PEX 8696

Interoperability Test Report

Version 1.0

October 2009

Website: www.plxtech.com
Technical Support: www.plxtech.com/support

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1. PURPOSE

This report details interoperability test procedures and results for the PEX 8696 Rapid Development Kit (PEX8696-16U16D BB RDK).

2. PRODUCT INFORMATION

The ExpressLane™ PEX 8696 device is the industry's first PCIe switch to offer 96 PCI Express Gen 2 (5.0 GT/s) lanes, capable of configuring up to 24 flexible ports. The switch conforms to the PCI Express Base Specification, rev 2.0. The 96-lane switch enables users to add scalable, high bandwidth, non-blocking interconnection to a wide variety of applications including servers, communications, storage, blade servers, and embedded systems. The PEX 8696 supports the PCI-SIG defined Multicast protocol for PCI Express as well as Multi-root architecture supporting up to eight upstream ports for backplane applications. The PEX 8696 also features an on-chip Non-Transparent port for dual-host and failover application and four on-chip Hot-Plug controllers, allowing users to implement single-chip solutions. The device is hardware configurable and software programmable, allowing users to tailor their port configurations and QoS operating characteristics to suit their application requirements. The PEX 8696 is offered in a 35 x 35 mm^2 1156-ball FCBGA. This device is available in lead-free packaging.

3. SCOPE

3.1 Test Phases

There are three test phases as defined below:

Phase 1: *Motherboards and System BIOS Testing* – This phase ensures the PEX 8696 RDK is properly detected in different operating systems and works with different motherboard chipsets, CPUs, BIOS, and drivers. Preference is given for testing with PCI Express Gen 2 systems.

Phase 2: *Endpoints Testing* – This phase consists of testing with endpoint devices, such as video adapter cards, Ethernet network cards, storage controllers and TV tuners.

Phase 3: *WHQL Certification* – This phase tests primarily focuses on the PCI compliance and IO stress tests of the DTM certification test suite.

The following Microsoft operating systems can be used as the software platforms:

- Windows XP Professional, Standard and x64 bit with Service Pack 3
- Windows Server 2003 with Service Pack 2
- Windows Vista with Service Pack 1 (Ultimate, Enterprise, x64 bit)
- Fedora Linux version 8, 9, 10
- Red Hat Linux 5.1
- Apple Mac X (Leopard version)
- Windows Server 2008 (Standard and x64 bit Enterprise)
- Windows Server 2008 R2
- Windows 7 RC1 Build 7100, dated 4-30-2009

Note: *It is not possible to test every combination of endpoints, BIOS versions, motherboard chipsets and drivers. However, the test cases below are selected carefully to ensure the widest interoperability coverage of the RDKs. Refer to the test checklists attached for the exact configurations and test results.*

3.2 Test Omissions and Assumptions

The following RDK features are not tested as part of interoperability.

1. *Hot-Plug Tests* – Parallel and serial Hot-Plug functionalities of the switch RDK are tested by the validation teams.
2. *Serial EEPROM Tests* –EEPROM functions are used and tested within the context of the PEX Device Editor software only.

3. *JTAG Header* - JTAG is not used for interoperability.
4. *Configuration modules* – Unless specified otherwise, testing covers default modules received with the RDK kit only. Not all possible module combinations will be tested.
5. *Dual Cast, Read Pacing, Crosslink, Nontransparent bridging (NT) and Spread Spectrum Clock Isolation (SSC)* – These application-specific features are beyond the scope of typical interoperability testing.
6. *Advanced SDK features* – Packet Generator, Probe mode and SERDES Eye Widths features are beyond the scope of interoperability testing.
7. *Power and Voltage Measurements*

4. PRETEST REQUIREMENTS

4.1 Collateral

As a minimum, the following items are required to complete the tests.

1. PEX 8696 RDK - See Hardware Reference Manual for PEX 8696-16U16D BB RDK
2. SDK 6.3: - Low-Level Application Software for Bridge/Switch Devices
3. System Platforms: - See Motherboards and Systems List.
4. Video Adapters: - NVIDIA 8800 GTS PCI Express (Gen 2)
   - Diamond Radeon HD 3850 PCI Express (Gen 2)
   - Matrox Millenium P650 PCI Express
   - NVIDIA NVS 440 PCI Express
   - AMD Radeon Pro x1600 PCI Express
5. Ethernet Adapters: - Intel Gigabit Ethernet PCI Express (Ophir)
   - Broadcom Nextreme x5715 PCI Express
   - SysKonnect 9E21D PCI Express
6. SCSI HBAs: - LSI Logic 22320 PCI Express
7. FC HBAs: - Qlogic QLA2432 PCI Express
8. TV tuners: - KWorld TV Tuner PVR-TV PE210

4.2 Other Documentation

The test procedures assume the tester has fully read the following documentation first:

1. PEX 8696 Hardware Reference Manual
2. PEX SDK 6.3 Release Notes
3. PEX 8XXX – PLX Switches/Bridges RDK Interoperability Design Note
4. Installation guides of the endpoints. See the manufacturers' latest product updates.

4.3 Software and Identification Information

Proper interoperability testing requires documenting test environments and setups. Some key information include: software and driver versions, system BIOS settings, RDK configurations (jumpers and switch settings), PCBs identifications, chip markings and auxiliary software utilities.

Use the attached Software and Hardware Identification Information sheet and completely fill out the exact hardware and software used.

4.4 System BIOS Settings

Modern PC test systems have a system BIOS that allows configuring specific settings. These settings, ranging from video displays to power management allow taking advantage of powerful hardware features.

It is critical that the System BIOS is properly configured. RDKs may not work at all or work in an unpredictable, if the settings are incorrect or sub-optimal. See the Design Note PEX 8XXX – PLX Switches/Bridges RDK Interoperability for more information.

To access the system BIOS, reboot the system and either hit the ESCAPE key or F1 key or F2 key or DELETE key (different BIOS have different access keys) BEFORE the Windows operating system loads. Verify that the BIOS parameters are set to the values below.

After changing the BIOS parameters, remember to SAVE THE SETTINGS (typically select the F10 key). Reboot the system to reinitialize the BIOS which then loads Windows normally.

4.5 Physical Layout of RDKs

4.5.1 Baseboard RDKs

The PEX 8696 RDK is only available as a baseboard.

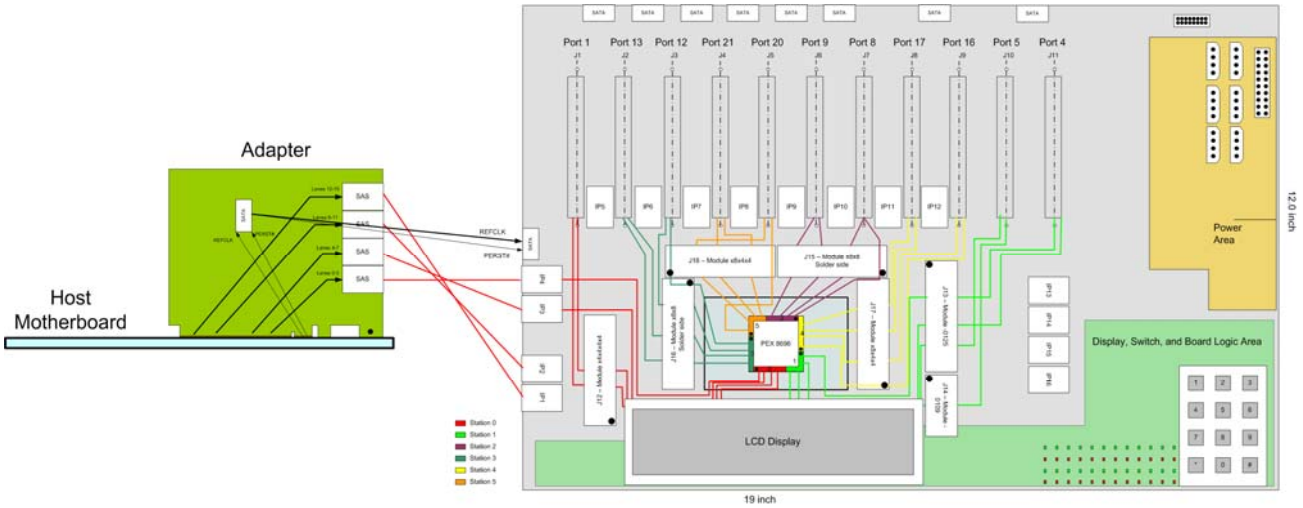

Figure 1. Example of Baseboard Switch

Station 0, x16 UP. All other Stations x8x8 DOWN. DEFAULT CONFIGURATION

4.5.2 Baseboard RDKs with Expansion Board

The PEX 8696 baseboard supports additional ports by using the Expansion Board.

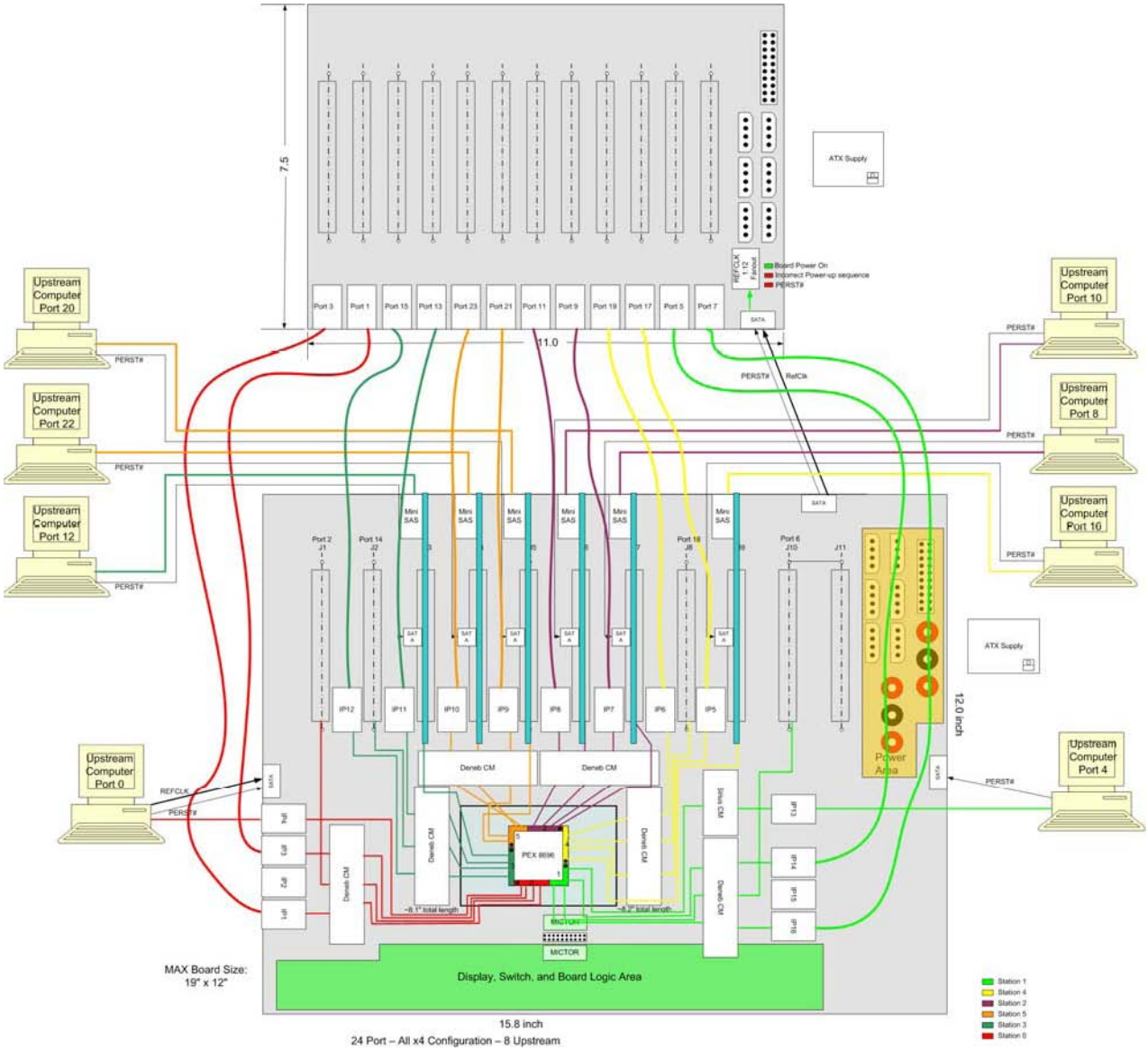

Figure 2. Example of Multiple Virtual switches with Expansion Ports

5. TEST DESCRIPTIONS AND PROCEDURES

5.1 Motherboards and System BIOS

The goal is to ensure that the RDK and SDK, together, perform fundamental functions interfacing with motherboard root complexes. Root complexes include Northbridge and/or Southbridge chipsets and system interrupt controllers.

In this phase, only the Cygnus RDK is tested in motherboard slots. No endpoints are used. The focus is the root complex interface and BIOS/motherboard detection of the PLX hardware only.

The general methodology is:

1. Reserve the test system. See the attached list of Motherboards and System BIOS.
2. The PC should already be preconfigured with the necessary hardware and software:
   - Windows operating system (Windows XP or Windows Server 2003 or Windows 64-bit Server 2003 or Windows Vista)
   - Formatted and partitioned internal ATA hard disk with at least 40 Gigabytes
   - At least 1 Gigabytes of memory and a Pentium 4 or equivalent CPU
   - PEX SDK software
3. Install the RDK board (using its default switch and jumper settings) into the system and connect the power connector.
4. Boot up the system into Windows and check that the RDK is correctly detected and enumerated.
5. Run the interoperability procedures against motherboards, chipsets, BIOS, endpoints (video adapters, Ethernet adapters, SCSI/FC HBAs or TV tuners).
6. Record all findings and work with engineering groups to resolve problems found.

5.1.1 Visual Link-Up Tests

See the Hardware Reference Manual of the bridge or switch product for exact locations and functions of the LEDs.

