# HDCC-708T104-OG1

## HD/SD-SDI CEA-608/708 Closed Caption Encoder with SCTE 104 Message Insertion

User Guide

Firmware Version: V0.31
Software Version: V0.77

**Part Number 821093, Revision A**

Wohler CONFIDENCE
VIDEO AUDIO CAPTIONING LOUDNESS
31055 Huntwood Avenue
Hayward, California
94544 USA
1 800 5 WOHLER
+1 (510) 870-0810
Fax +1 (510) 870-0811
www.wohler.com
info@wohler.com

## Reproduction

Licensed users and authorized distributors of Wohler Technologies, Inc. products may copy this document for use with Wohler Technologies., Inc. products provided that the copyright notice above is included in all reproductions.

## Customer Support

Wohler Technologies, Inc.
31055 Huntwood Avenue
Hayward, CA 94544
www.wohler.com

Phone: 510-870-0810
FAX: 510-870-0811
US Toll Free: 1-888-596-4537
(1-888-5-WOHLER)
Web: www.wohler.com
Sales: sales@wohler.com
Support: support@wohler.com

## Disclaimers

Even though Wohler Technologies, Inc. has tested its equipment and software, and reviewed the documentation, Wohler Technologies, Inc. makes no warranty or representation, either express or implied, with respect to software, documentation, their quality, performance, merchantability, or fitness for a particular purpose.

Wohler Technologies, Inc. reserves the right to change or improve our products at any time and without notice.

In no event will Wohler Technologies, Inc. be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect in the hardware, software, or its documentation, even if advised of the possibility of such damages.

Some states do not allow the exclusion or limitation for incidental or consequential damages, so the above exclusion or limitation may not apply to you.

## Printing

This document is intended to be printed on a duplex printer, such that the copy appears on both sides of each page. This ensures that all new chapters start on a right-facing page.

This document looks best when printed on a color printer since some images may be indistinct when printed on a black and white printer.

## Other Technologies and Products

Microsoft® Windows® and Internet Explorer® are registered trademarks of Microsoft Corporation.

Ross, ROSS, and ROSS® are registered trademarks of Ross Video Limited. DashBoard Control System™ is a trademark of Ross Video Limited.

openGear is the trademark of openGear Inc.

## Last Update

July 25, 2013

# Table of Contents

# CHAPTER 1
# Getting Started

## Introduction

### Overview

This chapter describes the basic captioning functions that you can perform using your Wohler HDCC-708T104-OG1 product, which will be referred to as simply HDCC in this manual.

### Goals for This Chapter

- ✓ Provide a Quick Start process that gives an overview of the installation.
- ✓ Identify the HDCC card's connectors.
- ✓ Understand the captioning functions the HDCC card performs.

### Topics

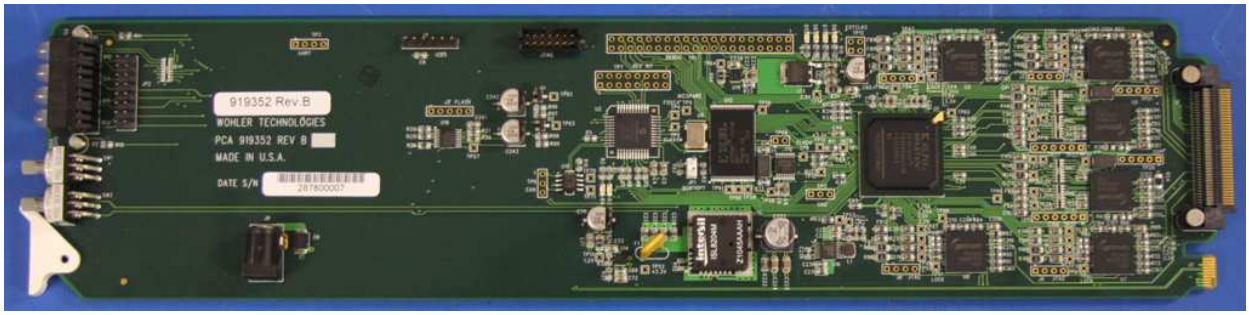
# Product Description

The HDCC is a versatile card for encoding captions on an HD/SD-SDI video stream in real time.

You can operate the HDCC in a Ross® openGear® DFR-8321 frame, which allows the card to be configured and controlled through the DashBoard® software. Refer to Using DashBoard on page 33 for instructions.

The HDCC is a single-channel card which allows caption insertion on a single video stream. Caption data goes to the card through several available serial connections: RS-232, USB, and Ethernet (via a virtual serial port).

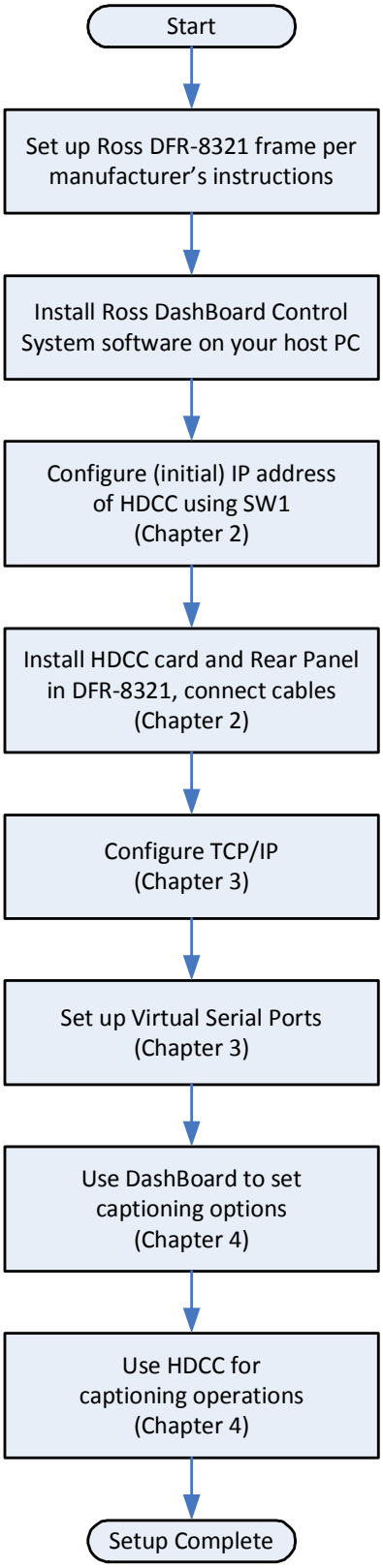
**Figure 1–1 HDCC Card**




# Quick Start Guides

Figure 1–2 on page 3 illustrates the installation and configuration processes for the Ross DFR-8321 frame.

## Figure 1–2 Quick Start, Ross DFR-8321 Frame

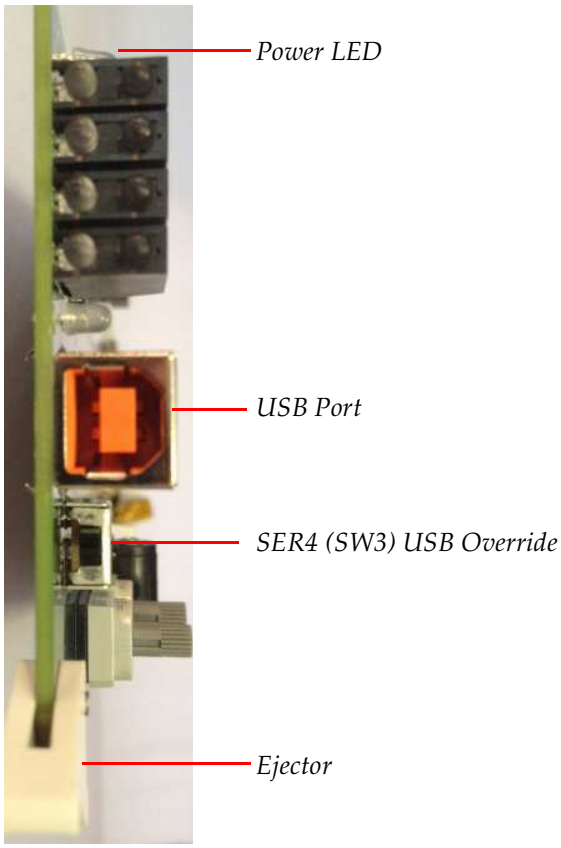


# I/O Connections

## Front Edge

The front edge of the HDCC card has a power LED (lit when power is applied), a USB port, and a USB override switch. The USB port is useful during the initial setup.

**Figure 1–3 HDCC Front Edge**

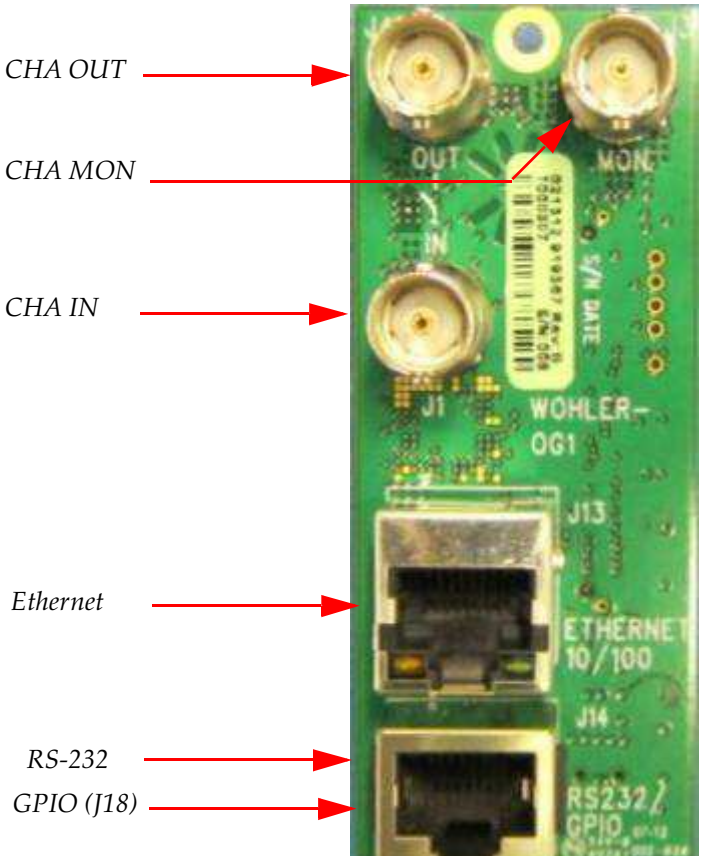


# HDCC in Ross DFR-8321 Frame

The HDCC consists of two main parts: the HDCC board which goes into a DFR-8321 slot, and the OG1 Rear Panel which is attached to the rear of the frame.

Figure 1–4 shows the input and output connectors of the Rear Panel supplied with the HDCC card. The input is **CHA IN** and the output is **CHA OUT**. The monitoring output (**CHA MON**) allows a duplicate of the regular output to be sent to a monitor for display with burned-in captions.

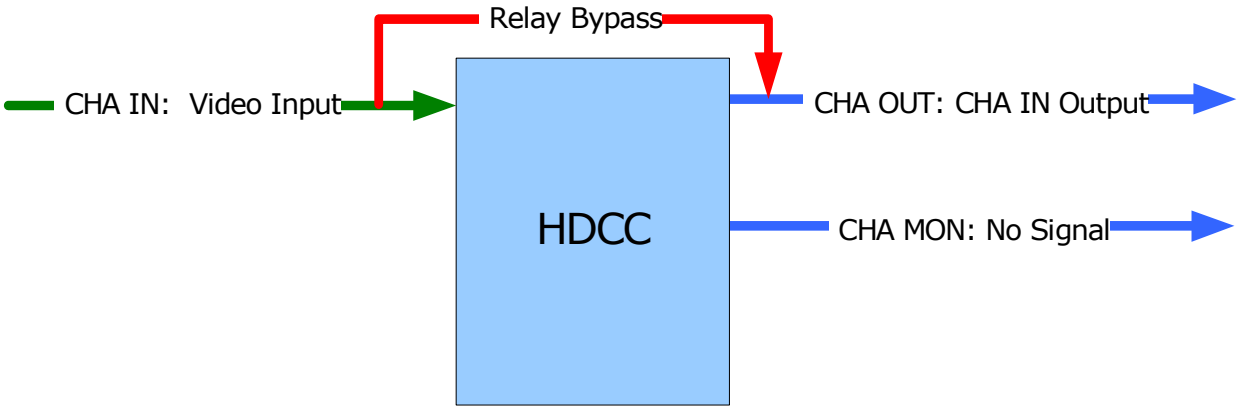
**Figure 1–4 OG1 Rear Panel**



## Relay Bypass

To prevent the loss of the broadcast signal in the event of power failure, the input is bypassed via a relay to the output, ensuring the signal will always pass through the card.

**Figure 1–5 Relay Bypass - No Power Condition**



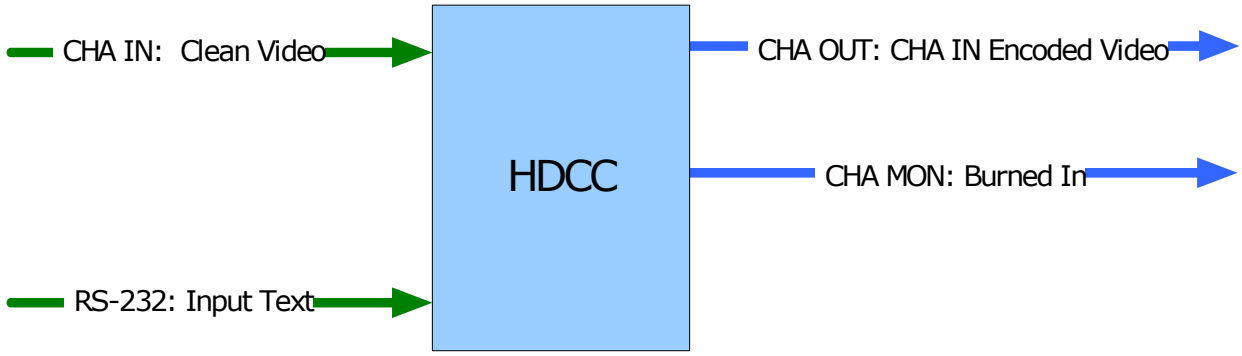

# Functions

## Encoding

The HDCC can receive caption data from either the RS-232 port, the USB port, or an Ethernet virtual serial port, and embed it into the input video stream. The monitoring output channel allows the encoding to be visually confirmed by displaying the video with captions overlaid.

The following example shows the connections necessary to encode user-supplied caption data onto the video stream using the RS-232 port. See Figure 1–6 below.

**Figure 1–6 Encoding Setup**



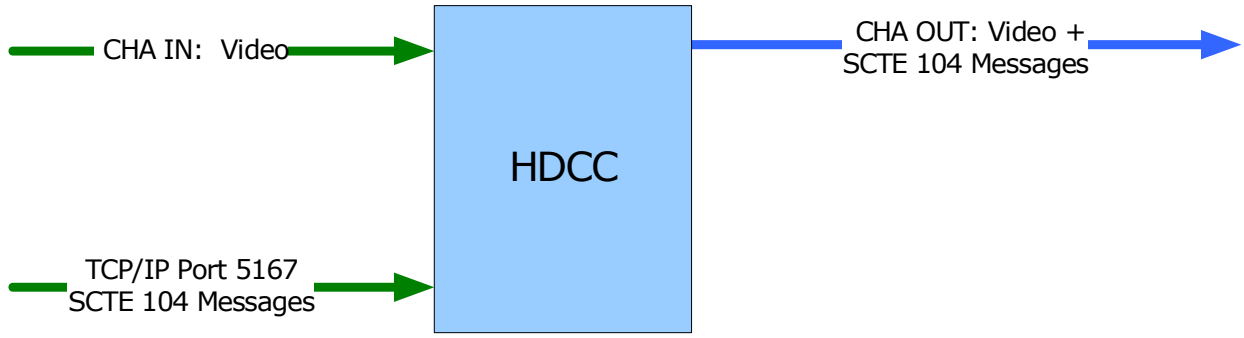

**Example:** The caption data supplied on RS-232 is encoded onto the video stream supplied at **CHA IN** and output to **CHA OUT** and **CHA MON**.

| Connections | |
|---|---|
| **Port** | **Data** |
| **CHA IN** | SMPTE HD/SD-SDI video stream with no captions present. |
| **CHA OUT** | SMPTE HD/SD-SDI video stream with user-supplied captions encoded. |
| **CHA MON** | SMPTE HD/SD-SDID video stream with burned-in captions to monitor. |
| **RS-232** | **Input**: Closed caption input data format.<br>**Output**: None. |

# SCTE 104 Message Insertion

The HDCC can insert SCTE 104 Automation Messages, received via **TCP/IP Port 5167**, into the VANC of the video signal applied to **CHA IN**.

