C separation modes (4-line adaptive, 4-line non-adaptive, 3-line adaptive and notch filter) for composite input and three different YPbPr inputs (BetaCam™, MII™, or SMPTE/N10) for component inputs.

Features include differential inputs, user configurable 75-ohm input termination, user Proc. gain controls, de-jitter filter on/off, Color Bars on/off and Pedestal on/off. User Proc adjustments can be saved and factory defaults can be restored. The configuration controls are mounted on the card edge for in-frame adjustments.

The input and outputs of the 9021 are the following:

**Input:**

- ❑ One SD analog video input on three BNCs

**Outputs:**

- ❑ Seven SD-SDI video outputs

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## Software Version

- ❑ This manual is written for software release number 1.0.
- ❑ To view the current software release number of your 9021 check the information submenu on the front edge controls or the card info menu in Dashboard.
- ❑ To upgrade your 9021 software, go to the download page at [www.cobaltdigital.com](http://www.cobaltdigital.com) to download the latest release, and upload the file through Dashboard™ (see Dashboard™ user manual, 3-5).

# Functional Block Diagram

This section diagrams the basic signal flow of your 9021 product.

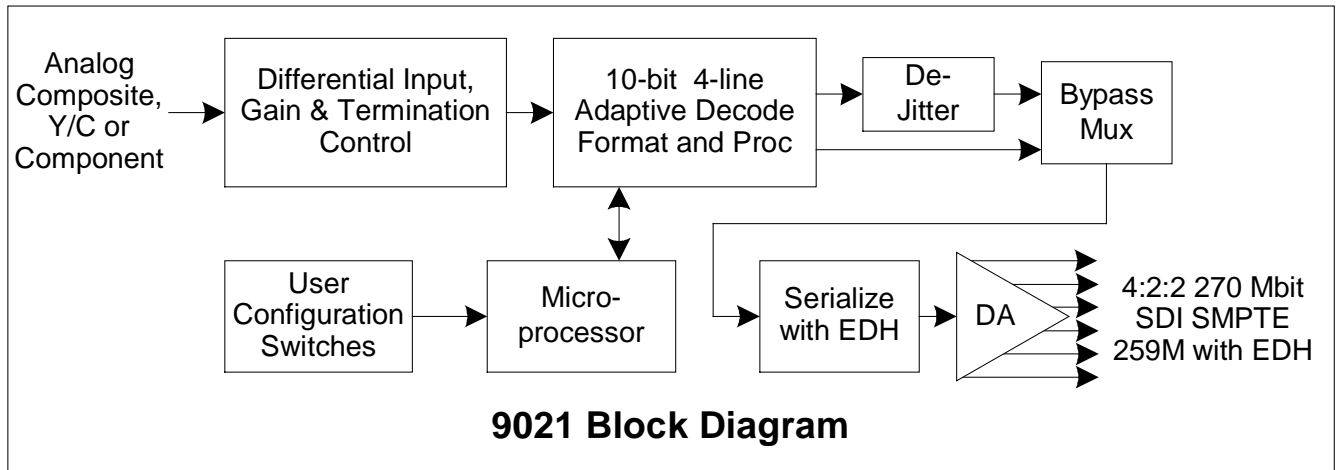


Figure 1. Simplified Block Diagram of 9021 Functions

# Supported Video Formats

## Input and Output Video

The 9021 supports both NTSC and PAL formats.

Raster structure	Frame Rate
486i <sup>1</sup>	29.97
575i <sup>1</sup>	25

Notes:

1. All rates displayed as frame rates, interlaced (“i”) field rates are two times the number shown.

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## Documentation Terms

The following terms are used throughout this guide:

- **“Frame”** refers to the **8310** frame that houses the **9021** card.
- **“Operator”** and **“User”** both refer to the person who uses the **9021**.
- **“Board”** and **“Card”** all refer to the **9021** card itself, including all components and switches.
- **“System”** and **“Video system”** refers to the mix of interconnected production and terminal equipment in which the **9021** operates.

