MQP Electronics Ltd

Power Delivery Tester

USB-PDT

Guide to Performing PD Compliance Tests

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1	Int	oduction4					
2	Co	nnecting up5					
3	Ins	stalling Software5					
4	Sta	rting up6					
5	Tes	sting Cable Markers					
	5.1	Vendor Information File (VIF)					
	5.2	General Information Tab9					
	5.3	Discover ID Tab					
	5.4	SVID Tab					
	5.5	Test Parameter Tab12					
	5.6	Cable Test Selector Tab13					
	5.7	Running the tests					
	5.8	HTML Report					
	5.9	Analyser Capture Report18					
	5.10	Viewing Scope Captures20					
	5.11	Saving the Results Files To Disk23					
	5.12	Providing Vendor with Results Files24					
	5.13	Exporting All Results Files25					
	5.14	Selecting a Previously Loaded Vendor Information File					
6	Tes	sting PD Devices					
	6.1	Vendor Information File					
	6.2	General Information Tab29					
	6.3	General Information (continued) Tab30					
	6.4	Source Capabilities Tab31					
	6.5	Sink Capabilities Tab					
	6.6	Discover ID (SOP) Tab					
	6.7	SVID Tab					
	6.8	Test Parameter Tab35					
	6.9	Test Selector Tab					
	6.10	Test Progress					
	6.11	Protocol Test Progress					
	6.12	Power Test Progress40					
	6.13	HTML Report File42					
	6.14	Capture File					

	6.15	Eye Diagram	.46
	6.16	Hard Reset Scope Capture	.48
	6.17	Capture File Error Indications	.49
	6.18	Power Supply Test Capture Details	. 50
	6.19	VBUS Scope Capture - Hard Reset	.51
	6.20	VBUS Scope Capture - Power Role Swap	. 52
7	Upd	ating PDT Firmware	. 53
8	PDT	Calibration Jig User Instructions	. 54
	8.1	Calibration Board	. 54
	1.1	Contents of Calibration Kit	. 54
	8.2	Connection diagram	. 55
	8.3	Calibrating Test Cable	. 57

1 Introduction

This is a brief introduction to the USB-PDT, specifically for running Cable E-Marker and PD Device Compliance Tests.

The USB-PDT is a Power Delivery Compliance tester.

Using the PDT-BT2-CON1 plug-in, it is capable of performing the Power Delivery Compliance Tests.



Notes: Currently the touch screen display is not a critical part of operation, but is reserved for future development.

Important: The SMA connectors provide a convenient place to access VBUS, CC1 and CC2. These are all directly connected to the signals in question, and the intention is that a high impedance oscilloscope be connected, if required. On no account should a 50 Ohm input be connected, as it is likely that damgage would result.

2 **Connecting up**

The USB-PDT is powered by a 24V power adapter connected to the back of the USB-PDA by a 4-pin DIN connector. Ensure that the flat on the plug is facing away from the fan before trying to insert the plug. Damage could result from trying to force the plug in the wrong way round. Also do not attempt to force the plug into the 'Feature' connector.

The USB cable provided should be connected between the back of the USB-PDT (Host 1) and its host computer which should be running Windows.



The connectors 'Aux 1' and 'Feature' and (not-fitted) 'Host 2' are reserved for future development.

3 Installing Software

The software (GraphicUSB) is supplied on a CD, though the latest version is also available on our website www.mqp.com .

The file to run (if it doesn't happen automatically) is GraphicUSB_setup.exe .

This will also install the USB drivers for the unit.

See <u>6.8</u> for information on specifying resistance of calibrated cable.

4 Starting up

After plugging in the cables to the back of the USB-PDT, run the GraphicUSB software.



When the Tester is ready, the Tester icon on the toolbar will be lit, and the white LED on the Tester plug-in will also light.

Check that the unit (and its plug-in) has been recognised, by clicking Help...About GraphicUSB... and check that the unit shows up there and its plug-in is recognised.

5 Testing Cable Markers

Connect one end of the Type-C Cable Under Test to the Type-C connector on the Tester plug-in. Leave the other end free. (After the test is complete, it is required that the complete test suite be run with the other end of the Cable Under Test connected.)

If the cable under test is actually a demonstration board, it must be connected to the Tester exactly as though it were a cable. This means:

- The cable used to connect the demo board must be a non-standard cable which conveys VCONN from the Tester to the demo board. (Normally VCONN is not propagated along a Type-C cable!)
- The demo board must be able to recognise, and correctly respond to VCONN being switched on and off. If this is not the case then exitting each test will not occur correctly, and the cable will fail the test.



Open the Cable Test Dialog by clicking on the yellow PD Cab icon, or by selecting Menu... Operations... PD... PD Cable Compliance...

PD Cable Compliance Tes	ts using USB-PDT		X
Status Capturing	Cable General Cable ID (SOP) Cable SVII Path to Vendor Information File C:\PdtData\PdVendorInfoFiles\Acme_Cable	Ds Modes (SOP) Test Parameters Cable Test : es.bd Save Vendor Info File	Selector
Rp Rd CC1 CC2 VBUS VCONN	i (e.g. from Memory Stick) Save and Close all Open PD Compliance Results Files Vendor	Save Current Vendor Compliance Results (e.g. to Memory Stick)	Save All Compliance Result Folders (e.g. to Memory Stick)
Active Connected Activity	Acme Cables Type Ti Cable Ti	ACB123 D 0990000	0.4 View Vendor Text File Extract Info From Cable UUT
	Vendor File Status:	SOP 🔽 SOP' 🗌 SOP	
Diagnostic Plug-in VBUS Gen Curr Sink			-
	Run Stop	Fest: -not running-	Timeout - Exit

5.1 Vendor Information File (VIF)

When running compliance tests at a workshop, the vendor is expected to have provided a text file defining the characteristics of the product to be tested. This file can be produced by a USB-IF application or can equally well be generated by the GraphicUSB application. The GraphicUSB application can also be used to make a correction to the VIF. This should only be done with reference to the rules in effect at the workshop in progress. It will probably always be necessary to one particular modification; the TID, which is not usually known by the vendor when they run the VIF generator application. It is important that this is corrected before running the tests, so that the report can contain the TID reference.

For now we assumed that the vendor has supplied the file on a memory stick.

GraphicUSB V4.66							
File Ed PD Cable Compliance Tests using USB-PDT Vbu Cable General Cable ID (SOP) Cable SVIDs Modes (SOP) Test Parameters Cable Test Selector							
Min Status	Path to Vendor Information File						
Capturing	Import Vendor Info File (e.g. from Memory Stick) Save Vendor Info File Select Existing Vendor Info File						
Rd CC1 CC2	Select Vendor Info File To Copy						
VBUS VCONN Active	Vendor Unknow Name Date modified Type Size						
Connected Connected Activity	Type Acme_Cables.txt 02/12/2015 11:19 Text Document 2 KB Cable Acme_Power.txt 02/12/2015 11:21 Text Document 76 KB						
11 1	Vendor F						
Mox Diagnostic	File name: Acme_Cables td Files of type: Text Files (*td)						
➡ Plug-in ➡ VBUS Gen ➡ Curr Sink	Open as read-only						
<u></u> え <i>発</i>	Timeout Timeout Run Stop						
For Help, press F1	No File Open						

Click on the 'Import Vendor Info File (e.g. from Memory Stick)' button.

Use the File Dialog to locate the VIF, and click on 'Open'. The file will be copied to a location used by the GraphicUSB app ([data files]\PdVendorInfoFiles\), and read in.

5.2 General Information Tab

The contents of the file will be validated, and the result shown in the bottom window. This report will describe any problem with the file, to enable easy correction. 'Path to Vendor Information File' will show the internal location allocated by the version of Windows in use.

