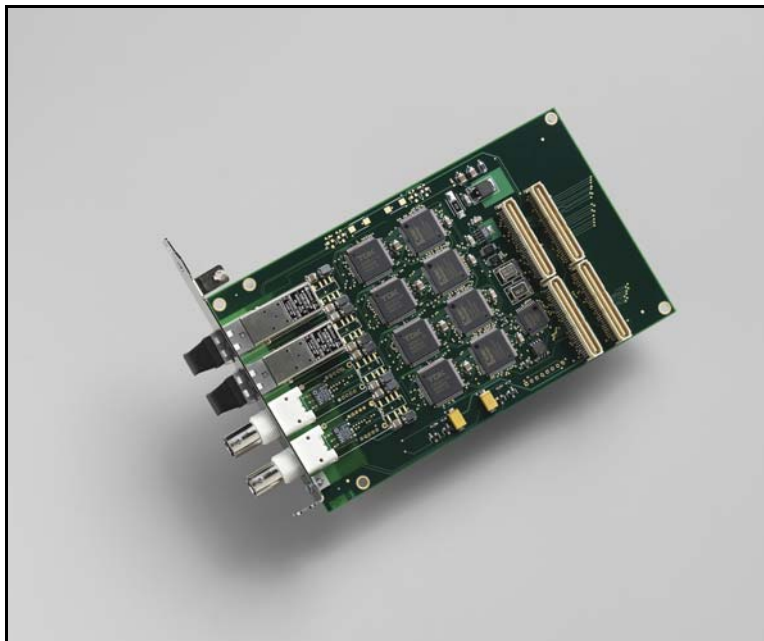




## User's Guide

# HRC Mezzanine Board



**High Rate Carrier (E4, STS3, OC3 / STM1)  
for use with a PCI / PCIe Main Board**

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# HRC Mezzanine Board

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## Overview

The HRC Mezzanine Board supports OC3 / STM1, STS3, or E4 signals in various combinations, including framing and descrambling for OC3 / STM1 framed data. The board allows DMA output at the rate of 139 or 155 Mb/s (DMA is provided through the PCI / PCIe Main Board). The PCI / PCIe interface has bandwidth to output OC3 / STM1 data on all four HRC channels.

The HRC has four connector locations; each is occupied by either a 75-Ω BNC coaxial interface with CMI-coded transmission, or a fiber-optic LC with a single-mode 1300 nm transceiver.

The standard connector combinations are: 4 BNC; 4 fiber-optic; 2 of each; or 3 BNC + 1 fiber-optic. Each BNC can be programmed for either input or output; for bidirectional coaxial operation, a maximum of two channels is available. The fiber-optic HRC has eight potential data streams (four in and four out), so full duplex operation on all four fiber ports is not possible.

## DMA: Four-channel vs. Legacy Sixteen-channel

Due to the constant filling and flushing of the DMA data pipeline in the host computer, some computers cannot support the PCI bandwidth required for more than two active HRC outputs. With 16-channel DMA, DMA burst size is smaller, and the PCI bus cannot switch between channels fast enough. With four-channel operation, however, DMA occurs in bigger bursts, with less switching — a more efficient mode of operation. Therefore, we recommend that you configure new systems for four-channel operation.

However, if you choose to use sixteen-channel operation, you can do so by using the UI FPGA configuration file `sshrcin.bit`, the software initialization file `hrcin.cfg`, and a PCI FPGA configuration file ending in `...16.bit` (either `pciss16.bit` or `pcigs16.bit`). Thus configured, the HRC can use eight of the sixteen available DMA channels (four in and four out), assuming that you have written your own firmware to do so. The DMA channels correlate to the HRC inputs and outputs as follows:

Channel 0 = input 0	Channel 2 = input 2	Channel 4 = output 0	Channel 6 = output 2
Channel 1 = input 1	Channel 3 = input 3	Channel 5 = output 1	Channel 7 = output 3

## FPGAs on the PCI / PCIe Main Board

The HRC is paired with an EDT PCI / PCIe Main Board, which has the following FPGAs:

- The *user interface (UI) FPGA* links the HRC to the main board's PCI or PCIe FPGA.
- The *PCI or PCIe FPGA* communicates with the host computer over the PCI or PCIe bus and implements the DMA engine, which transfers data between the board and the host. This FPGA loads automatically, at powerup, with the correct firmware from the main board's FPGA configuration flash memory ("flash memory").

For details, consult the PCI / PCIe Main Board User's Guide (see [Related Resources](#) below).