**Figure 1–7 SCTE 104 Message Insertion**



**Example:** This example demonstrates SCTE 104 message insertion. Messages provided at **TCP/IP Port 5167** are encoded into the VANC of the video supplied at **CHA IN**. The encoded video is output at **CHA OUT**. decoding.

| Connections | |
|---|---|
| **Port** | **Data** |
| **CHA IN** | SMPTE HD/SD-SDI video stream. |
| **TCP/IP Port 5167** | TCP/IP Port that provides SCTE 104 message data. |
| **CHA OUT** | Video from **CHA IN** with messages from **TCP/IP Port 5167** encoded in VANC. |

# CHAPTER 2
# Hardware Installation

## Introduction

### Overview

This chapter explains how to install your HDCC card in the Ross DFR-8321 frame.

### Goals for This Chapter

- ✓ Install your HDCC card in a Ross DFR-8321.
- ✓ Set **SW1** to configure a static IP address or DHCP for your HDCC card.

### Topics

# Safety Instructions

1. Read, keep, and follow all of these instructions; heed all warnings.
2. Do not use this equipment near water or expose the equipment to rain or moisture.
3. Use only the adaptors specified by the manufacturer.
4. Unplug the equipment during lightning storms or when unused for long periods of time.
5. Refer all servicing to qualified service personnel. Servicing will be required under all of the following conditions:
   - The equipment has been damaged in any way.
   - Liquid had been spilled or objects have fallen onto the equipment.
   - The equipment has been exposed to rain or moisture.
   - The equipment does not operate normally.
   - The equipment has been dropped.

# Unpacking

**CAUTION!** Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling the circuit boards in high static environments such as carpeted areas, and when synthetic or wool fiber clothing is worn. Always exercise proper grounding precautions when handling circuit boards.

Unpack each HDCC that you have received from its shipping container and check the contents against the packing list to ensure that all items are included. If any items are missing or damaged, please contact your Wohler sales representative immediately.

# Installing the HDCC in the Ross DFR-8321

## Requirements

### Tools

To install and use the HDCC, you will need a small Phillips screwdriver for attaching the rear panel adaptor to the frame.

### Chassis

Ross DFR-8321 openGear frame

### Hardware

- HDCC card
- OG1 Rear Panel (single channel)
- Screw
- O-Ring

# Installation

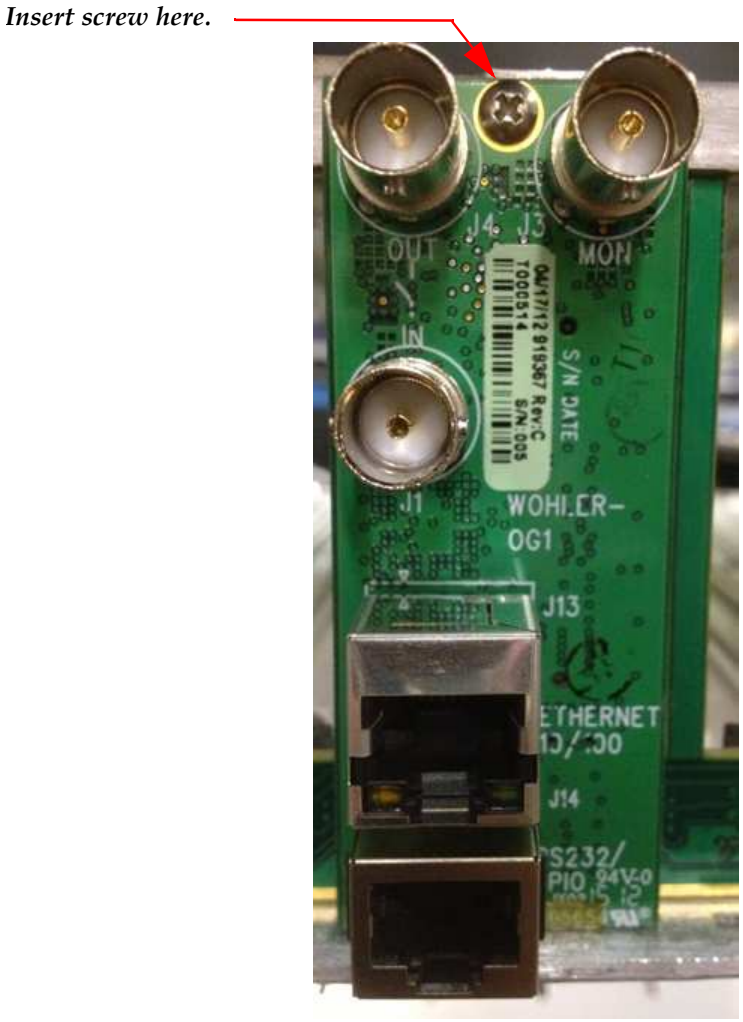
To install the HDCC board and OG1 Rear Panel in the frame, follow the steps below:

1. Ensure that the Ross DFR-8321 frame is properly installed.
2. Power down the frame.

**Important:** The OG1 requires two slots of the Ross DFR-8321 chassis.

3. Insert the screw into the two corner hole of the rear panel. Refer to Figure 2–1.

**Figure 2–1 OG1 Rear Panel**



4. After you have inserted the screw into the OG Rear Panel, place the O-ring on the screw. The O-ring will keep the screw from falling out during installation..

**Important:** The HDCC's IP address is determined by dip switch **SW1** on the inner surface of the rear panel. You may want to set the switch positions on **SW1** before installing the adapter in the frame. If so, skip ahead to Rear Panel DIP Switch on page 14, then come back here to finish the installation.

5. With the rear of the frame facing you, insert the rear panel into the base slot and tighten the top screw. Refer to Figure 2–2.

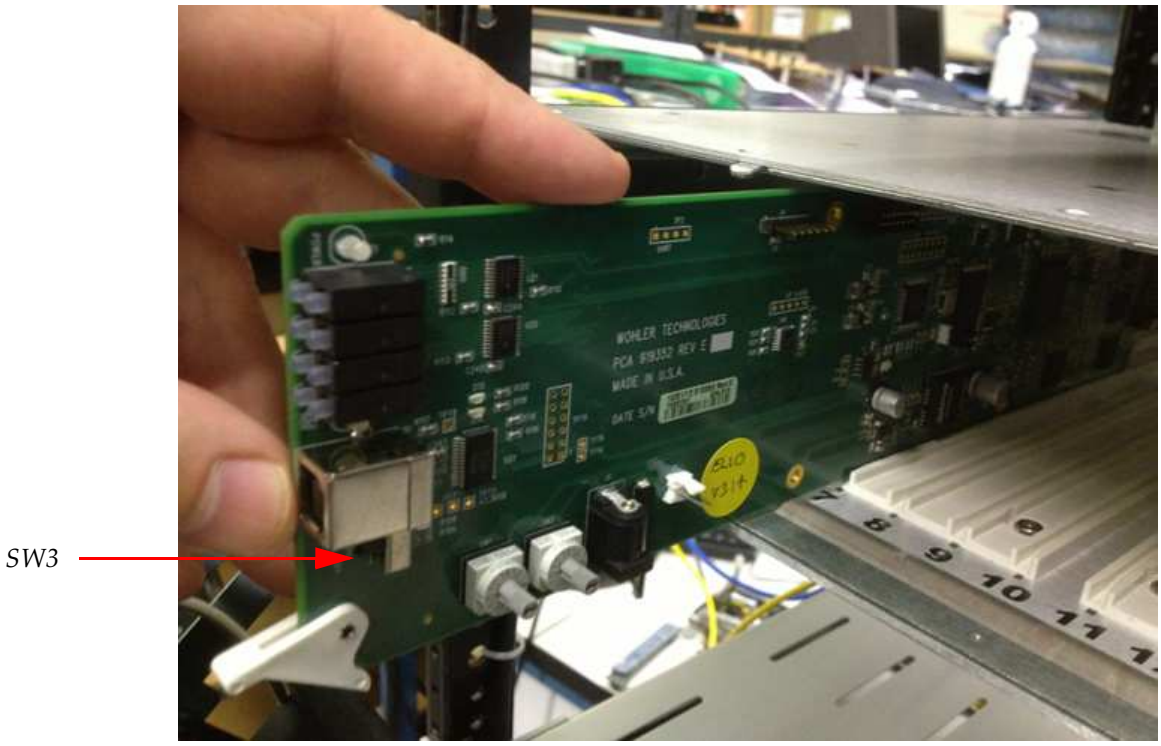
**Figure 2–2 Rear Panel Installed**


6. With the front of the frame facing you, press inward on both tabs to disengage the front panel from the chassis and pull the front panel towards you and then down.

7. Insert the card so that the ejector is at the bottom (Figure 2–3 on page 14) and then close the front panel.

**Note:** You can install the HDCC-OG1 card into any odd numbered slot. Again refer to Figure 2–3 on page 14.

**Figure 2–3 Install in DFR-8321 Frame**




**Note:** Ensure that **SW3** is in the **Off** position.

# Rear Panel DIP Switch

The Rear Panel has a miniature DIP switch, SW1, that sets the IP address of the card. SW1 is a slider-type DIP switch and is on the inside surface of the board.

Position 1 is set to **Off** at the factory so that the card's IP address will be based on the previously stored configuration (by default, to use DHCP network settings). If Position 1 is **On**, the static IP address set by Position 2 will apply.

**Table 2–1 Rear Panel DIP Switch Position Functionality**

| Position | Off | On | Default |
|---|---|---|---|
| 1 | Use internal settings for IP address. | Use static IP address determined by position 2. | **Off** |
| 2 | Static IP= 10.2.1.4 | Static IP= 192.168.2.4 | **Off** |
| 3 | Normal boot. | Execute boot loader. | **Off** |
| 4 | Not Used. | | |

**Important:** Position 3 should always be **Off**.

**Important:** If you're using the default static IP address, be aware that because the static IP addresses defined by the switch are *always* the same, no more than one HDCC card can be connected to the network **until** you change the card's (or frame's) TCP/IP settings (see next chapter).

**Important:** If you are setting up more than one HDCC card, you may need to clear your computer's ARP cache (that identifies which Ethernet MAC addresses are associated with which IP addresses) after you connect each HDCC card. Othewise, you may be unable to connect because your cache contains outdated information.

To clear the cache, open a Windows command prompt and type:

```
arp -d *
```

# Next Steps

1. Connect the SDI, serial, and Ethernet cables as needed.
2. Set up virtual serial ports (VSPs) if needed. Refer to next chapter.

**Important:** This concludes the procedure for installing the HDCC card and its rear panel.

If you want to configure your Ethernet port to support serial communications, continue on to Chapter 3: TCP/IP Configuration and Virtual Serial Port (VSP) on page 17.

# CHAPTER 3
# TCP/IP Configuration and Virtual Serial Port (VSP)

## Introduction

### Overview

This chapter describes how to configure your HDCC card for use on a TCP/IP network and how to install a Virtual Serial Port (VSP) to communicate with you HDCC card.

### Goals for This Chapter

- ✓ Configure your HDCC card's TCP/IP settings.
- ✓ Create a Virtual Serial Port (VSP) to provide serial port-like access to your HDCC card.

### Topics

# Functional Overview

## Virtual Serial Port (VSP) on the HDCC

Caption data is supplied to and received from the HDCC via serial ports. In addition to the RS-232 port (J14 on the rear panel) serial data is also accessible over the Ethernet port using a Virtual Serial Port. The HDCC provides a Virtual Serial Port as shown in Figure 3–1 below.

**Figure 3–1 HDCC to PC Connectivity**

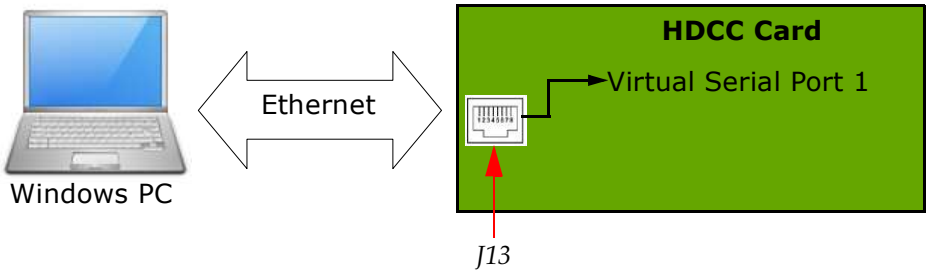



Figure 3–1 above provides a functional overview of the virtual serial port configuration. You can use third party software (link provided below) to create a virtual serial port which will transfer serial data to and from the HDCC over Ethernet. From the PC user's perspective, the Virtual Serial Port is indistinguishable from a hardware serial port.

Once the Virtual Serial Port is operational, you can change the HDCC settings through DashBoard to control how this serial port is routed to the captioning system.

## Required Information

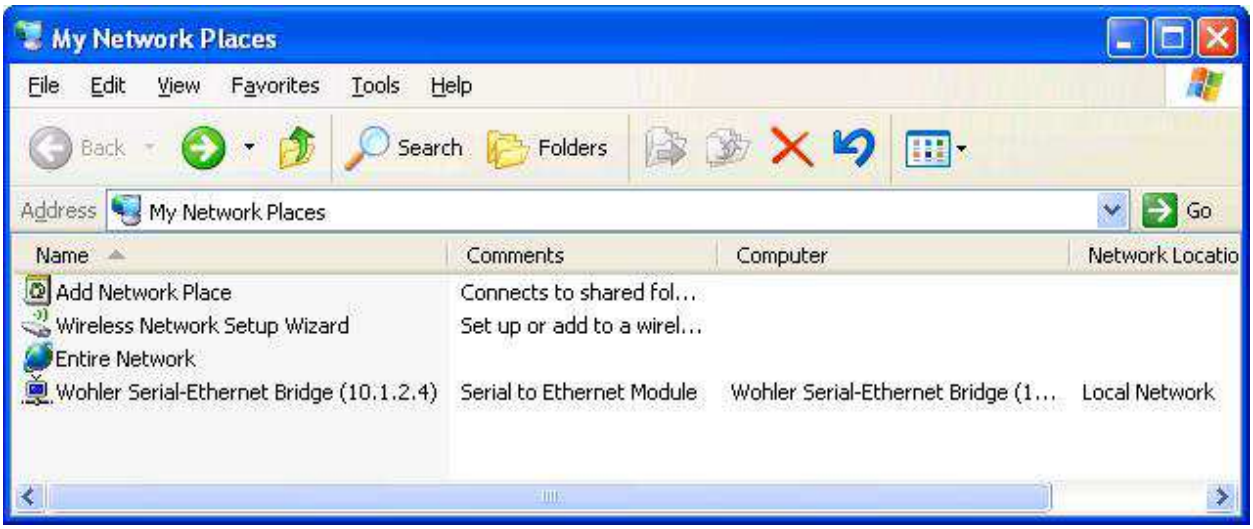
To set up a virtual serial port (VSP) you must know the HDCC card's IP address and telnet port numbers. Once you have this information, the serial port redirector software can be configured.

# Finding the HDCC on the Network

The HDCC card is factory set for **DHCP/AutoIP**. If you connect the HDCC card to a network with a DHCP server, the HDCC card's IP address will be assigned automatically. If you are using a Windows-

based computer you will be able to see the card in **My Network Places** as shown in Figure 3–2 below.

