

PGY-UFS3.X-PA MPHY, UniPro, UFS Protocol Analyzer



PGY-UFS3.X-PA, UFS Protocol Analyzer is a value based analyzer in its class. It offers protocol data capture and debug of data across MPHY, UniPro and UFS protocol layers. It allows for instantaneous decoding of UFS, UniPro and MPHY layers with flexibility to correlate decoded data across these protocol layers. PGY-UFS3.X-PA supports PWMG1 to HSG4B data rates and two TX, two RX lane decode. The active probe has minimum electrical loading on device under test (DUT) and captures protocol data without affecting the performance of DUT. PGY-UFS3.X-PA Protocol Analyzer support two lane data. Comprehensive decoding of UniPro & UFS data on the Fly enables validation of communication between UFS host and device.

PGY-UFS3.X-PA Protocol Analyzer allows Design and Test Engineers to obtain deep insight into UFS host and device communication. MPHY/UniPRO/UFS packet based triggering allows specific protocol data capture and analysis. PGY-UFS Protocol analyzer instantaneously provides decoding of UFS, UniPro and MPHY layers with a correlation to MPHY, UniPro and UFS layers.

Solder down active probes allows probing the MPHY test points. This allows the design and test engineers to capture UFS traffic between the host and UFS memory with high signal fidelity. Today's test engineers need to test the use case scenarios in their labs that mimic real-life use cases. The PGY-UFS3.X-PA, UFS Protocol Analyzer has been designed to enable engineers to closely monitor and analyze the traffic between the host and the device while executing the various use case scenarios.

PGY-MPHY-UniPRO-UFS Protocol Analysis Software

File Setup View Trigger Analytics Report Help

Connect Acquire Stop Acq Stop Transfer Stop Reset UFS_Mkr Time Δt1 MO M1 ± 21.92µs Δt2 MO M1 ± 21.92µs UFS_Mkr Time Δt1 P0 P1 ± 61.568µs Δt2 P0 P1

Connection View	DeviceConfigView	UFSView	PacpView	Analytics View	Report View	TriggerView	Color Settings	SymbolisView_HOST	SearchView		
P0	..7806	17.45784108s	READ_10	Host	Device	Gear	Task Tag	Total EHS Length	Segment Length	Data Offset	Expected Data Trans
	..7807	17.457875864s		DATA_IN	HS_G4B	01	00	1000	00000000		00001000
	..7808	17.457877688s		RESPONSE	HS_G4B	01	00	0000			
	..7809	17.45788104s	READ_10	Host	Device	Gear	Task Tag	Total EHS Length	Segment Length	Data Offset	Expected Data Trans
	..7810	17.457897816s		DATA_IN	HS_G4B	00	00	1000	00000000		00001000
	..7811	17.457899632s		RESPONSE	HS_G4B	00	00	0000			
	..7812	17.457913712s		DATA_IN	HS_G4B	02	00	1000	00000000		
	..7813	17.457915536s		RESPONSE	HS_G4B	02	00	0000			
	..7814	17.457919936s	READ_10	Host	Device	Gear	Task Tag	Total EHS Length	Segment Length	Data Offset	Expected Data Trans
	..7815	17.457937432s		DATA_IN	HS_G4B	03	00	1000	00000000		00001000
	..7816	17.457938208s	READ_10	Host	Device	Gear	Task Tag	Total EHS Length	Segment Length	Data Offset	Expected Data Trans
	..7817	17.45793936s		RESPONSE	HS_G4B	03	00	0000			

Index	KVD Code	8 Bit	Lane	Gear
..8808	D5.7	0xE5	Tx	HS_G4B
..8809	D4.4	0x84	Tx	HS_G4B
..8810	K28.5	0xB3	Tx	HS_G4B
..8811	D3.6	0xC3	Tx	HS_G4B
..8812	D31.1	0x3F	Tx	HS_G4B
..8813	D27.6	0x0B	Tx	HS_G4B
..8814	D21.7	0xF5	Tx	HS_G4B
..8815	D5.5	0xA5	Tx	HS_G4B
..8816	K28.5	0xB3	Tx	HS_G4B
..8817	D3.6	0xC3	Tx	HS_G4B
..8818	D31.1	0x3F	Tx	HS_G4B
..8819	D28.6	0xDC	Tx	HS_G4B
..8820	D5.4	0xB5	Tx	HS_G4B
..8821	D2.2	0x42	Tx	HS_G4B
..8822	K28.5	0xB3	Tx	HS_G4B
..8823	D7.0	0xB7	Tx	HS_G4B

