



openGear

CMI-100 User Guide

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 - offer the best product quality and support
2. Make Cool Practical Technology
 - develop great products that customers love

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If anything at all with your Ross experience does not live up to your expectations be sure to reach out to us at solutions@rossvideo.com.



David Ross
CEO, Ross Video
dross@rossvideo.com

Ross Video Code of Ethics

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2. We will do our best to understand our customers' requirements.
3. We will not ship crap.
4. We will be great to work with.
5. We will do something extra for our customers, as an apology, when something big goes wrong and it's our fault.
6. We will keep our promises.
7. We will treat the competition with respect.
8. We will cooperate with and help other friendly companies.
9. We will go above and beyond in times of crisis. *If there's no one to authorize the required action in times of company or customer crisis - do what you know in your heart is right. (You may rent helicopters if necessary.)*

CMI-100 · User Guide

- Ross Part Number: 8200DR-311-05
- Release Date: June 5, 2020.

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Patents

Patent numbers US 7,034,886; US 7,508,455; US 7,602,446; US 7,802,802 B2; US 7,834,886; US 7,914,332; US 8,307,284; US 8,407,374 B2; US 8,499,019 B2; US 8,519,949 B2; US 8,743,292 B2; GB 2,419,119 B; GB 2,447,380 B; and other patents pending.

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Refer to the “**Important Regulatory and Safety Notices**” document that accompanied your product.

Statement of Compliance

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed.

Compliance documentation, such as certification or Declaration of Compliance for the product is available upon request by contacting techsupport@rossvideo.com. Please include the product; model number identifiers and serial number and country that compliance information is needed in request.

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 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 Ltd. could void the user's authority to operate this equipment.*

Canada

This Class “A” digital apparatus complies with Canadian ICES-003 and part 15 of the FCC Rules.

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

European Union

This equipment is in compliance with the essential requirements and other relevant provisions established under regulation (EC) No 765/2008 and Decision No 768/2008/EC referred to as the “New Legislative Framework”.



Warning — *This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.*

Australia/New Zealand

This equipment is in compliance with the provisions established under the Radiocommunications Act 1992 and Radiocommunications Labeling (Electromagnetic Compatibility) Notice 2008.

Korea

This equipment is in compliance with the provisions established under the Radio Waves Act.

Class A equipment (Broadcasting and communications service for business use)

This device is a business-use (Class A) EMC-compliant device. The seller and user are advised to be aware of this fact. This device is intended for use in areas outside home.

Type of Equipment	User's Guide
A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A Equipment (Industrial Broadcasting & Communication Equipment)	This equipment is Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

International

This equipment has been tested under the requirements of CISPR 22:2008 or CISPR 32:2015 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 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 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.

Company Address



Ross Video Limited

8 John Street
Iroquois, Ontario, K0E 1K0
Canada

Ross Video Incorporated

P.O. Box 880
Ogdensburg, New York
USA 13669-0880

General Business Office: (+1) 613 • 652 • 4886

Fax: (+1) 613 • 652 • 4425

Technical Support: (+1) 613 • 652 • 4886

After Hours Emergency: (+1) 613 • 349 • 0006

E-mail (Technical Support): techsupport@rossvideo.com

E-mail (General Information): solutions@rossvideo.com

Website: <http://www.rossvideo.com>

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Introduction

This guide provides an overview of the CMI-100 Constant Metadata Inserter. The following chapters are included:

- “**Introduction**” summarizes the guide and provides important terms, and conventions.
- “**Before You Begin**” provides general information to keep in mind before installing and configuring your CMI-100.
- “**Hardware Overview**” provides an overview of the CMI-100 hardware components.
- “**Physical Installation**” provides instructions for the physical installation of the CMI-100 card and its rear module into an openGear frame.
- “**Configuration**” explains how to use the options in DashBoard to set up the CMI-100.
- “**Upgrading the Software**” provides instructions for upgrading the CMI-100 software via DashBoard.
- “**Technical Specifications**” provides the technical specification information for the CMI-100.
- “**Service Information**” provides information on the warranty and repair policy for your CMI-100.
- “**Glossary**” provides a list of terms used throughout this guide.

Related Publications

It is recommended to consult the following Ross documentation before installing and configuring your CMI-100:

- *DashBoard User Guide*, Ross Part Number: 8351DR-004
- *MFC-OG3-N and MFC-8322-S User Guide*, Ross Part Number: 8322DR-004
- *OGX-FR Series Quick Start Guide*, Ross Part Number: 8322DR-202
- *OGX-FR Series User Guide*, Ross Part Number: 8322DR-204

Documentation Conventions

Special text formats are used in this guide to identify parts of the user interface, text that a user must enter, or a sequence of menus and sub-menus that must be followed to reach a particular command.

Interface Elements

Bold text is used to identify a user interface element such as a dialog box, menu item, or button. For example:

In the **Network** tab, click **Apply**.

User Entered Text

Courier text is used to identify text that a user must enter. For example:

In the **Language** box, enter **English**.

Referenced Guides

Text set in bold and italic represent the titles of referenced guides, manuals, or documents. For example:

For more information, refer to the ***DashBoard User Guide***.

Menu Sequences

Menu arrows are used in procedures to identify a sequence of menu items that you must follow. For example, if a step reads “**File > Save As**,” you would click the **File** menu and then click **Save As**.

Important Instructions

Star icons are used to identify important instructions or features. For example:

- ★ Contact your IT department before connecting to your facility network to ensure that there are no conflicts. They will provide you with an appropriate value for the IP Address, Subnet Mask, and Gateway for your device.

Contacting Technical Support

At Ross Video, we take pride in the quality of our products, but if problems occur, help is as close as the nearest telephone.