PD Cable Compliance Tes	sts using USB-PDT		X
Status	Cable General Cable ID (SOP) Cable S Path to Vendor Information File C:\PdtData\PdVendorInfoFiles\Acme_Ca	VIDs Modes (SOP') Test Parameters Cable Test	Selector
Capturing Rp	Import Vendor Info File (e.g. from Memory Stick)	Save Vendor Info File	Select Existing Vendor Info File
CC1 CC2	Save and Close all Open PD Compliance Results Files	Save Current Vendor Compliance Results (e.g. to Memory Stick)	Save All Compliance Result Folders (e.g. to Memory Stick)
VBUS VCONN Active	Vendor Acme Cables	Product ACB123	Version Info
Connected Activity	Type Cable	TID 10990000	View Vendor Text File
	Vandas Ela Cistura		Create NotesText File
	File Validated	j sop i sop. j sop	SOP_DEBUG
Diagnostic Plug-in VBUS Gen Curr Sink			Ŧ
	Run Stop	Test: -not running-	Timeout . Exit

After correcting the TID, use the 'Save Vendor Info File' button, maintaining the suggested file name and location.

At this point, during a Workshop, it is recommended that you also use the 'Create Notes Text File' button. This creates a pre-initialised text document for making any observations about the testing. The file appears in the main window below this dialog. On saving, maintain the suggested file name and location.

The boxes under the buttons show the general characteristics of the vendor information file:

- Vendor Name
- Product Name
- TID
- UUT type (must be 'Cable' in this case)
- SOP* types which will be responded to with GoodCRC messages

5.3 Discover ID Tab

PD Cable Compliance Tests using USB-PDT	
Status Cable General Cable ID (SOP) Cable SVIDs Modes (SOP) Test Parameters Cable Test Selector VDM Header ID Header Data As Host Data As Dev Product Type Modal Operat USB VID Status VDM Ver Data As Host Data As Dev Product Type Modal Operat USB VID NO<	
Diagnostic Plug-in VBUS Gen Curr Sink Run Stop Test: -not running- Timeout Exit	

The parameters associated with:

- The VDM Header
- The ID Header, and
- The Cable VDO

can be viewed in the second tab, 'Cable ID'.

The third tab, 'Cable SVIDs, Modes' shows the SVID and Mode information provided by the vendor.

5.4 SVID Tab

PD Cable Compliance Test	ts using USB-PDT	x
Status Capturing Rp Rd CC1	Cable General Cable ID (SOP') Cable SVIDs Modes (SOP') Test Parameters Cable Test Selector Lowest number of SVIDs ever returned in Get SVIDs ACK Highest Number of SVIDs ever returned in Get SVIDs ACK Highest Number of SVIDs ever returned in Get SVIDs ACK SVID List Fixed and In Order Image: SVID to view SVID Value (h) Lowest Number of Modes ever returned No. of SVIDs defined SVID to view SVID Value (h) Lowest Modes ACK	Delete
CC2 VBUS VCONN Active Connected Activity	. SVID1 + Mode List Fixed In det Mode Volt 1 art Mode Vol	sert Before Add Delete Isert Before Add
Diagnostic ■ Plug-in ■ VBUS Gen ■ Curr Sink		*
	Test: -not running- Timeout Run Stop -	Exit

Note that these controls may be used to modify the vendor information file, see section on modifying vendor information.

5.5 Test Parameter Tab

PD Cable Compliance Tests using USB-PDT									
Cable General Cable ID (SOP') Cable SVIDs Modes (SOP') Test Parameters Cable Test Selector									
Tx Nominal Settings					Tx Group 2				
Status	High Level nom.	1100	mV	High Level nom.	1200	mV	High Level nom.	790	mV
Capturing	Low Level nom.	25	mV	Low Level nom.	0	mV	Low Level nom.	-250	mV
Rd	Bit Rate	300	Kb/s	Bit Rate	270	Kb/s	Bit Rate	330	Kb/s
CC1	Noise period	608	ns	Noise period	608	ns	Noise period	608	ns
VBUS	Noise amplitude	0	mVp/p	Noise amplitude	100	mVp/p	Noise amplitude	100	mVp/p
VCONN Active	Rise-/Falltime	735	ns	Rise-/Falltime	735	ns	Rise-/Falltime	735	ns
Connected	Offset period		us	Offset period		us	Offset period		us
Activity	Offset amplitude		mVp/p	Offset amplitude		mVp/p	Offset amplitude		mVp/p
Grp 1 Grp 2 Set Nominal Set Default Orig Set Nominal Set Default Orig Set Default Set Default Orig Set Default Set Default <t< td=""><td>Orig Set</td><td>Nominal</td></t<>					Orig Set	Nominal			
	Capture Tester Ey	ye		Capture Tester E	ye		Capture Tester E	ye	
Diagnostic Plug-in VBUS Gen Curr Sink									
	Run	Stop	Tes	t: -not running-				Timeout	Exit

The fourth tab is for the 'Test Parameters'.

The Tx parameters define the waveform sent by the Tester transmitter:

- under normal conditions
- while sending BIST messages during PHY-TX-INT-REJ Group 1 noise testing
- while sending BIST messages during PHY-TX-INT-REJ Group 2 noise testing

The Capture Tester Eye buttons allow the generated waveform to be displayed. This is useful as a double check on calibration. Before clicking on this button, ensure that nothing is connected to the plug-in panel.

The parameters relating to group 1 and 2 noise default to the Compliance Plan values, but may be altered during development to alter the stress on the receiver.

5.6 Cable Test Selector Tab

PD Cable Compliance Tes	ts using USB-PDT		×
	Cable General Cable ID (SOP) Cable	SVIDs Modes (SOP') Test Parameters Cable Test Selector	
Status Capturing Rp Rd CC1 CC2 VBUS VCONN Active Connected	SOP' Tests ✓ CAB-PHY-TX-EYE (+BIT) ✓ CAB-PHY-RX-INT-REJ ✓ CAB-PHY-RX-BUSIDL ✓ CAB-PHY-TERM ✓ CAB-PHY-MSG	SOP" Tests CAB-DP-PHY-TX-EYE (+BIT) CAB-DP-PHY-RX-INT-REJ CAB-DP-PHY-RX-BUSIDL CAB-DP-PHY-TERM CAB-DP-PHY-MSG	
Diagnostic Plug-in VBUS Gen Curr Sink	Set All Clear All Run Stop	Test: -not running-	Timeout - Exit

The last tab shows the selected tests (set on reading in the vendor file). Typically the SOP' tests will all be selected, and none of the SOP'' tests.

This actually depends on the setting of the 'SOP'' Controller Present' bit in the vendor file. To avoid running the SOP'' tests in this case, simply disable that bit (second tab), and resave the vendor info file, before re-running the test.

Any test may be enabled or disabled, in the dialog above. This may be useful if a certain test fails to complete for some reason.

5.7 **Running the tests**

PD Cable Compliance Tests using USB-PDT						
Cable General Cable ID (SOP') Cable SVIDs Modes (SOP') Test Parameters Cable Test Selector						
Status Capturing Rp Rd CC1 CC2 VBUS VCDNN Active Connected Activity	CAB-PHY-TX-EYE (+BIT) CAB-PHY-RX-INT-REJ CAB-PHY-RX-BUSIDL CAB-PHY-TERM CAB-PHY-MSG CAB_PHY-MSG	CAB-DP-PHY-TX-EYE (+BIT) CAB-DP-PHY-RX-INT-REJ CAB-DP-PHY-RX-BUSIDL CAB-DP-PHY-TERM CAB-DP-PHY-MSG				
Diagnostic Plug-in VBUS Gen Curr Sink	Set All Clear All	Test: CAB-PHY-RX-BUSIDL Check Response to SOP'	it			

Click on the 'Run' button (bottom left). This will start the test running and the test name and progress will be indicated at the bottom of the dialog. Test names will be colour-highlighted as they are run and completed.

Allow the test to run to completion before clicking on anything. This will be indicated by the Exit button being re-enabled.

