Agilent
Protocol Exerciser for
PCI Express

Hardware Guide

Agilent Technologies

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Where to find more information

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http://www.agilent.com/find/spt

You can also look for search a local contact for assistance on the following link:

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CAUTION

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Indicates warning or caution. If you see this symbol on a product, you must refer to the manuals for specific Warning or Caution information to avoid personal injury or damage to the product.

Frame or chassis ground terminal. Typically connects to the equipment's metal frame.

Indicates hazardous voltages and potential for electrical shock.

Indicates that antistatic precautions should be taken.

Indicates hot surface. Please do not touch.

Indicates laser radiation turned on.

CSA is the Canadian certification mark to demonstrate compliance with the Safety requirements.

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ISM GRP-1A classification according to the international EMC standard.

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Safety Summary

General Safety Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument.

Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

General

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

Environment Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters.

Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before Applying Power

Verify that all safety precautions are taken. The power cable inlet of the instrument serves as a device to disconnect from the mains in case of hazard. The instrument must be positioned so that the operator can easily access the power cable inlet. When the instrument is rack mounted the rack must be provided with an easily accessible mains switch.

Ground the Instrument

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Environmental Information

	This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/ electronic product in domestic household waste. *Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.* **Do not dispose in domestic household waste.** **To return unwanted products, contact your local Agilent office, or see www.agilent.com/environment/product/ for more information.**

Printing History

Agilent Technologies, Inc. can issue revisions between the product releases to reflect the latest and correct information in the guide. Agilent Technologies, Inc. also reserves its right to not issue a new edition of the guide for every system release.

The name of the guide and its part number are:

Manual Name: Agilent Protocol Exerciser for PCI Express- Hardware Guide

Manual Part Number: E2960-91041

The edition number of the guide, publishing time of the guide, and applicable release number of the product are given in the following table.

Edition	Published	Applicable Release
1	June, 2010	8.1

Contents

1

U4305A Exerciser Card

This chapter provides information on the U4305A exerciser card used for testing PCIe devices. This chapter describes the card's emulation modes, hardware features, components, and sample hardware configuration scenarios for this card in the overall setup.

U4305A Exerciser Card - Introduction

The Agilent U4305A exerciser card is a test and debug tool that provides features for testing the next generation of PCI Express technology. You can use this card to stimulate components on system boards and cards with various test scenarios. The Exerciser card can emulate a PCIe device or topology and can provide test conditions to test components on system boards and cards.

In this release, the U4305A Exerciser card provides only the functions of an LTSSM to help you perform thorough PCIe link testing and validation testing for the DUT's LTSSM. As an LTSSM Tester, the Exerciser card helps you verify the DUT's LTSSM state transitions and timeout implementations.

The U4305A Exerciser card can emulate a PCIe endpoint and act as a Downstream Component (DSC) for a System Under Test. It can also emulate a root complex and act as an Upstream Component to stimulate a PCIe Device Under Test. Refer to the topics "U4305A Exerciser Card as an Endpoint and "U4305A Exerciser Card as a Root Complex to know more.

NOTE	For information on installing and configuring the U4305A exerciser card, refer to Agilent PCIE Exerciser Gen3, Installation Guide.

For information on how to use the U4305A exerciser card, refer to Agilent Protocol Exerciser for PCI Express, User Guide.

Features

This topic describes the features of the U4305A exerciser card.

- U4305A is a standard height, half-length card as described in the PCI Express specification, and fits into every system including blade servers.

- U4305A supports LTSSM functions for upto x16 link widths.

- U4305A supports simultaneous use of LTSSM and Protocol Exerciser functions, without requiring any configuration.

- U4305A supports Gen1 (2.5 GT/s), Gen2 (5.0 GT/s), and Gen3 (8.0 GT/s) speeds as per PCIe specifications.

- You can manage, control, and use the U4305A Exerciser card using the Protocol Exerciser GUI and APIs.

Components

This topic describes the hardware components of the U4305A exerciser card.

