PEX 8509RDK

Interoperability Test Report

Version 1.0

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

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1. PURPOSE

This test report details interoperability procedures and results for the PEX 8509 switch RDK (Rapid Development Kit).

2. PRODUCT INFORMATION

The ExpressLane™ PEX 8509 8-lane, 8-port switch product offers PCI Express switching capability conforming to the PCI Express Specification r1.1. This device enables users to add low cost, scalable high bandwidth switching, both fan-in/out and peer-to-peer, to a wide variety of applications including office automation, network interface adapters, docking stations, AMC cards, and control planes in communications platforms. This switch is hardware configurable and software programmable, allowing users to tailor their port configurations and quality-of-service system needs to suit their application requirements. The PEX 8509 is offered in a 15 x 15mm 196-ball PBGA.

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 8509RDK is properly detected and works with different motherboard chipsets, CPUs, BIOS, and drivers.

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: Chip-to-chip Interoperability and WHQL Certification – This phase tests multiple PEX 8509RDKs, and other bridge or switch RDKs. Microsoft WHQL certification for a selected video card is done as well.

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

- Windows XP Professional with Service Pack 2
- Windows XP Professional, 64-bit Version
- Windows Server 2003 with Service Pack 1
- Windows Vista Enterprise
- Fedora Linux version 7.0

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 our RDKs. Refer to the test checklists attached for the exact configurations and actual test results.*

3.2 Test Omissions and Assumptions

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

1. Hot-Plug Tests - Hot-Plug functionality of the switch RDK has been successfully tested by the validation teams. At this time, however, most system BIOS, device drivers and operating systems (including Windows Vista) have not together fully support seamless hot-plug at the interoperability level. The interoperability lab will retest this key function as better support becomes available.
2. Serial EEPROM Tests – In-depth serial EEPROM tests are tested as by the validation teams. For interoperability, the EEPROM functions are used and tested within the context of the PEX Device Editor software.
3. JTAG Header - JTAG is not used for interoperability.
4. Targeted WHQL DTM Certification – WHQL DTM certification is done against Unclassified driver for the PLX bridge or switch device only. System certification and qualifying endpoints, such as video cards, ethernet cards, SCSI and FC HBAs are outside the scope of this document.

4. PRETEST REQUIREMENTS

4.1 Collaterals

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

1. PEX 8509RDK - See Hardware Reference Manual
2. SDK 5.1: - Low-Level Application Software for Bridge/Switch Devices
3. System Platforms: - See Motherboards and Systems List.
4. Video Adapters: - Matrox Millenium P650 PCI-Express
   - Nvidia NVS 440 PCI-Express
   - ATI 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: - Avermedia TV Tuner AverTV Combo PCI-Express

4.2 Other Documentation

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

1. Hardware Reference Manuals
2. PEX SDK 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 system have 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 suboptimal. 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.

Table 1. System BIOS Settings

System #	Bios Revision	Category/Subcategory and Parameter Settings
1	Phoenix Award BIOS v6.00PG 7100NMS V3.7 123104	PnP/PCI Configuration → Primary Graphic Adapter [First PCIE] → Maximum Payload Size [128] Cell Menu → PCI-E Spread Spectrum [Disabled] → PCIE Clock [100]
2	Phoenix Server 3 BIOS V6.; X6DAE-G BIOS Revision 1.2	Advanced → Default Primary video → PCI-e x16 → PCI-Exp x4 Slot #4 → Option ROM Scan [Enabled] → Enable Master [Enabled] → Latency timer [Default] → Advanced Chipset Control → PCI-e x16 BIOS workaround [Enabled]
3	Award AX8 BIOS 11 Version: 11K8T890-8237	Advanced Chipset Features → Init Display First [PCI Ex] → PnP/PCI configurations → Max Payload Size [128]
4	Phoenix Award BIOS V6.00PG NVIDIA BIOS V4.9x 4/26/2005- NF-CK804-6A61FS02C-00	Advanced Chipset Features → System Performance [Optimal] → PCI-E Spread Spectrum [Disabled] Integrated Peripherals → Init Display First [PCI Express]
5	AMI BIOS SE7520BD2.86B. P.08.20.0072	Advanced → PCI configuration → Dual Mode Video [Disabled] Integrated Peripherals → Init Display First [PCI Express]
8	Phoenix AWARD BIOS V6.00PG; P8SGA BIOS Revision 1.1; 03/29/2005-Grantsdale- 6A79DSX9C-00	Advanced → Advanced Chipset Control → PEG/PnP chip VGA Control [PEG Port] → PnP/PCI Configurations → Init display First [PCI-Exp] → Maximum Payload Size [128] → PCI-Express Root Port Function → PCI Express Port 1 [Auto] → PCI Express Port 2 [Auto] → PCI Express Port 3 [Auto] → PCI Express Port 4 [Auto] → PCI E Compliancy Mode [v1.0a] → Process & Clock Option → Spread Spectrum [Disabled]
9	Phoenix AWARD BIOS V6.00PG; V3.8 07/21/2005	Advanced Chipset Features → LDT & PCI Bus Control → LDT configuration [ENABLED] → Upstream LDT Bus Width [16 bit] → Downstream LDT Bus Width [16 bit] → LDT Bus Frequency [800 MHz] → PCI Reset Delay [Disabled] → Spread Spectrum [Disabled] Integrated Peripherals → Init Display First [PCI-E] PnP/PCI configuration → Maximum Payload Size [128]
10	Phoenix Award BIOS Revision 6.00PG; 1/23/2006-i955- W627EHF-6A79IA1AC-16	Advanced Chipset Features → PCI Express Root Port Function → PCI Express Slot 1 [Auto] → PCI Express Slot 2 [Auto] → PCI Express Compliancy Mode [v1.0a] → PEG Force x1 [Disable] → Init Display First [PCI-e] PnP/PCI Configuration → Maximum Payload Size [128]
11	Phoenix AWARD BIOS V6.00PG; Intel I945 BIOS 8I945P-G2 F10	MB Intelligent Tweaker [MIT] → PCI-E Overvoltage Control [Normal]

System #	Bios Revision	Category/Subcategory and Parameter Settings
12	Phoenix Award BIOS V6.00PG; 04/25/2005-M1695+M1567-6A7400-AC-00	Integrated Peripherals → Init Display First [PCI Express] PnP/PCI Configurations → PCI BAR Above 4 GB [Enabled] → Maximum Payload Size [128] Frequency/Voltage control → Programming Clock Generator [Enabled] → CPU Clock [200] → PCI-E Clock [100] → Spread Spectrum [Disabled]
14	AMI BIOS WPLI751.86P 10/13/2005 SMBIOS v2.3	Chipset → Northbridge configuration → Integrated Graphics Options → Primary Video Device [External PEG] → PCI Express configuration → Northbridge PCI Express → PEG Port [Auto] → PEG Scrambler Bypass [Disabled] → PEG Force x1 [Disabled] → PEG Link Disabled [Disabled] → PEG Isoch Flush Page [Enabled] → PEG Active State PM [Disabled] → PEG Endpoint Active State PM [Disabled] → SERR # on Non-Fatal Error [Disabled] → HNR Stability Algorithm [Enabled] → Southbridge PCI Express → PCI Express PME SC1 Enabled [Enabled] → PCI Express (1-6) [Enabled] → Root Port ASPM [L1/L0s] → DMI Active State PMI [L0s] → VCI for HD Audio [Enabled] → Northway Training W/A [Auto] → Northway S4 W/A [Disabled] → Select System/Device Setup → Select Port to Control [All Ports] → Device Control Register → Correctable Error Reporting [Enabled] → Non-Fatal Error Reporting [Enabled] → Fatal Error Reporting [Enabled] → Unsupported Req Error Reporting [Enabled] → Root Control Register → Correctable Error Reporting [Enabled → Non-Fatal Error Reporting [Enabled] → Fatal Error Reporting [Enabled] → PME Interrupt Enabled [Enabled] → PCI Express Wake [Enabled] → PCI Express SCI [Enabled] → Completion TimeOut (CTD) [Enabled] → VC1/TC MAP [TC7] → Remove Non-POR TCs from VC0 [Enabled] → LOCK PCIe Credits Registers [Disabled]
15	Phoenix Ltd 6.00 PG 10/11/2005 SMBIOS 2.2	PnP/PCI configurations → Init Display First [PCI Express] → Maximum ASPM supported [Los & L1] → Maximum Payload Size [128] Frequency → Spread Spectrum [Disabled] → Auto Detect PCI Clock [Enabled]
16	AMI BIOS SE7520BD2.86B. P.08.20.0072	Advanced → PCI configuration → Dual Mode Video [Disabled] Integrated Peripherals → Init Display First [PCI Express]