**Figure 3–2 HDCC Shown in My Network Places**




**Note:** The default IP address can be set by SW1. See the previous chapter

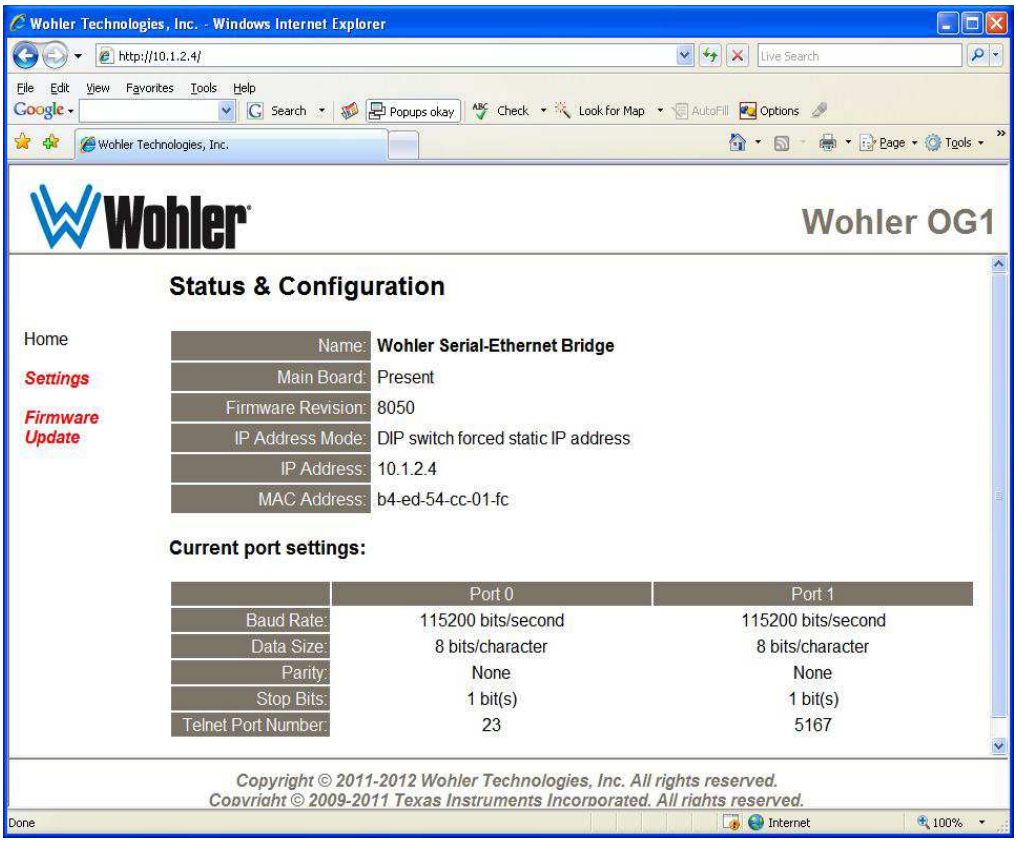
# Assigning a Static IP Address/Enabling DHCP

Double-clicking on the Wohler Serial-Ethernet Bridge (see Figure 3–2 above) will open a web browser and take you the card's configuration page where you can set a static IP address, if desired.

You can also reach the HDCC card configuration screen through a web browser by entering the IP address in the address bar. Refer to Figure 3–3 on page 20.

**Important:** The HDCC uses telnet port 23 for Eth VSP1. We **highly** recommend that you do not change this port number. All subsequent instructions depend on this port value.

## Figure 3–3 HDCC Configuration Page




1. Click **Settings** on the left hand side of the screen (Figure 3–3 above).

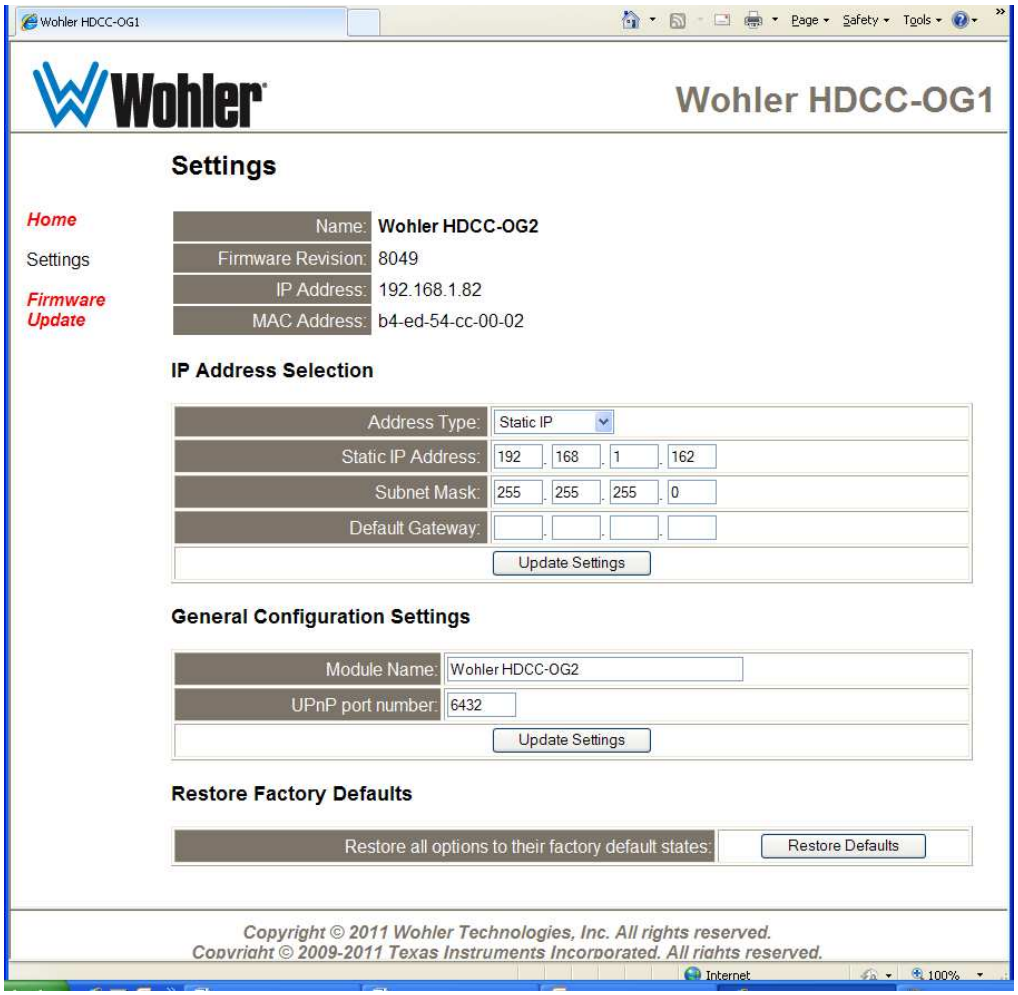
2. When the **Settings** screen appears (Figure 3–4 on page 21) click the drop down in **Address Type** to change it to **Static IP** or **DHCP/AutoIP**. If you're using DHCP, skip to Set 6. Othewise, continue to Step 3.

3. Enter the new **Static IP Address** for your network provided by your network administrator.

4. If needed, enter a different **Subnet Mask** (Figure 3–4 on page 21).

5. If your network administrator provides you with a **Default Gateway**, enter that, too.

## Figure 3–4 Settings Menu

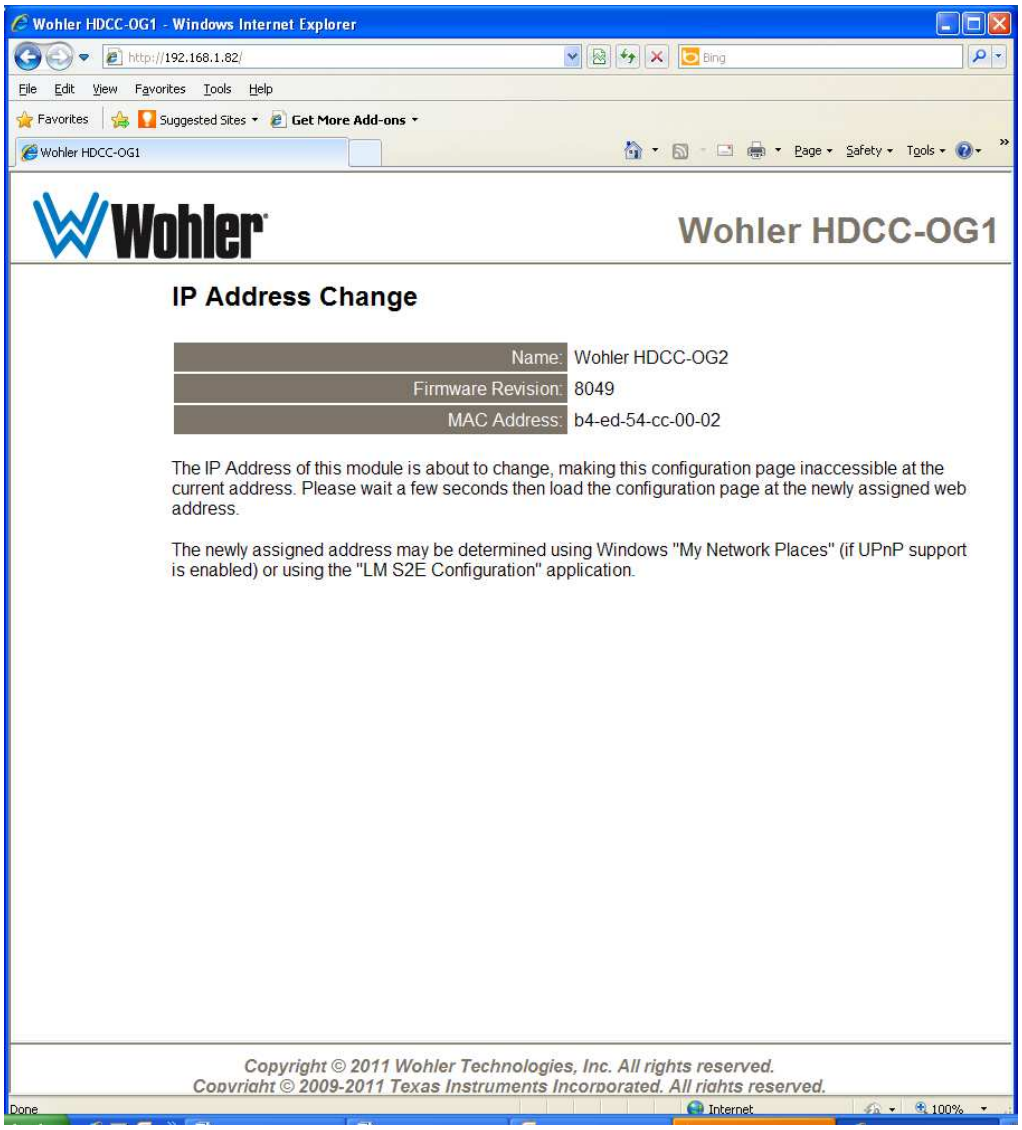



**WARNING!** Verify that all information is correct for your network. The HDCC card will become unreachable on your network if the wrong information is set.

If this occurs consult your IT department for assistance. You can set the card to a known static IP address using the DIP switch on the rear panel. See Rear Panel DIP Switch on page 14 for details.

6. Once the information is accurate, click on the **Update Settings** button in the **IP Address Selection** section.

## Figure 3–5 IP Address Change




7. Close this window (Figure 3–5 above).

8. Set **SW1** Position 1 so that the card will use the TCP/IP configuration you just set.

9. Power cycle the card.

**Important:** If SW1 Position 1 is set to **On**, the card will continue to use its default static IP address.

# Creating a VSP with the Lantronix Redirector

The Lantronix Redirector software allows you to create aVSP quickly and easily.

**Important:** If you are using Microsoft Windows 7 or 8, this software will not work for you. Instead, refer to Creating a VSP with Later Versions of Windows on page 31.

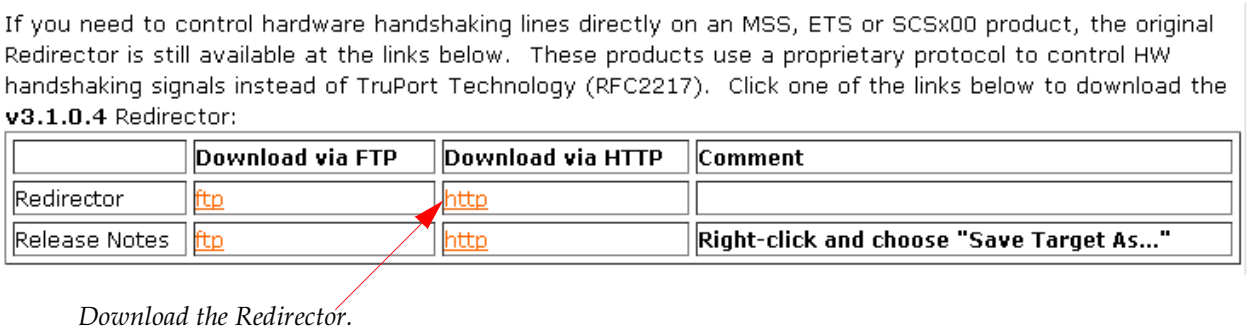
## Software Installation

1. Launch your web browser and navigate to http://ltxfaq.custhelp.com/app/answers/detail/a_id/928.

**Important:** Download only the legacy version 3.1.0.4. Do not use a more recent version. None of them will connect to the card's Ethernet interface.

