Please note that Cypress is an Infineon Technologies Company.

The document following this cover page is marked as “Cypress” document as this is the company that originally developed the product. Please note that Infineon will continue to offer the product to new and existing customers as part of the Infineon product portfolio.

Continuity of document content

The fact that Infineon offers the following product as part of the Infineon product portfolio does not lead to any changes to this document. Future revisions will occur when appropriate, and any changes will be set out on the document history page.

Continuity of ordering part numbers

Infineon continues to support existing part numbers. Please continue to use the ordering part numbers listed in the datasheet for ordering.

CY4500

EZ-PD™ Protocol Analyzer Guide

Doc. No. 002-12170 Rev. *C

Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709
www.cypress.com

© Cypress Semiconductor Corporation, 2016-2017. This document is the property of Cypress Semiconductor Corporation and its subsidiaries, including Spansion LLC (“Cypress”). This document, including any software or firmware included or referenced in this document (“Software”), is owned by Cypress under the intellectual property laws and treaties of the United States and other countries worldwide. Cypress reserves all rights under such laws and treaties and does not, except as specifically stated in this paragraph, grant any license under its patents, copyrights, trademarks, or other intellectual property rights. If the Software is not accompanied by a license agreement and you do not otherwise have a written agreement with Cypress governing the use of the Software, then Cypress hereby grants you a personal, non-exclusive, nontransferable license (without the right to sublicense) (1) under its copyright rights in the Software (a) for Software provided in source code form, to modify and reproduce the Software solely for use with Cypress hardware products, only internally within your organization, and (b) to distribute the Software in binary code form externally to end users (either directly or indirectly through resellers and distributors), solely for use on Cypress hardware product units, and (2) under those claims of Cypress’s patents that are infringed by the Software (as provided by Cypress, unmodified) to make, use, distribute, and import the Software solely for use with Cypress hardware products. Any other use, reproduction, modification, translation, or compilation of the Software is prohibited.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS DOCUMENT OR ANY SOFTWARE OR ACCOMPANYING HARDWARE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. To the extent permitted by applicable law, Cypress reserves the right to make changes to this document without further notice. Cypress does not assume any liability arising out of the application or use of any product or circuit described in this document. Any information provided in this document, including any sample design information or programming code, is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Cypress products are not designed, intended, or authorized for use as critical components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or system could cause personal injury, death, or property damage (“Unintended Uses”). A critical component is any component of a device or system whose failure to perform can be reasonably expected to cause the failure of the device or system, or to affect its safety or effectiveness. Cypress is not liable, in whole or in part, and you shall and hereby do release Cypress from any claim, damage, or other liability arising from or related to all Unintended Uses of Cypress products. You shall indemnify and hold Cypress harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of Cypress products.

Cypress, the Cypress logo, Spansion, the Spansion logo, and combinations thereof, WICED, PSoC, CapSense, EZ-USB, F-RAM, and Traveo are trademarks or registered trademarks of Cypress in the United States and other countries. For a more complete list of Cypress trademarks, visit cypress.com. Other names and brands may be claimed as property of their respective owners.

Contents

1. Introduction 6

1.1 Analyzer Contents 6

1.1.1 Hardware Not Included With the Analyzer 6

1.2 Getting Started 7

1.2.1 CY4500 EZ-PD™ Protocol Analyzer Installation 7

1.3 List of Recommended Hardware 7

1.3.1 Recommended Host and Client Devices 7

1.3.2 Recommended Adapters and Cables 7

2. Analyzer Installation 8

2.1 CY4500 EZ-PD™ Protocol Analyzer Software Installation 8

3. CY4500 EZ-PD™ Protocol Analyzer Hardware 12

4. Analyzer Operation 15

4.1 Capturing PD Packets Using CY4500 EZ-PD™ Protocol Analyzer 15

4.2 Updating PSoC 5LP Device Firmware on the CY4500 EZ-PD™ Protocol Analyzer 18

4.2.1 Updating Firmware Using EZ-PD Analyzer Utility 18

5. Appendix A: Terminology 21

Revision History 22

Document Revision History 22

Safety Information

The CY4500 EZ-PD™ Protocol Analyzer is intended for use as a development, demonstration, and debugging platform for hardware or software in a laboratory environment. The analyzer is not intended for general consumer use. It generates, uses, and can radiate radio frequency energy. It has not been tested for compliance with the limits applicable under any standard. Operation of the equipment may cause interference with radio communications, in which case users, at their own expense, will be required to take whatever measures may be required to correct this interference.

Attaching additional wiring to this product or modifying the product operation from the factory default may affect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures must be taken.

The CY4500 EZ-PD™ Protocol Analyzer as shipped from the factory has been verified to meet with requirements of CE as a Class A product.

CE

	The CY4500 EZ-PD™ Protocol Analyzer board contains electrostatic discharge (ESD)- sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment, which can cause a discharge without detection. Permanent damage may occur to devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused CY4500 EZ-PD™ Protocol Analyzer board in the protective shipping package.
	End-of-Life/Product Recycling The end-of-life cycle for this analyzer is five years from the date of manufacture mentioned on the back of the box. Contact the nearest recycler to discard the analyzer.

General Safety Instructions

ESD Protection

ESD can damage boards and associated components. If an ESD workstation is not available, use appropriate ESD protection by wearing an antistatic wrist strap attached to the chassis ground (any unpainted metal surface) on the board when handling parts.

Handling Boards

The board provided with CY4500 EZ-PD™ Protocol Analyzer is sensitive to ESD. This also applies to the boards that are provided with a plastic casing when they are removed from the casing. Hold the boards only by the edges. After removing a board from the box/casing, place it on a grounded, static-free surface. Use a conductive foam pad, if available. Do not slide the board over any surface.

1. Introduction

Cypress's CY4500 EZ-PD™ Protocol Analyzer supports protocol analysis of the USB-PD and USB Type-C specifications. It performs non-intrusive probing and captures accurate protocol messages on the CC line. This analyzer consists of Cypress's programmable MCU (PSoC® 5LP), which monitors data on the CC lines and sends this data to the host application over a USB interface. The Type-C plug and Type-C receptacle on this analyzer provide a pass-through for the Power Delivery (PD) Packets transmitted between each Type-C PD connection. The processor MCU taps these Power Delivery Packets without disturbing the system and transfers them over the USB interface to a PC running the host application.

1.1 Analyzer Contents

The CY4500 EZ-PD™ Protocol Analyzer consists of the following contents:

- CY4500 EZ-PD™ Protocol Analyzer board enclosed in a transparent casing
- USB 2.0 Type-A to Micro-B Cable
- Jumper wires (6 in number)
- Quick Start Guide

1.1.1 Hardware Not Included With the Analyzer

The CY4500 EZ-PD™ Protocol Analyzer Guide references the CY4531 CCG3 EVK as a Type-C host device for all the examples covered in this document. While it is highly recommended to have the CY4531 CCG3 EVK as a Type-C host device, it is not required and can be replaced with any USB Type-C host device, such as a notebook with a Type-C port. The following items are not included with the Analyzer:

- A USB Type-C host device (for example, a notebook with a Type-C port, CY4531 EZ-PD™ CCG3 Evaluation Kit (EVK)) and a USB Type-C client device.
- Type-C Power Adapter that supports USB-PD. Recommended power adapters are listed in the Recommended Adapters and Cables section.
- As an option, Type-C to DisplayPort/HDMI/VGA adapters that can be used as Type-C devices for running the examples in this user guide. Recommended adapters are listed in the Recommended Adapters and Cables section.