System #	Bios Revision	Category/Subcategory and Parameter Settings
17	DELL Bios Revision A07 (03/15/06)	Onboard Devices → Integrated NIC → On x/ PXE Video → Primary Video Power Management → Suspend Mode → S3 Maintenance → SERR DMI Message → Off POST Behavior →POST Hotkeys → Setup & Boot Menu
18	Intel BIOS CV92510A.86A.0477	Advanced → PCI Express Configuration → PCIE x16 Link Retrain [Enabled] → Link Stability Algorithm [Enabled] → Compliance Test Pattern [Enabled] → Video Configuration → PCIE Graphics [PEG]
19	AMI BIOS 2.58 ver 08.00.12 Build Date 03/14/06 AMMT_B14	Chipset → PCI Express Configuration → PCIE GFX1 Link Width [x16] → PCIE GFX2 Link Width [x16] → PCIE SB Paylad [64 bytes] → PCIE GFX Core Payload [64 bytes] → PCIE Relaxed Ordering 'rules [Disabled] → Hide Unused PCIE P2P Bridges [Disabled] → NB-SB PCIE Link ASPM [Disabled] →GFX PCIE Link ASPM [L0&L1] → GPP PcIE Link ASPM [L0&L1] → GFX0 Slot Power Limit, W [75] → GFX1 Slot Power Limit, W [25] → GPP Slot Power Limit, W [25] Power → Video Power Down Mode [Disabled]
20	AMI BIOS 080014 11/3/2006	Chipset → NorthBridge Configuration → Memory Configuration → Power Down control [Auto] → Alternate VID [VID] → Radeon Xpress x00 Configuration → Internal Graphics Configuration → Primary Video Controller [PCIE/IGFX/PCI] → Video Display Devices [AUTO] → PCI Express Configuration → Dual Slot GFX Configuration [AUTO] → OnBoard Marvell NIC [Enable]
22	Intel BIOS SN94510J.86A.0097.2006.1101.1459,11/1/2006	Advanced → Primary Video Adaptor → Ext PCIE Graphics (PEG) → Compliance Test Pattern → Disabled
24	Award BIOS F6, 10/12/2006	Advance BIOS Features → Init Display First → PEG MB Intelligent Tweaker (M.I.T) → PCI Express Frequency (Mhz) → [AUTO] → PCI-E Overvoltage Control → [Normal]
25	AMI BIOS v02.58	Advanced → Chipset → Boot Graphic Adapter Priority [PCI Express/PCI] → PEG Buffer Length [AUTO] → Link Latency [AUTO] → PEG Root Control [AUTO] → PEG Link Mode [AUTO] → High Priority Port Select [Disabled] → Onboard Devices Configuration → PCI- LAN [Enabled]
27	Phoenix Technologies	Advanced → Default Primary Video Adapter [PCI-e x16] → PCI-e I/O Packet [256B] → Slot 4 PCI-Exp x4 → [Option ROM Scan: Enabled] → [Enable Master: Enabled] → [Latency Timer: Default] → Slot 6 PCI-Exp x16 → [Option ROM Scan: Enabled] → [Enable Master: Enabled] → [Latency Timer: Default]

System #	Bios Revision	Category/Subcategory and Parameter Settings
31	AMI BIOS version S5000.86B.06.00.0074 02/02/2007	Advanced → PCI Configuration → Dual Monitor Video [Enabled]
32	AMI BIOS v0803	Advanced → Advanced chipset settings → Boot Graphic Adapter Priority [PCI Express/ PCI] → PEG Buffer Length [AUTO] → Link Latency [AUTO] → PEG Root Control [AUTO] → Slot Power [AUTO] → High Priority Port Select [Disabled]

4.5 Physical Layout of RDK

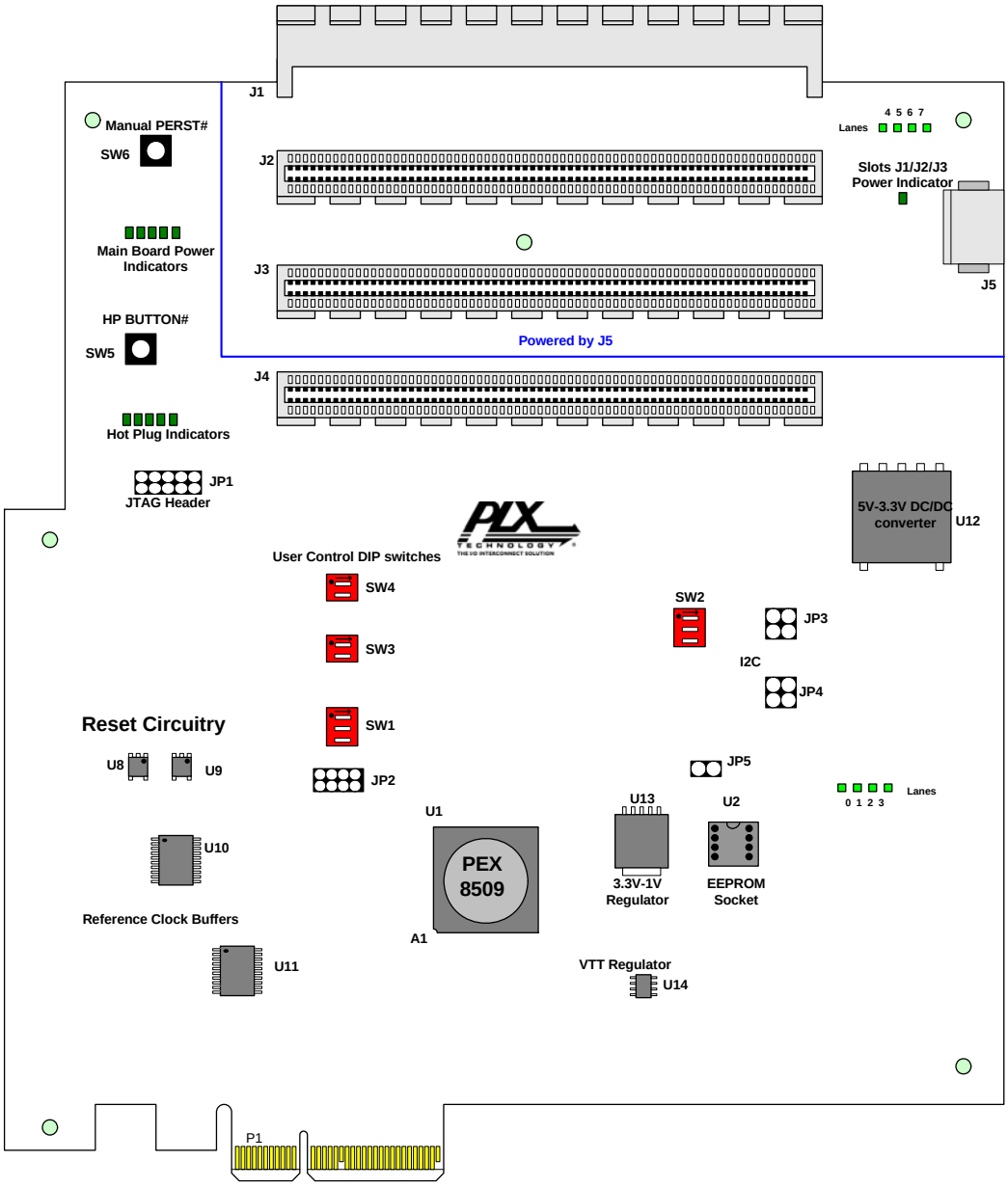

Figure 1. Front View of PEX 8509 RDK

Unless specified otherwise, default settings are used for all interoperability testing.