## Companion Products

For additional resources, the HRC is designed to work with these EDT products:

- Required – a PCI / PCIe Main Board (PCI SS, PCI GS, or PCIe8 LX / FX), for DMA and other resources
- Optional – a Time Distribution Board, for precise timestamping of the data.

For details on these products, see [Related Resources](#).

## Related Resources

The resources below may be helpful or necessary for your applications.

### EDT Resources

<i>Description</i>	<i>Detail</i>	<i>Web link</i>
• HRC specifications	Datasheet (on product page)	<a href="http://www.edt.com">www.edt.com</a>
• PCI / PCIe Main Board information	Datasheet and user's guide	<a href="http://www.edt.com/main_boards.html">www.edt.com/main_boards.html</a>
• Time Distribution board information	Datasheet and user's guide	<a href="http://www.edt.com/timedist.html">www.edt.com/timedist.html</a>
• Application Programming Interface	HTML and PDF versions	<a href="http://www.edt.com/manuals.html">www.edt.com/manuals.html</a>
• Installation packages: Windows, Linux, Solaris, Mac	Software / firmware downloads	<a href="http://www.edt.com/software.html">www.edt.com/software.html</a>

# Installation

To install the HRC, fit the connectors through the host back panel and then plug into the PCI connector. The BNC is farther from the PCI bus connector, so it can interfere with the host back panel and prevent the bottom of the HRC back panel from being inserted smoothly. To manipulate the board into position:

1. Place the edge connector between two PCI connectors on the motherboard.
2. Position the HRC back panel.
3. Lift the board slightly to insert the edge connector into the host socket.

The connector furthest from the PCI / PCIe bus connector is channel 0; see [Figure 1](#) or [Figure 2](#) for details.

## About the Software and Firmware

Your EDT installation package includes these HRC-specific files:

<code>sshrc.bit</code>	Four-channel version (signals can be either inputs or outputs). Configures the UI FPGA on the main board to communicate with the HRC for four-channel operation.
<code>sshrcin.bit</code>	Legacy sixteen-channel version (signals are inputs only). Configures the UI FPGA on the main board to communicate with the HRC for sixteen-channel operation.

The `pcd_config` subdirectory contains sample software initialization files for all board configurations. These files include:

<code>hrc.cfg</code>	Four-channel version. Configuration file for <code>initpcd</code> to use to configure the HRC for four-channel operation.
<code>hrcin.cfg</code>	Legacy sixteen-channel version. Configuration file for <code>initpcd</code> to use to configure the HRC for sixteen-channel operation.

**NOTE** Additional files are required for the PCI / PCIe Main Board that goes with the HRC mezzanine board. For details on those files, including how to load and use them, see [Related Resources on page 6](#).

The firmware file names you see in the top-level PCD directory do not match the file names given above because PCI bus slots come in two varieties: those supplying 3 V power, and those supplying 5 V power. Different firmware is required for the two kinds of slots, but the correct firmware file is chosen automatically when you run `pciload` or any other EDT-supplied firmware loading utility.

For example, you may see files named `cda16_3v.bit` and `cda16_5v.bit`, but the correct argument to supply to load the firmware is `cda16.bit`.

In some cases, you may also see additional firmware files incorporating changes required for various board revisions, or files with the same name in different subdirectories. You need not be concerned with any of these variations of name or path, however. In all cases, the names given above are the correct arguments to supply to the firmware-loading utilities.

## The PCD Device Driver

The PCD device driver is the software running on the host that allows the host operating system to communicate with the HRC. The driver is loaded into the kernel upon installation, and thereafter runs as a kernel module. The driver name and subdirectory is specific to each supported operating system; the installation script handles those details for you, automatically installing the correct device driver in the correct operating system-specific manner.

## FPGA Configuration Files

FPGA configuration files define the firmware required for the PCI FPGA and the UI FPGA. The PCI FPGA firmware files are in the `flash` subdirectory of the top-level PCD directory. UI FPGA firmware files are in the `bitfiles` subdirectory of the top-level PCD directory.

Each FPGA must be loaded with the firmware specific to the chosen interface, and the firmware in one FPGA must be compatible with the firmware in the other. By default, the correct FPGA configuration file for the PCI FPGA is loaded at the factory. However, you'll need to load the required FPGA configuration file for the UI FPGA yourself.

The firmware files specific to your HRC are listed at the beginning of this section. Instructions for loading them are provided in [Configuring the HRC](#).

