Stretch DVR RDK Installation and Quick Start Guide

Version 2.0

Confidential & Proprietary

Last modified: December 09, 2008

Part #: RU-0124-0002-000

Contents

Chapter 1 Hardware and Software Requirements and Installation

IMPORTANT!

This document is intended to guide you through the installation of hardware and software supplied with a new evaluation or reference design kit. If you are upgrading previously installed hardware, refer to the *Upgrading the PCIe DVR EVK/RDK* document for the current release.

NOTE: This guide applies to the VRC6016 (formerly, S6D1X16), the VRC6416, and the VRC6008 PCIe DVR boards. When a statement applies to all boards, the board designation used is VRC60xx. References to labels on a board are indicated with the VRC6016/VRC6416 label first followed immediately by the VRC6008 label in parentheses (for example, *J10* (*J9*)). Some directories and file names contain *vrc6016*, *vrc6416*, and *vrc6008* to differentiate the board to which they apply. For simplicity in instructions, that portion of the instruction is designated *vrc60xx*. Statements applying to only one board are clearly stated as such.

The following tasks are covered here:

- Installing the DVR Evaluation Kit (EVK) or Reference Design Kit (RDK) software
- Installing the PCIe DVR board
- Installing the PCI driver
- Running the sample DVR application
- Setting up the development environment
- Building the DVR application and the host software
- Loading the application firmware into Flash memory

1.1 Package Contents

The kit packages consist of the following components:

1. VRC60xx PCIe DVR board
2. Two alarm input–output daughter cards
3. Audio squid cable
4. Video squid cable

5. Ribbon cables for connection to the daughter cards
6. Stretch debug module
7. Ribbon cable for connection to the debug module
8. Male-to-female DB9 cable for the UART
9. Catapult Ethernet JTAG Probe
10. A zip file containing RDK/EVK software — located on the CD in the kit
11. DVR-to-PC reset cable

1.2 PC Requirements for Using the DVR Development Kit

Your PC must have the following hardware and software installed to be able to use the DVR development kit:

- Intel Pentium 3 GHz or higher, or 2.4 GHz dual-core or higher, or equivalent CPU, and at least 1 GB memory
- One available PCI Express slot
- One available disk drive power connector
- Display card that supports DirectX 9.0 (for Windows)
- For Windows installations, one of the following
  - Windows XP Professional Service Pack 2 or later
  - Windows Vista Business (this is a beta release for Windows Vista)
- For Linux installations: Red Hat Enterprise Linux 5 or CentOS 5

  NOTE: CentOS is available for download from http://www.centos.org.
- X Windows Server and display drivers supporting XVideo (Xv) extensions (for Linux)
- Web browser and Acrobat Reader for viewing documentation

1.3 Installing the RDK/EVK Software

Before you install the DVR hardware, you must install the RDK/EVK software, which is in the zip file included with the kit. Uncompress, extract, and save the contents of this zip file on your disk. The contents are organized into directories as follows:

<installpath>EVK/codecs **<installpath>RDK/codecs**	CODEC libraries, include files, and documentation
<installpath>EVK/SDVR **<installpath>RDK/SDVR**	DVR firmware and host-side modules, sources, pre-built binaries, documentation

NOTE: For a Linux installation we recommend that you use a root `<install path>` of `<user root path>/stretch` when you install the DVR EVK/RDK software; for Windows we recommend that you use `c:\stretch`.

The DVR software and documentation files are further organized as follows:

SDVR/bin/vrc6016 SDVR/bin/vrc6416 SDVR/bin/vrc6008	Device-specific pre-built executables and ROM images for the DVR application firmware
SDVR/doc	Documentation for the DVR SDK, the DVR firmware, and the demo application
SDVR/src/board/bootloader	DVR boot loader sources and makefiles
SDVR/src/board/diag	DVR board diagnostics sources and project files
SDVR/src/board/bsp	DVR board support package source files
SDVR/src/board/dvr-aux	DVR board AUX firmware sources and project files
SDVR/src/board/dvrfw	DVR board firmware sources and project files
SDVR/src/board/SCT	SCT sources and makefile
SDVR/src/common-include	Include files shared by the DVR firmware and the host software
SDVR/src/host/apps/dvrcp	DVR demo application sources—for reference only. *The demo application can be rebuilt only if the Trolltech Qt tool kit is available.*
SDVR/src/host/apps/sdvr-diag	DVR diagnostic application sources
SDVR/src/host/bin/windows	Pre-built libraries and executables
SDVR/src/host/include	Header files for the DVR SDK
SDVR/src/host/installer	Installer for the demo application

SDVR/src/host/lib/windows	Pre-built debug and release libraries for the drivers and SDK
SDVR/src/host/src/codecs	Source code for audio CODECs and MP4 file I/O library
SDVR/src/host/src/driver/linux/drv-s6	Sources and makefile for Linux PCI driver
SDVR/src/host/src/driver/linux/include	Include files shared by the Stretch Linux PCI driver and SCT
SDVR/src/host/src/driver/linux/lib_sct	Sources and makefile for Linux version of SCT
SDVR/src/host/src/driver/windows/Driver	Sources and project file for the Stretch Windows® PCI driver for the VRC60xx board
SDVR/src/host/src/driver/windows/inc	Include files shared by the Stretch Windows PCI driver and SCT
SDVR/src/host/src/driver/windows/SCT	Sources and project files for the Stretch PCI API to communicate with VRC60xx firmware
SDVR/src/host/src/player	Host-side player source files
SDVR/src/host/src/sdk	Sources and project file for the DVR SDK libraries
SDVR/src/xocd	Configuration files for XOCD to work with JTAG probes

The CODEC software and documentation files are further organized as follows:

codecs/doc	Documentation for the CODEC libraries
codecs/lib/vdec264_sc_aux codecs/lib/vdec264_sc_scp	H.264 decoder libraries and header files
codecs/lib/venc_264_sc_aux codecs/lib/venc264_sc_scp	H.264 encoder libraries and header files
codecs/lib/vncmpeg4_sc_aux codecs/lib/vencmpeg4_sc_scp	MPEG4 encoder libraries and header files
codecs/lib/ziebp_aux codecs/lib/ziebp_scp	Intelligent encoder base package, SCP and AUX libraries and header files

1.4 Installing the PCIe DVR Board

IMPORTANT! Be sure to disconnect the PC's power cord before installing the PCIe card as some PCs maintain power to the motherboard even though the PC is switched off.