Our 24-hour Hot Line service ensures you have access to technical expertise around the clock. After-sales service and technical support is provided directly by Ross Video personnel. During business hours (Eastern Time), technical support personnel are available by telephone. After hours and on weekends, a direct emergency technical support phone line is available. If the technical support person who is on call does not answer this line immediately, a voice message can be left and the call will be returned shortly. This team of highly trained staff is available to react to any problem and to do whatever is necessary to ensure customer satisfaction.

- **Technical Support:** (+1) 613-652-4886
- **After Hours Emergency:** (+1) 613-349-0006
- **E-mail:** techsupport@rossvideo.com
- **Website:** <http://www.rossvideo.com>

Before You Begin

The CMI-100 adds Vertical Ancillary (VANC) data services to an SDI (SMPTE 259) or HD-SDI (SMPTE 292) video signal, in accordance with SMPTE 291 and other related standards. Its function is to add one or more VANC packets containing data that is constant over some known period of time. Some examples are audio metadata (SMPTE 2020) and active format descriptor (AFD) metadata (SMPTE 2016), which are typically constant for any specific piece of program material.

Overview

Users who need to add a variety of dynamically changing VANC services (such as closed captioning) should consider the Ross Video TES9 encoder.

The CMI-100 provides a number of innovative tools for defining and selecting metadata services, in order to simplify your work-flow. For example:

- It is possible to specify a set of VANC services to be inserted for each expected video type. In this way, a post-production house might define a standard metadata configuration for one or more specific clients, that are triggered automatically by the presence of the specified video formats.
- The VANC services can also be triggered by contact closures on rear-panel GPIO connectors.
- Constant metadata packets can be authored using the Ross Video VANC MetaGenerator software application, then uploaded into the CMI-100 using DashBoard.
- Packets can also be captured from the video input. The user interface provides controls that allow the user to select packets from a list of those that are present in the input, and save them to non-volatile memory for later use.
- As a member of the openGear family, the CMI-100 shares a common control interface, known as DashBoard, with a broad array of other products.

The generic data type allows for the creation of data types not directly supported by the card. This includes such things as text tags to mark the source of a video stream and packets to trigger downstream devices.

Features

The following features make the CMI-100 the best solution for insertion of constant data or metadata VANC services:

- Operates automatically with major SD and HD video formats
- Intelligent VANC replacement enables automatic selection of local or network metadata, by inserting only when VANC data of the same type is not present in the input
- Can overwrite specific incoming metadata services, enabling selective metadata re-authoring
- Powerful metadata authoring and capture features
- Flexible selection of packets and assignment to scan lines
- GPIO and video-triggered VANC packet selection
- Fits openGear frames

Functional Block Diagram

This section provides the functional block diagram that outlines the work-flow of the CMI-100.

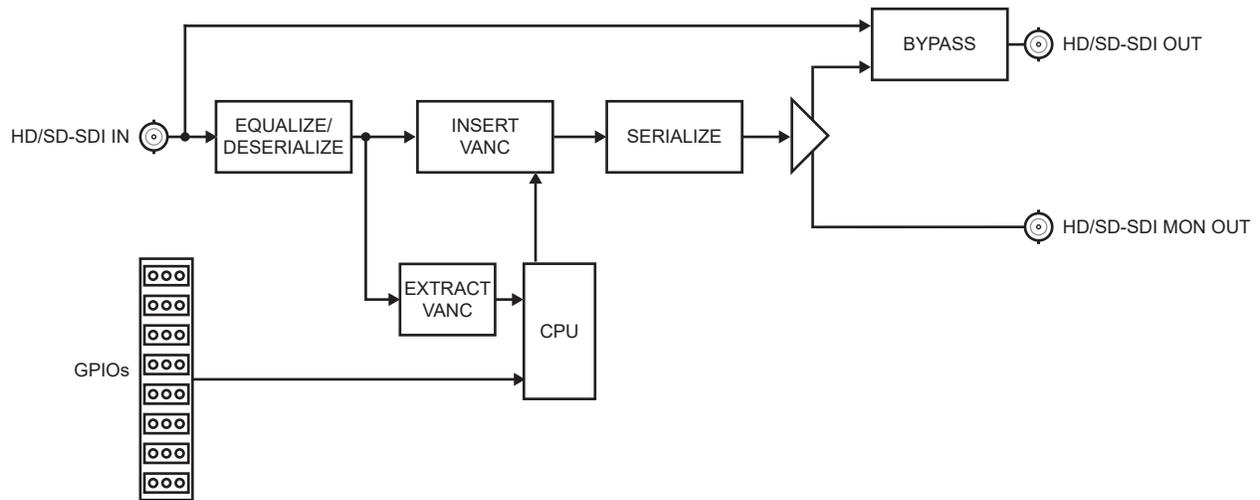


Figure 2.1 Simplified Block Diagram

User Interface

DashBoard enables you to monitor and control openGear frames and cards from a computer. DashBoard communicates with other cards in the frame through the Network Controller card. The DashBoard software and manual are available for download from our website.

For More Information on...

- configuring the CMI-100 in DashBoard, refer to the chapter “**Configuration**” on page 1.
- using DashBoard, refer to the *DashBoard User Guide* available from our website.

Hardware Overview

This chapter presents information on the CMI-100 hardware components and features.

Overview

The CMI-100 is an openGear modular system composed of two sub-systems.

- a main PCB which connects to a rear module and the openGear frame midplane
- a rear module that provides physical connectors

Main PCB Overview

The main PCB is a typical openGear card. An ejector on one end secures the module to the slot inside the openGear frame, and the other end inserts into a connector on the back of the rear module. This section provides a general overview of the CMI-100 card-edge components.

