Keysight PCIe Gen5 Protocol Testing

KEYSIGHT

INSTALLATION GUIDE

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Keysight Technologies Deutschland GmbH
Herrenberger Strasse 130,
71034 Böblingen, Germany

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Safety Summary

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 or operating instructions in the product manuals violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements. Product manuals may be available on the Web. Go to www.keysight.com and type in your product number in the Search field at the top of the page.

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Environmental Conditions

This instrument is intended for indoor use in an installation category 2, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 85%r.H. 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. Make all connections to the unit before applying power. Note the instrument's external markings described in “Safety Symbols”.

Ground the Instrument

If your product is provided with a grounding type power plug, the instrument chassis and cover must be connected to an electrical ground to minimize shock hazard. The ground pin must be firmly connected to an electrical ground (safety ground) terminal 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.

Fuses

See the user's guide or operator's manual for information about line-fuse replacement. Some instruments contain an internal fuse, which is not user accessible.

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

Only qualified, service-trained personnel who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

Cleaning

Clean the outside of the instrument with a soft, lint-free, slightly dampened cloth. Do not use detergent or chemical solvents.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Keysight Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

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

Safety Symbols

Table 1 Safety Symbol

Symbol	Description
	Direct current
	Alternating current
	Both direct and alternating current
	Three phase alternating current
	Three phase alternating current
	Earth ground terminal
	Protective earth ground terminal
	Frame or chassis ground terminal
	Terminal is at earth potential
	Equipotentiality
N	Neutral conductor on permanently installed equipment
L	Line conductor on permanently installed equipment
	On (mains supply)
	Off (mains supply)
	Standby (mains supply). The instrument is not completely disconnected from the mains supply when the power switch is in the standby position
	In position of a bi-stable push switch

Symbol	Description
	Out position of a bi-stable push switch
	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
	Caution, refer to accompanying documentation
	Caution, risk of electric shock
	Do not apply around or remove from HAZARDOUS LIVE conductors
	Application around and removal from HAZARDOUS LIVE conductors is permitted
	Caution, hot surface
	Ionizing radiation
	Indicates that antistatic precautions should be taken
CAT I	IEC Measurement Category I
CAT II	Measurement Category II
CAT III	Measurement Category III
CAT IV	Measurement Category IV

Compliance and Environmental Information

Table 2 Compliance and Environmental Information

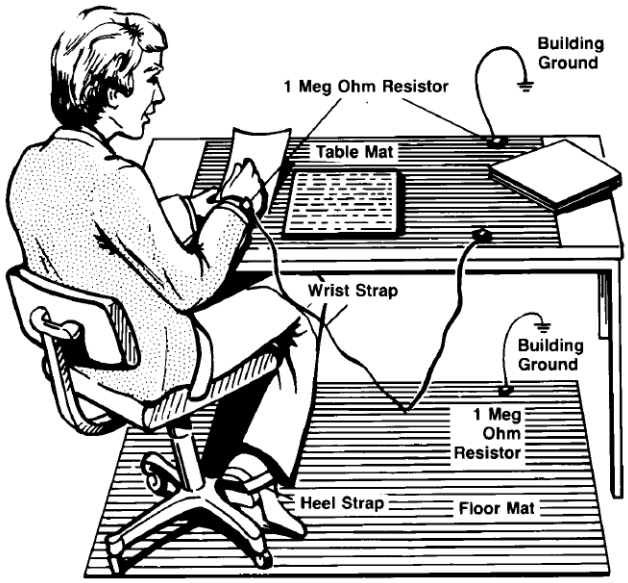
Safety Symbol	Description
	CSA is the Canadian certification mark to demonstrate compliance with the Safety requirements.
	The C-tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australia EMC Framework regulations under the terms of the Radio Communication Act of 1992.
	CE compliance marking to the EU Safety and EMC Directives. ISM GRP-1A classification according to the international EMC standard. ICES/NMB-001 compliance marking to the Canadian EMC standard.
KCC-REM-ATI TBU4431A	KC certification mark to demonstrate compliance with the South Korean EMC requirements. **South Korean Class A EMC declaration** This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.
	The crossed out wheeled bin symbol indicates that separate collection for waste electric and electronic equipment (WEEE) is required, as obligated by the EU DIRECTIVE and other National legislation. Please refer to keysight.com/go/takeback to understand your Trade in options with Keysight in addition to product takeback instructions.