The PCIe DVR board is designed to be used in the PCIe slot in a PC, but not as a stand-alone board. To install the hardware, carefully unpack the board from its anti-static case and insert it into the PCIe slot of a powered-down PC.

1.4.1 Connecting Power

The board must be powered from the PC's ATX power supply. Locate an unused SATA disk drive connector on the PC's power supply and connect it to the power connector on the board. This connector is labeled *J17*(*J11*)and is located on the upper left side of the board (see Figure 1-1 and Figure 1-2)

If your PC does not have an unused SATA disk drive connector, use an IDE-to-SATA adapter cable (not supplied with the kit) like the one shown in Figure 1-3.

VRC6016 AND VRC6416 ONLY

On the VRC6016 and VRC6416, if the IDE-to-SATA adapter cable is used, you must install a jumper on *J13* (located near the PCIe edge connector) to enable the board to draw 3.3V from the PCIe slot.

IMPORTANT!

VRC6016 AND VRC6416 ONLY

Some PC systems have SATA power connectors that do not contain a 3.3V supply line. Normal SATA connectors contain five wires from the power supply (typically color-coded White-Black-Red-Black-Orange). In the case of non-standard connectors, the last wire (typically color-coded Orange) is not present. In these cases, 3.3V is not supplied to the card from the SATA connector; therefore, installation should proceed as if an IDE-to-SATA adapter cable is being used by placing a jumper (supplied in this kit) on *J13* to draw 3.3V power from the PCIe interface.

Figure 1-1 Board Power Connector (VRC6016 and VRC6416)

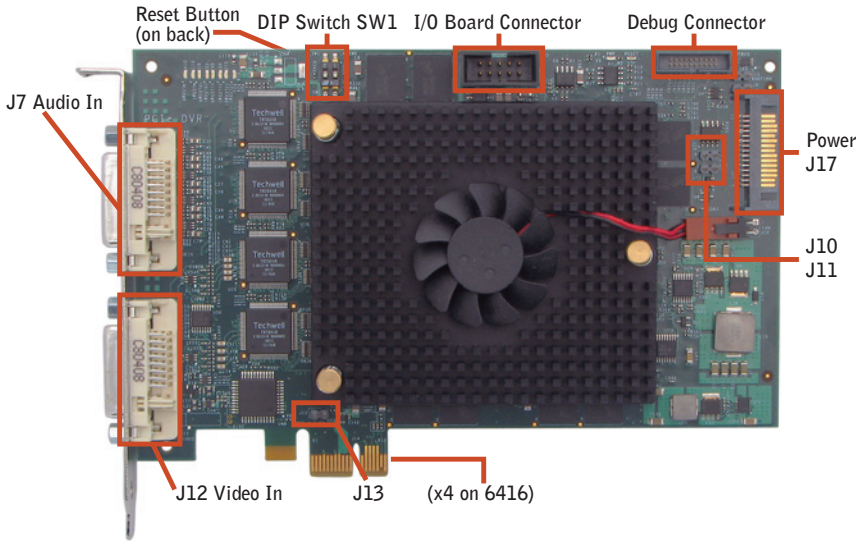


Figure 1-2 Board Power Connector (VRC6008)

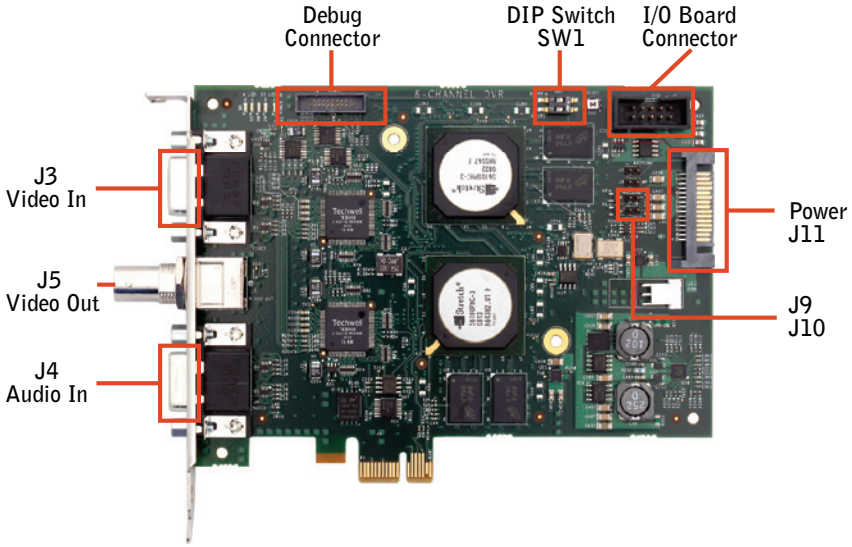


Figure 1-3 Typical IDE-to-SATA Adapter Cable

1.4.2 Connecting Audio and Video Cables

Locate the video squid cable (for VRC6016 and VRC6416 this is a DVI-to-BNC cable with yellow housing for the connectors; for VRC6008 this is a DB15 HD cable with yellow housing for the connectors) provided in the DVR RDK/EVK package. Connect the DVI/DB15 HDI side to the DVI/DB15 HD connector labeled *J12* (*J3*) on the board.

Locate the audio squid cable (for VRC6016 and VRC6416 this is a DVI-to-BNC cable with red housing for the connectors; for VRC6008 this is a DB15 HD cable with red housing for the connectors) provided in the DVR RDK/EVK package. Connect the DVI/DB15 HD side to the DVI/DB15 HD connector labeled *J7* (*J4*) on the board.

To connect the spot monitor output (SMO) on the VRC6016 and VRC6416, locate the connector labeled *17* on the video squid cable, and connect it to a monitor set up for composite video; on the VRC6008, use the supplied BNC connector.

1.4.3 Connecting Reset

An optional DVR reset connection can be made to the host PC reset signal using the DVR-to-PC reset cable. To do so, connect one end of the DVR-to-PC reset cable to the J10 (J9) or J11 (J10) DVR board jumper, and the other end to the host PC reset signal usually available on the mother board. Use the following table to ensure the right polarity of the cable connection.

J10 (J9) or J11 (J10)	Description	Function
1	Positive	PC Reset
2	Negative	Must be connected to ground

NOTE: Jumpers J10 (J9) and J11 (J10) are connected in parallel, so either one or both can be used.