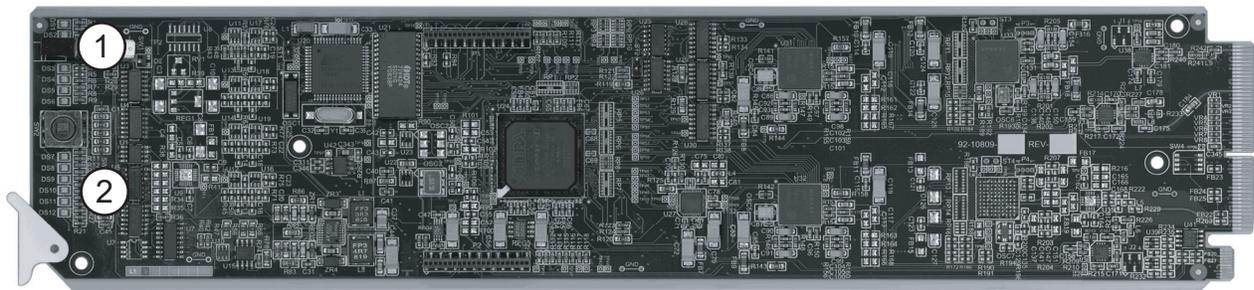


Figure 3.1 CMI-100 — Components

1. Bypass Switch (SW1)

If the CMI-100 is installed in a rear module that has a bypass relay, this two-position push-button is used to control the relay.

- › When the push-button is in the **IN** position, the CMI-100 is in the video signal path.
- › Pressing it once moves the switch to the **OUT** position and bypasses the CMI-100.
- › Pressing it again restores the CMI-100 to its active state.

2. Reset Switch (SW3)

This button is used for rebooting the card.

Control and Monitoring Features

This section provides information on the card-edge LEDs for the CMI-100. Refer to **Figure 3.2** for the location of the LEDs.

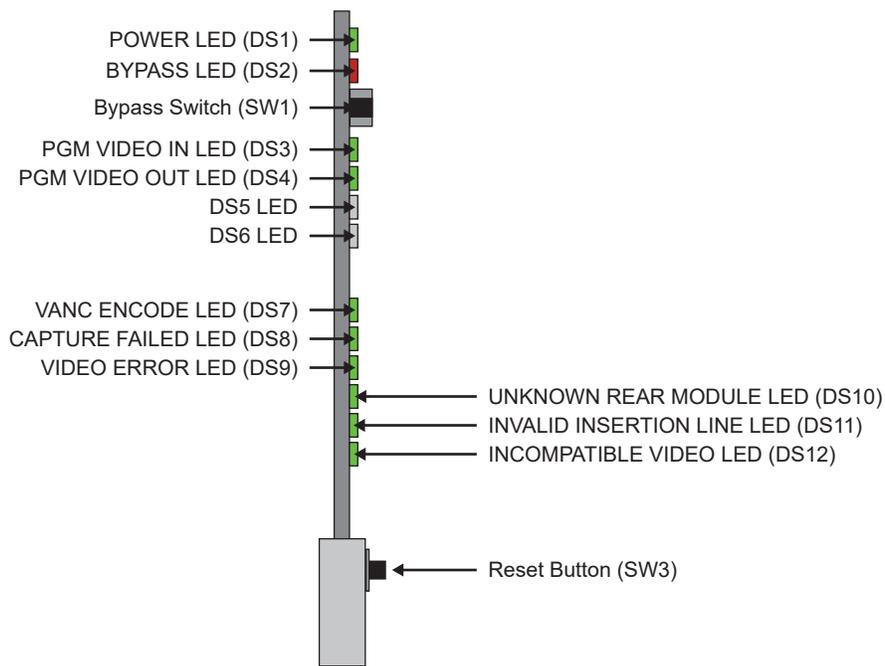


Figure 3.2 CMI-100 Card-edge Controls

Status and Selection LEDs on the CMI-100

The front-edge of the CMI-100 has LED indicators for communication activity. Basic LED displays and descriptions are provided in **Table 3.1**.

Table 3.1 LEDs on the CMI-100

LED	Color	Display and Description
POWER (DS1)	Green	When lit green, this LED indicates that the card is running with a valid input.
	Flashing Green	When flashing green, this LED indicates that the bootloader is waiting for a software upload.
	Orange	When lit orange, this LED indicates there is a warning for a signal or a configuration error is occurring.
	Red	When lit red, this LED indicates that the card is not operational. This will occur if, for example, there is not video input.
	Off	When off, this LED indicates that there is no power.
BYPASS (DS2)	Red	When lit red, this LED indicates the card video is bypassed.
	Off	When off, this LED indicates that the card is in the video path and is capable of inserting data.
PGM VID IN (DS3)	Green	When lit green, this LED indicates the Program Video input is present and valid.
	Red	When lit red, this LED indicates no valid input is present. Ensure the input cable is connected properly.
PGM VID OUT (DS4)	Green	When lit green, this LED indicates the Program Video output serializer is locked to a valid input.
	Red	When lit red, this LED indicates there is a hardware fault on the card.

Table 3.1 LEDs on the CMI-100

LED	Color	Display and Description
DS5		This LED is not implemented.
OSD SDI Out (DS6)	Green	When lit green, the OSD output serializer is locked to a valid input.
	Red	When lit red, there is a hardware fault on the card.
VANC ENCODE (DS7)	Green	When lit green, this LED indicates the CMI-100 is inserting VANC data into the video.
	Orange or Flashing Orange/Green	When lit orange or flashing orange/green, this LED indicates there is too much VANC data to fit in the specified line(s), and some data is being lost.
	Off	When off, this LED indicates there is no insertion.
CAPTURE FAILED (DS8)	Green	When lit green, this LED indicates correct operation.
	Orange	When lit orange, this indicates that the most recent Load command on the Capture menu failed.
VIDEO ERROR (DS9)	Green	When lit green, this LED indicates correct operation.
	Orange	When lit orange, this LED indicates that there has been an error (e.g. EDH) in the video input stream
UNKNOWN REAR MODULE (DS10)	Green	When lit green, this LED indicates a supported rear module is installed with the card.
	Orange	When lit orange, this LED indicates this indicates that the rear module connected to the CMI-100 is not one of the types recognized by the software. Operation may not be correct.
INVALID INSERTION LINE (DS11)	Green	When lit green, this LED indicates the card is configured to insert VANC data in a valid line.
	Red	When lit red, this LED indicates this indicates that the VAC-100 has been set to insert VANC data into an invalid line, that is a line that is not in the vertical interval for the current video format.
Incompatible Video Type (DS12)	Green	When lit green, this LED indicates correct operation.
	Red	When lit red, this indicates that you have selected a VANC service intended for interlaced video and that the current video input is progressive, or vice versa.

