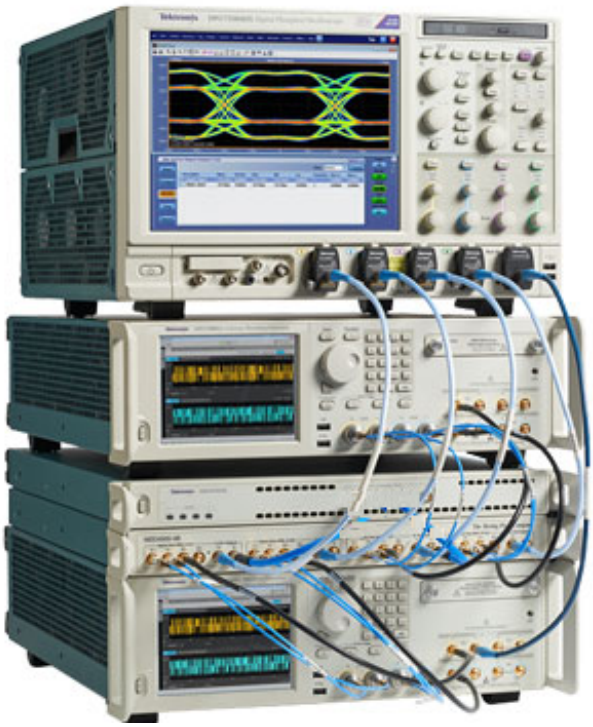
C-PHY Transmitter, Receiver, and Protocol Solution

C-PHY TX Essentials, C-PHYXpress, TMPC-CPHYVIEW, and Moving Pixel Datasheet



Tektronix C-PHY TX Essentials, C-PHYXpress, TMPC-CPHYVIEW, and Moving Pixel C-PHY Protocol solution provides one stop comprehensive C-PHY solution for conformance and characterization of Transmitter, Receiver, and Protocol Test requirements as per MIPI standards. C-PHY TX Essentials solution provides easy way to debug and characterize C-PHY data links. C-PHY TX application allows you to select electrical and timing measurements, as defined in MIPI C-PHY v1.0 specification.

Key features

Transmitter testing:

- Supports de-embed and embed feature for three-port on either side (6-port parameter support for de-embedding)
- Measures the rise time and fall time of the DUT C-PHY signals.
- Performs both eye height and eye width measurements, and also verifies the eye diagram on C-PHY signals.
- Verifies that the static point common mode voltage VCPTX of the trio signal is within the transmitter limit.
- Verifies that the common-mode voltage mismatch (ΔVCMTPX) of the DUT Data Lane HS transmitter is less than the maximum conformance limit.
- Verifies that the common-mode level variation is between 50 MHz to 450 MHz.
- Verifies that the common-mode level variation is above 450 MHz.
- Measures the Intra-pair skew of the trio signal.
- Modifies limits in TekExpress for debug and characterization.

Receiver testing:

- Simplified Receiver test setup:
  - Single setup to generate signal for C-PHY and D-PHY.
  - Easy to calibrate and provide repeatable results.
  - Direct synthesis method helps to create all types of stress with a single box.
- Test Coverage

  100% Test coverage. C-PHYXpress application allows you to create C-PHY standard conformant test signals up to C-PHY v1.1 specifications.
- Signal Fidelity

  Best-in-class AWG70000 Series with sampling rate of 50 GS/s with 10 bit vertical resolution, to provide best signal fidelity for C-PHY signal generation.
- Ease of Use

  C-PHYXpress provides batch processing to create multi-test scenarios for rigorous test requirements.

- Receiver conformance test and beyond:
  - C-PHYXpress application provides a platform to create a wide range of stimuli to test the device beyond specification.
  - Program Rise time and fall time of Data, Program ESC, LP Command along with Programmable Stress as mentioned below:
    - HS mode stressors
    - Random jitter and deterministic jitter
    - Embed insertion loss and de-emphasis
    - Duty cycle distortion
    - LP mode stressors
    - e_{Spike} and minimum pulse T_{MIN-RX}
    - Set up/hold time tolerance
    - Real-time skew control
- Offline signal generation

  C-PHYXpress application can work in offline mode or from PC, to control the AWG remotely and generate C-PHY signals.