1.4.4 Board Settings

Before downloading or running an application, make sure DIP switch SW1 on the back of the board is set properly for the desired activity.

Switch	Description	Function
1	On - Boot enabled Off - Boot disabled	PCI boot enable
2	On - Run Application Off - Manufacturing diagnostics	Application select

For normal operation, both switches must be on (toward the heat sink on VRC6016 and VRC6416, or toward the I/O board connector on VRC6008).

1.5 Connecting the Alarm I/O Daughter Cards to the DVR

Figure 1-4 and Figure 1-5 show how the alarm I/O daughter cards connect to the DVR board.

1.5.1 Setting the Alarm Card DIP Switches

There are two DIP switches on the alarm I/O cards, SW1 and SW2, SW1 controls the TWI address for the PCA9535 TWI expander IC and the AT25C01BN EEPROM. SW2 controls RS485 termination.

Figure 1-4 Connecting the Alarm I/O Daughter Card (VRC6016 and VRC6416)

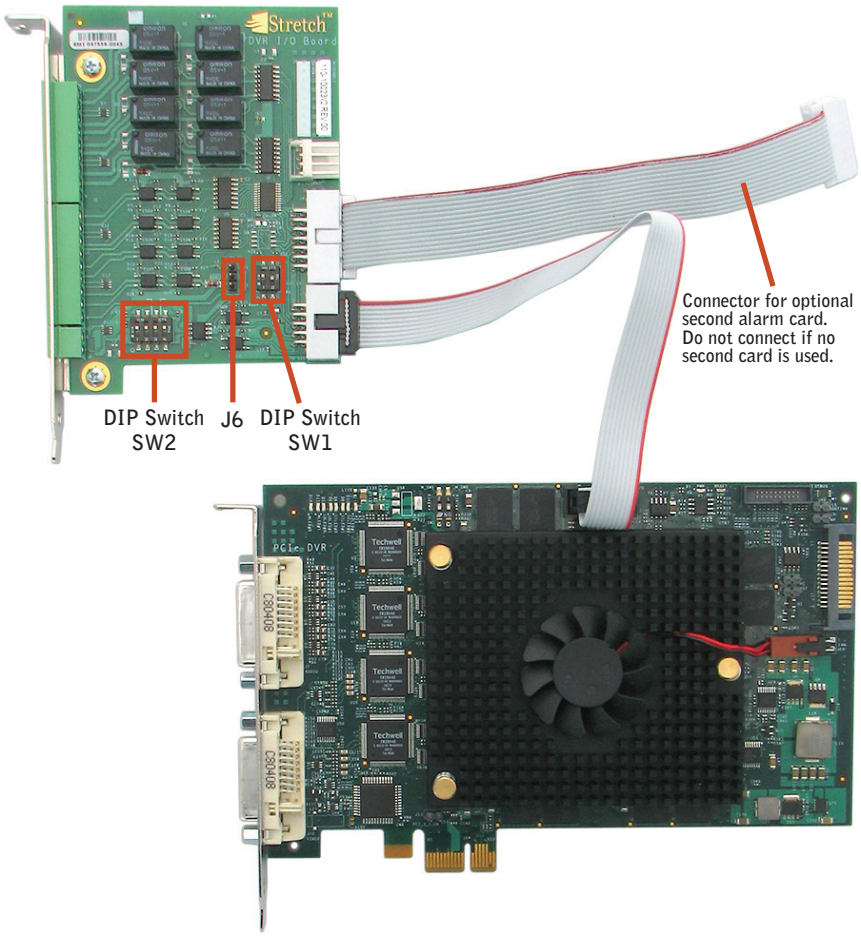
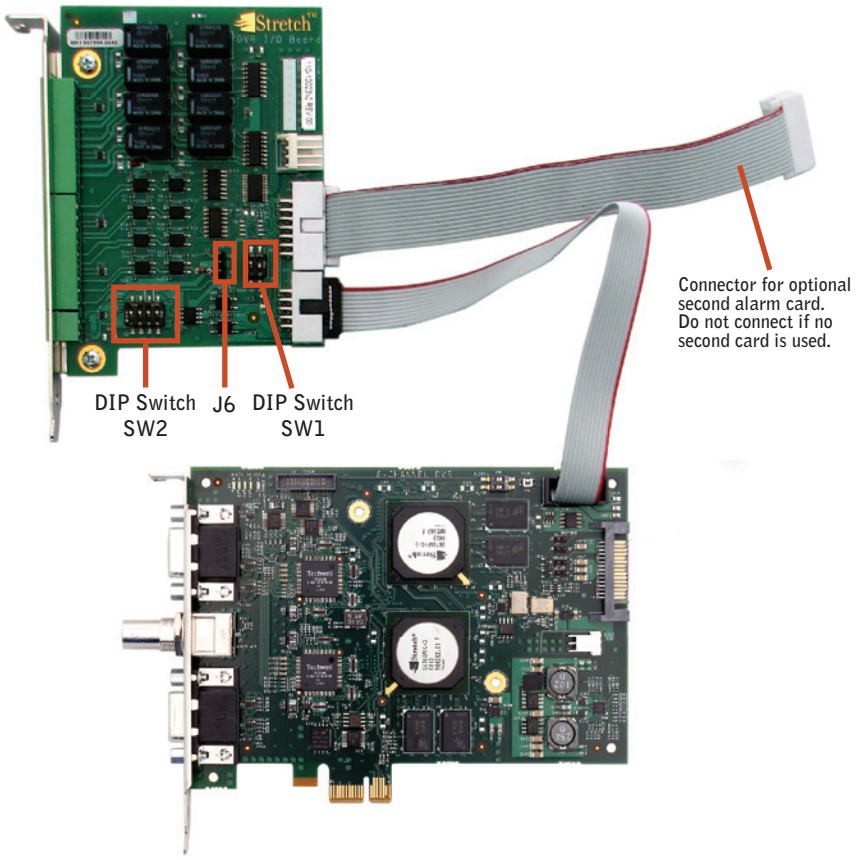


Figure 1-5 Connecting the Alarm I/O Daughter Card (VRC6008)



The following table shows the settings for SW1.

