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***USB PD Analyzer***  
***User Manual***

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**Table 1-1 - Document Revision History**

<i>Revision</i>	<i>Date</i>	<i>Changes</i>
1.0	Aug,2015	Initial version
1.1	Sep,19,2015	Application dependency description
1.2	Sep,20,2015	Add firmware upgrade warning notes Add USB to Serial driver install guide Add .net Framework install guide
1.3	Sep,26,2015	Add Diff function description
1.4	Oct,17,2015	Add base timeline set/clear function; Add auto upgrade function Update section 6
1.5	Oct,29,2015	Add statistic function
1.6	May,17,2016	Describe DFP/UFP direction in section 5
1.7	Oct,9,2017	Add capture to show Aux data analyzer

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## ***1 Introduction***

USB Power Delivery is designed to enable the maximum functionality of USB by providing more flexible power delivery along with data over a single cable. Its aim is to operate with and build on the existing USB ecosystem; increasing power levels from existing USB standards.

With USB Power Delivery the power direction is no longer fixed. This enables the product with the power (Host or Peripheral) to provide the power. For example, a display with a power supply from the wall can power, or charge, a laptop. Alternatively, USB power bricks or chargers can supply power to laptops and other battery powered devices through their, traditionally power providing, USB ports.

USB Power Delivery enables hubs to become the means to optimize power management across multiple peripherals by allowing each device to take only the power it requires, and to get more power when required for a given application. For example, battery powered devices can get increased charging current and then give it back temporarily when the user's HDD requires to spin up. Optionally the hubs can communicate with the PC to enable even more intelligent and flexible management of power either automatically or with some level of user intervention.

USB Power Delivery allows Low Power cases such as headsets to negotiate for only the power they require. This provides a simple solution that enables USB devices to operate at their optimal power levels.

PD Analyzer UPM device can capture the Power Delivery communication data on CC bus. We provide PC software tool achieve below major functionalities:

- PD package capture and parse on real-time
- DisplayPort alternate mode VDM message decode
- CC bus wave display and measure
- VBUS voltage/current Monitor
- Data import and export for offline processing
- Analyzer firmware upgrade
- DisplayPort Aux data capture and decode

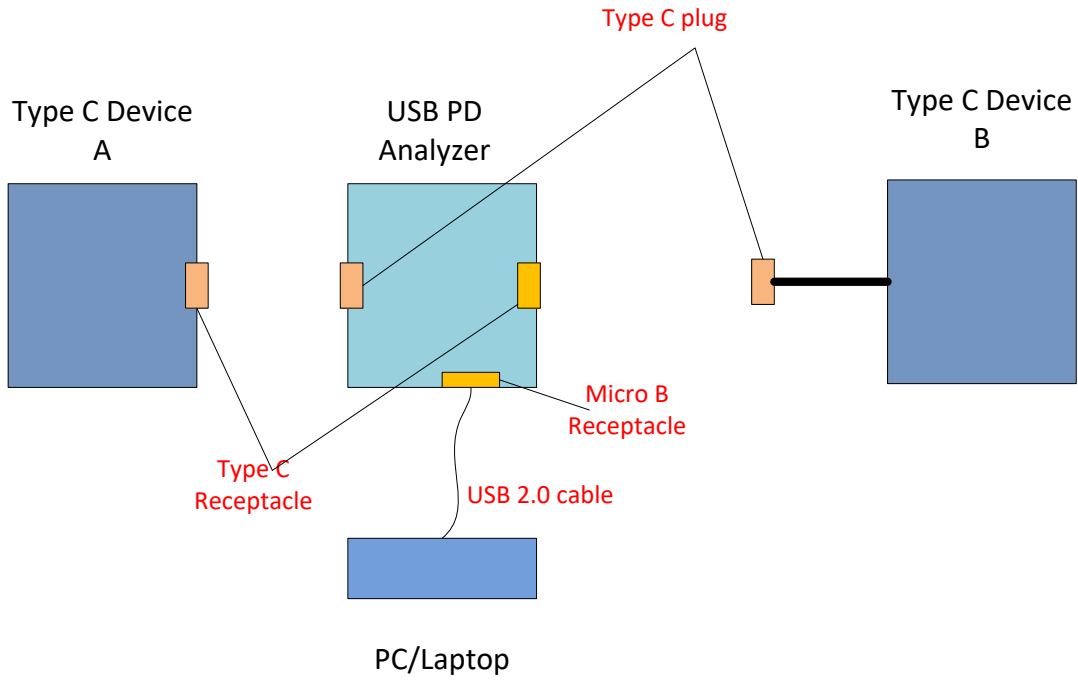


Figure 1 User scenario

## 2 Software Overview

The USB PD analysis software comprises the following elements:

