

PGY-MPGY-UFS Protocol Analyzer is the most feature rich comprehensive Protocol Analyzer available to capture and debug UFS protocol data. UFS Protocol Analyzer supports PWM and HS G3 Speed. The innovative active probe has minimum electrical loading on device under test (DUT) and captures protocol data without affecting the performance of DUT. PGY-MPHY-UFS protocol Analyzer can supports one lane to two lane data paths. Comprehensive decoding of data, protocol tests, and error analysis enables verification of communication between UFS host and device.

PGY-MPHY-UFS Protocol Analyzer allows Design and Test Engineers to obtain deep insight into UFS host and device communication. UFS level triggering on command, response, data or CRC errors. PGY-UHS II Protocol analyzer instantaneously provides decoding of UFS layer, UniPRO layer decoding of Protocol data.

Key features and benefits:

- Supports PWM and HS Gear 3 data rates
- Supports upto 4 data lanes (2 TX and 2 RX)
- Upto 30GB trace depth
- Decoding at MPHY, UniPRO and UFS layer
- Trigger based on UniPRO and UFS layer packet content
- Support triggering in PWM and HS gear 3 data rate speed
- Trigger on CRC error conditions allow capturing infrequent error events
- Trigger out signal for any specific protocol event allows triggering of other instruments such as oscilloscope
- Interface to host system using USB3.0 or Gigabit Ethernet interface
- Flexibility to upgrade the hardware firmware using GbE interface provides easy field up gradation of firmware
- Decoded data packets can be exported to txt file for further analysis

Specifications:

Interfaces Supported	MPHY, PWM and upto HS gear 3, four data lanes (2 TX and 2 RX)
Protocol Decode	MPHY (8B/10B), UniPRO and UFS
Data Decode	Supported
Storage Capability	Continuous streaming of protocol activity upto 30GB
Capture Mode	Manual Run/Stop, Time specific
Trigger on	UniPRO and UFS packets
Trigger Actions	Capture data and/or trigger out signal
Signal Input	Digital Signal input to mark the activities in Protocol activity
Host System Interface	USB3.0 or GbE interface



Host Machine Minimum Requirements

Microsoft Windows® 8, Windows 7, 64 bit
 16GB of RAM; Storage with at least 50 GB HDD space for the storing the acquired data display with resolution of at least 1024x768

Trigger Specifications

Stack	Protoocl Alayer	Packet Type
UniPRO	Link Startup Sequence	Trig_UPRO0
		Trig_UPRO1
		Trig_UPRO2
	PHY Capability Adapter packets (PACP)	PACP_PWR_reg
		PACP_PWR_cnf
		PAC_Cap_ind
		PACP_Cap_EXT1_ind
		PACO_EPR_ind
		PACP_TestMode_req
		PACP_Get_req
		PACP_Get_cnf
		PACP_SER_req
		PACP_SET_cnf
		PACP_TEST_DATA_0
		PACP_Test_DATA_1
		PACP_Test_DATA_2
		PACP_Test_DATA_3
	Data Link packets	SOF
		EOF
		EOF_ODD
		EOF_EVEN
COF		
AFC/NAC		
Traffic Class 0/Traffic Class 1		
UFS	UFS layer Packets	NOP IN
		NOP OUT
		Command
		Response
		Task Management Request
		task Management Response
		Ready To Transfer
		Ready to Transfer

Setup



PGY-PMHY-UNI-PRO-UFS Protocol Analyzer provides USB3.0 and GBe interface for host connectivity. Software runs in host machine enables configuration of PGY-MPHY-UFS hardware for UFS protocol analysis including boot information capture for eMMC for comprehensive Protocol Analysis. High-speed host connectivity enables continuous streaming of protocol data and storage for long period of time.

Comprehensive Protocol Analysis

PGY-MPHY-UNI-PRO-UFS Protocol Analyzer provides industry best protocol analysis capabilities. Easy to use interface reduces the protocol analysis time. Time stamped view of protocol decode listing provides easy view of protocol activities between host and device. At click of a button user can get decode of argument of Response from the device. Decoding of registers provides detail information on devices. Analytics features quickly provide insight into protocol activity without going through the complete protocol activity.