5. TEST DESCRIPTIONS AND PROCEDURES

5.1 Motherboards and System BIOS

The goal is to ensure that the RDKs and SDKs, 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 PEX 8509RDK 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. Verify the LEDs against their functional assignments from the Hardware Reference Manual.

5.1.2 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 the PCI-Express ports so continue to check each branch until the "PCI standard PCI-to-PCI bridge" appears.

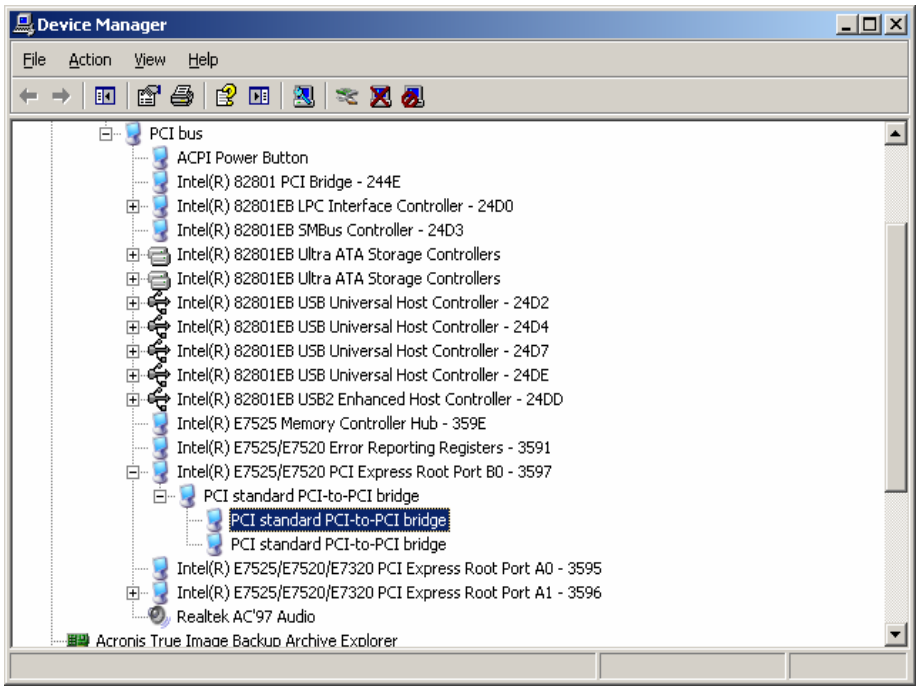

Figure 2. Device Manager Detection of Switch

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.

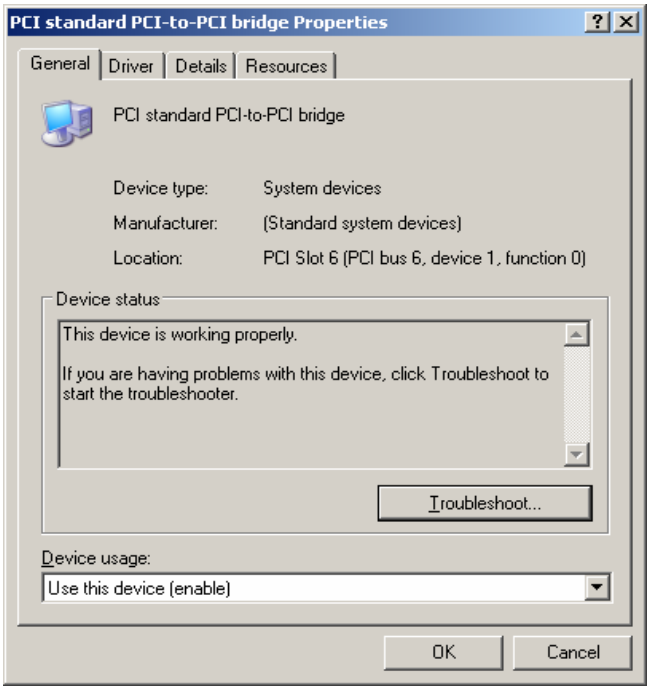

Figure 3. Routing Information of Switch Device

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

- PCI slot number
- Bus number
- Device number
- 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.

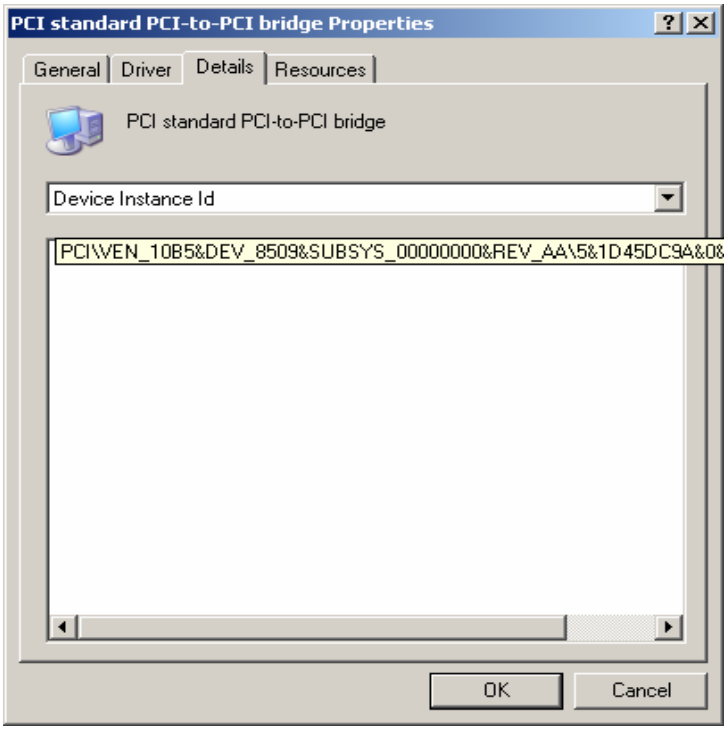

Figure 4. Vendor ID and Chip ID of Switch

Verify that the vendor ID is 10B5 and the chip ID is 8509.

5.1.3 Slot Tests

Different PC systems support different numbers and types of PCI-Express slots, ranging from x1 to 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 if the RDK is the Forward board. Insert into the PCI-X slot if the RDK is the Reverse board.

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.

5.1.4 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 and loading them, interoperability testing does not cover these advanced features.

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

5.1.4.1 Detection

See highlighted item in the above. 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 ChipType. Record this information and compare it against the slot number /bus number/ device number/ function number recorded earlier from the Device Manager Tests.