- A menu for data import, export and device firmware upgrade
- A list displaying USB PD protocol package.
- A package display panel to display detail protocol contents
- A wave display panel to display and measure CC timing
- A status bar with data path of the log file
- Toolbars for communication port setting, package keyword search and exporting the package description

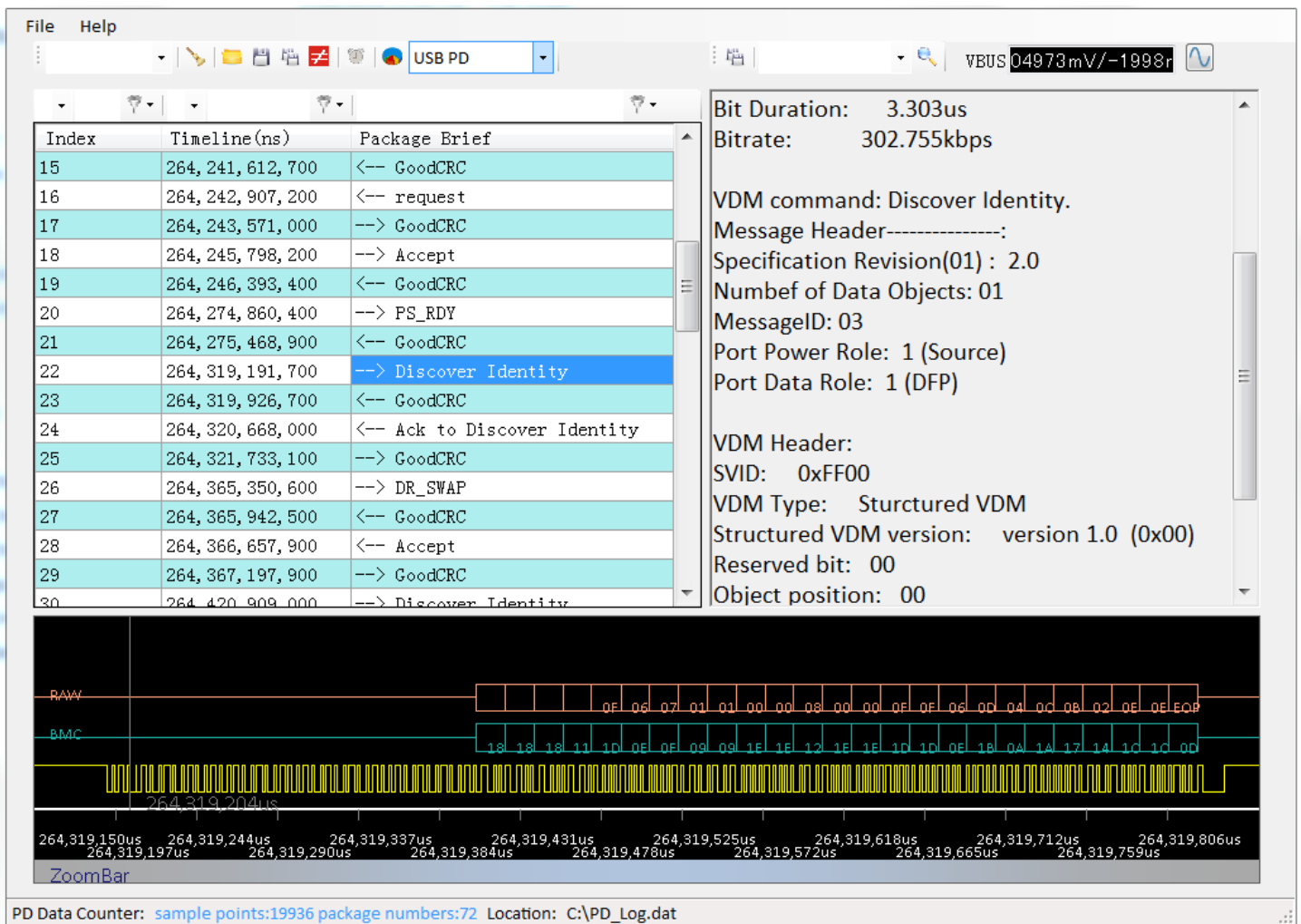


Figure 2 Application UI overview with PD decode information

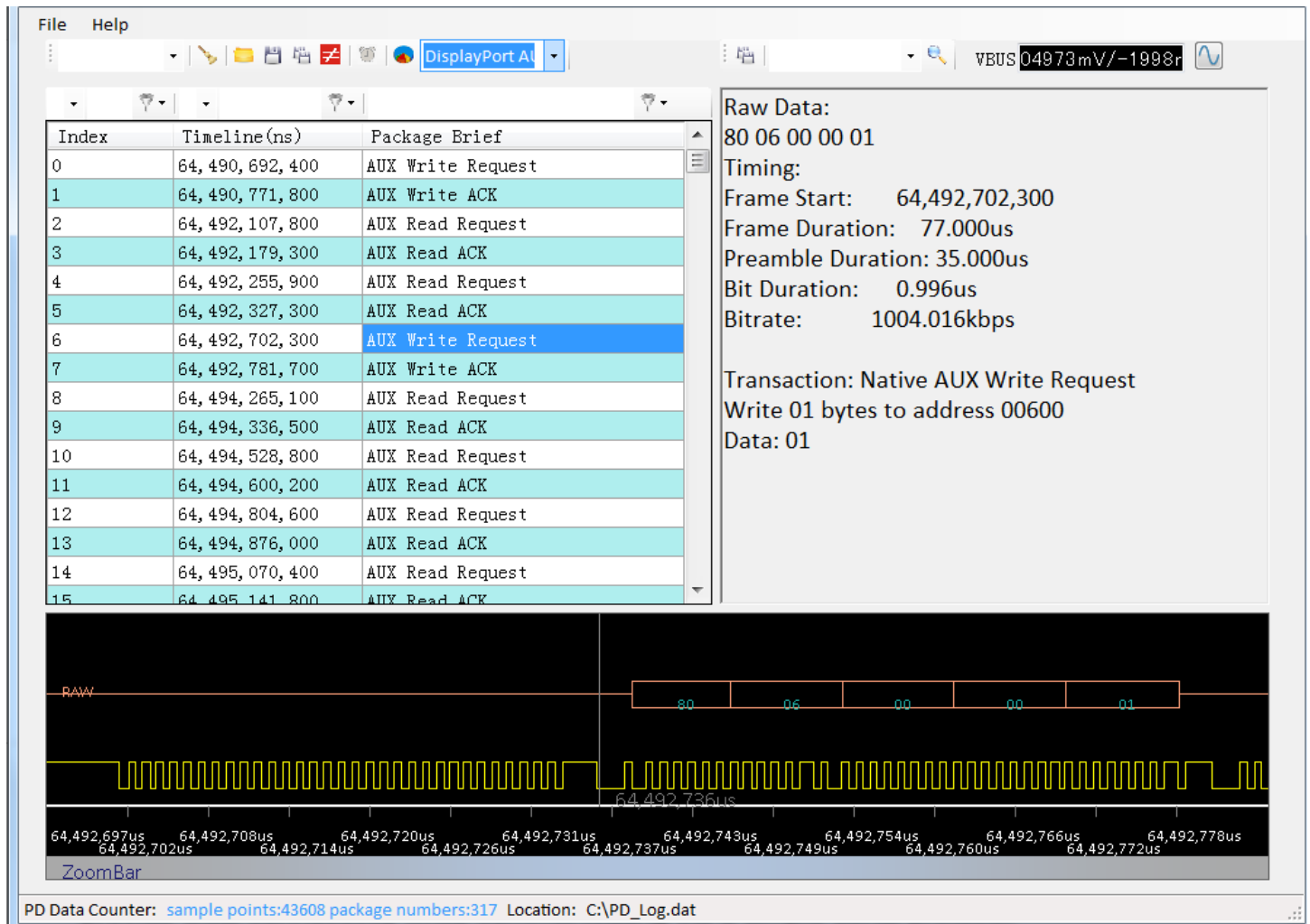


Figure 3 Application UI overview with Displayport aux data decode information



### 3 Driver Installation

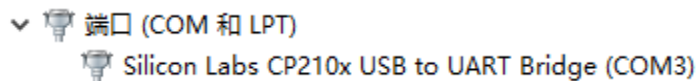
We use the [Silicon Labs](http://www.silabs.com) CP2102 USB-to-UART Bridge Controller in our product to provide USB connectivity while communicating via a simple serial protocol.

If you now go to your computer's Device Manager and expand the "Ports (COM & LPT)" list, you should see "USB-to-Serial Adapter" as one of the COM ports.

If the USB-to Serial doesn't appear on your device list, this program will not connect to our UPM hardware device. But you still can use the application to analyze the offline data.

You can download the driver from below address:

<http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx>



**Figure 4 USB to Serial Driver**

## 4 Device Communication

When you connect the USB cable to UPM device, application will automatically detect the new COM port and present the COM port in the combo list.

You have to manually select one COM port to use.

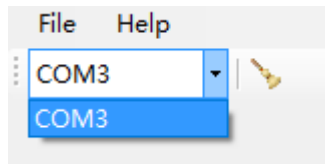


Figure 5 COM port selection

## 5 Recording

When your PC connected to the UPM device, this application will capture the CC data from the device and display the brief package description on the list.