1. Select a test system that has PCI Express slots. See the Motherboards and System BIOS list.
2. Make sure the system is fully powered OFF first.
3. Install the RDK into an available PCI Express slot. Connect the power connector.
4. Turn on the system and monitor the RDK's LEDs. When lighted green, these indicators show lanes or port linkup status.
5. Verify the LEDs against their functional assignments from the Hardware Reference Manual. Check for Gen 2 status with solid LEDs and blinking LEDs denoting Gen 1 status or reduced lanes.

5.1.2 Operating System Installation

Install one of the following operating system:

1. Microsoft operating system: This may include Windows XP Professional (standard or 64-bit version), or Windows Server 2003 or Windows Vista.
2. Apple operating system: Use OS X Leopard version
3. Fedora operating system: Use version 9 or later

Depending on the operating system, use Device Manager, System Profiler or UNIX's lspci command to show the detected devices.

5.1.3 Device Manager Detection Tests

These tests verify RDK detection at the operating system level.

1. Go into Control Panel → System → Device Manager. Select the View tab; right click to choose DEVICE BY CONNECTION.

2. Under “System Devices”, verify that a category called “PCI standard PCI-to-PCI bridge” appears.
3. Under the system’s name, there should be a category called ACPI Multiprocessor PC. Click on it and traverse through the hierarchical tree Microsoft ACPI-Compliant System → PCI Bus → Intel ® xxxx PCI Express Root yy. There could be multiple roots of the PCI Express ports so continue to check each branch until the “PCI standard PCI-to-PCI bridge” appears.

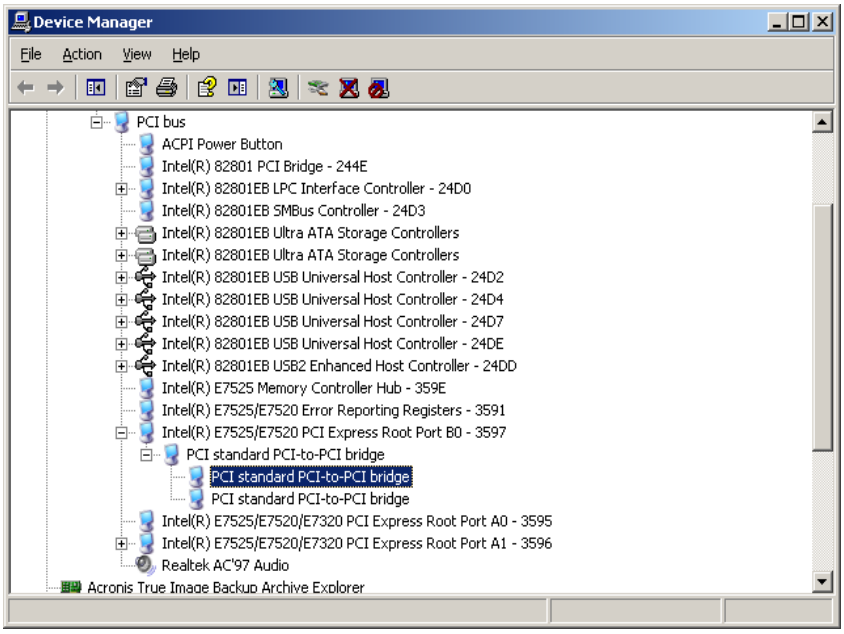

Figure 3. Device Manager Detection of Switch

Move the cursor over the “PCI standard PCI-to-PCI bridge” item, and right click. A small menu box appears. Select “Properties” and then a screen below displays.

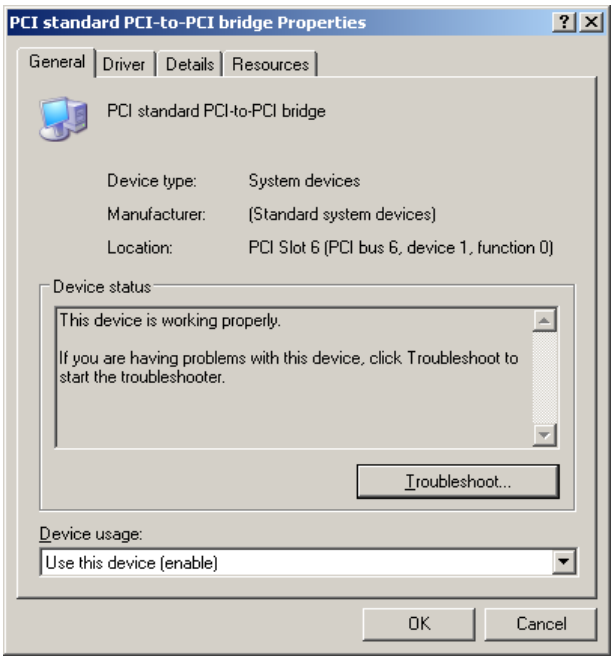

Figure 4. Routing Information of Switch Device

This window shows the “PCI standard PCI-to-PCI device” and lists its routing information in the LOCATION field:

1. PCI slot number
2. Bus number
3. Device number
4. Function number

Record this information before proceeding further. Next, move the cursor to the “Details” tab (the third tab), and click it.

The next screen shows sample product information.

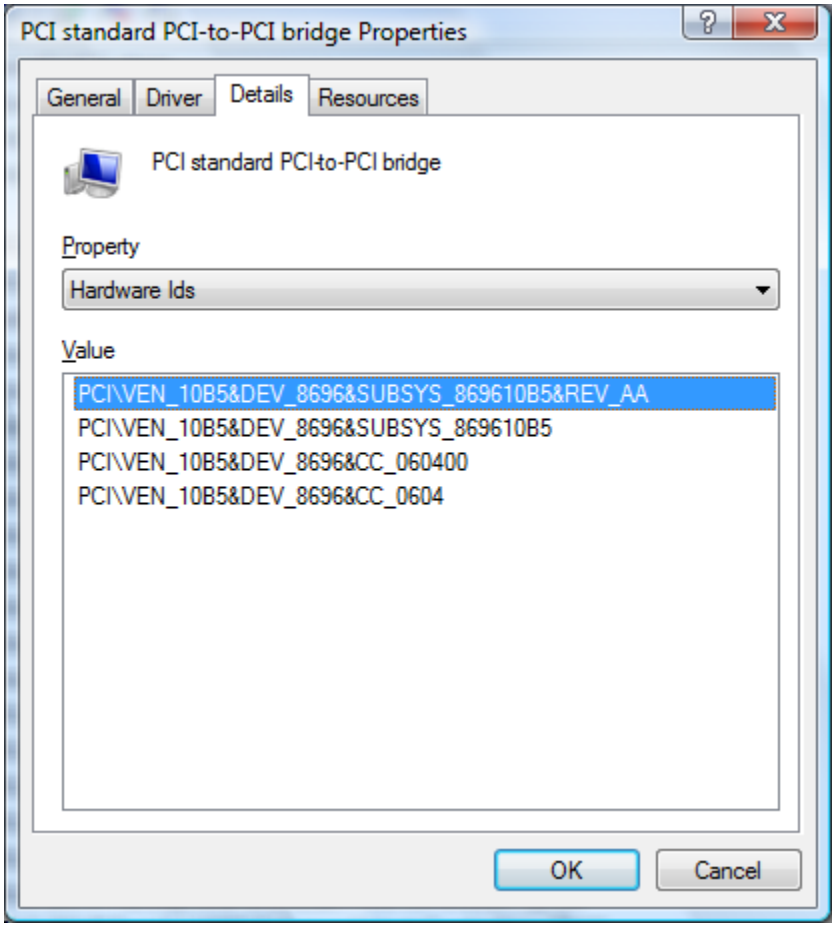

Figure 5. Vendor ID and Chip ID of PEX 8696 Switch

Verify that the vendor ID is 10B5 and the chip ID is 8696.

5.1.4 Slot Tests

Different PC systems support different numbers and types of PCI Express slots, ranging from x1, x2, x4, x8 or x16 lane widths.

Test all different lane widths that the system supports. Note that if there are multiple slots having the same lane width, select and test with one slot only. For example, if the system has multiple x1 slots, then test with one x1 slot only.

The recommended sequence is to test the x1 slot first, then x2, then x4 and so on.

1. Make sure the system is fully powered OFF.
2. Insert the RDK into the PCI Express x1 slot.
3. Run the following tests for each slot:
    a. Visual Link-Up tests
    b. Device Manager tests
4. Record all findings.
5. Repeat the above for x2, x4, x8 and x16 slots, if they are available.

5.1.5 PEX Device Editor Tests

The PEX Device Editor is a graphical interface provided as part of the SDK software to configure, control, and get status of the RDK hardware.

The PEX Device Editor portal serves two key functions:

1. Examine low-level device information (such as Dev ID, Bus, Device Number, Link width, port),
2. Read and write configuration registers, memory-mapped register, execute block reads

Even though the GUI offers other tools, such as comparing EEPROM images, probe mode, SerDes Eye Patterns and Performance Monitors, interoperability testing does not cover these advanced features.

To begin, go into Programs → PLX PEXSDK → PEX Device Editor.

5.1.5.1 Detection

See highlighted item in Figure 4. On the left pane is a smaller box showing the detected device. Check the device ID, Vendor ID, Revision, Bus, Function, Slot and Mode, and Chip type. Record this information and compare it against the slot number /bus number/ device number/ function number recorded earlier from the Device Manager Tests.

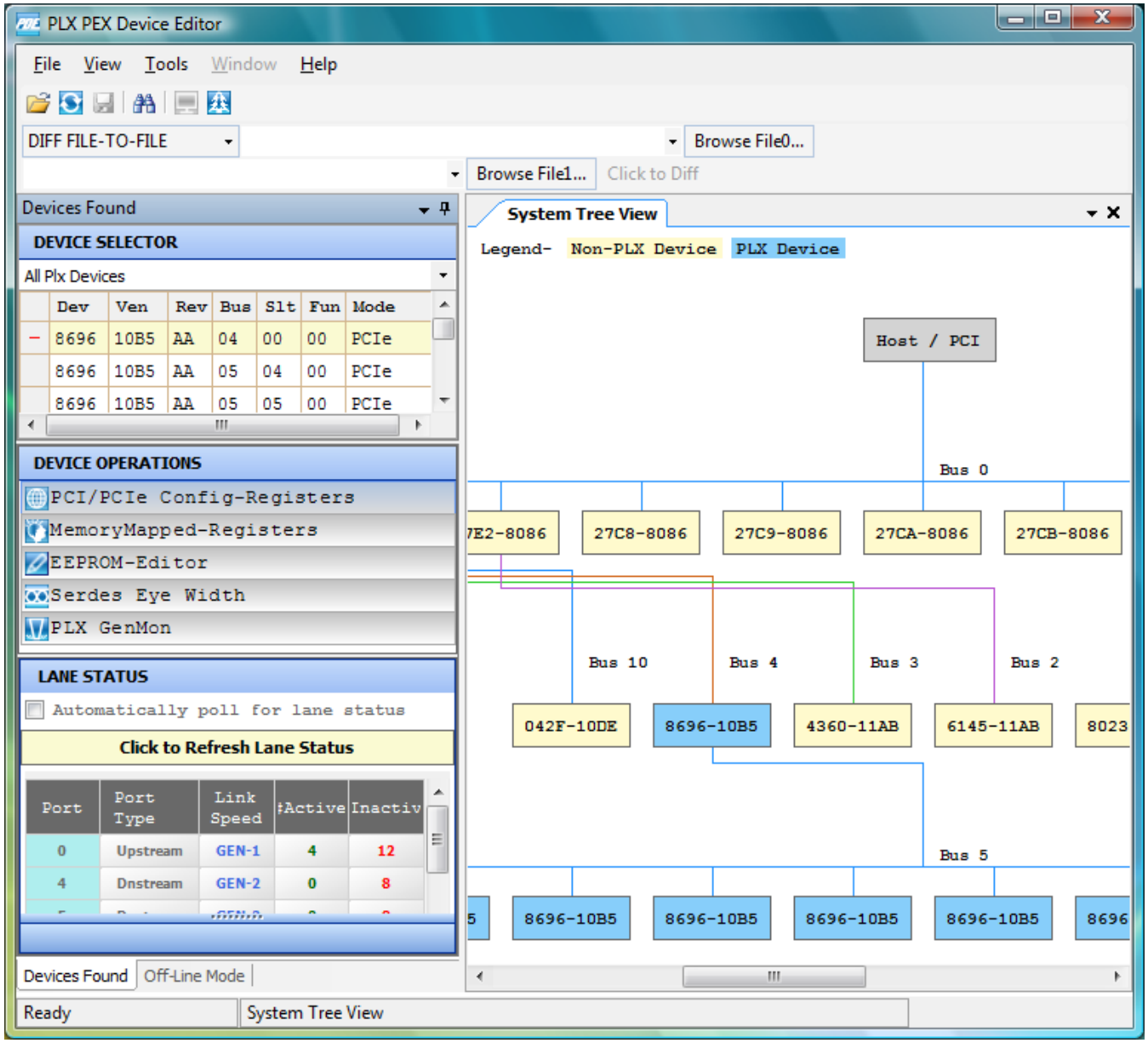

Figure 6. System Tree View of PEX 8696 Switch

Note: The PEX Device Editor software should display all the active and inactive upstream and downstream ports and the number of lanes found during the enumeration process. Count the total of these ports and lanes. This number should equal to the total number of ports and lanes supported by the RDK.

5.1.5.2 EEPROM Tests

Run the following tests only if the EEPROM is enabled (set by jumpers or switches on the board). Skip these tests if the EEPROM is not used.

1. ***Read PCI/PCIe Configuration Registers***
   a. Look at the middle box of the screen above, labeled “PCI/PCIe Configuration Registers”. Click to select. A new window should be displayed on the right screen.
   b. The Port, Configuration Address and Value drop-down boxes will appear. Select Port 0, Configuration Address 0.