ESD Protection

CAUTION Electrostatic discharge (ESD) can damage the circuits of the components on the hardware. Avoid applying static discharges to the front-panel connectors. Before connecting any coaxial cable to the connectors, momentarily short the center and outer conductors of the cable together. Avoid touching the front-panel connectors without first touching the frame of the instrument. Be sure the instrument and all connected devices (DUT, etc.) are properly earth-grounded (to a common ground) to prevent buildup of static charge and electrical over-stress. Take necessary anti-static precautions, such as wearing a grounded wrist strap, to minimize the possibility of electrostatic damage.

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station. The following list and figure shows an example of a static-safe work station using two types of ESD protection. Purchase acceptable ESD accessories from your local supplier.

- Conductive table-mat and wrist-strap combination.
- Conductive floor-mat and heel-strap combination.



Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. To ensure user safety, the static-safe accessories must provide at least 1 MW of isolation from ground.

WARNING These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

Contents

1 Planning the PCIe Gen5 Exerciser and Analyzer Installation

This chapter provides information to help you plan the hardware setup and software installation for the P5551A PCIe Gen5 Exerciser and P5552A PCIe Gen5 Analyzer. It lists the system requirements that should be met before you start installing the P5500 Traffic Analysis application for the Exerciser and Analyzer on the Controller PC. The chapter also provides information on the requirements that should be met for setting up the P5551A Exerciser card and P5552A Analyzer card.

Planning Considerations

This topic describes some planning considerations before starting with setting up the hardware and software for PCIe Exerciser and PCIe Analyzer.

- **Emulation mode of the Exerciser card:** The P5551A exerciser card can emulate a root complex or a PCIe endpoint with or without SRIOV / MRIOV capabilities based on the license obtained. (Currently, the SRIOV and MRIOV capabilities are not supported). The hardware setup is based on whether you want to use it to stimulate and load a System Under Test for system level testing or to stimulate a DUT into various test scenarios. If you want to load and stress a server system under test, you can use multiple exerciser cards.
- **Usage Scenario for the Analyzer card:** In the most common configuration, the P5552A Analyzer module is placed between the motherboard or the system under test and the IO Card. The Analyzer module captures and analyzes the traffic from the system under test and the IO card. However, in cases where you need to test a single PCIe device, you can use the Analyzer in conjunction with the P5551A PCIe Gen5 Exerciser module, which provides the traffic from the other side.
- **Identifying the Controller system PC:** A controller system hosts the full PCIe Exerciser and PCIe Analyzer functionality including all software components and hardware support services of Exerciser and Analyzer. This system is connected to the PCIe Exerciser card(s) and/or PCIe Analyzer card and communicates with the exerciser and/or analyzer card(s) through software sessions that you create using the P5500 Traffic Analysis software.

  Ensure that the Hardware and Software Requirements for Installation are met on the Controller system PC before starting installation.

Hardware and Software Requirements for Installation

Prior to starting the installation process, ensure that all the system requirements to install the P5500 Traffic Analysis software (PCIe Exerciser and Analyzer software) are in place.

In the following sections, you will learn about:

- "Controller PC Requirements" on page 13
- "Requirements for the P5551A Exerciser Card" on page 13
- "Requirements for the P5552A Analyzer Card" on page 13

Controller PC Requirements

On the Controller PC, following are the system requirements:

- Windows 10 64 bit operating system
- At least 16 GB RAM. For better performance, Keysight recommends you to install 32 GB RAM or higher.
- At least 10 GB free disk space on the C drive
- USB 3.0 interface for each exerciser/analyzer card

Requirements for the P5551A Exerciser Card

Following are the power, memory, and environmental specifications for the P5551A Exerciser card:

Power specifications

Exerciser Power dissipation: 150W (max)

Memory requirements

There is no external memory module required for the Exerciser card.

Environment specifications

Environment Specifications		
Temperature	Operating: +5 °C to + 35 °C	Storage: -40 °C to +70 °C
Humidity	Operating: 15% to 85% (Relative humidity)	Storage: 15 to 95% (Relative humidity)
Altitude	2000m (6,500 feet) max	

Requirements for the P5552A Analyzer Card

Following are the memory and environmental specifications for the P5552A Analyzer card:

Memory requirements

There is no external memory module required for the Analyzer card.

Environment specifications

Environment Specifications		
Temperature	Operating: +5 °C to + 35 °C	Storage: -40 °C to +70 °C
Humidity	Operating: 15% to 85% (Relative humidity)	Storage: 15 to 95% (Relative humidity)
Altitude	2000m (6,500 feet) max	

2 Setting Up the Hardware for Protocol Exerciser and Protocol Analyzer

Once all the system requirements are in place, you need to start setting up the hardware for Protocol Exerciser and Protocol Analyzer.