	Index	Timeline(ns)	Raw Data
	0	8,934,641,900.00	hard reset
	1	9,044,071,000.00	→ source capabilities
	2	9,044,859,900.00	← GoodCRC
	3	9,048,879,200.00	← request
	4	9,049,670,900.00	→ GoodCRC
	5	9,051,044,700.00	→ Accept
	6	9,051,704,400.00	← GoodCRC
	7	9,052,707,000.00	→ PS_RDY
	8	9,053,366,900.00	← GoodCRC
	9	9,054,378,600.00	→ Discover Identity
	10	9,055,167,900.00	← GoodCRC
	11	9,058,669,400.00	← Ack to Discover Identity
	12	9,059,862,900.00	→ GoodCRC
	13	9,062,332,700.00	→ Discover SVIDs
	14	9,063,121,900.00	← GoodCRC
	15	9,066,405,000.00	← GoodCRC

**Figure 6 CC Package List**

You can use mouse and keyboard to navigate package list.

The CC wave and detail package information will be updated according to the highlight package item.

- Index – Identify the current package ID
- Timeline – The time when the CC package was received
- Raw Data – A brief description about the current package

The timeline number means the time duration between the hardware device power on and the start position of the current package.

You also can set a new baseline time point (0 ns) from any package. Just select one package and click the red clock button. You also can reset the original runtime timeline by clicking the gray clock button.



**Figure 7 Timeline Set/Reset**

→ Means DFP to UFP    ← Means UFP to DFP

## 6 CC Timing Display

Below figure shows the CC wave display panel.

It will provide basic CC capture signal display, BMC coding data and RAW data display.

1. Measure the timing

Click mouse left button to select a start point, move the mouse and release the left button to select an end point. It will display the time between start point and end point.

2. Zoom in/Zoom out the wave.

Move the mouse cursor on Zoom Bar, scroll the mouse middle button to zoom in and zoom out. The zoom function will use the gray vertical line as the center.

3. Shift the wave.

Move the mouse cursor on the time scale bar, scroll the mouse middle button to shift the wave to left or right.

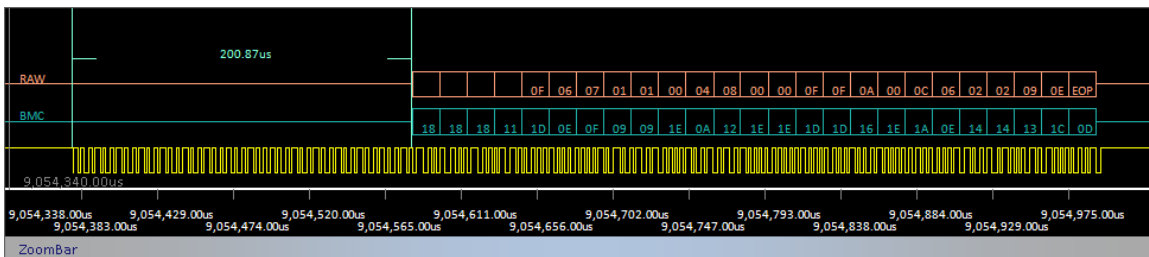


Figure 8 CC wave display

## 7 PD Analyzation

We provide the detail protocol analyzation about the CC communication. You can export the package data to a txt file by clicking the save button. You also can search the key word in the package data.

```
OrderedSet - SOP: Sync-1 Sync-1 Sync-1 Sync-2
RAW data (4 bytes CRC included):
6F 17 01 84 00 FF 0A 6C 22 E9

Timing:
Frame Start: 9,054,378,600.00
Frame Duration: 602.000us
Preamble Duration: 200.000us
Bit Duration: 3.288us
Bitrate: 304.136kbps

VDM command: Discover Identity.
Message Header-----:
Numbef of Data Objects: 01
MessageID: 03
Port Power Role: 1 (Source)
Specification Revision(01) : 2.0
Port Data Role: 1 (DFP)

VDM Header:
SVID: 0xFF00
```

Figure 9 CC protocol analyzation

## 8 Data Import and Export

From the main menu, you can save the captured data into an offline file and import it at any time. The status bar show which file is the current offline data file.

When you select save menu, it will use the current capture data to overwrite the file which is shown on the status bar.

When you select save as menu, it will open a file dialog for you to input a filename, at same time the status bar location field will display as your new filename.



PD Data Counter: [sample points:52770](#) [package numbers:197](#) Location: F:\pd.dat

**Figure 10 Status bar**

## 9 Diff Function

Diff function can be used at offline. You can use this tool to compare two different data log file.

Click open icon to load offline data for left side list and right side list.

You also can click saveAs button to create another local copy.

1. Double click one of the package on left or right list to open the message diff window  
It will compare the package on the same row.
2. You also can compare the different row package, just click mouse right button to open the menu, then select one package on the other list.