# Installation and Setup

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## In This Chapter

This chapter includes the following sections:

- Static Discharge
- Unpacking
- Rear Module Installation (Optional)
- Board Installation
- BNC Connections
- Menu Structure
- Factory Defaults

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## Static Discharge

Whenever handling the card 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.

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## Unpacking

Unpack each card 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 Cobalt Digital directly.

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## Rear Module Installation (Optional)

If you are installing the card in a 8310-C-BNC or 8310-BNC frame (one with a 100 BNC rear module installed across the entire back plane), skip this section.

If you are installing the card into a slot with no rear module, you should have ordered and received the RM-9021-A module. You will need to install it in your 8310 frame before you can connect cables.

Use the following steps to install a rear module in an 8310 openGear™ frame:

1. Refer to the openGear™ 8310 frame Owner's Manual, to ensure that the frame is properly installed according to instructions.
2. On the rear of the 8310, locate the card frame slot.
3. As shown in Figure 2, seat the bottom of the rear module in the seating slot at the base of the frame's back plane.

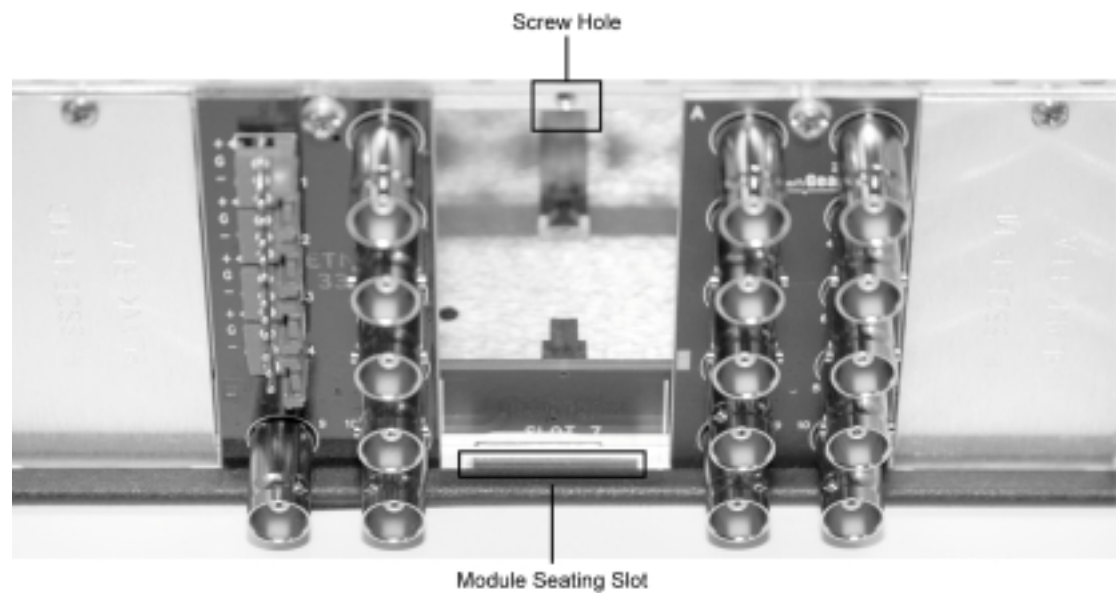


Figure 2. Rear Module Installation

4. Align the top hole of the rear module with the screw hole on the top edge of the 8310 back plane.
5. Using a Phillips driver and the supplied screw, fasten the rear module to the 8310 back plane. Do not over tighten.