## Software Initialization Files

Software initialization files (`.cfg`) are editable text files that run like scripts to configure EDT boards so that they are ready to perform DMA. The commands in a software initialization file are defined in a C application named `initpcd`. When you invoke `initpcd`, you specify which software initialization file to use with the `-f` flag.

A typical software initialization file loads an FPGA configuration file into the UI FPGA and sets up various registers to prepare the board for DMA transfers. Some software initialization files may also load an FPGA configuration file into an FPGA residing on the mezzanine board.

A variety of software initialization files are included with the EDT software, at least one of which is customized for each main board or main board / mezzanine board combination — that is, each FPGA configuration file has a matching software initialization file. Software initialization files are located in the `pcd_config` subdirectory of the top-level PCD directory. The software initialization files specific to your HRC are listed at the beginning of this section. Instructions for their use are provided in [Configuring the HRC](#).

Commands defined in `initpcd` and typically found in software initialization files allow for specific FPGA configuration files to be loaded (for example, `bitfile:`), write specified hexadecimal values to specified registers (for example, `command_reg:`), enable or disable byte-swapping or short-swapping to accommodate different operating systems' requirements for bit ordering (for example, `byteswap:`), or invoke arbitrary commands (for example, `run_command:`). For example:

```
bitfile: ssd16io.bit
command_reg: 0x08
byteswap: 1
run_command: set_ss_vco -F 1000000 2
```

For complete usage details, enter `initpcd --help`.

C source for `initpcd` is included so that you can add your own commands, if you wish. You can then edit your own software initialization file to use your new commands and specify that `initpcd` use your new file when configuring your board. If you would like us to include your new software initialization commands in subsequent releases of `initpcd`, email us at [tech@edt.com](mailto:tech@edt.com).

## Sample Applications and Utilities

Along with the driver, the FPGA configuration files, and the software initialization files, the EDT installation CD includes a number of applications and utilities that you can use to initialize and configure the board, access registers, or test the board. For many of these applications and utilities, C source is also provided,



so that you can use them as starting points to write your own applications. The most commonly useful are described below; see the README file for the complete list.

**NOTE** To build a new application, we recommend downloading the latest EDT installation package (see [Related Resources](#)). To rebuild an existing application, avoid version issues by using the same package used to build it, or relink / recompile the application using our latest download package.

## Sample Applications

<code>rd16</code>	Performs simple multichannel ring buffer input.
<code>wr16</code>	Performs simple multichannel ring buffer output.
<code>simple_read</code>	Performs DMA input without using ring buffers. Data is therefore subject to interruptions, depending on system performance.
<code>simple_write</code>	Performs DMA output without using ring buffers. Data is therefore subject to interruptions, depending on system performance.
<code>simple_getdata</code>	An example of a variety of DMA-related operations, including reading the data from the connector interface and writing it to a file, as well as measuring input rate.
<code>simple_putdata</code>	An example of a variety of DMA-related operations, including reading data from a file and writing it out to the connector interface.
<code>test_timeout</code>	Under normal operation, timeouts cancel DMA transfers. This application exemplifies giving notification when a timeout occurs, without canceling DMA.
<code>set_ss_vco</code>	A utility for programming the output clock or clocks on the HRC to specific frequencies used by the UI FPGA for input and output.

## Utility Files

<code>initpcd</code>	A utility for initializing and configuring the HRC.
<code>pdb</code>	A utility that enables interactive reading and writing of the UI FPGA registers.

## Basic Testing Files

EDT provides files to perform basic tests, such as verifying proper installation, on your EDT board (for details, see [Basic Testing](#)). These files include at least:

<code>sslooptest</code>	Tests most EDT boards. Determines the board model and runs the correct loopback test.
-------------------------	---

## Building or Rebuilding an Application

Executable and PCD source files are in the top-level EDT PCD directory. To build or rebuild an application, therefore, run `make` in this directory.

Windows users must install a C compiler, while Linux users can use the `gcc` compiler typically included with your Linux installation. If you use Windows, we recommend the Microsoft Visual C compiler; however, if you wish to use `gcc`, contact `tech@edt.com`.

After you've built an application, use the `--help` command line option for a list of usage options and descriptions.

# Configuring the HRC

To ensure proper functioning, all EDT boards must be loaded with the correct FPGA configuration files for their FPGAs. At powerup, the PCI / PCIe FPGA is loaded automatically with the correct file from flash memory; however, you must load the UI FPGA yourself. Before doing so, you may wish to check the firmware in the PCI / PCIe FPGA to ensure that it is correct and up to date.