Setting Up the P5551A Exerciser Card

You can set up hardware for Protocol Exerciser by plugging one or multiple exerciser cards into the motherboard or the server board, or by mounting them on the Keysight P5563A backplane board.

The following figure displays the P5551A exerciser card.

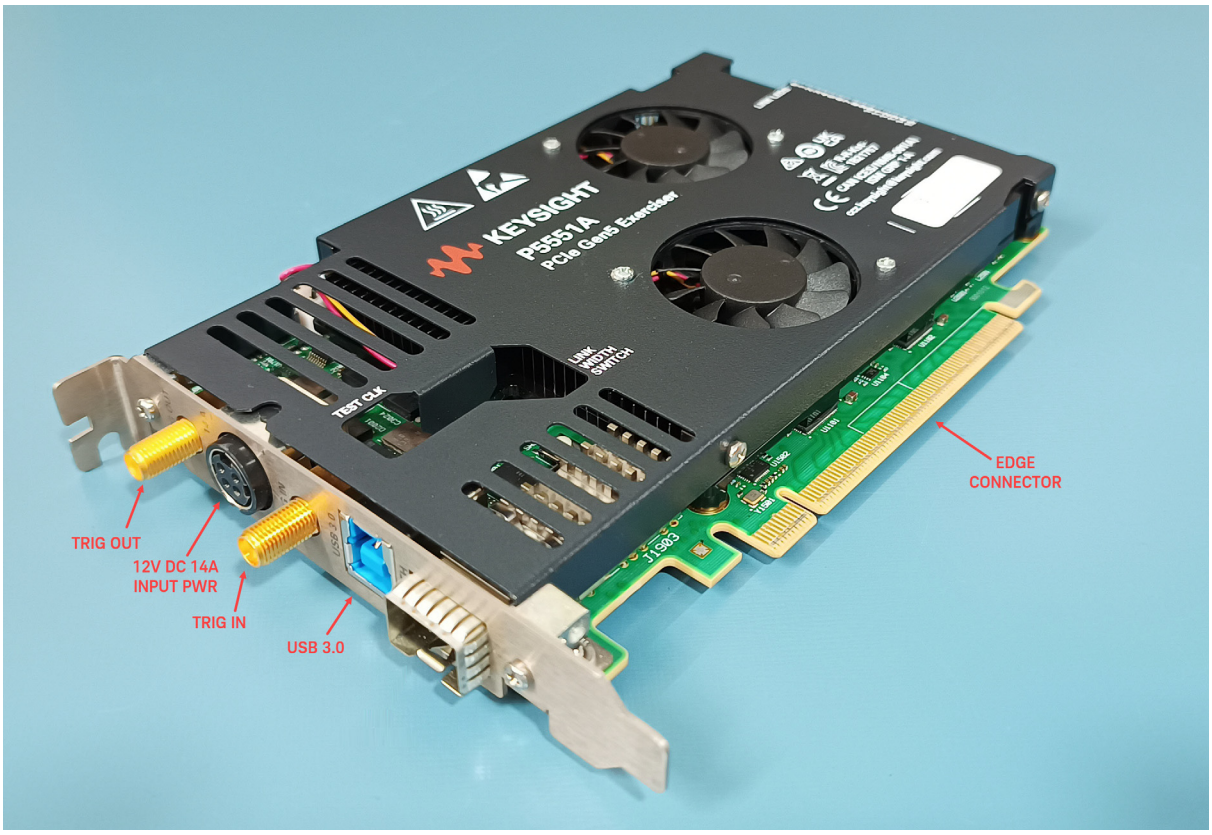


Figure 1 P5551A Exerciser card

NOTE For more information on P5551A exerciser card and its components, refer to *Keysight P5551A PCIe Gen5 Protocol Exerciser Hardware Guide*.

To Set Up Exerciser Card as a Root Complex

You generally mount an exerciser card on the Keysight P5563A backplane when you want to test a PCIe endpoint. The main application of this board is in testing an add-in card, such as a LAN or graphic card. In this scenario, exerciser card acts as a root complex (USC) to test a PCI Express end point. When you use the backplane, Exerciser card communicates to the DUT through the edge connectors.

To set up exerciser card to act as a root complex:

1 Plug the exerciser card's *Edge Connector* into one PCIe connector of backplane and the DUT into the other PCIe connector.