1.2 Getting Started

Once the steps to install the analyzer as described in Analyzer Installation chapter are completed, refer to the Analyzer Operation chapter for instructions on how to run a quick demonstration and observe analyzer functionality.

1.2.1 CY4500 EZ-PD™ Protocol Analyzer Installation

The CyInstaller installs the CY4500 EZ-PD™ Protocol Analyzer along with the EZ-PD™ Analyzer Utility software and all necessary CYUSB3.0 drivers. Refer to the Analyzer Installation chapter for more details.

1.3 List of Recommended Hardware

1.3.1 Recommended Host and Client Devices

See Table 1-1 for different options on choosing USB Type-C host and client devices. This analyzer is not shipped with any of the listed devices. A Type-C Power Adapter is required to run the example in the Analyzer Operation chapter.

Table 1-1. List of Recommended Host & Client Devices

No.	Description	Manufacturer	Vendor Link
	Host Devices		
1	Apple MacBook	Apple	Apple Store Link
2	Google Chrome book	Google	Google Store Link
3	CY4501 CCG1 Development Kit (Host Board)	Cypress	Cypress Link
4	CY4531 EZ-PD™ CCG3 EVK	Cypress	Cypress Link
5	CY4541 EZ-PD™ CCG4 EVK	Cypress	Cypress Link
	Client Devices		
1	Type-C Power Adapter that supports USB-PD	Apple	Apple Store Link
2	Type-C to Digital AV Multiport Adapter	Apple	Apple Store Link
3	CY4501 CCG1 Development Kit (Client Board)	Cypress	Cypress Link

1.3.2 Recommended Adapters and Cables

See Table 1-2 for different options to obtain a set of cables recommended to work with Type-C host/client devices. This analyzer is not shipped with these adapters or cables.

Table 1-2. List of Recommended Adapters and Cables

No.	Description	Manufacturer	MPN	Vendor Link
1	Type-C to Display Port Adapter	Belinda	-	Amazon Link
2	Type-C to HDMI Adapter	Cable Matters	-	Amazon Link
3	Type-C to VGA Adapter	Cable Matters	-	Amazon Link
4	DisplayPort to DisplayPort Cable (6”, gold plated)	Cable Matters	102005-6	Amazon Link
5	Mini DisplayPort to DisplayPort Cable (3”, gold plated)	Cable Matters	101007-BLACK-3	Amazon Link

2. Analyzer Installation

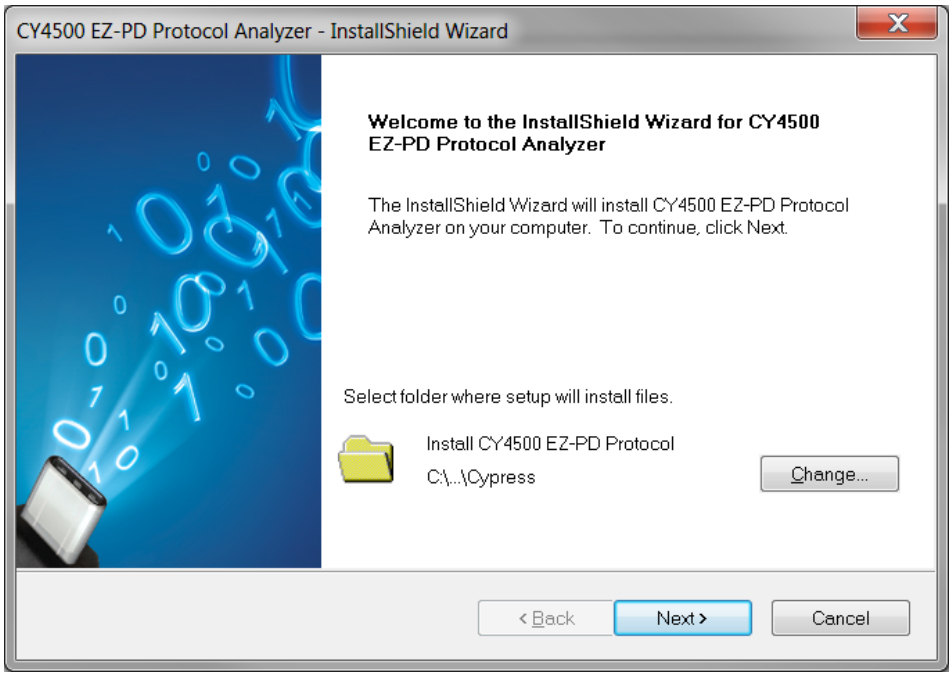
This chapter describes the steps to install the CY4500 EZ-PD™ Protocol Analyzer.

2.1 CY4500 EZ-PD™ Protocol Analyzer Software Installation

To install the analyzer software, follow these steps:

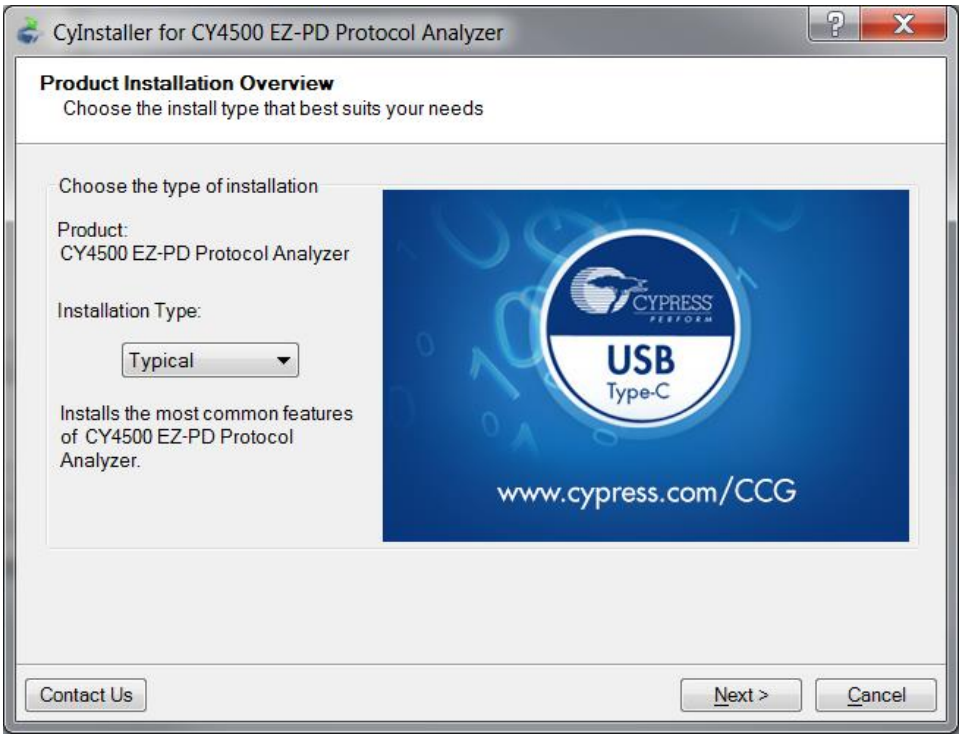
1. Download the latest analyzer software setup *CY4500Setup.exe* file from the Cypress website http://www.cypress.com/CY4500. This package contains the software EZ-PD Analyzer Utility for running the analyzer and the relevant documentation (User Guide, Quick Start Guide, and Release Notes). Double-click on the executable to start the installation. Click **Next** when the screen shown in Figure 2-1 appears.

