Keysight N8888A
Infiniium Protocol Decode Software Bundle
For Infiniium Series Oscilloscopes

Data Sheet

KEYSIGHT TECHNOLOGIES

Table of Contents

Serial buses are pervasive in today's digital designs and are used for a variety of purposes including onboard chip-to-chip communication, CPU to peripheral control, as well as for remote sensor data transfer and control.

Without intelligent oscilloscope serial bus triggering and protocol decode, it can be difficult to debug these buses and correlate data transfers with other mixed signal interactions in your system. The Keysight N8888A Protocol Decode Software Bundle for Infiniium real-time oscilloscopes offers triggering and decoding for 33 protocols.

The N8888A Protocol Decode Bundle includes the following Infiniium fixed perpetual protocol triggering and decode licenses:

1. I²C (N5391A/N5391B)
2. SPI (N5391A/N5391B)
3. RS232/UART (N5462A/N5462B)
4. eSPI (N8835A)
5. Quad eSPI (N8835A)
6. USB 2.0 (N5464A/N5464B)
7. USB 3.0 - USB 3.1 Gen 1 (N8805A/N8805B)
8. USB-PD (N8837A)
9. USB 3.0 SuperSpeed Inter-Chip (N8819A/N8819B)
10. Ethernet 10BaseT (N8825A/N8825B)
11. Ethernet 100Base-TX (N8825A/N8825B)
12. CAN (N8803C)
13. CAN-FD (N8803C)
14. LIN (N8803C)
15. FlexRay (N8803C)
16. SATA (N8801A/N8801B)
17. SAS (N8801A/N8801B)
18. PCI Express® Gen 1 (N5463A/N5463B)
19. PCI Express Gen 2 (N5463A/N5463B)
20. JTAG (N8817A/N8817B)
21. I²S (N8811A)
22. SVID (N8812A/N8812B)
23. ARINC 429 (N8842A)
24. MIL-STD-1553 (N8842A)
25. I3C (N8843A)
26. MIPI® CSI-3 (N8820A/N8820B)
27. MIPI DigRF® v4 (N8807A/N8807B)
28. MIPI D-PHY℠ (N8802A/N8802B)
29. MIPI LLI (N8809A/N8809B)
30. MIPI RFFE (N8824A/N8824B)
31. MIPI UniPRO℠ (N8808A/N8808B)
32. SPMI (N8845A)
33. UFS Universal Flash Storage (N8818A/N8818B)

N5391A/N5391B I²C

I²C specifications and characteristics	
I²C source (clock and data)	Analog channels 1, 2, 3, or 4 MSO models can additionally use digital channels D0 to D15 any waveform memory
Max clock/data rate	Any waveform memory up to 3.4 Mbps (automatic)
Auto setup	Automatically configures scope settings for proper I²C decode and protocol triggering
Triggering	Start and re-start 7-bit address
	Start and re-start 8-bit address
	Start and re-start 10-bit address
	Start and re-start 11-bit address
	Specify value for 3 fields choosing between the following: – Read or write – Address (value in HEX or binary) – Address acknowledge – Data (up to 20 bytes (specify in HEX, binary, ASCII, or decimal) – Operators include: = on 8-bit word boundaries

N5391A/N5391B SPI

SPI specifications and characteristics	
SPI protocols supported	2-wire SPI signals: Data source and clock source
	3-wire SPI signals: Data source, clock source, and chip select source
	4-wire SPI signals: Data source (MOSI), clock source, chip select source, data source (MISO)
SPI source (all signals)	Analog channels 1, 2, 3, or 4
	MSO models can additionally use digital channels D0 to D15
Max clock/data rate	Up to 50 Mbps (automatic)
Autoset	Automatically configures scope settings for proper SPI decode and protocol triggering
Decode word size	User-selectable from 4 to 32 bits
Decode bit order	User-selectable LSB or MSB
Triggering	Data length up to 200 bits
	Number of words * word size < 200 bits
	Number of words selectable up to 50
	Word size selectable from 4 to 32 bits
	Data operators include: =, OR