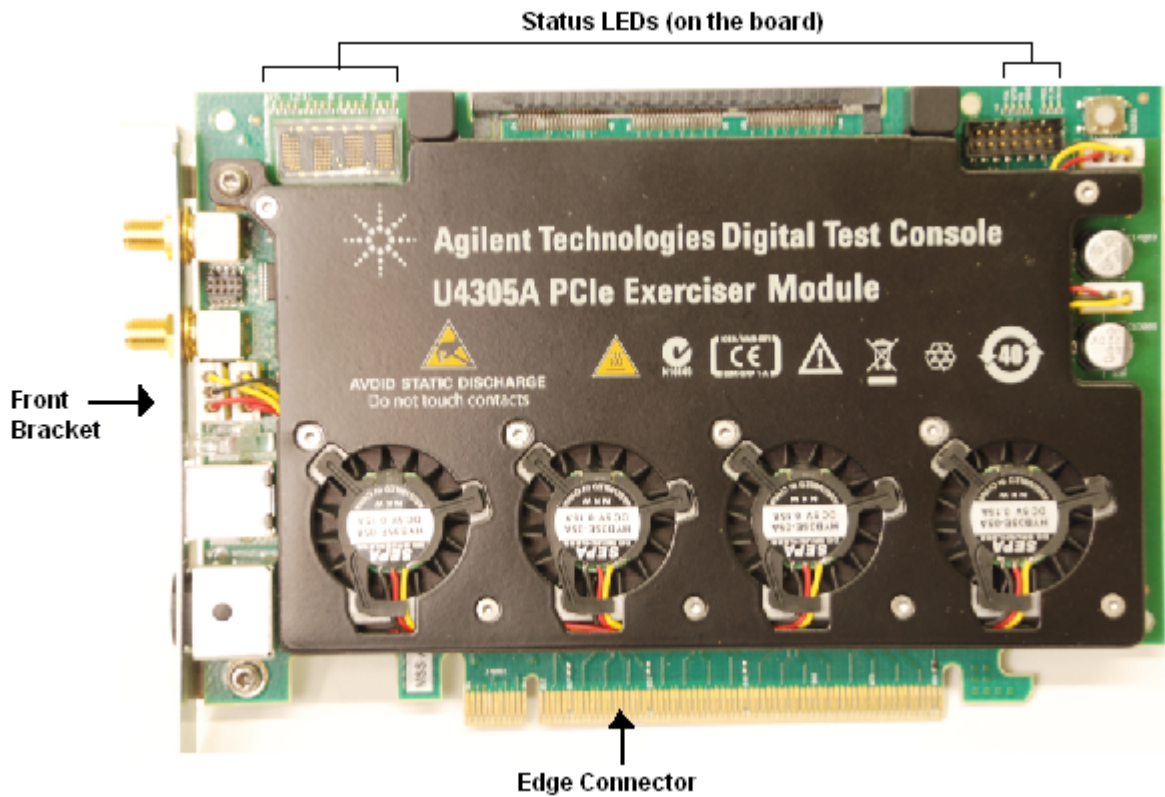Figure 1 and Figure 2 display the U4305A exerciser card to indicate the various components of this card.

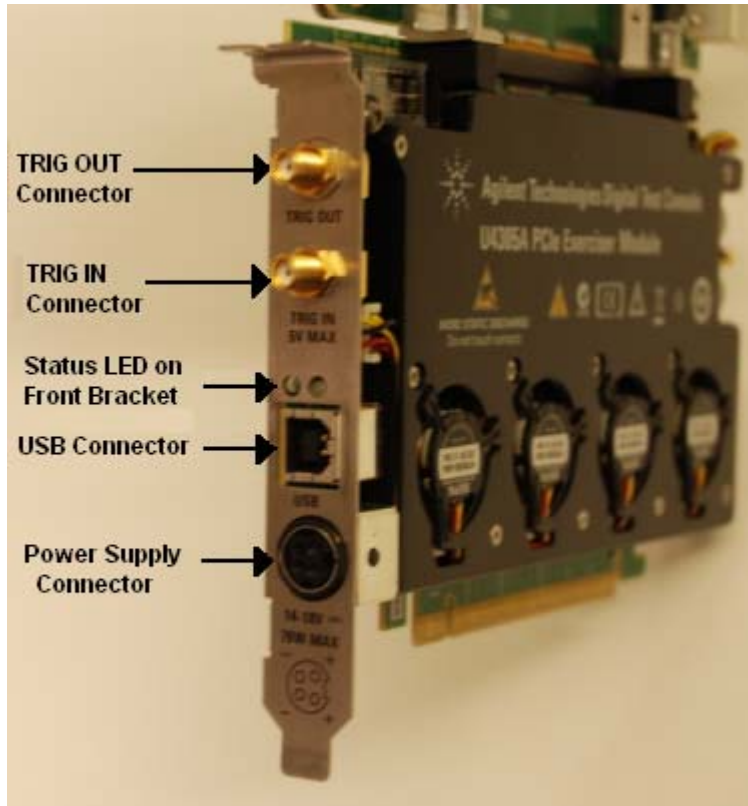**Figure 1**   U4305A Exerciser Card

Figure 2   U4305A Exerciser Card components on front bracket

The hardware components displayed in the above figures of the U4305A Exerciser card are described:

- **Edge Connector**: This component is used to connect the U4305A card with a PCIe Connector on the backplane board, or with a system.