GraphicUSB - IReport ACB123 2015-12-02-14-59 4651							
E File Edit Via	P Ele Edit View Operations Window PD Cable Compliance Tests using USB-PDT						
	Cable General Cable ID (SOP) Cable SVIDs Modes (SOP) Test Parameters Cable Test Selector						
Vbus: 0.0	Vbus: 0.030V 4.0mA						
Post-ru Post-ru Fest: C Goal: Initi	in Analysis AB-PHY-TX-E alise Cable Test.	Status Capturing Rp Rd CC1	CAB-PHY-TX-EYE (+BIT) CAB-PHY-RX-INT-REJ CAB-PHY-RX-BUSIDL CAB-PHY-TERM CAB-PHY-MSG	CAB-DP-PHY-TX-EYE (+BIT) CAB-DP-PHY-RX-INT-REJ CAB-DP-PHY-RX-BUSIDL CAB-DP-PHY-TERM CAB-DP-PHY-MSG			
Event #35 (Previous (Goal: Con Event #42 Event #43 Events #44 Event #44	Connected Goal succeeded) nfirm that correct le PD Message 41035 PD Sequence PD Continuou	VBUS VCONN Active Connected Activity	CAB_PROT_DISCOV				
(Previous (Goal: Sim (Previous (Test: C	Goal succeeded) nulate Cable Detac Goal succeeded) AB-PHY-RX-II	Diagnostic	Set Ali Clear Ali				
Mox Goal: Initi Event #90 (Previous (alise Cable Test. Connected Goal succeeded)	 Plug-in VBUS Gen Curr Sink 					
Goal: Col Event #96 Event #97	PD Message PD Message PD Message Goal succeeded)		Run Stop	Test: =none=	Timeout Exit		
For Help, press F1	Goal: Confirm UUT recognises multiple BIST Test Data messages with Tx Group 1 Noise Event #102 PD Message - BIST (from Tester) (SOP') Event #103 PD Message - Good CPC (from Cable or IIIT) (SOP') For Help, press F1 Cood CPC (from Cable or IIIT) (SOP')						

When the tests have completed, click on 'Exit'.

The test run will have created two documents:

- an HTML report
- an MQP Capture file (.mqu)

5.8 HTML Report



The HTML report comprises a number of sections:

- Header information describing
 - the test software version
 - the product being tested
 - The actual tests to be run
- Runtime Report

This is a description of the real time procedures. Some of these may result in test failures.

• Post-run Analysis Report

This is an analysis of the Analyser Capture file taken during the test run. The Capture file stores every PD event which occurred, together with embedded 'Goals'. The file is analysed for :

- PD timing errors
- PD protocol errors
- valid usage of all parameter fields
- o match of all parameter fields with vendor supplied information
- whether embedded test goals have been achieved

Every PD message is reported on in the Post-run Analysis Report (with the exception of multiple messages sent during the Interference Rejection tests).

At the end of the Post-run Analysis Report is a text summary of the Eye Diagram Scope report. This is sufficient to define Pass versus Fail for these PHY tests, but viewing the actual Scope capture (See below under Capture File) will always be beneficial.

• Error Summary

This lists the number of errors found, both run-time and post-run. Unless there is a good reason to decide otherwise, any error will result in a test failure.



🐺 GraphicUSB - [Report_ACB123_2015-12-02-11-58-46*]						
■ File Edit View Operations Window Help						
」 ● ☞ 🖬 📾 🎄 📾 ∰ ¼ 🖏 삶 삶 삶 ᢞ ᢞ 및 ② 🗐 🍲 🎟 🏧 🤮 🖪 🔲 🗖 ④ 🤤 ⑨						
Vbus: 0.027V 4.0mA						
	*					
Goal: Initialise Cable Test.						
Event #41739 Connected						
(Previous Goal succeeded)						
Goal: Discover ID of Cable.						
Events PD Sequence Start (VDM Discover ID)						
E #41744-41747						
Event #41744 PD Message - VDM - Discover ID Initiator (from Tester) (SOP')						
Event #41745 PD Message - GOODCRC (Iron Cable of OU) (SOP)						
Cable VDB B3128 - (HW Version) is not Vendor specid value	FAIL					
[PROT_MSG_DATA_VDM_ID_ACK_22]						
Cable VDO B27:24 - (Firmware Version) is not Vendor spec'd value.	FAIL					
[PROT_MSG_DATA_VDM_ID_ACK_23]						
PP Cable VDO B12:B11 - (Cable Termination type) is not vendor specia value.	FAIL					
Cable VDO B10 - (SSTX1 Directionality Support) is not Vendor spec'd value.	FAIL					
PROT_MSG_DATA_VDM_ID_ACK_29]						
The Cable VDO B10 - (SSTX1 Directionality Support) cannot be 1, as non-modal.	FAIL (repeat)					
[PROT_MSG_DATA_VDM_ID_ACK_29]	EAU					
IPPOT MSG DATA VIDM ID ACK 301	FAIL					
Cable VDO B9 - (SSTX2 Directionality Support) cannot be 1, as non-modal.	FAIL (repeat)					
<pre> [PROT_MSG_DATA_VDM_ID_ACK_30] </pre>	× • • •					
Cable VDO B8 - (SSRX1 Directionality Support) is not Vendor spec'd value.	FAIL					
[PROT_MSG_DATA_VDM_ID_ACK_31]						
EXECUTE OF CONTRACT OF CONTRAC	FAIL (repeat)					
Cable VDO B7 - (SSRX2 Directionality Support) is not Vendor spec'd value	FAII					
For Help, press F1						

In the event of an error being found, it is reported in a manner similar to the example shown above. The word 'FAIL' will appear in the right hand column of the report.

To the left of this the error is described, both in words, and also by reference to the error code defined in the Compliance Plan. Searching the Compliance Plan for this code will reveal the exact clause which has been violated.

👯 GraphicUSB - [Capture_ACB123_2015-12-02-11-58-46*]	
Eile Edit View Operations Window Help	_ & ×
] 🕒 🖆 🖶 ங 🕹 📵 🍓 🍇 🏡 삶 삶 삶 🥙 🗶 😂 💷 🖀 🛄 🙆 🖸	I ⊡ (Q Q ? ፼ □ □ □
Vbus: 0.030V 4.0mA	, , , , , , , , , , , , , , , , , , , ,
Imin Event # 1 VBUS OFF Imin 0.000 000 s Session End Imin PD COMPLIANCE TEST Imin 1.614 984 s Imin PD Compliance Goal Imin Initialise Cable Test Imin Event # 34 Imin VBUS ON Session Start Session Start Imin Event # 35 Imin C-Cable Event Imin Session Start Imin Event # 35 Imin Event # 35 Imin Event # 35 Imin Event # 35 Imin Event # 36 Imin Both Attached (3A) Imin Imin Imin Event Previous Goal Imin Imin Imin	Vbus Off Event What Is This? Vbus has gone low, ending the current session.
Image: Second	
A III For Help, proce 51 III 1777 propto	• _
41// events	

5.9 Analyser Capture Report

Underneath the HTML report (use menu item Window... to find it) is the Analyser Capture report.

The left hand pane shows the PD events (use Min and Max to reveal more of less detail).

The top right hand (Detail) pane gives an analysis of the event selected in the event pane.

The pane below the Detail pane shows any data involved in the event selected.

The bottom pane shows a zoomable timeline of all the events in the complete capture.

In the example above can be seen the BIST continuous waveform on the left (in brown), followed by two long blue lines (each containing 13000 BIST test messages during the Interference Rejection test), followed by various other PD messages from the other tests.

Above that is a simple representation of VBUS, going between 0 and 5V.