Moving Pixel C-PHY Protocol Generator and Decoder:

C-PHY Protocol Generator:

- Stand-alone instrument with simplified setup and operation.
- Supports MIPI C-PHY signaling up to 2.5 Gbps-per-lane, for 1 to 4 lanes.
- Provides independent channel and real time adjustments for voltage and skew.
- Supports up to C-PHY v1.0, CSI2 v1.3, and DSI v1.2 protocols.
- Provides automated video sequence construction according to the user-defined frame timing.
- Implements automatic image scaling, format conversion, and simple test pattern generation.
- Supports multi-message response capture using 4 KB buffer.
- Includes DSC binary support; optional DSC image compression support available.
- Provides scripting and remote-control capability using .NET DLL.

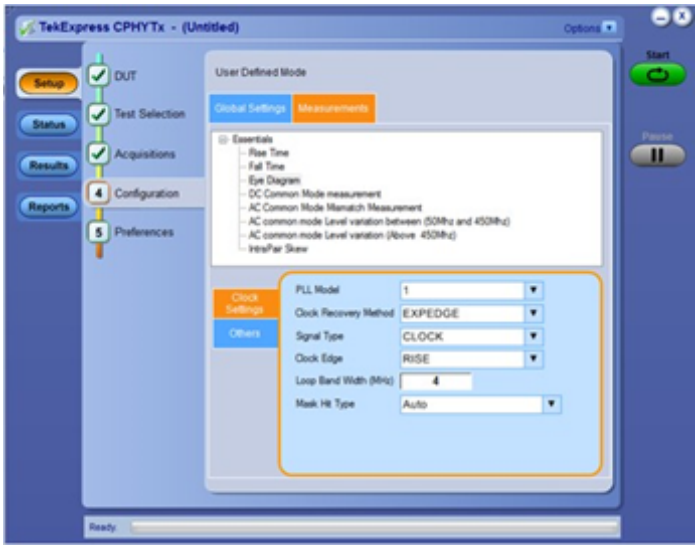
Oscilloscope based C-PHY Protocol Decode:

- Supports decode of single MIPI C-PHY lane up to 2.5 Gbps.
- Decodes and displays CSI2 v1.2 or DSI2 v1.0 protocol packets, and C-PHY v1.1 signaling states/symbols.
- DSI support does not include DSC, LPDT, BTA, or peripheral command decoding.
- Cursors on oscilloscope linked to both directions of the decode window.
- Provides search and display filtering capabilities.
- Decodes, displays, and exports (under user control) captured video frames.

Applications

- Automotive camera and display
- Mobile camera and display
- Camera CMOS Image sensors
- Display Driver ICs
- Application processor for mobile devices

MIPI C-PHY transmitter test

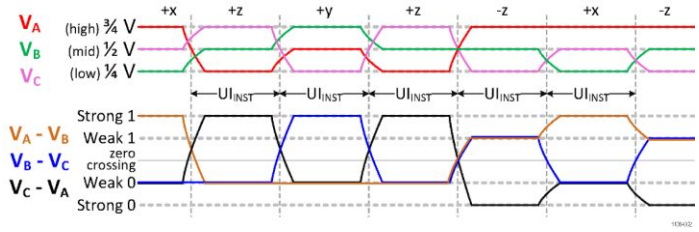


MIPI ® C-PHY v1.0 provides throughput high performance over bandwidth limited channels for connecting to peripherals, including displays and cameras. This interface allows the system designers to easily scale the existing MIPI ® Alliance Camera Serial Interface (CSI-2) ecosystem to support higher resolution image sensors with less power consumption.