N5462A/N5462B RS232/UART

RS-232/UART specifications and characteristics	
UART protocols supported	RS-232
	RS-422 up to 10 Mbp/s, differential probing recommended
	RS-485 up to 10 Mbp/s, differential probing recommended
	Other UART interfaces which admit to user-specified parameters available in the application
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode
	The Infiniium 90000 Series requires E2697A hi-pod adapters for probes with 1 MΩ impedance
UART source	Analog channels 1, 2, 3, or 4
	Any waveform memory
Auto setup	Automatically configures trigger levels, measurement thresholds, memory depth, sample rate, trigger and holdoff for proper decode and triggering
Decode word size	User-selectable: 5, 6, 7, 8, or 9 bits
	Parity: Odd, even, none
Decode bit order	User-selectable: LSB or MSB
Supported baud rates	User selectable: 1.2 kb/s up to 10 Mb/s
Idle polarity	User selectable: Low or high
Triggering	User selectable: Transmit or receive
	User selectable data length: 1 to 13 words (each word takes 2 trigger symbols)
	Word size selectable from 5 to 9 bits
	Enter trigger in HEX, binary, decimal or ASCII

N8835A eSPI and Quad eSPI

eSPI specifications and characteristics	
eSPI protocols supported	Single mode – Clock, Chip select, MOSI, MISO, Alert# (optional) 3
	Dual mode – Clock, Chip select, I/O[0], I/O[1], Alert# (optional) 3
	Quad mode – Clock, Chip select, I/O[0], I/O[1], I/O[2], I/O[3], Alert#(optional) 3
eSPI source (all signals)	Analog channels 1, 2, 3, or 4
	MSO models can additionally use digital channels D0 to D15
Max clock/data rate	Up to 66 Mbps (automatic)
Autoset	Automatically configures oscilloscope settings for proper eSPI decode and protocol triggering
Triggering	Hardware-/software-based triggering on – Channel Independent Commands – Channel Independent Responses – Peripheral Channel Posted and Completion Commands – Peripheral Channel Non-Posted Commands – Peripheral Channel Completion Responses – Virtual Wire Channel Commands – Virtual Wire Channel Response – OOB Message Channel Commands – Flash Access Channel Commands – Flash Access Channel Responses – Response Status Register – Alert Event (hardware-based trigger only) – Errors (CRC error)
Protocol search	All above in triggering except Alert event

N5464A/N5464B USB 2.0

USB 2.0 specifications and characteristics	
USB 2.0 supported speeds	Low-speed (1.5 Mb/s) requires single-ended probing, supported by all 9000A and 9000 H-Series bandwidth
	Full-speed (12 Mb/s) requires single-ended probing, supported by all 9000A and 9000 H-Series bandwidth
	High-speed (480 Mb/s) (requires differential probing), recommended
	2.5 GHz bandwidth or greater models
	HSIC data only (480 Mb/s)
	HSIC data and strobe
Probing	Single-ended required for USB low- and full-speed
	Differential required for USB high-speed (recommended 1.5-GHz 1130A or higher bandwidth)
	High resistance (1 MΩ) required for HSIC strobe (ex: N2796A)
D+ and D- data sources	Analog channels 1, 2, 3, or 4
	Any waveform memory
	For low- or full-speed USB protocol, MSO models can additionally use digital channels D0 to D15
Auto Setup	Automatically conigures trigger levels, measurement thresholds, Volts/div, vertical offset, memory depth, sample rate, trigger and holdoff for proper decode and triggering
Probing location requirements	General recommendation: keep cable lengths as short as possible
	High-speed (480 Mb/s) differential probing, recommend using cable lengths as short as possible
	Full-speed (12 Mb/s) single ended probing, must probe signals to be analyzed near the receiver of the transaction (far-end location)
	HSIC Data (480 Mb/s), must probe signals near the receiver of the transaction (far-end location). Probe impedance is not critical
	HSIC Strobe (480 Mb/s), must probe signals near the receiver of the transaction (far-end location) and should be probed in same location as HSIC Data. Probe must be high impedance (ex: N2796A) due to weak pull-up on Strobe during electrical idle
Trigger types	Token selections: – Any token, OUT, IN, SOF, or SETUP – AND-ing of user deined value for up to three of the following – PID check, address, endpoint, or CRC
	Data selections: – DATA0, DATA1, DATA2, MDATA – AND-ing for user deined value for PID check, payload, and CRC values
	Handshake selections:
	– Any handshake, ACK, NAK, NYET, STALL
	– User selectable PID check value for handshakes
	Special selections – Any special – Reserved with user selectable PID check value – Split with AND-ing of three of the following – PID check with user selectable value – Address with user selectable value – SC with choice of SSPLIT or CSPLIT – Port with user deined value – S with choice of full speed or low speed – ET with choice of isochronous, bulk, or interrupt – CRC with user deined value
	PING: AND-ing of user deined values for three of the following
	PID check, address, endpoint, CRC
	PRE/ERR with user deined PID check value
	Error selections – Any error, PID error, bad 5-bit CRC, bad 16-bit CRC