Cabling for the CMI-100

This section provides information for connecting cables to the installed rear modules on the openGear frames. Connect the input and output cables according to the following sections.

Rear Module Cabling

This section provides cabling diagrams for the rear modules. The type of rear module depends on the frame the card is installed in.

MDL-R10 Rear Module

This rear module is required when installing the CMI-100 in the DFR-8310 series frames. Each MDL-R10 Rear Module accommodates one card and occupies one slot. The rear module provides one SDI input, a bypass relay from the **BNC 1** to **BNC 3**, bi-directional Logic-level GPIOs, and a monitoring video output. (**Figure 3.3**)

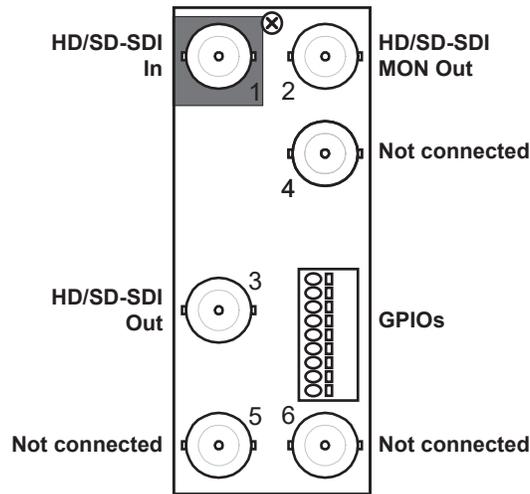


Figure 3.3 Cabling for the MDL-R10 Rear Module

R2-1234 Rear Module

The MDL-R20 Rear Module is required when installing the CMI-100 in the DFR-8321, OG3-FR series frames, and OGX-FR series frames. Each MDL-R20 accommodates one card and occupies two slots. The rear module provides one SDI input, a bypass relay from the **BNC 1** to **BNC 3**, bi-directional Logic-level GPIOs, and a monitoring video output. (**Figure 3.4**)

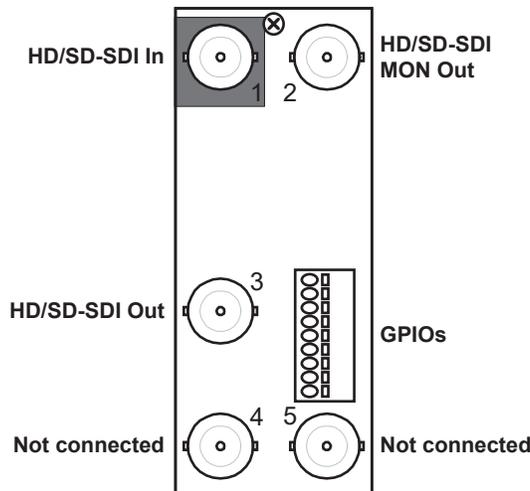


Figure 3.4 Cabling for the MDL-R20 Rear Module

Connections Overview

This section briefly outlines the types of connections available on the rear modules.

SDI In — BNC 1

BNC 1 accepts an SDI (SMPTE 259) or HD-SDI (SMPTE 292) video signal. The CMI-100 requires this input in all cases. It inserts VANC packets into this signal and routes the resulting output to **BNC 3**. The input signal is

internally terminated in 75ohms when the CMI-100 is active; when the CMI-100 is in bypass, the termination is provided by the downstream equipment connected to **BNC 3**.

SDI Out — BNC 3

BNC 3 carries the main program output from the CMI-100, consisting of the signal applied to **BNC 1**, with VANC data packets inserted.

SDI Monitoring Out — BNC 2

When the CMI-100 is active, **BNC 2** carries a copy of the SDI output present on **BNC 3**. This can be useful for test purposes. **BNC 2** does not have any bypass capability: with power off or the CMI-100 removed, there is no output signal on this jack.

GPIOs

GPIOs can be used to remotely control the operation of the CMI-100 by means of contact closures. VANC services can be enabled or disabled in several ways, one of which uses contact closures on one or more of these inputs. (Table 3.2) Note that the plugs are supplied with the module.

Table 3.2 GPIO Connections

Pin	Function	Connection
1	GPI 1	Connect to Ground to assert; open to negate
2	GPI 1 presence	Connect to Ground to enable GPI 1
3	GPI 2	Connect to Ground to assert; open to negate
4	GPI 2 presence	Connect to Ground to enable GPI 2
5	GPI 3	Connect to Ground to assert; open to negate
6	GPI 3 presence	Connect to Ground to enable GPI 3
7	GPI 4	Connect to Ground to assert; open to negate
8	GPI 4 presence	Connect to Ground to enable GPI 4
9	Ground	

Refer to **Figure 3.5** for MDL-R10 pinouts and **Figure 3.6** for MDL-R20 pinouts.

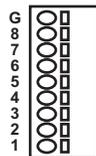


Figure 3.5 GPIO Pinouts for the MDL-R10



Figure 3.6 GPIO Pinouts for the MDL-R20

Physical Installation

This chapter provides instructions for installing the CMI-100, installing the card into the frame, cabling details, and updating the card software.

Before You Begin

Before proceeding with the instructions in this chapter, ensure that your openGear frame is properly installed according to the instructions in its manual.