2. Scroll to the bottom of the page and click on the **http** link for the **Redirector**.

**Figure 3–6 Redirector Download Location**



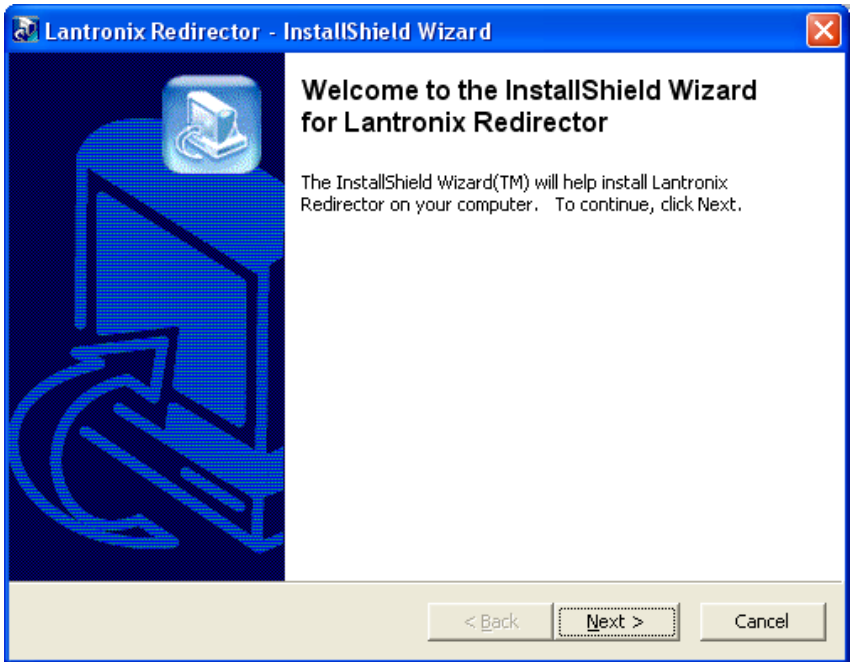

*Download the Redirector.*

3. Once the file is downloaded, double-click **red32.bit.exe** to install.

### Figure 3–7 Open File - Security Warning

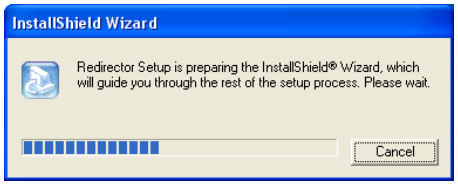

4. When the initial installation screen displays (Figure 3–7 above) click **Run**.

### Figure 3–8 Lantronix Welcome Screen



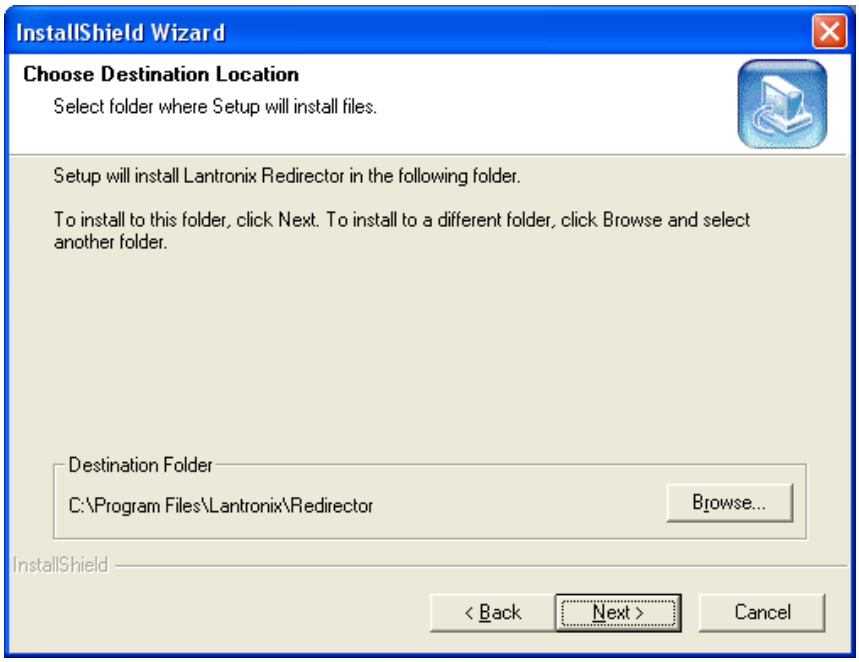

5. When the **Welcome** screen displays (Figure 3–8 above) click **Next**.

### Figure 3–9 InstallShield




6. The **InstallShield** screen will quickly display and then return you to the Welcome screen. Click **Next** again.

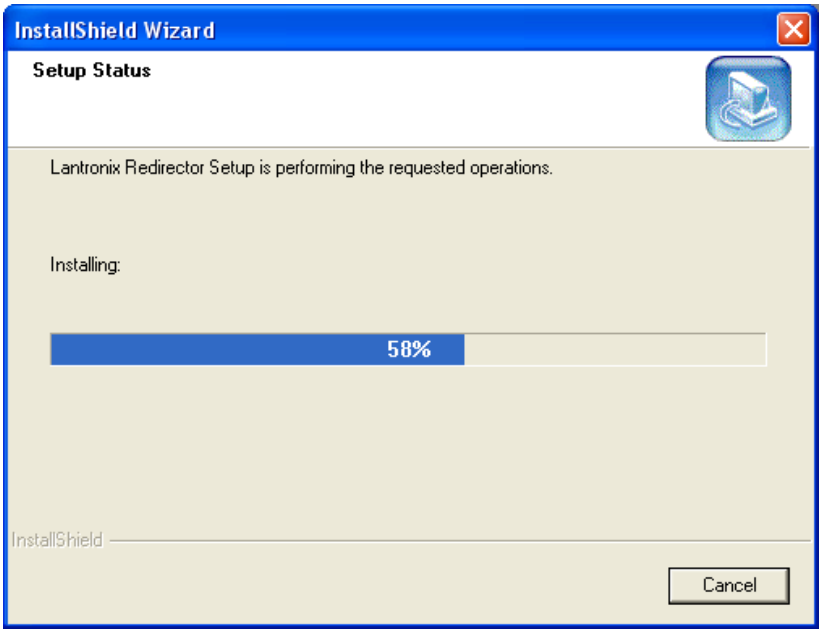
### Figure 3–10 Choose Destination Location




7. When the **Choose Destination Location** screen displays, accept the default and click **Next**.

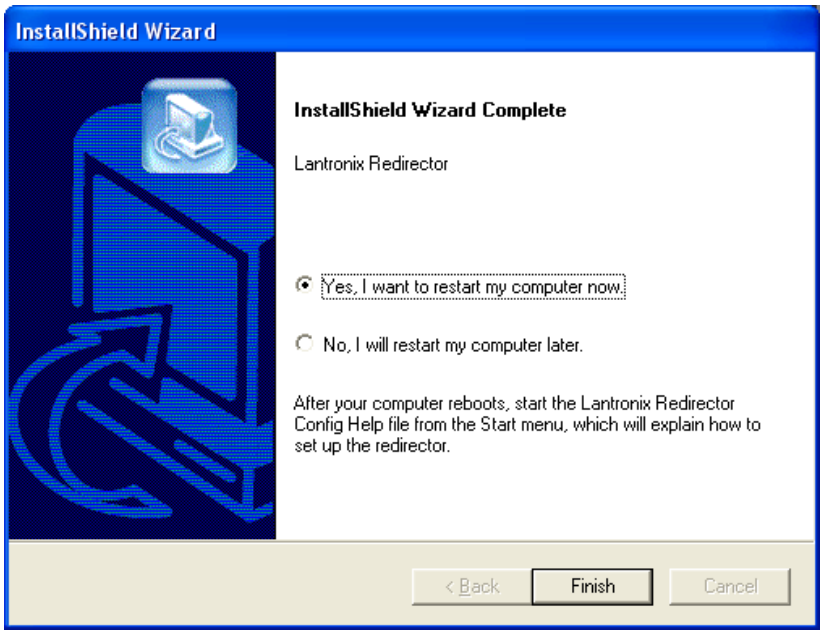
   The **Setup Status** screen (Figure 3–11 on page 26) will display and quickly complete the file installation.

### Figure 3–11 Setup Status




8. Before the wizard completes, take a moment to close all other applications on your PC before the system restarts your computer.

### Figure 3–12 Wizard Complete




9. When the **InstallShield Wizard Complete** screen displays, verify that **Yes,...** is selected, and click **Finish**. The system will restart.

# VSP Configuration

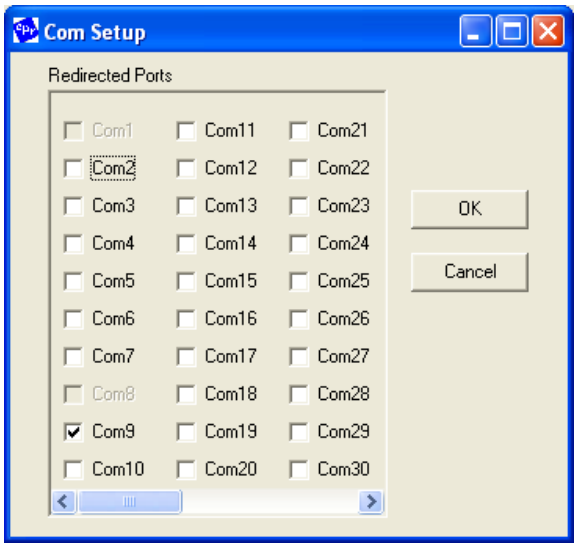
Now that the software is installed, you can set up VSPs.

1. After your computer reboots, launch the Lantronix Redirector by clicking the **Start** menu ⇨ **Programs** ⇨ **Lantronix** ⇨ **Redirector** ⇨ **Configuration**.

**Figure 3–13 Lantronix Redirector Configuration**


2. Click **Com Setup** on the left side of the screen.

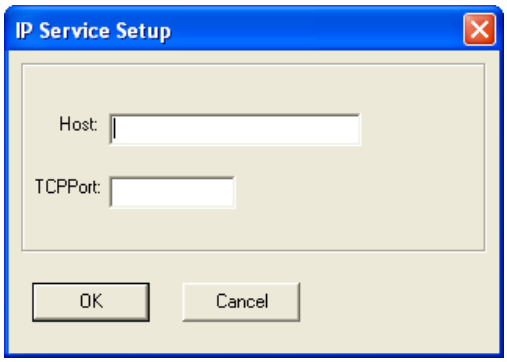
### Figure 3–14 Com Setup




3. Assign an available **Com** port (in our example Com9 is selected) and click **OK**.

4. Click **Add IP** on the right side of the screen.

### Figure 3–15 Wizard Complete



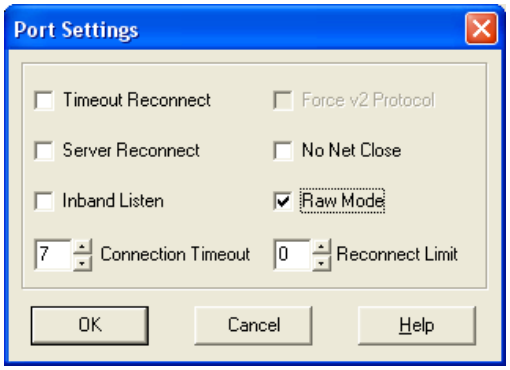

5. In the **Host** field (Figure 3–15 above) enter the IP address of your HDCC card. (Use **My Network Places** to rediscover it if necessary.)

6. In the **TCPPort** field (Figure 3–15 above) enter the telnet port number and click **OK**.

7. For VSP#1, this will be 23.

8. Click **Port Settings**.

### Figure 3–16 Port Settings

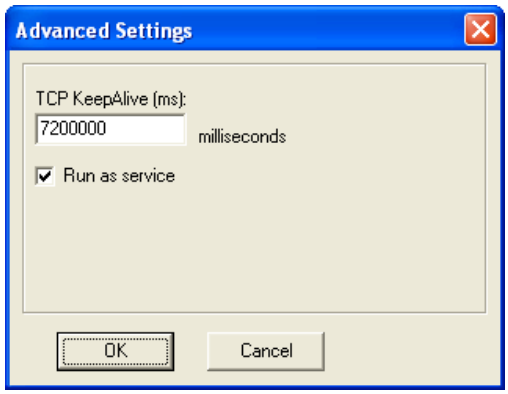



9. Check **Raw Mode** (Figure 3–16 above) and click **OK**.

**Important:** The virtual serial port will not function unless Raw Mode is enabled

10. Click **Advanced** at the top left corner of the application window.

### Figure 3–17 Advanced Settings




11. When the Advanced Settings dialog appears (Figure 3–17 above) check the **Run as service** box and click **OK**.

### Figure 3–18 Service Installation

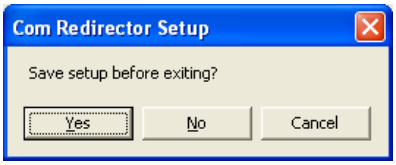

12. When the **Service Installation** (Figure 3–18 above) dialog appears, click **OK**.

### Figure 3–19 Config Info


13. When the **Config Info** dialog displays (Figure 3–19 above) click **OK**.

14. When the application window reappears, click **Close** near the center of the screen.

### Figure 3–20 Com Redirector Setup




15. When the **Com Redirector Setup** dialog appears (Figure 3–20) click **Yes**.

### Figure 3–21 Config Info


16. When the **Config Info** dialog displays (Figure 3–21 above) click **OK**.

17. Reboot the computer to enable the VSP. You should now have an available COM port that will serve as a serial connection to the HDCC card.

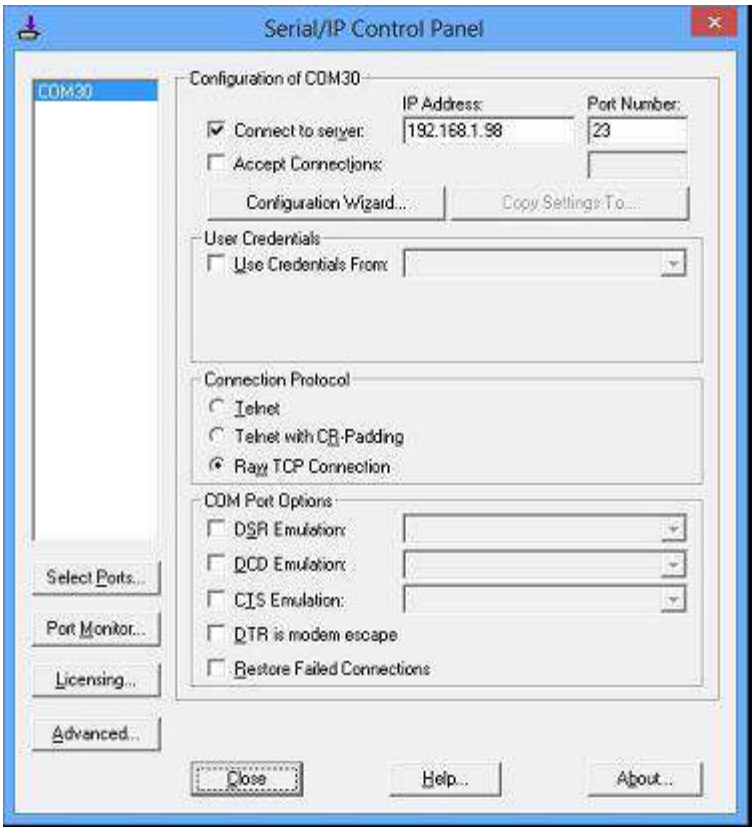
# Creating a VSP with Later Versions of Windows

Windows 7 or 8 users need to install an alternative COM port redirector. There are many freeware/shareware possibilities, but Tactical Software's Serial/IP COM Port Redirector has been used successfully with both Windows 7 and 8.

The product description can be found at: http://www.tacticalsoftware.com/products/serialip/index.html.

The software is not free (a two port license costs $150.00), but Tactical Software offers a free downloadable 30-day trial

**Figure 3–22 Tactical Serial/IP Control Panel**




With the software, you can configure two virtual COM ports. The port must use the IP address of the card and port 23 should be used for Eth1.

**Important:** Raw TCP connection must be selected or the VSP will not operate.

# SCTE 104 Interface

SCTE 104 automation messages canbe inserted via TCP/IP using port 5167. Automation message format and communications semantics are defined in the Society of Cable Telecommunications Engineers SCTE 104 2011 Specification: Automation System to Compression System Communications Applications Program Interface (API).

# CHAPTER 4
# Using DashBoard

## Introduction

### Overview

This chapter explains how to use the HDCC card in a Ross DFR-8321 frame with the DashBoard Control System™ (the PC graphic user interface, from here on referred to as *DashBoard*) to configure your HDCC card.

### Goals for This Chapter

- ✓ Use Ross's DashBoard Control System to operate your HDCC card.
- ✓ Learn the steps required for common captioning tasks.

### Topics

# Starting DashBoard

The operations of the HDCC card are controlled by the settings of internal registers, which are easily and intuitively configured with DashBoard.

1. Make sure your openGear™ DFR-8321 frame is installed, the HDCC card is installed within it, and DashBoard has been installed on a PC that is networked to the frame.

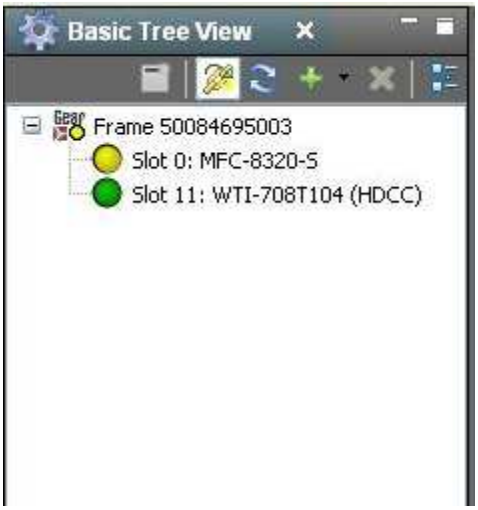
2. Power up the frame.