2 Connect the exerciser card with the Controller PC using USB.

3 Connect the exerciser card with Keysight-provided power supply using the power supply connector on the front bracket of the card.

This completes the hardware setup for Protocol Exerciser card acting as a root complex.

Figure 2 displays a sample setup of exerciser card mounted on the backplane board. The card is connected to a controller system through USB.

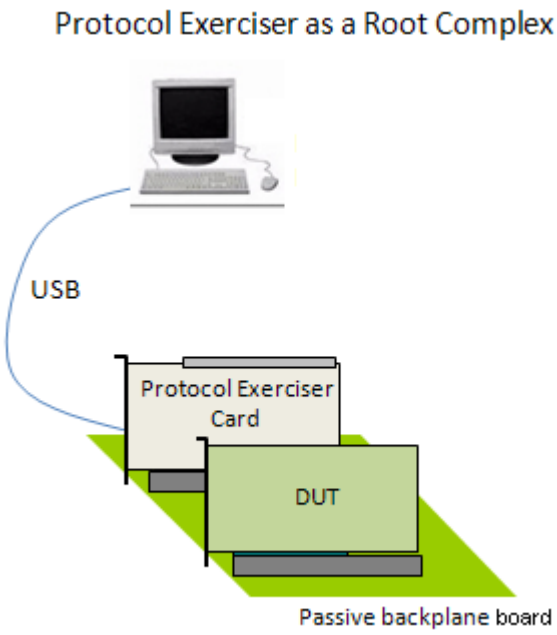


Figure 2 Exerciser Card mounted on a backplane

To Set Up Exerciser Card as a PCIe Endpoint

You plug the exerciser card into a motherboard or server board under test when you want to exercise the System Under Test (SUT) with various test scenarios. In this case, the exerciser card acts as a normal PCIe device (DSC) to test a PCI Express root complex.

To set up exerciser card to act as a PCIe endpoint:

1 Plug the exerciser card's *Edge Connector* into the system under test's motherboard.

2 Connect the exerciser card with the Controller PC using USB.

3 Connect the exerciser card with the Keysight-provided power supply using the power supply connector on the front bracket of the card.

Figure 3 displays a sample setup of exerciser card plugged into a system motherboard. The card is connected to a controller system through USB.

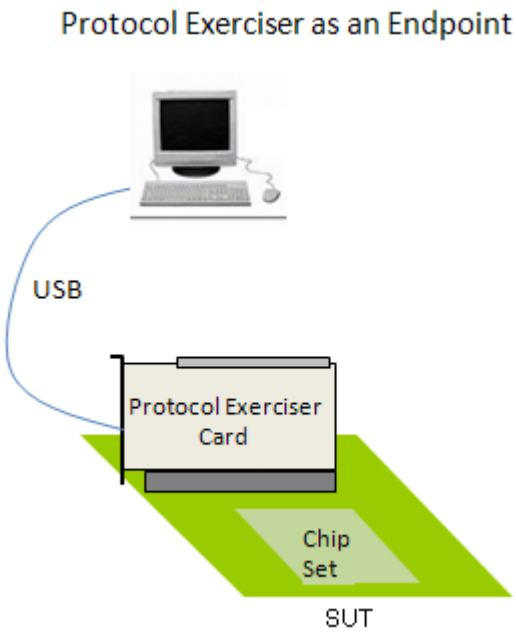


Figure 3 Exerciser Card plugged into a motherboard

CAUTION Components on the I/O module 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.

Setting Up the P5552A Analyzer Card

You can set up hardware for Protocol Analyzer by plugging the analyzer card between the motherboard or the system under test and the IO Card. The Analyzer module captures and analyzes the traffic from the system under test and the IO card.

The following figure displays the P5552A analyzer card.