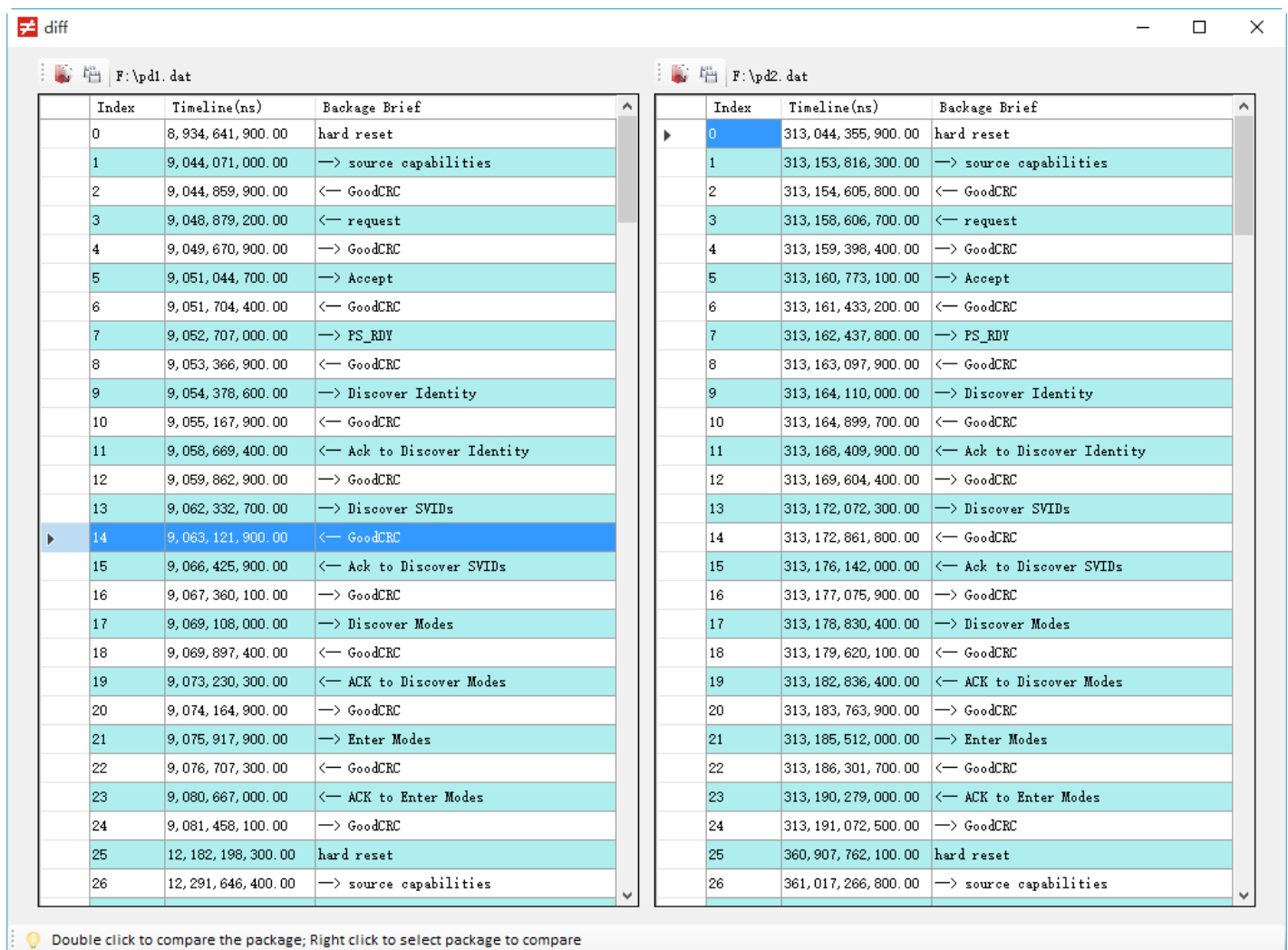



Figure 11 Package Diff



Figure 12 Package detail message diff



## 10 Statistic

After PD data capturing, click  icon to open statistic page, it will collect some package information and easy to have a whole picture of the data. The statistic content includes frame duration, frame bitrate etc.

- Scroll mouse middle button to shift to previous or next package
- Press mouse left button and move the mouse, it will quick sliding in the package list. At bottom of the panel, it will show the current scope position.
- Double click the bar to jump to the detail package list in main window.