躍 GraphicUSB - [Capture_ACB123_2015-12-02-11-58-46*]		
File Edit View Operations Window Help		_ 5 ×
······································	9 5	
	8 89	
Vbus: 0.027V 4.0mA		
Min PD Compliance Goal 134.896 650 s Discover ID of Cable.	efined Data Object	#1 (VDM Header)
H4174441747 PD PD Sequence (SOP') From Result	Value	Meaning
VDM Discover ID Cable ACK Complete	0xFF00800)1
Event # 41744 PD Preamble SOP' Header Data Objects (1) CRC EOP PD IDLE 134.926 498 s ⊕ 0101 AABB VDM Discover ID, Init 5BA71DF0 OK 61.05 us B31:16	0xFF00	PD SID
Standard	or Vendor	
134.927 183 s →0101 AABB GoodCRC DFBC5C2D OK 1.079 ms B15	1 IVDM	Structured VDM
Event # 41748 PD Preamble SOP' Header Data Objects (5) CRC EOP PD IDLE 134.928 748 s → 0101 AABB VDM Discover ID, ACK 052BCFE4 OK 34.30 us	0x0	V1.0
PD Structured Version Version	VDM	-
P Image: State of the state o		
Evaluate Previous Goal	ntent	
134.986 674 s check previous goal 00000000	: 4F 10 01 80 0	00 FF F0 0
	. ID A7 35	· · L
Ve 25V-5A		
x		
ا ا ا ا ا ا ا ا ا ا ا ا ا ا ا ا ا ا ا		
[♀, '	1	т т
\$₹ ^{0.000,000 s} 50.000,000 s III	100.000,000 s	4
For Help, press F1 41777 events		

The capture file shows a complete analysis of the PD messages which were transferred. Any general error will be shown by the use of an orange or red coloured area in the appropriate pane. Such errors will be detailed in the Details pane.

Use the Details pane to examine every aspect of the messages captured.

5.10 Viewing Scope Captures

GraphicUSB - [Capture_ACB123_2015-12-02-11-58-46*]	
Eile Edit View Operations Window Help	_ B ×
● ☞ 🖬 凾 ※ ඬ 🚇 🐛 ‰ ‰ ๙ ๙ 犬 犬 및 ◈ 트 🕿 🎟 🎟 🛄 A G	
V503. 0.027V 3.5MA	
Min Event # 41753	Scope Capture
	Scope captures are automatically taken at key points in
Evaluate Previous Goal check previous goal	Compliance Tests.
	This capture is of the BMC Tx Signal.
Image: State of the s	There are two scope displays associated with this
Event # 41755 VBUS OFF	capture.
135.178 792 s Session End	Show Scope Display
Evaluate Previous Goal	
PD 135.956 351 s check previous goal	
Event # 41775 Scope Capture #1 2 210 113 - FMC Tx Shop	
	No Data To Display
The second secon	
Max	
25V - 5A	
<u>۶</u>	······································
・ 0V - 0A VBUS 多 単1	a contract and a second of the
哭	
名 0.000,000 s 50.000,000 s 11	100.000,000 s
For Help, press F1 41777 events	

At the bottom of the Event pane is the Scope Capture event. This always comes at the end, if present. To view the scope capture, click on the Scope Capture event, then on the Show Scope Display in the Details pane.



The requirement to pass this test are:

- that the plot does not cut through the mask (and thereby show in red)
- that the risetime and falltime do not show in red
- that the tBitRate and pBitRate do not show in red

Further more the following should be observed:

- The crossing point at the centre should have a vertical position as close to 0.55V as possible. This assists in providing the maximum possible chance of avoiding the mask
- The left and right excursions should preferably not show more than one crossing point, or these points should have the smallest possible x distance. This results from the 1s and 0s having similar waveforms. If this is not the case, then meeting the eye diagram is made more difficult.



The second plot available is not required for compliance, but shows the actual BMC data waveform captured, and used to build the eye diagram.

5.11 Saving the Results Files To Disk

GraphicUSB	l bus toldor u	- omnty	
File Edit View Operations Help			
🕒 😂 🖬 🖶 X 🖻 PD Cable Compliance Test	ts using USB-PDT		
PD Cable Compliance Test Vbus: 0.027V IIn Image: Capturing and the second se	ts using USB-PDT Cable General Cable ID (SOP') Cable SVIDs Moder Path to Vendor Information File C.'PdtData'PdVendorInfoFiles'Acme_Cables txt Import Vendor Info File (e.g. from Memory Stick)	s (SOP) Test Parameters Cable Test : Save Vendor Info File ve Current Vendor Compliance Results (e.g. to Memory Stick) ret Pick the location where you to be saved F:\a folder Pick the location where you to be saved F:\a folder DVD RW Drive B D-ROM Drive B D-ROM Drive Sore No O GraphicUS D GraphicUS D GraphicUS D GraphicUS	Selector Select Existing Vendor Info File Save All Compliance Result Folders (e.g. to Memory Stick) want Compliance Results folder (D:) (E:) F:) B Install b n B NEW BITS b V4.56
浅	Run Stop		OK Cancel
For Help, press F1	No File Open		

After viewing the report and capture documents it is required to close and save them for the record. To do this click on the 'Save and Close all Open PD Compliance Files' button. The open documents will be closed, and saved in a folder built from the Vendor name and the Product Name ([data files] \[vendor]\[product]).

🚟 GraphicUSB	~				
File Edit View Operatio	PD Cable Compliance	Tests using USB-PDT			\mathbf{X}
● 🖆 🔲 🗎 🐰 Vbus: - 11n	X Status Active	Cable General Cable ID (SOP') Cable SVIDs M Path to Vendor Information File [C:\Documents and Settings\Administrator\Applic	odes (SOP') Test Parameters Cable Test Se cation Data\GraphicUSB\PdVendorInfoFiles\Ac	lector	
<mark>⊘</mark> <u>₩</u> &	Connected Has Contract Being Source	Import Vendor Info File (e.g. from Memory Stick)	Save Modified Info File (to use in new test run)	Select Existing Vend	lor Info File
	Swapped	Save and Close all Open PD Compliance Results Files	Save Current Vendor Compliance Results (e.g. to Memory Stick)	Save All Compliance F (e.g. to Memory	esult Folders Stick)
	Mismatch	Vendor	Save Location	? 🛛	
		Acme Type	Pick the location where you want Com to be saved	pliance Results folder	
ee.		Cable	E:\		SOP_DEBUG"
10 10 10 10 10 10 10 10 10 10 10 10 10 1		Vendor File Status:	System Volume I - Can temp - Can temp GUSB - Can WINDOWS	nformation 🔊	
Max		Hie Validated	Image: Construction of the second	ments	
∽	Product /Folder Name		My Network Places Windows XP Crack	×	~
<u>ह</u> इ	Product	Run Stop	not ru	Cancel	at Exit
For Help, press F1			55134 events		

5.12 **Providing Vendor with Results Files**

In order to provide the vendor with the files which have been captured for his product, insert his Memory stick into a suitable USB socket, and click on the 'Save Current Vendor Compliance Results (e.g. to Memory Stick)' button (see picture above).

In the dialog which appears, locate the memory stick name. Click on OK. The files will be copied to a unique folder on the memory stick. The vendor can then take away these files on his stick.



5.13 Exporting All Results Files

In order to provide another party with all the files which have been captured for every product, insert a Memory stick into a suitable USB socket, and click on the 'Save All Compliance Results Folders (e.g. to Memory Stick)' button (see picture above).

In the dialog which appears, locate the memory stick name. Click on OK. The files will be copied to a unique folder on the memory stick.