UniProView	Index	Timestamp	Host	Device	Gear	Flags	DestDeviceID	DestCPortID	ECM	Frame Seq	Credit Value	CRC
M0	..2250	17.457915736s		DL_AFC	HS_G4B					07		DB
	..2251	17.457915752s		DL_AFC	HS_G4B					07		DC
	..2252	17.457919936s		DL_DATA	HS_G4B	01	00	01	09			
	..2253	17.457920216s		DL_AFC	HS_G4B					09		1A
	..2254	17.457937432s		DL_DATA	HS_G4B	00	00	00	08			
	..2255	17.457937552s		DL_DATA	HS_G4B	00	00	00	09			
	..2256	17.457937648s		DL_AFC	HS_G4B					08		DC
	..2257	17.457937656s		DL_AFC	HS_G4B					08		DD
M1	..2258	17.457937672s		DL_DATA	HS_G4B	00	00	00	0A			
	..2259	17.457937672s		DL_AFC	HS_G4B					08		DE
	..2260	17.45793768s		DL_AFC	HS_G4B					08		DF
	..2261	17.457937696s		DL_AFC	HS_G4B					08		E0

SymbolisView_DEVICE	Index	KVD Code	8 Bit	Lane	Gear
..23	D26.2	0x5A	Rx	HS_G4B	
..24	D26.2	0x5A	Rx	HS_G4B	
..25	D26.2	0x5A	Rx	HS_G4B	
..26	D26.2	0x5A	Rx	HS_G4B	
..27	D26.2	0x5A	Rx	HS_G4B	
..28	D26.2	0x5A	Rx	HS_G4B	
..29	D26.2	0x5A	Rx	HS_G4B	
..30	D26.2	0x5A	Rx	HS_G4B	
..31	D26.2	0x5A	Rx	HS_G4B	
..32	D26.2	0x5A	Rx	HS_G4B	
..33	D26.2	0x5A	Rx	HS_G4B	
..34	K28.5	0xB3	Rx	HS_G4B	
..35	D9.1	0x29	Rx	HS_G4B	
..36	D27.4	0x9B	Rx	HS_G4B	
..37	D29.2	0x5D	Rx	HS_G4B	
..38	K28.5	0xB3	Rx	HS_G4B	

1.2.8.0 Received: 0 Current Mem: 0.000GB Max Mem: 2.839GB

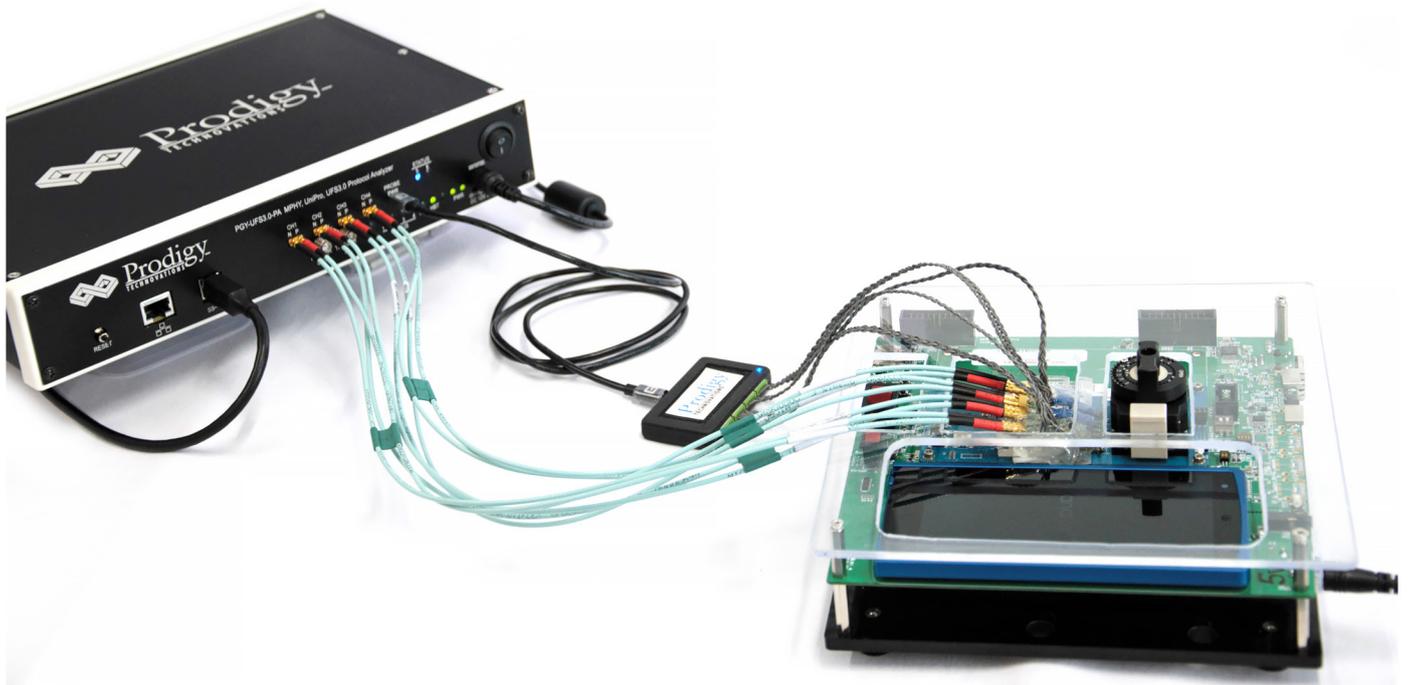
Analysis Completed..