SW1 A1	SW1 A0	TWI Address PCA9535 0100_0[A1][A0]R/W	TWI Address AT24C01BN 1010_0[A1][A0]R/W	I/O Board #
0	0	0100_000x	1010_000x	1
0	1	0100_001x	1010_001x	2
1	0	0100_010x	1010_010x	N/A
1	1	0100_011x	1010_011x	N/A

If two I/O boards are connected to a single DVR, the switch settings must be different on each board to prevent an address collision on the TWI bus. Therefore, when using two I/O boards, set one I/O board for address 0100_000x and the other one for 0100_001x (or vice versa).

NOTE: Currently, a DVR system can support a maximum of two I/O boards. Therefore, only two switch setting on SW1 are valid, as shown previously. Using unsupported addresses on SW1 causes a failure to read the I/O board's configuration and prevents further use of the board.

IMPORTANT! If the TWI addresses are the same for two I/O boards, then reading the board configuration and subsequent use of the boards will fail. Be sure to use separate addresses for proper operation.

SW2 is a 4-position switch that is used to control RS485 termination. Use position 4 alone to get the more common differential termination; use positions 1 and 2 together to get active termination. Position 3 is unused.

The following table shows the settings for SW2.

Active Termination [1]		Unused	Differential Termination [2]
Position 1	**Position 2**	**Position 3**	**Position 4**
Off	Off	n/a	On [3]
On [4]	On [5]	n/a	Off

[1] Alternate setting
[2] Recommended setting
[3] Closed applies a 120OHM resistor across the POS and NEG pins of the RS485 pair. This is the most common setting.
[4] Closed applies a 1K pull-up resistor to the POS pin of the RS485 signal
[5] Closed applies a 1K pull-down resistor to the NEG pin of the RS485 signal

1.5.2 Setting the Alarm Card Jumpers

The alarm inputs can operate in two modes. In the default mode, the alarm inputs are active low. In this mode, the inputs need to be grounded to create an alarm event and the opto-isolators are normally off. Place a jumper at J6 pins 1 and 2 to select this mode. This is also referred to as the *wet mode*. The second mode is called the *dry mode*. In this mode, the opto-isolators are normally on. To select this mode place a jumper at J6 pins 2 and 3. While in this mode, the alarm inputs need to be driven high.

1.6 Installing on Windows

The following sections describe how to install the PCI driver and the sample DVR application for use under Windows. The sample DVR application, also known as the DVR Control Panel (DVRCP) application, is provided with the DVR EVK/RDK release. The sample DVR application is intended to be used for demonstrations, testing, or as an initial reference design for a more full-featured host side DVR application developed by a customer.

1.6.1 Installing the Windows PCI Driver

After you have set up the hardware, restart your computer. Windows detects the new hardware and the Found New Hardware wizard asks you to install a driver for the device. In the first step, choose not to find the driver automatically (select the No, not for this time option). In the second step, choose to install the driver from a specific location and select the `<install path>/SDVR/src/host/bin/windows/Release` directory as the location to find the driver files (this directory contains the `.sys` and the `.inf` files for the driver). Windows finishes installing the driver for you. You may see a warning dialog, and if so, click Continue Anyway.

1.6.2 Installing the Sample DVR Application on Windows

Before proceeding, be sure you have set up the hardware and installed the PCI driver successfully.

To install the sample DVR application, follow these steps:

1. Locate and run the install program `setup.exe` in the `<install path>/SDVR/src/host/installer` directory.
2. Follow the install program instructions to install the sample DVR application.

Refer to the *Stretch DVR Control Panel User's Guide* in the `<install path>/SDVR/doc` directory for more information on how to use the sample DVR application to set up a DVR system.

1.6.3 Running the Sample DVR Application

Follow these steps to run the sample DVR application:

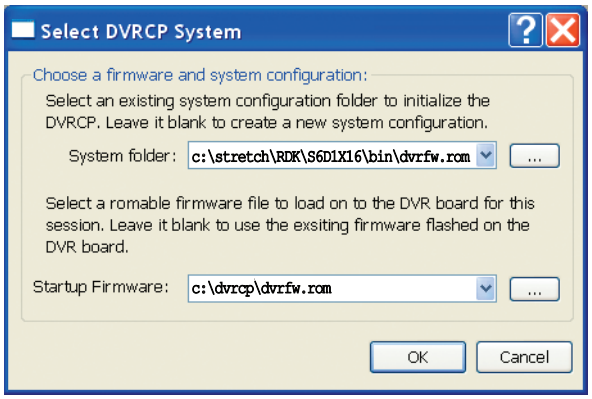
1. Run the sample DVR application by selecting the following from the Start menu:

   Start Menu -> Stretch -> dvrcp.exe

   The dialog in Figure 1-6 on page 1-12 appears.

2. In the Startup Firmware field, type the path to the ROM file that you want to load (or use the Browse button to select the file).
3. In the System Folders field, type the name of the directory containing the system configuration XML file (or use the Browse button to select the directory). Leave this field blank if you want to create a new system configuration.

Figure 1-6 Select DVRCP System Dialog



NOTE: A ROM file must be specified as there is no application code in the onboard Flash memory—only manufacturing diagnostics are in the onboard Flash memory when the board is shipped.

NOTE: For updating the Flash with a new application image, refer to Section 2.7, “Loading the Application into the Boot Flash ROM”, on page 2-9.

1.6.4 Selecting Firmware to Load

There are prebuilt versions of the firmware for each board in the `<install path>/SDVR/bin/vrc60xx` directory. The file `vrc6016_dvrfw.rom`, which is used for both the VRC6016 and VRC6416 boards, supports 16 inputs, but only supports one channel of output at a time using the onboard analog switch. The file `vrc6016_dvrfw_smo.rom` supports 15 inputs and tiled SMO output of up to 15 channels. The file `vrc6008_dvrfw.rom` supports eight inputs only, along with the analog SMO.

1.6.5 Displaying Live Video

The demo application requires a video display supporting DirectX 9.0 to display live video (host monitor output [HMO]) and to play back recorded files. You can verify the capabilities of your video display card by running the program `dxdiag.exe` from the Windows command prompt.

1.7 Installing on Linux

IMPORTANT!

The precompiled executables and libraries included in the Linux distribution package are built for the 64-bit version of CentOS 5 (kernel version 2.6.18-53). If your Linux installation is running a different kernel version, or if you wish to use the 32-bit version of CentOS 5, you will have to recompile all the executables. Type `uname -a` in a terminal window to check your kernel version.

Unzip the distribution package using the command

```
unzip SDVR-EVK-linux.zip
```

After the zip file is unpacked, you can find the precompiled binaries in `SDVR/src/host/bin/linux/2.6.18-53el5.x86_64/bin`.