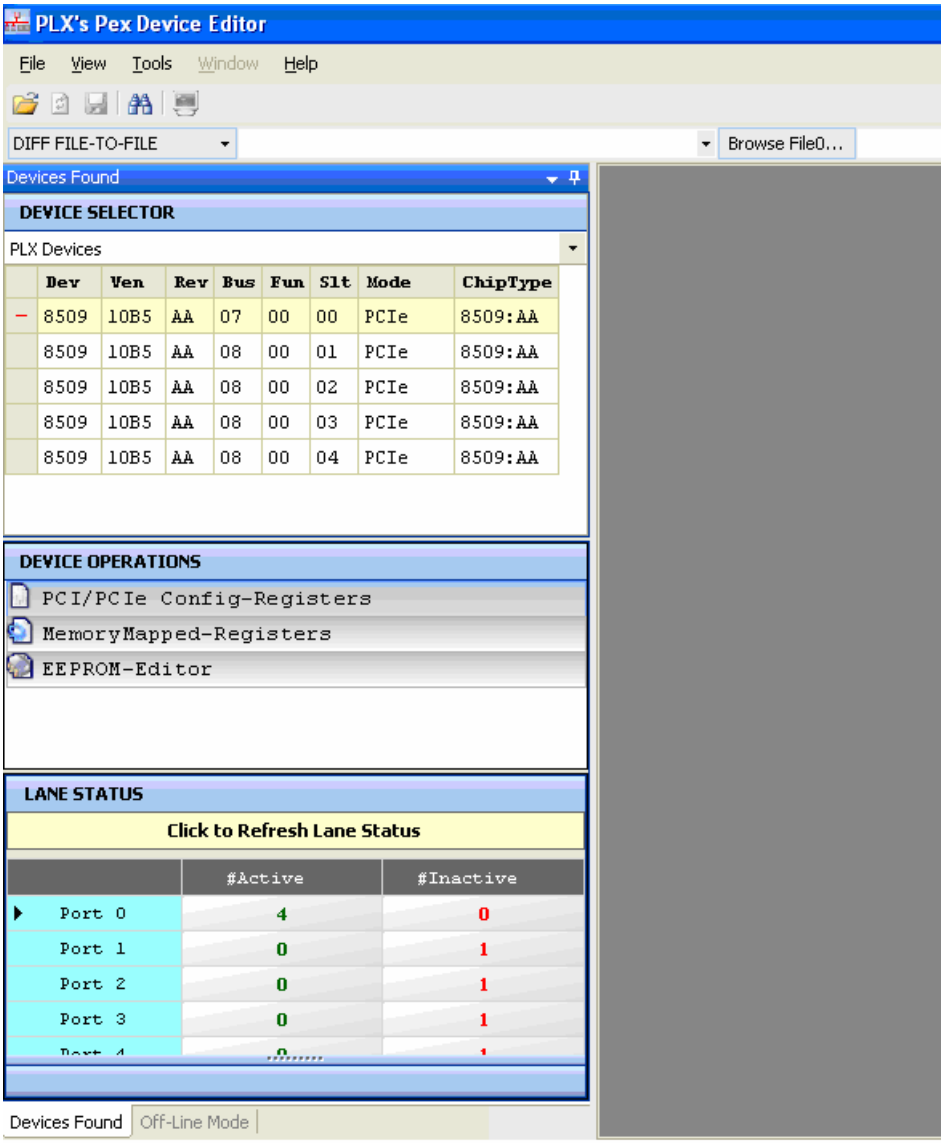

Figure 5. PEX Device Editor Display of Switch

Note: The PEX Device Editor software should display all the active and inactive upstream and downstream ports and their 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.

5.1.4.2 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.

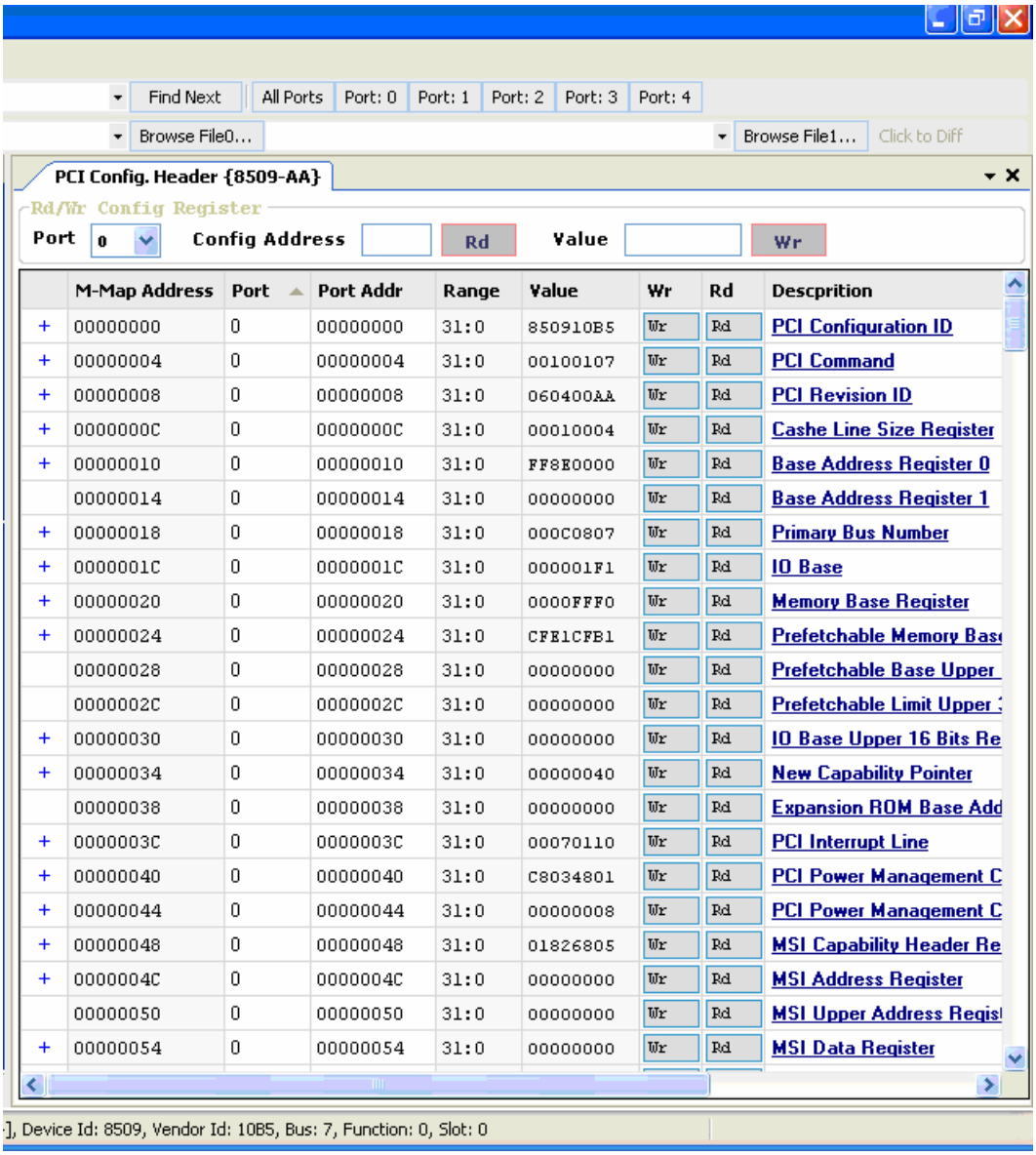

Figure 6. PCI / PCIe Configuration Registers of Switch

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 “850910B5” 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 {8509-AC}”.
   c. The Port, Configuration Address and Value drop-down boxes will appear. Select Port 0, Configuration Address 0.