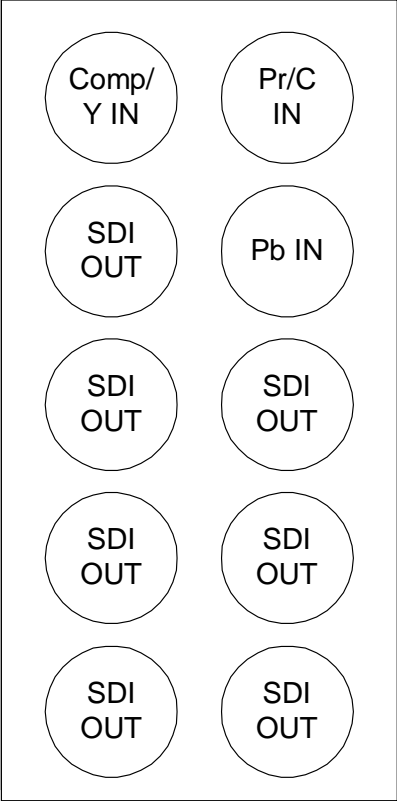
All modules are installed using the same method above.

The following section contains a drawing of the RM-9021-A module.

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# Rear Module Available for 9021

Figure 3. BNC Designations for the Card Rear Module available for the 9021.



**RM-9021-A**

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## Board Installation

Use the following steps to install the card in the openGear™ 8310 frame:

1. Refer to the Owner's Manual of the openGear™ 8310 frame to ensure that the frame is properly installed according to instructions.



### Warning

Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using convection cooling.

2. After selecting the desired frame installation slot, hold the card by the edges and carefully align the card edges with the slots in the frame. Then, fully insert the card into the frame until the rear connection plugs are properly seated on the midplane and rear modules.
3. Connect the input and output cables according to the diagram for the rear module being used. The inputs are internally terminated with 75 Ohms. It is not necessary to terminate unused outputs.

This completes the procedure for installing the card in the openGear™ 8310 frame.

# Card Control and Status

## Card Control Switches

The majority of the card control can be performed by the 8 switches on switch bank S1. Their operation is detailed in the following table.

<b>S1.1-4 VIDEO INPUT AND COLOR SEPARATION MODE</b>				
<b>On</b>	<b>On</b>	<b>On</b>	<b>On</b>	Composite 4-Line Adaptive Comb
<b>On</b>	<b>On</b>	<b>On</b>	<b>Off</b>	Composite 4-Line Non-adaptive Comb
<b>On</b>	<b>On</b>	<b>Off</b>	<b>On</b>	Composite 3-Line Adaptive Comb
<b>On</b>	<b>On</b>	<b>Off</b>	<b>Off</b>	Composite Notch Filter
<b>On</b>	<b>Off</b>	<b>xx</b>	<b>xx</b>	Y/C (S-Video)
<b>Off</b>	<b>On</b>	<b>On</b>	<b>On</b>	Component YPbPr BetaCam™
<b>Off</b>	<b>On</b>	<b>Off</b>	<b>Off</b>	Component YPbPr MII™
<b>Off</b>	<b>On</b>	<b>Off</b>	<b>On</b>	Component YPbPr SMPTE/N10
<b>Off</b>	<b>Off</b>	<b>On</b>	<b>On</b>	Component Y only BetaCam™
<b>Off</b>	<b>Off</b>	<b>Off</b>	<b>Off</b>	Component Y only MII™
<b>Off</b>	<b>Off</b>	<b>Off</b>	<b>On</b>	Component Y only SMPTE/N10
<b>S1.5 MANUAL GAIN CONTROL</b>				
<b>OFF</b>	Manual gain control enabled			
<b>ON</b>	Automatic gain control enabled			
<b>S1.6 COLOR BARS ON/OFF</b>				
<b>OFF</b>	Display Video			
<b>ON</b>	Display Color Bars			
<b>S1.7 JITTER FILTER</b>				
<b>OFF</b>	Jitter Filter Off			
<b>ON</b>	Jitter Filter On			
<b>S1.8 SETUP</b>				
<b>OFF</b>	Pedestal not removed (recommended for PAL)			
<b>ON</b>	7.5 IRE pedestal removed (recommended mode NTSC only)			

Other, less used, parameters are adjusted by dialing S3 and S4 to certain values, and then moving the thumb switch S2 up or down. These parameters are detailed in the following table. For any given parameters, pressing the REGISTER RESTORE button (S5) will restore the parameter to it's saved setting.