## Checking or Updating the PCI / PCIe FPGA Firmware

When upgrading to a new device driver, or switching to a FPGA configuration file with special functionality, you may need to reprogram the PCI / PCIe interface flash memory using `pciload`.

**NOTE** The presence of a newer version of the firmware with a new driver does not necessarily mean that the firmware must be updated; the README file will tell you if a package contains a mandatory upgrade.

The following procedure applies to standard firmware only. If you are running a custom firmware file and need to update it, first get a custom firmware configuration file from EDT.

- On Windows systems, double-click the Pcd Utilities icon to bring up a command shell in the installation directory `\EDT\Pcd`.
- On Linux systems, `pciload` is an application in the installation directory `/opt/EDTpcd`.
- On Mac systems, `pciload` is an application in the installation directory `/Applications/EDT/pcd`.

To see currently installed and recognized EDT boards and drivers, enter:

```
pciload
```

The program will output the date and revision number of the firmware in the flash memory.

To compare the PCI / PCIe FPGA firmware in the package with what is already loaded on the board, enter:

```
pciload verify
```

If they match, there's no need to upgrade the firmware. If they differ, you'll see error messages. This does not necessarily indicate a problem; if your application is operating correctly, you may not need to upgrade the firmware. However, if you do wish to update the standard firmware, enter:

```
pciload update
```

1. To upgrade or switch to a custom firmware file, enter:

```
pciload firmware_filename
```

...replacing *firmware\_filename* with the name of the PCI / PCIe Main Board FPGA configuration file, with or without the `.bit` file extension.

**NOTE** If the host computer holds more than one board, you can specify the correct board to load with the optional *unit\_number* argument (by default, 0 for the first or only board in a host), as shown:

```
pciload -u unit_number filename
```

2. At the prompt, press Enter to confirm the loading operation. (If the file date is older than the date of the file already in flash memory, you may need to press Enter twice.)

The board reloads the firmware from the flash memory only during power-up, so after running `pciload`, the old firmware remains in the PCI / PCIe FPGA until the system has power-cycled.

**NOTE** Updating the firmware requires cycling power, not simply rebooting.

For a list of all `pciload` options, enter:

```
pciload --help
```

## Loading the UI FPGA Firmware and Configuring the HRC

The utility `initpcd` loads the UI FPGA configuration files, programs the registers, sets the clocks (if necessary), and gets the HRC ready to perform DMA. This utility takes, as an argument, a software initialization file, and then automatically runs the pertinent commands.

If you use `initpcd` to configure the HRC, your application can concern itself solely with performing DMA and other application-specific operations; it will therefore omit HRC-specific operations and be portable to other EDT boards that perform DMA.

To configure the HRC, enter:

```
initpcd -u unit_number -f pcd_config/filename.cfg
```

...replacing `unit_number` with the number of the board (by default, 0), and replacing `filename` with one of the initialization files listed in [About the Software and Firmware](#); for example:

```
initpcd -f hrc.cfg
```

**NOTE** Software initialization files are editable text files. If the files provided do not meet your needs, copy and modify the one that's closest to your required configuration; then run `initpcd` with your new file.

## Using Custom FPGA Configuration Files

You can substitute your own FPGA configuration file, if necessary. If you wish to develop your own VHDL design, contact EDT. When you're done, be sure to create a new software initialization file for your new firmware file and update the `pcd_config` directory to include it.

---

## Configuring the Channels

An alternate way to configure the HRC, without using a software initialization file, is to enter:

```
bitload -u unit_number sshrc.bit
```

The `bitload` program detects and loads the main board's UI FPGA with `sshrc.bit`.

---

## Basic Testing

The loopback test determines the board configuration, loads the appropriate bitfile, generates test data and tests the board and its components with no external device connected. Test files are included — see [About the Software and Firmware on page 7](#) for the complete list.

**NOTE** The loopback test overwrites the bitfile in the UI FPGA. Before you can use the board again, you'll need to reconfigure it after the test has completed.

To perform this test:

1. Leave the board pair (main + mezzanine) in the host, but disconnect any external device and its cable.
2. In a command window, enter:

```
sslooptest -u unit_number
```

The outcome will vary for each type of board. Errors are redirected to the file `sslooptest.err` in the current directory; if no such file exists, the test completed without errors.