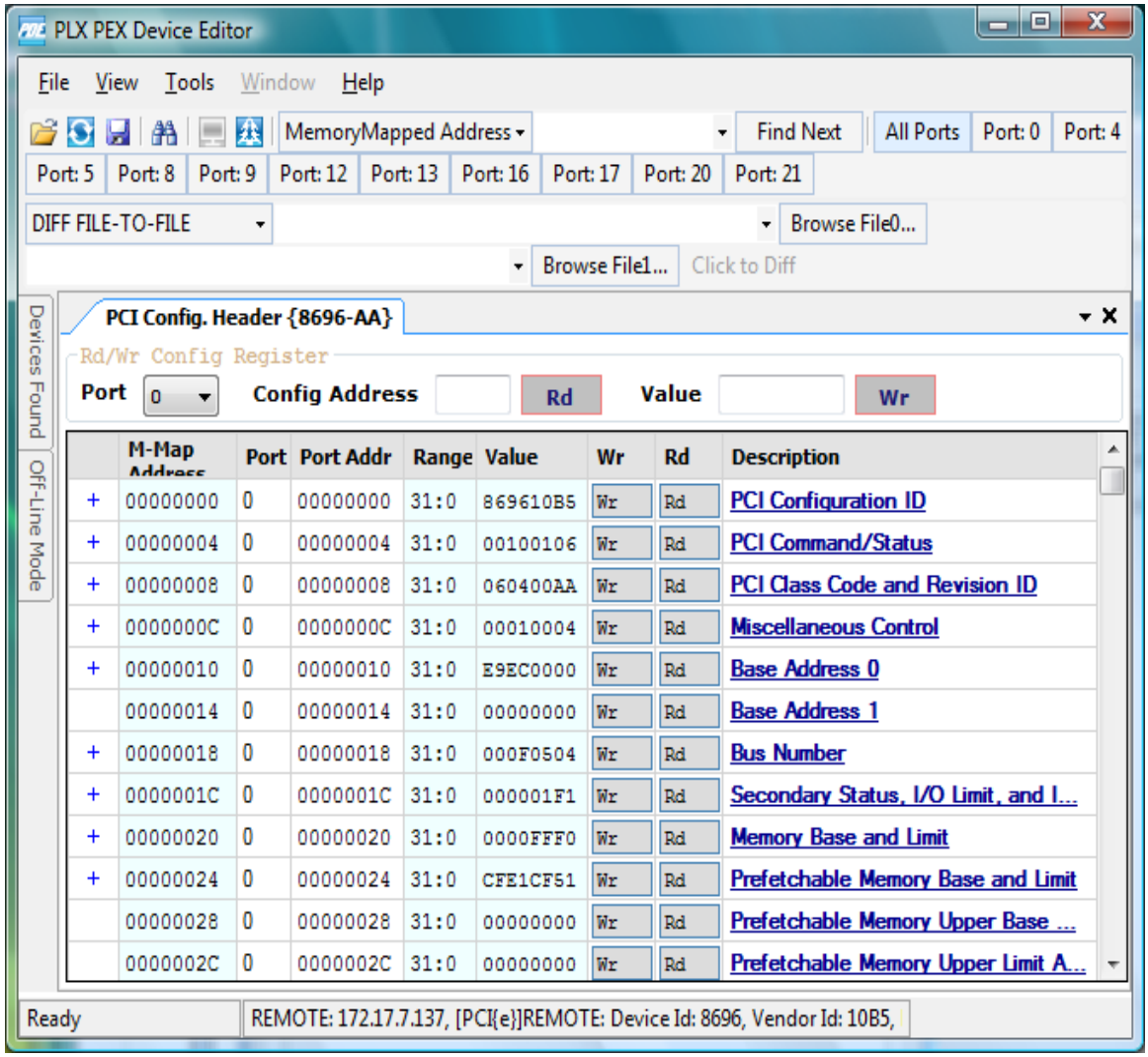

Figure 7. Configuration Registers of PEX 8696 Switch

   c. Click Rd (grayed out button). This process reads the CSR (Configuration Status Registers) and then displays the offset addresses [typically from 0000 to xxxx] and data.
   d. Check to ensure the four bytes show “869610B5” and “Read successful”. Change the offset addresses and the block size to read different ranges. There is no need to verify all the bytes displayed. The goal is just to be able to read and dump the EEPROM contents for display only.

2. *Read Memory-Mapped Registers*

a. Look at the middle box of the screen above, labeled “Memory Mapped Registers”. Click to select. A new window should be displayed on the right screen.
b. Click on the tab label “PLX-M Map Registers {8696-AA}”.
c. The Port, Configuration Address and Value drop-down boxes will appear. Select Port 0, Configuration Address 0.

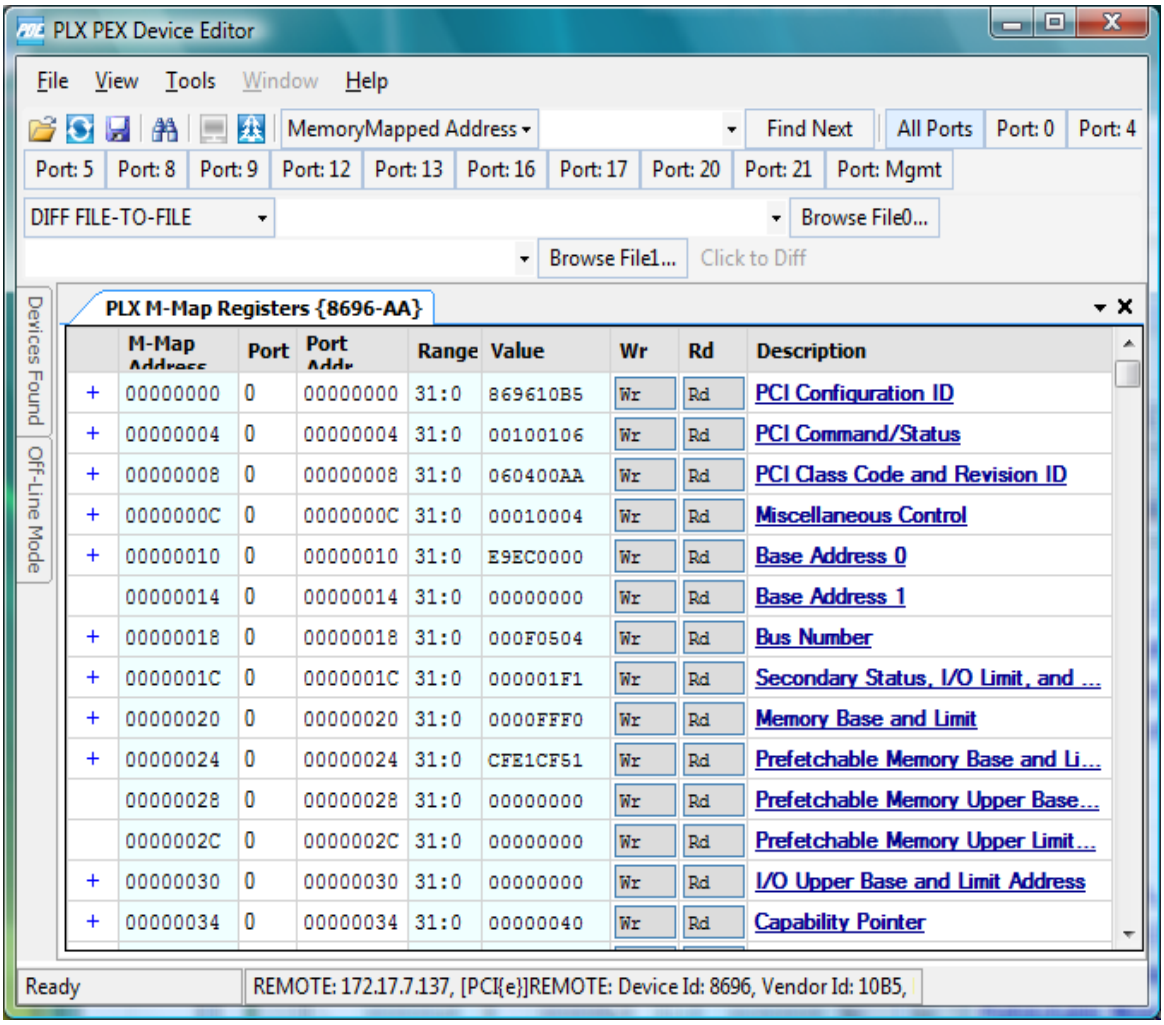

Figure 8. Memory-mapped Registers of PEX 8696 Switch

d. Click Rd (grayed out button). This process reads the memory-mapped registers and then displays the offset addresses [typically from 0000 to xxxx] and data.
e. Check to ensure the four bytes show “869610B5” and “Read successful”.
f. Change the offset addresses and the block size to read different ranges. There is no need to verify all the bytes displayed. The goal is just to be able to read and dump the EEPROM contents for display only.

3. *EEPROM Editor*

In some cases where it may be necessary to set special programming settings, the EEPROM Editor is available to change specific bits in registers. See the data book for more information.

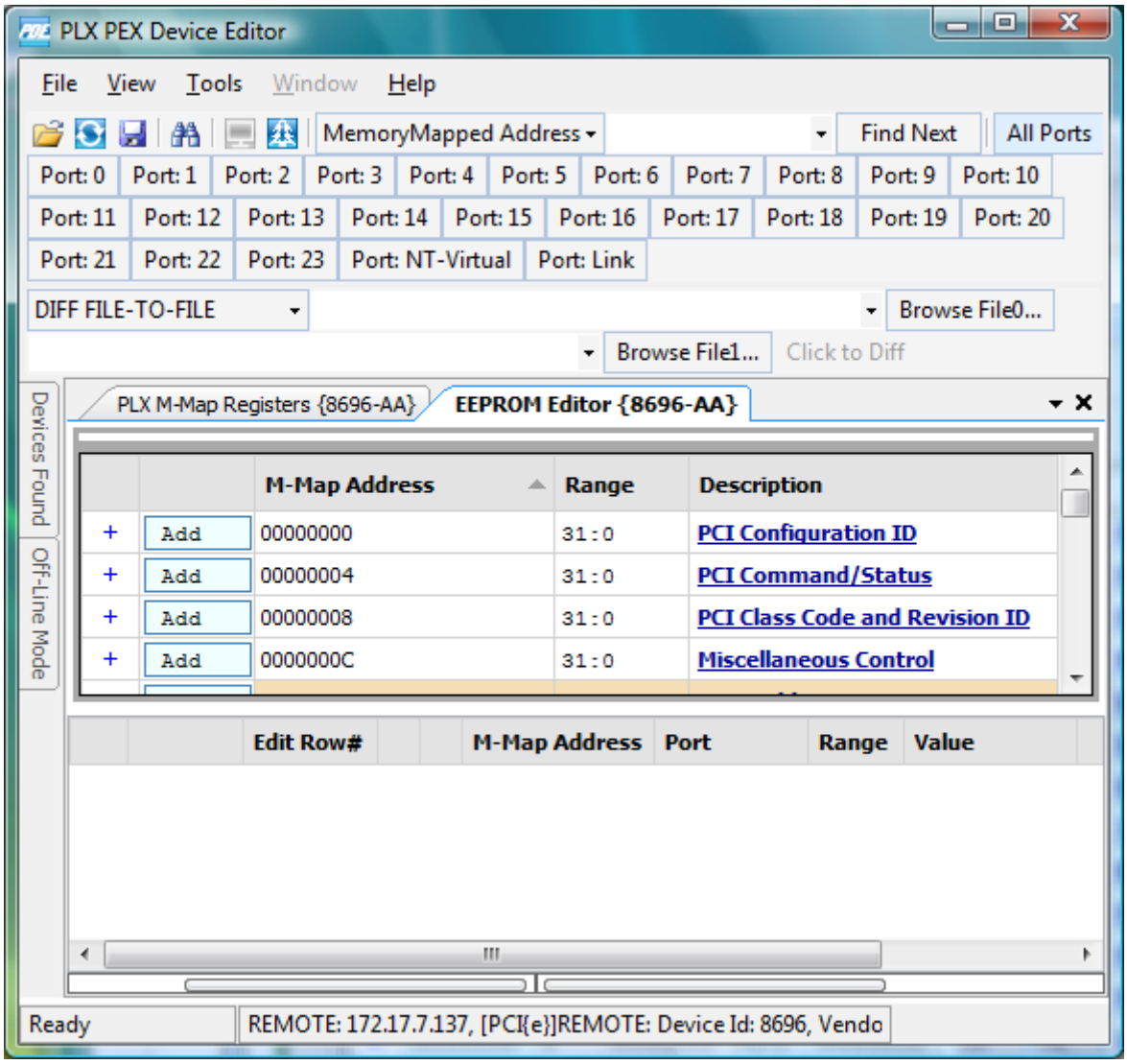

Figure 9. EEPROM Editor for PEX 8696

5.1.5.3 I²C Access

Use the I²C cable to connect the laptop to the I²C pins of the RDK.

Install the Aardvark driver 2.0 into the laptop or pc slave system that will access I²C. Check Device Manager (under the Universal Serial Bus Controller category) to make sure the “TotalPhase Aardvark I²C/SPC Host Adapter” is properly loaded.