<b>S3</b>	<b>S4</b>	<b>Internal</b>
<b>0</b>	<b>0</b>	<b>Normal card operation</b>
<b>1</b>	<b>1</b>	<b>Y Gain</b>
<b>1</b>	<b>2</b>	<b>Y Offset (Black level)</b>
<b>1</b>	<b>3</b>	<b>Color Saturation</b>
<b>1</b>	<b>4</b>	<b>Hue (for Composite and Y/C inputs only)</b>
<b>5</b>	<b>1</b>	<b>Luma Peaking Filter adjustment</b>
<b>6</b>	<b>1</b>	<b>Vbit transition (S2 Up = ITU, line 10) (S2 Down = SMPTE, Line 20, Default)</b>
<b>8</b>	<b>8</b>	<b>Restore Factory Defaults (Press S2 Up)</b>
<b>9</b>	<b>9</b>	<b>Save Settings (Press S2 Up)</b>

## Card Status LEDs

The card LEDs report the lock status of the device. See the table below for an explanation of each function.

LED NAME	DESCRIPTION
<b>LOCK LED</b>	Flashes green when not locked to input signal. When locked illuminates steady green. When S3 or S4 not at 0, indicates state of parameter.
<b>NTSC LED</b>	On when locked to NTSC input, off otherwise
<b>PAL LED</b>	On when locked to PAL input, off otherwise
<b>RMT LED</b>	reserved for future use

## Factory Default Settings

The factory default settings are as follows

- 1) S4 - Color is On
- 2) S5 – Test Pattern is Off
- 3) S6 – Setup is On
- 4) S7 – Output Sample Mode is 16:16:16
- 5) S8 – De-Jitter Filter is On

# Remote Control

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## In This Chapter

This section provides a detailed explanation on using remote control functions with your card.

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## DashBoard Control System Software

The DashBoard Control System enables you to monitor and control openGear™ frames and controller cards from a computer. The DashBoard software and manual can be downloaded from the Cobalt Digital Inc. website ([www.cobaltdigital.com](http://www.cobaltdigital.com)).

### *Using the Menus and Menu Descriptions*

You must first install the DashBoard Control System software on your computer. Refer to the *DashBoard User Manual* for software installation procedures and for using the DashBoard interface.

The following pages list the parameters from the menu tabs available in the DashBoard software when connected to a 9021.

Menu	Item	Format	Description
<b>Card Info (Read-only)</b>	Product	CDI-9021	The product name
	Manufacturer	Cobalt Digital Inc.	The manufacturer of the product
	Serial Number	#####	The product serial number
	Software Release Number	###	The release number of the firmware in this card
	PIC Software Build Number	##	The internal build number of this software
	Temperature	Degrees C / Degrees F	The surface temp of the board
	+12 V Power Rail	### W	Positive Supply Power
	-7.5 Power Rail	### W	Negative Supply Power
	Power	## W	Total power consumed by the board
	Input Signal	#####	Detected standard of the input signal.