Figure 2-1. CY4500 EZ-PD™ Protocol Analyzer Installer Screen



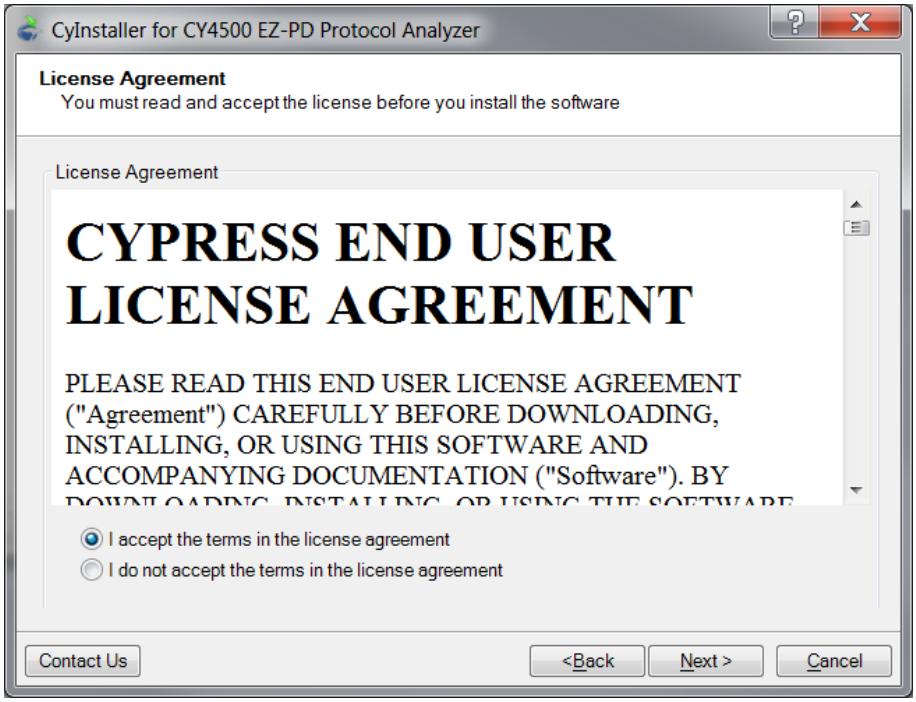
2. Select the required **Installation Type** and click **Next** to start the install (Figure 2-2). For first-time installation, it is recommended that you select “Typical” as the **Installation Type**.

Figure 2-2. Installation Wizard



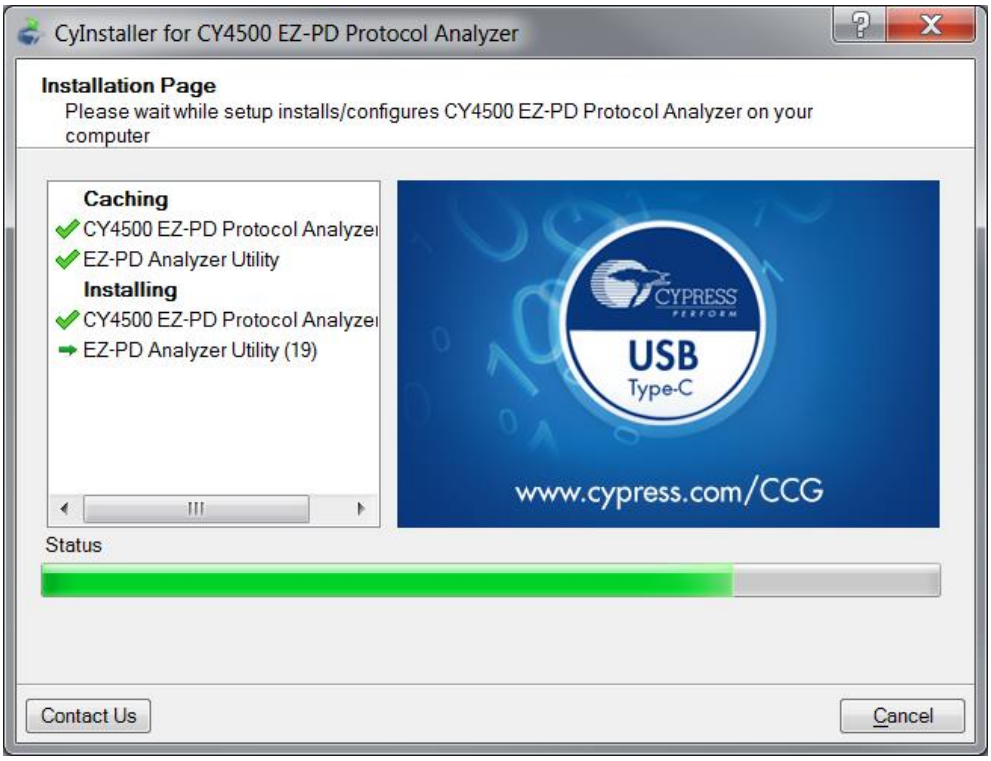
3. Accept the license agreement for the software components and click **Next** (Figure 2-3).

Figure 2-3. License Agreement



4. Figure 2-4 shows the installation progress.

Figure 2-4. Installation Progress

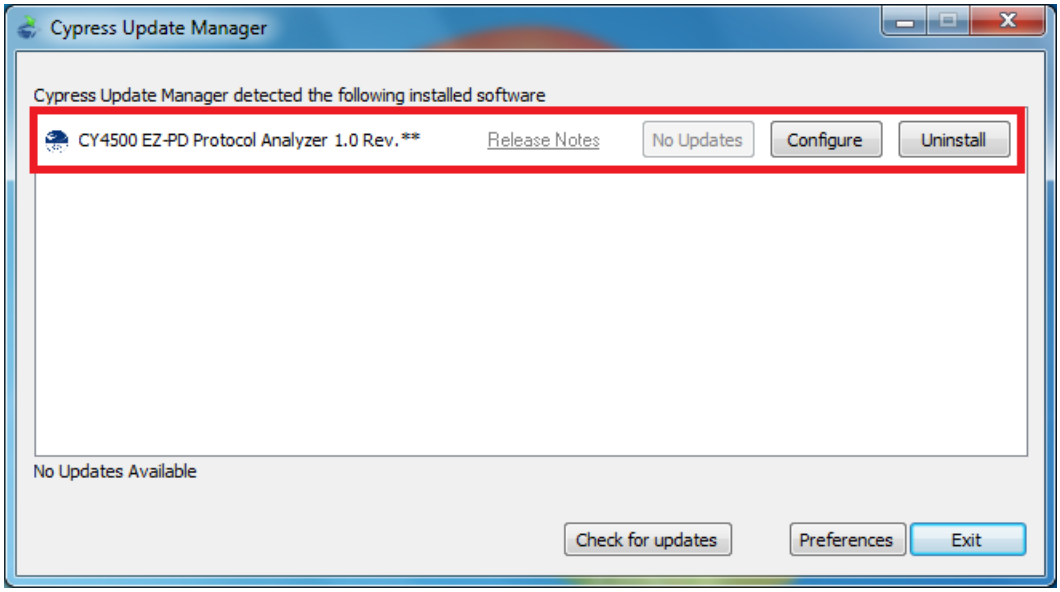


5. Enter **Contact Information** or select **Continue Without Contact Information** and click **Finish** (Figure 2-5).

Figure 2-5. Software Installation Complete

6. When installation is complete, you have the option to launch **Cypress Update Manager** (Figure 2-6) to ensure you have the latest software package. Click the **Check for updates** button at the bottom of the window. If “No Updates” appears adjacent to the CY4500 EZ-PD™ Protocol Analyzer, click the **Exit** button. If there are updates, click the **Update** button to download and install the latest analyzer package.