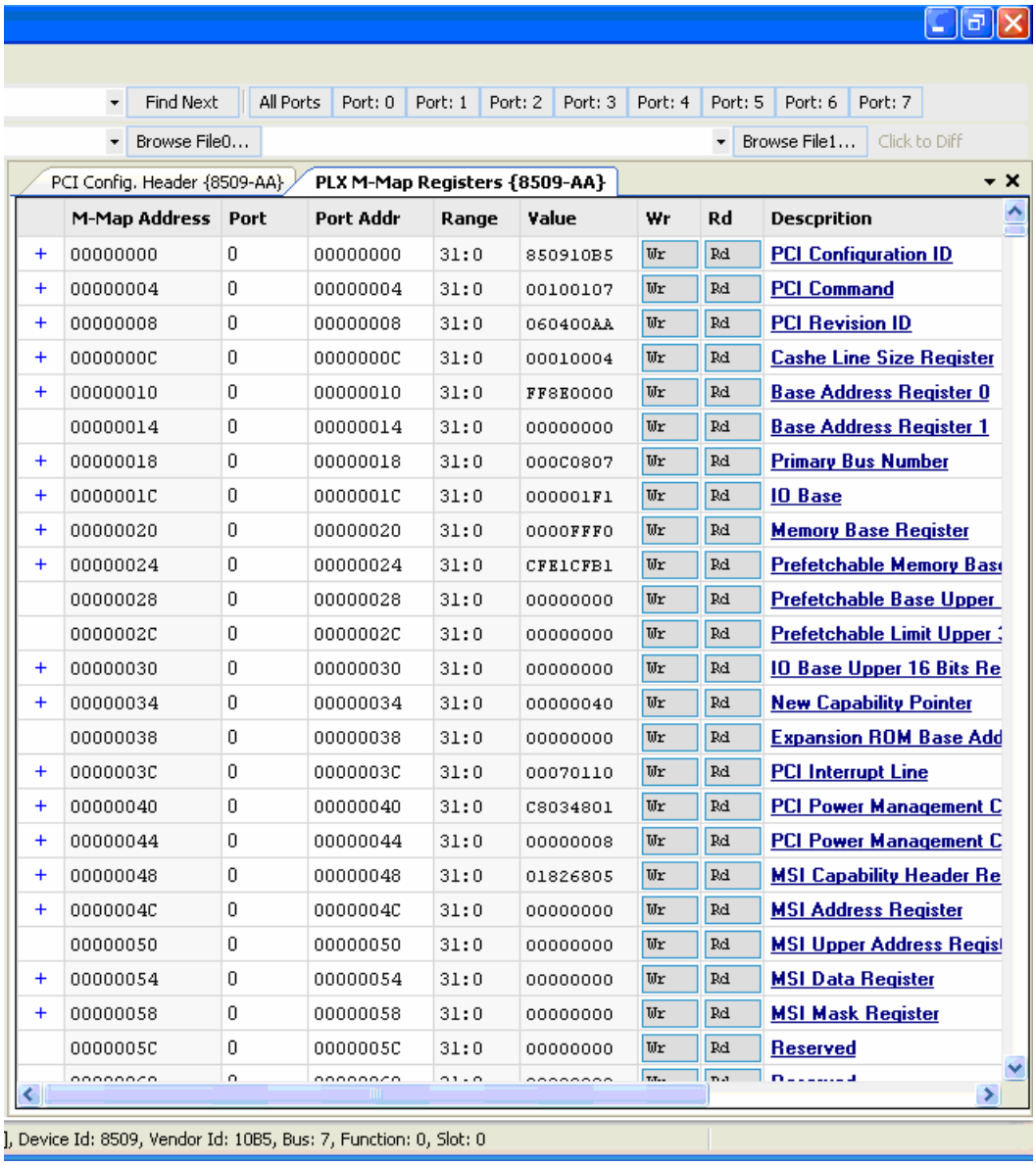

Figure 7. PCI / PCIe Memory-mapped Registers of Switch

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 “850910B5” 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.

5.2 Endpoints

This category requires testing both the PEX 8509RDK and a specified endpoint together as a unit. An endpoint can be a video adapter, an ethernet adapter or a SCSI Host Bus Adapter.

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 8509RDK. 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 reenumerated 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.

Some motherboards support primary and secondary graphics, depending on the PCI or PCI-Express modes. Reverify 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 a Nvidia video card is detected and displayed.

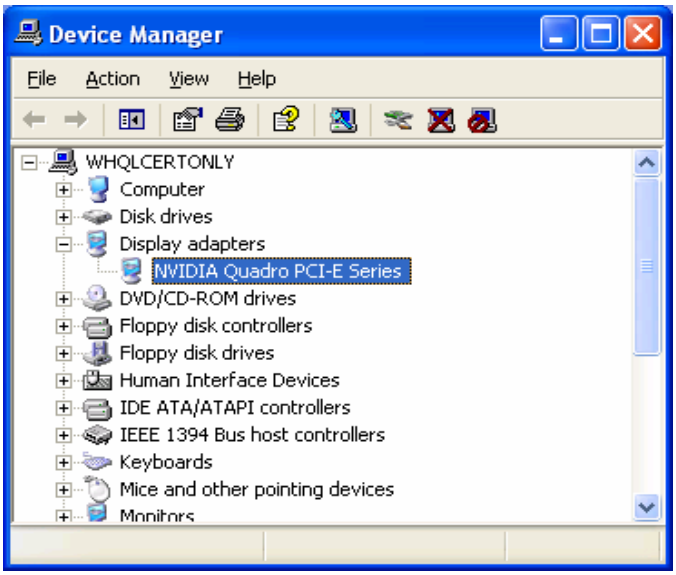

Figure 8. Device Manager Detection of NVIDIA Video Card

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.

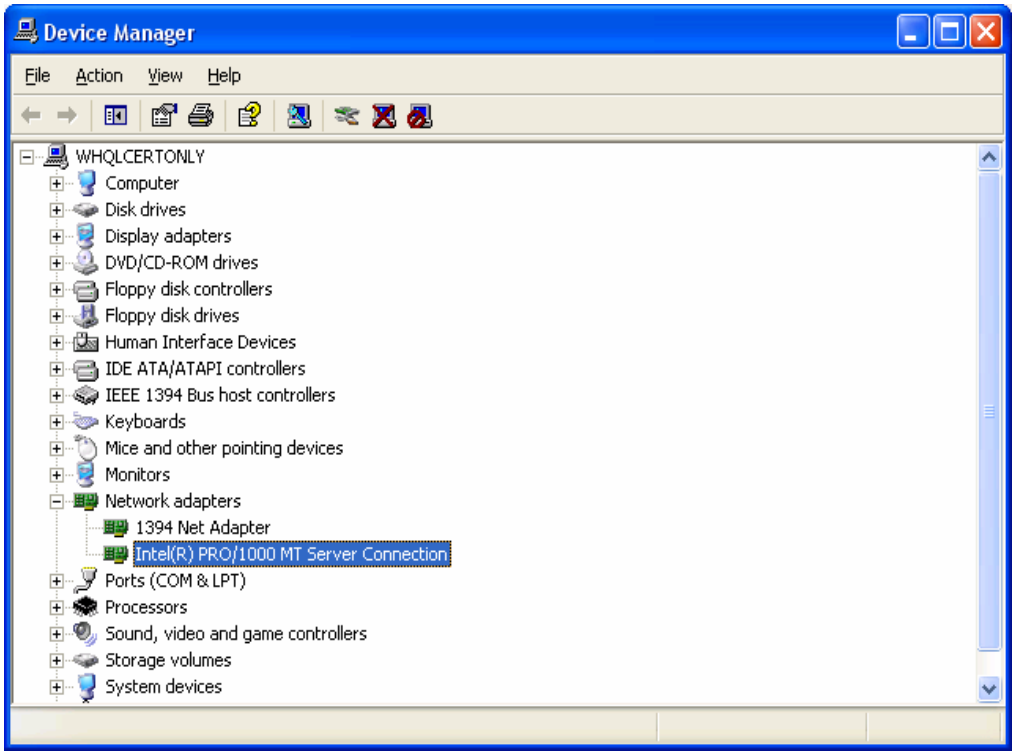

Figure 9. Device Manager Detection of Intel Network Card

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

5.2.2.3 Web-page access

Open the Internet Explorer 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.

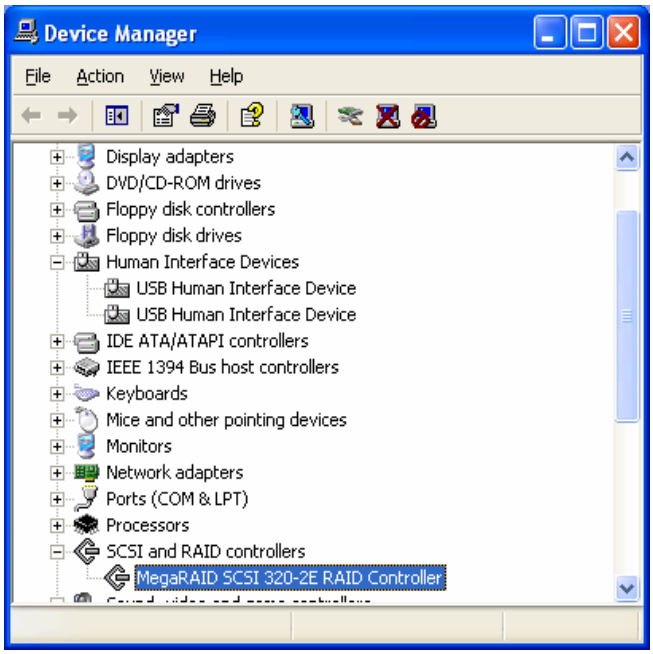

Figure 10. Device Manager Detection of LSI SCSI HBA

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.