N8805A/N8805B USB 3.1 Gen 1

USB 3.1 Gen1 specifications and characteristics	
USB 3.1 Gen 1 sources	Analog channels 1,2,3, or 4
	Any function and waveform memories
Data rate	5 Gbps
Probing	Differential required for USB 3.0 active traffic
Auto Setup	Automatically configures trigger levels, measurement thresholds, Volts/div, vertical offset, memory depth, sample rate, trigger and holdoff for proper decode and triggering
Triggering	Any Packet
	Order Sets
	Link Commands
	Header Packets
	Link Management Header Packets
	Transaction Header Packets
	Data Packet Payload
	Symbol Sequence
	Errors

N8837A USB-PD

USB-PD specifications and characteristics	
USB-PD protocols supported	USB PD R2.0 V1.0 USB PD R3.0 V1.1
USB-PD sources	Analog channels 1,2,3 or 4
Probing	Single-ended
Triggering	Ordered Sets – Any Ordered Set – SOP – SOP Prime – SOP Double Prime – Hard Reset – Cable Reset – SOP prime Debug – SOP Double Prime Debug
	Control Packets – Any Control Packet – GoodCRC – GotoMin – Accept – Reject – Ping – PS_RDY – Get_Source_Cap – Get_Sink_Cap – DR_Swap – PR_Swap – VCONN_Swap – Wait – Soft Reset
	Data Packets – Any Data Packet – Source Capabilities – Request – BIST Reciever Mode – BIST Transmit Mode – Returned BIST Counters – BIST Carrier Mode 0, 1, 2, or 3 – BIST Eye Pattern – BIST Test Data – BIST – Sink Capabilities – Vendor Defined
	Errors – Any Error – Bad 32-bit CRC – Invalid OS – Invalid 5b code – Sampler Error – Preamble Error

N8819A/N8819B USB 3.0 SuperSpeed Inter-Chip (SSIC)

USB 3.0 SSIC specifications and characteristics	
SSIC sources	Analog channels 1, 2, 3, or 4
	Any function and waveform memories
Data rate	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
	Up to 11.6 Gbps
Protocol type	SuperSpeed Inter-Chip (SSIC) v1.0
Auto setup	Automatically configures oscilloscope settings for proper SSIC decode and software-based protocol search including memory depth, edge triggering, holdoff, sample rate and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	Ordered sets
	Link commands
	Packets
	Link management packets
	Transaction packets
	Device notification transaction packets
	Data packets
	Isochronous timestamp packets
	SSIC RRAP packets
	Control
	Symbol sequence
	Errors

N8825A/N8825B Ethernet 10BaseT/ 100Base-TX

Ethernet specifications and characteristics	
Ethernet Sources	Analog channels 1, 2, 3, or 4
	Any function and waveform memories
Data Rate	Up to 100 Mb/s
Autoset	Automatically configures oscilloscope settings for proper Ethernet 10BaseT/ 100Base-TX decode and software-based protocol search including memory depth, edge triggering, holdoff, sample rate and measurement thresholds
Decoded Packet Types	MAC destination addresses – MAC source addresses – MAC length/type – Data – IPv4 header – IPv6 header – UDP header – TCP header – Frame check sequence – FCS – Cyclic redundancy check -CRC – End of packet – Error – 802.1Q
Triggering	All decoded packet types and errors
Protocol Search	All decoded packet types and errors

N8803C CAN/CAN-FD

CAN specifications and characteristics	
CAN sources	Analog channels 1, 2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
CAN data rate	100 bp/s up to 1 Mb/s
CAN-FD data rate	1 Mb/s to 10 Mb/s
Signal type	Differential (L-H), CAN_L, or CAN_H
Auto setup	Automatically configures scope settings for proper CAN decode and SW-based protocol triggering including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	Start of frame
	Data frame (frame containing node data for transmission) user specified value for data byte 0 in hex, binary, or decimal
	Immediately followed by data byte specified in hex, binary, or decimal
	Remote frame (frame requesting the transmission of a specific identifier)
	User specified identifier in hex, binary, or decimal
	Data or remote frame
	Error frame (frame transmitted by any node detecting an error)
.dbc support	Import of industry-standard .dbc files for symbolic trigger and decode Maximum number of messages = 256

