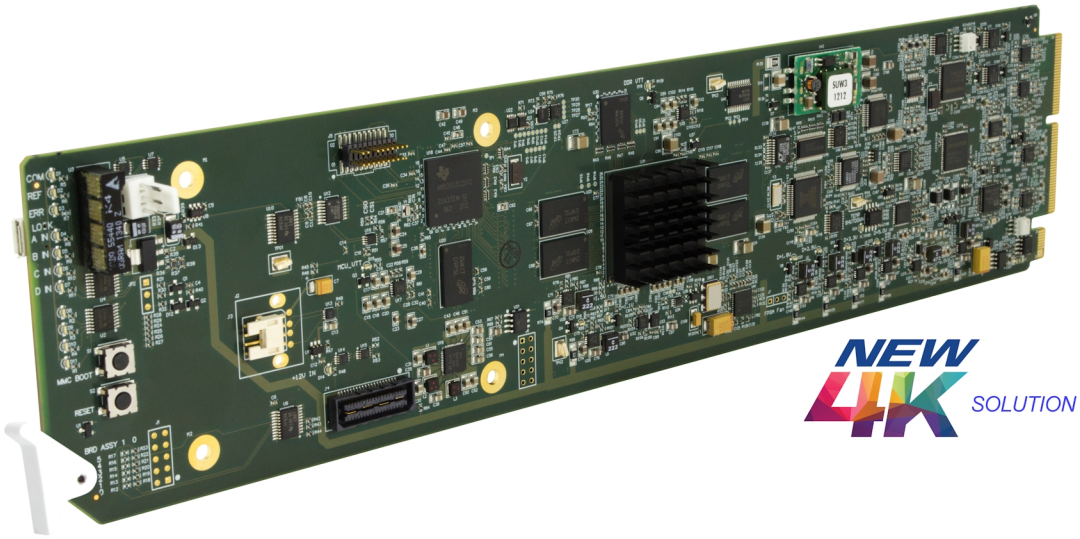
9902-DC-4K



UHDTV Quadrant Combining Downconverter

Product Manual

Cobalt Digital Inc.

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9902DC4K-OM (V1.0)

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Congratulations on choosing the Cobalt® 9902-DC-4K UHDTV Quadrant Combining Downconverter. The 9902-DC-4K is part of a full line of modular processing and conversion gear for broadcast TV environments. The Cobalt Digital Inc. line includes video decoders and encoders, audio embedders and de-embedders, distribution amplifiers, format converters, remote control systems and much more. Should you have questions pertaining to the installation or operation of your 9902-DC-4K, please contact us at the contact information on the front cover.

Manual No.:	9902DC4K-OM
Document Version:	V1.0
Release Date:	January 20, 2015
Applicable for Firmware Version (or greater):	1.84.0000
Description of product/manual changes:	- Original Release

Table of Contents

Chapter 1

Introduction

Overview

This manual provides installation and setup instructions for the 9902-DC-4K UHDTV Quadrant Combining Downconverter card (also referred to herein as the 9902-DC-4K).

This manual consists of the following chapters:

- **Chapter 1, "Introduction"** – Provides information about this manual and what is covered. Also provides general information regarding the 9902-DC-4K.
- **Chapter 2, "Installation"** – Provides instructions for installing the 9902-DC-4K in a frame, and connecting signal and control cabling to the 9902-DC-4K.
- **Chapter 3, "Setup Instructions"** – Provides overviews of setup operating controls and instructions for setting up the 9902-DC-4K to integrate within its signal flow environment.

This chapter contains the following information:

9902-DC-4K Card Software Versions and this Manual

When applicable, Cobalt Digital Inc. provides for continual product enhancements through software updates. As such, functions described in this manual may pertain specifically to cards loaded with a particular software build.

The Software Version of your card can be checked by viewing the **Card Info** menu in DashBoard™. See Checking 9902-DC-4K Card Information (p. 3-6) in Chapter 3, “Operating Instructions” for more information. You can then check our website for the latest software version currently released for the card as described below.

Note: Not all functionality described in this manual may appear on cards with initial software versions.

Check our website and proceed as follows if your card’s software does not match the latest version:

Card Software **earlier** than latest version	Card is not loaded with the latest software. Not all functions and/or specified performance described in this manual may be available. You can update your card with new Update software by going to the **Support>Firmware Downloads** link at www.cobaltdigital.com. Download “Firmware Update Guide”, which provides simple instructions for downloading the latest firmware for your card onto your computer, and then uploading it to your card through DashBoard™. **Software updates are field-installed without any need to remove the card from its frame.**
Card Software **newer** than version in manual	A new manual is expediently released whenever a card’s software is updated **and specifications and/or functionality have changed** as compared to an earlier version (a new manual is not necessarily released if specifications and/or functionality have not changed). A manual earlier than a card’s software version may not completely or accurately describe all functions available for your card. If your card shows features not described in this manual, you can check for the latest manual (if applicable) and download it by going to the card’s web page on www.cobaltdigital.com.

Cobalt Reference Guides

From the Cobalt® web home page, go to **Support>Reference Documents** for easy to use guides covering network remote control, card firmware updates, example card processing UI setups and other topics.

Manual Conventions

In this manual, display messages and connectors are shown using the exact name shown on the 9902-DC-4K itself. Examples are provided below.

- Card-edge display messages are shown like this:

  IN A

- Connector names are shown like this: **SDI IN A**

In this manual, the terms below are applicable as follows:

- **9902-DC-4K** refers to the 9902-DC-4K UHDTV Quadrant Combining Downconverter card.
- **Frame** refers to the HPF-9000, OG3-FR, 8321, or similar 20-slot frame that houses Cobalt® or other cards.
- **Device** and/or **Card** refers to a Cobalt® or other card.
- **System** and/or **Video System** refers to the mix of interconnected production and terminal equipment in which the 9902-DC-4K and other cards operate.
- Functions and/or features that are available only as an option are denoted in this manual like this:

  

Warnings, Cautions, and Notes

Certain items in this manual are highlighted by special messages. The definitions are provided below.

Warnings

Warning messages indicate a possible hazard which, if not avoided, could result in personal injury or death.

Cautions

Caution messages indicate a problem or incorrect practice which, if not avoided, could result in improper operation or damage to the product.

Notes

Notes provide supplemental information to the accompanying text. Notes typically precede the text to which they apply.

Labeling Symbol Definitions

	Important note regarding product usage. Failure to observe may result in unexpected or incorrect operation.
	Electronic device or assembly is susceptible to damage from an ESD event. Handle only using appropriate ESD prevention practices. If ESD wrist strap is not available, handle card only by edges and avoid contact with any connectors or components.
	Symbol (WEEE 2002/96/EC) For product disposal, ensure the following: • Do not dispose of this product as unsorted municipal waste. • Collect this product separately. • Use collection and return systems available to you.

Safety Summary

Warnings

! WARNING ! **To reduce risk of electric shock do not remove line voltage service barrier cover on frame equipment containing an AC power supply. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.**

Cautions

CAUTION **This device is intended for environmentally controlled use only in appropriate video terminal equipment operating environments.**

CAUTION **This product is intended to be a component product of an 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 its component products.**

CAUTION **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 only convection cooling. The 9902-DC-4K has a moderate power dissipation (<18 W). As such, avoiding placing the card adjacent to other cards with similar dissipation values if possible.**

CAUTION **If required, make certain Rear I/O Module(s) is installed before installing the 9902-DC-4K into the frame slot. Damage to card and/or Rear I/O Module can occur if module installation is attempted with card already installed in slot.**

CAUTION **If card resists fully engaging in rear I/O module mating connector, check for alignment and proper insertion in slot tracks. Damage to card and/or rear I/O module may occur if improper card insertion is attempted.**

CAUTION **The 9902-DC-4K FPGA is designed for a normal-range operating temperature around 85° C core temperature. Operation in severe conditions exceeding this limit for non-sustained usage are within device operating safe parameters, and can be allowed by setting this control to Disable. However, the disable (override) setting should be avoided under normal conditions to ensure maximum card protection.**

9902-DC-4K Functional Description

Figure 1-1 shows a functional block diagram of the 9902-DC-4K. The 9902-DC-4K includes input routing to accommodate four 3G/HD-SDI inputs and route these inputs to 4:1 (quadrant combining) video combining. Each path is equipped with independent frame sync. The output is available as a 2x DA 3G/HD-SDI output or HDMI/DVI. The output raster format is user-configurable.

9902-DC-4K Program Video Input/Output Formats

The 9902-DC-4K provides the following inputs and outputs:

- **Inputs:**
  - **SDI IN A** thru **SDI IN D** – four 3G/HD-SDI quadrant-divided video inputs
- **Outputs:**
  - **3G/HD-SDI OUT** – 2x DA 3G/HD-SDI combined-image video outputs
  - **HDMI/DVI OUT** – Combined-image HDMI/DVI out with selectable audio embedding (suitable for direct connection to monitor panels)

Note: Although the inputs will receive SMPTE 424M, 292M, or 259M inputs, quadrant-combined 4K content is realized only using 3G (SMPTE 424M) inputs for all quadrant-divided inputs.

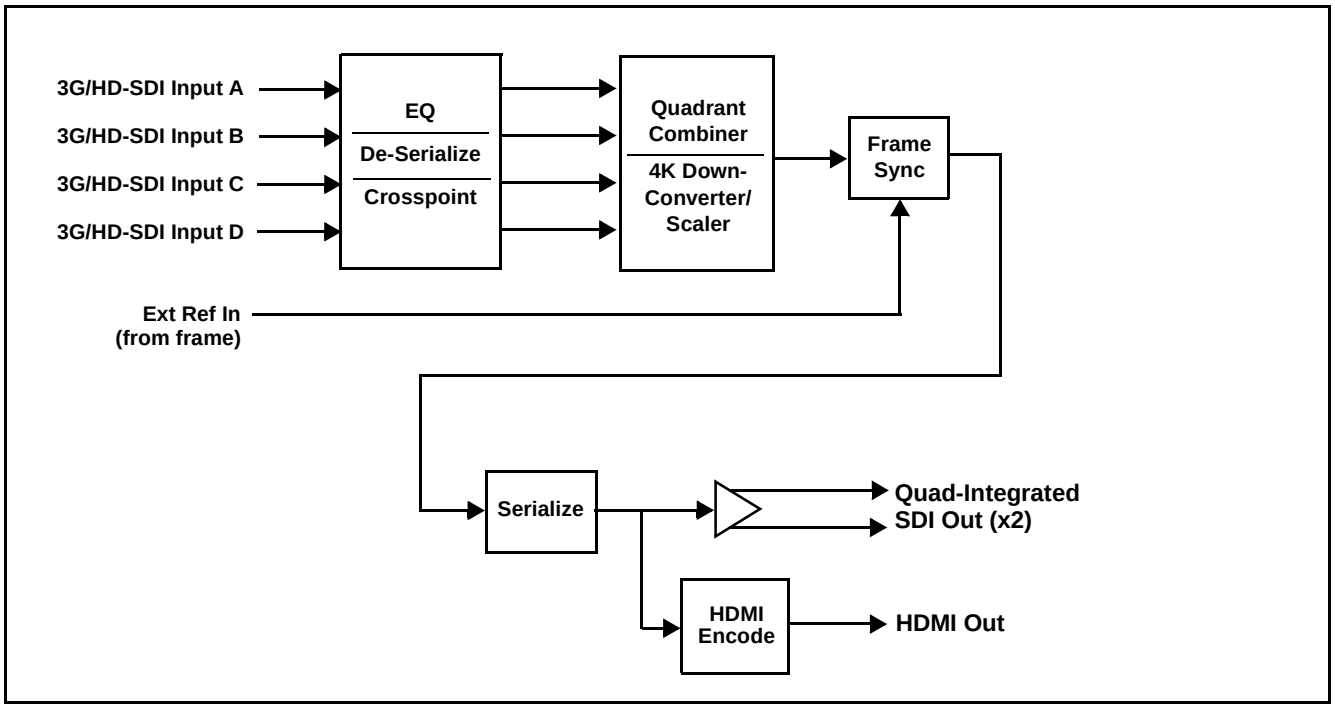

Figure 1-1 9902-DC-4K Functional Block Diagram

Video Processing Description

The 9902-DC-4K precisely combines the four quadrant-divided individual SDI feeds into a combined SDI image directly suitable for broadcast production usage or monitoring purposes. The combined SDI output can be scaled to 3G/HD-SDI. An HDMI output is also furnished which is directly usable by a monitor. The 9902-DC-4K features input select, timing alignment, and quadrant combining/scaling functions as described below.

