PGY-MMC-SD Datasheet
eMMC (4.41, 4.51 and 5.0) and SD (UHS-I) Electrical Validation and Protocol Decode Software

CommandType	CMD Start Bit	Transmission Bit	Command Index	CMD Argument	CRC7	CMD Stop Bit	Time	Minimum Clock Frequency	Mean Clock Frequency
GO_IDLE_STATE	0	1	0	0x00000000	0x4A	1	-1.3583 µS	389.89 KHz	390.01 KHz
SEND_OP_COND	0	1	1	0x40000080	0x74	1	357.62 µS	389.87 KHz	390.00 KHz
R3 Response	0	0	63	0x00FF8080	0x7F	1	493.52 µS	389.90 KHz	390.01 KHz
SEND_OP_COND	0	1	1	0x40000080	0x74	1	2.3439 mS	389.88 KHz	390.00 KHz
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Detail View correlates Waveform, Protocol and electrical measurements

Features

- eMMC and SD (UHS-I) electrical measurements and Protocol testing software conforms to eMMC version 4.51 and 5.0 and SD version 3.01 specification.
- eMMC/SD/SDIO Protocol Aware Trigger features
- Industry first Protocol decoding CMD and Data (1 bit/4 bit and 8 bit mode) using MSO capabilities of Oscilloscope
- Supports SDR and DDR and Boot mode for electrical measurement and protocol Decode
- Fastframe capability allows protocol analysis of CMD in 100s of second time
- Software automatically identifies the read and write operations using CMD and apply the electrical parameter limits accordingly.
- Detail View provides efficient debugging capability by correlating the analog waveform, protocol messages and electrical measurements for each protocol packet in single view
- Protocol View lists the protocol activities in sequential form to assist designers to know the host and card transactions
- Time stamp at the end of command token and time stamp at beginning of the response token in Protocol View enables designer to comply with specification and locate any anomaly in timing between host and card
- Software displays the details of command and response in Protocol View and list the errors messages in card status for quick analysis
- Ability to store the eMMC and SD protocol data in CSV and txt format
- Utility features like zoom, undo, and fit to screen for easy maneuvering the waveforms while debugging the cause to problem in Detail View makes it easy to use tool
- Software seamlessly integrates with Tektronix windows based oscilloscope and supports live signal analysis using live channels of oscilloscope
- Supports data analysis for long record length and more acquisition memory of oscilloscope enables analysis of protocol events for longer duration
- Report generation in pdf format.

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- Supports wfm and isf file formats of Tektronix oscilloscope for offline analysis

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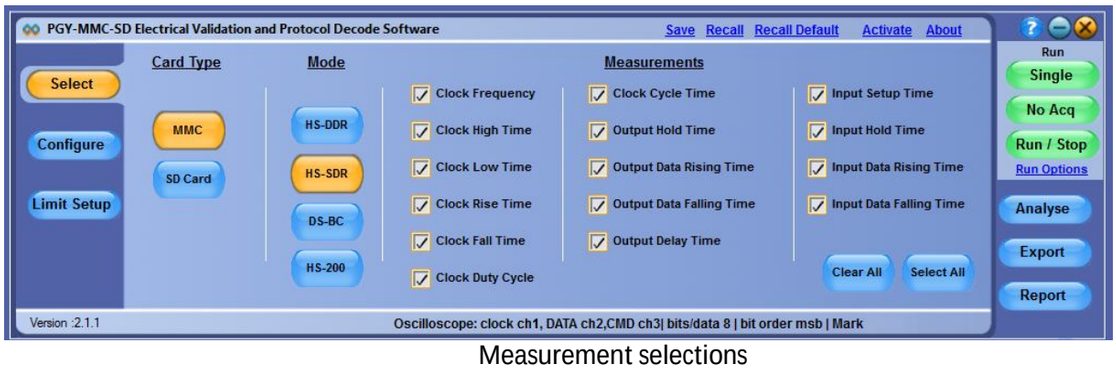
Applications

- ✓ Protocol Analysis
- ✓ eMMC and SD (UHS-I) Electrical Compliance Test (Supports eMMC4.42, 4.51 and 5.0 & SD3.01)
- ✓ Correlation of Analog waveform, Protocol activities and Electrical Measurements

Seamless Integration with Oscilloscope

PGY- MMC and SD Electrical Validation and Protocol Decode Software runs inside the Tektronix high performance windows oscilloscopes. Automatically imports the data from oscilloscopes live channels. Also supports Tektronix .wfm and .isf file formats. This enable live and offline testing of eMMC and SD Signals.