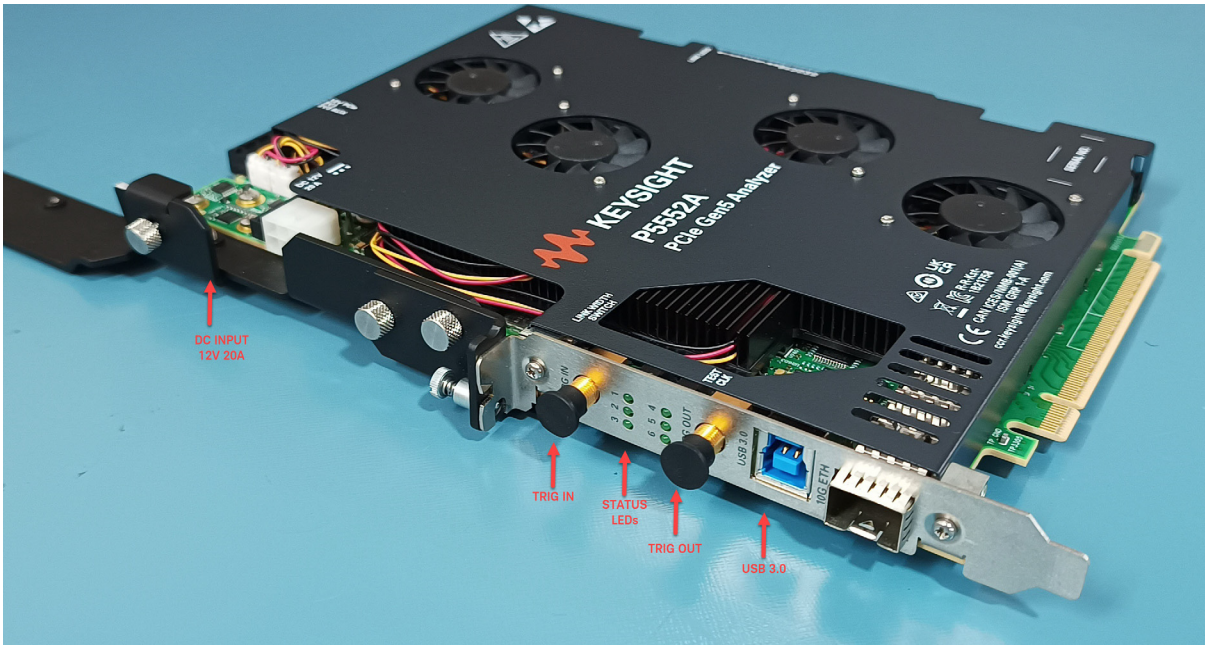


Figure 4 P5552A Analyzer card

NOTE For more information on P5552A analyzer card and its components, refer to *Keysight P5552A PCIe Gen5 Protocol Analyzer Hardware Guide*.

To Set Up Analyzer Card

Perform the following steps to set up the hardware in this configuration:

1 Plug the analyzer card's Edge Connector into the system under test's motherboard.

2 Connect the analyzer card with the Controller PC using USB.

3 Connect the analyzer card with the Keysight-provided power supply using the power supply connector on the front bracket of the card.

4 Connect the add-in card with the analyzer card's straddle mount connector.

The following image displays a sample setup of analyzer card plugged into a system motherboard and the add-in card connected to the analyzer module. The analyzer card is connected to a controller system through USB.

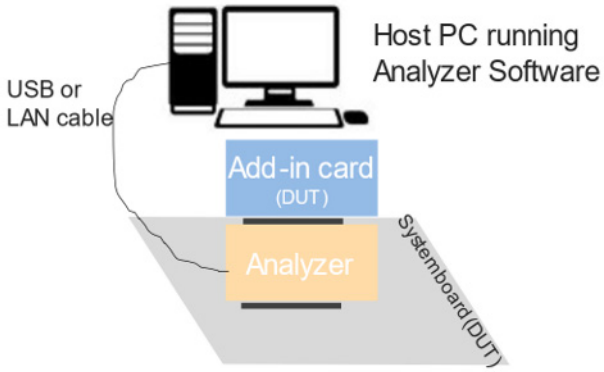


Figure 5 Analyzer Card between the Systemboard and Add-in card

CAUTION Components on the I/O module 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.

Setting Up P5551A Exerciser and P5552A Analyzer Together

You can set up hardware for Protocol Analyzer by plugging the analyzer card between the motherboard or the system under test and the IO Card, as described in the previous section. However, in cases where you need to test a single PCIe device, you can use the Analyzer in conjunction with the P5551A PCIe Gen5 Exerciser module, which provides the traffic from the other side.

Thus, you might have the following usage scenarios for using the Exerciser and Analyzer modules together:

- System board or motherboard (DUT) → Analyzer → Exerciser as a device (or add-in card)
- P5563A Test Backplane → Exerciser as a host (or the motherboard or system board) → Analyzer → Add-in Card (DUT)

To Set Up P5551A Exerciser and P5552A Analyzer Together

Perform the following steps to set up the hardware in this configuration:

1 Plug the exerciser card's Edge Connector into one PCIe connector of the test backplane.
2 Plug the analyzer card's Edge Connector into another PCIe connector of the test backplane.
3 Connect the analyzer card and the exerciser card with the Controller PC using USB.
4 Connect the analyzer card with the Keysight-provided power supply using the power supply connector on the front bracket of the card.
5 Connect the exerciser card with the Keysight-provided power supply using the power supply connector on the front bracket of the card.
6 Connect the add-in card with the analyzer card's straddle mount connector.