Figure 2-6. Cypress Update Manager



Note: You can launch the Cypress Update Manager at any time from **Start > All Programs > Cypress > Cypress Update Manager**.

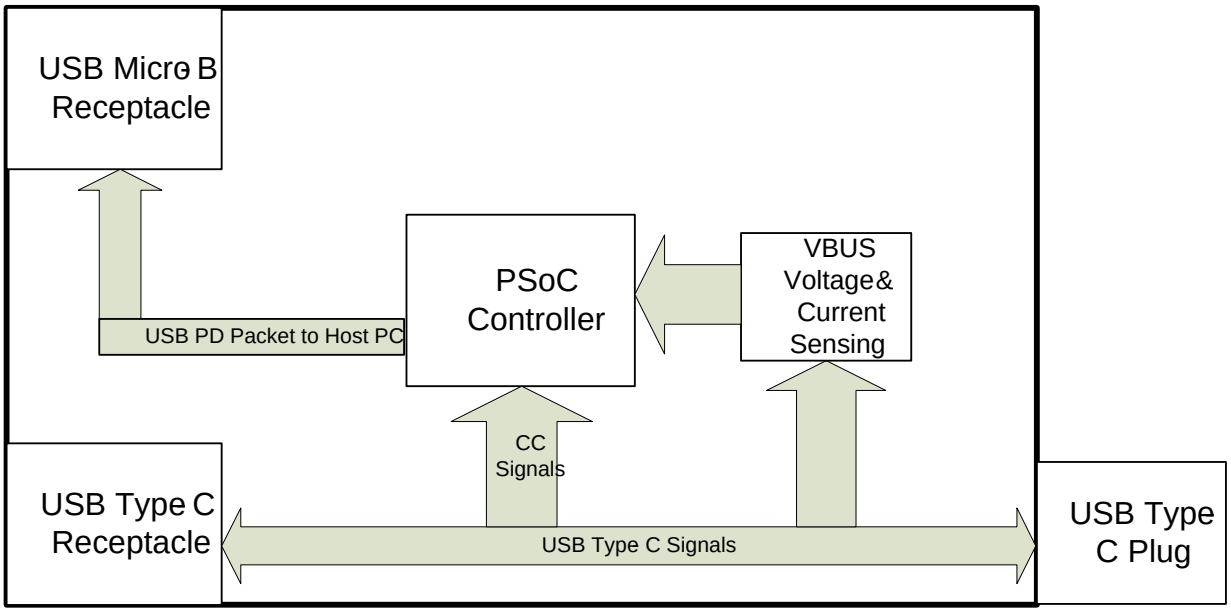
7. After the installation is complete, the contents are available at the following location: `<Install Directory>\CY4500 EZ-PD Protocol Analyzer\1.0`.

Note: On the Windows 32-bit platform, the default <Install Directory> is `C:\Program Files\Cypress`; on the Windows 64-bit platform, it is `C:\Program Files(x86)\Cypress`.

3. CY4500 EZ-PD™ Protocol Analyzer Hardware

The CY4500 EZ-PD™ Protocol Analyzer consists of a PSoC 5LP controller that probes into the USB Type-C signals over I^2C transpiring between the USB Type-C plug and receptacle, and then transfers them over to a host PC via a USB Micro-B cable. The EZ-PD Analyzer Utility must already be running on the host PC to receive these messages, decode them, and show them as an output. The block diagram for the CY4500 EZ-PD™ Protocol Analyzer board is shown in Figure 3-1.

Figure 3-1: CY4500 EZ-PD™ Protocol Analyzer Hardware Block Diagram



The board comprises of a Type-C plug at one end and a Type-C receptacle at the other, which is used to connect to the Type-C device or system under test. The board is powered over the USB micro-B port, which provides 4V, 500mA. The board also consists of one LED to indicate the power status. Besides this, it has connector headers brought out for the GPIOs, CC lines, VBUS, and SBU lines from the USB-PD system. Figure 3-2, Figure 3-3 and Figure 3-4 show the front view, back view and side view of CY4500 EZ-PD™ Protocol Analyzer board respectively. Table 3-1 contains their detailed description. Headers J1 and J8 are located on the back side of the board. Users need to take precaution and ensure that the exposed header pins of J1 and J8 do not get shorted. Shorting these exposed pins may result in a functional failure or unexpected behavior of the CY4500 EZ-PD™ Protocol Analyzer.

Figure 3-2: CY4500 EZ-PD™ Protocol Analyzer Board (Front View)

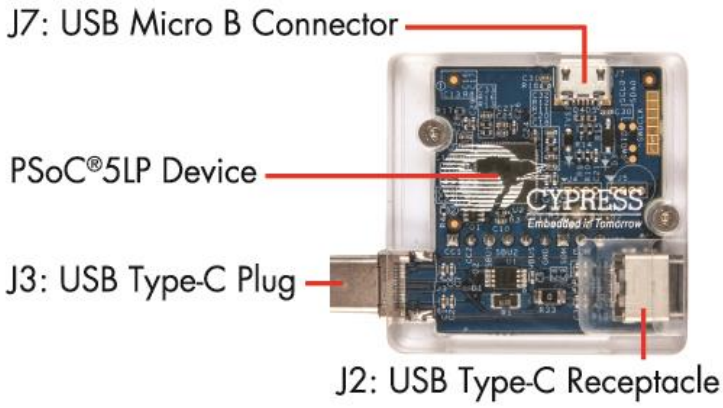


Figure 3-3. CY4500 EZ-PD™ Protocol Analyzer Board (Back View)

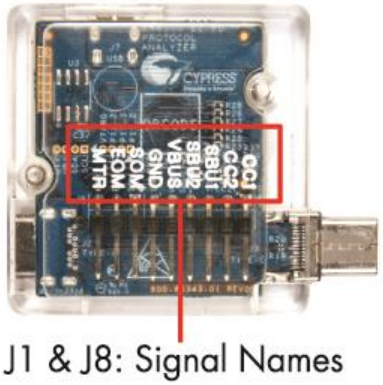


Figure 3-4. CY4500 EZ-PD™ Protocol Analyzer Board (Side View)

Table 3-1: CY4500 EZ-PD™ Protocol Analyzer Board Interfaces

Connector	Description
J1	USB Type-C Signal Header Pin 1: CC1 Pin 2: CC2 Pin 3: SBU1 Pin 4: SBU2 Pin 5: VBUS Pin 6: GND
J2	Type-C Receptacle
J3	Type-C Plug
J7	USB Micro-B Connector
J8	Message Trigger Header Pin 1: SOM Pin 2: EOM Pin 3: MTR

Note 1: Pins of header J8 are used for the triggering functionality. They can be connected using the jumper cables provided with the kit to an oscilloscope or other hardware that needs to be triggered. See the EZ-PD™ Analyzer Utility User Guide's section 2.3 for more details on how to use this functionality.

Note 2: The EZ-PD™ Protocol Analyzer Board is protected using a transparent casing. The board should not be removed from the casing any time while using the Analyzer.