Input Video Select Function

The input select function flexibly allows the four quadrant SDI inputs to be assigned to each of the four image quadrants comprising the overall combined-output raster. Using this function, the four inputs can be rearranged if necessary and as desired to correlate the quadrant inputs to the combined-image output.

Scaler/Combiner Function

This function provides conversion of each quadrant input to match a common user-selected format, resulting in images that are format-matched and suitable for combining into a single combined image. The combined output can be converted to numerous 3G/HD-SDI format choices.

Selectable underscanning allows the combined output raster size to be reduced as selected.

Quad Timing Alignment Function

This function provides for frame alignment control of the four quadrant inputs using either one of two external **FRAME REF IN (1,2)** reference signals distributed with the card frame, or a selected input video as a frame reference. As such, the card can accommodate asynchronous program video inputs.

This function also allows frame offset delay to be added between the output video and the frame sync reference.

Frame sync can select from either of two card frame reference sources, input video (**Input A**), or free-run (internal) timing. Selectable failover allows alternate reference selection should the initial reference source become unavailable or invalid.

Audio Processor Description

Audio Select/Embed

The audio processor operates as an internal audio router for selecting quadrant-input embedded channels 1-16 as channels (as a four-group package) to be embedded into the combined SDI and HDMI video outputs. The audio processor function operates with the timing alignment function to align audio with the selected reference.

Note:
- Output audio always corresponds to a single particular selectable quadrant input. Various output embedded channels cannot be sourced from a mix of various quadrant input embedded channels.
- To maintain conformance with CEA-861D HDMI audio channel line-up specifications and industry standard SDI convention, the HDMI output swaps between the C and LFE channels for the HDMI output.

User Control Interface

Figure 1-2 shows the user control interface for the 9902-DC-4K. Using DashBoard™, the 9902-DC-4K and other cards installed in openGear®[1] frames can be controlled from a computer and monitor.

DashBoard™ allows users to view all frames on a network with control and monitoring for all populated slots inside a frame. This simplifies the setup and use of numerous modules in a large installation and offers the ability to centralize monitoring. Cards define their controllable parameters to DashBoard™, so the control interface is always up to date.

The DashBoard™ software can be downloaded from the Cobalt Digital Inc. website: www.cobaltdigital.com (enter “DashBoard” in the search window). The DashBoard™ user interface is described in Chapter 3,“Setup Instructions”.

1. openGear® is a registered trademark of Ross Video Limited. DashBoard™ is a trademark of Ross Video Limited.

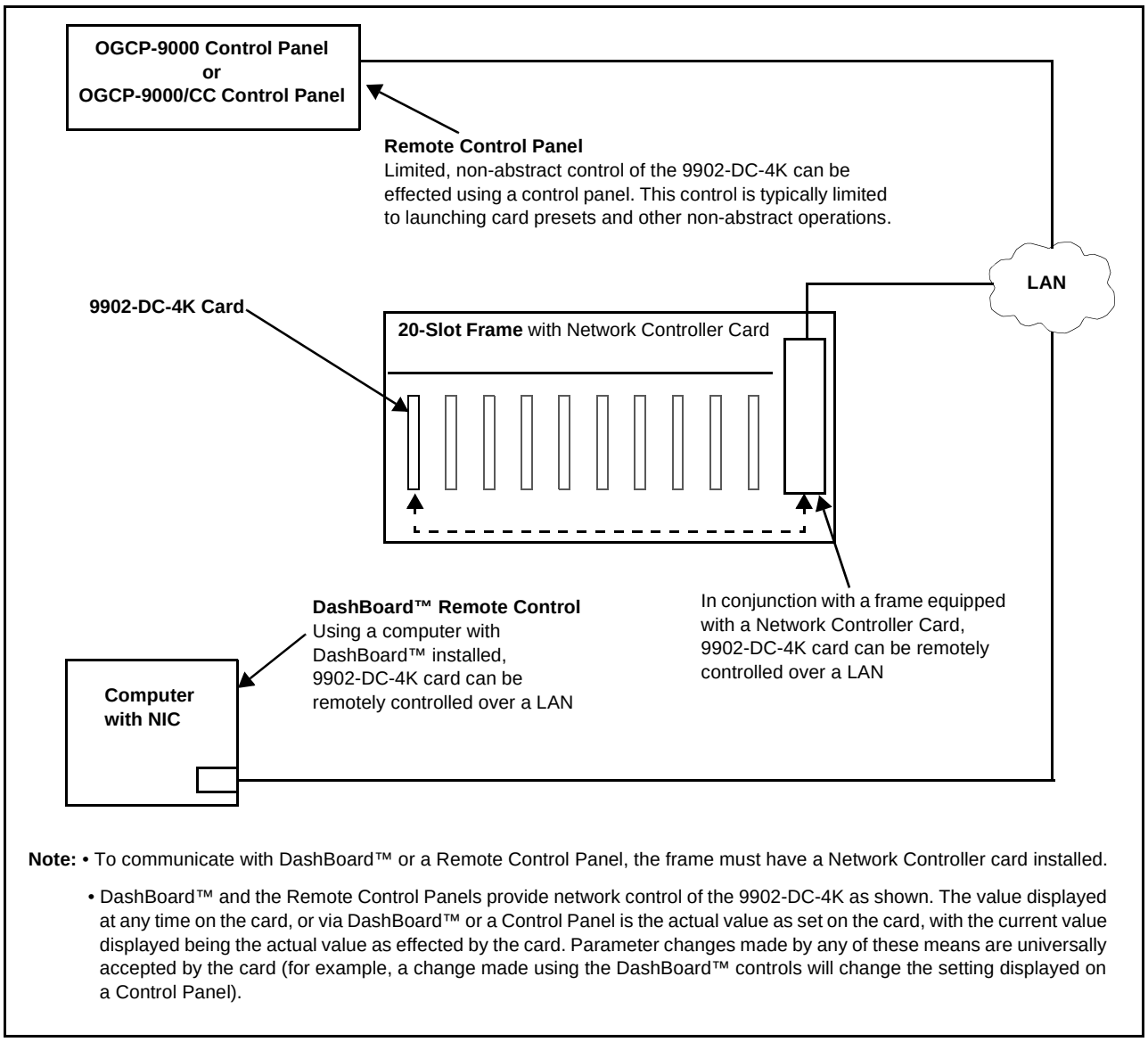

Figure 1-2 9902-DC-4K User Control Interface

Note: Download a copy of this guide by clicking on the **Support>Reference Documents** link at www.cobaltdigital.com and then select DashBoard Remote Control Setup Guide as a download, or contact Cobalt® as listed in Contact Cobalt Digital Inc. (p. 1-12).

9902-DC-4K Rear I/O Modules

The 9902-DC-4K physically interfaces to system video connections at the rear of its frame using a Rear I/O Module. All inputs and outputs shown in the 9902-DC-4K Functional Block Diagram (Figure 1-1) enter and exit the card via the card edge backplane connector. The Rear I/O Module breaks out the 9902-DC-4K card edge connections to BNC and other connectors that interface with other components and systems in the signal chain.

The full assortment of 9902-DC-4K Rear I/O Modules is shown and described in 9902-DC-4K Rear I/O Modules (p. 2-3) in Chapter 2, “Installation and Setup”.

Technical Specifications

Table 1-1 lists the technical specifications for the 9902-DC-4K Up/Down/ Cross Format Converter, Video/Audio In with Frame Sync card.

Table 1-1 Technical Specifications

Item	Characteristic
Part number, nomenclature	9902-DC-4K UHDTV Quadrant Combining Downconverter
Installation/usage environment	Intended for installation and usage in frame meeting openGear™ modular system definition.
Power consumption	< 18 Watts maximum
Installation Density	Up to 20 cards per 20-slot frame
Environmental: Operating temperature: Relative humidity (operating or storage):	 32° – 104° F (0° – 40° C) < 95%, non-condensing
Frame communication	10/100/1000 Mbps Ethernet with Auto-MDIX.
Indicators	Card edge display and indicators as follows: • 4-character alphanumeric display • Status/Error LED indicator • Input Format LED indicator
Program (Quadrant) Video Inputs	Four 3G/HD-SDI video inputs Data Rates Supported: SMPTE 424M, 292M Impedance: 75 Ω terminating Receive Cable Length: 3G/HD-SDI: 120/180 m (Belden 1694A) Return Loss (SDI): > 15 dB up to 1.485 GHz > 10 dB up to 2.970 GHz

Table 1-1 Technical Specifications — continued

Item	Characteristic
Serial Digital Combined Video Output	Number of Outputs: Two 3G/HD/SD-SDI BNC Impedance: 75 Ω Return Loss: > 15 dB at 5 MHz – 270 MHz Signal Level: 800 mV ± 10% DC Offset: 0 V ± 50 mV Jitter (3G/HD/SD): < 0.3/0.2/0.2 UI
HDMI Combined Video Output	HDMI CEA-861D
Frame Reference Input	Number of Inputs: Two, REF 1 and REF 2 from frame with selectable failover Standards Supported: SMPTE 170M/318M (“black burst”) SMPTE 274M/296M (“tri-color”) Return Loss: > 35 dB up to 5.75 MHz

Warranty and Service Information

Cobalt Digital Inc. Limited Warranty

This product is warranted to be free from defects in material and workmanship for a period of five (5) years from the date of shipment to the original purchaser, except that 4000, 5000, 6000, 8000 series power supplies, and Dolby® modules (where applicable) are warranted to be free from defects in material and workmanship for a period of one (1) year.