Loopback test output for a functional board contains such lines as:

```
Total errs=0 bufs=4000; Channel errs(NNx) bufs(YYx)
```

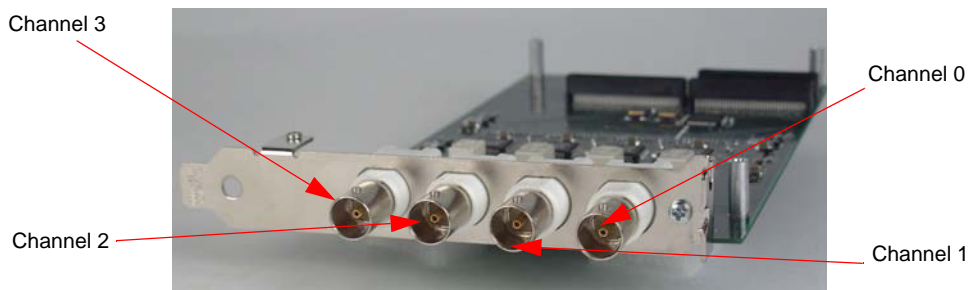
`Total errs` shows the error count so far; `bufs` shows the number of buffers in use. The three characters after `Channel errs` show the absence (N) or presence (Y) of a data error in a given channel (0–3); `x` indicates a channel is not in use. Similarly, a `Y` after `Channel... bufs` shows a buffer in use; `x`, that the corresponding channel is not in use. An `N` indicates that DMA is not occurring in a specific channel.

3. After the test, reconfigure the board using `initpcd` (or your own application) to disable loopback.
4. Reconnect the board to the external device.

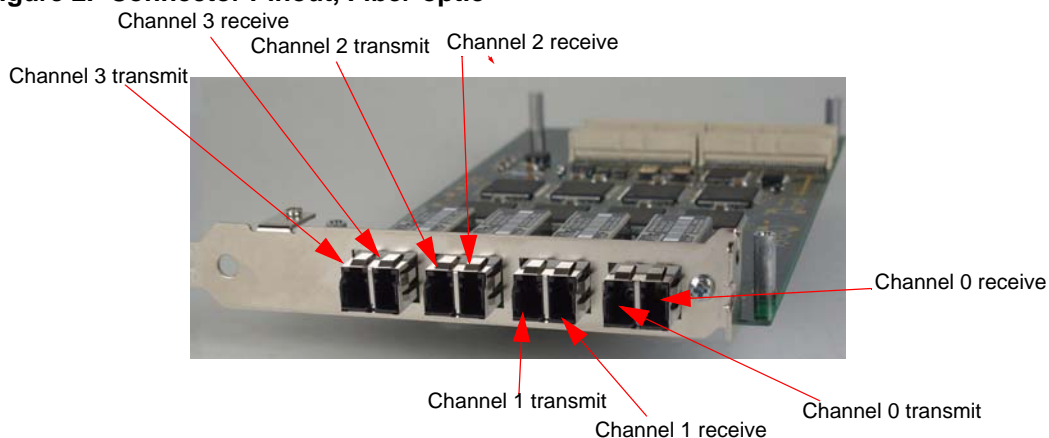
## Connector Pinout

The connectors connect to the channels as shown in [Figure 1](#) and [Figure 2](#).

**Figure 1. Connector Pinout, BNC**



**Figure 2. Connector Pinout, Fiber-optic**



# Registers

The following registers are implemented but not used: 0x01 Data Path; 0x03 Status; 0x04 Status Polarity; and 0x05–06 Direction Control. In addition, addresses 0x56–57 are reserved for internal use.

**NOTE** The registers shown are for four-channel operation. For sixteen-channel operation, the differences are:

0x18 Underflow	Not used.	0x25 Send / Receive Relay	Address is 0x15.
0x22 Channel Loopback	Address is 0x12.	0x26 Parallel Data Size	Address is 0x1C.
0x23 Channel Clock	Address is 0x13.	0x27 Enable Laser	Address is 0x1E.
0x24 Channel Clock Source	Address is 0x14.		

## 0x00 Command

**Access / Notes:** 8-bit read-write / PCD\_CMD

Bit	Name	Description
7–4	[no name]	Not used.
3	CMD_EN	Set to enable the FPGA configuration file. Clear to reset all channels, flush the FIFOs, and clear all under- and overflow bits.
2–0	[no name]	Not used.

## 0x02 Function

**Access / Notes:** 8-bit read-write / PCD\_CMD

Bit	Name	Description
7–1	[no name]	Not used.
0	FUNCT	When set, flush output word by word. When clear, wait for 16 words before transferring to PCI FPGA.

## 0x0F Configuration

**Access / Notes:** 8-bit read-write / PCD\_CONFIG

Use this register and [0x16, 17 Least Significant Bit First](#) to control how the data is ordered.