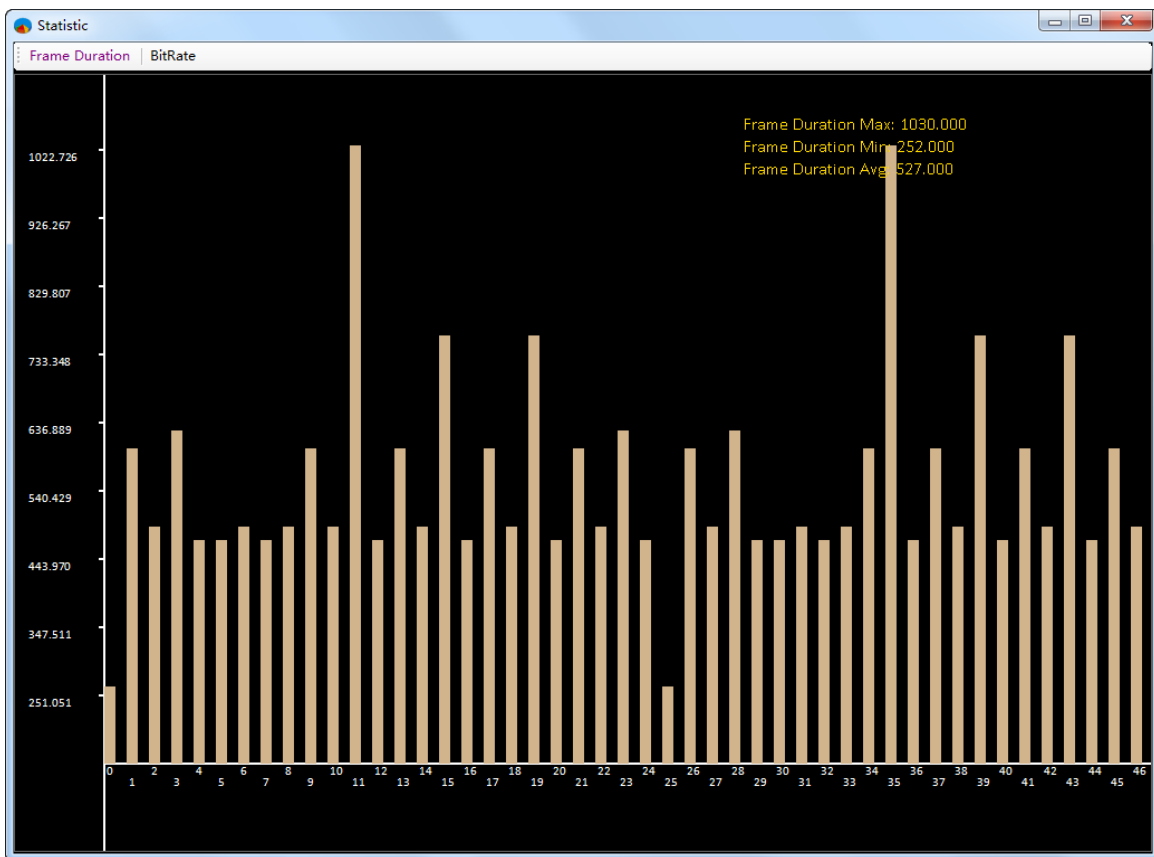


Figure 13 Frame duration statistic

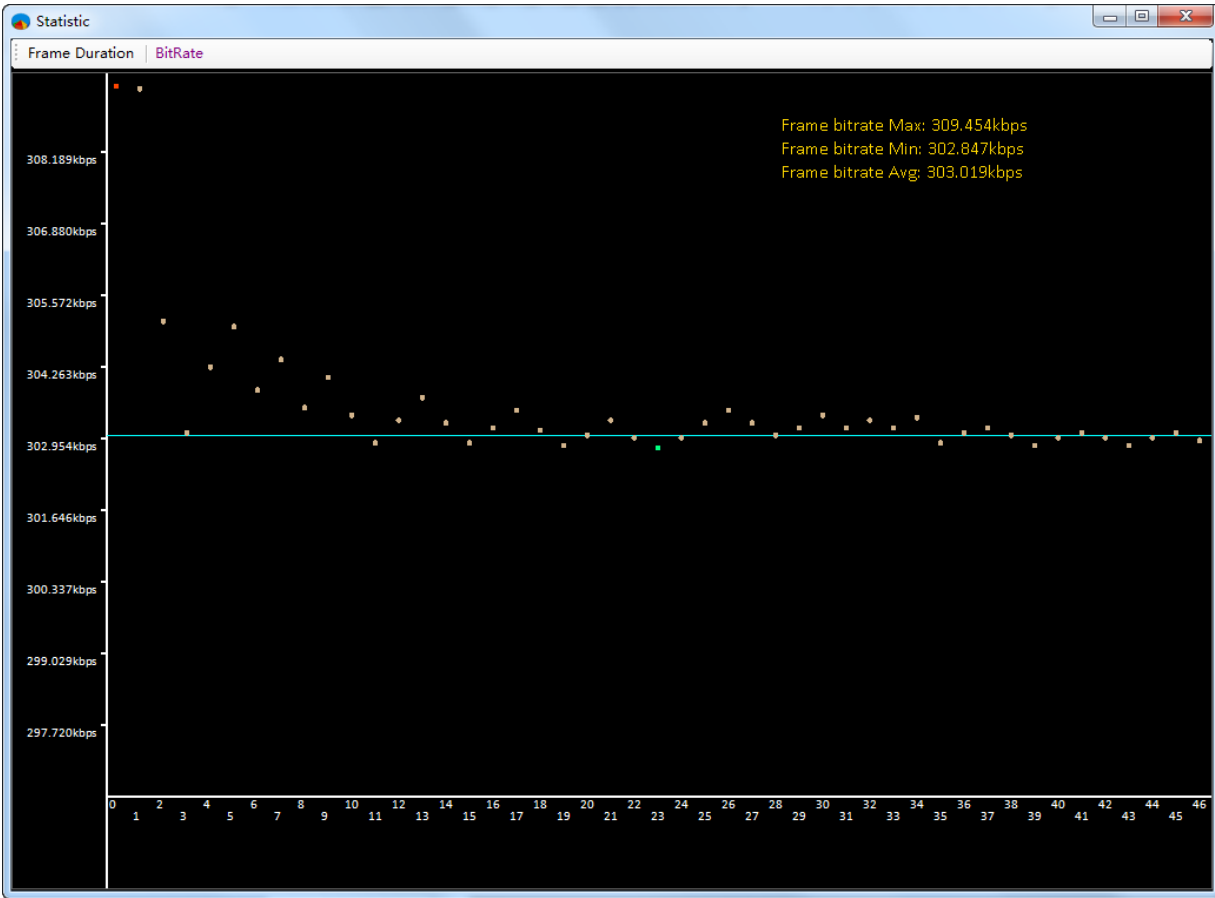


Figure 14 Frame bitrate statistic

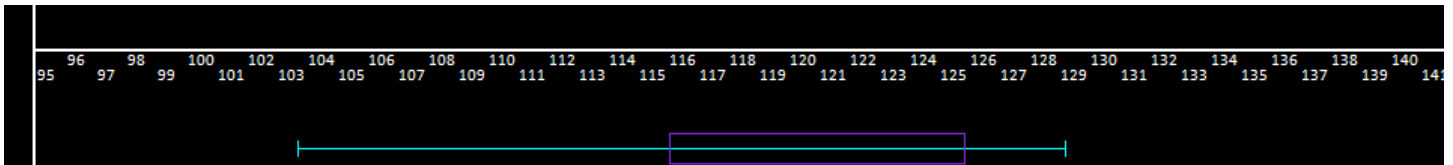


Figure 15 Quick sliding

## 11 Firmware Upgrade

You can upgrade UPM hardware firmware from this application.

- Step-1:

You need make sure the device is connected to PC correctly, when you open firmware upgrade page, it will automatically communicate with hardware device, if it detected a UPM device, it will show “Connected!” text by red color, also read out the current hardware firmware version.

- Step-2:

When you can read out the old hardware version, you can click load firmware button to open the new binary released by us.

- Step-3:

Click upgrade button, this program will download the new firmware to hardware.

Current version will be updated to new version after upgrading.

**WARNING:**

When application is starting to download, please do **NOT** plug out the USB cable.

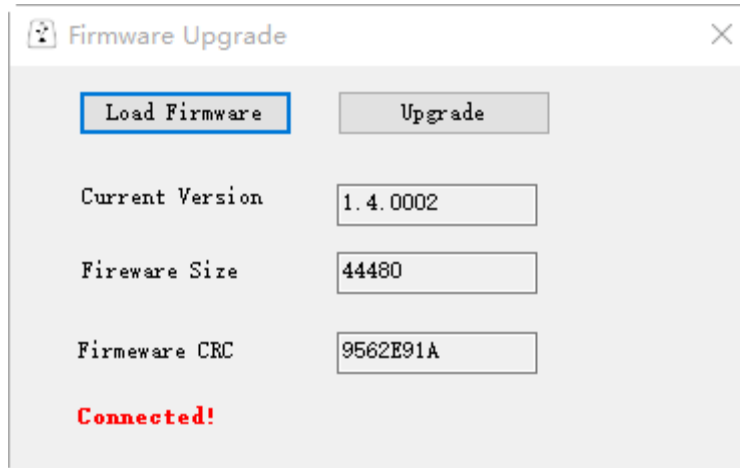


Figure 16 Firmware upgrade

## 12 Preferences

### 1. Auto Upgrade

Default is ON, program will download the latest version from the server, if download is success, and it will pop up a message window.

Click “OK” button, it will replace the current program with the latest one. Just close the application and restart it again.

Click “cancel” button, it will ignore this upgrade.

The old version was renamed as “PD\_Analyzer\_old.exe”. You can archive it or delete it by yourselves.