5.14 Selecting a Previously Loaded Vendor Information File

🐺 GraphicUSB					
File Edit View	Operations Help				
🕒 🖆 🔲 🏚	PD Cable Compliance Tes	sts using USB-PDT			X
Vbus: 0.0	Status	Cable General Cable ID (SOP) Cable Path to Vendor Information File C:\PdtData\PdVendorInfoFiles\Acme	SVIDs Modes (SOP')	Test Parameters Cable Te	st Selector
<u>&</u>	Capturing Bo	Import Vendor Info File (e.g. from Memory Stick)	Sa	ve Vendor Info File	Select Existing Vendor Info File
	Select Vendor Info File To Open		1 miles	-	Save All Compliance Result Folders (e.g. to Memory Stick)
	News	Data madified	Turne	Cine	sion Info
8	Name New folder	02/12/2015 12:13	Type File folder	5120	
PD	Acme_Cables.txt	02/12/2015 11:19	Text Document	2 KB	View Vendor Text File
PD'	Acme_Power.txt	02/12/2015 11:21	Text Document	76 KB	Extract Info From Cable LILIT
PD''					Create Nation Text File
?					
Max	File name: Acme_Cables.txt			Open	
7	Files of type: Text Files (*.bd)			▼ Cancel	
<u>۲</u> ج	Curr Sink				
矢 浅 変		Run Stop	Test: -not running-		Timeout - Exit
For Help, press F1		No	File Open		

In the case that a test needs to be repeated, the Vendor Information file has already been read and this need not be repeated. Simply locate the existing file by clicking on the 'Select Existing Vendor Information File' button, and the choosing the relevant vendor information file.

6 Testing PD Devices

Connect one end of the supplied calibrated Type-C Test Cable to the Type-C receptacle on the Tester plug-in. Connect the other end to the Unit Under Test (UUT).

• If the UUT has a captive cable, connect this to the Type-C receptacle on the Tester plug-in.



Open the Test Dialog by clicking on the green PD icon, or by selecting Menu... Operations... PD... PD Compliance...

The PD Compliance Test dialog will open:

PD Compliance Tests usir	ng USB-PDT	WWWWWWWWWWWWWWWWWWWWWWWWWWWW		×
	Gen Gen (cont) Source Sink ID Path to Vendor Information File	(SOP) SVIDs (SOP) Test Parameters Test Sel	ector	
	C:\PdtData\PdVendorInfoFiles\Acme_Po	wer.bd		
Capturing	Import Vendor Info File (e.g. from Memory Stick)	Save To Vendor Info File	Load An E	xisting Vendor Info File
Rd CC1	Save and Close all Open PD Compliance Results Files	Save Current Vendor Compliance Results (e.g. to Memory Stick)	Save All Co (e.g.	mpliance Result Folders to Memory Stick)
VBUS	Vendor	Product	Version Info	
VCONN	Acme Power	DEF456	1.4	
Active Connected Activity	Type DRP	TID 10990001		View Vendor Text File
Contract	, ,			Extract Info From UUT
PR Swapped DR Swapped	Vendor File Status			Create NotesText File
VC Swapped Mismatch	File Validated			*
Diagnostic Plug-in VBUS Gen Curr Sink				
	Run Stop	Test: -not running-		Timeout . Exit

6.1 Vendor Information File

When running compliance tests at a workshop, the vendor is expected to have provided a text file defining the characteristics of the product to be tested. This file can be produced by a USB-IF application or can equally well be generated by the GraphicUSB application. The GraphicUSB application can also be used to make a correction to the VIF. This should only be done with reference to the rules in effect at the workshop in progress. It will probably always be necessary to one particular modification; the TID, which is not usually known by the vendor when they run the VIF generator application. It is important that this is corrected before running the tests, so that the report can contain the TID reference.

For now we assumed that the vendor has supplied the file on a memory stick.

👯 GraphicUSB	LAUS FAIRAS IS AMARTI		8		
File Edit View Operations Help					
🕒 🖻 🗌 PD Compliance Tests using	USB-PDT		23		
Vbus: In Po compliance resisting Diagnostic Capturing Rp Rd CC1 CC2 VBUS VCDNN Active Connected Activity Contract Source PR Swapped Itax	Gen Gen (cont) Source Sink ID (SOP) SVIDs (SOP) Test Parameters Path to Vendor Information File C:VPdtData/VPdVendorInfoFiles/Acme_Power.bt Import Vendor Info File Save To Vendor Info File (e.g. from Memory Stick) Save To Vendor Info File Save To Vendor Info File Vendor Import Vendor Info File To Copy Vendor Vendor Name Date modified Type Acme_Cables.txt 02/12/2015 11:2 Vendor Acme_Power.txt 02/12/2015 11:2 Vendor File name: Acme_Power.txt	Test Selector Load An Existing Vendor Info File Type Size 9 Test Document 2 KB 1 Test Document 76 KB			
∑ Diamatia					
	Files of type: Text Files (*.txt)		icel		
VBUS Gen	Open as read-only				
^大 Curr Sink	Tech ant amains	Timest			
大	Run Stop	. Exit			
矛					
For Help, press F1	No File Open				

Click on the 'Import Vendor Info File (e.g. from Memory Stick)' button.

6.2 General Information Tab

The contents of the file will be validated, and the result shown in the bottom window. This report will describe any problem with the file, to enable easy correction. 'Path to Vendor Information File' will show the internal location allocated by the version of Windows in use.

PD Compliance Tests usir	ng USB-PDT	WWWWWWWWWWWWWWWWWWWWWWWWWWWW		×
Diagnostic Capturing Bp Bd	Gen Gen (cont) Source Sink ID Path to Vendor Information File C:\PdtData\PdVendorInfoFiles\Acme_Po Import Vendor Info File (e.g. from Memory Stick)	(SOP) SVIDs (SOP) Test Parameters Test Sel ower.bt Save To Vendor Info File	ector	xisting Vendor Info File
CC1 CC2 VBUS	PD Compliance Results Files	(e.g. to Memory Stick) Product	Version Info	mpilance Result Folders to Memory Stick)
VCONN Active Connected	Acme Power Type DBP	DEF456 TID 10990001	1.4	View Vendor Text File
Contract Source				Extract Info From UUT Create NotesText File
DR Swapped VC Swapped Mismatch	Vendor File Status			
Plug-in VBUS Gen Curr Sink		Task astronom		
	Run Stop	ji est, mut tanning-		. Exit

After correcting the TID, use the 'Save Vendor Info File' button, maintaining the suggested file name and location.

At this point, during a Workshop, it is recommended that you also use the 'Create Notes Text File' button. This creates a pre-initialised text document for making any observations about the testing. The file appears in the main window below this dialog. On saving, maintain the suggested file name and location.

The boxes under the buttons show the general characteristics of the vendor information file:

- Vendor Name
- Product Name
- Version Info
- TID
- UUT type

PD Compliance Tests usin	ng USB-PDT		
Diagnostic Capturing Rp Rd CC1 CC2 VBUS VCONN Active Connected Activity Contract Source PR Swapped DR Swapped VC Swapped Mismatch	SOP* ✓ SOP ✓ SOP ✓ SOP ✓ SOP ✓ SOP ✓ SOP ✓ SOP ✓ SOP_DEBUG ✓ SOP_DEBUG ✓ Type-C ✓ Captive Cable	Capabilities Externally Powered USB Comms Capable DR_Swap Capable VCONN_Swap Capable	Discover ID (SOP) Image: Responds to SOP Discover ID Image: Respond to the source Image: Requests PR_Swap as Source Image: Requests PR_Swap as Source Image: Requests PR_Swap as Sink
Diagnostic Plug-in VBUS Gen Curr Sink	Run Stop	Test: -not running-	Timeout - Exit

6.3 General Information (continued) Tab

The second tab shows more general information, usually derived from the Vendor Information File:

- SOP* types which will be responded to with GoodCRC messages
- Format of the product
- Capabilities not directly relating to being a Source or a Sink
- Whether the UUT attempts or responds to Discover ID (SOP)

PD Compliance Tests usin	ng USB-PDT				×
Diagnostic Capturing	Gen Gen (cont) Sour Source Profile Claimed	Ce Sink ID (SOP)	SVIDs (SOP) Test Parame	ters Test Selector	
Rd CC1 CC2 VBUS VCDNN Active Connected	Type PDO#1 Fixed PDO#2 Fixed	Peak Current / 100% IOC ▼ 100% IOC ▼	Max Voltage Voltage 5000 12000	Min Voltage mV mV	Max Current Max Power 3000 mA 3000 mA
Activity Contract Source PR Swapped DR Swapped VC Swapped Mismatch	PD0#3 Fixed • PD0#4 =none= • PD0#5 =none= • PD0#6 =none= •	100% IOC _	20000	mV	5000 mA
Diagnostic Plug-in VBUS Gen Curr Sink	PDO#7 =none= Run	Stop	not running-		Timeout - Exit

6.4 Source Capabilities Tab

The third tab shows information related to Source Capabilities, usually derived from the Vendor Information File:

- Source Profile Claimed (soon to be replaced with a different system!)
- Whether the UUT ever sends Pings
- Whether under any circumstances the UUT will clear to zero the USB Suspend bit
- The Source Capability details.