This register implements swapping. The structure of a 32-bit data word without swapping is:

short 1																short 0															
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
byte 3								byte 2								byte 1								byte 0							

If bit 3 (SSWAP) is set, short 0 precedes short 1. If bit 0 (BSWAP) is set, byte 2 precedes byte 3, and byte 0 precedes byte 1. If both are set, then the bytes are ordered as: 0, 1, 2, 3.

Bit	Name	Description
7–4	[no name]	Not used.
3	SSWAP	Short swap. Swaps the two 16-bit short words in a 32-bit data word – so that short 1 precedes short 0. Does not change the order of the bits within each short.
2–1	[no name]	Not used.
0	BSWAP	Byte swap. Swaps bytes 0 and 1, and also bytes 3 and 4, in a 32-bit data word – so that the bytes are ordered as: 1, 0, 3, 2. Does not change the position of the bits within each byte.

## 0x10, 11 Channel Enable

**Access / Notes:** 16-bit read-write / SSD16\_CHEN

Bit	Name	Description
15–4	[no name]	Not used.
3–0	CH_ENABLE[3–0]	Set a bit to enable the corresponding DMA channel; clear it to reset the corresponding channel.

## 0x16, 17 Least Significant Bit First

**Access / Notes:** 16-bit read-write / SSD16\_LSB

Use this register and [0x0F Configuration](#) to control how the data is ordered.

Bit	Name	Description
15–4	[no name]	Not used.
3–0	LSB_FIRST[3–0]	When set, the least significant bit of the 32-bit data word is the first bit, and the most significant bit is the last. When clear for a channel, the most significant bit of a 32-bit word is the first bit.

## 0x18, 19 Underflow

**Access / Notes:** 8-bit read-only / SSD16\_UNDER

Four-channel operation only.

Bit	Name	Description
7–4	[no name]	Not used.
3–0	UNDERFLOW[3–0]	When set, indicates that the corresponding channel's internal FIFO has emptied since the previous CMD_EN or CHANNEL_ENABLE, because data has been transmitted faster than DMA can fill the internal FIFO.  Reset by first disabling, then re-enabling, the channel (see <a href="#">0x10, 11 Channel Enable</a> ).

## 0x1A, 1B Overflow

**Access / Notes:** 16-bit read-only / SSD16\_OVER

Bit	Name	Description
15–4	[no name]	Not used.
3–0	OVERFLOW[3–0]	When set, indicates that the corresponding channel's internal FIFO has overflowed since the last CMD_EN or CHANNEL_ENABLE, ordinarily because DMA cannot empty the FIFO at the rate at which data is being received. Data received while the FIFO is in overflow is discarded.  Reset by first disabling, then re-enabling, the channel (see <a href="#">0x10, 11 Channel Enable</a> ).

## 0x22 Channel Loopback

**Access / Notes:** 8-bit read-write / HRC\_LOOPBACK

Bit	Name	Description
7–4	L_LOOPBACK	Sets local loopback. When set, the channel receiver is connected directly to the corresponding channel transmitter.
3–0	R_LOOPBACK	Sets remote loopback. When set, data received through the fiber-optic connector is immediately transmitted out the corresponding transmit connector.  Remote loopback is not possible for channels with BNCs, which allow data to flow in only one direction at a time.

## 0x23 Channel Clock

**Access / Notes:** 8-bit read-write / HRC\_CHAN\_CLK

Bit	Name	Description
7–4	[no name]	Not used.
3–0	OC3_STM1	Set when the corresponding channel requires the 155 Mb per second data rate; clear for 139 Mbps.

## 0x24 Channel Clock Source

**Access / Notes:** 8-bit read-write / HRC\_CHAN\_CLK\_SRC

Bit	Name	Description
7–4	[no name]	Not used.
3–0	SRC_CLK	When clear, the corresponding channel's transmitter uses the clock specified by the register <a href="#">0x23 Channel Clock</a> for clocking the transmit data. When set, the corresponding channel's transmitter uses the clock recovered from the receiver for clocking the transmit data.

## 0x25 Send / Receive Relay

**Access / Notes:** 8-bit read-write / HRC\_SEND\_RCV\_RELAY

Bit	Name	Description
7–4	[no name]	Not used.
3–0	TX_BNC	For channels that use BNCs only — when set, the corresponding channel transmits data; when clear, it receives data. For channels that use fiber-optic connectors, these bits have no effect.

## 0x26 Parallel Data Size

**Access / Notes:** 8-bit read-only / HRC\_PARALLEL\_DATA\_SZ

For boards of Rev 20 or above, this register is not used.