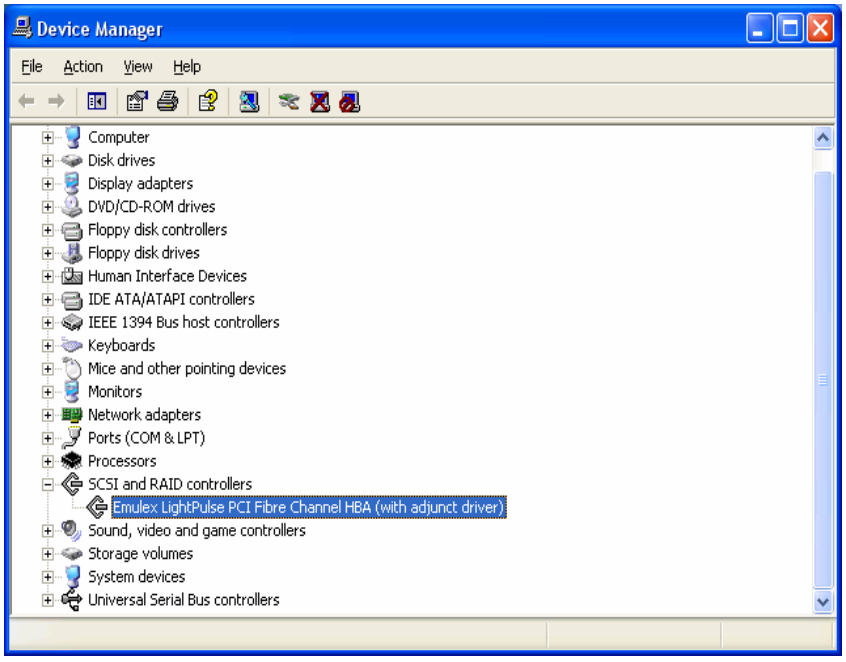

Figure 11. Device Manager Detection of Emulex Fibre-Channel HBA

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.

One formatted the drives are available to read and write files. Run tests below.

1. Create special directories within the SCSI or Fibre-channel drives, say 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 or 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.

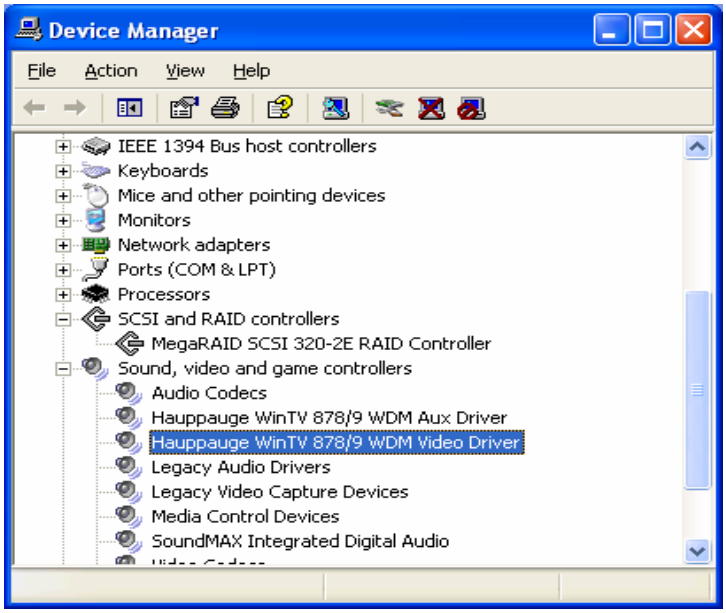

Figure 12. Device Manager Detection of Hauppauge TV Tuner

5.2.4.3 Video Capture and Display

TV tuners require video capture and display software. For example, Hauppauge TV tuners requires 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 a Microsoft application software. Launch it by double-clicking the application.
3. A new screen box appears as below.

Figure 13. 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 and Other Advanced Tests

5.3.1 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 screen shows seven (7) test classes for the bridge under the DEVICE category.

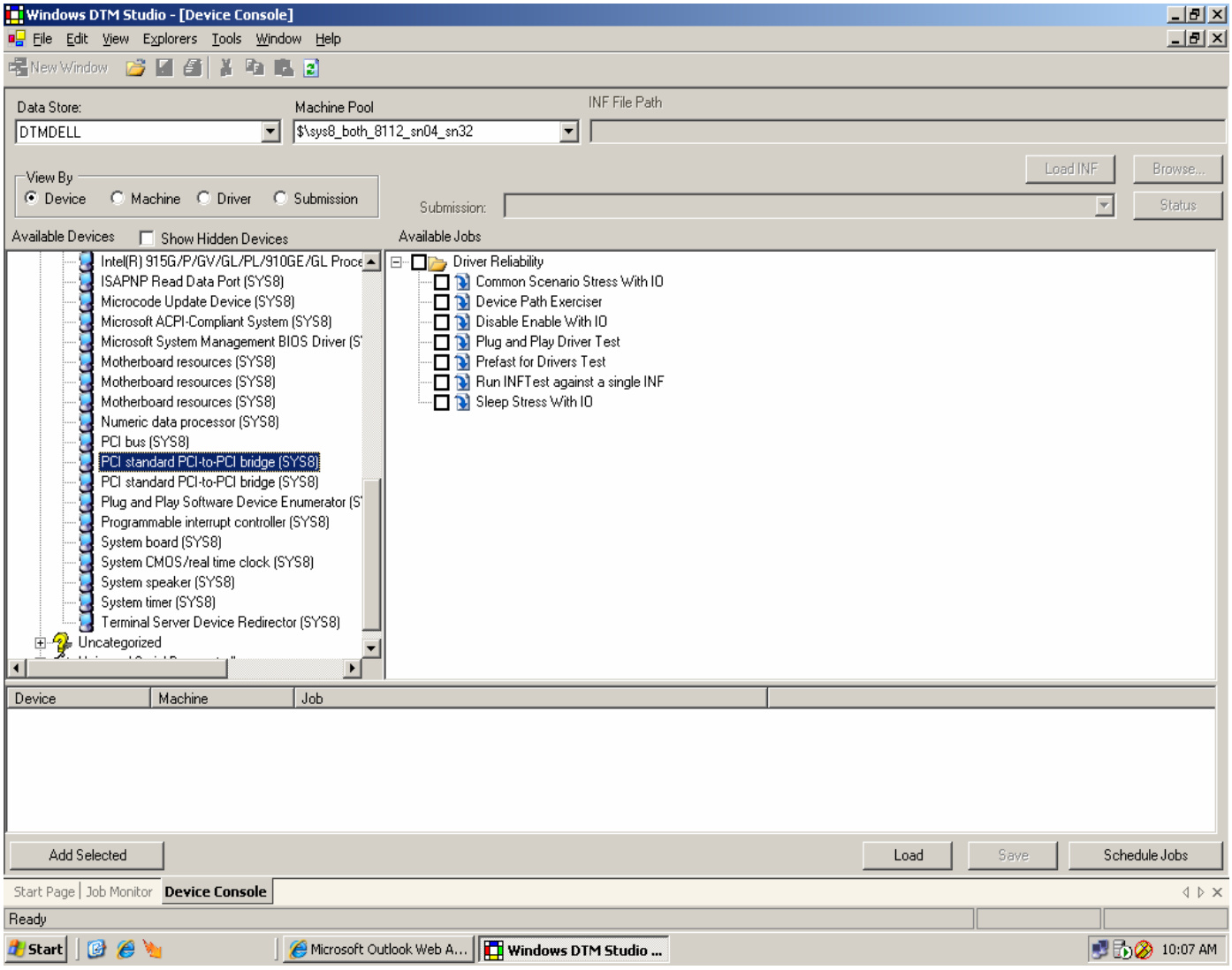

Figure 14. Unclassified Driver Tests for PCI-to-PCI Bridge Device

Click to select and run the above tests. The following 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 scenarios. Additionally, this job ensures that the device is still functional after these state changes through SimpleIO stress testing.