6.5 Sink Capabilities Tab

The fourth tab shows information related to Sink Capabilities, usually derived from the Vendor Information File:

- Sink Profile Claimed (soon to be replaced with a different system!)
- Whether the UUT sets the High Capability bit
- Whether under any circumstances the UUT will set to one the No USB Suspend bit
- Whether under any circumstances the UUT will set to one the Giveback bit
- The Sink Capability details.

6.6 Discover ID (SOP) Tab

The fifth tab shows information related to Discover ID (SOP), usually derived from the Vendor Information File:

- VDM Header Information
- ID Header Information
- Cert Stat Information
- Product VDO Information
- AMA VDO Information

6.7 SVID Tab

PD Compliance Tests usir	ig USB-PDT	x
PD Compliance Tests usin	Gen Gen (cont) Source Sink ID (SOP) SVIDs (SOP) Test Parameters Test Selector Image: SVID List Fixed and In Order Number of Modes returned in Get Modes Number of Modes ACK Image: No. of SVIDs defined SVID to view SVID Value (h) Number of Modes ACK Image: SVID 1 + 8087 Image: Mode List Fixed and in order Image: Mode ACK Image: No. of modes defined for SVID Mode to view Image: Mode Internable Image: Ima	Delete Insert Before Add Delete Insert Before Add
Diagnostic ■ Plug-in ■ VBUS Gen ■ Curr Sink	Test: -not running- Timeout Run Stop -	Exit

The sixth tab shows information related to Discover ID (SOP), usually derived from the Vendor Information File:

• SVID Information

Diagnostic Tx Rominal Settings Tx Group 1 Noise High Level nom. 1100 mV Low Level nom. 25 mV Bit Rate 300 Kb/s Noise period 608 ns Noise period 608 ns Noise amplitude mV p/p Bitse./Falltime 735 ns Offset period us Offset period us Offset amplitude mV p/p Source Grp 1 Grp 2 Set Nominal Capture Tester Eye Set Default Orig Set Nominal Capture Tester Eye Test Cable VBUS Loop Resistance 102 mOhm	PD Compliance Tests usin	g USB-PDT	: ID (SOP)		st Parameters	Test Selec	tor]		x
VBUS Gen Curr Sink Test: -not running- Timeout	Diagnostic Capturing Rp Rd CC1 CC2 VBUS VCDNN Active Connected Activity Contract Source PR Swapped DR Swapped VC Swapped Mismatch Diagnostic Plug-in VBUS Gen Curr Sink	Tx Nominal Settings High Level nom. Low Level nom. 25 Bit Rate 300 Noise period 608 Noise amplitude Offset period Offset amplitude Grp 1 Grp 2 Set No Capture Tester Eye	mV mV Kb/s ns mV p/p ns us mV p/p pominal	Tx Group 1 Noise High Level nom. Low Level nom. Bit Rate Noise period Noise amplitude Rise-/Falltime Offset period Offset amplitude Set Default Capture Tester Eg	1200 0 270 608 100 735 0rig Set No re	mV mV Kb/s ns mV p/p ns us mV p/p ominal	Tx Group 2 Noise High Level nom. Low Level nom. Bit Rate Noise period Noise amplitude Rise-/Falltime Offset amplitude Set Default Capture Tester E	790 -250 330 608 100 735 Orig Set ive Timeout	mV mV Kb/s ns mV p/p ns us mV p/p Nominal

6.8 Test Parameter Tab

The seventh tab shows the Test Parameter Settings.

Of particular inportance is the Test Cable VBUS Loop Resistance setting. You should enter here the figure on your calibrated test cable, in milliohms.



The Tx parameters define the waveform sent by the Tester transmitter:

- under normal conditions
- while sending BIST messages during PHY-TX-INT-REJ Group 1 noise testing
- while sending BIST messages during PHY-TX-INT-REJ Group 2 noise testing

The Capture Tester Eye buttons allow the generated waveform to be displayed. This is useful as a double check on calibration. Before clicking on this button, ensure that nothing is connected to the plug-in panel.

The parameters relating to group 1 and 2 noise default to the Compliance Plan values, but may be altered during development to alter the stress on the receiver.





The last tab shows the Test Selectors.

PD Tests should be run as three separate groups: PHY, Protocol and Power. This is to avoid the resultant files becoming too large and too slow.

The 'Settings during Tests' options default to the standard required settings for a full Compliance Test. The settings may be altered to experiment with different options. 'Sink Real Current' may be switched off while performing PD tests on a 'Silicon Only' product.

Bypass capacitance is normally set to various default values during tests. However for development reasons the value may be set to a specific value in this dialog.

As you may expect, any individual test may be selected, when working on a development issue.

The button 'Set All PHY Tests' causes the five PHY tests to be selected (and all others to be deselected). After selecting the tests, click on the 'Run' button.

You may then exit the dialog and examine the results of just the PHY tests, or continue to perform the other two groups of tests first, depending on the situation.

6.10 Test Progress

GraphicUSB - [HTML3*]		LOIC FOLGOFIC COMPANY	_	
E File Edit View Operations Window	Help			_ <i>8</i> ×
] 🗢 🖆 🖬 🖻 🐰 🖻 🗇 7a ''a 'a (PD Compliance Tests using	USB-PDT	00.08	x
Vbus: 0.037V 3.9mA	·,			
Receiver Impedance OK		Gen Gen (cont) Source Sink	ID (SOP) SVIDs (SOP) Test Parameters Test Sel	ector
Simulating Detach From UUT		PHY tests	Protocol Tests	Power Tests
L L L L L L L L L L L L L L L L L L L	Diagnostic	BMC-PHY-TX-EYE (+BIT)	BMC-PROT-SEQ-GETCAPS	BMC-POW-SRC-LOAD-P-PC
	Capturing	BMC-PHY-RX-INT-REJ	BMC-PROT-SEQ-CHKCAB-P-PC	BMC-POW-SRC-LOAD-CP-ACC
	Rp	BMC-PHY-RX-BUSIDL	BMC-PROT-SEQ-NOMRK-P-PC	
	CC1	BMC-PHY-MSG	BMC-PROT-SEQ-CHRCAB-CP-ACC	BMC-POW-SRC-TRANS-P-PC
	CC2		BMC-PROT-SEQ-SWAP-REJ	
	VBUS		BMC-PROT-SEQ-DRSWAP	BMC-POW-SNK-TRANS-C-CP
PD	Active		BMC-PROT-SEQ-VCSWAP	BMC-POW-SNK-TRANS-PC
PO'I	Connected		BMC-PROT-DISCOV	
	Contract		BMC-PROT-BIST-NOT-SV-SRC	
2	Source			
	DB Swapped	Set AILPHY Tests	Set AI PROT Tests	Set AILPOWER Tests
Max	VC Swapped	Settings during Tests	Bypass Capacitance	
V.	Mismatch		Defined By Test	
	Diagnostic	Emulate Cable Marker During Model Sink Real Current During Tests (default) C 0uF C 1uF	Clear All
	Plug-in VBUS Gen	Delays to Worst Case (default)	C 10uF	
21 80	Curr Sink		C 1000F	
た 1		Run Stop	Test: BMC-PHY-TERM Simulating Detach	Timeout 3s Exit
关				
For Help, press F1		BMC-PHY-TERM		

While running, progress will be indicated by the background colouring of the test name. Blue indicates a completed test while yellow indicates the test in progress.