- **Status LEDs (on board)**: This component has the LEDs to display the status information about the participating lanes of the link and power status of board and exerciser card. 16 LEDs displaying the lane status are in the upper left corner of the board and the rest of the 7 LEDs are in the upper right corner of the board. The module number to which U4305A is configured is also displayed in the upper left corner.

  To get a description of each LED on the board, refer to the topic "Exerciser Card Status LEDs in this chapter.

- **Status LEDs (on front bracket)**:

  The green LED represents the link speed status and has the following different states:

- *No light* means there is no link up between the Exerciser card and DUT.
- *Green light* means there is a link up at the Gen3 speed (8.0 GT/s).
- *Fast blinking light* means there is a link up at the Gen2 speed (5.0 GT/s).
- *Slow blinking light* means there is a link up at the Gen1 speed (2.5 GT/s).

The red LED on the front bracket will be on until the FPGA receives a valid configuration.

- **USB Connector**: This component is used to connect U4305A with the controller PC using the USB cable.

- **Power Supply Connector**: This component is used to connect U4305A with the external power supply. Use the power supply delivered with U4305A only.

- **TRIG OUT Connector**: This component is used to connect the U4305A card with other test equipments such as Protocol Analyzer to trigger these test equipments. The Exerciser card generates a trigger out pulse when a specified trigger out condition is met.

- **TRIG IN Connector**: This component is used to connect the U4305A card with other test equipments such as Protocol Analyzer to receive a trigger from these test equipments when a specified condition is met.

The electrical characteristics of the Trigger In/Out are as follows:

- **Trigger In**: Vin Low Max = 0.9V, Vin High Min = 2.0V max, Input current +/- 5uA

- **Trigger Out**: TTL levels series terminated with 50 Ohms. Vout High Min (no load termination) = 2.4V, Vout Low Max (no load termination) = 0.4V; Vout High Min (with 50 Ohms External termination to GND) = 1.2V, Vout Low Max (with 50 Ohms External termination to GND) = 0.2V.

WARNING	Do not directly touch any component on the U4305A exerciser card. It may be hot.

<table>
<tr><td>CAUTION</td><td>Components on the U4305A exerciser card are sensitive to the static electricity. Therefore, take necessary anti-static precautions, such as wear a grounded wrist strap, to minimize the possibility of electrostatic damage.</td></tr>
</table>

This component comes with a protective foam cover to protect it from electrostatic damage (Figure 3).

Figure 3   Protective Foam Cover for Edge Connector

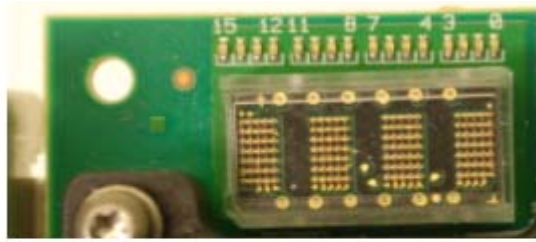<table>
<tr><td>NOTE</td><td>Please remove the protective foam cover before using the card, and attach it again when the card is not in use.</td></tr>
</table>

Exerciser Card Status LEDs

The U4305A Exerciser card has a number of status LEDs on the board and on the front bracket. This topic describes the meaning of each of these status LEDs.

The following figure displays the status LEDs on board.

16 Status LEDs in the left corner of card

7 status LEDs in the right corner of card

Figure 4   Exerciser card status LEDs

The following table describes the status LEDs on board and on the front bracket.

Table 1   Exerciser card status LEDs

LED Name/Label	Description
Status LEDs on the board	
16 status LEDs in upper left corner of the board	Displays the status of the lanes (x1-x16) in the link.
	All these LEDs are off if the link is not up.
	If the link is up, then the LEDs are on for only those lanes that are participating in the link.
POK	When this LED is ON, it indicates that the FPGA power supplies are operating.
	This is displayed in the upper right corner of the board.

LED Name/Label	Description
UPOK	When this LED is ON, it indicates that the Power supplies for the microprocessor system and USB are operating. This is displayed in the upper right corner of the board.
HB	This LED represents the Heartbeat. It blinks at about 1 second rate to indicate that the microprocessor is operating. This is displayed in the upper right corner of the board.
DONE	When this LED is on, it indicates that FPGA has been programmed successfully. This is displayed in the upper right corner of the board.
PE3.3	When this LED is on, it indicates that the +3.3V PCI Express power supply from the bottom (SYS) connector is up. This is displayed in the upper right corner of the board.
3.3VA	When this LED is on, it indicates that the +3.3V Aux PCI Express power supply from the bottom (SYS) connector is up. This is displayed in the upper right corner of the board.
PE12V	When this LED is on, it indicates that the +12V PCI Express power supply from the bottom (SYS) connector is up. This is displayed in the upper right corner of the board.
Status LEDs on front bracket	

LED Name/Label	Description
No light	There is no link up between the Exerciser card and DUT.
Green	There is a link up at the Gen3 speed (8.0 GT/s).
Fast Blinking light	There is a link up at the Gen2 speed (5.0 GT/s).
Slow Blinking light	There is a link up at the Gen1 speed (2.5 GT/s).
Red LED	The red LED on the front bracket will be on until the FPGA receives a valid configuration.