4. Analyzer Operation

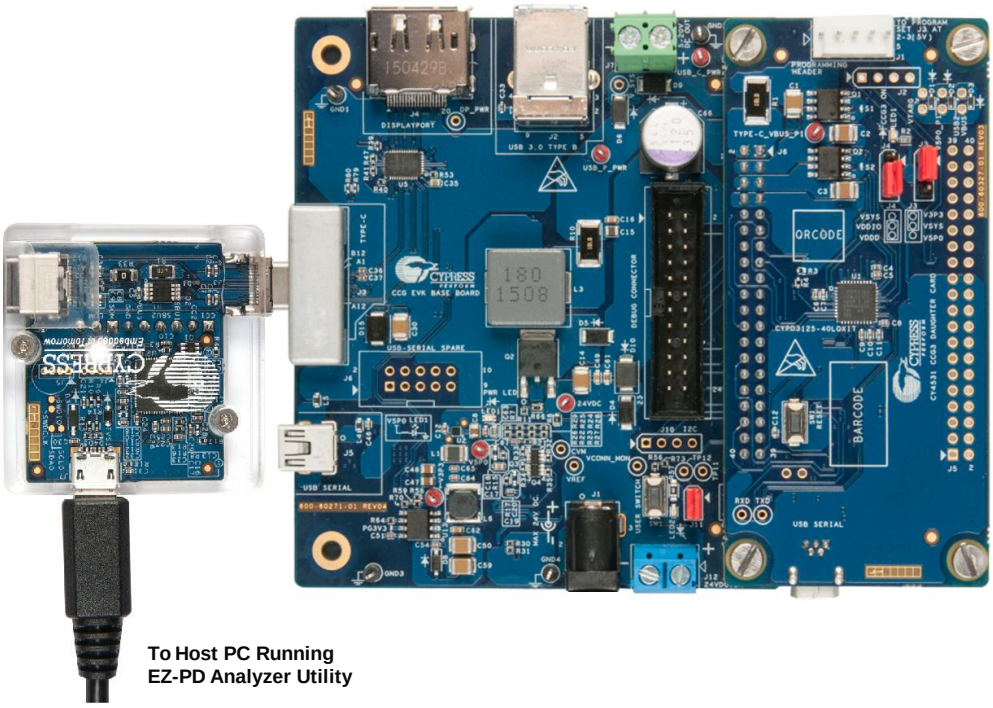
This chapter describes how to run the CY4500 EZ-PD™ Protocol Analyzer with the EZ-PD Analyzer Utility and also how to update the firmware of the PSoC 5LP device of the analyzer. You must complete the installation procedure explained in the Analyzer Installation chapter before proceeding.

4.1 Capturing PD Packets Using CY4500 EZ-PD™ Protocol Analyzer

The steps to run the CY4500 EZ-PD™ Protocol Analyzer in order to capture the Power Delivery Packets on the CC bus are as follows:

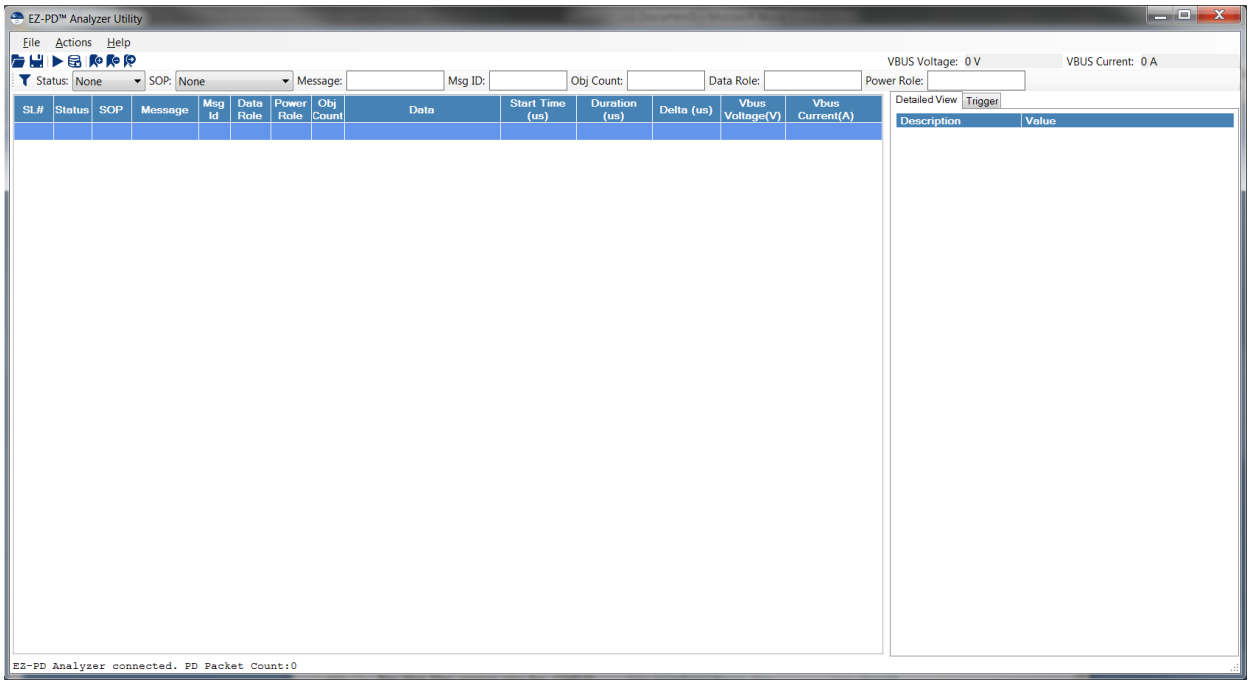
1. Using a USB Micro-B cable, connect the USB Micro-B receptacle (Connector J7) of the CY4500 EZ-PD™ Protocol Analyzer board to the host PC. LED1 of the CY4500 EZ-PD™ Protocol Analyzer board starts blinking in white color.
2. Connect the USB Type-C plug (Connector J3) of the CY4500 EZ-PD™ Protocol Analyzer board to the Type-C host device. In this user guide, the CY4531 EZ-PD™ CCG3 Evaluation Kit (EVK) (not provided with this analyzer) is used as a Type-C host device as an example.
3. Verify that your setup looks similar to the image shown in Figure 4-1.

Figure 4-1: Setup for Operating CY4500 EZ-PD™ Protocol Analyzer



4. On the host PC, launch the EZ-PD Analyzer Utility from **Start** > **All Programs** > **Cypress EZ-PD Analyzer Utility**. The EZ-PD Analyzer Utility's start-up page will look similar to the image shown in Figure 4-2.