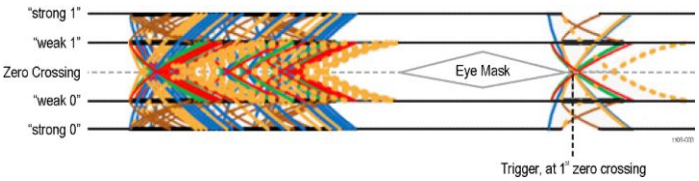
MIPI ® C-PHY and MIPI ® D-PHY are pin compatible, allowing connections to the companion device with either technology. C-PHY was designed to coexist on the same IC pin as D-PHY so that dual-mode devices can be developed.

MIPI C-PHY introduces 3-phase symbol encoding offering 2.28 bits per symbol to transmit data symbols on 3-wire lanes or trios, where each trio includes an embedded clock.

C-PHY signals have three levels and they are single-ended. They are represented as LineA, LineB, and LineC. At any given point in time, no signals are at the same voltage levels. The receiver side is differential and displays four different voltage levels; Strong 1, Weak 1, Strong 0, and Weak 0. The receiver however views either logic 1 or logic 0.



Voltage levels



Eye mask

C-PHY clock recovery

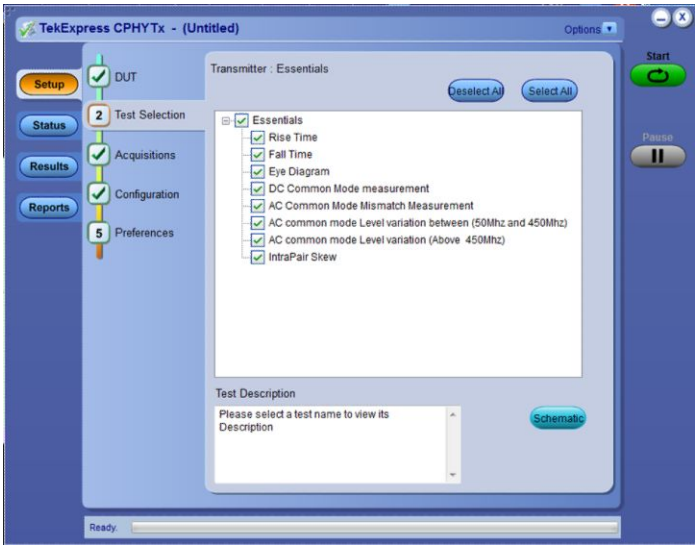
C-PHY uses a unique mechanism for clock recovery. C-PHY 1.0 implements a custom clock recovery algorithm referred to as *Triggered Eye*. In this model, the first zero crossing of the four differential signals is used as a trigger point for clock recovery and to render the eye diagram.

The eye mask is optimally placed for maximum eye opening where the eye height is measured. Because of the triggered eye mechanism, all jitter at the trigger point (zero crossing) is allowed and reflected on the other side. Refer to the previous *Eye mask* figure.

C-PHY transmitter test measurements

For characterization, debugging, and margin testing some of the key measurements required in the High Speed mode include:

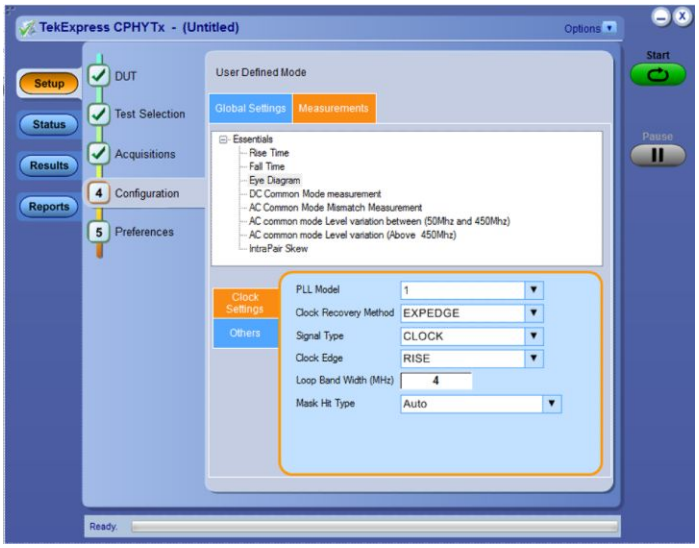
- Rise time
- Fall time
- Eye diagram
- AC common mode measurement
- DC common mode mismatch measurement
- AC common mode level variation from 50 MHz to 450 MHz
- AC common mode level variation above 450 MHz
- Intra-pair skew