1.7.1 Installing the Linux PCI Driver

Whether you rebuild the software or use the pre-built version, the following actions are required:

VRC6016 AND VRC6416 ONLY

Change the boot parameters to reserve 96MB of memory for the Linux driver and to reserve 256MB of address space for mapping the board memory. The Linux driver requires the kernel to reserve this memory for the board to work correctly. For CentOS, edit the file `/boot/grub/grub.conf`; for Ubuntu, edit the file `/boot/grub/menu.lst`.

VRC6008 ONLY

Change the boot parameters to reserve 48MB of memory for the Linux driver and to reserve 256MB of address space for mapping the board memory. The Linux driver requires the kernel to reserve this memory for the board to work correctly. For CentOS, edit the file `/boot/grub/grub.conf`; for Ubuntu, edit the file `/boot/grub/menu.lst`.

1. Locate the line that starts `kernel vmlinux-2.6.18-53 ...`, and add `mem=xxxM vmalloc=256M` at the end of the line.

   `xxx` is the number of megabytes of memory that the system will use. For example, if the system has 512MB of physical memory, `xxx` should be 416M (512M - 96M) for the VRC6016 and VRC6416 boards, and 464M (512M - 48M) for the VRC6008 board. Currently, 1 GB is the maximum supported memory size, so the largest setting for `xxx` is 928 for the VRC6016 and VRC6416 boards, and 976 for the VRC6008 board.

2. Reboot the system.

3. After the system has rebooted, log in to the system as root, and change directory to `SDVR/src/host`.
4. Type

   ```
   make load
   ```

   This command loads the Linux driver. `make load` uses `insmod` to load the driver and uses `mknod` to create the device file. Read the makefile under `SDVR/src/host/src/driver/linux` for more information on these commands. You can edit `/etc/local.rc` to automatically load the driver.

1.7.2 Running the Sample DVR Application

Follow these steps to run the sample application:

1. After the driver is loaded, to start the DVRCP test application, run

   ```
   SDVR/src/host/bin/linux/$(kernelversion).$(archname)/
   bin/dvrcp
   ```

   The application asks for the firmware path.

2. Select the appropriate ROM file from `SDVR/bin` as the firmware.

   DVRCP loads the firmware and boots the board.

   DVRCP also asks for a path to the system configuration file; leave this field blank if you have no configuration file to load.

1.7.3 Displaying Live Video

The DVRCP demo program requires an X Server that supports Xv extensions to display live video. If the X Server does not support Xv extensions, you can still use DVRCP to record video, but playback and host monitor output (HMO) will not work. To find out if your X Server and video driver support Xv extensions, at a shell prompt, type

```
xvinfo
```

If `xvinfo` prints “No adapter found” (or something similar), Xv is not supported.

During installation, CentOS installs an Xv-capable driver/server if it detects a video card that supports it. If your card does not support Xv extensions, you may have to download the driver software from your video card manufacturer’s web site and install it. ATI and Nvidia both provide Linux drivers for download. The Stretch DVR kit has not been tested with any other type of video card.

1.8 Running the Diagnostic Application

To run the board diagnostic test application, `sdvr-diag.exe`, which can be found in the same location as the DVRCP sample application, `<install path>/SDVR/src/host/bin/Windows/Debug` and `/Release` directories, enter the following command. It runs various tests on the board and then prints the test results. The diagnostic can only be run when the sample DVR application is not running.

To run the diagnostic, open a command shell and change to the appropriate directory.

At the prompt, type the following:

`sdvr-diag.exe` *<board-index> <path-to-fw>*

where *<board-index>* is 1 for the first board, 2 for the second, and so on. *<path-to-fw>* is the complete path to the diagnostic firmware `.rom` file. This file, `dvrdiag.rom`, is prebuilt and in the `<install path>/SDVR/bin/vrc60xx` directory. After the test completes successfully, the results for each chip on the board are displayed.

Chapter 2 Setting Up the Development Environment for the PCIe DVR

This section describes how to set up the development environment for the PCIe DVR.

2.1 Hardware and Software Requirements

To set up the DVR development and debug environment, you need the following hardware and software:

- A PC running Windows XP Service Pack 2 that includes the following:
  - An RS-232 (UART) port
  - A parallel port (LPT) for the wiggler or a network connection for the Catapult
- For modifying or rebuilding the firmware:
  - Stretch Software Development Tools Release 2008.09 or later
  - Xtensa OCD version 7.0.1 or later
- Stretch DVR EVK or RDK
- A Stretch S6 debug board
- A ribbon cable for connecting the debug board and DVR
- A UART cable
- A Catapult JTAG probe and an Ethernet cable

NOTE: For Windows, if you wish to run `dvrcp`, or use the display API in the SDK, you need a display card that supports DirectX 9.0 or later. For Linux, you need a display card that supports X Windows Xv extensions.

NOTE: If the Stretch Software Development Tools and the XOCD software are not installed, refer to the following documents for how to do so:

- *Stretch SDK Installation Guide for Windows XP* (included in the Stretch Software Development Tools Release download)
- *Installing and Configuring the Catapult EJ-1 JTAG Probe* guide
- Section 2.4, “Installing the JTAG/OCD Software on Your PC”, on page 2-5

NOTE: To obtain the latest version of the Stretch Software Development Tools and the Xtensa OCD software and documentation, download them from the stretch customer portal at https://support.stretchinc.com/.

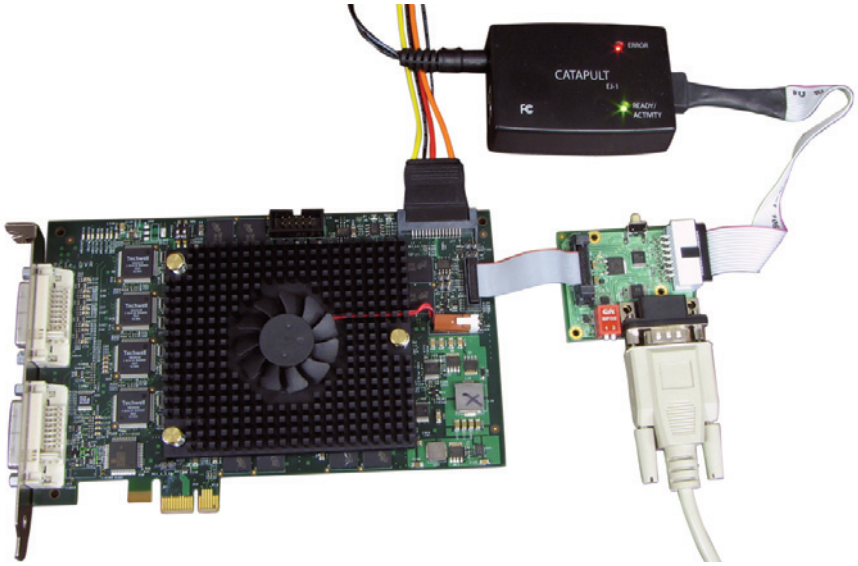
If you wish to modify or rebuild the SDK, PCI driver, or demo application, refer to Section 2.5, "Building the SDK, Driver, and Demo Application", on page 2-6 for the tools required to do so.