N8803C LIN

LIN specifications and characteristics	
LIN sources	Analog channels 1, 2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
Data rate	2400 bp/s to 625 kb/s
Auto setup	Automatically configures scope settings for proper LIN decode and SW-based protocol triggering including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds, and clock recovery
Decoded fields	All. Supports LIN versions 1.3, 2.0, and 2.1
Triggering (software-based)	LIN packets, including user-specified values for ID, parity, and payload wakeup, or errors including: parity, check, sync, frame length, header length or wakeup

N8803C FlexRay

FlexRay specifications and characteristics	
FlexRay sources	Analog channels 1, 2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
Data rate	Up to 20 Mb/s
Cycle time	100 ns up to 100 ms
Auto setup	Automatically configures scope settings for proper FlexRay decode and SW-based protocol triggering including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds, and clock recovery
Decoded fields	All
Triggering (software-based)	Cycle TSS Any TSS User specified frame ID in hex, decimal, or binary, All cycles Repetition factor of 1, 2, 4, 8, 16, 32, or 64 Base cycle (decimal)

N8801A/N8801B SATA/SAS

SATA/SAS specifications and characteristics	
SATA/SAS sources	Analog channels 1,2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode
Data rate	1.5 Gb/s, 3.0 Gb/s and 6 Gb/s
Signal type	Single-ended, Differential
Auto setup	Automatically configures scope settings for proper SATA/SAS decode and SW-based protocol triggering including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	Start of frame
	Data frame (frame containing node data for transmission)
	User specified value for data byte 0 in hex, binary, or decimal
	Immediately followed by data byte specified in hex, binary, or decimal
	Remote frame (frame requesting the transmission of a specific identifier)
	User specified identifier in hex, binary, or decimal
	Data or remote frame
	Error frame (frame transmitted by any node detecting an error)

N5463A/N5463B PCI Express Gen 1

PCIe® Gen 1 specifications and characteristics	
PCIe sources (data and clock)	Analog channels 1, 2, 3 or 4 or any waveform memory
PCIe	Gen 1 (2.5 Gb/s) x1 (bi-directional), can monitor x4, x8 or x16 one lane at a time
Auto setup	Automatically configures trigger levels, measurement thresholds, clock recovery, memory depth, sample rate, trigger and holdoff for proper decode and triggering
Decode	Scrambled and unscrambled data symbols (control symbols are never scrambled)
	Control symbols
	Ordered Sets
	Data link and transaction layer packets including – Header Fields – Data Payload
Triggering	Packets
	DLLP packets- Ack, nak, PM-enter L1, PM-enter L23, PM-active state request L1, PMrequest ack, vendor specific, InitFC1-P, InitFC1-NP, InitFC1-Cpl, InitFC2-P, InitFC2-NP, InitFC2-Cpl, UpdateFC-P, UpdateFC-NP, UpdateFC-Cpl
	TLP packet
	3DW packets- Memory read request, Memory request locked, I/O read request, Configuration read type 0, type 1, completion, Completion without data, with data, Lck mem read, No data, Memory write request, I/O write request, Configuration write type 0, type 1, Completion for Lck memory read
	4DW Packets
	Memory read or write request
	Memory request locked
	Msg
	Routed to root complex
	Routed by address
	Routed by ID
	Broadcast from root complex
	Local terminate at receiver
	Gathered and routed to root complex
	MsgD
	Routed to root complex
	Routed by address
	Routed by ID
	Broadcast from root complex
	Local terminate at receiver
	Gathered and routed to root complex
	Symbol sequence- enter as K-codes, HEX, binary or decimal
	Errors- Bad 16B CRC, bad LCRC, bad ECRC, bad packet, zero field is nonzero
	Ordered sets- SKP ordered set, Fast training sequence, Electrical idle ordered set,
	Electrical idle exit sequence, TS1 training sequence, TS2 training sequence, modified compliance pattern, delayed modification compliance pattern, compliance pattern, delayed compliance pattern
Probing	Keysight recommends qty. 2 5-GHz or greater InfiniiMax differential probes (1132A)