Multilayer Protocol Layer

PGY-MPHY-UNI-PRO-UFS Protocol Analysis offers multilayer of protocol activity with flexibility to link all views for easy correlation of data. This software brings information MPHY layer to

application single multi window view. This gives bit level protocol decode will user to analyze the communication between host and UFS memory.

PGY-MPHY-UniPRO-UFS Protocol Analysis Software

File View Trigger Analyse Report Help

Connect Acquire Stop

Search [X] Search Filter Out

Frame Description X UFS Frame

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	ESC_PA 0x1								EscParam_PA = PACP_BEGIN 0x1								
0	PACP_FuntionId = PACP_CAP_ind 0x306																
0	TSleepNoConfig 0x8				Reserved 0x1				Flags 0x3		MaxHS 0x3		MaxPWM 0x4				
0	TStallNoConfig 0xF								TSaveConfig 0xC8								
0	VersionInfo 0x3																
0	Reserved 0xFFFF																
0	Reserved 0xFFFF																
0	Reserved 0xFFFF																

UFS View X

Index	Direction	Description
0	TX > RX	NOP_OUT
1	TX > RX	TEST UNIT READY
2	TX > RX	REQUEST SENSE
3	TX > RX	TEST UNIT READY
4	TX > RX	NOP_OUT
5	TX > RX	QUERY_REQUEST
6	TX > RX	QUERY_REQUEST
7	TX > RX	QUERY_REQUEST
8	TX > RX	QUERY_REQUEST
9	TX > RX	QUERY_REQUEST
10	TX > RX	QUERY_REQUEST
11	TX > RX	QUERY_REQUEST
12	TX > RX	QUERY_REQUEST

UniProView X

Index	Direction	Description
39	TX > RX	TRG_UPR2
40	TX > RX	TRG_UPR2
41	TX > RX	TRG_UPR2
42	TX > RX	TRG_UPR2
43	TX > RX	TRG_UPR2
44	TX > RX	TRG_UPR2
45	TX > RX	TRG_UPR2
46	TX > RX	TRG_UPR2
47	TX > RX	TRG_UPR2
48	TX > RX	TRG_UPR2
49	TX > RX	TRG_UPR2
50	TX > RX	TRG_UPR2
51	TX > RX	EOB
52	TX > RX	SOB
53	TX > RX	PACP_CAP_EXT1_ind
54	TX > RX	PACP_CAP_ind
55	TX > RX	EOB
56	TX > RX	SOB
57	TX > RX	DL_AFC
58	TX > RX	DL_AFC
59	TX > RX	EOB
60	TX > RX	SOB
61	TX > RX	DL_AFC
62	TX > RX	DL_AFC
63	TX > RX	EOB
64	TX > RX	SOB
65	TX > RX	PACP_PWR_req
66	TX > RX	EOB
67	TX > RX	SOB
68	TX > RX	DL_DATA

TestView1_TX

Index	K/D Code	8 Bit	Lane	Gear
102	K28.6	0xDC	0	PWM_GO
103	K28.1	0x3C	0	PWM_GO
104	K28.5	0x8C	0	PWM_GO
105	K28.3	0x7C	0	PWM_GO
106	K28.3	0x7C	0	PWM_GO
107	D1.0	0x01	0	PWM_GO
108	D3.0	0x03	0	PWM_GO
109	D9.0	0x09	0	PWM_GO
110	D1.0	0x01	0	PWM_GO
111	D16.0	0x10	0	PWM_GO
112	D0.0	0x00	0	PWM_GO
113	D0.0	0x00	0	PWM_GO
114	D16.0	0x10	0	PWM_GO
115	D16.0	0x10	0	PWM_GO
116	D10.0	0x0A	0	PWM_GO
117	D8.2	0x48	0	PWM_GO
118	D15.0	0x0F	0	PWM_GO
119	D8.2	0x48	0	PWM_GO
120	D15.0	0x0F	0	PWM_GO
121	D8.2	0x48	0	PWM_GO
122	D15.0	0x0F	0	PWM_GO
123	D8.2	0x48	0	PWM_GO
124	D31.7	0xFF	0	PWM_GO
125	D31.7	0xFF	0	PWM_GO
126	D31.7	0xFF	0	PWM_GO
127	D31.7	0xFF	0	PWM_GO
128	D27.1	0x38	0	PWM_GO
129	D24.0	0x18	0	PWM_GO
130	K28.3	0x7C	0	PWM_GO
131	D1.0	0x01	0	PWM_GO