C-PHY TX Essentials

Custom-triggered eye diagram

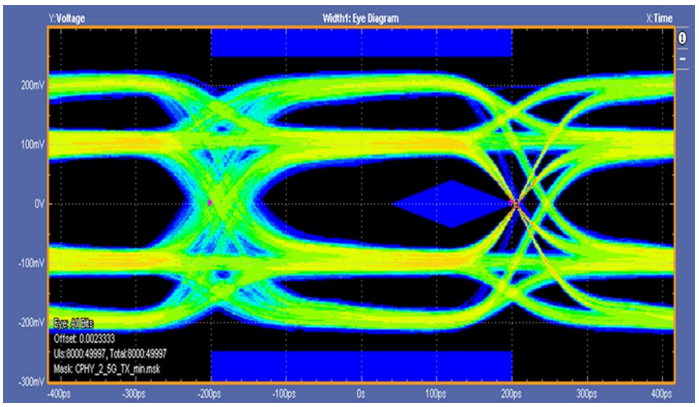
The following figure displays the C-PHY TX Essentials Test software being configured for a custom-triggered eye diagram, with auto mask position for optimal mask placement.



C-PHY TX Essentials

Eye diagram analysis for 3M UI

The Jitter and Eye diagram rendering performed over the entire record length helps designers to characterize the devices better by displaying anomalies of the device over an extended period. The software allows you to run the eye diagram analysis for 3M UI and overnight run for a detailed characterization.



Eye diagram analysis

Rise time/Fall time transition details

Each differential waveform has four transitions of interest, when characterizing the device:

- Strong to weak transition (S-W)
- Weak to strong transition (W-S)
- Weak to weak transition (W-W)
- Strong to strong transition (S-S)

The following figure shows the details for measuring the transitions.

Rise Time					
Measurement Details	Measured Value	Units	Test Result	Margin	Low Limit
RiseTime(S-W) of AB	140.3649	ps	Pass	110.3649	30
RiseTime(W-S) of AB	139.5112	ps	Pass	109.5112	30
RiseTime(W-W) of AB	141.4319	ps	Pass	111.4319	30
RiseTime(S-S) of AB	148.3397	ps	Pass	118.3397	30
RiseTime(S-W) of BC	130.7273	ps	Pass	100.7273	30
RiseTime(W-S) of BC	137.8409	ps	Pass	107.8409	30
RiseTime(W-W) of BC	144.7337	ps	Pass	114.7337	30
RiseTime(S-S) of BC	134.7395	ps	Pass	104.7395	30
RiseTime(S-W) of CA	1173.7167	ps	Pass	1143.7167	30
RiseTime(W-S) of CA	140.7383	ps	Pass	110.7383	30
RiseTime(W-W) of CA	133.4577	ps	Pass	103.4577	30
RiseTime(S-S) of CA	138.4778	ps	Pass	108.4778	30