U4305A Exerciser Card as an Endpoint

This topic introduces you to the U4305A exerciser card emulating a PCIe endpoint.

NOTE	For detailed information on how to set up the U4305A exerciser card as a PCIe endpoint, refer to the Agilent PCIE Exerciser Gen3 Installation guide.

You can use the U4305A exerciser card as an endpoint to stimulate a System Under Test into various test scenarios for LTSSM testing. To accomplish this, you plug the exerciser card as a normal PCIe device into the motherboard under test through the Edge connector of the card.

A controller system hosts the Protocol Exerciser software and hardware support services to control and manage the Exerciser card. Exerciser card is connected to this controller system through a USB cable. The following figure displays a sample hardware setup in which the U4305A exerciser card is emulating a PCIe endpoint.
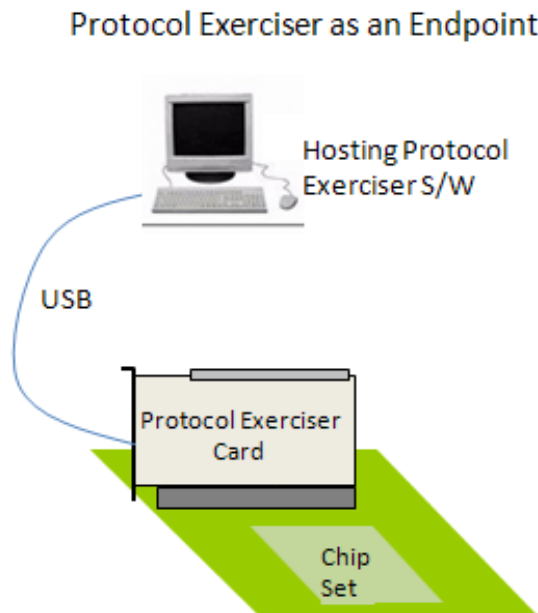

Figure 5   Exerciser card emulating a PCIe endpoint

U4305A Exerciser Card as a Root Complex

This topic introduces you to the U4305A exerciser card emulating a root complex.

NOTE	For detailed information on how to set up the U4305A exerciser card as a root complex, refer to the Agilent PCIE Exerciser Gen3 Installation guide.

You can use the U4305A exerciser card as a root complex to stimulate a DUT into various LTSSM test scenarios. To accomplish this, you plug the exerciser card into a passive backplane board through the Edge connector of the card. In this case, the Exerciser card communicates to the DUT through the bottom connectors.

A controller system hosts the Protocol Exerciser software and hardware support services to control and manage the Exerciser card. Exerciser card is connected to this controlling system through a USB cable. The following figure displays a sample hardware setup in which the U4305A exerciser card is emulating a PCIe root complex.
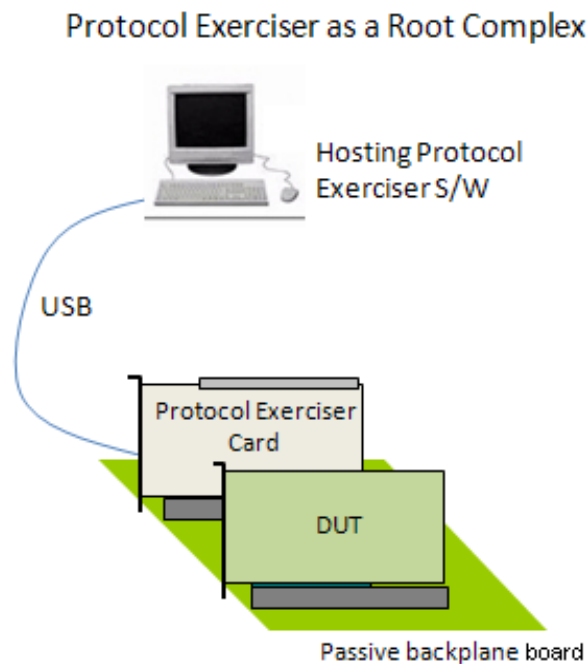

Figure 6 Exerciser card emulating a root complex

Index

E

H

P

S

T

U

E2960-91041

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