Cobalt Digital Inc.'s (“Cobalt”) sole obligation under this warranty shall be limited to, at its option, (i) the repair or (ii) replacement of the product, and the determination of whether a defect is covered under this limited warranty shall be made at the sole discretion of Cobalt.

This limited warranty applies only to the original end-purchaser of the product, and is not assignable or transferrable therefrom. This warranty is limited to defects in material and workmanship, and shall not apply to acts of God, accidents, or negligence on behalf of the purchaser, and shall be voided upon the misuse, abuse, alteration, or modification of the product. Only Cobalt authorized factory representatives are authorized to make repairs to the product, and any unauthorized attempt to repair this product shall immediately void the warranty. Please contact Cobalt Technical Support for more information.

To facilitate the resolution of warranty related issues, Cobalt recommends registering the product by completing and returning a product registration form. In the event of a warrantable defect, the purchaser shall notify Cobalt with a description of the problem, and Cobalt shall provide the purchaser with a Return Material Authorization (“RMA”). For return, defective products should be double boxed, and sufficiently protected, in the original packaging, or equivalent, and shipped to the Cobalt Factory Service Center, postage prepaid and insured for the purchase price. The purchaser should include the RMA number, description of the problem encountered, date purchased, name of dealer purchased from, and serial number with the shipment.

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Contact Cobalt Digital Inc.

Feel free to contact our thorough and professional support representatives for any of the following:

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

Phone:	(217) 344-1243
Fax:	(217) 344-1245
Web:	www.cobaltdigital.com
General Information:	info@cobaltdigital.com
Technical Support:	support@cobaltdigital.com

Chapter 2

Installation

Overview

This chapter contains the following information:

Installing the 9902-DC-4K Into a Frame Slot

CAUTION

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 only convection cooling. The 9902-DC-4K has a moderate power dissipation (<18 W). As such, avoiding placing the card adjacent to other cards with similar dissipation values if possible.

CAUTION

This device contains semiconductor devices which are susceptible to serious damage from Electrostatic Discharge (ESD). ESD damage may not be immediately apparent and can affect the long-term reliability of the device.

Avoid handling circuit boards in high static environments such as carpeted areas, and when wearing synthetic fiber clothing. Always use proper ESD handling precautions and equipment when working on circuit boards and related equipment.

Note: **If installing the 9902-DC-4K in a slot with no rear I/O module, a Rear I/O Module is required** before cabling can be connected. Refer to Installing a Rear I/O Module (p. 2-3) for rear I/O module installation procedure.

CAUTION

If required, make certain Rear I/O Module(s) is installed before installing the 9902-DC-4K into the frame slot. Damage to card and/or Rear I/O Module can occur if module installation is attempted with card already installed in slot.

Note: Check the packaging in which the 9902-DC-4K was shipped for any extra items such as a Rear I/O Module connection label. In some cases, this label is shipped with the card and to be installed on the Rear I/O connector bank corresponding to the slot location of the card.

Install the 9902-DC-4K into a frame slot as follows:

1. Determine the slot in which the 9902-DC-4K is to be installed.
2. Open the frame front access panel.
3. While holding the card by the card edges, align the card such that the plastic ejector tab is on the bottom.
4. Align the card with the top and bottom guides of the slot in which the card is being installed.
5. Gradually slide the card into the slot. When resistance is noticed, gently continue pushing the card until its rear printed circuit edge terminals engage fully into the rear I/O module mating connector.

CAUTION

If card resists fully engaging in rear I/O module mating connector, check for alignment and proper insertion in slot tracks. Damage to card and/or rear I/O module may occur if improper card insertion is attempted.

6. Verify that the card is fully engaged in rear I/O module mating connector.
7. Close the frame front access panel.
8. Connect the input and output cables as shown in 9902-DC-4K Rear I/O Modules (p. 2-3).
9. Repeat steps 1 through 8 for other 9902-DC-4K cards.

Note:
- The 9902-DC-4K BNC inputs are internally 75-ohm terminated. It is not necessary to terminate unused BNC inputs or outputs.
- External frame sync reference signals are received by the card over a reference bus on the card frame, and not on any card rear I/O module connectors. The frame has BNC connectors labeled **REF 1** and **REF 2** which receive the reference signal from an external source such as a house distribution.
- To remove a card, press down on the ejector tab to unseat the card from the rear I/O module mating connector. Evenly draw the card from its slot.

10. If network remote control is to be used for the frame and the frame has not yet been set up for remote control, perform setup in accordance with Setting Up 9902-DC-4K Network Remote Control (p. 2-5).

Note: If installing a card in a frame already equipped for, and connected to DashBoard™, no network setup is required for the card. The card will be discovered by DashBoard™ and be ready for use.

Installing a Rear I/O Module

Note: This procedure is applicable **only if a Rear I/O Module is not currently installed** in the slot where the 9902-DC-4K is to be installed.

If installing the 9902-DC-4K in a slot already equipped with a suitable I/O module, omit this procedure.

Install a Rear I/O Module as follows:

1. On the frame, determine the slot in which the 9902-DC-4K is to be installed.
2. In the mounting area corresponding to the slot location, install Rear I/O Module as shown in Figure 2-1.

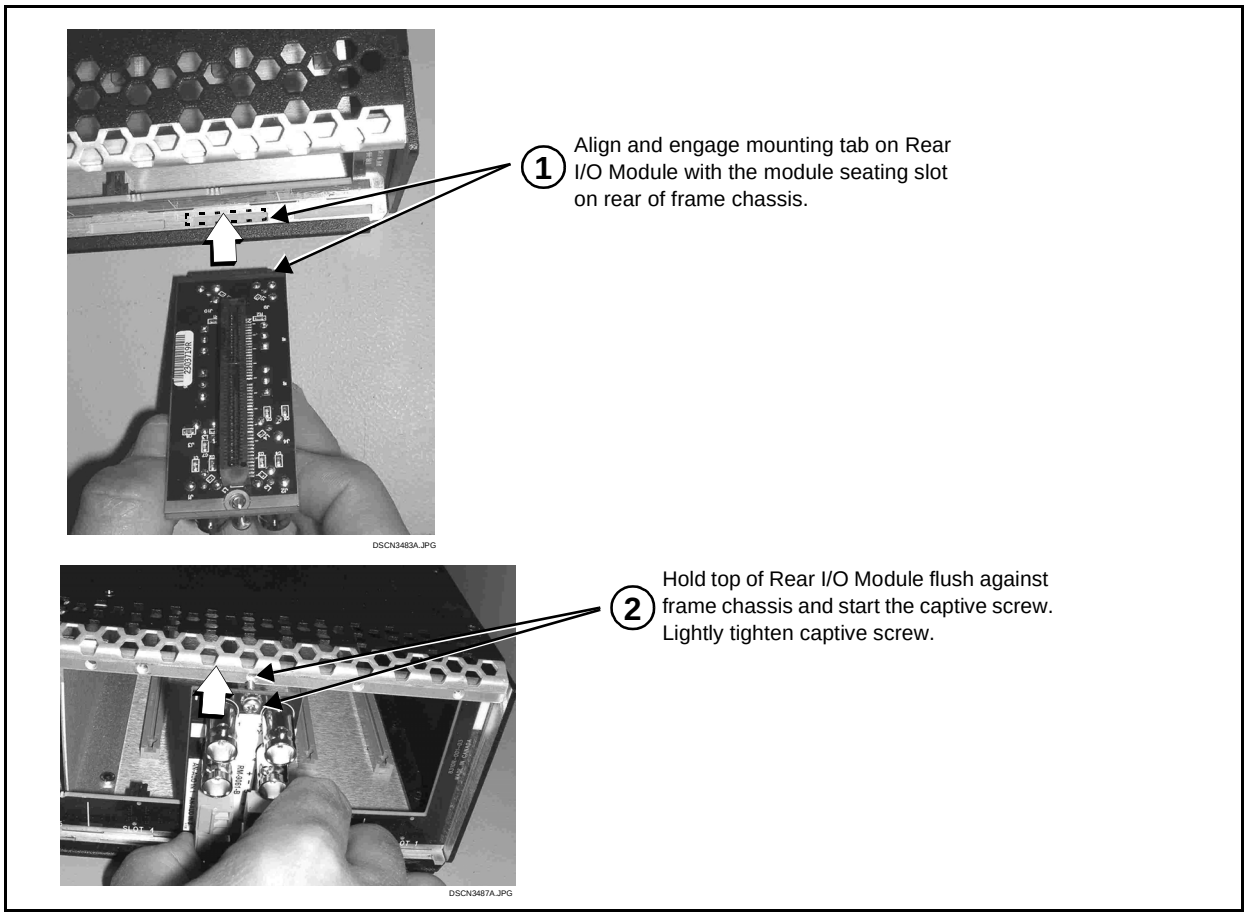
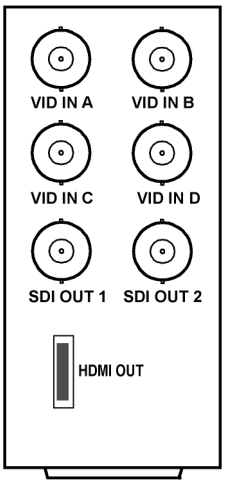


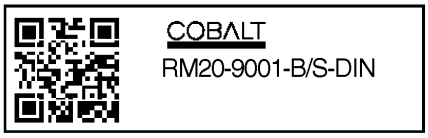
Figure 2-1 Rear I/O Module Installation

9902-DC-4K Rear I/O Modules

Table 2-1 shows and describes the full assortment of Rear I/O Modules specifically for use with the 9902-DC-4K.

Table 2-1 9902-DC-4K Rear I/O Modules

9902-DC-4K Rear I/O Module	Description
RM20-9902DC4K-B 	Provides the following connections: • Four Quadrant Video In BNCs (**VID IN A** thru **VID IN D**) • Two 3G/HD/SD-SDI Quadrant Combined Video Out BNCs (**SDI OUT 1** and **SDI OUT 2**) • **HDMI OUT** Quadrant Combined Video/Audio Out connector



SAMPLE-NOT FOR USE

Due to the density of connector placement on Rear Modules using high-density connectors (e.g., RM20-9001-B/S-DIN), these modules use a QR barcode label instead a regular label. Simply scan the image with a smart phone and a link to the rear module label (as shown in our catalog) will appear. (Smart phone must have a QR reader app such as QuickMark QR Code Reader or equivalent.)

Not all devices may be able to acquire the image. If this occurs, use the device to access the web page for card/rear module to view the diagram.

Setting Up 9902-DC-4K Network Remote Control

Perform remote control setup in accordance with Cobalt® reference guide "Remote Control User Guide" (PN 9000RCS-RM).

Note: • If network remote control is to be used for the frame and the frame has not yet been set up for remote control, Cobalt® reference guide **Remote Control User Guide (PN 9000RCS-RM)** provides thorough information and step-by-step instructions for setting up network remote control of Cobalt® cards using DashBoard™. (Cobalt® OGCP-9000 and/or OGCP-9000/CC Remote Control Panels are not recommended for use with this product.)