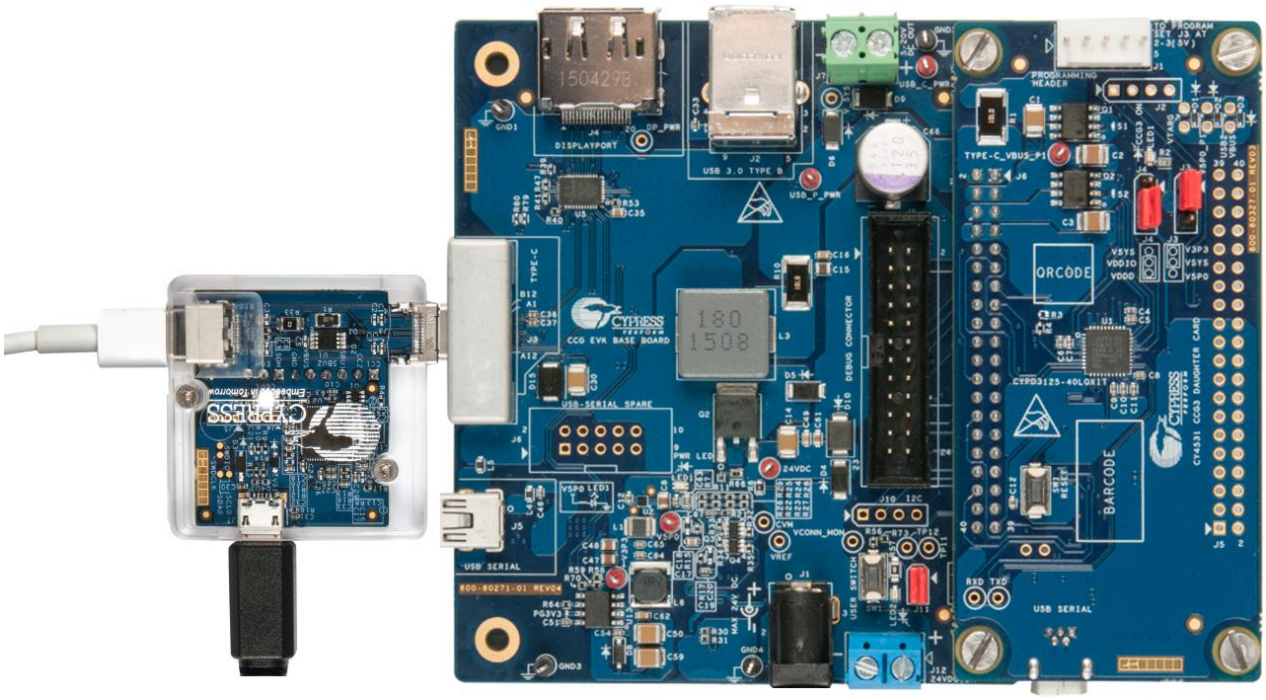
Figure 4-2: EZ-PD Analyzer Utility Start-up Page



5. Click on the **Start Capturing** icon ▶. The icon changes to the **Stop Capturing** icon ■. Alternatively, you can start capturing data by clicking on **Actions > Start Capturing** from the menu bar. The status bar at the bottom of the utility window shows the message “EZ-PD Analyzer is running” (similar to the status bar at the bottom of Figure 4-4).

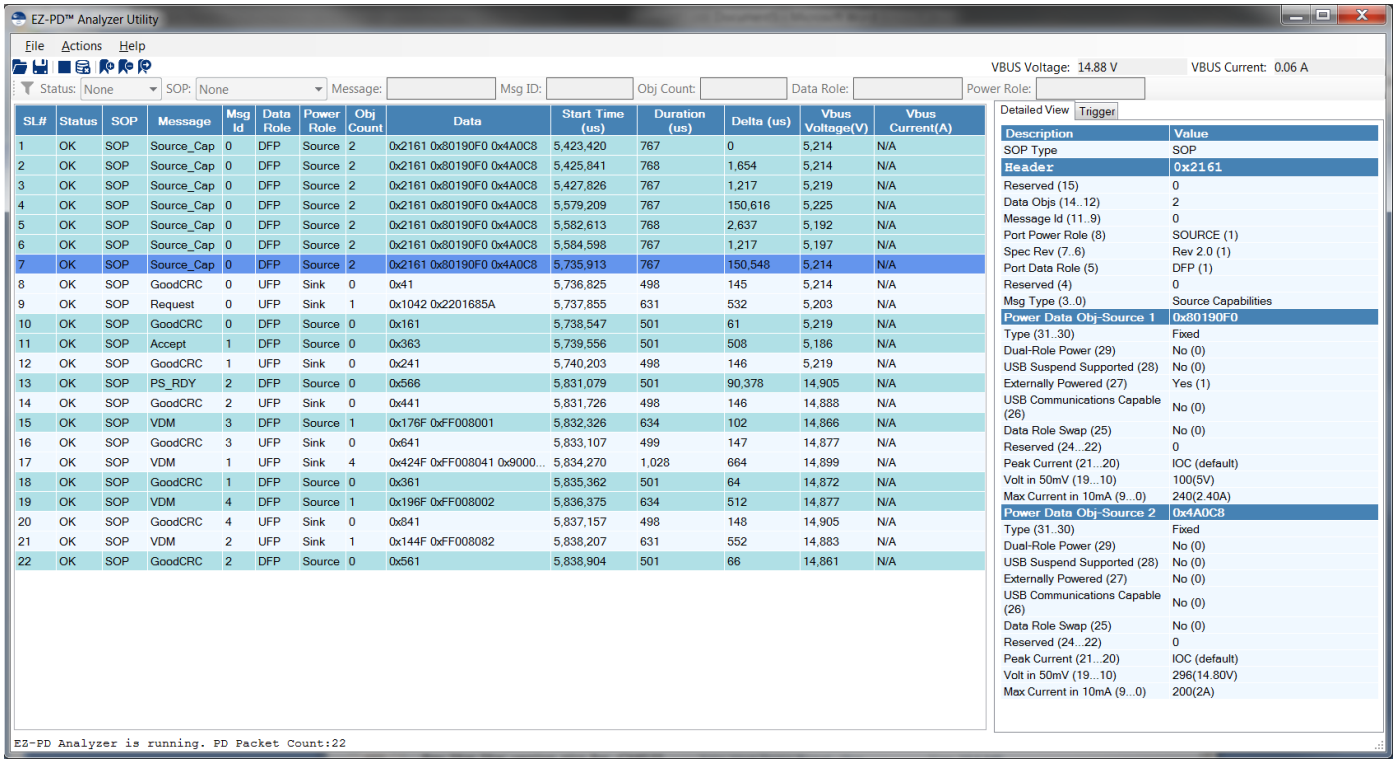
6. Connect a USB Type-C power adapter (not provided with the analyzer) to the USB Type-C receptacle (Connector J2) of the CY4500 EZ-PD™ Protocol Analyzer board. Verify that your setup looks similar to the image shown in Figure 4-3. The USB Type-C power adapter mentioned here is just an example. Any USB Type-C device can be used in its place.

Figure 4-3: Completing the Setup for Operating CY4500 EZ-PD™ Protocol Analyzer



7. Upon connecting the USB Type-C power adapter, the utility running on the host PC automatically displays a string of messages on the screen. Make sure that the hardware connections are not loose or do not get disconnected in the middle of a data capturing event. The running EZ-PD Analyzer Utility, along with the messages, will look similar to the image shown in Figure 4-4.

Figure 4-4: EZ-PD Analyzer Utility Showing PD Packets Captured on CC Line



8. The EZ-PD Analyzer Utility displays the messages that have been captured (sent and received) between the USB Type-C host device and the USB Type-C client device on the CC line. Click on the ■ icon to stop capturing messages. Alternatively, you can stop capturing data by clicking on **Actions > Stop Capturing** from the menu bar. Upon clicking this icon, the status bar at the bottom of the utility window displays **EZ-PD Analyzer is stopped**.
9. You can save the captured set of messages by clicking on **File > Save**. These files can be saved in the *.ccgx*, *.xlsx* or *.csv* formats, but only the file saved in *.ccgx* format can be opened using the EZ-PD Analyzer Utility by clicking **File > Open**.
10. To clear a captured group of messages, you can either click the Clear Data icon or click on **Actions > Clear Data** from the menu bar. This clears all the captured group of messages. If they are not saved prior to clicking the Clear Data icon, then these messages are lost.
11. If the hardware shown in Figure 4-3 is not stable or gets disconnected at any point, the status bar at the bottom of the utility window shows the message **EZ-PD Analyzer is disconnected.**
12. For more information on how to use the EZ-PD Analyzer Utility, refer to the EZ-PD™ Analyzer Utility User Manual by clicking **Help > User Manual**.