Windows based protocol analysis software, provides industry best protocol correlation between UFS to UniPro and MPHY layers. Time correlation between the different protocol layers significantly reduces debug time of designs. Floating window design of this software allows engineers to view UFS view, UniPro view and MPHY view on different computer monitors and automatically correlate the UFS packets to MPHY layer. This makes analysis very easy while analyzing the gigabytes of Protocol information.

Key Features

- ✦ Supports version MPHY 4.0, UniPro 1.8 and UFS version 2.1/3.1
- ✦ Supports PWM G1 to G7 and HS G1,2,3, 4 A and B Series
- ✦ Supports one/two data lanes (2 TX and 2 RX)
- ✦ Flexibility to capture very large data using continuous streaming of Protocol data to host computer
- ✦ Hardware based circular buffer
- ✦ Flexibility to decode selected data from 8GB buffer
- ✦ Solderdown active probe provide high signal fidelity
- ✦ Decoding at MPHY, UniPro and UFS layers
- ✦ Trigger based on MPHY, UniPro and UFS layers packet content
- ✦ Trigger out signal at trigger event allows the triggering of other instruments such as oscilloscope
- ✦ Interface to host system using USB3.0
- ✦ Flexibility to upgrade the hardware firmware using GbE interface provides easy field up gradation of FPGA firmware
- ✦ Decoded data packets can be exported to txt file for further analysis
- ✦ Light weight and can be deployed for on-site/ field tests

Test Setup



PGY-UFS3.X-PA UFS Protocol Analyzer provides USB3.0 and Gbe interface for host computer connectivity. High-speed host connectivity enables continuous streaming of protocol data to host HDD and storage for long period of time. Software offers multi-view such as MPHY view, UniPro view and UFS View. Each view lists the respective protocol packets and its details with correlation of each layer for easy debug. Lightweight Analyzer is easy to carry during field visit.

Equalizer And Memory

Advanced Settings

Burst Speed Detection	Sync Wait Time	Host	Device
<input type="radio"/> Sync Speed <input checked="" type="radio"/> PACP PWR Gear	Host: <input type="text" value="10"/> Device: <input type="text" value="32"/>	CTLE: <input type="text" value="MANUAL"/> DFE Gain: <input type="text" value="MANUAL"/>	CTLE: <input type="text" value="MANUAL"/> DFE Gain: <input type="text" value="MANUAL"/>
		Freq Boost: <input type="text" value="5"/> Wide Band Gain: <input type="text" value="7"/> DFEgain CFG: <input type="text" value="31"/>	Freq Boost: <input type="text" value="0"/> Wide Band Gain: <input type="text" value="0"/> DFEgain CFG: <input type="text" value="31"/>