Download a copy of this guide by clicking on the **Support > Reference Documents** link at www.cobaltdigital.com and then select DashBoard Remote Control Setup Guide as a download, or contact Cobalt® as listed in Contact Cobalt Digital Inc. (p. 1-12).

• If installing a card in a frame already equipped for, and connected to DashBoard™, no network setup is required for the card. The card will be discovered by DashBoard™ and be ready for use.

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Chapter 3

Setup Instructions

Overview

If you are already familiar with using DashBoard to control Cobalt cards, please skip to 9902-DC-4K Function Menu List and Descriptions (p. 3-7).

This chapter contains the following information:

Control and Display Descriptions

This section describes the user interface controls, indicators, and displays for using the 9902-DC-4K card.

Access to the 9902-DC-4K functions (and the controls, indicators, and displays related to a particular function) follows a general arrangement of Function Menus under which related controls can be accessed (as described in Function Menu/Parameter Menu Overview below).

Note: When a setting is changed, settings displayed on DashBoard™ are the settings as effected by the card itself and reported back to the remote control; the value displayed at any time is the actual value as set on the card.

Function Menu/Parameter Menu Overview

The functions and related parameters available on the 9902-DC-4K card are organized into function **menus**, which consist of parameter groups as shown below.

Figure 3-1 shows how the 9902-DC-4K card and its menus are organized, and also provides an overview of how navigation is performed between cards, function menus, and parameters.

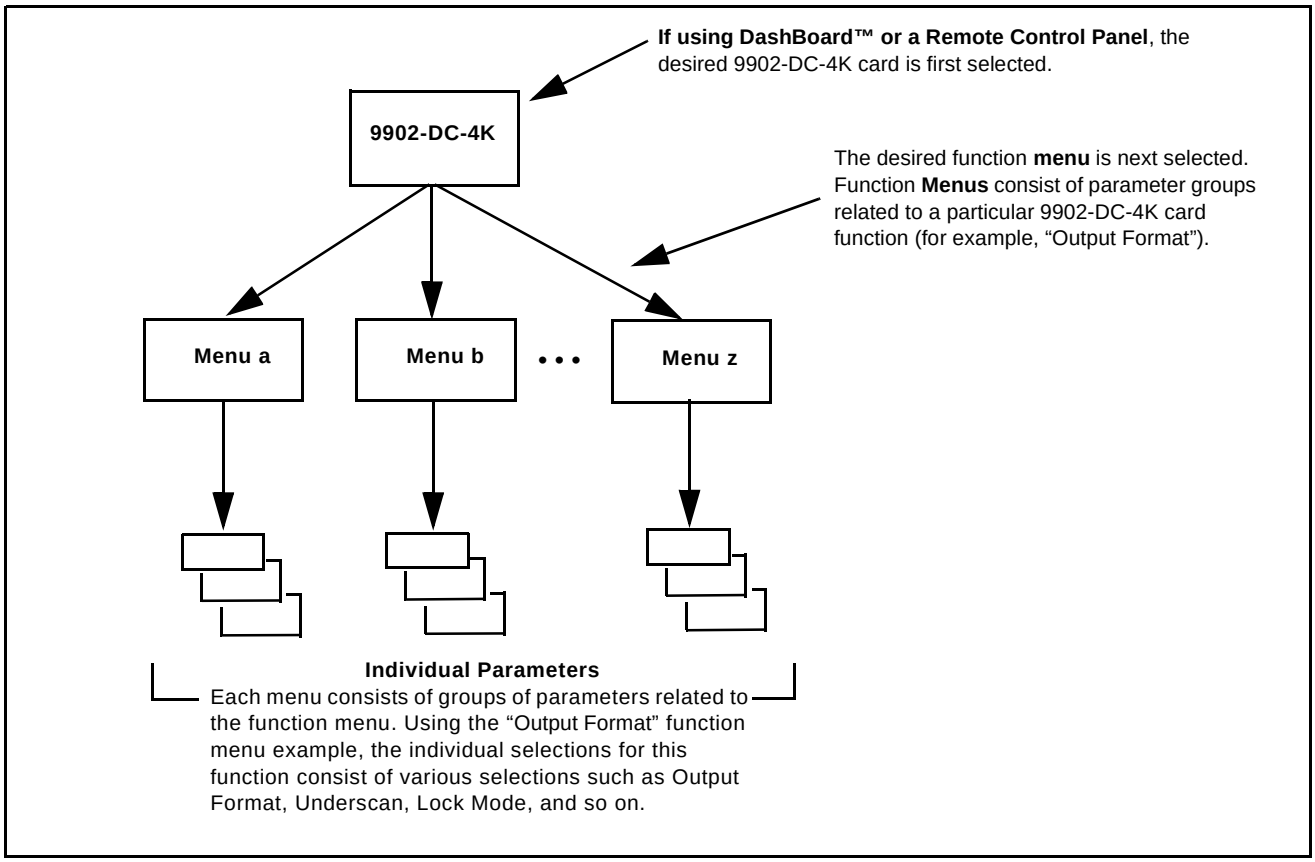


Figure 3-1 Function Menu/Parameter Menu Overview

DashBoard™ User Interface

(See Figure 3-2.) The card function menus are organized in DashBoard™ using tabs. When a tab is selected, each parametric control or selection list item associated with the function is displayed. Scalar (numeric) parametric values can then be adjusted as desired using the GUI slider controls. Items in a list can then be selected using GUI drop-down lists.

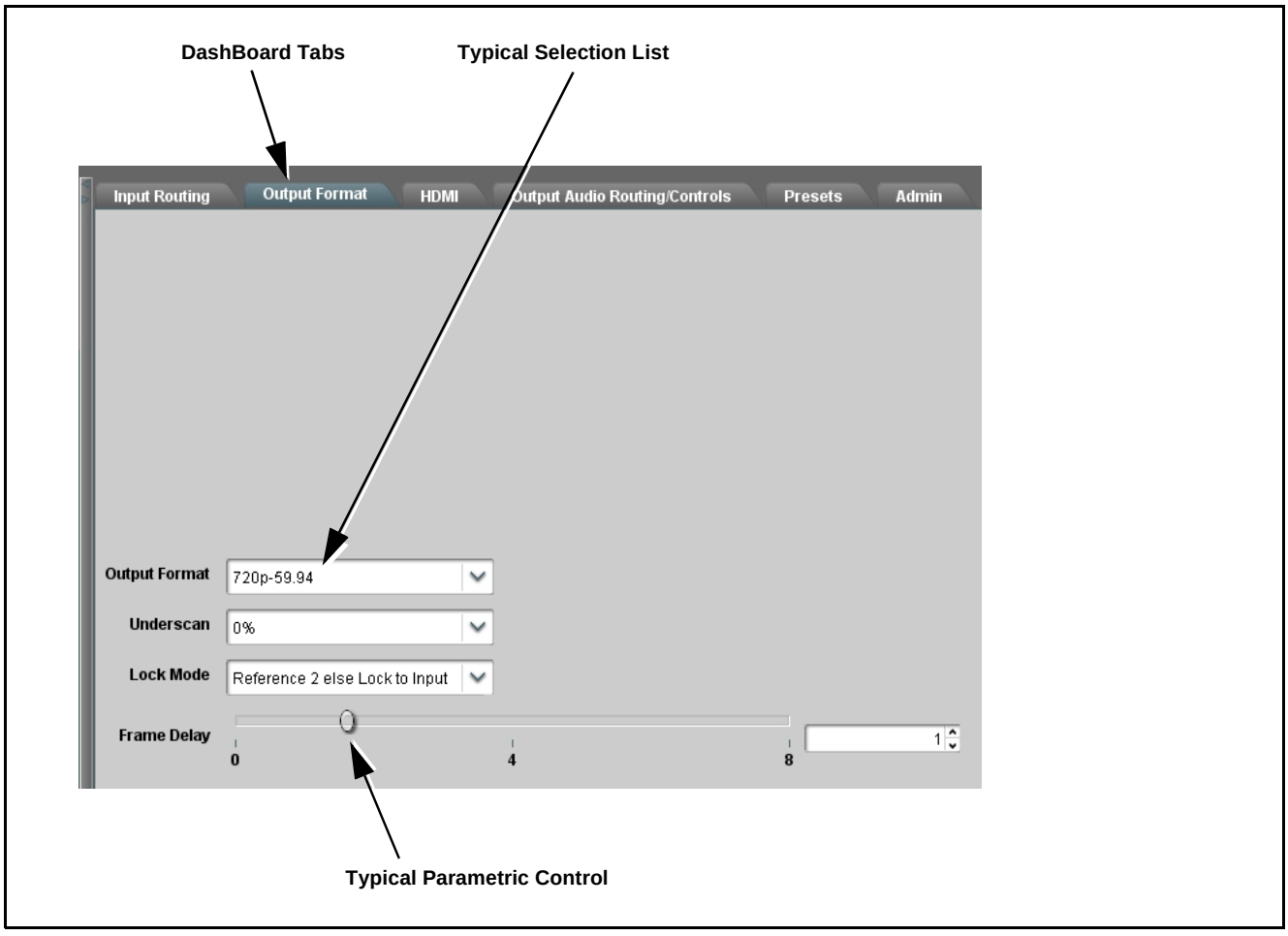


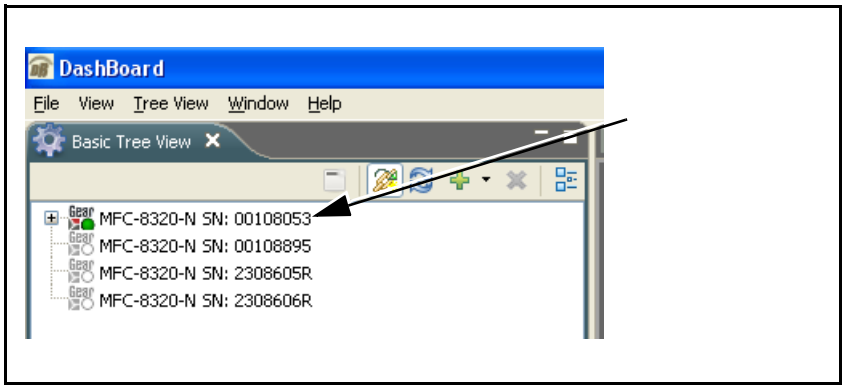
Figure 3-2 Typical DashBoard Tabs and Controls

Accessing the 9902-DC-4K Card via Remote Control

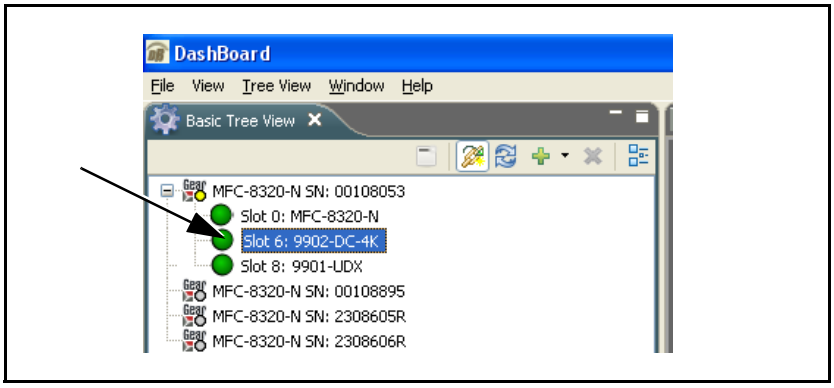
Access the 9902-DC-4K card using DashBoard™ or Cobalt® Remote Control Panel as described below.