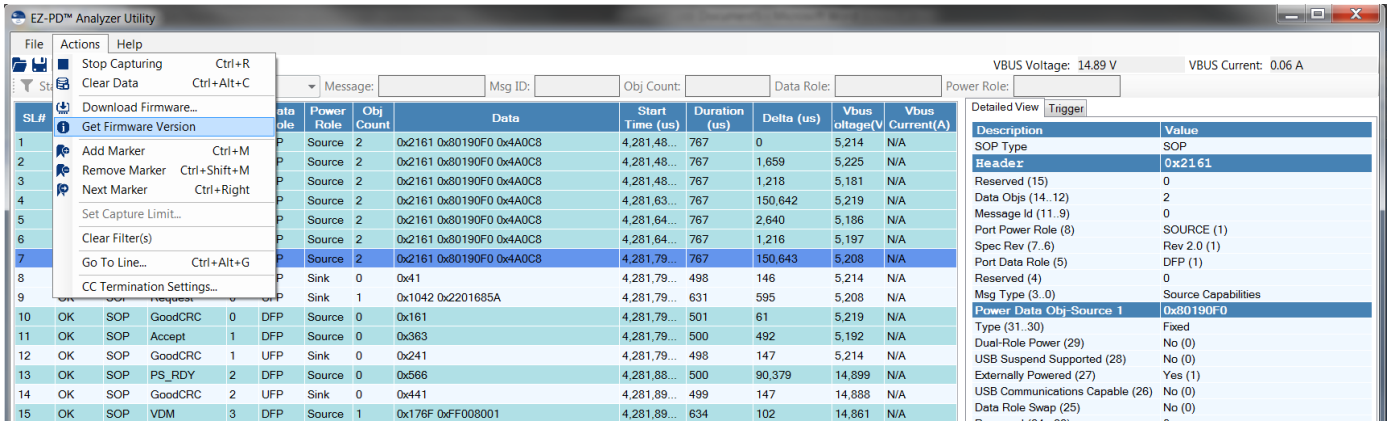
4.2 Updating PSoC 5LP Device Firmware on the CY4500 EZ-PD™ Protocol Analyzer

The firmware of the PSoC 5LP device present on the CY4500 EZ-PD™ Protocol Analyzer board can be updated using the EZ-PD Analyzer Utility.

4.2.1 Updating Firmware Using EZ-PD Analyzer Utility

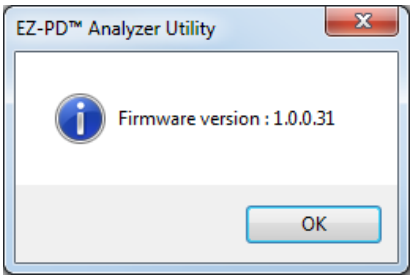
1. Using a USB Micro-B cable, connect the USB Micro-B receptacle (Connector J7) of the CY4500 EZ-PD™ Protocol Analyzer board to the host PC. LED1 of the CY4500 EZ-PD™ Protocol Analyzer board starts blinking in white color.
2. On the host PC, launch the EZ-PD Analyzer Utility from **Start > All Programs > Cypress EZ-PD Analyzer Utility**. The utility's start-up page will look similar to the image shown in Figure 4-2.
3. Check the current firmware loaded on the EZ-PD Protocol Analyzer Hardware by selecting **Actions > Get Firmware Version** as shown in Figure 4-5.

Figure 4-5: Get the current firmware version



4. Wait for the firmware version dialog box to appear as shown in Figure 4-6.

Figure 4-6: Firmware version dialog box

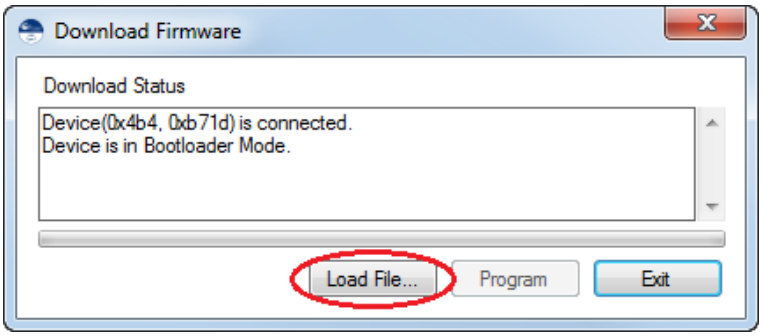


Click **OK** to return to the main menu. Proceed with rest of the procedure to download the firmware incase a newer version of the firmware is available.

5. Click on **Actions > Download Firmware** to initiate the firmware update. If the analyzer hardware is not connected, the status bar at the bottom of the utility window shows the message **EZ-PD Analyzer is not connected**. Ensure that the board connections are secure. If the utility window has any unsaved messages, a new window will pop up with a message “Data is about to clear from the window. Do you want to save?”. Users can select Yes or No based on their requirement.

6. Upon executing step 5, a new window, **Download firmware,** opens as shown in Figure 4-7. The device enters the bootloader mode by default.