Acquisition/Error Analysis

Analyze	Hardware Filters	Buffer Type	CRC Error Count
<input type="radio"/> Live Decode <input checked="" type="radio"/> Post Capture	<input checked="" type="checkbox"/> AFC <input type="checkbox"/> DLData Payload Drop	<input checked="" type="radio"/> Continuous/8GB <input type="radio"/> Circular (H/W)	<input type="checkbox"/> DLData <input type="checkbox"/> AFC
		Buffer Size: <input type="text" value="100"/> MB PreTrigger: <input type="text" value="0"/> MB	

PGY-UFS3.X provides flexibility to set TX and RX CTLE and DFE equalizer to address reflection and poor SI signals while probing the MPHY signals. This helps in reducing the error decoding of packets. Newly introduced hardware based circular buffer provides the flexibility to continuously capture the protocol data and analyze the data in circular buffer size. User can set trigger on circular buffer and capture the protocol data at specific events.

UFS Protocol Layer Decode

Index	Timestamp	Host	Device	Gear	Task Tag	Total EHS Length	Segment Length	Data Offset	Expected Ds	Logical Block Add	Device In	Transfer Le	Response
..7809	17.45788104s	READ_10		HS_G4B	03	00	0000		00001000	005E28B6		0001	
..7810	17.457897816s		DATA_IN	HS_G4B	00	00	1000	00000000					
..7811	17.457899632s		RESPONSE	HS_G4B	00	00	0000				00		Success (00)
..7812	17.457913712s		DATA_IN	HS_G4B	02	00	1000	00000000					
..7813	17.457915536s		RESPONSE	HS_G4B	02	00	0000				00		Success (00)
..7814	17.457919936s	READ_10		HS_G4B	01	00	0000		00001000	005E5B72		0001	
..7815	17.457937432s		DATA_IN	HS_G4B	03	00	1000	00000000					
..7816	17.457938208s	READ_10		HS_G4B	00	00	0000		00001000	005D0F2E		0001	
..7817	17.457939264s		RESPONSE	HS_G4B	03	00	0000				00		Success (00)
..7818	17.457974088s	READ_10		HS_G4B	02	00	0000		00001000	005E707A		0001	
..7819	17.457979048s		DATA_IN	HS_G4B	01	00	1000	00000000					
..7820	17.457980872s		RESPONSE	HS_G4B	01	00	0000				00		Success (00)
..7821	17.457981648s	READ_10		HS_G4B	03	00	0000		00001000	005E2517		0001	
..7822	17.457994984s		DATA_IN	HS_G4B	00	00	1000	00000000					
..7823	17.457996808s		RESPONSE	HS_G4B	00	00	0000				00		Success (00)
..7824	17.458019368s	READ_10		HS_G4B	01	00	0000		00001000	005E5B7C		0001	
..7825	17.458031576s		DATA_IN	HS_G4B	02	00	1000	00000000					
..7826	17.458031672s	READ_10		HS_G4B	00	00	0000		00001000	005DAD56		0001	
..7827	17.4580334s		RESPONSE	HS_G4B	02	00	0000				00		Success (00)
..7828	17.458037632s		DATA_IN	HS_G4B	03	00	1000	00000000					
..7829	17.458039448s		RESPONSE	HS_G4B	03	00	0000				00		Success (00)
..7830	17.458073704s	READ_10		HS_G4B	02	00	0000		00001000	005E8D79		0001	
..7831	17.458076264s		DATA_IN	HS_G4B	01	00	1000	00000000					
..7832	17.458078088s		RESPONSE	HS_G4B	01	00	0000				00		Success (00)
..7833	17.458083496s	READ_10		HS_G4B	03	00	0000		00001000	005E0192		0001	
..7834	17.458087656s		DATA_IN	HS_G4B	00	00	1000	00000000					
..7835	17.45808948s		RESPONSE	HS_G4B	00	00	0000				00		Success (00)
..7836	17.458116096s	READ_10		HS_G4B	01	00	0000		00001000	005E5244		0001	
..7837	17.458127792s	READ_10		HS_G4B	00	00	0000		00001000	005D8026		0001	
..7838	17.4581304s		DATA_IN	HS_G4B	02	00	1000	00000000					
..7839	17.458132224s		RESPONSE	HS_G4B	02	00	0000				00		Success (00)
..7840	17.458140168s		DATA_IN	HS_G4B	03	00	1000	00000000					
..7841	17.458141992s		RESPONSE	HS_G4B	03	00	0000				00		Success (00)
..7842	17.458170272s	READ_10		HS_G4B	02	00	0000		00001000	005E7F40		0001	