Accessing the 9902-DC-4K Card Using DashBoard™

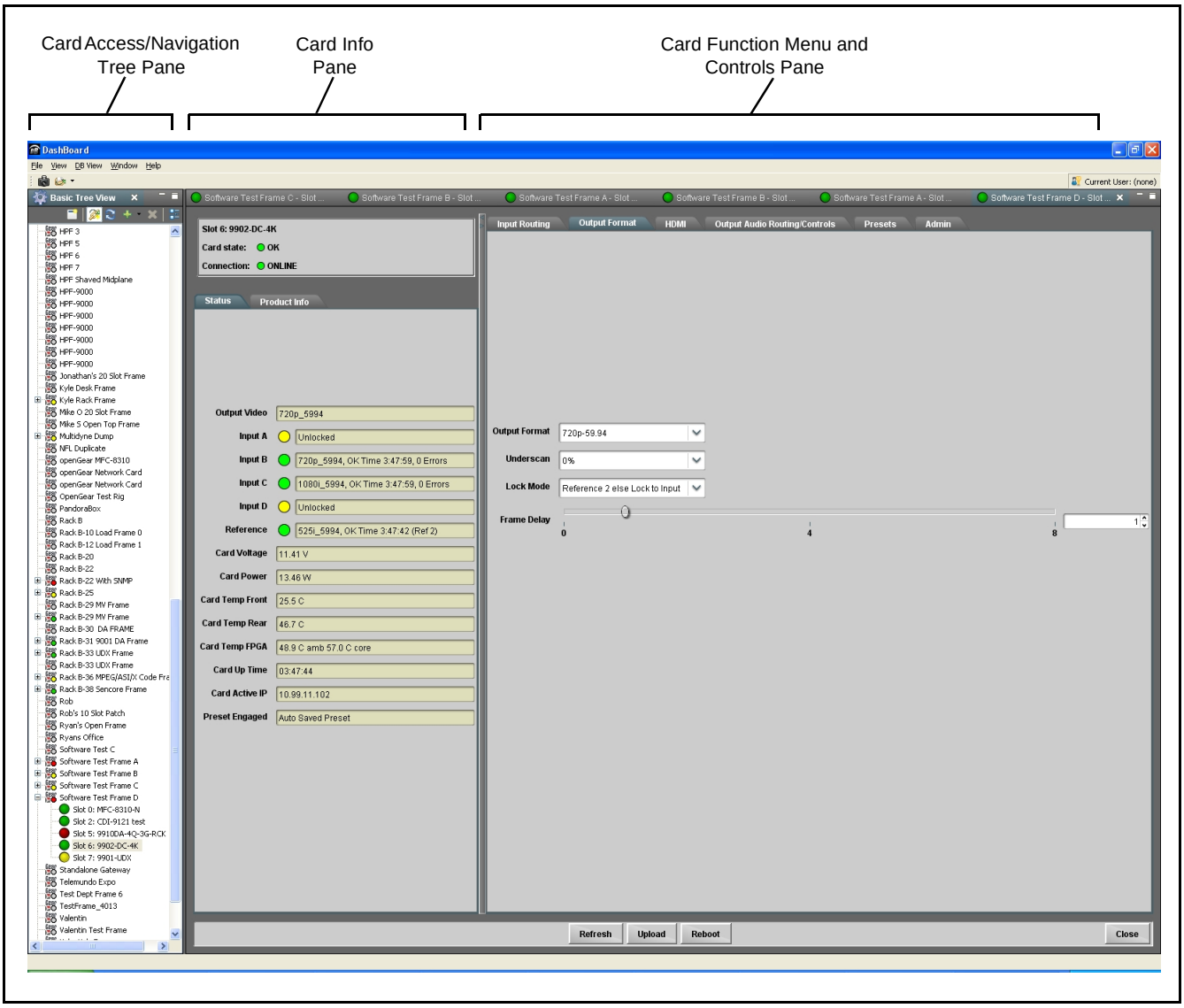
1. On the computer connected to the frame LAN, open DashBoard™.
2. As shown below, in the left side Basic View Tree locate the Network Controller Card associated with the frame containing the 9902-DC-4K card to be accessed (in this example, “MFC-8320-N SN: 00108053”).



3. As shown below, expand the tree to access the cards within the frame. Click on the card to be accessed (in this example, “Slot 6: 9902-DC-4K”).



As shown on the next page, when the card is accessed in DashBoard™ its function menu screen showing tabs for each function is displayed. (The particular menu screen displayed is the previously displayed screen from the last time the card was accessed by DashBoard™).


Card Access/Navigation Tree Pane
Card Info Pane
Card Function Menu and Controls Pane
DashBoard
File View DB View Window Help
Current User: (none)
Basic Tree View
Software Test Frame C - Slot ...
Software Test Frame B - Slot ...
Software Test Frame A - Slot ...
Software Test Frame B - Slot ...
Software Test Frame A - Slot ...
Software Test Frame D - Slot ...
Slot 6: 9902-DC-4K
Card state: OK
Connection: ONLINE
Status
Product Info
Output Video 720p_5994
Input A Unlocked
Input B 720p_5994, OK Time 3:47:59, 0 Errors
Input C 1080i_5994, OK Time 3:47:59, 0 Errors
Input D Unlocked
Reference 525i_5994, OK Time 3:47:42 (Ref 2)
Card Voltage 11.41 V
Card Power 13.46 W
Card Temp Front 25.5 C
Card Temp Rear 46.7 C
Card Temp FPGA 48.9 C amb 57.0 C core
Card Up Time 03:47:44
Card Active IP 10.99.11.102
Preset Engaged Auto Saved Preset
Input Routing
Output Format
HDMI
Output Audio Routing/Controls
Presets
Admin
Output Format 720p-59.94
Underscan 0%
Lock Mode Reference 2 else Lock to Input
Frame Delay
0
4
8
Refresh
Upload
Reboot
Close

Checking 9902-DC-4K Card Information

The operating status and software version the 9902-DC-4K card can be checked using DashBoard™. Figure 3-3 shows and describes the 9902-DC-4K card information screen using DashBoard™.

Note: Proper operating status in DashBoard™ is denoted by green icons for the status indicators shown in Figure 3-3. Yellow or red icons respectively indicate an alert or failure condition. Refer to Troubleshooting (p. 3-15) for corrective action.

The **Tree View** shows the cards seen by DashBoard™. In this example, Network Controller Card is hosting a 9902-DC-4K card in slot 6.

Status Display
This displays shows the status and format of the signals being received by the 9902-DC-4K, as well as card status.

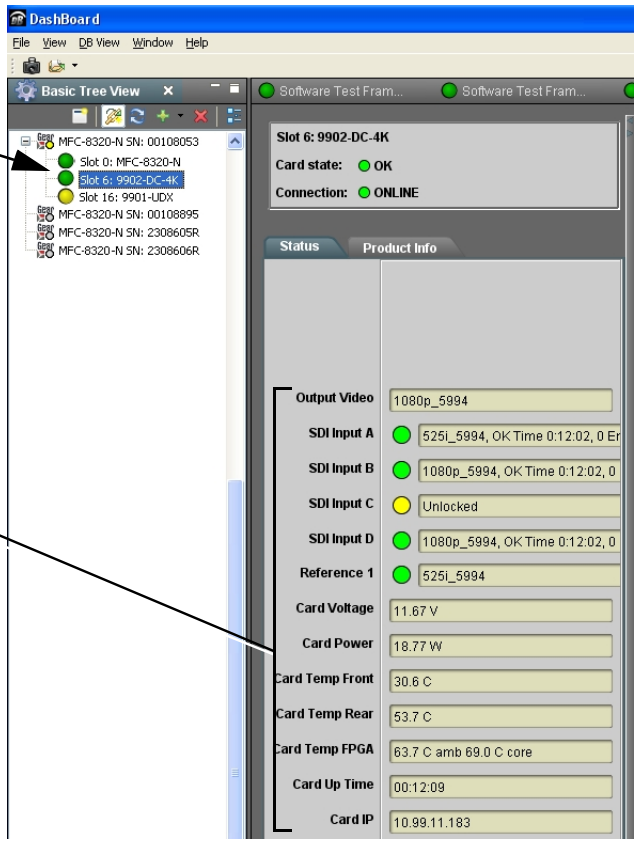


Figure 3-3 9902-DC-4K Card Info/Status Utility

9902-DC-4K Function Menu List and Descriptions

Table 3-1 individually lists and describes each 9902-DC-4K function menu and its related list selections, controls, and parameters. Where helpful, examples showing usage of a function are also provided. Table 3-1 is primarily based upon using DashBoard™ to access each function and its corresponding menus and parameters.

Note: • All numeric (scalar) parameters displayed on DashBoard™ can be changed using the slider controls, ⇕ arrows, or by numeric keypad entry in the corresponding numeric field. (When using numeric keypad entry, add a return after the entry to commit the entry.)

On DashBoard™ itself and in Table 3-1, the function menu items are organized using tabs as shown below.

The table below provides a quick-reference to the page numbers where each function menu item can be found.

Table 3-1 9902-DC-4K Function Menu List

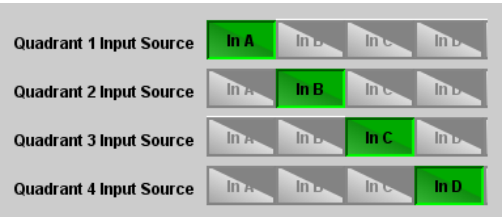
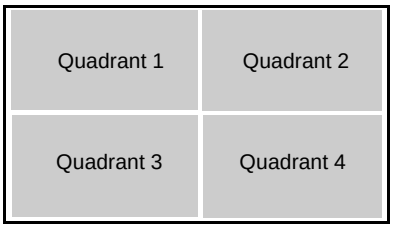
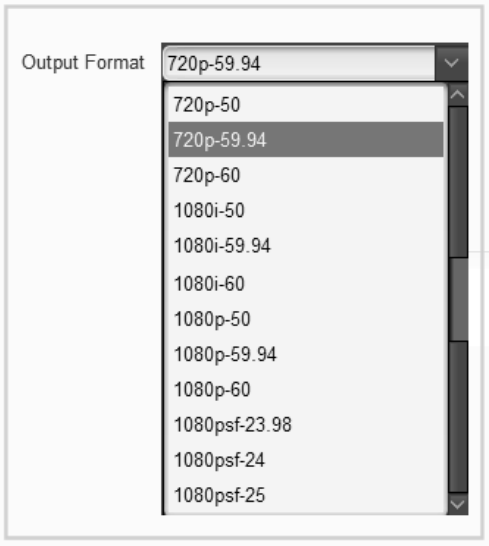
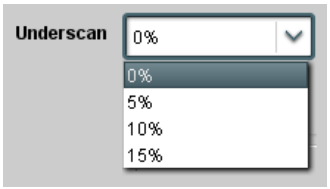
Input Routing	Provides controls to select input routing of card SDI inputs to the four quadrants comprising the combined image raster.
• Quadrant Input Source Select 	Routes the card SDI inputs (VID IN A thru VID IN D as **In A** thru **In D**, respectively) to the four card quadrant inputs. (In this example, VID IN A thru VID IN D are respectively routed as Quadrant 1 thru Quadrant 4 input sources.) Default correlation of **In A** thru **In D** and quadrant identification is as shown to the left and below: 
Output Format	Provides controls to set combined output format/ conditioning and card global ref lock mode.
• Output Format Selector 	Provides conversions to formats as shown. **Note:** Although drop-down and card will allow output video raster/rate choices unrelated to the input rates (for example, PAL 50Hz rate for NTSC 59.94Hz input rates), cross-rate conversion choices should not be used for critical applications (frames will be dropped when performing such conversions).
• Underscan Select 	Provides underscanning to reduce the merged output raster size by choices shown.