Bit	Name	Description
7–4	[no name]	Not used.
3–0	8/4_BIT	When clear, the transceivers clock for 8-bit parallel transmit data and return received 8-bit parallel data. When set, clocks are doubled and 4-bit data is transmitted.

## 0x27 Enable Laser

**Access / Notes:** 8-bit read-write / HRC\_ENABLE\_LASER

For boards of Rev 20 or above, this register is not used.

Bit	Name	Description
7–4	[no name]	Not used.
3–0	8/4_BIT	When set, enables the transmitting lasers for the corresponding channel's fiber-optic transceiver. When clear, the laser is disabled and data cannot be transmitted on that channel. (It can be received, though.) For channels that use BNCs, these bits have no effect.



## 0x2A–2D Channel Framing Control and Status

**Access / Notes:** 8-bit read-write / [access below]

0x2A = Channel 0 (HRC\_CH0\_FRAMING)  
 0x2B = Channel 1 (HRC\_CH1\_FRAMING)  
 0x2C = Channel 2 (HRC\_CH2\_FRAMING)  
 0x2D = Channel 3 (HRC\_CH3\_FRAMING)

Bit	Name	Description
7	[no name]	Not used; always reads 0.
6	FRAME_LOCK	When set, the framing circuitry has locked onto incoming OC3 / STM1 frames.
5	BYTE_SYNC	When set, the byte synchronization framing pattern is found.
4	BIT_SYNC	When set, the bit synchronization framing pattern is found.
3		Not used; always reads 0.
2	SEARCH	Set and then clear to cause the framing circuitry to drop and then relock onto the OC3/ STM1 framing patterns.
1	DESCRAMBLE	When set, enables descrambling.
0	[no name]	When set, enables framing

## 0x48 Loss of Signal

**Access / Notes:** 8-bit read-only / HRC\_LOSS\_OF\_SIGNAL

Bit	Name	Description
7–4	[no name]	Not used.
3–0	LOS[3–0]	When set, indicates that the transceiver for the corresponding channel cannot detect an external signal. If remote or local loopback is enabled (see <a href="#">0x22 Channel Loopback</a> ), this signal still shows input signal status; it is independent of loopback mode.

## 0x72 PRBS15 Generator

**Access / Notes:** 8-bit read-only / HRC\_PRBS15

Bit	Name	Description
7–4	[no name]	Not used.
3–0	PRBS15_EN[3–0]	When set, enables PRBS15 test code generation for the corresponding channel.

## 0x7F Board ID

**Access / Notes:** 8-bit read-write / EDT\_BOARDID

Used to identify EDT mezzanine boards. A value of 0x2 in the lowest four bits indicates an extended board ID, hard-wired into a nonvolatile complex programmable logic device (CPLD). The `extbdid` application seeks the identifier in the board ID register; if it finds a value of 0x2, then it seeks the extended board ID from the CPLD instead.

Bit	Access	Name	Description
7–4	RW	[no name]	Used by <code>extbdid.exe</code> .
3–0	R only	BOARD_ID	See the table below for details on EDT board ID and extended board ID (CPLD).