Static Discharge

Throughout this chapter, please heed the following cautionary 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 CMI-100 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.

Quick Start

Assuming you have a openGear frame, a CMI-100 card, and a required Full Rear Module, the following steps will get you started with VANC metadata insertion:

1. Connect the frame to your LAN. Refer to the *OGX-FR Series User Guide* and *MFC-OG3-N and MFC-8322-S User Guide* for details.
2. Install DashBoard on a computer connected to the LAN. The DashBoard software and user manual are available from the Ross Video website.
3. Install the rear module in the frame, as described in the section “**Installing a Rear Module**” on page 20.
4. Install the CMI-100 as described in the section “**Installing the CMI-100**” on page 21.
5. Connect a 292 or 259 signal to the **SDI IN** BNC on the rear module as described in the section “**Cabling for the CMI-100**” on page 15.
6. Connect the **SDI OUT** BNC to an SDI analyzer or VANC monitoring test set, and turn the frame power on. For information on our VANC monitoring tools, visit the Ross Video website.
7. Launch DashBoard on your computer. It should automatically find your frame within a minute or two.
8. Select the “+” next to the frame name to show the cards in the frame, then double-click the CMI-100.
9. Select a VANC packet for encoding as follows:
 - a. Select the **Setup Encoding** tab.
 - b. Select the **Default** box.
 - c. Select a VANC packet (for example the AFD packet for your video format).
 - d. Click **Start**.
10. Select the **Outgoing Services** tab. The VANC packet that you selected in the previous step should be present in the list.

11. Check the SDI analyzer or VANC Monitor connected to the SDI output for presence of your VANC packet.
12. Proceed to the chapter “**Configuration**” on page 1 for further explanation of the controls that are available to you.
13. If you want to use contact closures to control VANC encoding:
 - Connect wires from the GPIO jacks on the rear panel to your controlling equipment, as described in the section “**Cabling for the CMI-100**” on page 15.
 - Consult the section “**Assigning VANC Services to GPIOs and Video Formats**” on page 1.
14. If needed, you can use our VANC Metadata Generator program to create custom VANC packets and package them together for upload to the CMI-100. If you do not have this program, contact your openGear sales representative.

Installing the CMI-100

This section outlines how to install a rear module and card in a openGear frame. Refer to the chapter “**Hardware Overview**” on page 13 for cabling details.

Rear Modules

When installing the CMI-100:

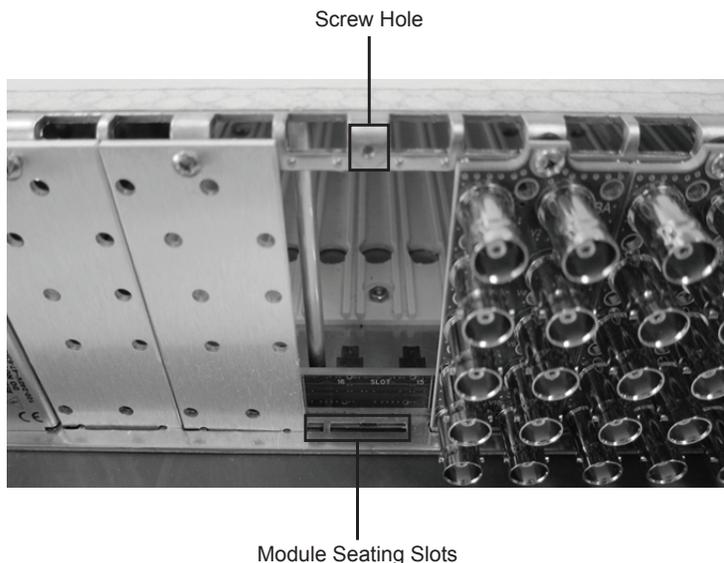
- **DFR-8310 series frames** — The **MDL-R10** Full Rear Module is required. The CMI-100 is not compatible with the DFR-8310-BNC frames.
- **DFR-8321 series, OG3-FR series, and OGX-FR series frames** — The **MDL-R20** Full Rear Module is required.

Installing a Rear Module

If the Rear Module is installed, proceed to the section “**Installing the CMI-100**” on page 4-21.

To install a rear module in your openGear 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 CMI-100 installation.
3. Install the bottom of the Rear Module in the **Module Seating Slot** at the base of the frame’s back plane.



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.

Installing the CMI-100

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

To install the CMI-100 in an openGear frame

1. Locate the Rear Module you installed in the procedure “**Installing a Rear Module**” on page 4-20.
2. Hold the CMI-100 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 plug 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 this wax sheet before affixing the label.
5. Affix the supplied rear module label to the BNC area of the Rear Module.

Configuration

This chapter explains how to use the user interface to set up the CMI-100. This discussion is based on the use of DashBoard through a network connection, however most of these functions are also available through the local Heads-up Display.

Configuring the General Settings

This section provides a summary of the initial tasks you may wish to perform before configuring your card for inserting data VANC services.

To configure the general settings

1. Select the **Settings** tab.
2. Assign a unique name to a CMI-100 card by typing a new name in the **Card ID** field. This is especially useful if you have more than one CMI-100 in a frame. If this field were blank, the name would just be “CMI-100”.
3. Select an **Encode Mode** as follows:
 - **Overwrite** — Select this option if, for some reason, you want to eliminate incoming VANC services from the output.
 - **Prepend** — Select this option if you want to place your VANC services before any incoming services in the lines. You might choose this if you want to give priority to your locally-added services in the case where there may be insufficient space in the line(s) for both incoming and local services.
 - **Append** — Select this option to allow the CMI-100 to add your VANC data services after any that are present on the same line(s) of the input signal. This is the preferred mode of operation, since it adds your VANC data services with no effect on any others.