Table 3-1 9902-DC-4K Function Menu List — continued

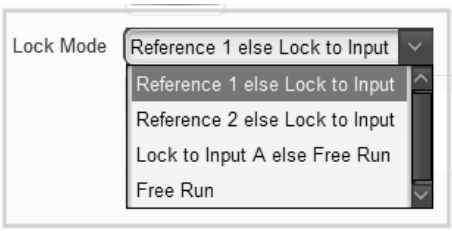
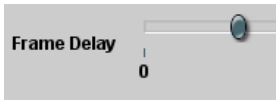
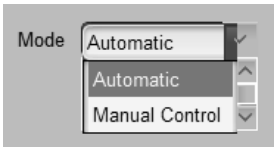
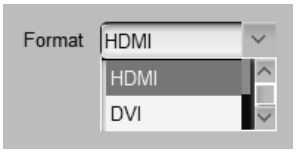
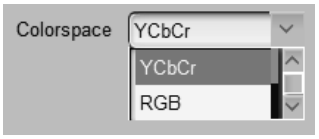
Output Format	(continued)
• **Video Lock Mode Select** 	Selects lock to reference functions from the choices shown and described below. • **Free Run:** Quadrant inputs and output video is locked to the card's internal clock. Output video is **not** locked to external reference. • **Lock to Reference:** Quadrant inputs and output video is locked to selected external reference (Ref 1 or Ref 2) received on the frame reference bus, else input. • **Lock to Input A:** Uses Input A program video input video signal as the reference standard, else free-run. **Note:** Lock to reference provides the most stable operation, and is preferred where available. In this case, source video should also be locked to the same reference.
• **Frame Delay Control** 	When Framesync is enabled, specifies the smallest amount of latency delay (frames held in buffer) allowed by the frame sync. The frame sync will not output a frame unless the specified number of frames are captured in the buffer.

Table 3-1 9902-DC-4K Function Menu List — continued

HDMI	Provides settings to force an HDMI or DVI output suitable for direct connection to monitors using a DVI input in case the connection is not detected by the monitor. Also provides color mode controls to match HDMI/DVI output to the color space of the monitor.
• **Mode Control** 	Sets HDMI/DVI output to use the connected monitor to inform 9902-DC-4K to automatically detect the monitor format, or to use manual (forced) control. Where the monitor may not be able to provide this handshake signal, it is recommended to use **Manual** mode and force the desired mode as described below.
• **Format Manual (Forced) Mode Control** 	Sets HDMI card output as forced HDMI or DVI mode.
• **Colorspace Control** 	Forces output colorspace as either YCbCr or RGB.

Note: The HDMI output on this card conforms with CEA-861D HDMI audio channel line-up specifications. As such, a swap between the C and LFE channels for the HDMI output is automatically performed.

If connecting to a device that does not meet CEA-861D HDMI, a Ch3 / Ch4 swap using the Output Audio Routing/Controls may be required to effect desired C - LFE line-up.

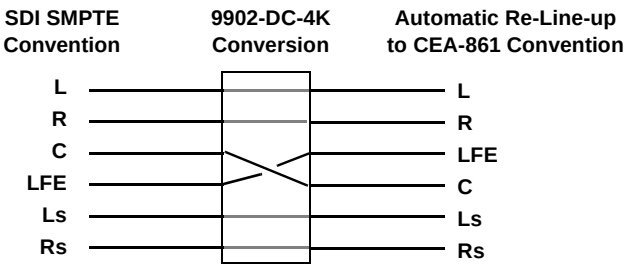


Table 3-1 9902-DC-4K Function Menu List — continued

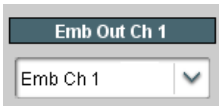
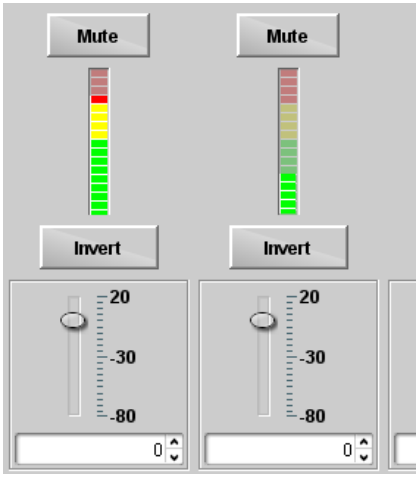
Output Audio Routing/Controls	Provides an audio crosspoint allowing the audio source selection for each embedded audio output channel. Also provides Gain, Phase Invert, and Muting controls and peak level meters for each output channel.
Note: • **Embedded Ch 2** thru **Embedded Ch 16** have controls identical to the **Source**, **Gain**, **Mute**, and **Invert** controls described here for **Embedded Ch 1**. Therefore, only the **Embedded Ch 1** controls are shown here. • For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the **Silence** selection.	
• Embedded Audio Output Input Source 	Selects the four-group embedded audio to be embedded in the output embedded SDI audio (and HDMI Ch1 - Ch8 embedded audio). (In this example, **In A** quadrant input audio is selected as the output four-group audio.)
• Group Enable/Disable Controls 	Allows enable/disable of embedded audio groups 1 thru 4 on card program video output to accommodate some legacy downstream systems that may not support all four embedded audio groups. **Note:** Changing the setting of this control will result in a noise burst in all groups. This control should not be manipulated when carrying on-air content.
• Embedded Output Channel Source 	Using the drop-down list, selects the audio input source to be embedded in the corresponding embedded output channel from the following choices: • Card **Audio Bus (Emb) Ch 1** thru **Ch 16** • Built-in Tone generators **Tone 1** thru **Tone 16** (all are -20 dBFS level; freq (Hz) in ascending order are 100, 200, 300, 400, 500, 600, 700, 800, 900, 1k, 2k, 4k, 6k, 8k, 12k, and 16k) **Note:** Multiple tone generators, even if set to the same frequency, may not exhibit phase coherence. If identical tones with frequency and phase coherence are required, use a single tone generator (e.g., "Tone 1") across multiple channels instead of multiple generators set to the same frequency.
• Channel Mute/Phase Invert/Gain Controls and Peak Level Display 	Provides **Mute** and phase **Invert** channel controls, as well as peak level meter for each output channel. (Meter shows level as affected by Level control.) **Gain** controls allow relative gain (in dB) control for the corresponding destination Embedded Audio Group channel. (-80 to +20 dB range in 1.0 dB steps; unity = 0 dB) **Note:** Although this card can pass non-PCM data such as Dolby® E or AC-3, setting the gain control to any setting other than default 0 will corrupt Dolby data.

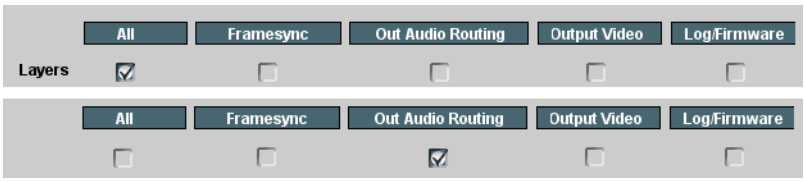
Table 3-1 9902-DC-4K Function Menu List — continued

Presets	Allows user control settings to be saved in a one-button Preset and then loaded (recalled) as desired, and provides a one-button restore of factory default settings.

• Preset Layer Select

Allows selecting a functional layer (or "area of concern") that the preset is concerned with. Limiting presets to a layer or area of concern allows for highly specific presets, and masks changing card settings in areas outside of the layer or area of concern.

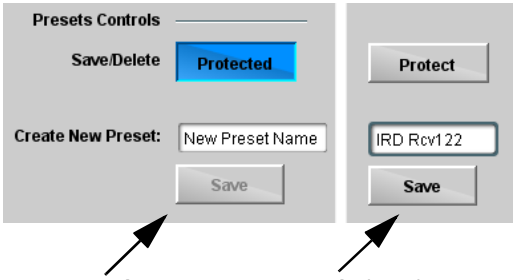
Default **All** setting will "look" at all device settings, and save and invoke **all** settings when the preset is invoked (loaded).



Selecting a layer (in this example, "Out Audio Routing") will set the preset to **only** "look at" and "touch" output audio routing settings and save these settings under the preset. When the preset is invoked (loaded), **only** the output audio routing layer is "touched".

Example: Since audio routing can be considered independent of other settings, if normal audio routing was set up with a particular input routing setting in effect, and at a later time audio routing is desired to be saved as a preset, selecting **Out Audio Routing** here limits preset-invoked changes to **only** the audio routing layer, "telling" the preset save/load to not concern itself with other aspects such as input routing settings. In this manner, when the preset is invoked any unrelated settings in effect will remain untouched, with only the audio routing changes invoked.

• Preset Enter/Save/Delete



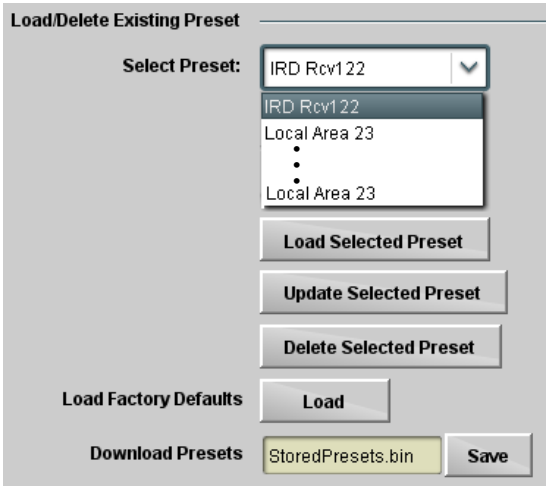
Protected state – changes locked out

Ready (open) state – changes can be applied

Locks and unlocks editing of presets to prevent accidental overwrite as follows:

- **Protect (ready):** This state awaits Protected and allows preset Save/Delete button to save or delete current card settings to the selected preset. **Use this setting when writing or editing a preset.**
- **Protected:** Toggle to this setting to lock down all presets from being inadvertently re-saved or deleted. **Use this setting when all presets are as intended.**
- **Create New Preset:** Field for entering user-defined name for the preset being saved (in this example, "IRD Rcv122").
- **Save:** Saves the current card settings under the preset name defined above.