3. Open the DashBoard application by double-clicking the desktop icon or selecting it from the Start menu.

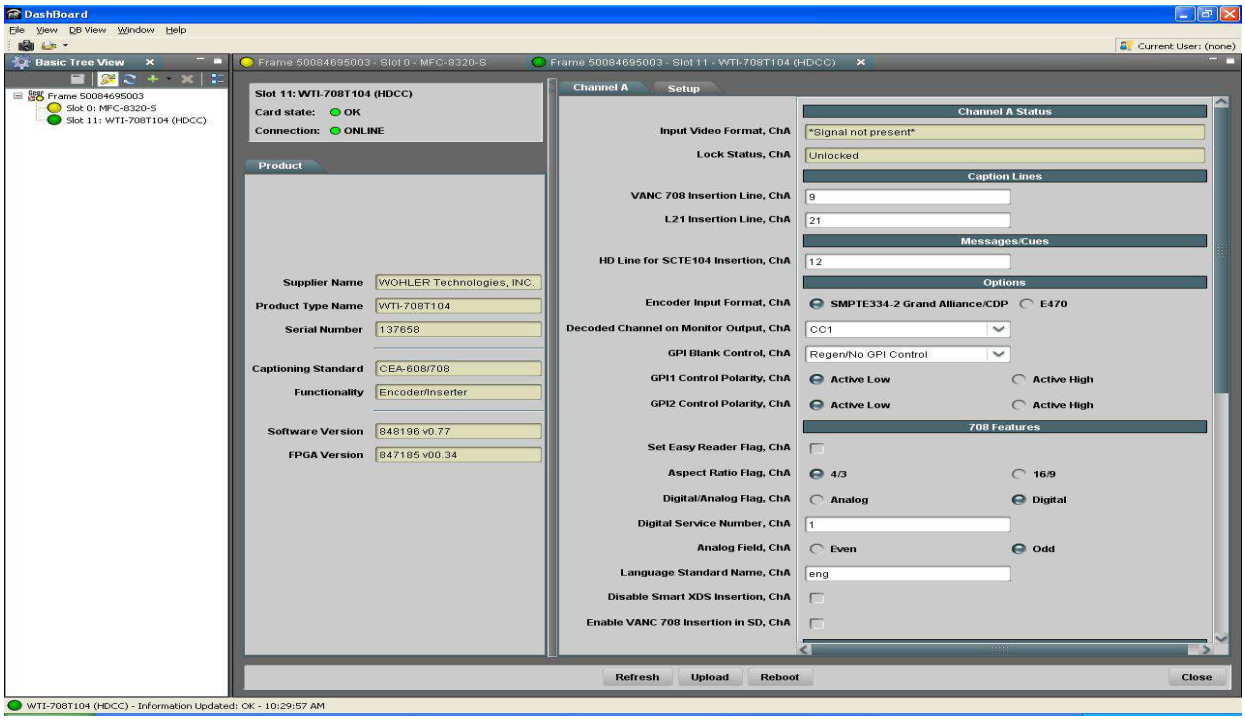
4. When the application opens, it will discover any openGear frames on the network and display them in the left side window of the main screen (Figure 4–1 below) the DashBoard tree. Clicking on the frame's entry in this window will show cards that are installed within it.

   **Note:** Depending on the frame contents, the card may take several minutes to appear in the list.

**Figure 4–1 DashBoard Tree**



## Figure 4–2 DashBoard Main Screen (Top)




**Note:** The Wohler HDCC card will appear as **WTI-708T104 (HDCC)** in the list of cards installed in the frame.

5. Double-click on the HDCC card in the list of cards and the user interface will appear in the main screen.

6. If everything is in order, the **Card state** and **Connection** indicators in the left frame of the window will be green and product information will appear in the Product submenu (see Figure 4–3 below).

**Figure 4–3 Product Information Pane**


Figure 4–3 shows some product details about the HDCC that may be helpful at a future date, including the software and FPGA firmware part numbers and revisions.

# Common Controls

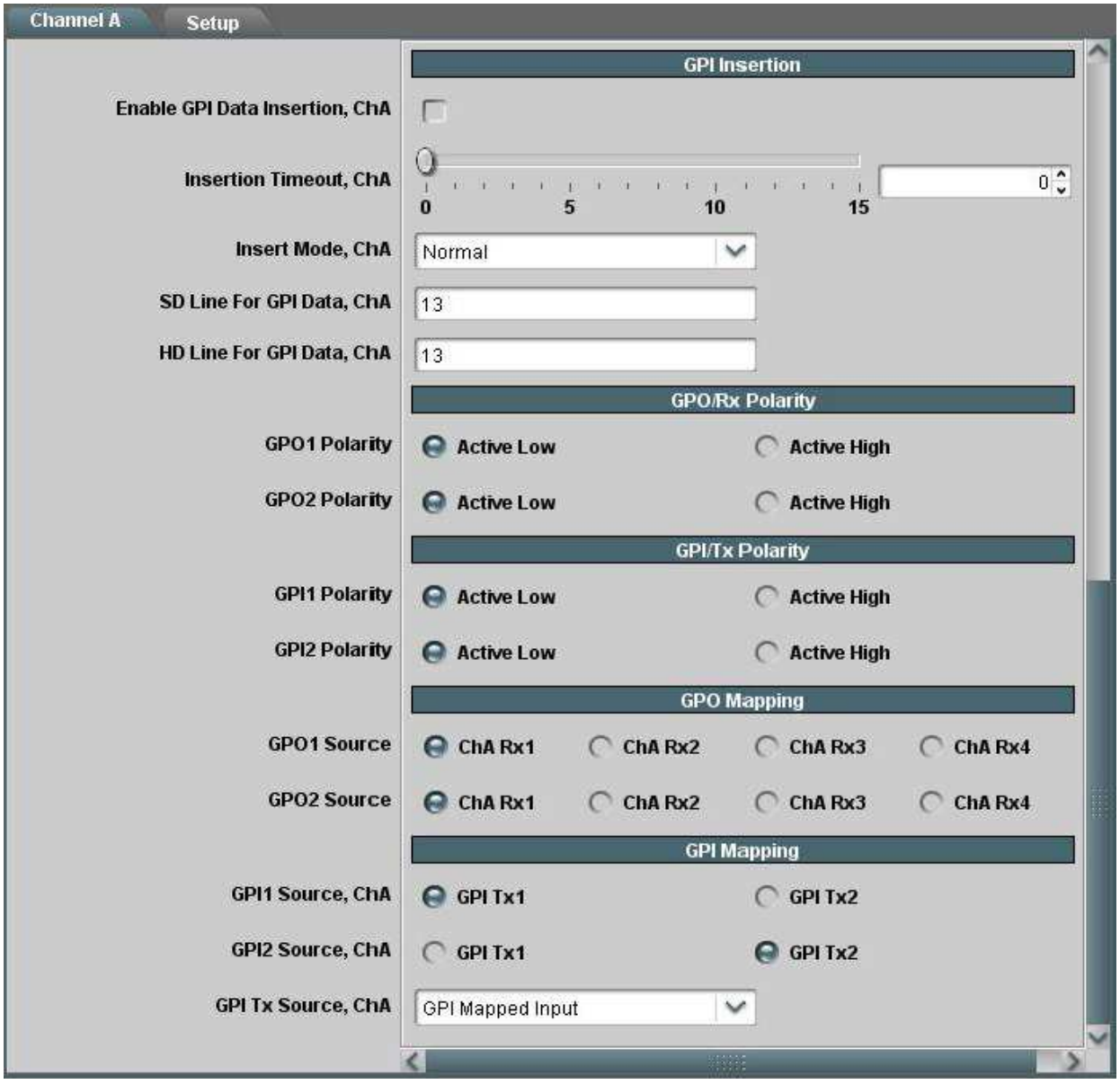
At the bottom of the screen (no matter which tab is selected) you can perform two systemic functions.

- **Upload**: Not currently used.
- **Refresh**: Clicking this button causes the HDCC card to re-query all the settings. A screen indicating that the card is busy will appear while the system is refreshing.
- **Reboot**: Clicking this button causes the HDCC card to reboot. A screen indicating that the card is busy will appear while the system is rebooting.

# Channel A Tab

Click the **Channel A** tab in DashBoard and change the settings (see Figure 4-4 below) to customize your configuration. The **Channel A** menu is divided into sections, each with a heading that describes the features below it. We'll cover each of the options of each section below.

**Figure 4–4 Channel A**



# Channel A Status

None of these fields are user-editable; they reflect the state of the input video signal as it is measured.

- **Input Video Format** is the video format (resolution, frame rate) of the incoming signal on **CHA IN**.
- **Lock Status** indicates whether the HDCC has locked onto a valid video signal on **CHA IN**.

# Caption Lines

These are the video lines used for caption encoding.

- **VANC 708 Insertion Line, ChA** indicates on which line of an HD signal captions will be placed.
- **L21 Insertion Line, ChA** indicates on which line of an SD signal captions will be placed.

# Messages/Cues

- **HD Line for SCTE-104 Insertion, ChA** indicates on which line of an HD signal SCTE-104 messages will be placed.

**Note:** SCTE-104 messages can only be placed on HD (720p, 1080i) video signals.

# Options

These controls define how several features of the HDCC operate.

- **Encoder Input Format, ChA** selects the input form of caption data, either **Grand Alliance** (SMPTE RP 2007) and **CDP** (SMPTE 334-2), or **E470** (compatible with a common industry format).
- **Decoded Channel on Monitor Output** selects which caption stream (CC1-CC4) will be displayed on the burned-in monitor output.

- **GPI Blank Control** selects which (if any) of external general purpose inputs can be used to blank incoming captions (i.e., strip captions from the video signal).

- **GPI 1/2 Polarity Control, ChA** controls whether a low voltage (e.g., switch closure) or a high voltage signals an active input on the general purpose I/O connector.

## 708 Features

These features are options for encoding captions on HD material.

- **Set Easy Reader Flag, ChA** inserts a flag that indicates the caption text is written for comprehension by beginning readers.

- **Aspect Ratio Flag, ChA** specifies which screen format the caption authoring assumed.

- **Digital/Analog Flag, ChA** selects Digital (708) or Analog (608) services.

- **Digital Service Number, ChA** defines the service number of the captioning data if the **Digital/Analog Flag** is set to **Digital**.

- **Analog Field, ChA** controls which field is used for caption information if the **Digital/Analog Flag** is set to **Analog**,.

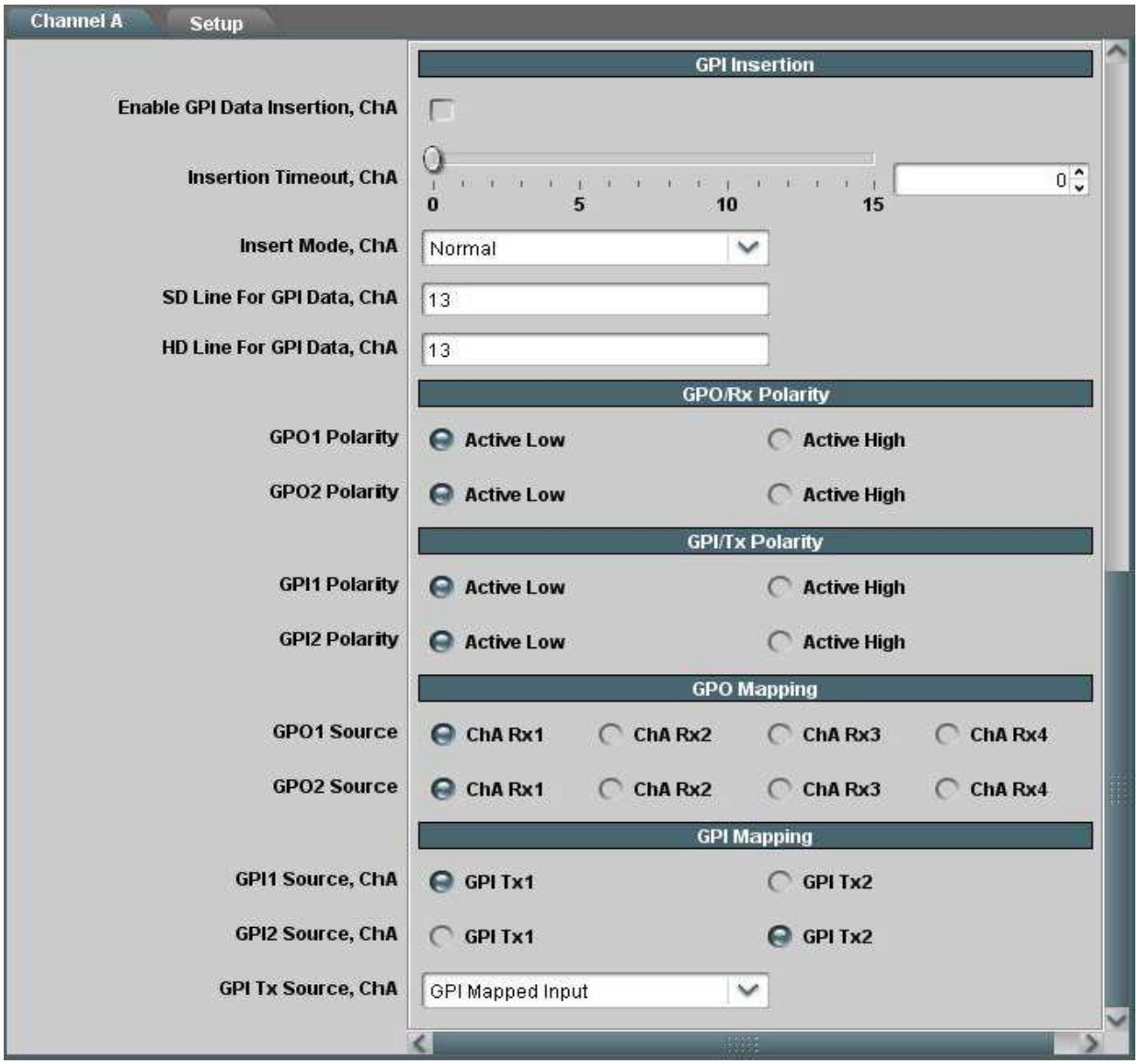
- **Language Standard Name, ChA** a three-letter identification of the language standard used.

- **Disable Smart XDS Insertion** disables the feature that buffers XDS data until an empty space on the video line is encountered.

- **Enable VANC 708 Insertion in SD, ChA** enables CEA-708 captions to be encoded on SD video signals.

Additional controls on the Channel A menu can be accessed by scrolling down. Refer to Figure 4–5 on page 40.

**Figure 4–5 Channel A (Continued)**




# GPI Insertion

This section controls the transmission of data bits (e.g., for cues) on the video stream.

- **Enable GPI Data Insertion, ChA** enables the encoding of bits on the video stream.
- **Insertion Timeout, ChA** controls how long an asserted bit will be continuously transmitted before timing out

- **Insert Mode, ChA** controls whether an asserted bit will timeout (Normal) or whether the bit will be maintained permanently.
- **SD Line for GPI Data, ChA** specifies on which video line of an SD video signal bits will be encoded.
- **HD Line for GPI Data, ChA** specifies on which video line of an HD video signal bits will be encoded.

## GPO/Rx Polarity

- **GPO 1/2 Polarity** controls how the output on the general purpose I/O connector will reflect a received bit/cue: **Active Low** (a low voltage indicates an asserted bit) or **Active High** (a high voltage indicates an asserted bit).

## GPI/Tx Polarity

- **GPI 1/2 Polarity** controls how an input on the general purpose I/O connector will be interpreted for transmission of a bit: **Active Low** (a low voltage indicates an asserted input) or **Active High** (a high voltage indicates an asserted input).

## GPO Mapping

- **GPO 1/2 Source** controls how received bits on the video stream are mapped to the outputs on the general purpose I/O connector.