Notice — *when you insert a VANC service into a line that already contains packets with the same DID and SDID as the service that you are adding, the CMI-100 either deletes the incoming packets before inserting its own, or refrains from inserting to allow the incoming data to flow through; this depends on the Priority setting in the Setup Encoding menu. This eliminates any possible confusion caused by two or more versions of the same service.*

4. The **First Capture Line** and **Last Capture Line** should normally be set to 1 and 20 for most video formats, although 720p and 1080psf allow Last Capture Line numbers up to 25. One reason to reduce the range would be if there are so many VANC services displayed on the Incoming Services screen that you find it difficult to locate one that you wish to capture.
- ★ The CMI-100 will not capture from lines that are not considered part of the vertical interval (for example, lines above 20 for 1080i 59.94Hz), even if you include them in the capture range.

Assigning VANC Services to GPIOs and Video Formats

The **Setup Encoding** tab allows you to define one of four VANC services, labeled Encode1 through Encode4, selected in the **Encoding Service** box. For each of these four services, you can assign different VANC packets to each of the recognized video formats, and also optionally control transmission with a GPIO contact closure.

- ★ As used here, the term “packet” refers to a group of one or more VANC packets that are inserted in one or both fields of an interlaced video signal, or one or two frames of a progressive signal. Some services such as AFD contain a single packet, whereas others such as audio metadata may contain two or more VANC packets. The term “packet” is used to designate any of these combinations of VANC packets that is assigned to a video format for one of the CMI-100's four services.

Specifying a GPIO Condition

The **GPIO Condition** selector allows you to specify which GPIO condition, if any, will trigger transmission of the VANC packets that are part of this service. The selector only allows you to select GPIO contacts that are present; refer to the section “**GPIOs**” on page 17 for details on wiring these ports so that their presence is detected. For example, if only GPIO 1 is installed, the selections available for GPIO Condition are Don’t Care, GPIO 1 Open and GPIO 1 Closed. If you select GPIO 1 Closed, the packets defined for this service will only be inserted when the GPIO 1 contacts are closed. If you select Don’t Care, the packets will be inserted regardless of the state of the GPIOs.

Setting Priorities

The **Priority** buttons are used to specify what to do when the input contains VANC data that has the same DID and SDID values in the same line as the service you are inserting.

Select **Local Has Priority** if you want to replace the incoming data by the service you define here (for example, because the incoming data is incorrect).

Select **Upstream Has Priority** if you want your data to be inserted only when there is none present in the input. An example of the latter is a network-affiliated station that inserts metadata (say, AFD) into its program signal; if the network provides AFD in its distribution feed, this setting can be used to automatically pass network AFD during network programming and insert local AFD otherwise. The **Priority** buttons apply when the **Encode Mode** on the Settings menu is **Append** or **Prepend**. If the **Encode Mode** is **Overwrite**, any data in the lines selected for insertion is overwritten unconditionally. Data in lines that are not used for insertion is unaffected in all cases.

If desired, you can have the insertion of the service automatically depend on the current input video type, by specifying a VANC packet for each video format. Alternatively, you can specify the default packet and then assign the default to any or all of the video formats. In this example, different AFD packets have been assigned to three 59.94Hz formats: 1080i, 720p and 480i. The presence at the video input of one of these video formats causes the corresponding AFD packet to be inserted. With any other video input, nothing is inserted.

★ The packets that you can assign to services contain the video type that they are intended to be inserted into. The CMI-100 will not insert packets authored for interlaced video into progressive signals, or vice versa. It does not prevent you from selecting them on the menu. However, if they are not the correct type, they are not inserted and an alarm condition is generated.

Specifying the DID and SDID Values

For each VANC service, you can specify the DID and SDID values to be used when inserting them. These are addresses assigned by SMPTE for services that have been standardized. Fixed values have been assigned for audio metadata and Active Format Descriptor (AFD), for example.

When authoring metadata packets using the VANC MetaGenerator tool, the intended DID and SDID values are included in the file, along with the payload. Similarly, when you capture VANC packets from the video input using the CMI-100, the received DID and SDID values are stored along with the packet payload. You can choose to use these default DID and SDID values by selecting DID and SDID Selection = Default. If you prefer, you can override these defaults by picking Custom and entering the desired values. You should be aware that using non-standard values of DID and SDID may prevent downstream receiving equipment from recognizing your VANC data.

You can also specify the video line where the VANC packet will be inserted. Again, you can specify either Default or Custom. The line number is in the range 1-20 or 1-25 for most video formats, but some standards recommend using lines that are located two or more lines after the switching line defined in SMPTE RP168. When you select a line number for interlaced video formats, the equivalent line in the second field is also enabled for VANC insertion.

For HD (SMPTE 292) video formats, the VANC data can be inserted into either the luminance or chrominance component; you need to specify which one to use. For SD (SMPTE 259) video, this selection is not available.

Uploading VANC Packets to the CMI-100

The **VANC MetaGenerator** program is used for authoring several types of constant VANC data or metadata. It can generate AFD and Bar Metadata, Audio Metadata and arbitrary user-defined data patterns. A description of the facilities offered by this program is well beyond the scope of this manual. Refer to the *VANC MetaGenerator User's Guide* for details.

- ★ Before uploading a file of VANC packets to the CMI-100, you should be aware that this will overwrite all other VANC packets in the CMI-100. For this reason, it is essential that you include all desired packets in the file when using the Combine function in VANC MetaGenerator.
- ★ The CMI-100 will reboot after the upload, causing it to go into bypass and then return to active operation; since each of these switches interrupts one frame of the video, care is required to avoid disruption of on-air programming.

VANC MetaGenerator produces a file containing VANC packets with a name that you specify, normally MetaData.bin. Let us assume that you have stored this file in the default folder (C:\Program Files\VANC MetaGenerator\Data) on the computer where you use DashBoard to control the CMI-100.

To load your data file into the CMI-100

1. Launch the VANC MetaGenerator program.
2. Click **Upload**.

This button is located near the bottom of the screen.