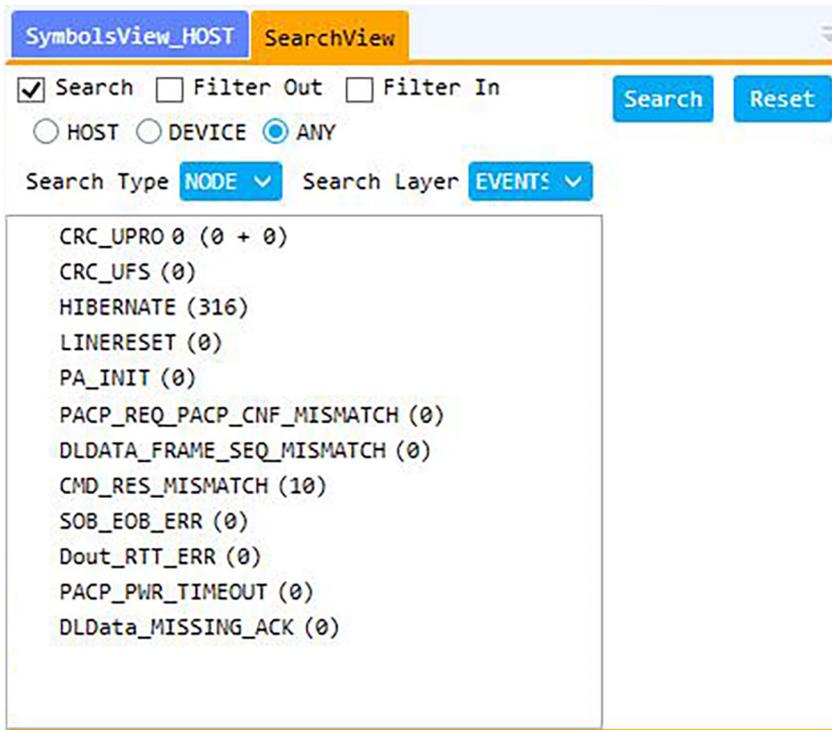
PGY-UFS3.X-PA Software can display each UFS packet parameters in a listing window. Right click lists all the packet parameter for user selection. User can color code the fonts or background color for easy identification for each UFS packet.

PACP And Unipro View

The screenshot displays the PGY-MPHY-UniPRO-UFS Protocol Analysis Software interface. The main window shows a list of packets with columns for Index, Timestamp, Direction, Description, Gear, Tx Gea, Tx Lane, Tx Mode, Rx Gear, Rx Lane, Rx Mode, Flags, CRC, MIBattribut, MIBvalue, and LineReset. The 'PACPView' window is active, showing a detailed view of a PACP packet with columns for Index, Timestamp, Host, Device, Gear, Flags, EOM, Frame Seq, Credit Value, and CRC. The 'UniProView' window is also visible, showing a list of UniPro packets with columns for Index, Timestamp, Host, Device, Gear, Flags, EOM, Frame Seq, Credit Value, and CRC. The software interface includes a menu bar (File, Setup, View, Trigger, Analytics, Report, Help) and a toolbar with various icons for file operations and analysis.

PGY-UFS3.X-PA Software separates the PACP packets in a separate view for easy analysis of power change packets and link to UniPro packets. Users can view the MPHY states stall, prepare, sync information in UniPro view apart from user selection for DL_Data and AFC/NACK Packet details.

Error Events, Search And Filter



The screenshot shows the 'SearchView' tab in the software. It includes search and filter controls:

- Search Filter Out Filter In
- Buttons: Search, Reset
- Radio buttons: HOST DEVICE ANY
- Search Type: **NODE** (dropdown)
- Search Layer: **EVENTS** (dropdown)

The list of error events displayed is:

```

CRC_UPRO 0 (0 + 0)
CRC_UFS (0)
HIBERNATE (316)
LINERESET (0)
PA_INIT (0)
PACP_REQ_PACP_CNF_MISMATCH (0)
DLDATA_FRAME_SEQ_MISMATCH (0)
CMD_RES_MISMATCH (10)
SOB_EOB_ERR (0)
Dout_RTT_ERR (0)
PACP_PWR_TIMEOUT (0)
DLData_MISSING_ACK (0)
    
```

PGY-UFS3.X-PA Software does the live decode and list all the events. The list of events are shown in this picture. Users can easily note the errors in captured protocol data. In large buffer capture, it takes extremely difficult to locate the errors. But PGY-UFS3.X-PA software simplifies this by listing events while decoding the captured data.