N5463A/N5463B PCI Express Gen 2

PCIe Gen 2 specifications and characteristics	
PCIe sources (data and clock)	Analog channels 1,2,3 or 4 or any waveform memory
PCIe	Gen 2 (up to 5 Gbps (automatic))
Auto Setup	Automatically configures trigger levels, measurement thresholds, clock recovery, memory depth, sample rate, trigger and holdoff for proper decode and triggering
Decode options	Symbol display formats
	Hex
	K/D codes
	Label
	Decimal
	Maximum number of directions (2)
Triggering	Packet types
	Ordered sets
	Packets
	DLLP packets
	TLP packets
	3DW packets
	4DW packets
	Symbol sequence
	Errors
	Packet set type
	SKP ordered set
	Fast training sequence
	Electrical Idle ordered set
	Electrical Idle exit set
	TS1 training sequence
	TS2 training sequence
	Modified compliance pattern
	Delayed modified compliance pattern
	Compliance pattern
	Delayed compliance

N8817A/N8817B JTAG

JTAG specifications and characteristics	
Protocols supported	TCK, TMS, TDI, and TDO. TRST can additionally be acquired by a spare scope or digital channel but is not used for protocol decode
JTAG Sources	Analog channels 1, 2, 3, or 4
	Digital channels 0 through 15
	Any waveform memory
Speeds	All (up to bandwidth of scope)
	TAP state, instruction registers, data registers, length, and data values
	Edge trigger typically used on channel acquiring TMS signal
	Searching and trigger
	Idle Select DR
	Reset Exit DR
	Capture IR
	Shift/pause DR TDI
	Shift/pause IR TDI
	Shift/pause DR TDO
	Shift/pause IR TDO
	Exit1 DR
	Exit1 IR
	Pause DR
	Pause IR
	Exit 2 DR
	Exit 2 IR
	Update DR TDI
	Update IR
	Update DR TDI
	Update DR TDO
	Update DR TDO

N8811A I²S

I²S specifications and characteristics	
I²S protocols supported	Standard I²S, left-justified, right-justified, TDM
I²S source	Analog channels 1, 2, 3 or 4
	Digital channels D0 to D15 (on MSO models)
	Waveform memories
Configuration options	Transmitted/Received word size (4 to 32)
	Alignment – Standard I²S, left-justified, right-justified, or TDM
	Word select/Frame sync edge direction – Rising or falling
	Clock edge direction – Rising or falling
	Display base – Hex, signed decimal, or binary
Triggering	I²S protocol triggering
	Errors – Transmitted word size error – Any error
	I²S packet – = (Equal to entered data value) – ≠ (Not equal to entered data value) – < (Less than entered data value) – > (Greater than entered data value) – >< (Within range of entered data values) – <> (Out of range of entered data values) – Increasing value that crosses armed (<=) and trigger (>=) entered data values – Decreasing value that crosses armed (>=) and trigger (<=) entered data values
Autoset	Automatically configures oscilloscope for proper I²S decode and protocol triggering

N8812A/N8812B SVID

SVID specifications and characteristics	
SVID sources	Analog channels 1, 2, 3, or 4
	MSO models can additionally use digital channels D0 to D15 any waveform memory
Maximum frequency	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode
Signal type	Single ended
Auto setup	Automatically configures scope settings for proper SVID decode and SW-based protocol triggering including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering	Packet types
	Set
	Get
	Set rejected
	Get rejected
	Errors

N8842A ARINC 429

ARINC 429 specifications and characteristics	
ARINC 429 input source	Analog channels 1, 2, 3 or 4
	Waveform memories
Decoded word format	Label/SSM/data/SDI
	Label/SSM/data
	Label/data
Baud rates	High (100 kb/s)
	Low (12.5 kb/s)
	User-defined
Signal type	Differential (A-B)
	Line A (non-inverted)
	Line B (inverted)
Triggering	ARINC 429 packet – Label, SDI, data, SSM, parity
	Label range
	Bits specific – Word start, word stop, all 0 bits, all 1 bits, all bits
	Errors – Any error, gap error, parity error, word error, word or gap error
Display	Label – Octal
	SDI – Binary
	Data – Hex, decimal, binary, ASCII
	SSM – Binary
	Errors – Text