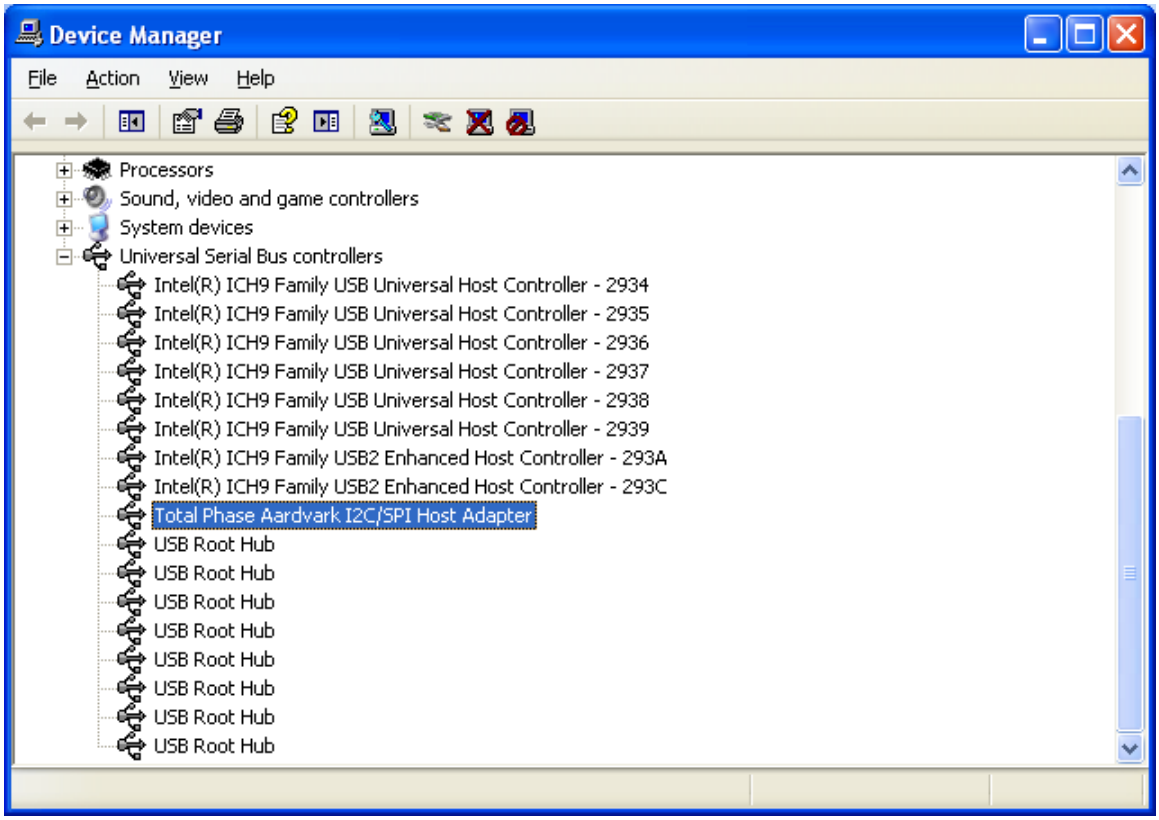

Figure 10. I²C Adapter Detection in Device Manager

Launch the PEX Editor application.
Within PEX Editor, under the Device Selector tab, click and search for connected “PLX (I²C) Devices”. If the I²C function works correctly, then the PEX 8696 device is detected and displayed and the user can access the Configuration Registers, Memory-mapped Registers, EEPROM Editor, SERDES Eye bandwidth and PLX GenMon.

The following screen shows how the I²C function displays the menu for device access.

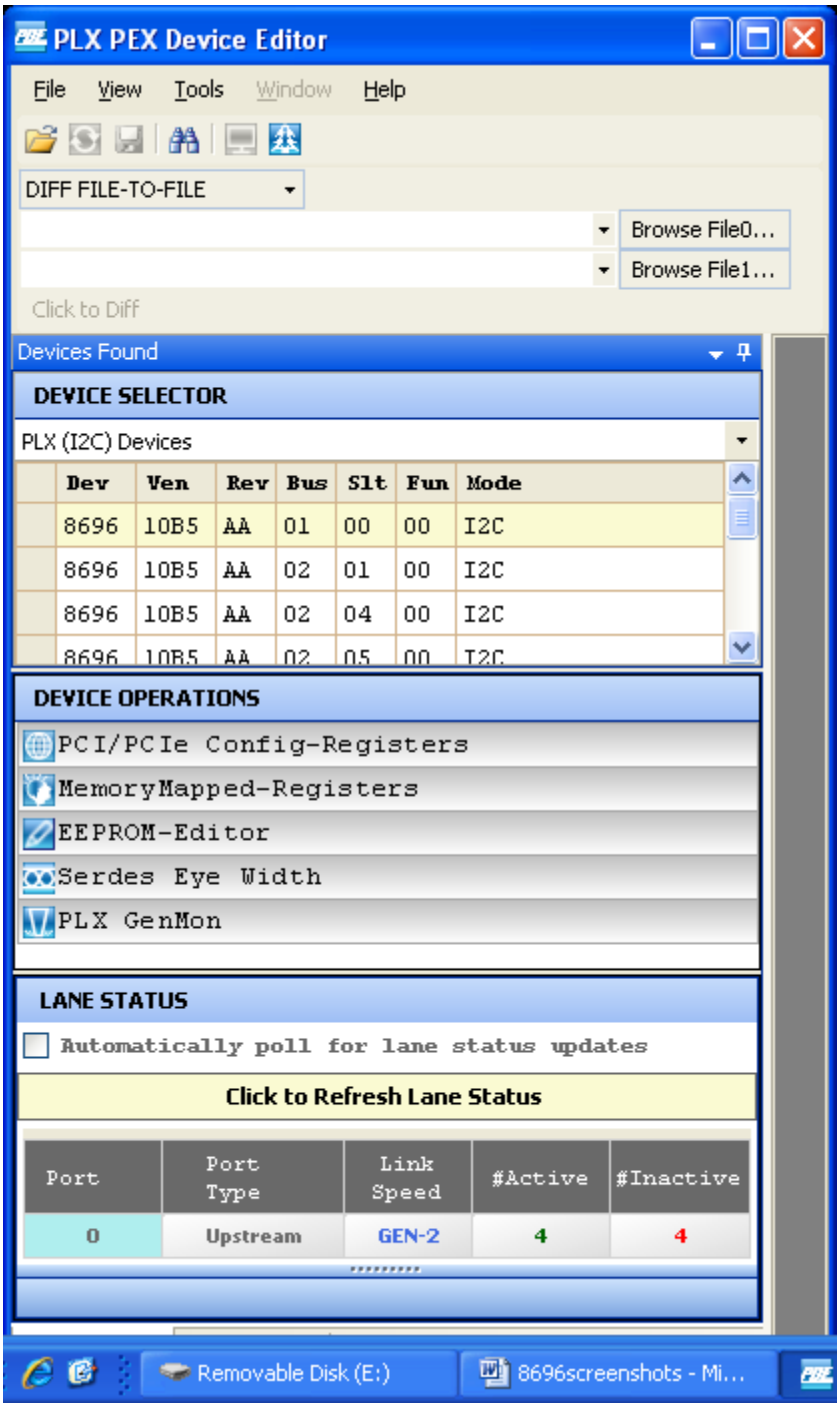

Figure 11. I²C Access of PEX 8696 Device

5.1.6 MAC Operating System Detection

Insert the RDK into a selected PCIe slot. Turn on the system and have it boot it up into the MAC operating system.
To check for RDK detection, execute the following steps:

a) Go → Utilities → System Profiler → PCI Cards → PCI Bridge
b) Check the displayed devices for the PLX RDK.
c) Note that devices are listed according to slots detected.

5.1.7 Redhat and Fedora Linux Operating Systems Detection

Select one (1) system and install the Fedora Linux operating system. Run the lspci command to check for device detection.

a. lspci – this Linux command (located in the \SBIN directory) lists detected PCI devices in the system. Check for switch as well as any connected downstream devices.
b. Repeat the above for the Redhat operating system.

5.2 Endpoints

Testing endpoints includes both Gen 2 and Gen 1 devices such as video cards, ethernet adapters, and storage controllers. Testing requires using both the PEX 8696 RDK and a specified endpoint together as a unit.

Select and test the endpoints behind the switch or bridge in all provided port modes (x1, x4, x8). Depending on whether the device is a bridge or a switch, FORWARD and REVERSE modes may apply. See the list of Endpoint Devices and Connectivity Kits.

The general methodology for testing endpoints is as follows:

1. Insert the RDK into one of the PCI Express slot. Connect external power to board.
2. Connect one (1) endpoint device to the PCI Express slot of the RDK. Reboot the system and install device drivers for the endpoint. Some endpoints such as video adapters have embedded drivers as part of the operating system in which case no drivers may be needed. However, it is highly recommended to use the latest manufacturer-supplied drivers from the CD or by downloading the latest drivers from the internet.
3. Reboot the system. Check the device driver under CONTROL PANEL → DEVICE MANAGER.
4. Run specific tests related to the endpoint. For example, if the device is an Ethernet adapter card, connect to a specific internet website, such as www.plxtech.com. If the device is a video adapter card, check for visual displays on the screen monitor.

SPECIAL NOTE*: Do not connect multiple endpoint devices to the PEX 8696RDK. The focus is to qualify each endpoint component independently and individually. As a result, test with only one (1) endpoint at a time only. Testing multiple endpoints is done in fully-loaded configurations, which are part of phase 3.*

5.2.1 Video Adapter Tests

Standard PC systems have embedded graphics support or come with an existing video adapter. PCI Express video cards present a new class of video devices to the BIOS and operating system that must be redetected and re-enumerated along with the existing video devices.

In most cases, PCI Express video devices can coexist with other video devices. However, the system BIOS may require disabling the embedded graphics support and/or removing the existing video card in order for the PCI Express video card to work.

1. Make sure the system is completely powered OFF.
2. Perform the following steps:
   a. Select a PCI Express video card from the list of video cards to be tested.
   b. Insert the RDK into a free (unpopulated) motherboard's PCI Express slot.

c. Connect the Power Connector to the RDK.
d. Insert the video card in any one of the PCI Express slot of the RDK.
e. Connect one end of the monitor cable to the output connector of the video card. Some video cards require special DVI-OUT adapters to convert between 15-pin SVGA and DVI-OUT connections. Use the adapters as appropriate.
f. Power on the system and watch the RDK's LEDs to display endpoint detection and lane status.

Some motherboards support primary and secondary graphics, depending on the PCI or PCI Express modes. Re-verify the proper settings in the system BIOS (see System BIOS settings list) before running the tests below.

5.2.1.1 Video display on the monitor

Turn on the monitor and the system. Check for visual display. Be default, the Windows OS should load standard VGA driver automatically or detects a new device and requests for a driver.

Note: If no manufacturer's video drivers are available, Windows automatically loads the generic "standard video adapter" driver.

5.2.1.2 Driver installation & updates

Manufacturer-supplied drivers allow enhanced performance beyond standard video driver supplied by the Windows operating system. If available, always install the driver software.

5.2.1.3 Driver detection

Check Device Manager → Display Adapters to make sure the new driver is loaded. There should be no yellow bangs, or red crosses next to the driver name. Otherwise, there are either resource conflicts or the driver does not detect or load properly or the driver is disabled.

The following screen shows how an NVIDIA video card is detected and displayed.

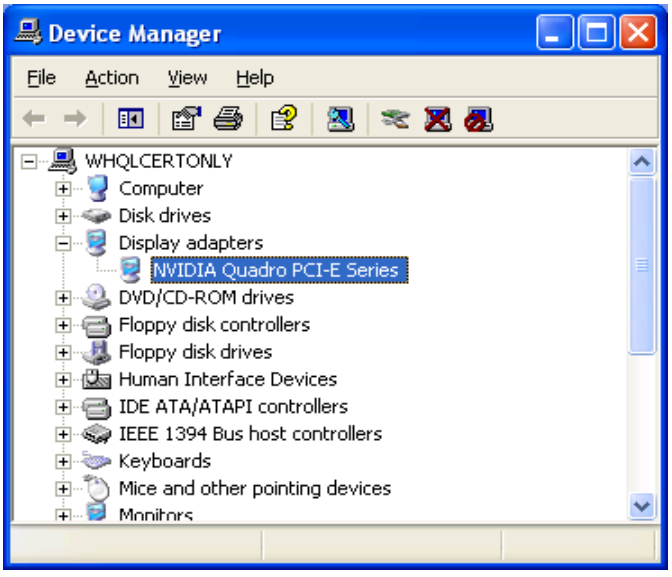

Figure 12. Device Manager Detection of NVIDIA Video Card

If it is necessary to update drivers from the CD or the internet, right-click the item and select "UPDATE DRIVER".

5.2.2 Ethernet Adapter Tests

Standard PC systems have embedded graphics support or preinstalled Ethernet adapters. Some PCI Express endpoints may only work by disabling the embedded graphics support and/or removing the existing adapter completely.

5.2.2.1 Driver installation

Manufacturer-supplied drivers allow enhanced performance beyond standard network card driver supplied by the Windows operating system. If available, always install the driver software.

5.2.2.2 Driver detection & updates

Check Device Manager → Network Adapters to make sure the new driver is loaded. There should be no yellow bangs, or red crosses next to the driver name. Otherwise, there are either resource conflicts or the driver does not detect or load properly or the driver is disabled.

The following screen shows how an Intel network adapter card is detected and displayed.

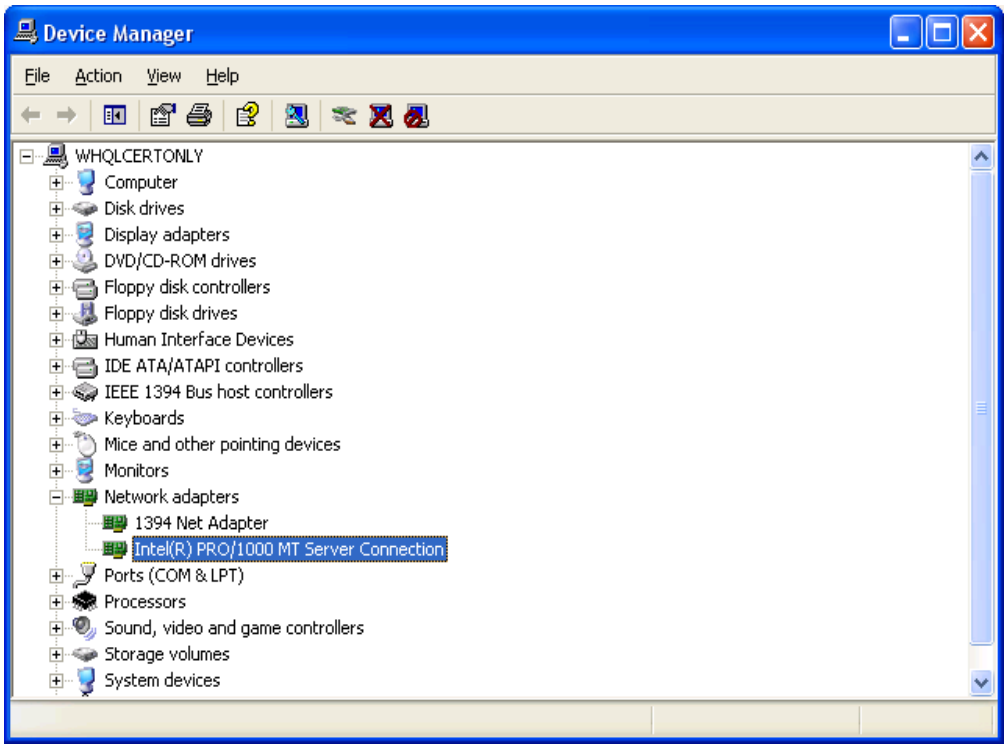

Figure 13. Device Manager Detection of Intel Network Card

To update drivers from the CD or the internet, right-click and select “UPDATE DRIVER”.