3. Browse to your folder, select your file and click **Open**.

Typically, you would select **MetaData.bin**, as this is the default name of the file generated by the VANC MetaGenerator program.

4. When prompted to confirm the decision to upload, click **Finish**.
5. Click **OK** to close the dialog.
6. Once the file has been uploaded to the CMI-100, the VANC packets in the file will become available for insertion. If you click one of the selectors (say, Default) on the **Setup Encoding** tab, the available selections should be displayed, including those that you have just uploaded, plus any that have been captured from the video input.

Capturing VANC Packets from the Video Input

This is an alternative method of acquiring constant VANC packets for subsequent insertion. It requires that you have access to a video signal that contains a VANC service that you want to be able to insert into other video signals at a later time.

To capture VANC packets from the video input

1. In the Device View of your CMI-100, select the **Incoming Services** status tab to view a list of the VANC packets that are presently available in the input.
2. Select the **Capture a VANC Service** tab.
3. To capture and store a single VANC packet per field from the input signal:
 - a. Locate the first desired VANC service is (labeled Decode 1). This will be the first VANC service present in the input signal.
 - b. Select **Decode 1** from the **Select Incoming VANC Service** menu. A glance at the **Captured Services** tab reveals that Capture Buffer 1 is empty and thus available for use.
 - c. Select **Capture Buffer 1** from the **Select Capture Buffer** menu.
4. Click **Load**.

Once the operation has been completed, which should be instantaneous if the desired service is continuously available, the captured VANC packet is stored in non-volatile memory and is available for insertion. If you click one of the selectors (say, Default) on the **Setup Encoding** tab, **Capture Buffer 1** should be displayed as an available selection.

- ★ This function captures a single VANC packet per field from the input signal. If there are two or more packets in the same field having the same DID and SDID values, only one packet is captured and stored.

Configuring the Alarms

The **Alarms** tab allows you to specify which conditions of the CMI-100 will cause an alarm indication (red) on your status tabs in DashBoard and the on-screen display output. These alarm settings also apply to the generation of SNMP traps if SNMP is enabled on the openGear frame that houses the CMI-100.

Encoding Overflow

This alarm reports when an attempt to insert more data than could fit in the specified line(s), usually because you are adding VANC services to ones which are already present. If this alarm is enabled and this condition occurs, the Encoding Status field on the Alarms status tab displays “Overflow”.

Capture Failure

This alarm reports when the Load operation on the Capture a VANC Service tab was not successful. If this alarm is enabled and this condition occurs, the Last Capture field on the Alarms status screen displays “Failed”.

Unknown Rear Module

This alarm reports when the CMI-100 is plugged into a rear module that it does not recognize. This could have an effect on the video output, since the types and locations of jacks are unknown. If this alarm is enabled and this condition occurs, the Rear Module field on the Alarms status tag displays “Unknown”.

Invalid Line

This alarm reports when there has been an attempt to insert VANC data in a line that is not part of the vertical interval (or example, line > 20 for 1080i 59.94Hz). If this alarm is enabled and this condition occurs, the Encoding Line field on the Alarms status tab displays “Invalid”.

Loss of Video

This alarm reports when normally an emergency and should therefore always be enabled. If it is and this condition occurs, the Video Presence field on the Alarms status tab displays “Missing”.

Incompatible Video

This alarm reports when you have selected a VANC service intended for interlaced video and that the current video input is progressive, or vice versa. If this alarm is enabled and this condition occurs, the Video Type field on the Alarms status tab displays “Incompatible”.

Error in Video

This alarm reports when a detectable video error, such as an EDH or CRC error, has occurred in the input video. If enabled, this alarm causes the status to blink briefly from green to yellow when an error occurs, and stays yellow if errors are occurring constantly. If this alarm is enabled and this condition occurs, the Video Status field on the Alarms status tab displays “Error”.

Encoder in Bypass

This alarm reports when the CMI-100's video is bypassed. This could be because it has been set to Bypass on the Settings tab, or the card-edge Bypass button is in the Out position, or because of a fault condition such as missing video input. If this alarm is enabled and this condition occurs, the Bypass Switch field on the Alarms status tab displays "Bypass".

Monitoring

The **Status** tabs provide read-only information such as software revision issue, signal status, and power consumption of the CMI-100.

Product Status

The **Product** tab has information about the CMI-100 which will be helpful to a Ross Video technician when there are questions about the operation of the unit. This tab summarizes the read-only information, such as board revision, serial number, and rear module type.

Incoming Services Status

The **Incoming Services** tab displays a list of VANC services that are present in the video input signal. This includes the input video type and indicates whether the rear module is in active or bypass state. The Capture Lines are specified by the **Settings** tab. Lastly, it shows up to eight VANC services found in the selected lines. For each one, the following information is displayed:

- Line number (e.g. 9)
- Component (L for luma or C for chroma)
- DID:SDID (e.g. 50:01) These addresses are assigned by SMPTE to identify data services.
- Packet size in bytes. If there are two packets (typically one per field), both are shown (e.g. 64,30).

Captured Services Status

The **Captured Services** tab displays a list of VANC services that have been captured from the video input signal and stored in non-volatile memory in the CMI-100. This display includes the input video type and indicates whether the rear module is in active or bypass state. It also lists the contents of the eight capture buffers that may have been filled with incoming VANC packets, using the **Capture a VANC Service** tab. For each one, the following information is displayed:

- Line number (e.g. 9)
- Component (L for luma or C for chroma)
- DID:SDID (e.g. 50:01) These addresses are assigned by SMPTE to identify data services.
- Packet size in bytes. If there are two packets (typically one per field), both are shown (e.g. 64,30).
- Video format from which the packet was captured (e.g. 1080i 59.94)

Outgoing Services Status

The **Outgoing Services** tab displays a list of VANC services that are currently being inserted into the program video by the CMI-100. This shows the input video type and indicates whether the rear module is in the active or bypass state. The four Encode lines show the VANC services that have been enabled using the **Setup Encoding** tab. For each one, the following information is displayed:

- Line number (e.g. 12)
- Component (L for luma or C for chroma)
- DID:SDID (e.g. 41:05) These addresses are assigned by SMPTE to identify data services.
- Service name (e.g. "AFD1080i")

GPIO Status

The **GPIO Status** tab displays the status of the four general purpose (GPIO) inputs. Each of these ports has three pins, one of which indicates the presence of a connection. The status of each of the inputs is consequently one of the three possible values: Not Connected, Open, or Closed.