Rise time transition details

Fall Time					
Measurement Details	Measured Value	Units	Test Result	Margin	Low Limit
FallTime(S-W) of AB	143.0787	ps	Pass	113.0787	30
FallTime(W-S) of AB	137.6550	ps	Pass	107.6550	30
FallTime(W-W) of AB	143.3528	ps	Pass	113.3528	30
FallTime(S-S) of AB	151.5852	ps	Pass	121.5852	30
FallTime(S-W) of BC	136.7325	ps	Pass	106.7325	30
FallTime(W-S) of BC	127.5669	ps	Pass	97.5669	30
FallTime(W-W) of BC	135.7097	ps	Pass	105.7097	30
FallTime(S-S) of BC	133.0481	ps	Pass	103.0481	30
FallTime(S-W) of CA	124.1492	ps	Pass	94.1492	30
FallTime(W-S) of CA	129.4092	ps	Pass	99.4092	30
FallTime(W-W) of CA	130.3964	ps	Pass	100.3964	30
FallTime(S-S) of CA	138.7919	ps	Pass	108.7919	30

Fall time transition details

Insertion loss and crosstalk

As part of characterizing the device, designers need to embed or de-embed insertion loss and crosstalk. This is supported using the filter files generated that uses the S4P/S6P or S-Parameter files, as shown in the following figure.

Insertion loss and crosstalk

Measuring intra-pair skew

The skew between trios, referred to as the intra-pair skew, is an informative test of interest to many design engineers. The following figure shows a report generated by the Tektronix C-PHY TX Essentials software that includes details and status of the intra-pair skew for 12 wire state combinations.

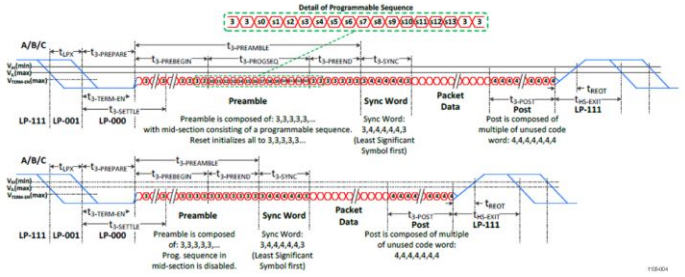
IntraPair Skew			
Measurement Details	Measured Value	Units	Test Result
IntraPairSkew X+ and X-	38.0833	ps	Pass
IntraPairSkew X- and X+	34.5023	ps	Pass
IntraPairSkew Y+ and Y-	6.7493	ps	Pass
IntraPairSkew Y- and Y+	5.2762	ps	Pass
IntraPairSkew Z+ and Z-	30.0168	ps	Pass
IntraPairSkew Z- and Z+	37.7221	ps	Pass
IntraPairSkew X+ and Y-	35.4974	ps	Pass
IntraPairSkew X- and Y+	37.6085	ps	Pass
IntraPairSkew Y+ and Z-	29.5982	ps	Pass
IntraPairSkew Y- and Z+	31.0565	ps	Pass
IntraPairSkew Z+ and X-	16.2642	ps	Pass
IntraPairSkew Z- and X+	18.0421	ps	Pass

Intra-pair skew

Signaling and termination

C-PHY signaling is similar to D-PHY. For instance, it dynamically switches from LP mode to HS Mode of the timing measurements defined for C-PHY are similar to D-PHY.

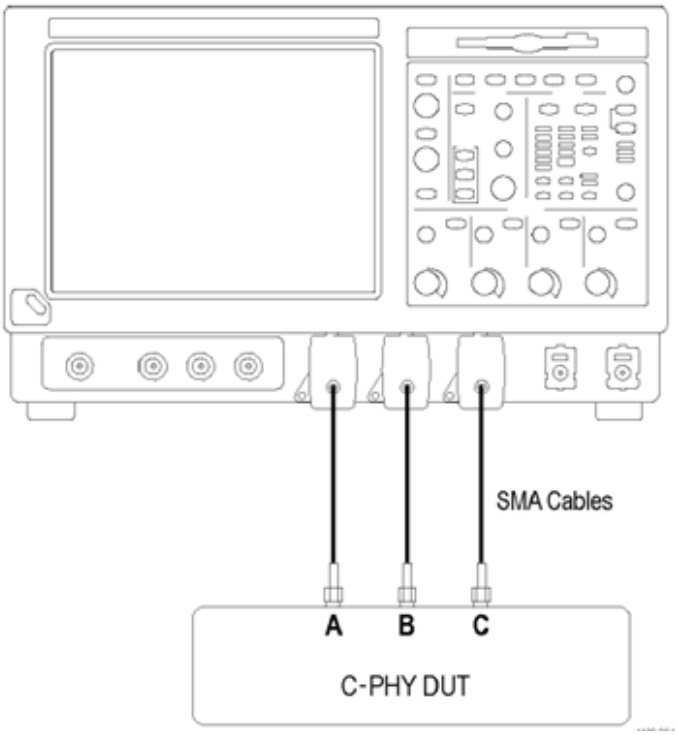
The following figure is from the MIPI Alliance C-PHY specification v1.0. It shows the structure of a C-PHY signal (HS data transmission in Burst).