0.0.0.1 Received: 0 Dropped: 0

Device not found

UniPRO layer View:

PGY-MPHY-UniPRO-UFS Protocol Analysis Software

File View Trigger Analyse Report Help

Connect Acquire Stop

Search [X] Search Filter Out

Frame Description X

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	ESC_DL 0x1								SOF 0x0		TC 0x0		Reserved 0x7				
0	DL_SDU - Byte0 0x81								DL_SDU - Byte1 0x81								
0	DL_SDU - Byte2 0x0								DL_SDU - Byte3 0x0								
0	DL_SDU - Byte4 0x0								DL_SDU - Byte5 0x0								
0	DL_SDU - Byte6 0x0								DL_SDU - Byte7 0x0								
0	DL_SDU - Byte8 0x0								DL_SDU - Byte9 0x0								
0	DL_SDU - Byte10 0x0								DL_SDU - Byte11 0x0								
0	DL_SDU - Byte12 0x0								DL_SDU - Byte13 0x0								
0	DL_SDU - Byte14 0x0								DL_SDU - Byte15 0x0								
0	DL_SDU - Byte16 0x0								DL_SDU - Byte17 0x0								
0	DL_SDU - Byte18 0x0								DL_SDU - Byte19 0x0								
0	DL_SDU - Byte20 0x0								DL_SDU - Byte21 0x0								
0	DL_SDU - Byte22 0x0								DL_SDU - Byte23 0x0								
0	DL_SDU - Byte24 0x0								DL_SDU - Byte25 0x0								
0	DL_SDU - Byte26 0x0								DL_SDU - Byte27 0x0								
0	DL_SDU - Byte28 0x0								DL_SDU - Byte29 0x0								
0	DL_SDU - Byte30 0x0								DL_SDU - Byte31 0x0								
0	DL_SDU - Byte32 0x0								DL_SDU - Byte33 0x0								
1	ESC_DL 0x1								EOF EVEN 0x1		Frame Sequence 0x0						

UniProView X

Index	Direction	Description
57	TX > RX	DL_AFC
58	TX > RX	DL_AFC
59	TX > RX	EOB
60	TX > RX	SOB
61	TX > RX	DL_AFC
62	TX > RX	DL_AFC
63	TX > RX	EOB
64	TX > RX	SOB
65	TX > RX	PACP_PWR_req
66	TX > RX	EOB
67	TX > RX	SOB
68	TX > RX	DL_DATA
69	TX > RX	DL_AFC
70	TX > RX	DL_AFC
71	TX > RX	DL_DATA
72	TX > RX	DL_AFC
73	TX > RX	DL_AFC
74	TX > RX	SOB
75	TX > RX	DL_DATA
76	TX > RX	EOB
77	TX > RX	DL_AFC
78	TX > RX	DL_AFC
79	TX > RX	DL_AFC
80	TX > RX	DL_AFC
81	TX > RX	DL_AFC
82	TX > RX	EOB
83	TX > RX	DL_DATA
84	TX > RX	SOB
85	TX > RX	TRG_UPRO
86	TX > RX	EOB

0.0.0.1 Received: 0 Dropped: 0

Shell Created



PGY-MPHY-UniPRO UFS Protocol Analysis software allows designer to focus on specific Protocol layer. Software displays the UniPPRO packets and selected packets bit level decode. Now user can debug design issues at each layer