5.2.2.3 Web-page access

Open your internet Web browser. Type an internet URL address, such as www.plxtech.com . Check to see if the Website is accessible. Within the Website, click on several different links such as company or products information ensure network downloads are accessible.

5.2.3 SCSI or Fibre-Channel HBA Tests

5.2.3.1 Driver installation

Manufacturer-supplied drivers allow enhanced performance beyond standard SCSI or Fibre-channel storage controller driver supplied by the Windows operating system. If available, always install the driver software.

5.2.3.2 Driver detection

Check Device Manager → SCSI and RAID controllers to make sure the new driver is loaded. There should be no yellow bangs, or red crosses next to the driver name. Otherwise, there is either resource conflicts or the driver does not detect or load properly. The following screen illustrates the LSI Logic SCSI Raid Controller detection.

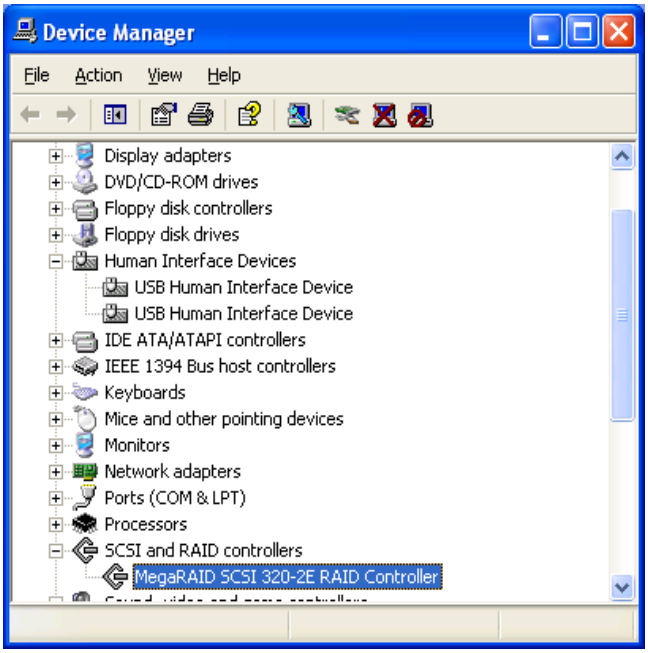

Figure 14. Device Manager Detection of LSI SCSI HBA

If the Fibre-channel HBA is used, the driver installation and detection is similar to the SCSI HBA. It is also displayed in the same SCSI and RAID controller category.

The following screen illustrates the Emulex Fibre-channel HBA detection.

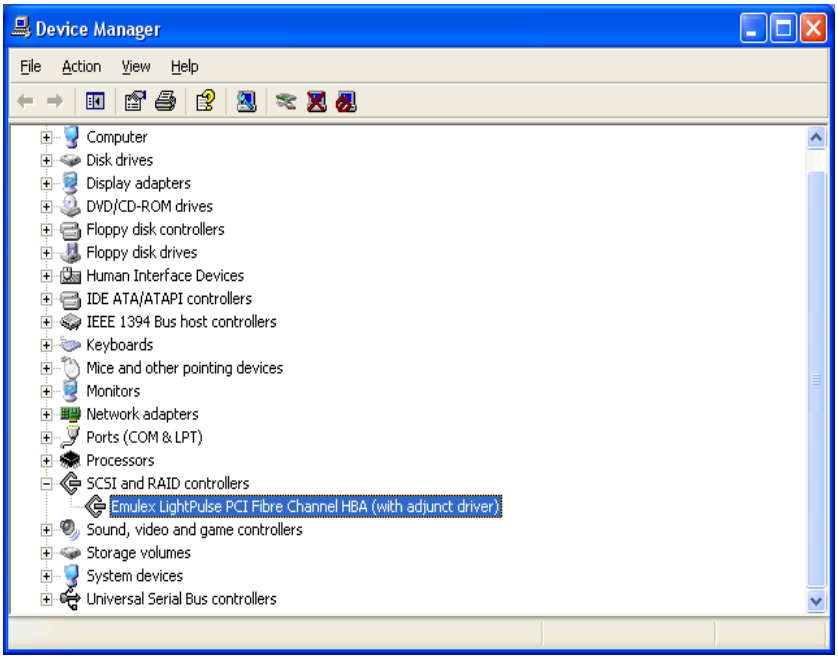

Figure 15. Device Manager Detection of Emulex Fibre-Channel HBA

5.2.3.3 Read/Write data files

Modern HBAs have their own BIOS. After powering up the system, the SCSI or Fibre-channel BIOS together with the system BIOs automatically enumerate and display the connected devices. For example, if an LSI Logic MegaRaid adapter is installed, the BIOS displays its own BIOS version, lists SCSI/FC devices detected and momentarily pauses with the CTRL-M prompt to allow the user to configure HBA's BIOS settings.

Refer to the manufacturer's documentation to set the HBA BIOS properly. The Windows operating system does not detect and enumerate properly if the HBA BIOS settings are set incorrectly.

Once the HBA BIOS is set up correctly, Windows should also detect the HBA, its connected drives and assign them drive letters. Refer to Microsoft's DISK MANAGEMENT utility to partition and format the drives.

Once the formatted drives are available to read and write files, run the tests below.

1. Create special directories within the SCSI or Fibre-channel drives, for instance TEMP.
2. Copy some directories from the internal ATA drives over to the SCSI or Fibre-channel drives.
3. Switch to the SCSI or Fibre-channel drive and verify that the new folders and files are fully copied over.

5.2.4 TV Tuner Cards

TV tuners cards are devices emulating TV devices or other display devices such as cameras or camcorders through adapter cards. TV tuners typically offer both video and sound features and may have sophisticated download and uploading features through TV antennas, satellites or networked sources.

Interoperability testing focuses on simple capture and display features only

TV tuner cards install similarly to video cards or Ethernet card or SCSI/FC cards. However, TV tuner cards require an external power source, so use the correct adapter and connect to power jack on the back of the card.

5.2.4.1 Driver installation

Install the manufacturer-supplied drivers for Windows from the CD. For more updated drivers, download from the internet at the vendor's website. For example, the Win TV 2000 TV tuner driver downloads are available at www.hauppauge.com in the support section.

5.2.4.2 Driver detection

Check Device Manager → Sound, video and game controllers to make sure the new driver is loaded properly. There should be no yellow bangs, or red crosses next to the driver name. Otherwise, there are resource conflicts or the driver is disabled or does not load properly. The following screen shot illustrates the Win TV 2000 TV tuner card.

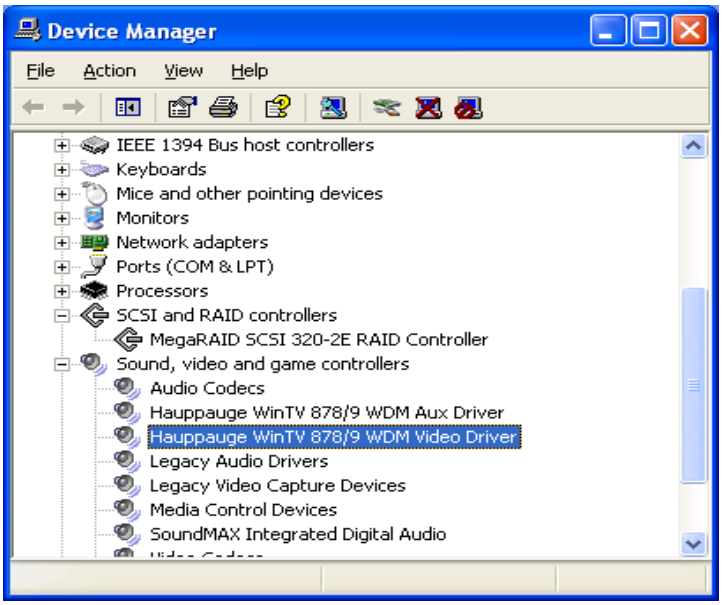

Figure 16. Device Manager Detection of Hauppauge TV Tuner

5.2.4.3 Video Capture and Display

TV tuners require video capture and display software. For example, Hauppauge TV tuners require proprietary Hauppauge WinTV 2000 software. Do not mix and match video capture and display software from other TV tuner vendors. They may not be compatible.

1. Install the Win TV 2000 software from the CD. The software may have separate video and audio components, resulting in multiple detection passes by Windows.
2. Once fully installed, the application resides in PROGRAMS as Microsoft application software. Launch it by double-clicking the application.
3. A new screen box appears as below.

Figure 17. Sample Launch Pad of WinTV Application

4. Click on the first button (TV Mode) and the camera starts the capture.
   Record all results and observations.

5.3 WHQL DTM Certification

WHQL tests are highly dependent on the exact type and configurations of the system and endpoints. The Unclassified driver mode in DTM allows the user to select just the bridge device itself for testing. DTM automatically mounts the appropriate tests to determine if the device meets this minimum WHQL driver certification.

The following sample screen shows test classes for the bridge under the DEVICE category.

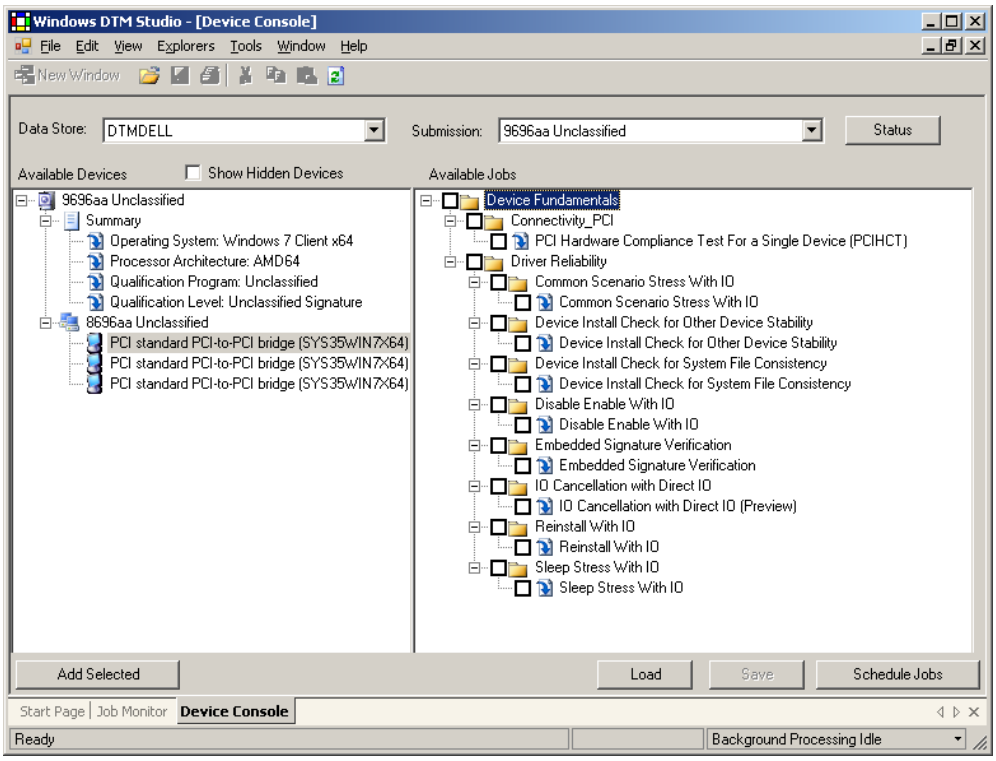

Figure 18. Sample DTM Test Selections

Click to select the following tests. They are exact test descriptions from Microsoft.

5.3.1.1 Common Scenario Stress with IO

The Common Scenario Stress with IO job ensures that the device-under-test accepts and correctly handles numerous Plug-and-Play (PnP) and power management state change scenarios, including disable/enable and suspend/hibernate/wake. Additionally, this job ensures that the device is still functional after these state changes through SimpleIO stress testing.

5.3.1.2 Disable Enable with IO

The Disable Enable with IO job ensures that the device can be disabled and enabled without error. Additionally, this job tries to ensure that the device is still functional after these changes in state through SimpleIO stress testing.

5.3.1.3 Sleep Stress with IO

The Sleep Stress with IO job ensures that the device under test permits the system to be cycled through all supported sleep states. Additionally, it ensures that the device is still functional after these state changes through SimpleIO stress testing.

5.3.1.4 PCI Compliance

This section tests for compliance to PCI Express 2.0 specifications.

5.4 Advanced Test Configurations

5.4.1 Fully-Loaded Endpoint Configurations

This test loads as many different endpoints as possible into the RDK slots and stresses the board by running simultaneous traffic. Typically, video adapters, Ethernet adapters, and SCSI or Fibre-channel adapters are used together.

Fully-loaded configurations use multiple endpoints together, which individually have been qualified and passed with the RDK already. That is, the endpoints selected should have passed Phase 2 of the Endpoints tests.

1. Select and record the exact name and model of the selected endpoint (see Endpoints and Connectivity Kits list).
2. Fully load all the slots of the PEX 8696RDK with endpoints. As a minimum, populate the RDK with one video adapter, one Ethernet adapter and one SCSI or FC controller adapter
3. Connect the video monitor to the video adapter endpoint, the Ethernet cable to the Ethernet endpoint and SCSI/FC disk drives to the SCSI/FC controller endpoint.
4. Power up the system and run the following tests:
    a. Visual Link-Up Tests
    b. Device Manager Tests
    c. Endpoints Tests
        - Video adapter tests
        - Ethernet adapter tests
        - SCSI/FC adapter tests
5. Record all observations and results.