Two documents are created during the PHY test run:

- an HTML report (.html)
- an MQP Capture file (.mqu)

After the 'Exit' button is re-enabled, you may click it to gain access to the generated reports, or proceed to do the Protocol Tests.

	liber tolder is empty					
GraphicUSB - [Report_DEF456_2015-12-02-12-41-54*]						
File Edit View Operations Window Help						
D Compliance Tests us	ing USB-PDT					
Vbus: 0.027V 3.9mA						
Min	Gen Gen (cont) Source Sink ID (SOP) SVIDs (SOP) Test Parameters	Test Selector				
Post-run Analysis	PHY tests Protocol Tests	Power Tests				
Test: BMC-PHY-TX-E	☐ BMC-PHY-TX-EYE (+BIT) 🔽 BMC-PROT-SEQ-GETCAPS	BMC-POW-SRC-LOAD-P-PC				
Goal: Get UUT into PD Mode 📃 Capturing	BMC-PHY-RX-INT-REJ	BMC-POW-SRC-LOAD-CP-ACC				
Events #26-27 PD Sequence S Bd	BMC-PHY-TERM	BMC-POW-SRC-TRANS-P-PC				
Event #27 PD Message - CC1	☐ BMC-PHY-MSG 🔽 BMC-PROT-SEQ-NOMRK-CP-ACC	BMC-POW-SRC-TRANS-CP-ACC				
Events #28-34 PD Sequence 9 UU2	BMC-PROT-SEQ-SWAP-REJ					
RDO B25 - (US VCONN	I ■ BMC-PROT-SEQ-DRSWAP	BMC-POW-SNK-TRANS-C-CP				
PD [PROT_MSG_L] Active RDO B24 - (No Connected	₩C-PROT-DISCOV					
Event #29 PD Message - C Activity	BMC-PROT-BIST-NOT-5V-SRC					
Event #30 PD Message - A Contract Contract Contract Contract Contract Source	I BMC-PROT-REV-NUM					
(Previous Goal succeeded)	Set All PHY Tests	Set All POWER Tests				
Mox Event #34 PD Message - VC Swapped	Settings during Tests	acitance				
Goal: Confirm that correct ler	Control Parison Mart Tarte (default)	d By Test				
V Event #38 PD Message - I Diagnostic	✓ Sink Real Current During Tests (default) ✓ 1uF	Clear All				
Event #39 PD Message - (VBUS Gen	Delays to Worst Case (default) C 10uF C 10uF C 10uF					
Previous Goal succeeded)	Test =none=	Timeout				
😤 Goal: Simulate UUT Detach.	Run Stop	. Exit				
(Previous Goal succeeded)						
For Help, press F1						





The button 'Set All PROT Tests' causes the eleven Protocol tests to be selected (and all others to be de-selected). Some tests may be inappropriate to the UUT Type. After selecting the tests, click on the 'Run' button.

While running, progress will be indicated by the background colouring of the test name. Blue indicates a completed test while yellow indicates the test in progress.

Two documents are created during the Protocol test run:

- an HTML report (.html)
- an MQP Capture file (.mqu)

After the 'Exit' button is re-enabled, you may click it to gain access to the generated reports, or proceed to do the Power Tests.

GraphicUSB - [HTML4*]				
E File Edit View Operations Window	Help			_ <i>8</i> ×
] • 🛎 🖬 🖻 🐰 🖻 🚳 74 174 144	PD Compliance Tests usin	n USB-PDT	0.0.0	×
Vbus: 0.125V 1275mA		,		
VDM Discover ID request was ACKed sending Discover SVIDs VDM Image: Sending Discover SVIDsVIDsVIDsVIDsVIDsVIDsVIDsVIDsVIDsVIDs	Diagnostic Capturing Rp Rd CC1 CC2 VBUS VCDNN Active Connected	Gen Gen (cont) Source Sink PHY tests G BMC-PHY-TX-EYE (+BIT) G BMC-PHY-RX-INT-REJ BMC-PHY-RX-BUSIDL BMC-PHY-TERM G BMC-PHY-MSG	D (SOP) SVIDs (SOP) Test Parameters Test Selo Protocol Tests V BMC:PROT:SEQ:GETCAPS V BMC:PROT:SEQ:CHKCAB:P-PC V BMC:PROT:SEQ:CHKCAB:CP-ACC V BMC:PROT:SEQ:NOMRK:CP-ACC V BMC:PROT:SEQ:NOMRK:CP-ACC V BMC:PROT:SEQ:SWAP: V BMC:PROT:SEQ:SWAP V BMC:PROT:SEQ:VWAP V BMC:PROT:SEQ:VVAP	Power Tests Power Tests BMC-POW-SRC-LOAD-P-PC BMC-POW-SRC-TRANS-P-PC BMC-POW-SRC-TRANS-P-PC BMC-POW-SRK-TRANS-CCP BMC-POW-SNK-TRANS-CCP BMC-POW-SNK-TRANS-PC
₩ ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?	Activity Contract Source PR Swapped DR Swapped VC Swapped Mismatch Diagnostic Plug-in VBUS Gen Curr Sink	Set All PHY Tests Settings during Tests For Emulate Cable Marker During Mon For Sink Real Current During Tests (c For Delays to Worst Case (default) Run Stop	Image: Processing state Figure 1 Image: Processing state BWC-PROT-REV-NUM Image: State Set All PROT Tests Image: State Bypass Capacitance Image: State Image: Processing state Image: Processing state Image: Processing state	Clear All Clear All Timeout 4s Exit
For Help, press F1 BMC-PROT-DISCOV				





The button 'Set All POWER Tests' causes the six Power tests to be selected (and all others to be deselected). Some tests may be inappropriate to the UUT Type. After selecting the tests, click on the 'Run' button.

Two documents are created during the Power test run:

- an HTML report (.html)
- an MQP Capture file (.mqu)

After the 'Exit' button is re-enabled, you may click it to gain access to the generated reports.





After the 'Exit' button is re-enabled, you may click it to gain access to the generated reports.

6.13 HTML Report File

The HTML report comprises a number of sections:

- Header information describing
 - the test software version
 - the product being tested
 - The actual tests to be run
- Runtime Report

This is a description of the run time procedures. Some of these may result in test failures.



• Post-run Analysis Report

This is an analysis of the Analyser Capture file taken during the test run. The Capture file stores every PD event which occurred, together with embedded 'Goals'. The file is analysed for :

- o PD timing errors
- PD protocol errors
- valid usage of all parameter fields
- o match of all parameter fields with vendor supplied information
- whether embedded test goals have been achieved

Every PD message is reported on in the Post-run Analysis Report (with the exception of multiple messages sent during the Interference Rejection tests).

At the end of the Post-run Analysis Report for the PHY tests is a text summary of the Eye Diagram Scope report. This is sufficient to define Pass versus Fail for these PHY tests, but viewing the actual Scope capture (See below under Capture File) will always be beneficial.





Error Summary

This lists the number of errors found, both run-time and post-run. Unless there is a good reason to decide otherwise, any error will result in a test failure.

🔀 GraphicUSB - [Report_DEF456_2015-12-02-12-41-54*]					
Eile Edit View Operations Window Help					
● ☞ 묘 ■ ※ ඬ 疊 ¼ ¼ ¼ 삶 삶 ॵ 뿃 뿃 및 ◈ 围 ☎ 晒 ᡂ 盟 函 급 〒 ④ ⊖ १ ឰ					
Vbus: 0.027V 5.2mA					
Capture#2 BMC Eye Diagram UI = 3390ns Ref Freq = 294985Hz Risetime = 357.1ns Falltime = 436.2ns pBitRate = 0.006% Eye diagram is valid. Image: Solution of the second s					
0 Retries by Tester using SOP ²					
For Help, press F1	No File Open				

MQP Electronics Ltd

6.14 Capture File

Underneath the HTML report (use menu item Window... to find it) is the Analyser Capture report.

The left hand pane shows the PD events (use Min and Max to reveal more of less detail).