UFS packet layer view

The screenshot displays the software interface for PGY-MPHY-UniPRO-UFS Protocol Analysis. The main window is titled 'UFS Frame' and shows a bit-level decode of a frame. The bit positions are numbered from 31 down to 0. The frame is divided into several fields:

Bit Range	Field Name	Value
31-28	ESC_DL	0x1
27-24	SOF	0x0
23-21	TC	0x0
20-17	Reserved	0x7
16-13	DestDeviceID_Enc(L3s=1)	0x81
12-10	DestCPortID_Enc(L4s=1)	0x81
9-8	COMMAND	0x1
7-4	Flags[F(0) R(1) W(0) ATTR(Simple)]	0x40
3-2	LUN[WLUN_ID(1)]	0xC4
1-0	Task Tag	0x0
31-24	IID	0x0
23-16	SCSI (SPC, SBC)	0x0
15-12	Reserved	0x0
11-8	Reserved	0x0
7-4	Reserved	0x0
3-2	Total EHS Length	0x0
1-0	Reserved	0x0
31-24	Expected Data Transfer Length	0x24
23-16	INQUIRY	0x12
15-12	Reserved	0x0
11-8	Page Code	0x0
7-4	Allocation Length [15:8]	0x0
3-2	Allocation Length [7:0]	0x24
1-0	Control	0x0
31-28	CDB[8]	0x0
27-24	CDB[9]	0x0
23-21	CDB[10]	0x0
20-18	CDB[11]	0x0
17-15	CDB[12]	0x0
14-12	CDB[13]	0x0
11-9	CDB[14]	0x0
8-7	CDB[15]	0x0
31-28	ESC_DL	0x1
27-26	EOF_EVEN	0x1
25-24	Frame Sequence	0x9
1-0	CRC16	0xDE08

Below the frame decode, there is a 'UFS View' table listing transactions:

Index	Direction	Description
75	TX → RX	INQUIRY
76	TX → RX	INQUIRY
77	TX → RX	QUERY_REQUEST
78	TX → RX	INQUIRY
79	TX → RX	INQUIRY
80	TX → RX	INQUIRY
81	TX → RX	REPORT LUNS
82	TX → RX	INQUIRY
83	TX → RX	INQUIRY
84	TX → RX	INQUIRY
85	TX → RX	QUERY_REQUEST
86	TX → RX	INQUIRY
87	TX → RX	INQUIRY
88	TX → RX	INQUIRY
89	TX → RX	INQUIRY
90	TX → RX	QUERY_REQUEST
91	TX → RX	INQUIRY
92	TX → RX	INQUIRY
93	TX → RX	INQUIRY
94	TX → RX	QUERY_REQUEST
95	TX → RX	INQUIRY
96	TX → RX	INQUIRY
97	TX → RX	INQUIRY
98	TX → RX	INQUIRY
99	TX → RX	INQUIRY
100	TX → RX	INQUIRY
101	TX → RX	INQUIRY
102	TX → RX	INQUIRY
103	TX → RX	TEST UNIT READY
104	TX → RX	TEST UNIT READY

At the bottom left, it shows '0.0.0.1 Received: 0 Dropped: 0'. At the bottom right, it says 'Shell Created'.

This view displays for information application layer transactions. UFS layer packets are listed and its packet level content.

Search and Filter:

PGY-MPHY-UniPRO-UFS Protocol Analyzer offers flexibility to search and filter for specific packets. User can be specific define the search at bit level for a packet.

Analytics

PGY-MPHY-UniPRO-UFS software would allow engineer to quickly view the error conditions.

- Errors reported in packets
- Linking the error bit info to packets
- CRC errors
- Gear changing information
- Lane width
- Credit overflow analysis

- IOPS Analysis
- Performance Analysis of packets

Ordering information:

PGY-MPHY-UniPRO-UFS UFS Protocol Analyzer

(Shipment includes Hardware, software CD, One set probe, USB3.0 and Ethernet Cable, Power adapters)

Warranty:

Hardware and software carries warranty of one year.

Probes are covered three months warranty for any manufacturing defects

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