N8842A MIL-STD-1553

MIL-STD-1553 specifications and characteristics	
MIL-STD-1553 protocols supported	MIL-STD-1553A and MIL-STD-1553B
MIL-STD-1553 input source	Analog channels 1, 2, 3 or 4
	Waveform memories
Triggering	Command/status word – RTA, data, parity
	Data word – Data, parity
	Specific events – Data word start/stop, command/status word start/stop
	Errors – Any error, parity error, manchester error, sync error
Display	Remote terminal address (RTA) – Hex
	Data - Hex, decimal, binary, ASCII

N8843A I3C

I3C specifications and characteristics	
I3C protocol supported	Legacy I2C standard mode, fast mode, fast mode+ (plus)
	I3C SDR (standard data rate)
	I3C HDR-DDR (double data rate)
I3C source (SDA, SCL)	Analog channels 1, 2, 3, or 4
	Digital channels D0-D15 (on MSO models)
	Waveform memories
Data rate	Up to 12.5 MHz
Triggering/Search	Start/Restart
	Stop
	Legacy I2C message
	Typical I3C SDR message
	I3C SDR broadcast message
	I3C SDR direct message
	Errors
Configuration option	Legacy I2C configuration

N8820A/N8820B MIPI CSI-3

MIPI DigRF v4 specifications and characteristics	
MIPI CSI-3 sources	Analog channels 1, 2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
Data rate	Up to 5.83 Gbps
Protocol type	Camera Serial Interface version 3.0 (CSI-3)
Auto setup	Automatically configures scope settings for proper MIPI CSI-3 decode and SW-based protocol search including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	Host to target transactions
	Target to host transactions
	Symbol sequence
	Errors

N8807A/N8807B MIPI DigRF v4

MIPI DigRF v4 specifications and characteristics	
MIPI DigRF v4 sources	Analog channels 1, 2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
Data rate	Up to 5.83 Gbps
Protocol type	DigRF v4 v1.00.00
Auto setup	Automatically configures scope settings for proper MIPI DigRF v4 decode and SW-based protocol search including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	DLC frame
	SDLC frame
	Tx frames
	Rx frames
	Symbol sequence
	Error

N8802A/N8802B MIPI D-PHY

MIPI D-PHY specifications and characteristics	
MIPI D-PHY sources	Analog channels 1, 2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
Data rate	Up to 2500 Mb/s
Protocol type	CSI-2 v1.00, DSI v1.01, DSI v1.02, DCS v1.02
Auto setup	Automatically configures scope settings for proper MIPI D-PHY decode and SW-based protocol triggering including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	Short Packet
	Long Packet
	Low-Power Data Transmission
	Errors
	Any Error
	Bad 166 CRC
	Bad 86 ECC

N8809A/N8809B MIPI LLI

MIPI LLI specifications and characteristics	
MIPI LLI sources	Analog channels 1, 2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
Data rate	Up to 5.83 Gbps
Protocol type	LLI v1.0
Auto setup	Automatically configures oscilloscope settings for proper MIPI LLI decode and software-based protocol search including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	PA message
	Service transactions
	DL message
	LLI transactions
	Head-of-burst
	Tail-of-burst
	NACK
	Symbol sequence
	Error

N8824A/N8824B MIPI RFFE

MIPI RFFE specifications and characteristics	
MIPI RFFE sources	Analog channels 1, 2, 3, or 4
	Any math functions and waveform memories
	Digital channels on MSO model
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode
Data rate	Up to 26 MHz
Protocol type	RFFE v1.10 and v2.0
Auto setup	Automatically configures oscilloscope settings for proper MIPI RFFE decode and software-based protocol search including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	Any command frame
	Extended register read
	Extended register write
	Extended register read long
	Extended register write long
	Register read no response
	Extended register read no response
	Extended register read long no response
	Register write
	Register read
	Register 0 write
	Error

N8808A/N8808B MIPI UniPro

MIPI UniPro specifications and characteristics	
MIPI UniPro sources	Analog channels 1, 2, 3, or 4
	Any waveform memories
	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
Data rate	Up to 5.83 Gbps
Protocol type	UniPro v1.41 and v1.61
Auto setup	Automatically configures scope settings for proper MIPI UniPro decode and software-based protocol search including memory depth, edge triggering, holdoff, sample rate, and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	All including extended frame format
	L2 frames
	PACP frames
	Triggers
	Symbol sequence
	Errors