SPECIAL NOTE: Do not test each endpoint at a time. All endpoints (which should already qualified individually in the Endpoints Section) must be connected to the PEX 8696 RDK at the same time and tested together as a unit.

5.4.2 Fully- Loaded RDK and Fully-Loaded Expansion Board

Refer to Figure 2. This test is an extension of the fully-loaded endpoints configuration of the RDK. In this scenario, connect the expansion board to the baseboard. In addition to populating the baseboard RDK's slots with

endpoints, also populate all twelve slots of the expansion board with endpoints such as video cards, network cards and storage controllers.

Be sure to power on the expansion board first, then the baseboard RDK and then the host system. Repeat the visual linkup tests, device manager tests and endpoints tests.

5.4.3 Virtual Switch Configurations

The PEX 8696 RDK supports different numbers of virtual switches: 8, 6, 5, 4, 3, 2. Virtual switches testing are dependent on the RDK Board port configurations and configuration modules used.
The following table (extracted from Table 1 of the PEX 8696 HRM) shows the different options.

	Port Configuration	Config Module (CM)	CM Connector	Lanes Routed to Connector			
				0 - 3	4 - 7	8 - 11	12 - 15
Station 0	x16	CM-090	J12	IP4	IP3	IP2	IP1
	x8, x8	CM-093				J1	
	x8, x4, x4	CM-091				J1	IP1
	x4, x4, x4, x4	CM-091					
Station 1	x16	CM-090, CM-108	J13, J14	J11			
	x16 (Cable)	CM-093, CM-107		IP13	IP14	IP15	IP16
	x8, x8	CM-125, CM-109		J11		J10	
	x8 (Cable), x8	CM-124, CM-109		IP13	IP14	J10	
	x8, x4, x4	CM-125, CM-107		J11		J10	IP16
	x4, x4, x4, x4	CM-091, CM-107		J11	IP14	J10	IP16
Station 2	x16	CM-090	J15	J7			
	x8, x8	CM-091		J7		J6	
	x8, x4, x4	CM-092		J7		J6	IP9
	x4, x4, x4, x4	CM-093		J7	IP10	J6	IP9
Station 3	x16	CM-090	J16	J3			
	x8, x8	CM-091		J3		J2	
	x8, x4, x4	CM-092		J3		J2	IP5
	x4, x4, x4, x4	CM-093		J3	IP6	J2	IP5
Station 4	x16	CM-090	J17	J9			
	x8, x8	CM-092		J9		J8	
	x8, x4, x4	CM-091		J9		J8	IP11
	x4, x4, x4, x4	CM-124		J9	IP12	J8	IP11
Station 5	x16	CM-090	J18	J5			
	x8, x8	CM-092		J5		J4	
	x8, x4, x4	CM-091		J5		J4	IP7
	x4, x4, x4, x4	CM-124		J5	IP8	J4	IP7

Default Configuration

External Cable Configuration

Table 1. PEX 8696 RDK Port Configurations

5.4.3.1 Testing the PEX 8696 for the Maximum 8 Virtual Switches

Refer to Section 3.3 of the PEX 8696 HRM for more information on virtual switches.

For testing all 8, 6, 5, 4, 3, 2 virtual switches, use x4x4x4x4x4x4 configurations modules. The strapping options include setting the SW8 dipswitch and checking the corresponding upstream and downstream ports. Refer to the following table to program the virtual switches.

# of Switches	SW8 Setting (VS-Mode[2:0])	Upstream Ports	Downstream Ports
8	111	P0	P1,P2
		P4	P3,P5
		P8	P6,P7
		P10	P9,P11
		P12	P13,P14
		P16	P15,P17
		P20	P21,P18
		P22	P23,P19

Table 2. SW8 settings, Upstream Ports and Downstream Ports for 8 Virtual Switches

The following figure shows the cable adapters, slots and host connections for 8 Virtual Switches.

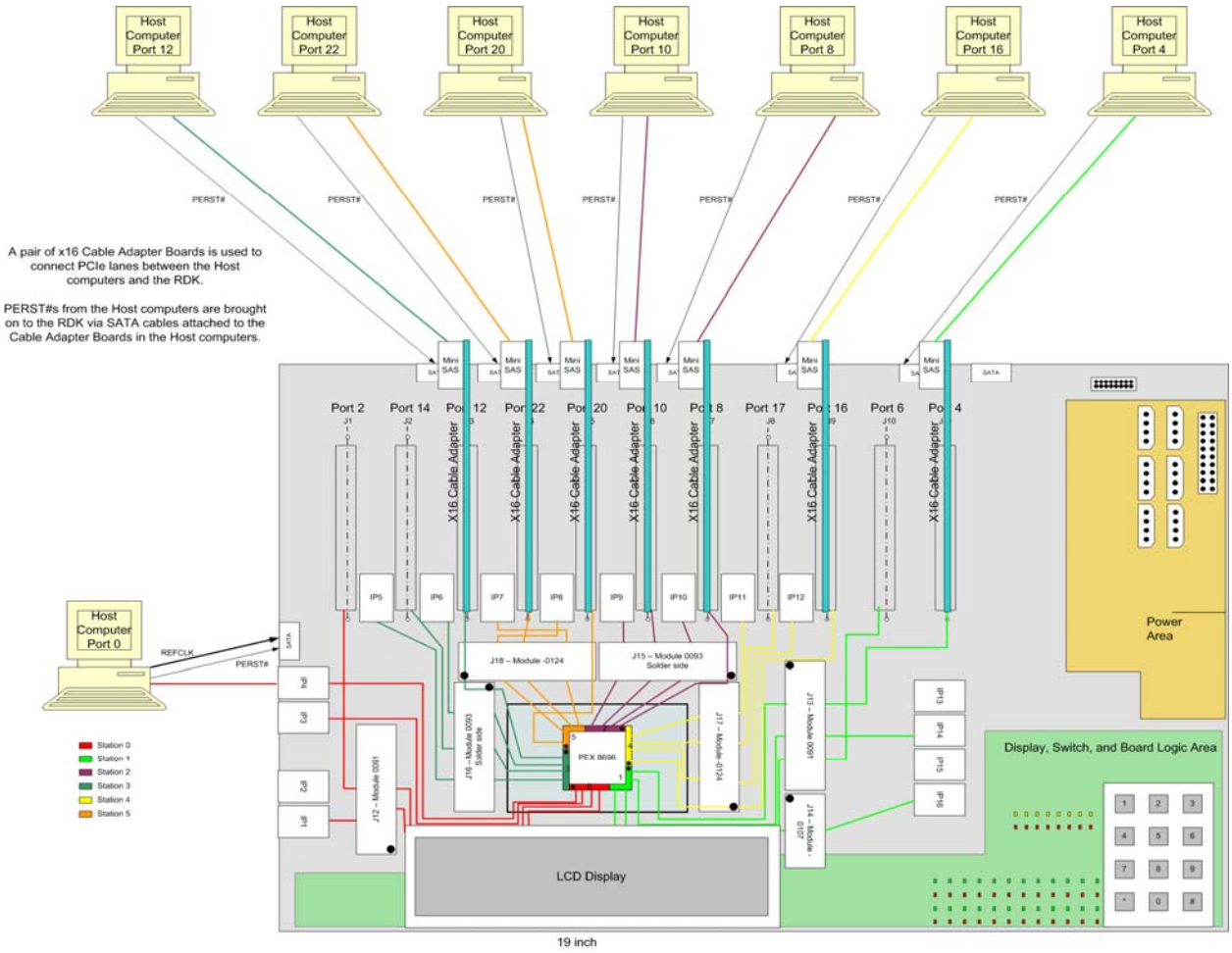

Figure 19. Virtual Switch Connections Using x4x4x4x4 Configuration Modules

Carefully note that each Station is colored coded and the exact lane assignments must match the RDK Port Configurations and Configuration Modules.

Configure for 8 virtual switches using the following steps:

1. Configure for x4x4x4x4 for all stations. Replace the default configuration modules with CM-091, CM091, CM-107, CM-093, CM124, CM124 modules. This will allow testing the maximum number of virtual switches, resulting in the maximum numbers of upstream and downstream ports.
2. Program SW8 for '111'.
3. Using Figure 19 above as reference, insert the cable adapters in RDK. Next, insert equivalent cable adapters in the Host systems 12, 22, 20, 10, 8, 16, 4.Finally, connect the mini-SAS cables and the red SATA cable into the exact connectors as shown.
4. Power on the RDK first and then power on the Host system.

Once the RDK and the host systems are set up for virtual switches, run the following tests:

1. Visual LEDs Linkup – check the Port Status Indicators of the baseboard RDK. The LEDs should light up and show the detected upstream ports and downstream ports. Verify that these upstream and downstream ports correspond to definitions in Table 2 above.

2. Device Manager Detection – For every host system that is connected to the upstream port slot of the RDK (for example, Host computer ports 12, 22, 20,10, 8,16, 4, 0), verify that Device Manager correctly detect and display the “PCI Standard PCI to PCI Bridge”. See Figure 3 as an example. Verify that these upstream and downstream ports correspond to definitions in Table 2 above.

3. PEX Editor Detection – For every host system that is connected to the upstream port slot of the RDK (for example, Host computer ports 12, 22, 20, 10, 8, 16, 4, 0), install SDK 6.3 and check the PEX Editor to make sure it detects the RDK. See Figure 6 as an example. Check the displayed upstream and downstream ports to make sure they correspond to definitions in Table 2 above.

4. Endpoint Tests - Connect endpoints, such as video cards, ethernet adapter cards or SCSI/Fibre Controller cards to the assigned downstream ports. Run video display tests, network tests or data storage tests to make sure the correct host system can access its assigned downstream ports.

SPECIAL NOTE: For practical hardware and space considerations, it is possible to use fewer actual host systems to verify all eight VS. For example,

1. Test 2 or 3 upstream ports at a time. Multiple cable adapters may be inserted into the same host system. This is done by inserting one cable adapter into one available PCIe slot of the system. Pair this cable adapter with another cable adapter inserted into the upstream port of the RDK.
2. Once the above 2 or 3 upstream ports are verified, test other upstream ports of the RDK (i.e. move the cable adapters to different PCIe slots of the RDK).

5.4.3.2 Testing the PEX 8696 for 6, 5, 4, 3, 2 Virtual Switches

Using the exact hardware setup above, but only changing SW8 settings (VS-MODE[2:0]), repeat the testing for 6, 5, 4, 3, 2 virtual switches.

# of Switches	SW8 Setting (VS-Mode[2:0])	Upstream Ports	Downstream Ports
6	101	P0	P1 .. P3
		P4	P5 .. P7
		P8	P9, P10
		P16	P11, P17
		P20	P21, P18
		P22	P23, P19
5	100	P0	P1..P3, P12..13
		P4	P5..P7, P14..15
		P8	P9..P11
		P16	P17..P19
		P20	P21..P23
4	011	P0	P1..P3, P12..P13
		P4	P5..P7, P14..P15
		P8	P9..P11, P20..P21
		P16	P17..P19, P22..P23
3	010	P0	P1..P7
		P8	P9..P15
		P16	P17..P23
2	001	P0	P1P11
		P12	P13..P23

Table 3. Programming SW8 for 6, 5, 4, 3 or 2 Virtual Switches

6. Test Results

Before testing begins, log all the equipment, and setup information. See the Software and Hardware Identification Information checklist attached. During testing, take detailed notes of all observations, symptoms, workarounds or other useful information for the follow-up or debug process.

6.1 Attachment A – Software and Hardware Identification Information

Fill in the table below with exact labels, versions used by the hardware and the software.

Table 4. Software and Hardware ID Information

Name	Version	Other Identification Information
PEX SDK	6.3 (dated 09-21-2009)	
RDK (board+chip) - PEX 8696 Default Configuration: Default Configuration modules: Expansion board: Virtual Switch Configuration:	 - Board Serial No: 8696AAA-28090019 Chip markings: Not Available - Baseboard; Station 0, x16 Up. All other Stations x8x8 Down CM-090, CM-125, CM-109, CM-091, CM-091, CM-092, CM-092 Option available to add 12 PCIe slots x4x4x4x4 ports using configuration modules CM-091, CM091, CM-107, CM-093, CM-124, CM-124. Set VS through SW8[2:0] dipswitches	 SMT 044218-0022
Operating Systems - Windows XP Professional - Windows Server 2003 - Windows Vista - Fedora Linux - Red Hat Linux - Mac OS - Windows Server 2008 - Windows 7 Ultimate	 - Standard and x64 bit with Service Pack 3 (volume license) - Standard version with SP2 (volume license) - Standard and x64 bit Enterprise - Versions 8, 9, 10 - Version 5.1 Server x86 DVD - Version X (Leopard) ver 10.4.11 - Standard and x64 bit Enterprise - Version 6.1.7100 Build 7100	
WHQL test suites - Driver Test Manager (DTM)	 - WLK 1.4 with DTM Version 1.4.7100.017	

6.2 Attachment B – Motherboards and System BIOS

Table 5. Test Results Matrix for Motherboards and System BIOS

Test Category	System Number (Refer to Motherboards and Systems List Attachment) : Fill in Pass or Fail (P or F) For explanation details, refer to the Note Number after P or F below. NA = Not Available NT = Not Tested														
	1	2	4	5	12	14	23	24	27	29	31	35	36	37	38
Visual Link-Up Test	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
OS Installation															
• **Windows XP Pro**	P		P	P	P	P	P	P	P			P	P	P	P
• **Windows Server 2003**	P						P			P					
• **Windows 7**		P		P								P		P	
• **Vista**	P	P		P				P			P	P			
• **Mac X OS (Leopard)**											P				
• **Linux Fedora, Red Hat**			P					P							
• **Windows Server 2008**			P				P								
- Windows: Device Mgr Detection	P	P	P	P	P	P	P	P	P		P	P	P	P	P
- Apple: Sys Profiler Detection											P				
- Linux: LSPCI Device Detection			P					P							
Slot Tests	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
PEX Editor Detection Tests	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Power Options under Win XP, or Vista or Win 7															
o **Restart**	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
o **Standby/Sleep**	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
o **Hibernation**	P	P	P	NA	P	P	P	P	P	P	NA	P	P	P	P
o **Shutdown**	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