### 2. Log control

Default is “OFF”. You can turn on it to save some log for debugging.

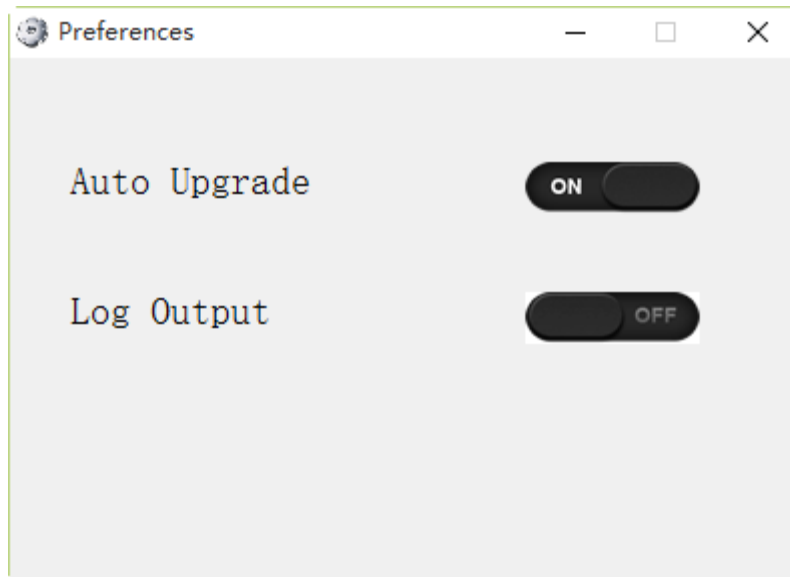


Figure 17 Preferences Menu

## 13 Trouble Shooting

This application require .Net Framework, if you get below error message, please download .Net Framework 4.0 or above version from Microsoft website.

<http://www.microsoft.com/en-US/download/details.aspx?id=17718>

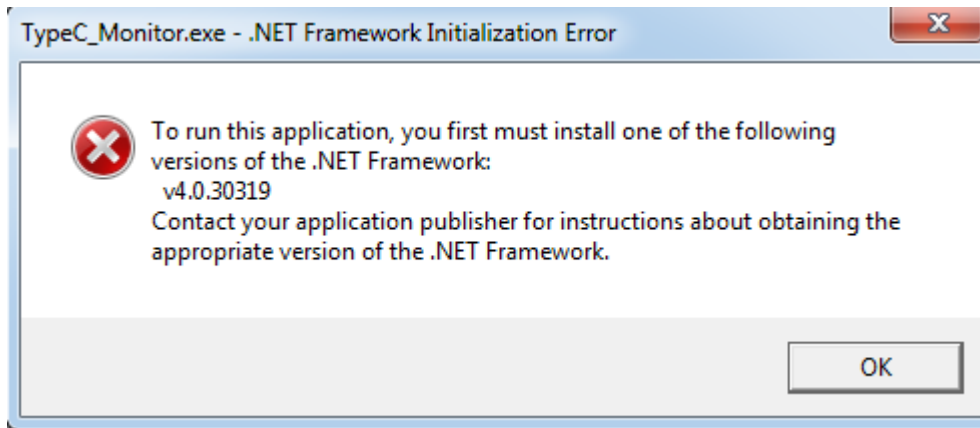


Figure 18 .NET Framework error

If you encounter any problems, please send email to [support@f-linc.com](mailto:support@f-linc.com)

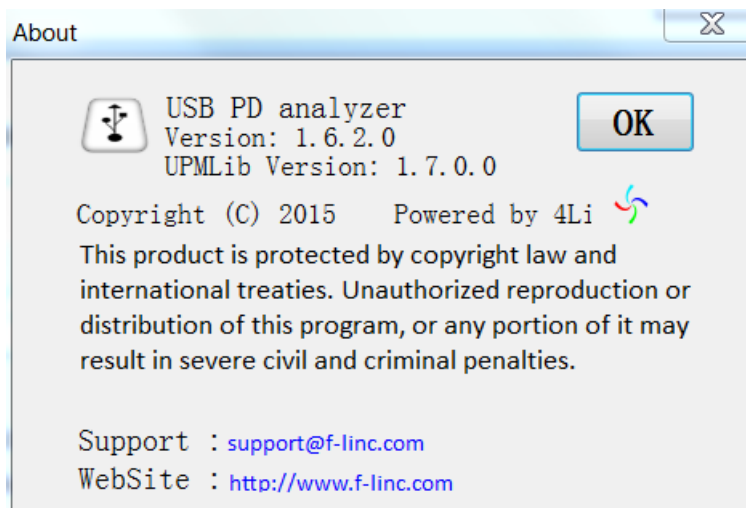


Figure 19 Support