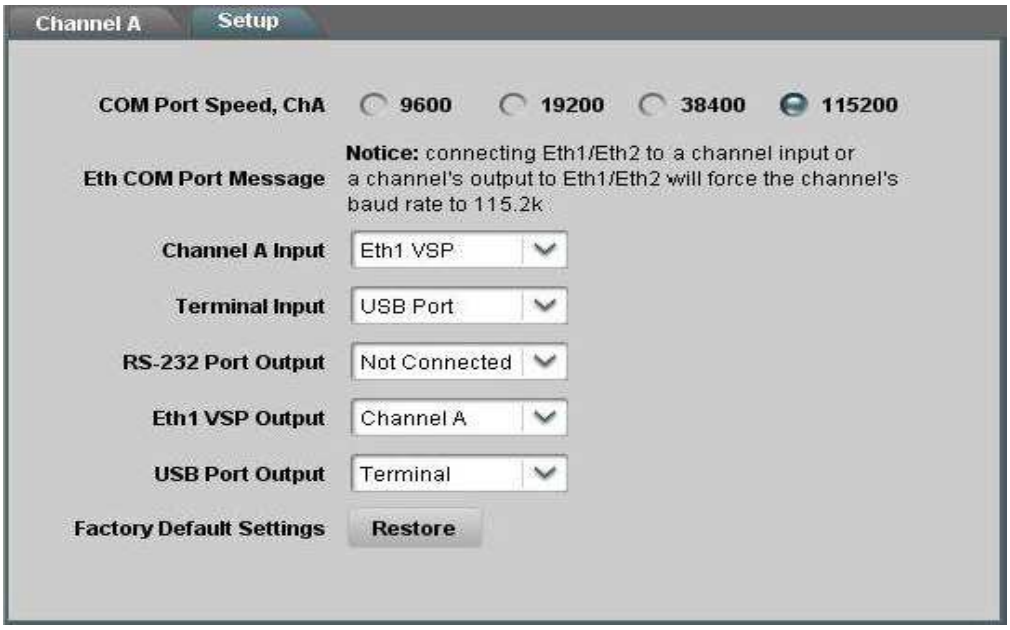
## GPI Mapping

- **GPI 1/2 Source** controls how input bits on the general purpose I/O connector are mapped to transmitted bits on the video stream.
- **GPI Tx Source** controls whether transmitted bits will be as presented on the general purpose I/O connector or logically OR'ed with received bits on the incoming video stream.

# The Setup Tab

The **Setup** tab shown in Figure 4–6 allows you to set the COM Port routing/settings and reload the factory defaults.

**Figure 4–6 Setup**




- **COM Port Speed, ChA** controls the baud rate of the Channel A data interface (encoder input, decoder output).

**Important:** If Eth1 VSP is selected in Channel A Input or Channel A is selected for Eth1 VSP Output, the baud rate will automatically set to 115.2k. However, the baud rate on the redirected COM port on the PC can still be set to any desired baud rate.

- **Channel A Input** controls which system serial port is connected to Channel A for encoding.
- **Terminal Input** controls which system serial port provides input when using the terminal.
- **RS-232 Port Output** controls what function (**Channel A** decoder, **Terminal**) supplies the output for the RS-232 port. Select **Channel A** to get decoder output or **Terminal** to get the terminal display.
- **Eth1 VSP Output** controls what function (**Channel A** decoder, **Terminal**) supplies the output for the Eth1 VSP port.

- **USB Output** controls what function (Channel A decoder, Terminal) supplies the output for the USB port.

- **Factory Default Settings**: Clicking the **Restore** button will apply the original factory settings to the card, overwriting any changes you have made.

# How Do I...?

In this section we provide a list of questions and answers to help you set up and use your new HDCC product as efficiently as possible.

## How do I encode captions on Channel A using the RS-232 port?

### Situation

You want to put captions on the video supplied to Channel A using captioning data provided by the RS-232 port.

### Preparation

Make sure an SDI cable with a video stream is connected to the input **CHA IN**, the card/frame is powered and operational, and a serial cable is connected from the RS-232 port on the rear panel to a PC that can provide caption intention data.

### Process

1. In the **Setup** tab, set the **Channel A Input** to **RS-232** and the **COM Port Speed** to whatever is required by your caption data source.

2. Set the **VANC 708 Insertion Line, ChA** control (if HD) or the **Line21 Insertion Line, ChA** (if SD) control to the video line number on which you wish to insert the captions.

3. Set the **Encoder Input Format, ChA** control to **Grand Alliance/CDP** or **E470**, depending on the data format supplied by your caption data source.

Caption data supplied to the RS-232 port will now be encoded on the video output from **CHA OUT** and **CHA MON**.

# How do I encode captions on Channel A using the VSP Eth1 port?

## Situation

You want to put captions on the video supplied to Channel A using captioning data provided by virtual serial port **VSP Eth1**

## Preparation

Make sure an SDI cable with a video stream is connected to the input **CHA IN**, the card/frame is powered and operational, the HDCC is networked to a PC, and that the PC has a virtual serial port set up (see Chapter 3) over which it will supply caption intention data.

## Process

1. In the **Setup** tab, set the **Channel A Input** to **VSP Eth1**. The COM port speed will automatically switch to 115.2k. Note that when using a virtual serial port, this COM port speed is independent of that used on the PC; the virtual COM port on the PC can be set to any baud rate.

2. Set the **VANC 708 Insertion Line, ChA** control (if HD) or the **Line21 Insertion Line, ChA** control (if SD) to the video line number on which you wish to insert the captions.

3. Set the **Encoder Input Format, ChA** control to **Grand Alliance/CDP** or **E470**, depending on the data format supplied by your caption data source.

Caption data supplied to the **VSP Eth1** port will now be encoded on the video output from **CHA OUT** and **CHA MON**.

# How do I encode SCTE-104 messages on Channel A?

## Situation

You want to encode SCTE-104 automation messages on the video supplied to Channel A .

## Preparation

Make sure an SDI cable with a video stream is connected to the input **CHA IN**, the card/frame is powered and operational, the HDCC is networked to a PC that can supply the SCTE-104 automation messages.

## Process

1. In the **Channel A** tab, set the HD Line for **SCTE-104 Insertion, ChA** control to the number of the video line on which you want to encode SCTE-104 messages.

2. Provide SCTE-104 messages to the card via TCP/IP (see Chapter 3). The TCP/IP port on the HDCC that receives SCTE-104 messages is 5167.

SCTE-104 data supplied to port 5167 on the TCP/IP interface will now be encoded on the video output from **CHA OUT**.

# How do I transmit general purpose data (cues, etc.) on Channel A?

## Situation

You want to transmit general purpose data/cues on Channel A using the HDCC's general purpose I/O connector for input.

## Preparation

Make sure an SDI cable with a video stream is connected to the input **CHA IN** and the card/frame is powered and operational. Provide the necessary connections to the general purpose I/O connector (see Chapter 5) to input the data bits.

## Process

1. In the **Channel A** tab, check the **Enable GPI Data Insertion, ChA** checkbox.

2. In the **HD Line for GPI Insertion, ChA** (if HD) or **SD Line for GPI Insertion, ChA** (if SD) control, provide the video line number on which bits will be transmitted.

3. Set the **GPI/Tx Polarity** controls to **Active High** or **Active Low** to determine how a voltage supplied to the input pin on the general purpose I/O connector will be interpreted.

4. Set the **GPI Mapping** controls to map the input on the general purpose I/O connector to the transmitted bit on the video stream.

Supplying the proper voltage to the proper pin on the general purpose I/O connector will now set a bit transmitted in the video stream.

# How do I receive general purpose data (cues, etc.) on Channel A?

## Situation

You want to receive general purpose data/cues on the video stream supplied to Channel A and output them to the HDCC's general purpose I/O connector (e.g., to cue equipment).

## Preparation

Make sure an SDI cable with a video stream is connected to the input **CHA IN** and the card/frame is powered and operational. Provide the necessary connections to the general purpose I/O connector (see Chapter 5) to receive the data bits.

## Process

1. In the **HD Line for GPI Insertion, ChA** (if HD) or **SD Line for GPI Insertion, ChA** (if SD) control, provide the video line number on which bits will be received.

2. Set the **GPO/Rx Polarity** controls to **Active High** or **Active Low** to determine how a received bit will be presented as a voltage on an output pin of the general purpose I/O connector will be interpreted.

3. Set the **GPO Mapping** controls to map the received bits to pins on the general purpose I/O connector.

Received bits will now be represented per the polarity/mapping settings on the general purpose I/O connector.

# CHAPTER 5
# Using the General Purpose Inputs/Outputs

## Introduction

### Overview

This chapter describes the functionality of the GPI/O connectors on the adaptors.

### Topics

# Functionality

The GPI interface allows the user to encode contact closure triggers into a HD or SD video stream frame accurately. The encoded data uses a proprietary algorithm designed to withstand severe degradation and prevent false triggering or releasing of GPIs. Error checking information is embedded within the GPI data stream which accomplishes this task and is far more advanced than simple CRC.

Typical triggers that users can encode from automation include (but are not limited to:

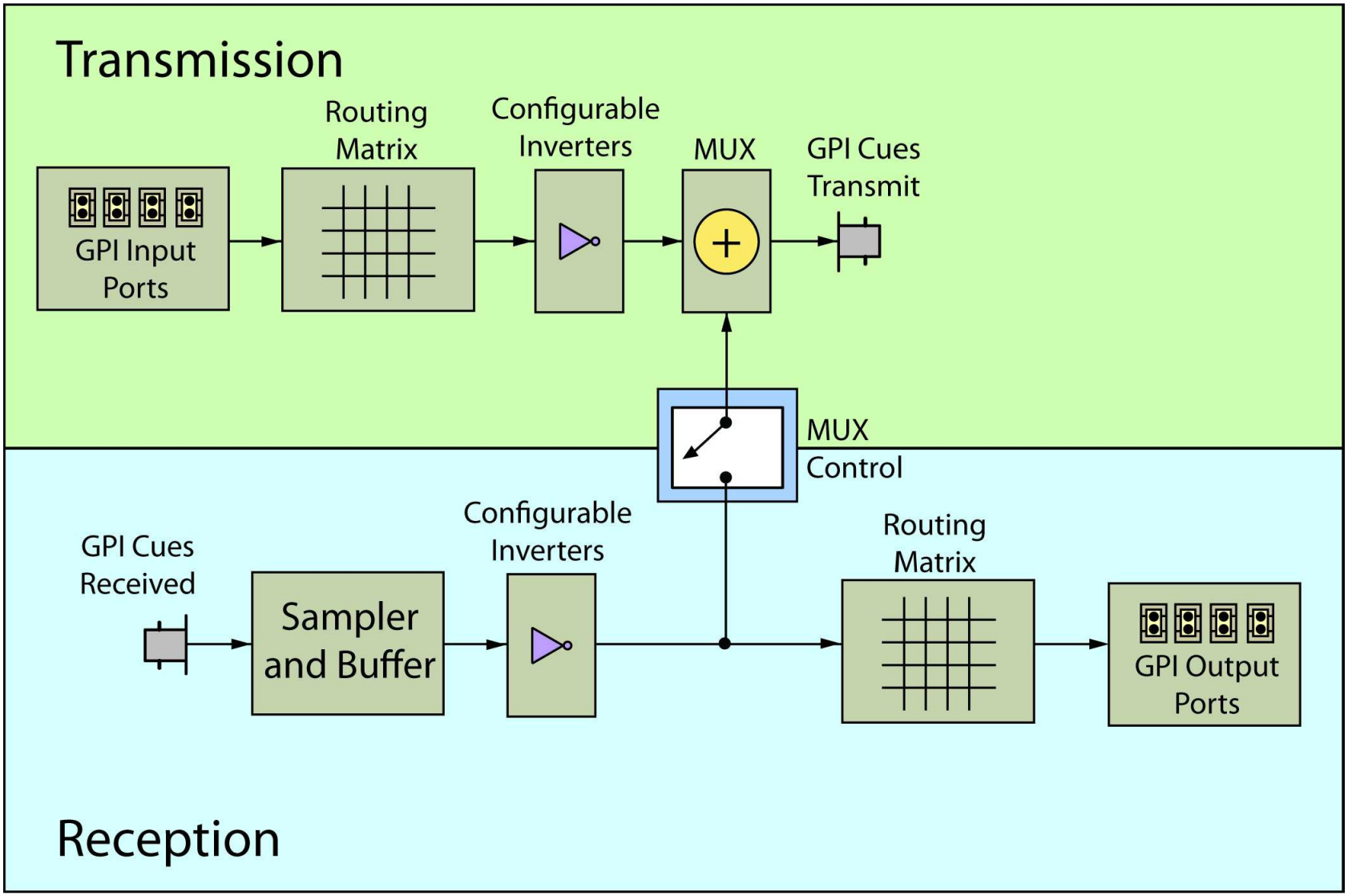
- ARC switching
- Commercial cue triggers (more accurate than the antiquated cue tone system)
- Machine control
- Regional commercial insertion cards

Typically the GPI data is encoded on Line 13 for both the HD-SDI signals and the SD-SDI signals. However, the HDCC is flexible enough to allow you to assign the lines on which you want the GPI data. See GPI Insertion on page 40 for details.

You can also use the GPI interface to control other operational aspects of the card.

Figure 5–1 on page 51 illustrates the GPI/O signal flow through the HDCC. For our purposes, a GPI is an input signal to the HDCC card supplied by the user through the physical GPI/O port that can activate certain modes in the HDCC card, and/or can be encoded onto the outgoing SDI video stream to notify downstream equipment of some condition, event, or command. A GPO is a signal the HDCC card receives on the incoming SDI video stream that is output to the physical GPI/O port to signify some condition, event, or command generated by upstream equipment.

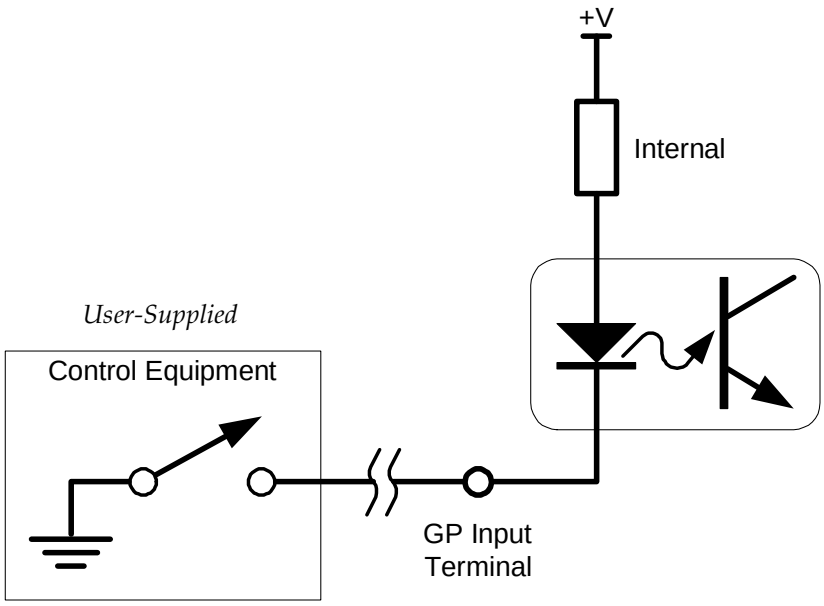
**Figure 5–1 GPI/O Functional Diagram**



# GPIs

The GP inputs are designed to be asserted by switching the closures to ground. Asserting a GP input will result in that input state being encoded on the appropriate line of the video signal or the required function being activated.

**Figure 5–2 Input Diagram**



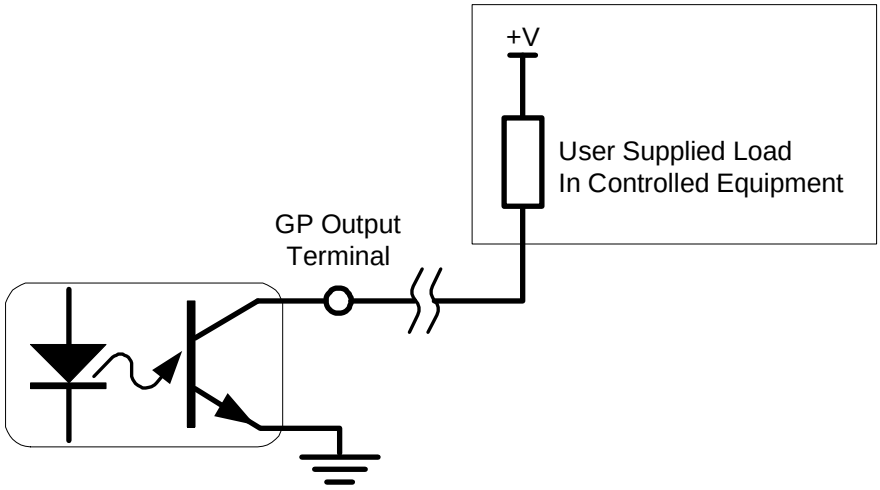

# GPOs

If the incoming SDI data stream contains GP data on the appropriate line of the video signal, the corresponding GP output on the card can be activated. The GP output is asserted when its voltage is high.