Search and Filter allows you directly locate the error events or UFS or UniPro or PACP packet in the protocol listing windows. Filter-in and Filter-out makes it easy view the data of interest in the protocol listing window.

Comprehensive Protocol Analysis Using Multi-View



PGY-UFS-PA UFS Protocol Analyzer provides USB3.0 and Gbe interface for host computer connectivity. High-speed host connectivity enables continuous streaming of protocol data to host HDD and storage for long period of time. Software offers multi-view such as MPHY view, UniPro view and UFS View. Each view lists the respective protocol packets and its details with correlation of each layer for easy debug.

PGY Protocol Analyzer's 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 the device. At a click of a button, user can view the decode of each packet and the intended function. Floating window software architecture allows the user to view each protocol layer on separate monitors for easy debug. Autocorrelation of each selected packet from UFS to MPHY layers simplifies the debug activity

Specifications

Data Rates Supported	PWM G1 to G7, High Speed Gear 1, Gear 2, Gear 3 and Gear 4, Rate A and B
Link Width	Configurable for 1TX/1RX or 2TX/2RX
Probes	Solder Down Active Probes
Protocol Decode	MPHY, UniPro and UFS layers
Trace Capture Size	Supports Continuous streaming of Protocol data to Host computer SSD/HDD. Tested for 30GB of Trace depth
Trigger	Based MPHY, UniPro, UFS Packets
Front Panel Connectors	Interface for Active probes. Trigger in/out SMA connectors
Interface for Host Computer	USB3.0 and Gigabit Ethernet interface
Host Computer Requirements	Windows 7/8.0/8.1/10 64bit operating System. It supports a RAM of minimum 8GB but the product would give a faster response for a 16GB. The minimum storage capacity of 1GB should be available in the hard disk drive. User can use more storage based on trace storage requirement. Display resolution of the monitor is 1024X768. Host computer should support USB3.0 or GBe interface.
Dimension	(W x H x D) (20.5X5X25)cms
Weight	Approx. 2.5Kg
Power Requirement	12V, 3A DC Power Supply (AC/DC Supplied along with Analyzer)

Trigger Specifications

Stack	Protocol Analyzer	Packet Type
	Link Start-up Sequence	Trig_UPRO0
		Trig_UPRO1
		Trig_UPRO2
UniPRO	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
		Commands
		Response
		Task Management Request
		Task Management Response
		Ready To Transfer
		Ready to Transfer

Solder Down Probe Tips



P5021-L-WE 14 Gbps probe tips
with passive equalizer at input

P5021-L 14 Gbps probe tip
with isolation resistor

P5021 14 Gbps probe tips for
direct access to test points

Probing UFS signal is one of the key challenge in reliable UFS protocol decode. In most of the DUT, test points are located close to each other without enough space to solder the probe tips. Prodigy Technovations offers three type of 14 Gbps Probe tips which provides flexibility to choose the probe tips to meet the need. P5021-L and P5021-L-WE Probe tips has isolation resistor which can be changed based signal strength at test points. This helps in reducing reflections while accessing the test point and maintaining the signal integrity. The passive equalizer in P5021-L-WE helps in maintaining the differential impedance between the lane. If test points are easily accessible, then P5021 probe tip can be used to probe the test points.

Ordering Information

PGY-UFS3.X-PA UFS Protocol Analyzer

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

Warranty

Hardware and software carries a warranty of one year.

Probes are covered for a three-month warranty for any manufacturing defects

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About Prodigy Technovations Pvt Ltd

Prodigy Technovations is the leading provider of innovative protocol analysis solutions for mainstream and emerging technologies. We provide Protocol Decode, and PHY layer testing solutions on Test & Measurements equipment's. The company's ongoing efforts include successful implementation of innovative and comprehensive protocol Analysis solutions using latest hardware technologies.