2.2 Connecting the Debug Module to the DVR and the PC

Follow these steps to connect the components:

1. Turn off the power to the DVR board.
2. Connect the debug board to the DVR board using the ribbon cable.
3. Connect the debug board and the PC using the UART cable.
4. Connect the debug board and the Catapult.
5. Connect the Catapult using the Ethernet cable (Figure 2-1 illustrates a VRC6016 connection; the VRC6416 and VRC6008 are similar).
6. Make sure both switches on the debug board are up (off; see Figure 2-2).
7. Turn on the power to the PC.

Figure 2-1 VRC6016 and Debug Module Connected



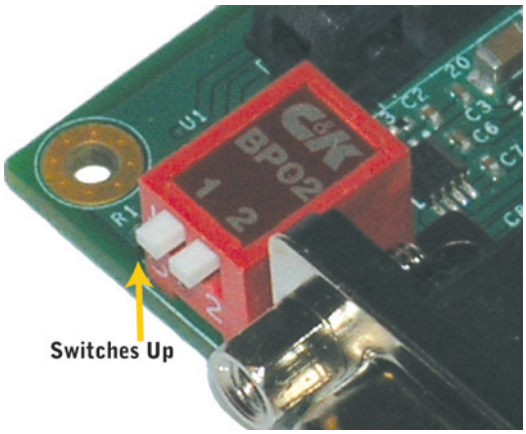
2.2.1 Board Settings and Reset

Before working with the Debug Board, make sure DIP switch SW1 is set properly for the desired activity.

Switch	Description	Function
1	On - Boot disabled Off - Boot enabled	PCI boot enable
2	On - UART disabled Off - UART enabled	UART enable

For normal operation, both switches must be off (up position).

Figure 2-2 Debug Board Switches Up



IMPORTANT! Should the boot loader firmware become corrupted, turn on DIP switch 1 and reload the boot loader firmware. After this is complete, turn off DIP switch 1 to continue. Refer to Section 2.8, “Building the Boot Loader”, on page 2-11 for more information.

IMPORTANT! During normal operation, while the DVR board is installed in a PCIe slot, do not push the reset button on the back of the board. If you use this reset button, the PCIe driver will fail and the host PC may lock up. This button is not used except in certain situations to assist with activities like installing the DVR board boot loader firmware; it is not meant to be used during normal operation.

2.3 Setting up the UART Monitor Window

The UART provides the window into the DVR board operations. It is the standard output for processor 0 and the DVR board. Follow these steps to set it up:

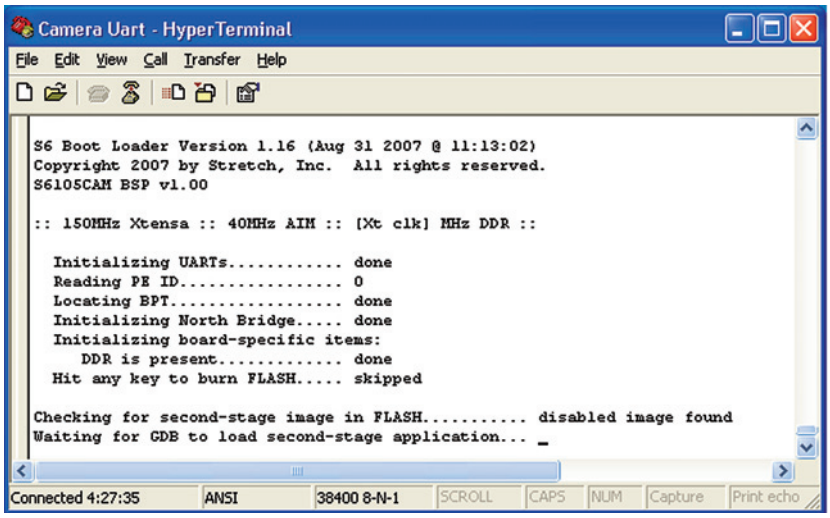
1. Start a HyperTerminal (or similar program) and then configure it with the following settings:

Port: Set this to the COM port to which your UART cable is connected
Baud: 38400 bps
Data bits: 8
Parity: None
Stop bits: 1
Flow Control: None

2. Make sure your HyperTerminal is in connected mode.
3. Press the reset button on the debug board.

If you see messages printed to the HyperTerminal window (see Figure 2-3), the UART is operational (the messages may not exactly match those in Figure 2-3); otherwise, contact your Stretch support representative for assistance.

Figure 2-3 Successful UART Monitor Window Set-up



2.4 Installing the JTAG/OCD Software on Your PC

Follow these steps to install the JTAG/OCD software. These steps are also described in `<install path>/SDVR/src/xocd/README`.

1. Use XOCD version 7.0.1 or later. You can download the latest supported version from the Stretch Customer Portal.
2. After you install XOCD, copy the appropriate topology file from `<install path>/SDVR/src/xocd` into the `<daemon install path>/Tensilica/Xtensa OCD Daemon 7.0.1` directory, and rename it `topology.xml`.

   NOTE: The default configuration files included in the XOCD installer will not work for this board. Configuration files for use with ByteTools Catapult probe are included as discussed with this kit.

3. If you are using the ByteTools Catapult EJ-1 Ethernet JTAG probe, edit the topology file and set the probe's IP address in the ipaddr field.

   NOTE: *TN-0100: Installing and Configuring the Catapult EJ-1 JTAG Probe,* available on the Stretch Customer Portal, explains how to set up the probe and discover its IP address.