6.3 Attachment C - Video Adapters

Table 6. Test Results Matrix for Video Adapters

Test Category	System Number (Refer to Motherboards and Systems List) : Fill in Pass or Fail (P or F). For explanation details, refer to the Note Number after P or F below. NA = Not Available NT = Not Tested														
	1	2	4	5	12	14	23	24	27	29	31	35	36	37	38
Video Adapter Tests															
Card Name & Model: NVIDIA 8800 GTS (Gen 2)															
Video display on the monitor	P								P	P				P	P
Driver installation	P								P	P				P	P
Driver detection (See Note 2 below)	P								P	P				P	P
Card Name & Model: ATI Diamond Radeon HD 3850 (Gen 2)															
Video display on the monitor	P								P					P	P
Driver installation	P								P					P	P
Driver detection	P								P					P	P
Card Name & Model: ATI x1950 Pro Radeon															
Video display on the monitor	P								P					P	P
Driver installation	P								P					P	P
Driver detection	P								P					P	P

6.4 Attachment D - Ethernet Adapters

Table 7. Test Results Matrix for Ethernet Adapters

Test Category	System Number (Refer to Motherboards and Systems List): Fill in Pass or Fail (P or F) For explanation details, refer to the Note Number after P or F below. NA = Not Available NT = Not Tested														
	1	2	4	5	12	14	23	24	27	29	31	35	36	37	38
Ethernet Adapter Tests															
Intel Pro/1000 PT Dual Port Server															
Driver installation	P		P					P	P					P	
Driver detection	P		P					P	P					P	
Web-page access	P		P					P	P					P	
DLINK – 560T															
Driver installation	P1		P1					P1	P1					P1	
Driver detection	P1		P1					P1	P1					P1	
Web-page access	P1		P1					P1	P1					P1	
Broadcom 5708 NEXTREME															
Driver installation	P		P					P	P					P	
Driver detection	P		P					P	P					P	
Web-page access	P		P					P	P					P	
Intel 10 Gig XFSR Dual Port															
Driver installation								P	P						
Driver detection								P	P						
Web-page access								P	P						

Notes: Dlink 560T --- This rogue network adapter does not meet PCIe 2.0 specifications and will only work in Gen-1 mode. The RSVD-17# switch (pin 5 of SW13) of the RDK must be flipped to get this network card to link up properly.

6.5 Attachment E - SCSI/FC HBAs and TV Tuners

Table 8. Test Results Matrix for SCSI/FC HBAs and TV Tuners

Test Category	System Number (Refer to Motherboards and Systems List): Fill in Pass or Fail (P or F) For explanation details, refer to the Note Number after P or F below. NA = Not Available NT = Not Tested														
	1	2	4	5	12	14	23	24	27	29	31	35	36	37	38
SCSI/FC Storage HBA Tests															
LSI SCSI 320-2E RAID Controller															
Driver installation	P							P	P					P	
Driver detection	P							P	P					P	
Read/Write data files	P							P	P					P	
Emulex LP 1050EX-F2															
Driver installation	P							P	P					P	
Driver detection	P							P	P					P	
Read/Write data files	P							P	P					P	
Marvell SAS Controller															
Driver installation	P							P	P					P	
Driver detection	P							P	P					P	
Read/Write data files	P							P	P					P	
TV Tuner Tests															
KWorld TV Tuner PVR-TV PE210															
Driver installation	P1								P1					P1	
Driver detection	P1								P1					P1	
Video capture & display	P1								P1					P1	

Notes: KWorld TV Tuner PVR-TV PE210 --- This rogue TV tuner card does not meet PCIe 2.0 specifications and only works in Gen-1 mode. The RSVD-17# switch (pin 5 of SW13) of the RDK must be flipped to get this network card to link up properly.

6.6 Attachment F -- WHQL Certification Results for PEX 8696 RDK

Table 9. WHQL Certification Results for PEX 8696 RDK

RDK Manufacturer: PLX Technology **Other Notes:** DTM 1.4.7100.017
Type (PCIe): PCI Express interface with 8696AA Revision
Board Revision: 8696 Baseboard RDK
Controller System : Dell Precision 670, Xeon 2.8 GHz, 1 Gigabytes memory, Windows Server 2003
Client System: ASUS P5Q Pro, Intel E5200 CPU @2.5 GHz, 4 Gigabytes DDR2, Vista Ultimate x64 bit

Test Category	Pass/Fail Results	Notes
Common Scenario Stress With I/O	PASS	Run in automated mode
Disable Enable With IO	PASS	Run in automated mode
Sleep Stress With IO	PASS	Run in automated mode
PCI compliance Test Suite	PASS	Run in automated mode

6.7 Attachment G – Fully-Loaded and Virtual Switch Configurations

Table 10. Advanced Tests

Test Category	System Number (Refer to Motherboards and Systems List): Fill in Pass or Fail (P or F) For explanation details, refer to the Note Number after P or F below. NA = Not Available NT = Not Tested														
	1	2	4	5	12	14	23	24	27	29	31	35	36	37	38
Fully-loaded Configuration															
Video adapter: NVIDIA 8800 GTS					P			P						P	
Video adapter: NVIDIA Quadro NVS 290					P			P						P	
Video adapter: ATI VisionTek 9250					P			P						P	
Video adapter: ATI VisionTek 9250					P			P						P	
Ethernet adapter: Intel Pro100/1000					P			P						P	
Ethernet adapter: Broadcom BCM5708A0804F					P			P						P	
Ethernet adapter: Broadcom BCM5751PKFBG					P			P						P	
SCSI/FC adapter: LSI Ultra320 SCSI 2000 series					P			P						P	
PEX 8533 RDK					P			P						P	
PEX 8647 RDK					P			P						P	
PEX 8111 Forward RDK					P			P						P	
Fully-loaded RDK + Fully-Loaded Expansion Board					P			P						P	

Test Category	System Number (Refer to Motherboards and Systems List): Fill in Pass or Fail (P or F) For explanation details, refer to the Note Number after P or F below. NA = Not Available NT = Not Tested															
	1	2	4	5	6	12	14	23	24	27	28	31	35	36	37	38
Virtual Switch Configurations																
- Two virtual switches																
o Visual LED Linkup					P	P				P					P	
o Device Mgr Detection					P	P				P					P	
o PEX Editor Detection					P	P				P					P	
- Three virtual switches																
o Visual LED Linkup					P	P				P					P	
o Device Mgr Detection					P	P				P					P	
o PEX Editor Detection					P	P				P					P	
- Four virtual switches																
o Visual LED Linkup					P	P				P					P	
o Device Mgr Detection					P	P				P					P	
o PEX Editor Detection					P	P				P					P	
- Five virtual switches																
o Visual LED Linkup					P	P				P					P	
o Device Mgr Detection					P	P				P					P	
o PEX Editor Detection					P	P				P					P	
- Six virtual switches																
o Visual LED Linkup					P	P				P					P	
o Device Mgr Detection					P	P				P					P	
o PEX Editor Detection					P	P				P					P	
- Eight virtual switches																
o Visual LED Linkup					P	P				P					P	
o Device Mgr Detection					P	P				P					P	
o PEX Editor Detection					P	P				P					P	

7. Test Equipment

7.1 Motherboards and System BIOS

Table 11. List of Motherboards and their Key Information

System #	Motherboard	Root Complex	CPU	BIOS	PCI Express Slots	Operating System
1	**ASUS (Gen 2)** M3A32-MVP Deluxe AMD X2 2 GB DDR2, PC2-5300	AMD Northbridge RD790 Southbridge SB600	AMD	**AMI** Version: 0603 11/26/2007	4- x16	Windows XP Pro SP3 Vista Enterprise
2	**ASUS (Gen 2)** P5Q Pro Intel Pentium Dual-Core CPU E5200@ 2.50GHz, 4 GB DDR2	INTEL Northbridge P45/P43 rev. A3 Southbridge 82801JR (ICH10R) rev. 00	INTEL	**AMI** Version:0401 04/13/2009	2- x16 3- x1	Windows 7 Vista 7 Ultimate SP2 Vista Ultimate x64 Windows 2008 Server R2 x64
4	**ASUS (Gen 2)** Maximus Formula 512 MB DDR2 PC2-6400	Intel Northbridge X38 rev. 01 Southbridge 82801 (ICH9 rev. 01)	INTEL	**AMI** Version: 0505 10/12/2007	2- x16 3- x1	Windows XP Pro SP3 Vista Enterprise Fedora 8 Windows 2008 Server
5	**ASUS (Gen 2)** P6T Intel Core i7 CPU 920 @2.67GHz 12 GB DDR3	Intel Northbridge X58 rev.12 Southbridge 82801JR (ICH10R) rev. 00	Intel	**AMI** Version: 0507 04/28/2009	3- x16 1- x1	Windows XP Pro SP3 Vista Ultimate with SP1 Windows 7
6	**GIGABYTE** GA-P35-DS3L Duo Core E6420 2 GB DDR2 SDRAM 333	Intel Northbridge P35/G33/G31 rev. 02 Southbridge ID2918 rev. 02	INTEL	**PHOENIX AWARD** Version: BIOS F5 09/07/2007	3- x1 1-x16	Windows 2003 Server SP2 Standard and Enterprise Fedora 8
7	**HP** Proliant ML 115 G1 Dual Core Opteron 1210 1 GB DDR2 300	Nvidia Northbridge nForce 570 SLI rev. A2 Southbridge nForce 570 SLI rev. A3	AMD	**HP** Version: 011 03/10/2007	2-x8 1-x16	Windows 2003 Server SP2 Windows 7
11	**ASUS** P5N32-E SLI Core 2 Duo E6600 DDR2, PC2-6400, 4 Gigabytes	Intel Northbridge nForce 680i SLI SPP rev. A2 Southbridge 680i SLI MCP rev. A2	INTEL	**PHOENIX** Version: 1002 03/28/2007	3-x16 1-x1	Windows XP Pro SP3
12	**ASUS P5E (Gen 2)** Intel Core 2 Duo E6850 2 GB DD2 PC2-5300	Intel Northbridge X38 rev. 01 Southbridge 82801Ib (ICH9) rev. 02	INTEL	**AMI** Version: 0203 10/11/2007	2- x16	Windows XP Pro SP3 Vista Enterprise
13	**ASUS** P5WDG2 WS Pro Intel Pentium 4 530 2 GB DDR2	Intel Northbridge i974X rev. C0 Southbridge 82801GB (IXH7) rev. 01	INTEL	**AMI** Version: 0803 03/01/2007	2-x16	Windows XP Pro SP3
14	**AMD (Gen 2)** Shiner 512MB DDR2 PC2-4300	AMD Northbridge ID9600 rev. 00 Southbridge ID 439D rev. 00	INTEL	**AMI** Version: 080014 12/07/2007	2- x16 1- x1	Windows XP Pro SP3 Vista Enterprise Windows 2008 Server

System #	Motherboard	Root Complex	CPU	BIOS	PCI Express Slots	Operating System
15	**AMD (Gen 2)** Hammerhead 4 GB DDR2, PC2-4300	AMD Northbridge RD790 Southbridge AIT SB600	AMD	**AMI** Version: 080014 08/14/2007	4- x16 1-x1	Windows XP Pro SP3 Vista Enterprise Fedora 8
19	**AMD** Platform Tigris Bali Mobile Reference Platform S2g3 dual core AMD 64 processor 4 GB DDR3, PC2-6400	AMD North bridge RD880M rev A11 Southbridge SB710 rev A14	AMD	**PHOENIX** Version: PBA1128a 11/28/08	1- x1 3- PCIe minicard	Vista Ultimate SP2 Windows 7
20	**ASUS (Gen 2)** Rampage Formula Intel Core2 Quad CPU Q9550 @ 2.8GHz, Socket 775 LGA, Yorkfield	Northbridge Intel X48 rev.01, Southbridge Intel 82801R (ICH9R) rev.02	INTEL	**AMI** 04/03/08	2- x16 2- x1	Windows XP Pro SP3 Vista Ultimate SP1 Vista Ultimate x64 SP1
21	**HP** Workstation XW 8200 Intel Xeon, 3.2 GHz Cranford 5GB SDRAM	Intel Northbridge E7525 Southbridge 82801EB (ICH5) rev. 0C	INTEL	**HP** Version: 786B8 v2.10 5/31/2006	1- x16 1- x1	Windows Server 2003 (Standard and Enterprise) Windows Server x64 for 2003 Fedora Core Linux 9 Red Hat Linux 5.1
23	**DELL** Precision 690 Xeon 5110 Woodcrest 4 Gigabytes	Intel Northbridge 5000X rev. 12 Southbridge 6321ESB rev. 09	INTEL	**DELL** Version : A05 05/24/2007	3-x8 1-x16	Windows XP Pro x64 Windows Server 2008
24	**GIGABYTE** GA-965P-S3	Intel Northbridge 965P Southbridge ICH8	INTEL	**PHOENIX AWARD** Version F6, 10/12/2006	1- x16 3- x1	Windows XP Pro SP3 Fedora Linux 8 Red Hat Linux 5.1
26	**ASUS** P5W64 WS	Intel Northbridge 975X Southbridge ICH7R	INTEL	**AMI** Version: 02.58	4- x16	Windows XP Pro SP3
27	**INTEL (Gen 2)** Tylersburg B2 PDK platform Socket 775 LGA, 1600 MHz DDR3 PC3-6400E (400Mhz) Elpida	Intel Northbridge Intel ID3400 rev.00 Southbridge Intel 82801B (ICH9) rev.02	INTEL	**INTEL** Version: TCV023_CRB	1- x16 3- x8	Windows Server 2008 x64
29	**DELL** PowerEdge 2900 Xeon 5150 Woodcrest 7 GB DDR2	Intel Northbridge Intel 5000X rev. 11 Southbridge Intel 6321ESB rev. 09	INTEL	**DELL** Version: 1.1.3 08/21/2006	4-x8	Windows Server 2003 SP2
31	**APPLE** Mac Pro Xeon 5130 Woodcrest 4 BG DDR2	Intel Northbridge 5000X rev. 31 Southbridge 632ESB rev. 09	INTEL	**APPLE** Version: MP11.88Z.005D.B00.0709141354 09/14/2007	4-x16	Apple Mac OS X (Leopard) Vista Ultimate SP2
35	**DELL (Gen 2)** T7400 1 GB DDR2	Intel Northbridge ID4003 rev. 20 Southbridge 6321ESB rev. 09	INTEL	**DELL** Version: A00 11/05/2007	2-x16 1-x8	Windows 7 Vista Ultimate SP2 Windows Server 2008