The following image displays the hardware setup described above.

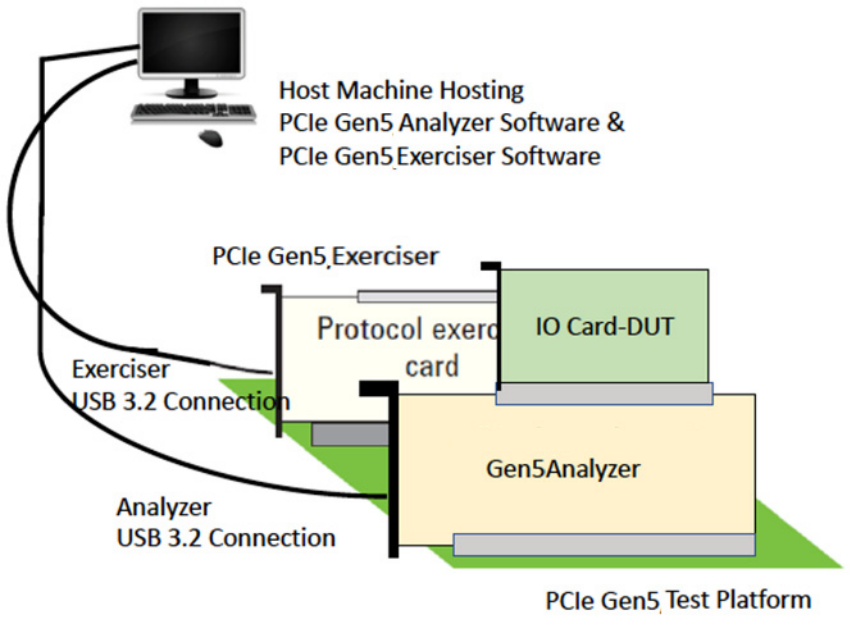


Figure 6 Analyzer Card between the Systemboard and Add-in card

CAUTION Components on the I/O module 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.

3 Installing P5500 Traffic Analysis Application

Once you have set up the hardware for Protocol Exerciser and Protocol Analyzer, you can start installing the P5500 Traffic Analysis software application on the Controller PC.

Installing P5500 Traffic Analysis Application

The following section provides step-by-step instructions on installing P5500 Traffic Analysis software.

Installing P5500 Traffic Analysis Software

1 Download the latest version of P5500 Traffic Analysis application.

2 Double-click the .exe file to begin installation.

If legacy components or a previous version of the software are installed on your computer, then a message box appears and prompts you to remove them.

To remove legacy components/previous version, do the following:

a Click **Yes**. The uninstallation process starts. Once this process ends, the Uninstall Complete screen of the wizard appears.

b Click **Finish**.

3 Repeat Step 2.

This time, the welcome screen of the installation wizard appears.

4 Click **Next**.

The License Agreement screen appears.

5 Click **Yes**.

The **Pre-Installation Summary** screen appears. This screen displays information relevant to the software installation.

6 Click **Next**.

The installation procedure begins. This might take a couple of minutes.

The **Setup Complete** screen is displayed.

7 Click **Finish**.

This completes the P5500 Traffic Analysis application installation.

Installing Licenses

You must install the following licenses to be able to run the P5500 Traffic Analysis software:

- P5551PSWA - one for each Exerciser module
- P5552PSWA - one for each Analyzer module

Any of the following types of this license can be installed:

- node-locked
- transportable
- USB portable
- floating

Further, any of the above licenses can be installed for the following time durations:

- 6 months
- 12 months
- 24 months
- 36 months
- perpetual

The above licenses can be installed using the Keysight PathWave License Manager software that gets installed when you install the P5500 Traffic Analysis software. For steps on installing the licenses using the Keysight PathWave License Manager, refer to its Online Help.

Verifying the Software Installation

You can verify if the P5500 Traffic Analysis software is installed successfully by performing the following steps:

- In the Start menu, the **Keysight PCIe Traffic Analysis** folder is added to the Programs folder.
- The PCIe Traffic Analysis application is accessible from the above folder.