5.3.1.2 Device Path Exerciser

The Device Path Exerciser test is designed to test the reliability and security of drivers by calling them through various user-mode I/O interfaces with valid, invalid, meaningless, and poorly-formatted buffers and data that will cause the driver to stop responding (that is, "crash") if they are not managed correctly.

The Device Path Exerciser test is designed to test a single device driver as part of a Device Logo test.
The Systems - Device Path Exerciser test is designed to test every device driver in the system as part of a Systems Logo test.

5.3.1.3 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.

5.3.1.4 Plug and Play Driver test

The Plug and Play Driver test exercises various PnP-related codes paths in the driver and user-mode components. Although this test requires a driver to handle almost all of the PnP IRPs, there are three areas that are stressed specifically: Removal, Rebalance, and Surprise Removal. The test provides a mechanism to test each of these separately or all together (that is, stress). This testing is accomplished by using a combination of user-mode API calls (through the test application) and kernel-mode API calls (through an upper filter driver).

5.3.1.5 PREfast for Drivers

PREfast for Drivers (PFD) is a compile-time verification tool that is designed specifically to detect errors in kernel-mode driver code. PFD can catch errors such as copying a whole I/O request packet (IRP) without modifying members and saving a pointer to a string, or structure argument, instead of copying an argument in a DriverEntry routine.

5.3.1.6 Run INFTest against a single INF

The Run INFTest against a single INF test is an automated Driver Test Manager (DTM) test job that runs the ChkINF utility. ChkINF is a set of perl scripts that verify the structure and syntax of setup information (INF) files for drivers that are designed for Microsoft Windows 2000 or later versions of the Windows operating system.

5.3.1.7 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.

5.3.2 Fully-Loaded Configurations

This test loads as many different types of 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 8509RDK 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 Test Section) must be connected to the PEX 8509RDK at the same time and tested together as a unit.

5.3.3 Breakout Boards

The breakout boards provide optional hardware connections to support x4 x2 x2 lane splits. Insert one breakout board in one slot of the PEX 8509RDK. Insert endpoints such as a video card and an ethernet card into the breakout slots. Rerun motherboard and system BIOS tests and fully-loaded tests.

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 2. Software and Hardware ID Information

Name	Version	Other Identification Information
PEX SDK	5.1	
RDK (board+chip) -PEX 8509RDK -PEX 8509RDK -PEX 8509RDK	- Board Serial No: 0018 Chip markings: PEX8509-AC25BI 0714 GT0278.3C-ES Korea - Board Serial No: 0025 Chip markings: PEX8509-AC25BI 0714 GT0278.3C-ES Korea - Board Serial No: 0044 Chip markings: PEX8509-AC25BI 0714 GT0278.3C-ES Korea	 P/N: 90-0075-000-A LAC-10 94V-0 1507 P/N: 90-0075-000-A LAC-10 94V-0 1507 P/N: 90-0075-000-A LAC-10 94V-0 1507
Operating Systems - Windows XP Professional - Windows Server 2003 - Windows Vista - Fedora Linux	- Standard with Service Pack 2 (volume license) with latest updates - Standard version (volume license) - Final Release (January 2007) - Version 7	
WHQL test suites - Driver Test Manager (DTM)	- Version 1.0.6000.01 with latest QFE updates as of April 6, 2007	

6.2 Attachment B – Motherboards and System BIOS

Table 3. 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	3	4	5	8	9	10	12	14	15	16	17	18	19	20	21	22	24	24	27	31
Visual Link-Up Test	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Operating System Installation • **Installation (XP or Vista)** • **Upgrade (XP Pro to Vista)**	P	P	P	P		P	P	P	P	P	P	P			P			P	P	P		P
Slot Tests	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Device Manager Detection Tests Devices By Connection	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P			
PEX Editor Detection Tests Detection Read Configuration Registers Read Memory-mapped Registers	P P P	P P F1	P P P	P P P	P P F1	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P P	P P F1
Power Options under Win XP, Vista o **Restart** o **Standby/Sleep** o **Hibernation** o **Shutdown**		P P P P					P P P P	P P P P			P P P P	P P P P						P P P P			P P P P	P P P P

Notes: (Explain clearly below if there are any failures in the test cases in the matrix above.)

1. F1 –- System bluescreened when READ Memory-mapped registers was selected in the SDK. This behavior was only seen in some systems using Intel chipsets. This is a known problem in SDK 5.1 and will be fixed in the next SDK revision.

6.3 Attachment C - Video Adapters

Table 4. 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	3	4	5	8	15	16	17	18	19	20	21	22	24	26	27	31
Video Adapter Tests																		
Card Name and Model: Nvidia NVS 440																		
Video display on the monitor	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Driver installation	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Driver detection	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Card Name and Model: Matrox Millenium P650																		
Video display on the monitor		P						P							P			
Driver installation		P						P							P			
Driver detection		P						P							P			
Card Name and Model: ATI x1600 Radeon																		
Video display on the monitor	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Driver installation	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Driver detection	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

6.4 Attachment D - Ethernet Adapters

Table 5. 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	3	4	5	8	9	10	12	14	15	17	20	22	27
Ethernet Adapter Tests														
Intel Pro/1000 PT Dual Port Server														
Driver installation	P	P	P	P	P	P	P	P	P	P	P	P		P
Driver detection	P	P	P	P	P	P	P	P	P	P	P	P		P
Web-page access	P	P	P	P	P	P	P	P	P	P	P	P		P
Marvell Yukon 88E8050 ASF														
Driver installation	P	P	P	P	P	P	P	P	P	P	P	P	P1	P
Driver detection	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Web-page access	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Broadcom BCM5715														
Driver installation	P	P	P	P	P	P	P	P	P	P	P	P	P1	P
Driver detection	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Web-page access	P	P	P	P	P	P	P	P	P	P	P	P	P	P

Notes: (Explain clearly below if there are any failures in the test cases in the matrix above.)

P1 - The Nic card did not work in the top slot of the 8509. Windows Manager marked the device (PCI standard PCI-to-PCI bridge with an exclamation point and said it could not load the driver required for this device.). It is most likely that the bridge device on the Broadcom NIC and the system is out of resources. All five of the 8509 PCI standard PCI-to-PCI Bridges enumerated and displayed appeared in Windows Manager Device without problems.

6.5 Attachment E - SCSI/FC HBAs and TV Tuners

Table 6. 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	3	4	5	8	9	20	21	22	24	26	27	30	31
SCSI/FC Storage HBA Tests														
LSI Logic 22320 MegaRAID														
Driver installation										P				
Driver detection										P				
Read/Write data files										P				
Qlogic QLA-2432														
Driver installation				P						P				
Driver detection				P						P				
Read/Write data files				P						P				
TV Tuner Tests														
KWorld TV Tuner PVR-TV PE210														
Driver installation			P					P	P					
Driver detection			P					P	P					
Video capture & display			P					P	P					
Avermedia TV Tuner Combo														
Driver installation			P					P	P					
Driver detection			P					P	P					
Video capture & display			P					P	P					

Notes: (Explain clearly below if there are any special notes, exceptions or failures in the test cases in the matrix above.)