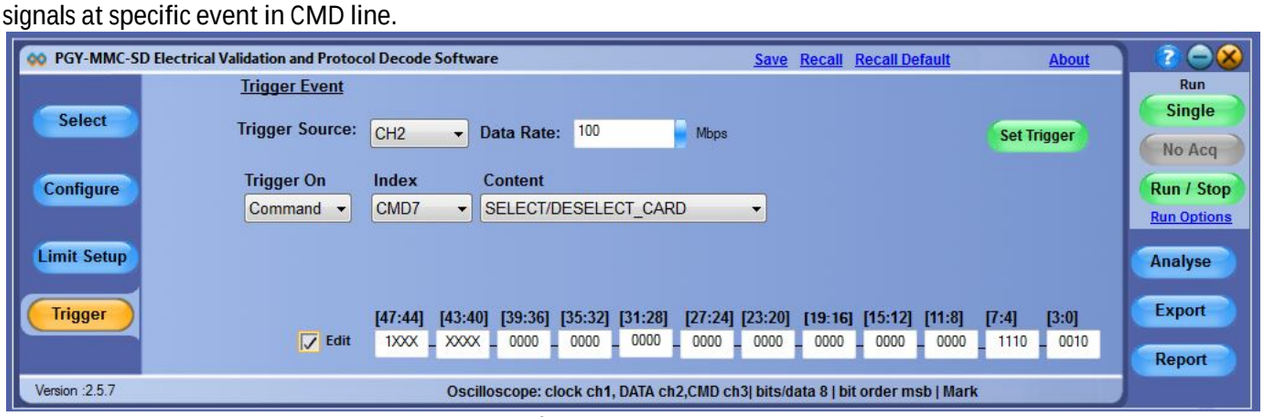


Measurement selections

- Provides the flexibility to select type of Card interface to be tested and related Bus speed modes
- Flexibility select necessary or all electrical measurements
- Save and recall of application setup for repetitive testing at different times
- Supports single and continuous test mode using oscilloscope live data
- Ob-line help

eMMC/SD/SDIO Protocol Aware Triggering

For efficient test and debugging eMMC/SD/SDIO, it is important to capture signals at right condition. PGY-MMC-SD software provides protocol aware triggering along serial pattern trigger option of the oscilloscope to capture signals at specific event in CMD line.



Trigger setup menu

- Flexibility to trigger on command or response
- Offers all the standard triggers patterns with command and Response
- Flexibility to edit trigger pattern

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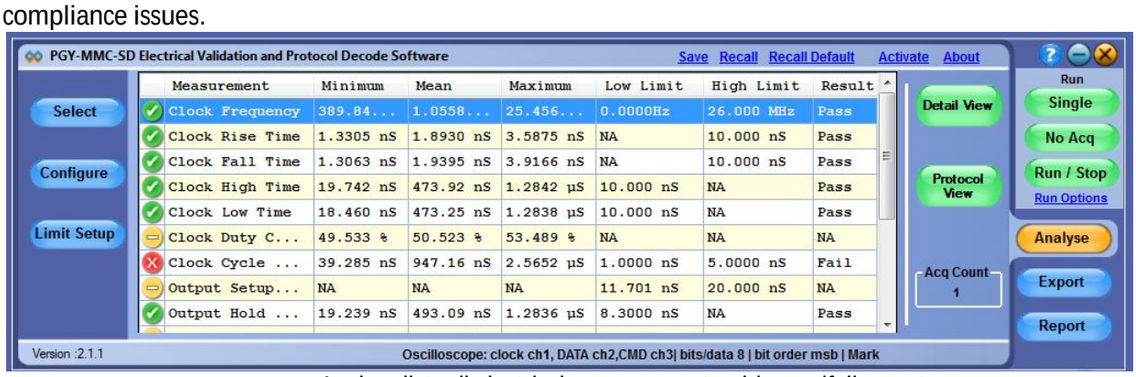
Automated Electrical Validation and Protocol Decode Software

As per the specification of eMMC and SD, the measurement limits are different for read and write operation. The PGY-MMC-SD measurement algorithms automatically find the read and write operations and validates with the respective limits. This enables you to save time in identifying the read and write operation and isolating any compliance issues.