# Technical Specifications

Table 4. Card - Technical Specifications

Category	Parameter	Specification
<b>Serial Digital Video Outputs</b>	Data Rates Supported	SMPTE 259M-C SD-SDI: 270 Mbps
	Frame Rates Supported	486i 29.97 NTSC, 575i 25 PAL
	Output Error Coding	SMPTE EDH
	Equalization	1000ft (300 meters) Belden 1694A
	Output Return Loss	>17dB at 270MHz
<b>Analog Video Input</b>	Number of Inputs	3
	Input Type	Differential, Common Mode Rejection (< 4.8V p-p)
	Video Inputs	Composite, Component YPbPr (BetaCam™, MII™, SMPTE/N10) and Y/C
	Conversion Bit Depth	10-Bits
	SD Color Separation	4-Line Adaptive Comb, 4-Line Non-adaptive Comb, 3-Line Adaptive Comb or Notch Filter
	Frequency Response	Y- 0-5.0MHz ± 0.25db
	Differential Phase	< 0.8%
	Differential Gain	< 1.8%
	S/N	>50 dB
	K-Factor	< 1%
	Input Return Loss	> 35dB at 5MHz
<b>Other</b>	Total Power Consumption	<5W
	Warranty	Five Year Transferable

Specifications are subject to change without notice.

# Service Information

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## In This Chapter

This chapter includes the following sections:

- Troubleshooting Checklist
- Warranty and Repair Policy

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## Troubleshooting Checklist

Routine maintenance to this openGear™ product is not required. In the event of problems with your card, the following basic troubleshooting checklist may help identify the source of the problem. If the module 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 at the end of this manual.

1. **Visual Review** — Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the module, 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. **Reseat 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. **Module Exchange** — Exchanging a suspect module with a module that is known to be working correctly is an efficient method for localizing problems to individual modules.

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## Warranty and Repair Policy

The openGear™ card 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 Cobalt Digital Inc. card proves to be defective in any way during this warranty period, Cobalt Digital Inc. 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 openGear™ card 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 Cobalt Digital Inc. 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 openGear™ card Owner's Manual provides all pertinent information for the safe installation and operation of your Cobalt Digital Inc. Product. Cobalt Digital Inc. policy dictates that all repairs to the openGear™ card are to be conducted only by an authorized Cobalt Digital Inc. factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Cobalt Digital Inc. factory representative, will automatically void the warranty. Please contact Cobalt Digital Inc. Technical Support for more information.

### ***In Case of Problems***

Should any problem arise with your openGear™ card, please contact the Cobalt Digital Inc. 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 openGear™ card. 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 Cobalt Digital Inc. will be shipped collect.

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

# Ordering Information

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## 9021 and Related Products

Your **9021 Standard Definition A/D 10-bit Analog Composite, Y/C and Component to SDI** is a part of the openGear™ family of products. Cobalt Digital offers a full line of openGear™ terminal equipment including distribution, conversion, monitoring, synchronizers, encoders, decoders, embedders, and de-embedders, as well as analog audio and video products.

### ***Standard Equipment***

- **9021** Standard Definition A/D 10-bit Analog Composite, Y/C and Component to SDI
- **9021-OM** Standard Definition A/D 10-bit Analog Composite, Y/C and Component to SDI Owner's Manual

### ***Optional Equipment***

- **9021-OM** Standard Definition A/D 10-bit Analog Composite, Y/C and Component to SDI Owner's Manual (additional Owner's Manual)
- **RM-9021-A** openGear™ Rear Module compatible with 9021 (10 BNC connector)
- **8310-C** Digital Products Frame and Power Supply with Cooling Fans (2RU, holds 10 cards)
- **8310-C-BNC** Digital Products Frame and Power Supply with fixed 100-BNC Rear Module and Cooling Fans. (2RU, holds 10 cards)
- **MFC-8310-N** Network Controller Card (Additional)

**Notes:**

# Contact Us

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## Contact Cobalt Digital Inc.

<b>PHONE</b>	<b>General Business Office and Technical Support</b>	217.344.1243
	<b>Fax</b>	217.344.1245
<b>E-MAIL</b>	<b>General Information</b>	Info@cobaltdigital.com
	<b>Sales Information</b>	Sales@cobaltdigital.com
<b>POSTAL SERVICE</b>	<b>Cobalt Digital Inc.</b>	2406 East University Avenue Urbana, IL 61802 USA

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