N8845A SPMI

SPMI specifications and characteristics	
SPMI protocol supported	SPMI v1.0
	SPMI v2.0
SPMI source (SCLK, SDATA)	Analog channels 1, 2, 3, or 4
	Digital Channels D0 to D15 (on MSO models)
	Waveform memories
Data rate	Up to 26 MHz
Configuration option	GSID (Group Slave ID)
Triggering/Search	Reset
	Sleep
	Shutdown
	Wakeup
	Authenticate (No response)
	Master Read (No response)
	Master Write
	Transfer Bus Ownership (No response)
	Device Descriptor Block Master Read
	Device Descriptor Block Slave Read
	Register Write/Read
	Extended Register Write/Read
	Extended Register Write/Read Long
	Register 0 Write

N8818B UFS Universal Flash Storage

UFS specifications and characteristics	
UFS sources	Analog channels 1, 2, 3, or 4
	Any function and waveform memories
Data rate	The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode. Differential probing may be required
	Up to 5.83 Gbps
Protocol type	JEDEC UFS v1.1 and v2.0
Auto setup	Automatically configures oscilloscope settings for proper UFS decode and software-based protocol search including memory depth, edge triggering, holdoff, sample rate and measurement thresholds
Decoded fields	All including extended frame format
Triggering (software-based)	Host to target transactions
	Target to host transactions
	Symbol sequence
	Errors

www.axiestandard.org

AdvancedTCA® Extensions for Instrumentation and Test (AXIe) is an open standard that extends the AdvancedTCA for general purpose and semiconductor test. The business that became Keysight was a founding member of the AXIe consortium. ATCA®, AdvancedTCA®, and the ATCA logo are registered US trademarks of the PCI Industrial Computer Manufacturers Group.

www.lxistandard.org

LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. The business that became Keysight was a founding member of the LXI consortium.

www.pxisa.org

PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.

Download your next insight

Keysight software is downloadable expertise. From first simulation through first customer shipment, we deliver the tools your team needs to accelerate from data to information to actionable insight.

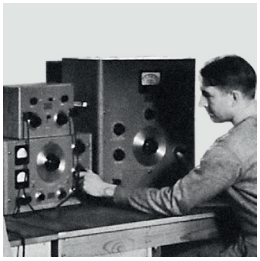
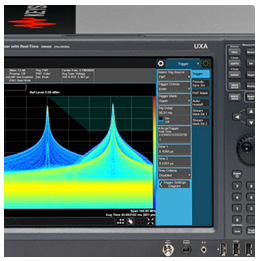
- Electronic design automation (EDA) software
- Application software
- Programming environments
- Productivity software

Learn more at
www.keysight.com/find/software

Start with a 30-day free trial.
www.keysight.com/find/free_trials

Evolving Since 1939

Our unique combination of hardware, software, services, and people can help you reach your next breakthrough. We are unlocking the future of technology.
From Hewlett-Packard to Agilent to Keysight.


myKeysight

myKeysight

www.keysight.com/find/mykeysight
A personalized view into the information most relevant to you.

www.keysight.com/find/emt_product_registration
Register your products to get up-to-date product information and find warranty information.

KEYSIGHT SERVICES
Accelerate Technology Adoption.
Lower costs.

Keysight Services

www.keysight.com/find/service
Keysight Services can help from acquisition to renewal across your instrument's lifecycle. Our comprehensive service offerings—one-stop calibration, repair, asset management, technology refresh, consulting, training and more—helps you improve product quality and lower costs.

CALIBRATION UP TO 10 YEARS WARRANTY
ASSURANCE PLANS

Keysight Assurance Plans

www.keysight.com/find/AssurancePlans
Up to ten years of protection and no budgetary surprises to ensure your instruments are operating to specification, so you can rely on accurate measurements.

Keysight Channel Partners

www.keysight.com/find/channelpartners
Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/N8888A

KEYSIGHT TECHNOLOGIES

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:
www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 11 2626
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353 Opt. 1 (DE) Opt. 2 (FR) Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
(BP-9-7-17)

DEKRA Certified
ISO9001 Quality Management System

www.keysight.com/go/quality
Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2015
Quality Management System

Published in USA, December 1, 2017
5992-2512EN
www.keysight.com