**Table 1. EDT Board ID and Extended Board ID (CPLD)**

Bd ID Register, Bits 3–0	Ext. BdID	Mezzanine Board	* Main Boards It Works With	Detail
0 0 0 0	0x0	RS422	LX, GS, SS	–
0 0 0 1	0x1	LVDS	LX, GS, SS	–
0 0 1 0	0x2	Reserved	–	For extended board IDs (below).
– – – –	0x0A	SRXL	LX, GS, SS	–
– – – –	0x10	16TE3	LX, GS, SS	–
– – – –	0x11	OC192	LX, GS	–
– – – –	0x12	3x3G	LX, GS, SS	–
– – – –	0x13	MSDV	LX, GS, SS	–
– – – –	0x14	SRXL2 (rev01 & 02)	LX, GS, SS	Contact EDT to exchange for later revision.
– – – –	0x15	Net10G	LX, GS	–
– – – –	0x16	DRX	AMC	–
– – – –	0x17	DDSP	LX, GS, SS	–
– – – –	0x18	SRXL2 (rev03+)	LX, GS	For the IDM + LBM option.
– – – –	0x19	SRXL2 (rev03+)	LX, GS	For the IDM + IDM option.
– – – –	0x1A	SRXL2 (rev03+)	LX, GS	For the IMM + IMM option.
– – – –	0x1B	SRXL2 (rev03+)	LX, GS	For the IMM + LBM option.
– – – –	0x1C	SRXL2 (rev03+)	LX, GS	For the IDM + IMM option.
– – – –	0x1D	DRX16	LX, GS	For the IDX + IDX option.
– – – –	0x1E	OCM2.7G	AMC	–
– – – –	0x1F	3P	LX	–
0 0 1 1	0x3	Reserved	–	–
0 1 0 0	0x4	SSE	LX, GS, SS	–
0 1 0 1	0x5	HRC	LX, GS, SS	For E4, STS3, STM1 / OC3 I/O.
0 1 1 0	0x6	OCM	LX, GS, SS	–
0 1 1 1	0x7	Combo 2	LX, GS, SS	For LVDS I/O.
1 0 0 0	0x8	ECL/LVDS-E/RS422-E	LX, GS, SS	For ECL, LVDS, RS422, E1/T1 I/O.
1 0 0 1	0x9	TLK1501	[Legacy]	–
1 0 1 0	0xA	Reserved	–	–
1 0 1 1	0xB	Combo 3	LX, GS, SS	For RS422 I/O.
1 1 0 0	0xC	Combo 3	LX, GS, SS	For LVDS I/O.
1 1 0 1	0xD	Combo 3	LX, GS, SS	For ECL I/O.
1 1 1 0	0xE	Combo 2	LX, GS, SS	For RS422 I/O.
1 1 1 1	0xF	Combo	LX, GS, SS	For ECL I/O.

\* LX = PCIe8 LX / FX / SX; GS = PCI GS; SS = PCI SS; AMC = AMC FX5

## 0xA0 Mezzanine Board Bitfile Version

**Access / Notes:** 8-bit read-write / MEZZ\_BITFILE\_VER

Use this register to read the FPGA configuration file version string from ROM. Write the ROM address to the register and read the ASCII data from the same register. The version string is a maximum of sixteen bytes long, so only the first four bits of the address are significant.

Bit	Name	Description
7–0	ID_ADD_DATA	Write an address from which to read the ROM contents. Result is <code>sshrc x.y</code> where <code>x</code> is replaced with the major revision (1 as of this printing) and <code>y</code> the minor version of the FPGA configuration file.

# Revision Log

Below is a history of modifications to this guide.

Date	Rev	By	Pp	Detail
20120122	03a	PH,MM	14, 16	<ul style="list-style-type: none"> <li>Corrected second "0x16,17" register to "0x18,19."</li> <li>Corrected second "0x25" register to "0x26."</li> </ul>
20120122	03a	PH	All	<ul style="list-style-type: none"> <li>Repaginated entire book with arabic numerals from title page to end.</li> </ul>
20100600	03	PH	i-2	<ul style="list-style-type: none"> <li>Updated title pages (new format).</li> <li>Updated "Related Resources" (new format).</li> <li>Added "FPGAs" and "Companion Products" sections.</li> </ul>
20100600	03	PH	7	<ul style="list-style-type: none"> <li>Changed head "Testing Procedures" to "Basic Testing."</li> </ul>
20100600	03	PH,MM, TL,BO	3-7	<p>Text inset "apps &amp; utilities" – reinserted, with these changes:</p> <ul style="list-style-type: none"> <li>Deleted "xtest" per MM.</li> <li>Changed subhead "Testing Files" to "Basic Testing Files" per TL.</li> </ul> <p>Text inset "config" – reinserted, with these changes:</p> <ul style="list-style-type: none"> <li>Changed "PROM" to "flash memory" &amp; rewrote Step 2 to say "If the file date is older than the date of the file already in flash memory..." per TL / BO.</li> </ul>
20100600	03	PH	All	<ul style="list-style-type: none"> <li>Text: Changed "Xilinx" to "FPGA" and "PCI" to "PCI / PCIe" where applicable.</li> </ul>
20100600	03	PH	End	<ul style="list-style-type: none"> <li>Registers: <ul style="list-style-type: none"> <li>All – updated to new format</li> <li>0x7F Board ID – updated to new content</li> <li>0x0F Configuration &amp; 0x16 LSB – updated notes &amp; data word structure table</li> </ul> </li> </ul>
20100600	03	PH	End	<ul style="list-style-type: none"> <li>Added Revision Log.</li> </ul>
20100600	03	PH	All	<ul style="list-style-type: none"> <li>Incorporated the HRC 16-channel addendum information into this guide.</li> </ul>
20060000	00-02	LW	All	<ul style="list-style-type: none"> <li>Created new guide.</li> </ul>