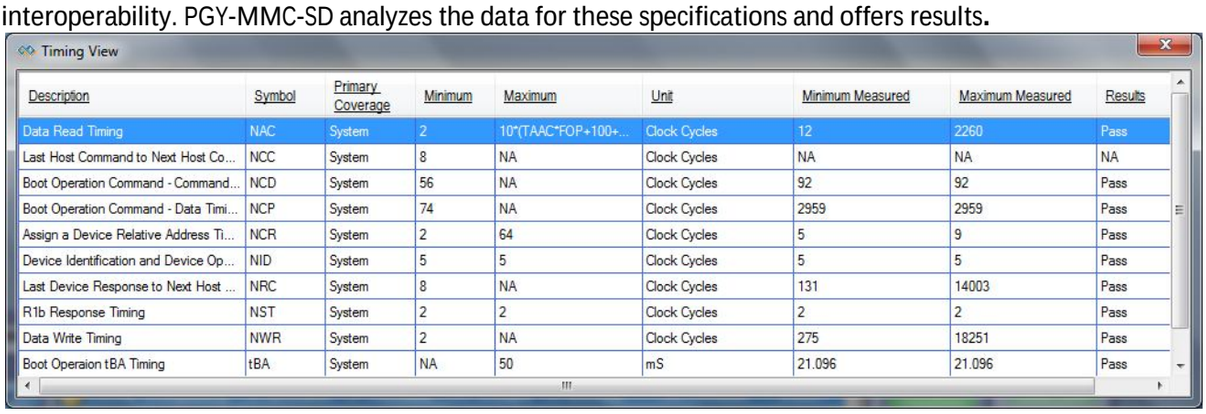


Analyze lists all electrical measurements with pass/fail report

- Lists electrical measurements with mean, minimum and maximum values measured for the entire acquired waveform
- Indicates if measurement exceeds the min or max limits by orange color
- Lower and Upper limits of the electrical measurements are compared against measured values
- Supports Electrical Measurements as per eMMC 4.41 and 4.51 and UHS3.1 Specification.
- Automated identification read and write operation and apply electrical limits as per eMMC and UHS-I specification

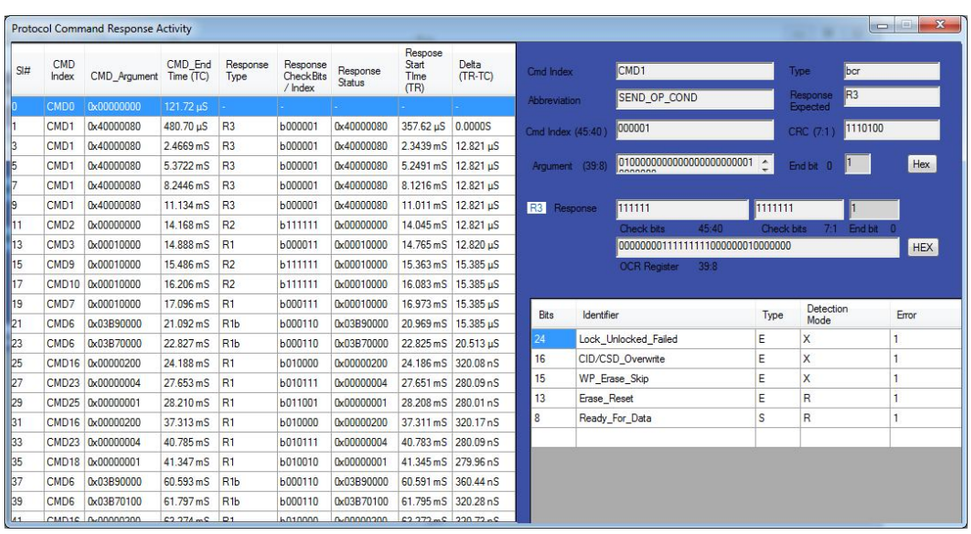
Timing Parameters between CMD, Response and Data

EMMC specifies the minimum and maximum cycles to present between the host and device to ensure interoperability. PGY-MMC-SD analyzes the data for these specifications and offers results.