System #	Motherboard	Root Complex	CPU	BIOS	PCI Express Slots	Operating System
36	**HP (Gen 2)** Workstation XW4600 1 Gigabytes	Intel Northbridge X38 rev. 00 Southbridge 82801IB (ICH9) rev. 02	INTEL	**HP** Version: 786F3 v1.06 01/29/2008	2-x16 1-x8 1-x1	Vista Ultimate SP2 Windows XP Pro SP3 Windows 7
37	**MSI (Gen 2)** K9N2 Diamond Athlon 64 X2 Dual Core 3600+ 8 GB DDR2	Nvidia Northbridge nForce 780a SLI SPP rev. A2 Southbridge nForce 780 SLi MCP rev. A2	AMD	**AMI** Version: 2.0 04/10/2008	3- x16 1- x1	Windows 7 Windows XP Pro SP3 Vista Ultimate SP2
38	**GIGABYTE (Gen 2)** Gigabyte GA-EP45-DS3R/DS3 Intel core 2 Duo CPU E4500 @ 2.20GHz, Socket 775 LGA, Conroe	Intel Northbridge ID2E20 rev. 02 Southbridge ID3A16 rev.00	INTEL	**Phoenix Award** Version: F4 05/28/2008	2-x16 3-x1	Windows XP Pro SP3
40	**AMCC** Power PC 460EX Evaluation Kit (up to 1.067 GHz), 512 MB DDR2 SDRAM	AMCC Power PC	AMCC	**Software Support:** Resource CD, Denx CD	1-x1 1-x4	Embedded Linux
41	**FREESCALE MCEVALHPCN-8641D** Power PC 1.0 GHz to 1.5GHz 4GB of RAM	Freescale MPC8641D (dual core) South Bridge: ULI 1575	FREESCALE	**Software Support**: U-Boot bootloader, CodeWarrior Development Studio v8.8 Rev D Build 80229, Linux BSP, and DINK Debugger	1-x16	GNU/Linux Kernel 2.6.23
42	**FREESCALE PPCEVAL-DS-8572B** Dual e500 Core Power PC 1.5 GHz	Freescale MPC8572B	FREESCALE	**Software Support**: U-Boot bootloader, CodeWarrior Studio v8.8 Rev D Build 80229, Linux BSP, and DINK Debugger	2-x16	GNU/Linux Kernel 2.6.23
43	**FREESCALE –DS-8536** E500 Core Power PC 1.5 GHz	Freescale MPC8536	FREESCALE	**Software Support**: U-Boot bootloader, CodeWarrior Studio v8.8 Rev D Build 80229, Linux BSP, and DINK Debugger	3-x16	GNU/Linux Kernel 2.6.23
44	**FREESCALE MPC8544DS** E500 Core Power PC 1.067 GHz	Freescale MPC8544DS	FREESCALE	**Software Support:** U-Boot bootloader, CodeWarrior Studio v8.8 Rev D Build 80229, Linux BSP, and DINK Debugger	2-x16	GNU/Linux Kernel 2.6.23
46	**AMD (Gen 2)** Pufferfish AMD Phenom II X4 910 Processor @ 2600.0 MHz 2 GB DDR3, PC3-10700H 667 MHz	AMD Northbridge ATI ID5A11 rev. 00 Southbridge ATI SB700 rev. 00	AMD	**AMI** Version: 080014 10/31/2008	2-x16 1-x4	Vista Ultimate SP2 Windows XP Pro SP3
47	**CAVIUM NETWORKS** EBH Octeon CN5650 NSP Pass 2.1 Core clock: 800 MHz, DDR clock: 399 MHz DRAM: 4096 MB Flash: 8 MB	Cavium Networks CN 5650 processor	Cavium Networks	**Cavium Networks** U-Boot 1.1.1	1-x1	Fedora Core Linux 8 Fedora Core Linux 10
48	**AMD (Gen 2)** GUAM Dual Core 804 MHz 3 GB DDR3	AMD Northbridge: RS 880 Southbridge: SB880	AMD	**Phoenix Award** Version: EGM1006a 10/06/2009	1-x4	Vista Ultimate SP2

7.2 Endpoint Devices and Connectivity Kits

Table 12. List of Endpoint Devices and Connectivity Kits

Device Category	Product Manufacturer	Model Name/Number	Product Details	System Interface	Software Drivers and/or Drivers
Graphics adapters	BFG Technology	GeForce 8800 GTX	575 MHz core clock; 900 MHz memory clock; support for both Microsoft® DirectX 10 and DirectX 9; PureVideo™ HD^2 technology	PCI Express	ForceWare Release 158 Version: 158.22 Release Date: May 17, 2007
	NVIDIA (Gen 2)	GeForce 8800 GTS Alpha Dog Edition	NVIDIA graphics card PCI Express 2.0 512 DDR3, Order code PV-T88G-YDF4, GF 88000GTS 650M 512MB DDR3 DUAL PCI TV PCI-E, S/N.IXF229432	PCI Express	Driver CD xfx Play Hard version 169.06, s/n door card, DVI adapter, quick install guide, Company of heros cd game pak.
	Kaser	GeForce 6600	NVIDIA CineFX 30 engine; 256 MB ; Duall 400 MHz RAMDACs; OpenGL support	PCI Express	NVIDIA ver N.5.II.I
	Kaser	Radeon x300SE	ATI Radeon (VPU) ; 128 MB system memory; 15 VGA connector; S-Video/composite connector, DVI connector	PCI Express	International Installation CD ver A5.7.1
	PNY Technologies	GeForce 6600	NVIDIA SLI Ready and CineFX 3.0 Engine; 300 MHz core clock, 128-bit DDR memory interface 256 MB DDR; VGA + DVI+HDTV/S-Video Outputs	PCI Express	Verto GDRV-7777
	ATI	Diamond Stealth Radeon X300SE	ATI Radeon; 128 MB /Mo Hypermemory; requires 420 W power supply or higher; Dual monitor Display	PCI Express	ATI Catalyst drivers v 6.0
	NVIDIA	Quadro NVS-280	Microsoft-certified component; integrated component of Dell Precision 670	PCI Express	Nv4-disp.dll Ver 6.14.0010.6127
	NVIDIA	PCI Express 6200	GeForce 6 Series Turbocache	PCI Express	ForceWare Release 80 Ver 84.21
	NVIDIA	Quadro NVS-440	256 DDR3 memory, 4 x DVI-I , 1920x1200; BIOS ver 5.43.02.88.03	PCI Express	Drivers CD ver 81.67
	NVIDIA	Quadro FX 3700	512MB, 256-bit, 112 CUDA processor cores, Dual-link DVI, PCIe 2.0 support, SLI technology	PCI Express	Drivers Release 182 Version: 182.65 Release Date: 05-04-2009
	Matrox	Millenium P650 P65-MDDE128F	128 MB memory	PCI Express	Matrox Parhelia Series & Matrox P-Series
	Matrox	M9125	512 MB memory	PCI Express	Windows XP Driver: 2.08.00.074 SE U WHQL, dated Jun. 5, 2009
	Connect 3D	ATI Radeon X1600 series. C3D 3050	512MB GDDR2+DVI+TV	PCI Express	CD=Connect 3D, Graphics card driver Version 10.4
	ATI	X1950 Pro 256 MB	Dual GPU PCIe x16 Video card with two DVI-I and one S-Video connector outputs. Requires 6-pin external power.	PCI Express	CD 100 180-G01513-100 ATI Catalyst Software

Device Category	Product Manufacturer	Model Name/Number	Product Details	System Interface	Software Drivers and/or Drivers
	ATI	ATI Radeon x700 series.	One DVI output and one VGA output; ASIC type RV410 with x16 card edge	PCI Express	Display driver for Windows XP; version 7.8, August 13, 2007
	ATI (Gen 2)	Diamond Radeon HD 3850 Gen 2 PCIe x16 Video cards AMD/ATI ASIC is RV670	GPU PCIe x16 Video card with two DVI-I and one S-Video connector outputs. Does require a 6 pin external power connecter.	PCI Express	CD version 3.0 p/n.34083, with Quick Start guide., 1 ATI Crossfire cable, 1 s-video to rca out connector adapter, 1 s-video to rca composite video out adapter, 2 DVI to VGA adapters.
	AMD (Gen 2)	Diamond Radeon HD 4870 Gen 2 PCIe x16 video cards	Direxit 10.1, CrosfireX Ready, 512 MB , GDDR5, 2560 x1600 maximum resolution	PCI Express	AMD Catalyst Software Suite version 8.9
	S3 (Gen 2)	Chrome 540GTX 256MB GDDR3 DVI/HDMI	PCIe Gen 2 x16, Chromotion™ Video Engine, DirectX® 10.1, Shader Model 4.1, 1920x1080p HD resolution	PCI Express	Microsoft Certified Driver 6.14.10.0270 April 30, 2009
Ethernet Cards	HP	Broadcom NetXtreme	Gigabit PCI-E	PCI Express	Broadcom NetXtreme Ethernet drivers v 8.1
	Broadcom	BCM5708A0804F long low profile	Single port. 10/100/1000Base-T	PCI Express	Broadcom NetXtreme Ethernet drivers v10.12.01, 3/13/2007
	Broadcom	BCM5751PKFBG	Single port. 10/100/1000Base-T SP #393626-001 Short low profile cards.	PCI Express	Broadcom NetXtreme Ethernet drivers v10.24D, 2/1/2007
	Dlink	DGE-560T	Gigabit PCI-E Ethernet adapter; support 10/100/1000 Mbps transfer rate; low-profile; 256 MB memory	PCI Express	Wired Ver 1.00
	SysKonnect	SK-9E21D SK-9E22	10/100/1000Base-T Adapter; auto-detect, 802.3ab, u, ad, 802.1pq; ACPI 2.0 compatible; up to 133 MHz Bus Speed; PCI 2.3 compliant Dual-port version	PCI Express	Installation CD V 4.33
	Silicom	BCM5714CKPBG	Single-port, x1 lane, Low profile	PCI Express	Installation CD PxGx rev 9.0.5
	Intel	Pro/1000 Dual Port PT	Gigabit copper for servers	PCI Express	Intel Ophir drivers
	Intel	10 Gig XFSR	Dual Port Server Adapter	PCI Express	Intel 10 Gig drivers
	Silicom	Dual-port 10 Gigabit Ethernet (SR)	Intel® 10 Gigabit XF SR Dual Port Server Adapter	PCI Express	Intel 10 Gigabit XF SR Ethernet Version 13, 4/10/2008
	Marvell	VA6800m V1.0	SAS x8 controller	PCI Express	See www.marvell.com website
	Chelsio Communications	B320E	Dual Port 10 GBit Bypass Server Adapter; x8 PCIe	PCI Express	Microsoft-certified T3 Ndis Function driver, driver date 4/24/2008, version 1.4.19.7
TV Tuner Cards	KWorld	TV Tuner PVR-TV PE210	PCI- Dual Hybrid _ LP; Philip SAA 7162E/G; Dual Analog Card PVR	PCI Express	PCI-E Dual Version F; CD Software Hypermedia KW v1.01; SoundMAX Digital Audio v5.12.1.3620 5/27/2003
	Avermedia	TV Tuner AverTV Combo	NTSC/ATSC Combo Desktop TV	PCI Express	Avermedia Driver Installation XP v2.5; Aver TV AP6 Application ver 6.0.7
HBAs & Storage Controllers	Qlogic	QLA-2432	PCI Express Gigabit Fibre channel adapter; using FW 4.00.12	PCI Express	SAN Surfer Management Suite (SMS) ver 2006
	Emulex	LP1050EX-F2	PCI Express Single Port Fibre Channel adapter	PCI Express	CD- Technical Information and Drivers 04-334 07/2004 FC1061802-00R

Device Category	Product Manufacturer	Model Name/Number	Product Details	System Interface	Software Drivers and/or Drivers
	Emulex	LP11002	PCI Express Dual Port Fibre Channel adapter	PCI Express	Windows 2003 Server Driver 5.2.41a1-1b
	Emulex (Gen 2)	LPE12000	PCI Express Single Port Fibre Channel adapter; 8 Gig/sec FC data rate; 5 Gig/sec at PCIe 2.0 with x4 lanes	PCI Express	Storport Minidriver v. 2.00a12 for Windows Vista FC port driver 2.42a0 for Windows Server 2003
	SIIG	SATA II PCIe RAID	SATA II PCIe RAID adapter ; compliant to PCI-e base spec 1.0a; low-profile; uses Silicon Image SIL 3132	PCI Express	SIIG SATA II PCIe RAID v12.3.1
	LSI Logic	LSI22320 MegaRaid	Ultra-320 SCSI Host Bus Adapter	PCI Express	Driver 1.20.18 for Win XP
	Fusion IO	FS1-001-081-ES-0001	Gen-1 80 GB x4 PCIe RAM Disk Drive; Single Level Cell NAND	PCI Express	Driver 1.2.6.38143 for Windows 64 bit
Connectivity Devices and Kits	DLink	DGS-1008D	8-port gigabit switch; 10/100/1000Mbps switched ports; IEEE 802.3 flow control for full duplex	Not applicable	Not Applicable
	Linksys	EXHUB12S	Stackable Ethernet 100Base TX-12-Port Hub	Not applicable	Not Applicable