

USB Power Delivery Tester

Communication Protocol Guide

Model PM110 Rev 1

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Introduction

This document explains the details of the communication protocol used with Passmark USB Power Delivery testers.

High level languages can access to the Passmark USB Power Delivery tester using the FTDI's proprietary "direct" driver interface. This interface, D2XX, is provided via a proprietary DLL (FTD2XX.DLL). Please refer to the "D2XX Programmer's Guide" for detailed explanation of the functions available in the dll.

<http://www.ftdichip.com/Support/Documents/ProgramGuides.htm>

Search in D2XX devices

D2XX driver allows you to get a list of all FTDI devices connected. Below is an example code for searching in D2XX devices to find the Passmark USB Power Delivery testers:

```
DWORD    devcount = 0;
UCHAR    serial[50];
FT_STATUS ftStatus;

ftStatus = FT_ListDevices(&devcount, NULL, FT_LIST_NUMBER_ONLY);
for (DWORD curDevice = 0; curDevice < devcount; curDevice++)
{
    ftStatus = FT_ListDevices((PVOID)curDevice, serial, FT_LIST_BY_INDEX
| FT_OPEN_BY_SERIAL_NUMBER);
    if(ftStatus == FT_OK)
    {
        if(!strncmp((char*)serial, "PMPD" , 4))
        {
            // Add this serial number to the list of testers.
        }
    }
}
```

Open a device

The below code opens a device by its serial number and returns a handle that will be used for subsequent accesses.

```
FT_HANDLE devHandle;
FT_STATUS ftStatus;

ftStatus = FT_OpenEx(serial, FT_OPEN_BY_SERIAL_NUMBER, &devHandle);
if(ftStatus == FT_OK)
{
    FT_SetBaudRate(devHandle, 115200);
    FT_SetDataCharacteristics(devHandle, FT_BITS_8, FT_STOP_BITS_1,
FT_PARITY_NONE);
    FT_SetTimeouts(devHandle, 1, 100);
}
```

}

Send and Receive data

```
FT_STATUS ftStatus;
ftStatus = FT_Write(devHandle, buf, len, &NumBytesWritten);
ftStatus = FT_Read(devHandle, buf, 1, &NumRecvBytes);
```

Communication Protocol

Communication Format

Following is the frame structure for the commands sent by the host and response received from the tester.

Header	Length	Command	Data	Checksum	Closing Flag
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- Opening Flag: This is a single byte that indicates the beginning of the frame.
- Length: This byte indicates the total number of bytes between Length and Checksum.
- Command: This byte is used to instruct the tester which operation to perform. For the response packets, this indicates which command's response.
- Data [Payload]: Data bytes are the parameters of a command or response. The least significant byte is always sent and received first (LSB First).
- Checksum: This byte is used on the host as well as the tester to check the validity of the packet and to trap any data corruption. This is calculated by XORing all the bytes except the Checksum byte.
- Closing Flag: This is a single byte that indicates the end of the frame.

Commands

Command Overview

Table below summarizes the list of USB Power Delivery Tester.

Command	Description
0x0A	Get Connection Status
0x0B	Get Capabilities
0x0C	Get Statistics
0x0D	Change Power Profile
0x10	Set Load
0xE0	Change Config
0xE1	Get Config

Get Connection Status

Command:

Header	Length	Command	Data	Checksum	Flag
0x02	0x01	0x0A	-	0x0A	0x03

Response:

Header	Length (bytes)	0x02
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Length	1	0x0B
Command	1	0x0A
Connection Status	1	0x00: Not Connected 0x01: Connected
Port Type	1	0x01: SDP (Standard Downstream Port) 0x02: CDP (Charging Downstream Port) 0x03: DCP (Dedicated Charging Port) 0x04: Type-C (with PD support) 0x05: Proprietary Charger 0x06: Type-C (without PD support)
Selected Voltage	2	Selected Voltage in millivolts
Max Current	2	Maximum current for the selected voltage
Max Power	4	Maximum power for the selected voltage
Checksum	1	To be calculated
Flag	1	0x03

Example:

> Request: 02 01 0a 0a 03

> Response: 02 0b 0a 01 04 88 13 60 09 e0 2e 00 00 39 03

Port Type = Type-C (with PD support), Selected Voltage = 5000 millivolts, Max Current = 2400mA, Max Power = 12000 milliwatts

Get Capabilities

Command:

Header	Length	Command	Data	Checksum	Flag
0x02	0x01	0x0B	-	0x0B	0x03

Response:

Header	Length (bytes)	0x02
Length	1	0x25
Command	1	0x0B
Num Power Profiles	2	Number of power profiles
Power Data Objects	35	Profile Index (2 byte) Voltage in millivolts (2 bytes) Max Current in milliamperes (2 bytes) . Next Profile Data Object
Checksum	1	To be calculated
Flag	1	0x03

Example:

> Request: 02 01 0b 0b 03

> Respond: 02 2d 0b 03 00 01 00 88 13 60 09 02 00 28 23 b8 0b 03 00 20 4e cc 10 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 dc 03
Num Power Profiles = 3, Profile Index = 1, Voltage = 5000 millivolts, Max Current =
2400mA, Profile Index = 2, Voltage = 9000 millivolts, Max Current = 3000mA,
Profile Index = 3, Voltage = 20000 millivolts, Max Current = 4300mA

Get Statistics

Command:

Header	Length	Command	Data	Checksum	Flag
0x02	0x01	0x0C	-	0x0C	0x03

Response:

Header	Length (bytes)	0x02
Length	1	0x09
Command	1	0x0C
Data	8	Internal Temperature in Celsius (1 byte) = 0x00 Reserved Heatsink Temperature in Celsius (1 byte) Voltage in millivolts (2bytes) Set Current in milliamperes (2bytes) Current in milliamperes (2bytes)
Checksum	1	To be calculated
Flag	1	0x03

Example:

> Request: 02 01 0c 0c 03

> Response: 02 09 0c 00 1a 5e 14 00 00 00 00 54 03

Internal Temperature = 0, Heatsink Temperature = 26, Voltage = 5214 millivolts, Set Current = 0mA, Current = 0mA

Change Power Profile

Command:

Header	Length	Command	Data	Checksum	Flag
0x02	0x02	0x0D	Profile Index	To be calculated	0x03

Profile Indexes can be optioned by sending “Get Capabilities” command.

Response:

Header	Length (bytes)	0x02
Length	1	0x02
Command	1	0x0D
Data	1	Status Byte 0x00: Successful 0x01: Failed
Checksum	1	To be calculated
Flag	1	0x03

Example - Select Profile #3:
 > Request: 02 02 0d 03 0d 03
 > Response: 02 02 0d 00 0e 03
 Status = Successful

Set Load

Command:

Header	Length	Command	Data	Checksum	Flag
0x02	0x03	0x10	Load in milliamperes (2 bytes)	To be calculated	0x03

Response:

Header	Length (bytes)	0x02
Length	1	0x02
Command	1	0x10
Data	1	Status 0x00: Successful 0x01: Failed
Checksum	1	To be calculated
Flag	1	0x03

Example – Set Load 1000mA:
 > Request: 02 03 10 e8 03 f9 03
 > Response: 02 02 10 00 13 03
 Status = Successful

Change Config

Command:

Header	Length	Command	Data	Checksum	Flag
0x02	Depends on the parameter	0xE0	See Table below	0x10	0x03

Parameter	Data Bytes
Loopback Port	Disable: 0x00 0x00 Enable: 0x00 0x01
Current Limit	Enforce Limits: 0x01 0x00 Allow 20% over current: 0x01 0x01 Force Limit: 0x01 0x02 MaxCurrent in milliamperes (2 Bytes) Example: Set maximum current to 3000mA 0x01 0x02 0xB8 0x0B
Max SDP Current	0x02 MaxCurrent in milliamperes (2 Bytes) Example: Set maximum current to 900mA 0x02 0x84 0x03

Response:

Header	Length (bytes)	0x02
Length	1	0x02
Command	1	0xE0
Data	1	Status 0x00: Successful 0x01: Failed
Checksum	1	To be calculated
Flag	1	0x03

Example – Enable Loopback Port:

> Request: 02 03 e0 00 01 e3 03

> Response: 02 02 e0 00 e3

Status = Successful

Get Config

Command

Header	Length	Command	Data	Checksum	Flag
0x02	0x02	0xE1	See Table below	0x10	0x03

Parameter	Data Bytes
Loopback Port	0x00
Max SDP Current	0x02

Response:

Header	Length (bytes)	0x02
Length	1	Depends on the parameter
Command	1	0xE1
Data	Depends on the parameter	Loopback Port: 0x00: Disabled 0x01: Enables Max SDP Current: 2 bytes LSB First
Checksum	1	To be calculated
Flag	1	0x03

Example – Loopback Port:

> Request: 02 02 e1 00 e2 03

> Response: 02 02 e1 01 e3 03

Loopback Port = Enabled