Protocol View

PGY-MMC-SD software lists all the protocol activity between the host and card. Engineers can now quickly view the command and its corresponding response from card. Selected protocol activity details are listed on right side of the list table. Now Engineers can know the errors reported by card or any other message to host without struggling to know the content of each message.



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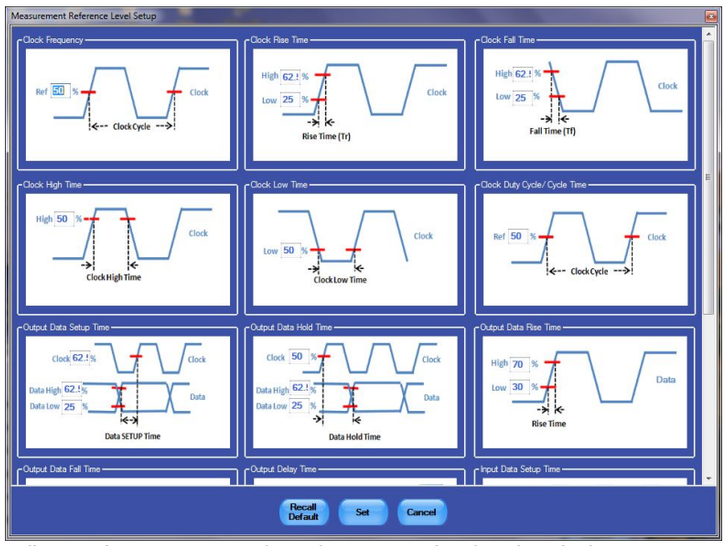
Protocol View

Characterization of PHY layer by custom limit setup

PGY-MMC-SD is not just for standard electrical compliance testing, you can also vary the limits and test your device with custom limits. The intuitive limits and reference level setup allows you to configure the limits and reference levels for your custom testing needs. This enables you to test your device beyond the specification and characterize it.



Config panel to custom set the reference setting for electrical measurement

Powerful Debug environment: Detail view

In Detail View, engineers can view the analog waveform, details of protocol and electrical measurements in single view. If there is any failure in electrical measurement or error in protocol messages, designers can quickly correlate the protocol data with analog waveforms. These protocol errors can be caused due to the failure in electrical measurements. User can select any row in the detail view; corresponding analog waveform will be zoomed and displayed. In the same row, engineers can view all the electrical measurements corresponding to the selected row. Utility features such as zoom, cursors, and markers make custom measurement while debugging.

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Detail view

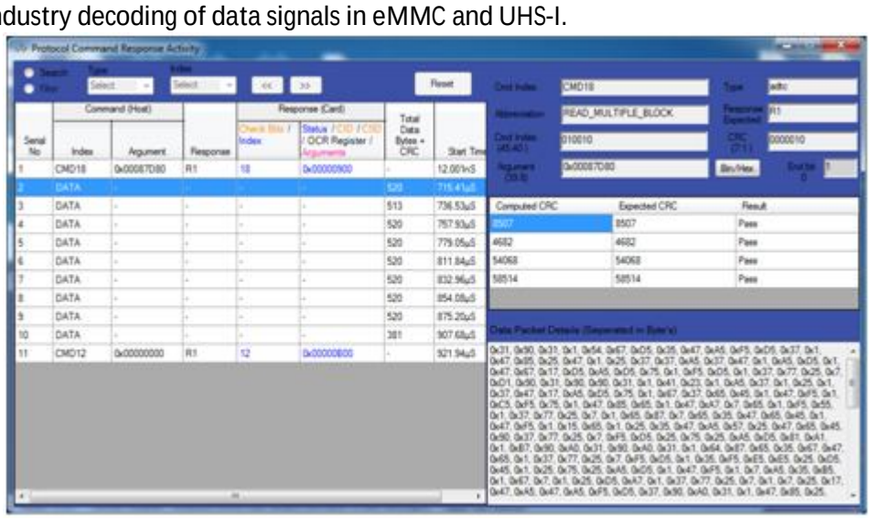
Detail view provides following capabilities:

- Plots the acquired waveform in waveform view window
- Lists all decoded command and response tokens in each row in decode table
- Indentifies of type of command and response for easy protocol interpretation
- Lists respective electrical measurements for command and response for each row

- Selected Protocol command or response's related analog waveform is plotted in a window.
- Bus Diagram view overlays protocol data for the selected row along with waveform
- Snap button enables storing selected waveform window for report generation purpose
- Zoom, fit to screen, pan, undo, vertical and horizontal cursors enables quick analysis and measurement of electrical signals

Industry First Decoding of CMD and data Signals:

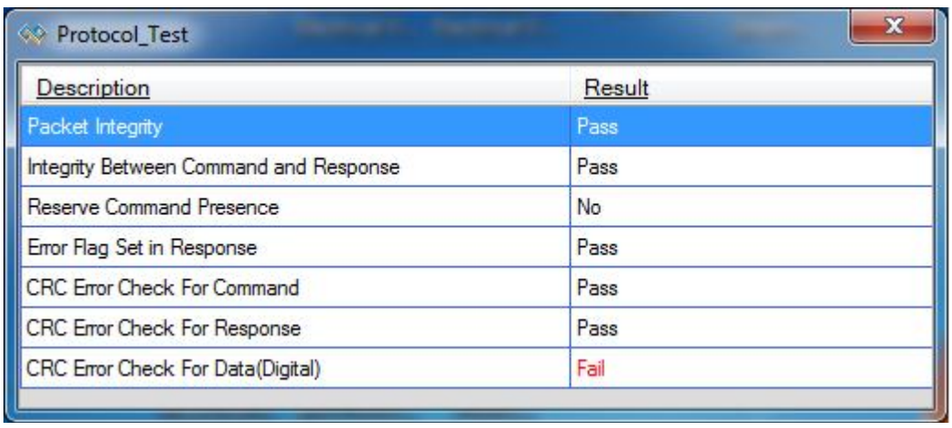
PGY-MMC-SD leverages powerful capabilities of Digital Channels of MSO70000/5000 series oscilloscope to provide industry decoding of data signals in eMMC and UHS-I.



Digital Decode View

Protocol test:

PGY-MMC-SD software automatically checks for Protocol Integrity. This allows very easy method ensuring protocol packets are as per protocol specifications of eMMC, UHS-I Specifications.



Description	Result
Packet Integrity	Pass
Integrity Between Command and Response	Pass
Reserve Command Presence	No
Error Flag Set in Response	Pass
CRC Error Check For Command	Pass
CRC Error Check For Response	Pass
CRC Error Check For Data(Digital)	Fail

PGY-MMC-SD Datasheet

Tektronix Oscilloscopes Supported

- DPO/MSO5000 series
- DPO7000 series
- DPO/MSO/DSA 70000 series

Ordering Information

PGY-MMC-SD (shipment includes CD with PGY-MMC-SD Electrical Validation and Protocol Decode Software)

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About Prodigy Technovations Pvt Ltd

Prodigy Technovations Pvt Ltd (www.prodigytechno.com) is a leading global technology provider of Protocol Decode, and Physical layer testing solutions on test and measurement equipment. The company's ongoing efforts include successful implementation of innovative and comprehensive protocol decode and physical Layer testing solutions that span the serial data, telecommunications, automotive, and defense electronics sectors worldwide.

Other products

- HDMI and MHL Protocol Compliance Test Software
- UniPRO and LLI Protocol Decode Software
- UFS Protocol Decode Software
- HSI Electrical Validation and Protocol Decode Software
- I2C Electrical validation and Protocol Decode Software
- SPI Electrical Validation and Protocol Decode Software
- I2S Electrical, Audio, and Protocol Testing Software
- UART/RS232 Protocol Decode Solution
- FlexRay Protocol and SI Analysis Software
- USB2.0 Protocol Decode Software
- HSIC Protocol Decode Software
- RFFE Protocol Analysis Software
- KX/KR Ethernet DME and Line Training Analysis Software
- SSIC Protocol Analysis Software
- SPMI Protocol Analysis Software
- DigRF V4 Protocol Analysis Software

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