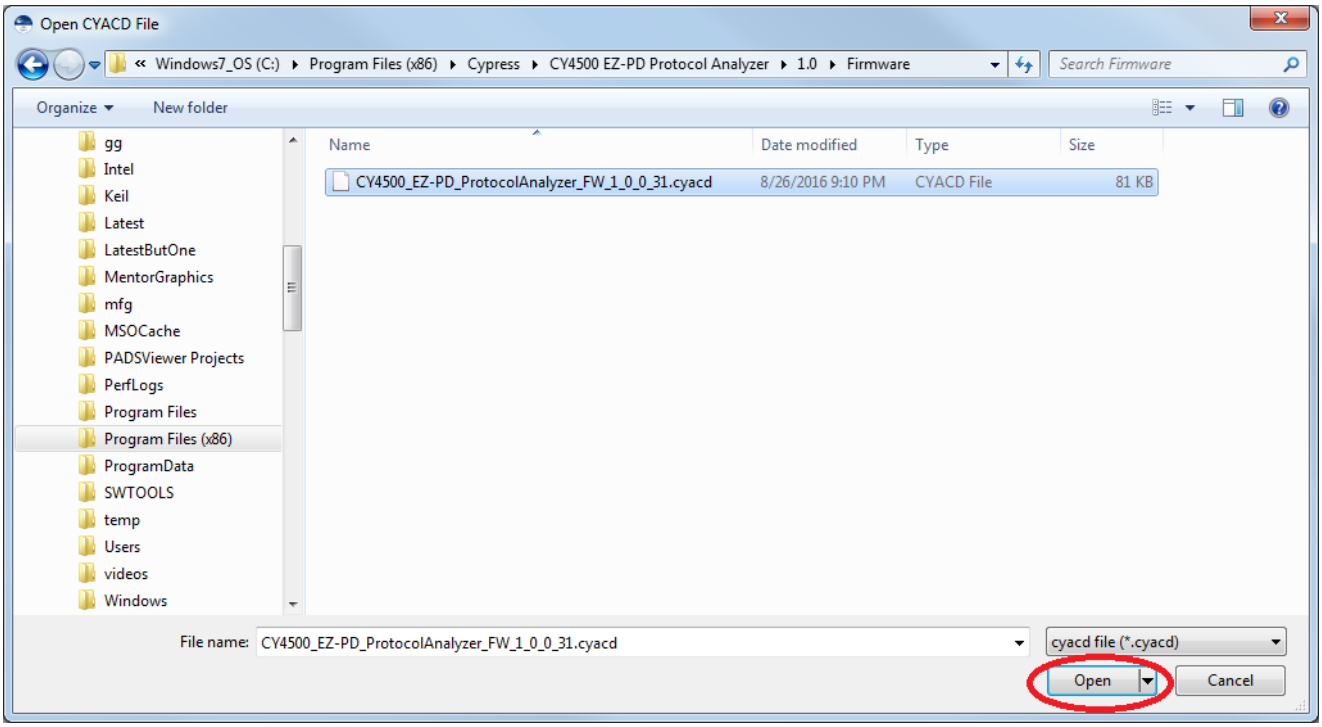
Figure 4-7: “Download Firmware” Window



7. Click **Load File…** as shown in Figure 4-7 and select the CY4500 firmware file in .cyacd format as shown in Figure 4-8. Click **Open**. The binary file provided with the analyzer is available at the following location: `<Install Directory>\CY4500 EZ-PD Protocol Analyzer\1.0\Firmware`.

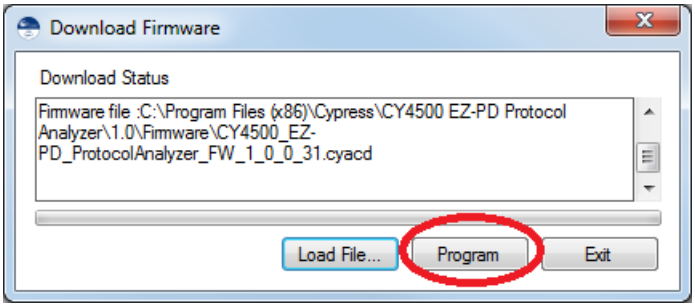
   Note: On a Windows 32-bit platform, the default <Install Directory> is `C:\Program Files\Cypress`; on the Windows 64-bit platform, it is `C:\Program Files(x86)\Cypress`.

Figure 4-8. Selecting the CY4500 Firmware File



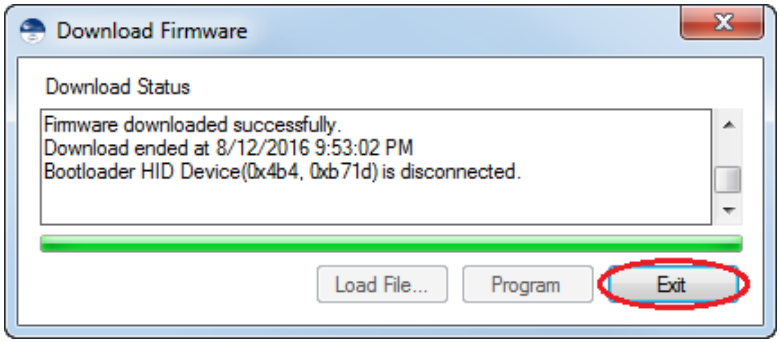
8. Click **Program** to initiate the firmware download process as shown in Figure 4-9.

Figure 4-9. Initiating Firmware Download



9. This starts the firmware download process. Click **Exit** when complete as shown in Figure 4-10.

Figure 4-10. Completion of Firmware Download



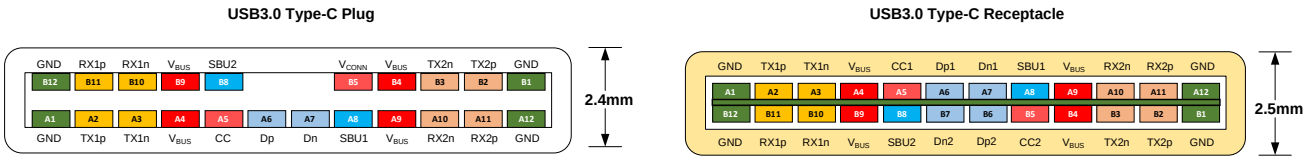
10. The steps to update the firmware are now complete. The CY4500 EZ-PD™ Protocol Analyzer hardware restarts with the firmware used in step 7 and is ready to use.

5. Appendix A: Terminology

This guide assumes that the user of the CY4500 EZ-PD Protocol Analyzer is familiar with the fundamentals of Type-C connectivity and the USB Power Delivery protocol. A brief description of Type-C terms is provided here for reference.

- Alternate Modes: A feature of a USB Type-C system whereby one or both of the SuperSpeed lanes may be repurposed for use with a different serial protocol, such as a DisplayPort, eSATA, or Thunderbolt.
- Client Device: A USB peripheral such as a hub, docking station, or monitor.
- Configuration channel (CC): A USB Type-C bus wire used to transmit protocol signals. This is a half-duplex 300-kHz signal.
- Consumer: A Type-C port that sinks power from VBUS.
- DisplayPort: A digital display interface standard developed by the Video Electronics Standards Association. It is used primarily to connect a video source to a display such as a computer monitor.
- Downstream facing port (DFP): A USB Type-C port on a host or a hub to which devices are connected.
- Dp, Dn: USB Type-C bus wires used to transmit and receive USB 2.0 data.
- Dual-role port (DRP): A USB Type-C port that can operate as either a DFP or a UFP.
- Electronically Marked Cable Assembly (EMCA): A USB cable that includes an IC that reports cable characteristics (such as current rating) to the Type-C ports.

Figure 5-1. Type-C Plug & Receptacle pins



- Host Device: A USB Host system such as a PC, notebook, laptop, and so on.
- Provider: A Type-C port that sources power over VBUS.
- Sideband use (SBU): A USB Type-C bus wire used for non-USB control signals, such as DisplayPort control signals.
- Type-C Transceiver**:** A transmitter/receiver that communicates over the CC.
- TX1p, TX1n, RX1p, RX1n, TX2p, TX2n, RX2p, and RX2n: USB Type-C bus wires used to transmit and receive SuperSpeed USB and PCIe or DisplayPort data.
- Upstream facing port (UFP): A USB Type-C port on a device or a hub that connects to a host or the DFP of a hub.
- USB Power Delivery (USB PD, PD): A new USB standard that increases maximum power delivery over USB from 7.5 W to 100 W.
- USB Type-C (Type-C): A new standard with a slimmer USB connector and a reversible cable, capable of sourcing up to 100 W of power and supporting Alternate Modes.
- VBUS: A USB Type-C bus wire used for power; initially 5 V, but increased up to 20 V on USB PD systems.
- VCONN**:** A USB Type-C bus wire used to power the IC in the EMCA.

Revision History

Document Revision History

Document Title: CY4500 EZ-PD™ Protocol Analyzer Guide Document Number: 002-12170			
Revision	**Issue Date**	**Origin of Change**	**Description of Change**
**	7/8/2016	VGT	New user guide for CY4500 EZ-PD™ Protocol Analyzer.
*A	11/9/2016	VGT	Added CE logo, updated images for CY4500 EZ-PD™ Protocol Analyzer hardware in Chapters 3 and 4. Updated GUI snapshots in Chapter 4, added jumper wires in Section 1-1, added Note 1 under Table 3-1.
*B	11/11/2016	SELV	Fixed formatting issues
*C	05/26/2017	NIBK	Updated Cypress Logo and Copyright.