• Preset Save/Load Controls



- **Select Preset:** drop-down allows a preset saved above to be selected to be loaded or deleted (in this example, custom preset "IRD Rcv122").
- **Load Selected Preset** button allows loading (recalling) the selected preset. When this button is pressed, the changes called out in the preset are immediately applied.
- **Update Selected Preset** button allows saving any card settings changes to the selected preset. When this button is pressed, the changes in effect are rolled into the selected preset.
- **Delete Selected Preset** button deletes the currently selected preset.
- **Load Factory Defaults** button allows loading (recalling) the factory default preset. When this button is pressed, the changes called out in the preset are immediately applied.

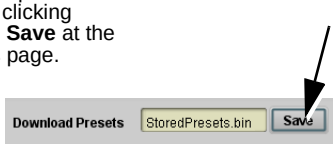
Note: Load Factory Defaults functions with no masking. The Preset Layer Select controls have no effect on this control and will reset **all** layers to factory default.

- **Download Presets** saving the preset files to a folder on the connected computer.

Table 3-1 9902-DC-4K Function Menu List — continued

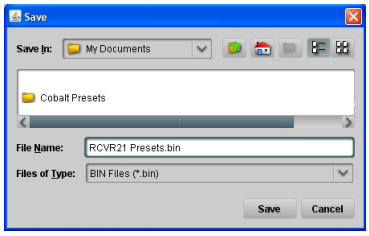
Presets	**(continued)**

Download (save) card presets to a network computer by clicking **Download Presets – Save** at the bottom of the Presets page.



Browse to a desired save location (in this example, *My Documents\Cobalt Presets*).

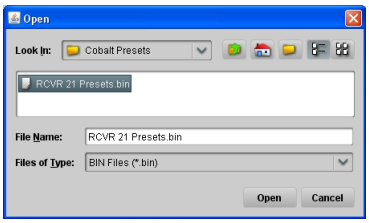
The file can then be renamed if desired (*RCVR21 Presets* in this example) before committing the save.



Upload (open) card presets from a network computer by clicking **Upload** at the bottom of DashBoard.

Browse to the location where the file was saved on the computer or drive (in this example, *My Documents\Cobalt Presets*).

Select the desired file and click **Open** to load the file to the card.



Note: • Preset transfer between card download and file upload is on a **group** basis (i.e., individual presets cannot be downloaded or uploaded separately).

• After uploading a presets file, engagement of a desired preset is only assured by selecting and loading a desired preset as described on the previous page.

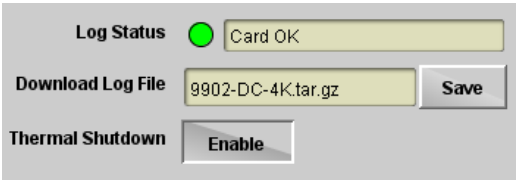
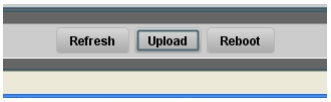
Admin	Provides a global card operating status and allows a log download for factory engineering support. Also provides controls for selecting and loading card firmware upgrade files.
• **Log Status and Download Controls** 	• **Log Status** indicates overall card internal operating status. • **Download Log File** allows a card operational log file to be saved to a host computer. This log file can be useful in case of a card error or in the case of an operational error or condition. The file can be submitted to Cobalt engineering for further analysis. • **Thermal Shutdown** enable/disable allows the built-in thermal failover to be defeated. (Thermal shutdown is enabled by default). **CAUTION** **The 9902-DC-4K FPGA is designed for a normal-range operating temperature around 85° C core temperature. Operation in severe conditions exceeding this limit for non-sustained usage are within device operating safe parameters, and can be allowed by setting this control to Disable. However, the disable (override) setting should be avoided under normal conditions to ensure maximum card protection.**

Table 3-1 9902-DC-4K Function Menu List — continued

Admin	(continued)
• **Firmware Upgrade Controls**	Firmware upgrade controls allow a selected firmware version (where multiple versions can be uploaded to the card's internal memory) to invoke an upgrade to a selected version either instantly, or set to install on the next card reboot (thereby allowing card upgrade downtime to be controlled at a scheduled point in time).

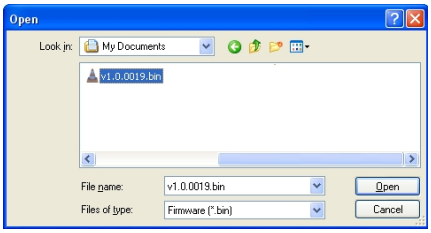
Note: The page/tab here allows managing multiple firmware versions saved on the card. New upgrade firmware from our web site can always be directly uploaded to the card without using this page. Instructions for firmware downloading to your computer and uploading to the card can be found at the **Support>Firmware Downloads** link at www.cobaltdigital.com.

1. Access a firmware upgrade file from a network computer by clicking **Upload** at the bottom of DashBoard.



2. Browse to the location of the firmware upgrade file (in this example, *My Documents\v1.0.0019.bin*).

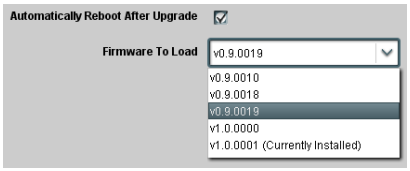
3. Select the desired file and click **Open** to upload the file to the card.



• **Immediate firmware upload.** The card default setting of **Automatically Reboot After Upgrade** checked allow a selected firmware version to be immediately uploaded as follows:

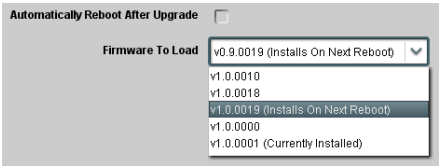
1. Click **Firmware To Load** and select the desired upgrade file to be loaded (in this example, "v1.0.0019").

2. Click **Load Selected Firmware**. The card now reboots and the selected firmware is loaded.



• **Deferred firmware upload.** With **Automatically Reboot After Upgrade** unchecked, firmware upgrade loading is held off until the card is manually rebooted. This allows scheduling a firmware upgrade downtime event until when it is convenient to experience to downtime (uploads typically take about 60 seconds).

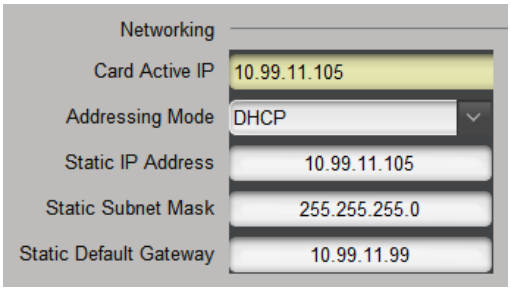
1. Click **Firmware To Load** and select the desired upgrade file to be loaded (in this example, "v1.0.0019"). Note now how the display shows "Installs on Next Reboot".



2. Click **Load Selected Firmware**. The card holds directions to proceed with the upload, and performs the upload only when the card is manually rebooted (by pressing the **Reboot** button).

3. To cancel a deferred upload, press **Cancel Pending Upgrade**. The card reverts to the default settings that allow an immediate upload/upgrade.

Table 3-1 9902-DC-4K Function Menu List — continued

Admin	(continued)
• **Networking Settings Controls**	Control using IP has not been fully implemented at this release. This function is reserved
	The **Networking** section provides a dedicated Ethernet connection to card control and monitoring via a rear module Ethernet port. (This IP interface is entirely independent and separate from the card's DashBoard frame-based remote control/monitoring interface.) • **Addressing Mode** selsects either DHCP or static. • Where Static is selected, standard IP fields allow entry of address, subnet mask, and default gateway.

Troubleshooting

This section provides general troubleshooting information and specific symptom/corrective action for the 9902-DC-4K card and its remote control interface. The 9902-DC-4K card requires no periodic maintenance in its normal operation; if any error indication (as described in this section) occurs, use this section to correct the condition.

Error and Failure Indicator Overview

The 9902-DC-4K card itself and its remote control systems all (to varying degrees) provide error and failure indications.

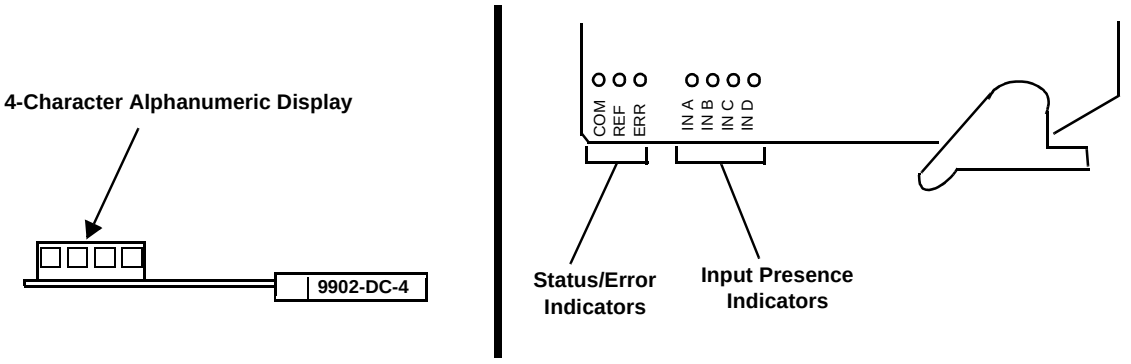
The various 9902-DC-4K card and remote control error and failure indicators are individually described below.

Note: The descriptions below provide general information for the various status and error indicators. For specific failures, also use the appropriate subsection listed below.

• Basic Troubleshooting Checks (p. 3-19)
• 9902-DC-4K Processing Error Troubleshooting (p. 3-19)
• Troubleshooting Network/Remote Control Errors (p. 3-20)

9902-DC-4K Card Edge Status/Error Indicators and Display

Figure 3-4 shows and describes the 9902-DC-4K card edge status indicators and display. These indicators and the display show status and error conditions relating to the card itself and remote (network) communications (where applicable). Because these indicators are part of the card itself and require no external interface, the indicators are particularly useful in the event of communications problems with external devices such as network remote control devices.



Item	Function
Alphanumeric Display	Reserved
COM LED	Blue LED flashes when 9902-DC-4K is receiving control message from remote network control (e.g., DashBoard™ or Cobalt® Remote Control Panel)
REF LED	Blue LED illuminates indicating 9902-DC-4K is receiving valid reference when set up for framesync operation.
ERR LED	Red LED illuminates when 9902-DC-4K unable to lock to framesync.
Input Presence LEDs	LEDs for SDI inputs A thru D indicate the input signal presence.