6.6 Attachment F - WHQL Certification using DTM (Driver Test Manager)

Table 7. WHQL Certification Results for PEX 8509RDK

RDK Manufacturer: PLX Corporation **Other Notes:** DTM 1.0.6000.011 with QFEs 4-6-2007
Type (PCI-e): PCI-Express interface with 8509 Revision AA
Board Revision: P/N 90-0071-000-A
Controller System : Dell Precision 670, Xeon 2.8 GHz, 1 Gigabytes memory, Windows Server 2003
Client System: SuperMicro P8SGA, Pentium 4, 2.8 GHz, 1 Gigabytes memory, Windows XP Professional

Test Category	Pass/Fail Results	Notes
Common Scenario Stress With I/O	PASS	Run in automated mode
Device Path Exerciser	PASS	Run in automated mode.
Disable Enable With IO	PASS	Run in automated mode
Plug and Play Driver Test	PASS	Run in automated mode
Prefast for Drivers Test	PASS	Driver file rules format check.
Run INFTest against a single INF	PASS	Run in automated mode
Sleep Stress With IO	PASS	Run in automated mode

Notes:

1. The PEX 8509RDK was certified as a kit using four components. Namely, they are: the PCI Express X1 Cable Adapter card plugged into system 8's x1 slot (X1 PCI-E #1), the cable, port expander board, and the PEX 8509RDK itself. Refer to Figure 1 for reference.

7. TEST EQUIPMENT

7.1 Motherboards and System BIOS

Table 8. List of Motherboards and their Key Information

System #	Motherboard	Root Complex	CPU	BIOS	PCI Express Slots	Operating System
1	**MSI** K8N Neo4 Platinum SLI; 512MB SDRAM DDR 266/333/400	Nvidia NForce 4 SLI	AMD	**Phoenix Award** v6.00PG 7100NMS V3.0 123104	2- x16	Windows XP Pro SP
2	**SUPERMICRO** X6DAE-G; 512MB SDRAM DDR 266/333	Intel E7525 TumWater	INTEL	**Phoenix Server 3** v6; X6DAE-G BIOS Revision 1.2	1- x16 1- x4	Windows XP Pro SP2 Windows Server 2003
3	**ABIT** AX-8; DDR 400	VIA K8T890/VT8237	INTEL	**Phoenix Award** BIOS 1.0	1- x16 3- x1	Windows XP Pro SP2
4	**NVIDIA** NF4-CRB; 512MB SDRAM DDR 266/333	Nvidia NForce 4	AMD	**Phoenix Award** v6.00PG NVIDIA BIOS V4.9x 4/26/2005-NF-CK804-6A61FS02C-00	1- x16 2- x1	Windows XP Pro SP2 Vista Enterprise
5	**INTEL** SE7520BD2; 512MB SDRAM DDR 266/333, DDR2 400	Intel E7520 Lindenhurst	INTEL	**AMI** v2.53; SE7520BD2 22 86B.P.03.10.0052	1- x8 1- x4	Windows 2003 Server Windows XP Pro SP2
8	**SUPERMICRO** P8SGA; 512MB DDR 400 SDRAM	Intel Pentium 4, 800Mhz FSB; Intel 915G Chipset	INTEL	**Phoenix Award** BIOS v6.00PG; P8SGA BIOS Revision 1.1; 03/29/2005	1 x16 3- x1	Windows XP Pro SP2
9	**MSI** RS480M2-IL	ATI SB400 IXP400	AMD	**Phoenix Award** v6.00PG; W8093AMSv30B9	1- x16	Windows XP Pro SP2
10	**ABIT** AW8; 1GB SDRAM DDR2 800/667/533	Intel 955	INTEL	**Phoenix Award** v6.00PG; 5/23/05-i955-W627EHF-6A79IA1AC-10	1- x16 2- x1	Windows XP Pro SP2
12	**ULI** EV9567	ULI EV9567	INTEL	**Phoenix Award** v6.00PG	1- x16 2- x4	Windows XP Pro SP2
14	**INTEL** Lakeport	Intel TK53tWJ RU	INTEL	**AMI** WPLI751.86P 10/13/2005 SMBIOS v2.3	1- x16 2- x1	Windows XP Pro SP2
15	**WINFAST** 761GXK8MC	SIS SIS964	AMD	**Phoenix** 6.00 PG 10/11/2005 3 PCI, 1 AGP, 1 PCI-e x16	1- x16	Windows XP Pro SP2
16	**INTEL** SE7520BD2; 512MB SDRAM DDR 266/333, DDR2 400	Intel E7520 Lindenhurst	INTEL	**AMI** v2.53; SE7520BD2 22 86B.P.03.10.0052	1- x8 1- x4	Windows 2003 Server Vista Enterprise

System #	Motherboard	Root Complex	CPU	BIOS	PCI Express Slots	Operating System
17	**DELL** Precision Workstation 470	Intel E7525 Tumwater	INTEL	**DELL** Revision A07 (03/15/06)	1- x16 1- x4	Windows XP Pro SP2
18	**INTEL** D925EXCV2 1GB SDRAM	Intel 925	INTEL	**INTEL** CV92510.86A.047	1-x16 1-x4	Windows XP Pro SP2
19	**AMD** Athlon 64 X2 dual 2.21Ghz Core processor 4200+ 2GB SDRAM	AMD North bridge RD580 Southbridge SB450	AMD	**AMI** ammt_a14.rom	2- x16 2- x1	Windows XP Pro SP2 Vista Enterprise
20	**AMD** Athlon 64 X2 dual 2.21Ghz Core processor 4200+ 3.2GB SDRAM	AMD North bridge RS690 South bridge SB600	AMD	**AMI** 080014 11/3/2006	1-x16 1-x4	Windows XP Pro SP2 Vista Enterprise
21	**HP** Workstation XW 8200 5GB SDRAM	Intel E7525	INTEL	**HP** 786B8 v2.10 5/31/2006	1- x16 1- x1	Windows Server 2003 Windows Server x64 for 2003
22	**INTEL** D945PVS 512MB SDRAM	Intel 945	INTEL	**Intel** SN94510J.86A.0097.2006.1101.1459,11/1/2006	2- x1 1- x16	Windows XP Pro SP2 Vista Enterprise
24	**GIGABYTE** GA-965P-S3	Intel Northbridge 965P Southbridge ICH8	INTEL	**Phoenix Award** F6, 10/12/2006	1- x16 3- x1	Windows XP Pro SP2
25	**ASUS** P5ADS-E Premium	Intel Northbridge i925XE rev. C2 Southbridge 82801FB (ICH6) rev04	INTEL	**AMI** 1006.005 10/13/2005	2-x1 1-x16	Windows XP Pro SP2
26	**ASUS** P5W64 WS	Intel Northbridge 975X Southbridge ICH7R	INTEL	**AMI** v02.58	4- x16	Windows XP Pro SP2
27	**SUPERMICRO** **X7DA8**	Intel Northbridge 5000X rev 31 Southbridge 6321ESB rev. 09	INTEL	**Phoenix** V6.00 1/26/2007	2-x16	Windows XP Pro SP2 Windows 2003 Server Vista Enterprise
31	**INTEL** S5000VSA	Intel Northbridge 5000V Rev B1 Southbridge 6321ESB	INTEL	**Intel** S5000.86B.06.00.0074.020220071613, 02/02/2008	2-x8	Windows XP Pro SP2 Vista Enterprise
32	**ASUS** P5WDG2 WS Pro	Intel Northbridge 975X rev. C0 Southbridge 82801GB(ICH7R)	INTEL	**AMI** 0803, 03/01/2007	2-x16	Windows XP Pro SP2 Vista Enterprise

7.2 Endpoint Devices and Connectivity Kits

Table 9. 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	Nvidia	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
	Kaser	GeForce 6600	Nvidia CineFX 30 engine; 256 MB ; Duall 400 MHz RAMDACs; OpenGL support	PCI-Express	Nvidia version N.5.II.I
	Kaser	Radeon x300SE	ATI Radeon (VPU) ; 128 MB system memory; 15 VGA conneceotr; 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
	Matrox	Millenium P650 P65-MDDE128F	128 MB	PCI-Express	Matrox Parhelia Series & Matrox P-Series
	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
	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
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 card.	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

Device Category	Product Manufacturer	Model Name/Number	Product Details	System Interface	Software Drivers and/or Drivers
	SysKonnect	SK-9E21D SK-9E22	10/100/1000Base-T Adapter; autodetect, 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
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
	Emulex	LP11002	PCI-Express Dual Port Fibre Channel adapter	PCI-Express	Windows 2003 Server Driver 5.2.41a1-1b
	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
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