**Important:** The GP outputs are optically isolated and "open collector" so the user must provide the appropriate pull-up resistor for each GP output. See Figure 5–3 below.

The HDCC-708TX-OG1 provides two GPOs. (See Connector Pin Assignments on page 65 in Chapter 4 for connectivity.)

**Figure 5–3 Output Diagram**




# GPI/O Polarities

You can control the polarities of the encoded GPIs, both at the receiving stage (Rx) and at the encoding stage (Tx).

## GPI Encoded Polarity (Rx)

| Channel | Register | Bit(s) | Values |
|---|---|---|---|
| 1 | 0Fh | 0 through 3 | See Table 5–1 below. |

The polarity settings are listed in Table 5–1 below.

**Table 5–1 GPI Assertion Polarity**

| Bits | GPI | Active Low (default) | Active High |
|---|---|---|---|
| 0 | GPI-0 | 0 | 1 |
| 1 | GPI-1 | 0 | 1 |

# GPI Encoded Polarity (Tx)

| Channel | Register | Bit(s) | Values |
|---|---|---|---|
| 1 | 0Fh | 4 through 7 | See Table 5–2 below. |

You can set the polarity of the GPI as encoded on the data stream as shown in Table 5–2 below.

**Table 5–2 Register 0Fh and 2Fh: Bits 4 through 7**

| Bits | GPI | Active Low (default) | Active High |
|---|---|---|---|
| 4 | GPI-0 | 0 | 1 |
| 5 | GPI-1 | 0 | 1 |

# Enabling/Disabling GPI Transmission

| Channel | Register | Bit(s) | Values |
|---|---|---|---|
| 1 | 12h | 7 | 0=Disable<br>1=Enable |

The HDCC-708TX-OG1 can be configured to enable or disable transmission of GPI data by setting bit 7 of register 12h.

# CHAPTER 6
# Terminal

## Introduction

### Overview

This chapter describes how to access the Terminal to change the HDCC card's registers directly.

### Goals for This Chapter

- ✓ Explain the purpose and operation of the Terminal.
- ✓ Explain how to access the Terminal with any serial connection.

### Topics

# Background

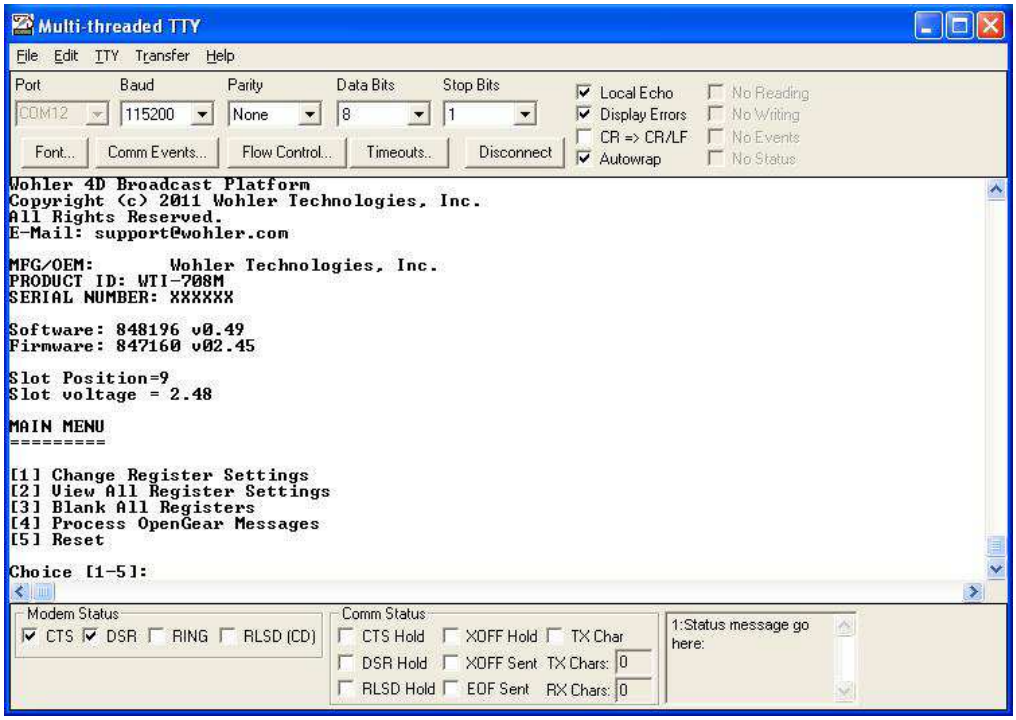
The HDCC card's operation is governed by several registers. These registers are modified automatically when you use the DashBoard.

However, more advanced users may prefer to configure these registers manually. You can do so by accessing the Terminal via a number of ports: RS-232, Ethernet Virtual Serial Ports, and the USB port.

The sections below describe how to connect to the Terminal with each method.

# Configuring the HDCC Card for Terminal Access

**Figure 6–1 Terminal Main Menu**




Access to the Terminal is controlled by the **BOOTOPT** jumper on the card as shown in Figure 6–2 on page 58. The sections below describe how it is used.

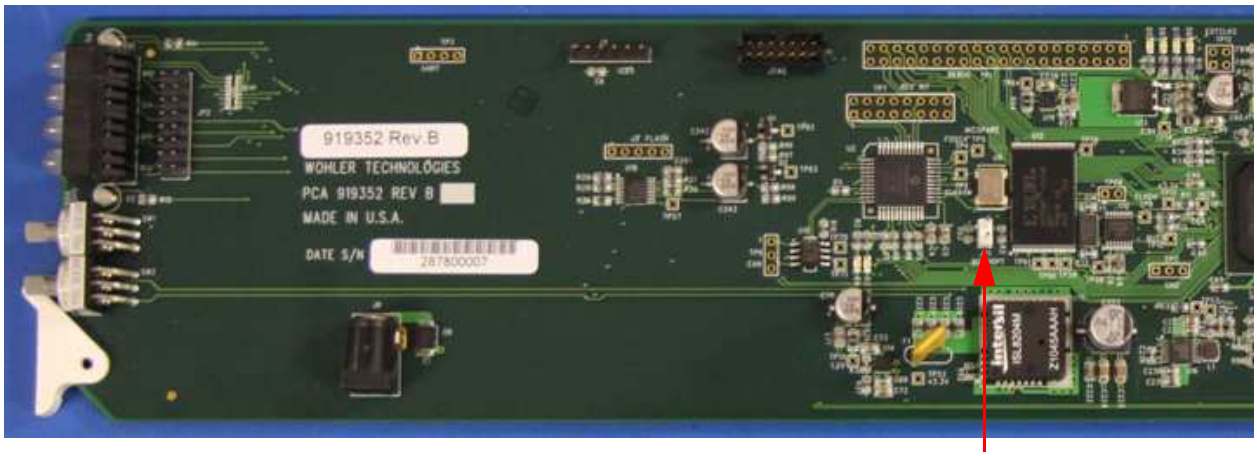
**Note:** When using the DFR-8321 frame, be aware that while the card is configured for Engineering Menu access, it will not be controllable from DashBoard. To restore DashBoard operation, power down the card, remove the jumper, and re-power the card.

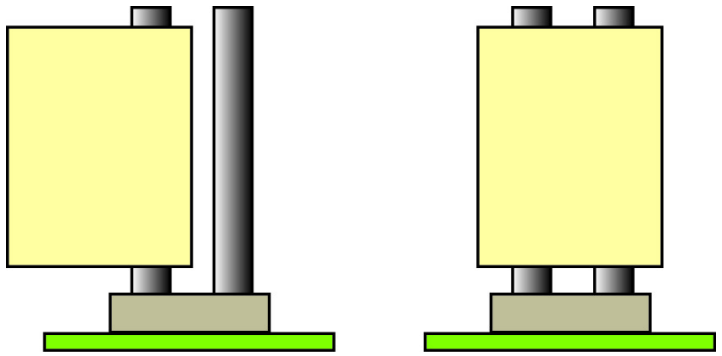
**WARNING!** Use caution when modifying the HDCC card's register values. Incorrect values may cause the card to behave unpredictably.

# Accessing the Terminal via the RS-232 Port

1. In DashBoard's **Setup Menu**, set the Terminal input to **RS-232** and the RS-232 output to **Terminal**.
2. Power down the card, install the **BOOTOPT** jumper (see Figure 6–2 on page 58).
3. Verify the SW3 is set to **OFF**.
4. Connect a serial cable from your PC to the RS-232 connector on the rear panel.
5. Re-power the card.
6. Open a terminal emulator (e.g., HyperTerminal, PuTTY, etc.) with the serial COM port set to 115.2k, 8 data bits, 1 stop bit, no parity, and no handshaking.
7. Press the Enter key to display the Engineering Menu as shown in Figure 6–1 on page 56.
8. Power off the card, remove the **BOOTOPT** jumper, and re-power the card to restore normal operation. (See Figure 6–2 on page 58 for details.)

**Figure 6–2 BOOTOPT Jumper Location**



*BOOTOPT Jumper Removed = Normal Operation*

*BOOTOPT Jumper Installed = Access Engineering Menu*

9. Go to the Engineering Menu functions below.

# Accessing the Terminal via the Virtual Serial Port

1. In DashBoard's **Setup Menu**, set the Terminal input to **Eth1** and the Eth1 output to **Terminal**.

2. Power down the card, install the **BOOTOPT** jumper (see Figure 6–2 above) and re-power the card.

3. Verify the SW3 is set to **OFF**.

4. Verify that Eth1 is installed per Chapter 2 of this document.

5. Connect an Ethernet cable from your network to the Ethernet connector on the rear panel.

6. Open a terminal emulator (e.g., HyperTerminal, PuTTY, etc.) with Eth1's COM port set to 115.2k, 8 data bits, 1 stop bit, no parity, and no handshaking.

7. Press the Enter key to display the Main Menu. (See Figure 6–1 on page 56).

8. Power off the card, remove the **BOOTOPT** jumper, and re-power the card to restore normal operation. (See Figure 6–2 on page 58 for details.)

# Accessing the Terminal via the USB Port (Front of Card)

There are two methods of accessing the Terminal via USB: the first requires configuration via DashBoard; the second uses SW3 on the card's front edge to override any software settings.

The following instructions are configuration via DashBoard.

1. In DashBoard's **Setup Menu**, set the Terminal input to **USB** and the USB output to **Terminal**.

2. Power down the card, install the **BOOTOPT** jumper (see Figure 6–2 on page 58), connect a USB cable between the host computer and the HDCC's USB connector, and re-power the card.

3. Verify the SW3 is set to **off**.

4. Connect a USB cable from your network to the USB connector on the front edge of the HDCC card.

5. Install the USB-Serial interface software as prompted.

6. Open a terminal emulator (e.g., HyperTerminal, PuTTY, etc.) with USB serial port set to 115.2k, 8 data bits, 1 stop bit, no parity, and no handshaking.

7. Press the Enter key to display the Main Menu. (See Figure 6–1 on page 56).

8. Power off the card, remove the **BOOTOPT** jumper, and re-power the card to restore normal operation. (see Figure 6–2 on page 58)

The following instructions show how to access the terminal without DashBoard configuration.

1. Power down the card, set **SW3** to **On**, install **BOOTOPT** jumper, connect a USB cable from your host computer to the USB connector on the front edge of the HDCC card, and re-power the card. (See Figure 6–2 on page 58 for details.)

2. Install the USB-Serial interface software as prompted.

3. Open a terminal emulator (e.g., HyperTerminal, PuTTY, etc.) with USB serial port set to 115.2k, 8 data bits, 1 stop bit, no parity, and no handshaking.

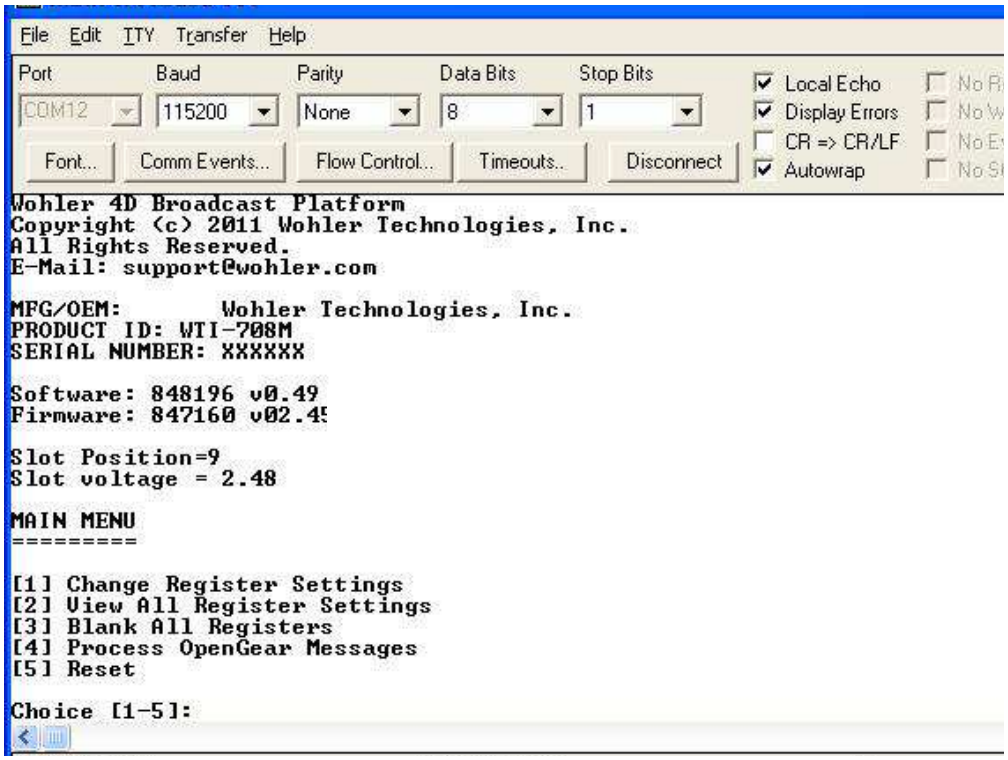
4. Press the Enter key to display the Main Menu. (See Figure 6–1 on page 56).

5. Power off the card, remove the **BOOTOPT** jumper, set SW3 to OFF (Refer to Figure 2–3 on page 14.), and re-power the card to restore normal operation. (See Figure 6–2 on page 58 for details.)

# Main Menu

The Main Menu provides several functions for quick and easy modifications. You can also find software and firmware version listed above the menu. Refer to Figure 6–3 on page 61 and the following descriptions of each menu option for details.

## Figure 6–3 Main Menu




*Software and Firmware Part Numbers and Versions*

*Engineering Menu*

**Important:** Refer to Appendix A for a detailed list of registers.

1. **Change Register Settings**: Allows you to modify any available register value.

2. **View All Register Settings**: Shows you the register list and all of the current values for each.

3. **Blank All Registers**: Sets all registers to zero.

**WARNING!** Without further register modifications, the card will be unusable after the registers are erased. Use only with extreme caution/discretion.

**Note:** Some registers are READ ONLY and will display a value even after you select option **[3] Blank All Registers**.

4. **Process OpenGear Messages**: Disables the Main Menu and returns control of the HDCC card to DashBoard to start processing openGear messages.

5. **Reset**: Reboots the hardware.

**Note:** If the **BOOTOPT** jumper is not removed, the card will boot back to the Main Menu.

# CHAPTER 7
# Specifications and Pin-Outs

## Introduction

### Overview

This chapter lists the specifications of the HDCC-708T104-OG1 and provides the pin-outs for its connectors.