Figure 3-4 9902-DC-4K Card Edge Status Indicators and Display

DashBoard™ Status/Error Indicators and Displays

Figure 3-5 shows and describes the DashBoard™ status indicators and displays. These indicator icons and displays show status and error conditions relating to the 9902-DC-4K card itself and remote (network) communications.

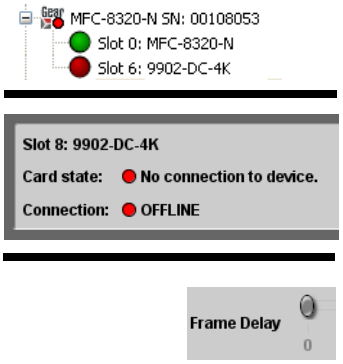
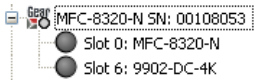
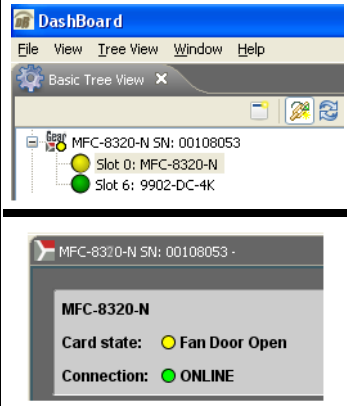
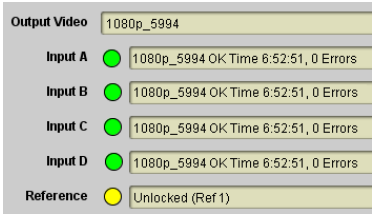
Indicator Icon or Display	Error Description
	Red indicator icon in Card Access/Navigation Tree pane shows card with Error condition (in this example, the Card Access/Navigation Tree pane shows a general error issued by the 9902-DC-4K card in slot 6). Specific errors are displayed in the Card Info pane (in this example “No connection to device” indicating 9902-DC-4K card is not connecting to frame/LAN). If the 9902-DC-4K card is not connecting to the frame or LAN, all controls are grayed-out (as shown in the example here).
	Gray indicator icon in Card Access/Navigation Tree pane shows card(s) are not being seen by DashBoard™ due to lack of connection to frame LAN (in this example, both a 9902-DC-4K card in slot 6 and the MFC-8320-N Network Controller Card for its frame in slot 0 are not being seen).
	Yellow indicator icon in Card Access/Navigation Tree pane shows card with Alert condition (in this example, the Card Access/Navigation Tree pane shows a general alert issued by the MFC-8320-N Network Controller Card). Clicking the card slot position in the Card Access/Navigation Tree (in this example Network Controller Card “Slot 0: MFC-8320-N”) opens the Card Info pane for the selected card. In this example, a “Fan Door Open” specific error is displayed.
	Yellow indicator icon in 9902-DC-4K Card Info pane shows error alert, along with cause for alert (in this example, the 9902-DC-4K is not receiving an enabled framesync source).

Figure 3-5 DashBoard™ Status Indicator Icons and Displays

Access Card Info panes for specific cards by clicking the card slot position in the Card Access/Navigation Tree pane (as shown in the example in Figure 3-6).

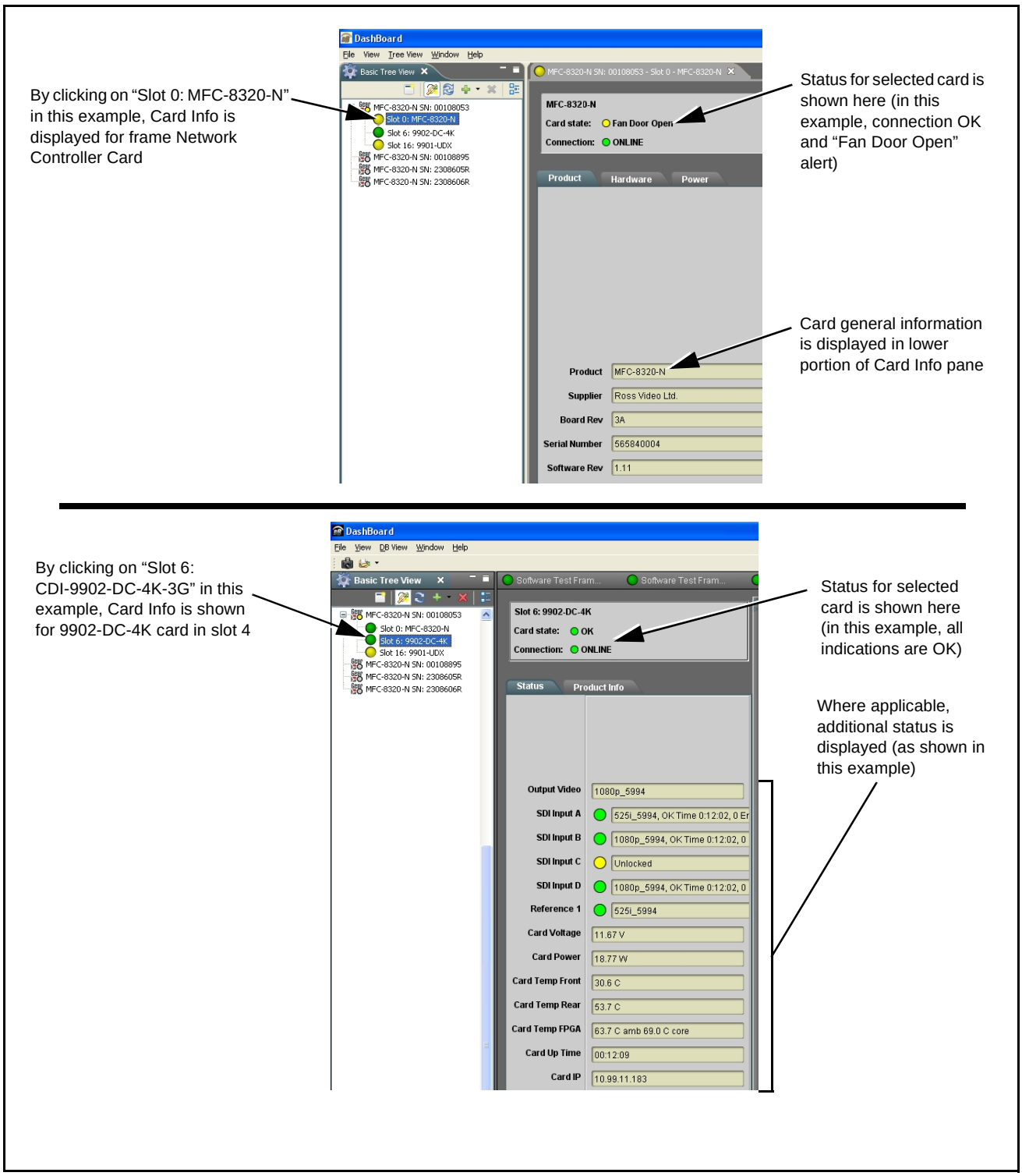


Figure 3-6 Selecting Specific Cards for Card Info Status Display

Basic Troubleshooting Checks

Failures of a general nature (affecting many cards and/or functions simultaneously), or gross inoperability errors are best addressed first by performing basic checks before proceeding further. Table 3-2 provides basic system checks that typically locate the source of most general problems. If required and applicable, perform further troubleshooting in accordance with the other troubleshooting tables in this section.

Table 3-2 Basic Troubleshooting Checks

Item	Checks

Verify power presence and characteristics	• On both the frame Network Controller Card and the 9902-DC-4K, in all cases when power is being properly supplied there is always at least one indicator illuminated. Any card showing no illuminated indicators should be cause for concern.
	• Check the Power Consumed indication for the 9902-DC-4K card. This can be observed using the DashBoard™ Card Info pane.
	  • If display shows **no** power being consumed, either the frame power supply, connections, or the 9902-DC-4K card itself is defective.
	  • If display shows **excessive** power being consumed (see Technical Specifications (p. 1-9) in Chapter 1, “Introduction”), the 9902-DC-4K card may be defective.

Check Cable connection secureness and connecting points	Make certain all cable connections are fully secure (including coaxial cable attachment to cable ferrules on BNC connectors). Also, make certain all connecting points are as intended. Make certain the selected connecting points correlate to the intended card inputs and/or outputs. Cabling mistakes are especially easy to make when working with large I/O modules.
Card seating within slots	Make certain all cards are properly seated within its frame slot. (It is best to assure proper seating by ejecting the card and reseating it again.)
Check status indicators and displays	On both DashBoard™ and the 9902-DC-4K card edge indicators, red indications signify an error condition. If a status indicator signifies an error, proceed to the following tables in this section for further action.
Troubleshoot by substitution	All cards within the frame can be hot-swapped, replacing a suspect card or module with a known-good item.

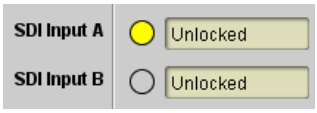
9902-DC-4K Processing Error Troubleshooting

Table 3-3 provides 9902-DC-4K processing troubleshooting information. If the 9902-DC-4K card exhibits any of the symptoms listed in Table 3-3, follow the troubleshooting instructions provided.

In the majority of cases, most errors are caused by simple errors where the 9902-DC-4K is not appropriately set for the type of signal being received by the card.

Note:
- The error indications shown below are typical for the corresponding error conditions listed. Other error indications not specified here may also be displayed on DashBoard™ and/or the 9902-DC-4K card edge status indicators.
- Where errors are displayed on both the 9902-DC-4K card and network remote controls, the respective indicators and displays are individually described in this section.

Table 3-3 Troubleshooting Processing Errors by Symptom

Symptom	Error/Condition	Corrective Action
• **DashBoard™** shows **Unlocked** message in 9902-DC-4K Card Info pane.  • Card edge **Input Presence** LED(s) not illuminated.	No video input present	Make certain intended video source is connected to appropriate 9902-DC-4K card video input. Make certain BNC cable connections between frame Rear I/O Module for the card and signal source are OK.
Audio not processed or passed through card	Enable control not turned on	On **Output Audio Routing/Controls** tab, **Audio Group Enable** control for group 1 thru 4 must be turned on for sources to be embedded into respective embedded channel groups.
Selected upgrade firmware will not upload	Automatic reboot after upgrade turned off	Card **Presets** > **Automatically Reboot After Upgrade** box unchecked. Either reboot the card manually, or leave this box checked to allow automatic reboot to engage an upgrade upon selecting the upgrade.

Troubleshooting Network/Remote Control Errors

Refer to Cobalt® reference guide “Remote Control User Guide” (PN 9000RCS-RM) for network/remote control troubleshooting information.

In Case of Problems

Should any problem arise with this product that was not solved by the information in this section, please contact the Cobalt Digital Inc. Technical Support Department.

If required, a Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions. If required, a temporary replacement item will be made available at a nominal charge. Any shipping costs incurred are the customer’s responsibility. 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 product.

See Contact Cobalt Digital Inc. (p. 1-12) in Chapter 1, “Introduction“ for contact information.

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