4. Run the Xtensa OCD Daemon (XOCD) by selecting the following from the Start menu:

   Start Menu -> Xtensa OCD Daemon 7.0.1 -> Xtensa OCD Daemon

   Make sure to unblock the program if you have a firewall enabled, otherwise you will not be able to connect to it.

5. Use the following steps to verify installation:

   a. Open a Stretch command shell and type:

   ```
   st-gdb
   ```

   b. From the debugger prompt, type:

   ```
   target remote localhost:20000
   ```

   or

   ```
   target remote <xocd_server>:20000
   ```

   where <*xocd_server*> is the name or IP address of the machine where XOCD is running, and 20000 is the port number. You should be able to connect to the processor and examine its registers.

VRC6016 AND VRC6416 ONLY

Ports 20000–20003 connect to the S6SCP processors, and ports 20004–20007 connect to the S6AUX processors. That is, port 20000 connects to the S6SCP in the first (master) S6 device, port 20001 connects to the S6SCP in the second S6 device, and so on.

VRC6008 ONLY

Ports 20000–20001 connect to the S6SCP processors, and ports 20002–20003 connect to the S6AUX processors. That is, port 20000 connects to the S6SCP in the first (master) S6 device, port 20001 connects to the S6SCP in the second S6 device, and so on.

6. Refer to the Stretch IDE documentation for how to establish a board connection to the Stretch IDE using XOCD.

2.5 Building the SDK, Driver, and Demo Application

The next two sections describe how to build the SDK, driver and demo application on Windows and on Linux.

2.5.1 Building on Windows

NOTE: Windows Vista is supported only as beta for this release.

The following development tools are required to build the SDK and other host-side software:

- Microsoft Visual Studio or Visual C++ version 2003 or later (the code compiles fine with version 2003, but the project files are all version 2005-compatible)
- Microsoft Windows Drivers Kit (WDK), version 6001.18001, for building the Windows PCI drivers. This can be downloaded from http://www.microsoft.com/whdc/DevTools/wdk/WDKpkg.mspx
- Microsoft Windows DirectX SDK, version March 2008 or later. This is available for download from http://www.microsoft.com/downloads/

IMPORTANT!

Set the environment variable `MS_DDK_ROOT` to point to the root directory where the DDK is installed. Failing to do so prevents the driver from being built.

IMPORTANT! To build the dvrcp sample DVR application, you need the Qt toolkit from Trolltech, version 4.0 or later. This is not free software. Set the QT root environment variable to where qt is installed.

IMPORTANT! To be able to use the DirectX SDK, make sure to add C:\Progam Files\Microsoft DirectX SDK (March2008)\Include to the include path, and C:\Progam Files\Microsoft DirectX SDK (March 2008)\lib\x86 to the libraries path. The exact paths may differ based on the version of the DirectX SDK. You also need to include the libraries `ddraw.lib` and `dxguid.lib` in your project settings.

To build the DVR SDK, SCT, PCIe driver, and the DVR Diagnostic application, use the batch file `dvr_host.bat`. This batch file invokes the Microsoft Compilation tools on the solution file `dvr_host.sln`. Both files are located in the `<install path>/SDVR/src/host` directory.

Open a command shell and type the following:

```
dvr_host.bat msvcexpress
```

or

```
dvr_host.bat msvc
```

To build the DVR Diagnostic application, sample DVR application, and its install program use the batch file `dvr_host.bat`. This batch file invokes the Microsoft Compilation tools on the solution files `dvr_host.sln`, `dvrcp.sln`, and `sdvrdemo_setup.sln`. All these files are located in the `<install path>/SDVR/src/host` directory.

Open a command shell and type the following:

```
dvr_host.bat msvcexpress dvrcp
```

or

```
dvr_host.bat msvc dvrcp
```

NOTE: Depending on what release of the MS Visual C++ or MS Visual C++ Express tools you are using, you may need to edit the `dvr_host.bat` file to set the correct path to the MS tools to set up the build environment.

NOTE: MS Visual C++ Express tools do not support building installation programs. This step will be skipped if you are using these tools.

After the libraries are built, you can copy them and the DLLs into the appropriate location in your project and link them into your DVR application.

NOTE: The DVR SDK header file `sdvr_sdk.h` used in these builds can be found in the `<install path>/SDVR/src/host/include` directory.

2.5.2 Building on Linux

After the zip file is unpacked, the precompiled Linux binaries are located in `SDVR/src/host/bin/linux/2.6.18-53.e15.x86_64/bin`, where `2.618-53e15.x86_64` is the kernel version.

Type `uname -a` in a terminal to check whether your kernel version matches the version in the unpacked file. If it does not match, you need to recompile the binaries.

The following packages are required to rebuild the software (for other distributions, the packages should have similar names):

CentOS 5	Ubuntu 7.10
gcc-c++	g++
libaio-devel	libaio-dev
kernel-dev	kernel-package
qt4-devel	libqt4-dev
libXv-devel	libxv-dev

For Ubuntu, or other Debian-based distributions, use the command:

```
sudo apt-get install <package-name>
```

For CentOS, or other Red Hat-based distributions, use the command:

```
yum install <package-name>
```

To run the build

1. Change directory to `SDVR/src/host`
2. Type **`make`**

After the build is finished, the binaries will be in `SDVR/src/host/bin/linux/$(`*kernel-version*`).$(`*archname*`)/bin`, where you will find the following four files:

File Name	Purpose
dvrcp	Stretch DVR demo application
s6stretch.ko	Linux driver
lintest	Test application for developers
sctdemo_s6.rom	Test application for developers

The library files will be in `SDVR/src/host/bin/linux/$(`*kernel-version*`).$(`*archname*`)/lib`.

2.6 Building the Firmware

If you wish to modify or rebuild the DVR firmware, you first have to install the Stretch Software Development Kit release 2008.09 or later.

After the Stretch Development Tools and DVR SDK are installed, the DVR firmware can be rebuilt by following these steps:

1. The S6AUX component must be built prior to building the ROM image for the DVR firmware. To do this, using the Stretch IDE, open and build the `dvrtw_aux.spf` project in the `<install path>/SDVR/src/board/dvr_aux` directory.
2. To build the ROM image for the DVR firmware, using the Stretch IDE, open and build the `vrc6016.spf` or the `vrc6008.spf` project in the `<install path>/SDVR/src/board/dvrfw/main` directory.