### Topics

# Specifications

## Table 7–1 Physical Specifications

| Specification | Value |
|---|---|
| Dimensions (H x W x D) | Card:<br>3″ x 12.75″x 0.5″<br>(76.2 mm x 323.85 mm x 12.7 mm) |
| | Rear Panel:<br>3.6250″ (H) x 1.3125″ (W) 1.3750″ (D)<br>(142.88 mm x 33.34 mm x 34.93 mm) |
| Shipping Weight (combined) | 1 lbs (.45 kg) |
| Space Requirements | 2 RU |
| Supplied Accessories | Rear panel adaptor |
| Power Requirements | Receives power from frame |
| Power Consumption | Approximately 10 W |

## Table 7–2 Technical Specifications

| Specification | Value |
|---|---|
| Inputs | 1 (BNC) HD/SD-SDI autosensing<br>1 (RJ-45) GPI |
| Outputs | 1 (BNC) HD/SD-SDI Closed Captioned<br>1 (BNC) HD/SD-SDI Open Captioned<br>1 (RJ-45) GPO |
| Inputs/Outputs | 1 (RJ-45) Ethernet (10/100 TX)<br>1 (RJ-45) RS-232 and GPI/O<br>1 USB |
| Frame compatibility | openGear |
| Available functions | • HD/SD Closed Caption Encoding/Inserting<br>• GPI Encoding and Decoding<br>• Closed Caption OSD Monitoring |
| Supported Formats | • 480i60<br>• 576i50<br>• 720p (all field rates)<br>• 1035i (all field rates)<br>• 1080i (all field rates) |

**Table 7–2 Technical Specifications (Continued)**

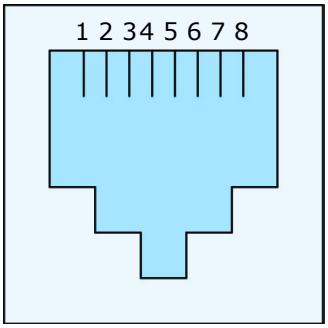
| Specification | Value |
|---|---|
| Available communication protocols | • GrandAlliance<br>• CDP<br>• SCTE 104 |
| Supported closed caption specifications | CEA-608, CEA-708 both encapsulated 608 and native 708 |

# Connector Pin Assignments

**Table 7–3 RS-232/GPI/O Pin-Out Assignments**

| Pin | Label | Interface |
|---|---|---|
| 1 | Rx0 | Open Collector |
| 2 | Not Connected | |
| 3 | TxD | Active Low |
| 4 | GND | |
| 5 | TX (Out) | RS-232 |
| 6 | RX (In) | RS-232 |
| 7 | Rx1 | Open Collector |
| 8 | Tx1 | Active Low |

**Figure 7–1 RS-232/GPI/O RJ-45 Pin-Out**

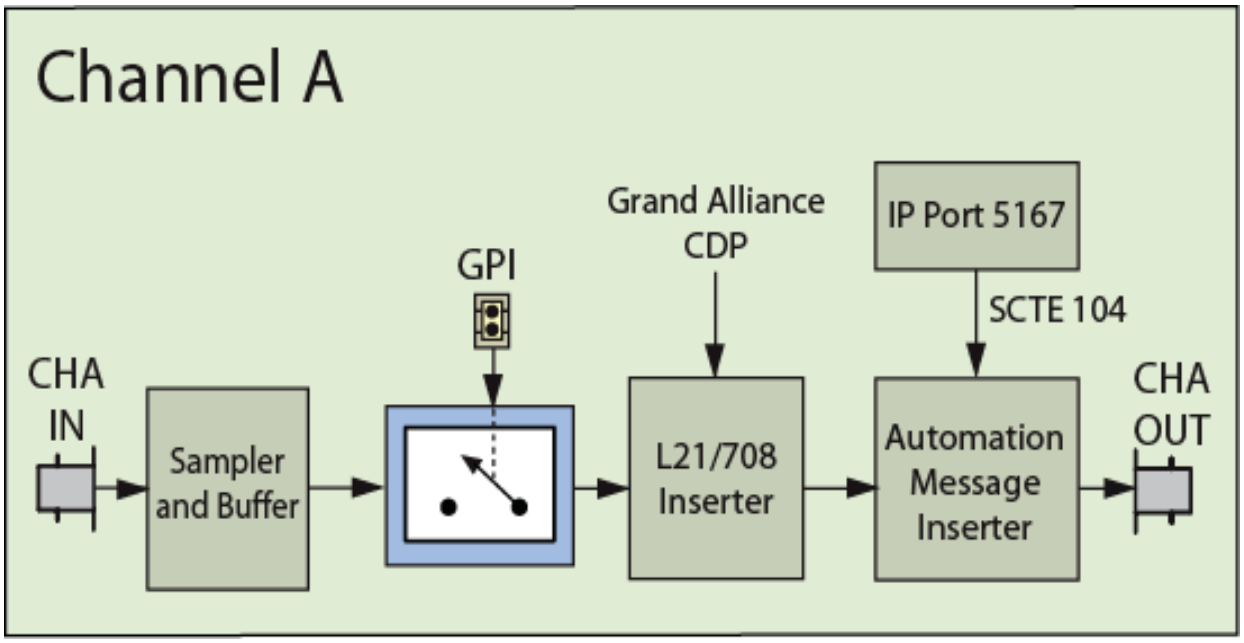



**WARNING!** RS-232 voltage levels are present on pins 5 and 6. These voltages can damage digital components. Make certain the connectivity is RS-232-compatible before connecting.

# Technical Functional Overview

Figure 7–2 below illustrates the design of the HDCC-708T104-OG1.

**Figure 7–2 HDCC-708T104-OG1 Block Diagram**



# APPENDIX A
# Engineering Registers

## Introduction

### Overview

This appendix details the HDCC-708TX-OG1's engineering registers which control the card's functions.

### Topics

# Accessing the Engineering Menu

To access the Engineering Menu, refer to the *Hardware Installation Guide* (part number 821150).

# Modifying the Register Settings

**WARNING!** If a register is not listed in Table A–1 below, do not modify it. Doing so will cause unpredictable results.

### Table A–1 Register Table Summary

| CH1 | Description |
|---|---|
| 00h | HD Line for CEA-708 Insertion |
| 01h | Not Used |
| 02h | SD Line for CEA-608 Insertion and Monitoring |
| 03f | Not Used |
| 04h | Not Used |
| 05h | Not Used |
| 06h | Not Used |
| 07h | Not Used |
| 08h | Transmission Features |
| 09h | Horizontal Timing Offset for GPI SD Insertion Line (Reserved) |
| 0Ah | SD Line for GPI Data Insertion |
| 0Bh | HD Line for GPI Data Insertion |
| 0Ch | HD Line for SCTE 104 Insertion |
| 0Dh | Not Used |
| 0Eh | Not Used |
| 0Fh | GPI Rx/Tx Polarity Control |
| 10h | Special Features 2 |
| 11h | Regen/Blank Control With External GPI |
| 12h | GPI Data Insertion Control and Encoder Timeout |
| 13h | GPI Mapping for Tx |
| 14h | GPI Mapping for Per-Field Blank Control (Reserved) |
| 15h | Not Used |
| 16h | Not Used |
| 17h | Not Used |
| 18h | Not Used |

## Table A–1 Register Table Summary

| CH1 | Description |
|---|---|
| 19h | Not Used |
| 1Ah | Not Used |
| 1Bh | Not Used |
| 1Ch | Not Used |
| 1Dh | Not Used |
| 1Eh | Not Used |
| 1Fh | Not Used |
| 4Dh | Timing Offset—Do Not Change |
| 4Eh | GPO 1 and 2 Mapping |

## Table A–2 Register Settings, Descriptions, and Default Values

| CH1 | Description | Default |
|---|---|---|
| 00h | **HD Line for CEA-708 Insertion**<br>*Min: 07—Max: 19* | 09h |
| 01h | Not Used | |
| 02h | **SD Line for CEA-608 Insertion, Extraction, and Monitoring**<br>*Min: 06—Max: 16* | 15h |
| 03h | Not Used | |
| 04h | Not Used | |
| 05h | Not Used | |
| 06h | Not Used | |
| 07h | Not Used | |

## Table A–2 Register Settings, Descriptions, and Default Values

<table>
<tr><th>CH1</th><th>Description</th><th>Default</th></tr>
<tr><td>08h</td><td>Transmission Features<br>Min: N/A—Max: N/A<br><table>
<tr><th>Bit(s)</th><th>Function</th></tr>
<tr><td>7</td><td>Enable SMPTE 333 Protocol<br>(Not Yet Used)<br>0 = Disabled<br>1 = Enabled</td></tr>
<tr><td>6:5</td><td>Com Port Speed<br>00 = 9600 baud<br>01 = 19200 baud<br>10 = 38400 baud<br>11 = 115200 baud</td></tr>
<tr><td>4:3</td><td>Not Used</td></tr>
<tr><td>2</td><td>Enable VANC 608/708 Insertion in SD<br>0 = Normal<br>1 = Insert</td></tr>
<tr><td>1</td><td>Enable “Smart XDS” Insertion Feature<br>0 = Normal: Smart XDS Insertion Feature Enabled<br>1 = Smart XDS Feature Disabled</td></tr>
<tr><td>0</td><td>Disable VANC 608/708 Insertion in HD<br>0 = Normal: Insertion Enabled<br>1 = Insertion Disabled</td></tr>
</table></td><td>00h</td></tr>
<tr><td>09h</td><td>Reserved—Do Not Change</td><td>—</td></tr>
<tr><td>0Ah</td><td>SD Line for GPI Data<br>Min: 06h—Max: 16h</td><td>0Dh</td></tr>
<tr><td>0Bh</td><td>HD Line for GPI Data<br>Min: 07h—Max: 19h</td><td>0Dh</td></tr>
<tr><td>0Ch</td><td>HD Line for SCTE 104 Insertion</td><td>0Ch</td></tr>
<tr><td>0Dh</td><td>Not Used</td><td>—</td></tr>
<tr><td>0Eh</td><td>Not Used</td><td>—</td></tr>
</table>

## Table A–2 Register Settings, Descriptions, and Default Values

<table>
<tr><th>CH1</th><th>Description</th><th>Default</th></tr>
<tr><td>0Fh</td><td>GPI Tx/Rx Polarity<br>Min: N/A—Max: N/A<br><table><tr><th>Bit(s)</th><th>Type</th><th>Function</th></tr><tr><td>0</td><td>GPI Rx 0</td><td rowspan="8">0 = Normal (Active Low)<br>1 = Inverted (Active High)</td></tr><tr><td>1</td><td>GPI Rx 1</td></tr><tr><td>2</td><td>GPI Rx 2</td></tr><tr><td>3</td><td>GPI Rx 3</td></tr><tr><td>4</td><td>GPI Tx 0</td></tr><tr><td>5</td><td>GPI Tx 1</td></tr><tr><td>6</td><td>GPI Tx 2</td></tr><tr><td>7</td><td>GPI Tx 3</td></tr></table></td><td>00h</td></tr>
<tr><td>10h</td><td>Special Features—2<br>Min: N/A—Max: N/A<br>This register controls miscellaneous functions on the card including the video outputs.<br><table><tr><th>Bit(s)</th><th>Function</th></tr><tr><td>3:4[a]</td><td>Video Output Mode:<br>00 = Normal<br>01 = Both outputs set to monitoring<br>10 = Both outputs are clean<br>11 = Not Used</td></tr><tr><td>5</td><td>GPI Tx Source:<br>0 = GPI mapped input (See Registers 13h and 33h.)<br>1 = GPI mapped input ORed with GPI Rx</td></tr></table>a Normal (default) = Monitoring O/Ps are 3 and 4; Clean O/Ps are 1 and 2<br>Monitoring = Burned-in captions on all O/Ps<br>Clean = No burned-in captions on any O/Ps</td><td>00h</td></tr>
</table>

## Table A–2 Register Settings, Descriptions, and Default Values

<table>
<tr><th>CH1</th><th>Description</th><th>Default</th></tr>
<tr><td>11h</td><td>
Regen/Blank Control with External GPI<br>
Min: N/A—Max: N/A
<table>
<tr><th>Bit(s)</th><th>Value</th><th>Blank Controlled by...</th></tr>
<tr><td rowspan="3">0:3</td><td>0000</td><td>GPI Control (Regen Operation)</td></tr>
<tr><td>0001</td><td>External GPI 0</td></tr>
<tr><td>0010</td><td>External GPI 1</td></tr>
</table>
<table>
<tr><th>Bit(s)</th><th>Polarity Control</th><th>Function</th></tr>
<tr><td>4</td><td>GPI 0</td><td rowspan="2">0 = Normal (Active Low)<br>1 = Inverted (Active High)</td></tr>
<tr><td>5</td><td>GPI 1</td></tr>
</table>
</td><td>00h</td></tr>
<tr><td>12h</td><td>
GPI Insertion Control and Insert Mode Timeout<br>
Min: N/A—Max: N/A
<table>
<tr><th>Bit(s)</th><th>Function</th></tr>
<tr><td>0:3</td><td>Insert Mode Time Out<br>(0.5 second intervals):<br>0000 = 0 seconds<br>0001 = 0.5 seconds<br>0010 = 1.0 seconds<br>.<br>.<br>.<br>1111 = 7.5 seconds</td></tr>
<tr><td>4:5</td><td>Time Out<br>00 = Normal (Automatic Fall Back to Regen Mode After Timeout)<br>01 = Permanent Insert Mode in Field 0<br>10 = Permanent Insert Mode in Field 1<br>11 = Permanent Insert Mode in Both Fields</td></tr>
<tr><td>6</td><td>Not Used</td></tr>
<tr><td>7</td><td>GPI Data Insertion<br>0 = Off<br>1 = On</td></tr>
</table>
</td><td>—</td></tr>
</table>

## Table A–2 Register Settings, Descriptions, and Default Values

<table>
<tr><th>CH1</th><th>Description</th><th>Default</th></tr>
<tr><td>13h</td><td>GPI Mapping for Tx<br>Min: N/A—Max: N/A<br><table><tr><th>Bit(s)</th><th>GPI Tx Source</th><th>Function</th></tr><tr><td>0:1</td><td>1</td><td rowspan="4">External GPIs:<br>00 = GPI 0<br>01 = GPI 1</td></tr><tr><td>2:3</td><td>2</td></tr><tr><td>4:5</td><td>3</td></tr><tr><td>6:7</td><td>4</td></tr></table></td><td>E4h</td></tr>
<tr><td>14h</td><td>GPI Mapping for Per-Field Blank Control<br>(Reserved)</td><td>—</td></tr>
<tr><td>15h</td><td>Not Used</td><td>—</td></tr>
<tr><td>16h</td><td>Not Used</td><td>—</td></tr>
<tr><td>17h</td><td>Not Used</td><td>—</td></tr>
<tr><td>18h</td><td>Not Used</td><td>—</td></tr>
<tr><td>19h</td><td>Not Used</td><td>—</td></tr>
<tr><td>1Ah</td><td>Not Used</td><td>—</td></tr>
<tr><td>1Bh</td><td>Not Used</td><td>—</td></tr>
<tr><td>1Ch</td><td>Not Used</td><td>—</td></tr>
<tr><td>1Dh</td><td>Not Used</td><td>00h</td></tr>
<tr><td>1Eh</td><td>Not Used</td><td>—</td></tr>
<tr><td>1Fh</td><td>Not Used</td><td>—</td></tr>
<tr><td>4D</td><td>Timing Offset—Do Not Change<br>Min: N/A — Max: N/A</td><td>06h</td></tr>
</table>

## Table A–2 Register Settings, Descriptions, and Default Values

<table>
<tr><th>CH1</th><th>Description</th><th>Default</th></tr>
<tr><td>4Eh</td><td>GPO 0 and 1 Source<br>Min: N/A—Max: N/A<br><table><tr><th>Bit(s)</th><th>Function</th></tr><tr><td>0:3</td><td>GPO 0 Source:<br>0000 = Ch 1 GPI Rx 0<br>0001 = Ch 1 GPI Rx 1<br>0010 = Ch 1 GPI Rx 2<br>0011 = Ch 1 GPI Rx 3</td></tr><tr><td>4:7</td><td>GPO 1 Source:<br>0000 = Ch 1 GPI Rx 0<br>0001 = Ch 1 GPI Rx 1<br>0010 = Ch 1 GPI Rx 2<br>0011 = Ch 1 GPI Rx 3</td></tr></table></td><td>10h</td></tr>
</table>