The top right hand (Detail) pane gives an analysis of the event selected in the event pane.

The pane below the Detail pane shows any data involved in the event selected.

The bottom pane shows a zoomable timeline of all the events in the complete capture.

In the example above can be seen the BIST continuous waveform on the left (in brown), followed by two long blue lines (each containing 13000 BIST test messages during the Interference Rejection test), followed by various other PD messages from the other tests.

Above that is a simple representation of VBUS, going between 0 and 5V.

The black rectangle labelled #1 is a VBUS scope capture of a Hard Reset event.



6.15 Eye Diagram

GraphicUSB - [Capture_DEF456_2015-12-02-12-41-54*]	
<u>File Edit View Operations Window Help</u>	
] ● ☞ 묘 軸 炎 ඬ 叠 ¼ ዄ ኤ ស ๙ ៧ 옷 옷 Ҷ ◈ 目 ☎ 晒 醖 🐰 Δ G	<u>⊤</u> €, Q, ? ፼] 🗳
Vbus: 0.027V 1275mA	
1in PD Compliance Goal 1in 116.363 276 s Simulate UUT Detach. 1in Event # 54809 116.365 693 s Session End 1in Evaluate Previous Goal 1in Onex previous Goal 1in Evaluate Previous Goal 1in	Scope Capture Scope captures are automatically taken at key points in Compliance Tests. This capture is of the BMC Tx Signal. There are two scope displays associated with this capture. Show Scope Display
=== End of Capture ===	No Data To Display
	1
V 25V - 5A V - K - OV - 0A VBUS K -	1 ⁴¹
漢 0.000.000 s ' ' ' 50.000,000 s ' ' ' 昇 (100.000,000 s
For Help, press F1 54856 events	

The last event in the Events pane is the Scope Capture event #2, relating the the eye diagram. Click on this event, then on Show Scope Display. The Eye Diagram will appear.



Clicking 'Next' on the Eye Diagram shows the complete captured BIST 2 waveform.

Zooming is achieved by placing the cursor at the bottom of the graph until a magnifying glass icon appears, and then using the scroll wheel.



The waveform is not part of the compliance test but allows some development interpretation of various problem signals.



6.16 Hard Reset Scope Capture

Scope Capture #1 in this case, is a Hard Reset, generated by the tester, with VBUS controlled by the tester. It is included here to show how a mask is automatically drawn to indicate valid areas for the VBUS waveform. Typically the blue voltage waveform will be coloured red if the VBUS cuts through part of the mask.



6.17 Capture File Error Indications

The Capture File indicates error

T GraphicUSB - [Capture DEF456 2015-12-02-12-46-52*]	
File Edit View Operations Window Help	
┃	
Vbus: 0.027V 5.3mA	
Min PD COMPLIANCE TEST	Power Delivery Compliance Goal
Image: Compliance Goal Compliance Goal 2.113 368 s Get UUT into PD Mode as a Source (5V/100mA)	Protocol Engine, which responds as required to whatever message exchanges the UUT may initiate.
Event # 23 C-Cable Event 2.171 491 s DFP Attached	compliance evaluation is performed by performing an
Event # 25 C-Cable Event 2.243 462 s Both Attached (3A)	No Data To Display
Event # 27 VEUS ON 2.330 300 s Session Start	
PD PD Sequence (SOP) From Result 2.424 327 s Announce Source Capabilities Source Sink Found	
Event # 29 PD Preamble SOP Header Data Objects (1) CRC EOP 2.424 327 s → 0101 AAAB Source Capabilities 5.0V 1BAA10A6 OK	
Hex Event # 30 (7) PD Preamble SOP Header CRC EOP PD IDLE	•
V 25V - 5A #1#2#3#4#6#6#7#8#9 #10 ##1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#	#21 #23 #26 #27
	11
For Help, press F1 940 events	'
	///

6.18 **Power Supply Test Capture Details**

During the Power Suppy tests, a number of scope captures are automatically made of the VBUS voltage and current waveforms, plotted against the points in time that PD messages are sent.

The sequences that attract scope captures are:

- PR_Swap sequences
- Request sequences
- Hard Reset sequences

The scope captures are numbered, and can be viewed by:

- clicking inside the timeline view scope capture rectangle
- locating the scope capture event in the event pane and clicking on it, then on 'Show Scope Display' in the details pane



6.19 VBUS Scope Capture - Hard Reset

In the above view we click on scope capture timeline rectangle #10, and see the following' Hard Reset' scope capture. It is noticable that the mask has closed up at the left end because the voltage fell too quickly, and the waveform therefore cuts through the mask.



6.20 VBUS Scope Capture - Power Role Swap

The following scope capture shows a successful PR_Swap sequence:



Zooming in shows how the PD message positions are indicated in their exact time positions:



This capture shows a Request sequence for a change of current without a voltage change. The green line indicates a current decrease at the start of the sequence. Negative current is current sunk by the PDT. Note that the voltage remains in specification.

The plotted voltage is calculated, on a point by point basis, to be the voltage at the source end of the cable. This is why the calibrated cable must be used and its resistance entered into the Test Parameter dialog:



7 Updating PDT Firmware

= to be added =

8 PDT Calibration Jig User Instructions



1.1 Contents of Calibration Kit

- Calibration Board
- 5V dc / 5A Power Adapter
- Mains cable for Power Adapter
- SMA to SMA cable
- 2.5mm jack plug to 2.5mm jack plug cable

8.1 Calibration Board



8.2 Connection diagram



Set up the PDT and Calibration kit as shown above. Then run GraphicUSB on the Host Computer. Select menu... Operations...PD...PDT Calibration.

USB-PDT User Calibration	
User Calibration requires the PDT Calibration Jig, whit certified calibrated multimeter. The calibration sections may be performed individually recommended. After a calibration session, remember to back up the If you have more than one Plug-in, use 'Calibrate Plug	ch is an optional extra. Using this jig the PDT can be calibrated in the field using a y. It should be remembered though, that following the sections from left to right is calibration data. g-in Only' on all but the first.
 Calibrate PDT and Plug-in 	C Calibrate Plug-in Only
Calibrate Calibrate Calibrate Calibrate Calibrate VBUS Gen Voltage Meas Current Meas Current Sink	Calibrate Tx/Rx PLUG-IN On;ly Start Backup Start Restore
No data available 0 0 0 No data available dd mm yyyy	No data available 0 0 0 Verbose
Calibrated by: Name of Calibration Operat	tor Report To File
Continue Abort Calibration Requested reading: 0.000000 C V C mV	(Exit)

Now follow the instructions given in the dialog.

Normally:

- Select Calibrate PDT and Plug-in
- Enter name of person doing the calibration in the 'Calibrated by' box
- The calibration is performed in 5 separate stages, from left to right.
- Follow the instructions carefully

If you are calibarting a second plug-in it is important to only calibrate the plug-in and not the whole PDT unit, so in this case:

- Select Calibrate Plug-in Only
- Follow the instructions carefully

After successful calibration, click 'Start Backup' to save the calibration data to a file.

8.3 Calibrating Test Cable

Current Set Up

- 1. Connect 10 Amp Calibrated Meter between F & D
- 2. SW1, SW2 & SW3 to B,
- 3. Adjust 1A course & Fine pots for 1.000Amp.
- 4. Disconect Current Meter.

Cable Resistance Calibration

- 1. Using 1 Amp Calibrated Source (see current set up above)
- 2. Plug in C Cable between CAB & UUT Sockets
- 3. Set all Switches to B (1A through Cable)
- 4. Measure Volts between F & D.

5. The Millivolt Reading = Milli Ohm Resistance Value

Example: Reading = 123mV this equates to a resistance of 123mOhm

The value for PDT Cables will be between 95mR &145mR

(This is based on the equation R=V/I where I= 1 Amp)

Warning: Do Not Use an Ohm Meter to Measure Resistance Directly As Damage May Be caused to the Meter by passing 1 Amp through it!