   NOTE: Building the ROM image for the DVR firmware can take some time to complete, so do not terminate the build prematurely.

Refer to the Stretch IDE documentation for how to use the Stretch IDE tools.

2.7 Loading the Application into the Boot Flash ROM

NOTE: Reprogramming the DVR Flash is optional as the DVR SDK provides functions to download the DVR firmware over PCIe. The sample DVR application shows you how to do this. Refer to Section 1.6.3, “Running the Sample DVR Application”, on page 1-11 for more on how to do this.

To update the DVR application firmware in the board's boot Flash ROM, you first need to create the binary ROM-able image file. The Stretch IDE projects are set up to create the binary `.rom` files from the executable `.exe` files when you do a build. The DVR SDK also ships with pre-built `.exe` and `.rom` files.

If you modify the application in any way and rebuild it, you must use the supplied IDE project to build the correct `.rom` file. The ROM image has executables for both the S6SCP and S6AUX processors in it.

Updating the board firmware image in the DVR board Flash ROM requires you to use the `st-flash` tool on the host PC, and a JTAG connection to the DVR board, using XOCD. This requirement assumes the following has been previously completed.

- The Stretch Software Development Tools Release 2008.09 or later has been installed so that you can use the `st-flash` tool.
- The Xtensa OCD version 7.0.1 or later has been installed and set up so that you can establish an XOCD connection (refer to Section 2.4, "Installing the JTAG/OCD Software on Your PC", on page 2-5).
- The Stretch debug board has been connected to the DVR board with a Catapult JTAG probe attached (refer to Section 2.2, "Connecting the Debug Module to the DVR and the PC", on page 2-2).

  NOTE: Refer to the *Binary Utilities Reference Manual* for instructions on how to use `st-flash`. Refer to the *Stretch SDK Installation Guide for Windows XP* (included in the Stretch Software Development Tools Release download) for instructions on how to install the Stretch Software Development Tools Release 2008.09 or later.

Follow these steps to complete the update:

1. Make sure the host side DVR application is shut down.
2. Establish an XOCD connection to the DVR board.
3. Update the DVR board Flash ROM using the `st-flash` tool with the `dvrfw.rom` file as follows. The file is located in `<install path>/SDVR/src/board/dvrfw/main/Remote` directory.

   Open a Stretch command shell and type the following:

   ```
   st-flash -V -s localhost:20000 -f vrc60xx_dvrfw.rom
   -ms6100-3
   ```

   or

   ```
   st-flash -V -s <xocd_server:port> -f vrc60xx_dvrfw.rom
   -ms6100-3
   ```

   where *<xocd_server>* is the name or IP address of the machine where XOCD is running, and *<port>* is the port number.
4. After the update is complete, you can continue using the host DVR application.

2.8 Building the Boot Loader

New boards are shipped from the factory preprogrammed with the boot loader. If you have a board that came with an older release of the kit, then you need to update the boot loader from the latest release. You can rebuild the boot loader using the makefile provided with the application. This makefile is in the `<install path>/SDVR/src/board/bootloader`. directory. Change to this directory and run `st-make`. The output will be two versions of the boot loader image; the one with a `-g` suffix is the debug version.

Updating the boot loader firmware image in the DVR board boot Flash ROM requires you to use the `st-flash` tool on the host PC, and a JTAG connection to the DVR board using XOCD. This requirement assumes the following have been previously completed.

- The Stretch Software Development Tools Release 2008.09 or later has been installed so that you can use the `st-flash` tool.
- The Xtensa OCD version 7.0.1 or later has been installed and set up so that you can establish an XOCD connection (refer to Section 2.4, “Installing the JTAG/OCD Software on Your PC”, on page 2-5).
- The Stretch debug board has been connected to the DVR board with a Catapult JTAG probe attached (refer to Section 2.2, “Connecting the Debug Module to the DVR and the PC”, on page 2-2).

  NOTE: Refer to the *Binary Utilities Reference Manual* for instructions on how to use `st-flash`. Refer to the *Stretch SDK Installation Guide for Windows XP* (included in the Stretch Software Development Tools Release download) for instructions on how to install the Stretch Software Development Tools Release 2008.09 or later.

Follow these steps to complete the update:

IMPORTANT! Corrupted or improperly updated boot loader firmware can cause the board to stop booting. This may also cause Windows to stop booting or operating if the board is still plugged into the PC. If this happens, follow the additional steps (marked with an asterisk (*)). These extra steps can be skipped if the boot loader firmware was not corrupted. If problems persist, contact your Stretch technical support representative.

1. Make sure the host side DVR application is shut down.

   *a. Shut down the host PC.

   *b. Remove the DVR board from the PCIe slot, leaving the power cable attached.

*c. On the Stretch debug board, set DIP switch SW1 switch 1 to on (down) to disable DVR board booting.

*d. Restart the host PC.

2. Establish an XOCD connection to the DVR board.

3. Update the DVR board Flash ROM using the `st-flash` tool with the `vrc60xx_bootldr.exe` or `vrc60xx_bootldr-g.exe` file as follows. These files are located in the `<installpath>/SDVR/src/board/bootloader/boot` directory.

   Open a Stretch command shell and type the following:

   ```
   st-flash -V -s localhost:20000 -f
   vrc60xx_dvrfw_bootldr.exe -do 0 -ms6100-3
   ```

   or

   ```
   st-flash -V -s <xocd_server:port> -f
   vrc60xx_dvrfw_bootldr-g.exe -do 0 -ms6100-3
   ```

   where <*xocd_server*> is the name or IP address of the machine where XOCD is running, and <*port*> is the port number

4. After the update is complete, reboot the host PC so that the new DVR board boot firmware can be used.

   *a. Shut down the host PC before rebooting.

   *b. Reinstall the DVR board into the PCIe slot, leaving the power cable attached.

   *c. On the Stretch debug board, set DIP switch SW1 switch 1 to off (up) to enable DVR board booting.

   *d. Restart the host PC.

IMPORTANT! If the boot loader becomes corrupted, refer to Section 2.2, “Connecting the Debug Module to the DVR and the PC”, on page 2-2, to set the debug board DIP switches before reloading the boot loader firmware.

2.9 Release Notes and Troubleshooting

For release notes and errata information, refer to `RELEASE_NOTES.TXT` in the `<install path>/SDVR/doc` directory.

For troubleshooting tips, refer to the file `TTIPS.TXT` in the `<install path>/SDVR/doc` directory.