Alarm Status

The **Alarms** status tab reports the status of the various conditions that are monitored. Each of these conditions can be enabled or disabled on the **Alarms** setup tab. The **Card Status** is a summary of these indicators. It reports the most severe alarm condition that is present:

- If all the indicators are green, the Card Status is green and OK.
- If any of the indicators are red, the Card Status is also red and its description is the underlying error condition.

Upgrading the Software

Your CMI-100 can be upgraded in the field via DashBoard.

To upgrade the software on a CMI-100

1. Contact Ross Technical Support for the latest software version file.
 2. Launch the DashBoard client on your computer.
 3. Display a tab for the card you wish to upgrade by double-clicking its status indicator in the **Basic Tree View**.
 4. From the **Device** tab, click **Upload** to display the **Select File for upload** dialog.
 5. Navigate to the ***.bin** upload file you wish to upload.
 6. Click **Open** and follow the on-screen instructions.
 7. Click **Finish** to start the upgrade.
 8. Monitor the upgrade.
 - A **Upload Status** dialog enables you to monitor the upgrade process.
 - The card reboots automatically once the file is uploaded. The card is temporarily taken off-line.
 - The reboot process is complete once the status indicators for the **Card State** and **Connection** return to their previous status.
- ★ If you are running DashBoard version 2.3.0 or lower, you must click **Reboot** in the **Device** tab to complete the upgrade process.

Troubleshooting

If you encounter problems when upgrading your card software, verify the following:

- Ethernet cable is properly connected if you are uploading the file via a network connection.
- The file you are attempting to load is a ***.bin** file that is for the card you are upgrading.

Technical Specifications

This chapter provides the technical specification information for the CMI-100.

★ Technical specifications are subject to change without notice.

Table 7.1 CMI-100 Technical Specifications

Category	Parameter	Specification
SDI Inputs	Number of Inputs	1
	Data Rates and SMPTE Standards Accommodated	480i 59.94Hz (SMPTE 259M)
		576i 50Hz (SMPTE 259M)
		1080i 50Hz, 1080i 59.94Hz, 1080i 60Hz (SMPTE 292M)
		720p 50Hz, 720p 59.94Hz, 720p 60Hz (SMPTE 292M)
		1080p 23.98Hz, 1080p 24Hz (SMPTE 292M)
		1080psf 23.98Hz, 1080psf 24Hz (SMPTE 292M)
	Impedance	75ohm terminating in Active mode
		Loop-through to SDI Output in Bypass mode
Equalization	>100m of Belden 1694A cable @ 1.485Gbps	
	>300m of Belden 1694A cable @ 270Mbps	
Return Loss	>13dB to 1.485GHz	
SDI Outputs	Number of Outputs	1 Program output 1 output monitor
	Impedance	75ohm
	Return Loss	>10dB to 1.485GHz
	Signal Level	800mV ±10%
	DC Offset	0V ±50mV
	Rise & Fall Time (20-80%)	700ps. Typical (270Mbps) 120ps. Typical (1.485Gbps)
	Overshoot	<8%
GPIO Inputs	Number of Inputs	1 three-pin connector
Power	Maximum Power Consumption	5W

Service Information

Troubleshooting Checklist

Routine maintenance to this openGear product is not required. In the event of problems with your CMI-100, 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 re-insert it into the frame.
4. **Check Control Settings** — Refer to the Installation and User Controls sections of this manual to 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.

Reset Button

In the unlikely event of a complete card failure, you may be instructed by a Ross Technical Support specialist to perform a complete software reload on the CMI-100.

Warranty and Repair Policy

The CMI-100 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 CMI-100 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 CMI-100 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 CMI-100 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 CMI-100 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 CMI-100, 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 CMI-100. 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.

Glossary

The following terms are used throughout this guide:

Active image — the portion of the video picture area (production aperture) that is being utilized for output content. Active image excludes letterbox bars and pillar-box bars.

Card — openGear terminal devices within openGear frames, including all components and switches.

CBR — constant bit rate.

CDN — content distribution network.

DashBoard — the DashBoard Control System.

DF — Differentiated Services.

DTVCC captions — CEA-708 captions.

Frame — the openGear frame frame that houses the CMI-100.

GPIO — the DC signals used by one device to control another (General Purpose Input-Output).

Metadata — some of the VANC data that the CMI-100 monitors (such as closed captioning) is “data essence”, not metadata. For convenience, this manual uses the term “metadata” to refer to all VANC data types.

MIB — management information base.

Network Controller Card — the MFC-OG3-N and any available options unless otherwise noted.

NTSC captions — the CEA-608-D: Line 21 Data Services captions.

openGear frame — refers to the OGX-FR series frames unless otherwise noted.

PAL — PAL-B and PAL-G unless otherwise stated.

PCR — program clock reference.

PID — packet identifier.

Production aperture — the image lattice that represents the maximum possible image extent in a given standard (e.g. the full size of all active pixels and active lines). For example, the 1080i production aperture would be 1920x1080.

System — the mix of interconnected production and terminal equipment in your environment.

TPG — Test Packet Generator.

User — the person who uses the CMI-100.

VANC — refers to the Vertical Ancillary Data space of a serial digital video signal, and is defined by SMPTE 291M.