C-PHY signal (HS data transmission in Burst)

To take measurements during this switchable termination mode, load boards or termination boards are needed. The physical setup for taking these measurements require an oscilloscope, probes, and a termination board.

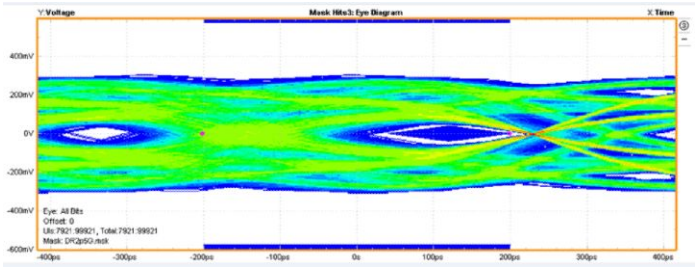
The following figure shows the physical set up for HS measurements. Termination board and probes are not required for HS measurements, you can connect SMA cables directly.



SC-PHY High Speed measurements

C-PHY Rx calibration

The primary purpose of the C-PHY TX software is for transmitter characterization; the core measurements supported by this software are designed to be used for receiver calibration. The C-PHY receiver calibration, according to the CTS, recommends calibrating the eye diagram with the predefined rise time/fall time. This calibration includes support for DCD (Duty Cycle Distortion), as an important stress parameter which drives closure of the eye. The next step includes calibrating the C-PHY signal with impairment of the DC common mode and AC common mode noise. The generation of these stresses is supported using the Tektronix AWG 70000 Series Arbitrary Waveform Generator.



C-PHY Rx calibration

P7700 probe for MIPI C-PHY (C-PHY Essentials only)

The MIPI application requires a special type of probing because of different impedances in High Speed and Low Power modes. In High Speed mode, C-PHY signals are in terminated environment. In Low Power mode, C-PHY signals are operated in unterminated environment with single-ended signals. MIPI C-PHY has two main requirements for probing:

- Provide high impedance
- Differential and single-ended mode

The P7700 Series probe (C-PHY Essentials only) provides an active buffer tip, few millimeters away from the end of tip. This provides the best signal fidelity for MIPI C-PHY application along with flexible connectivity options.

The TriMode probe helps to create differential, single-ended, and common mode measurements accurately with the probe setup. This unique capability allows you to work more effectively and efficiently, switching between differential, single-ended and common mode measurements without moving the probe's connection points.

P7700 Series TriMode probe (C-PHY Essentials only)

You can be confident in the signal fidelity of your measurements. The innovative new probe design uses SiGe Technology to provide the bandwidth and fidelity needed today and in the future.

The P7700 Series TriMode probe (C-PHY Essentials only) architecture provides:

- An active buffer amplifier on the tips with the probe input only 3.2 mm from the input
- Excellent step response and low insertion loss up to 20 GHz
- Low-DUT loading with 100 kΩ (DC) and 0.4 pF (AC) performance
- High CMRR
- Low noise

Receiver testing

The C-PHYXpress plugin creates C-PHY signals for High Speed, High Speed Burst, and Low Power content with worst-case impaired input signals.

The Receiver test solution consists of the following steps:

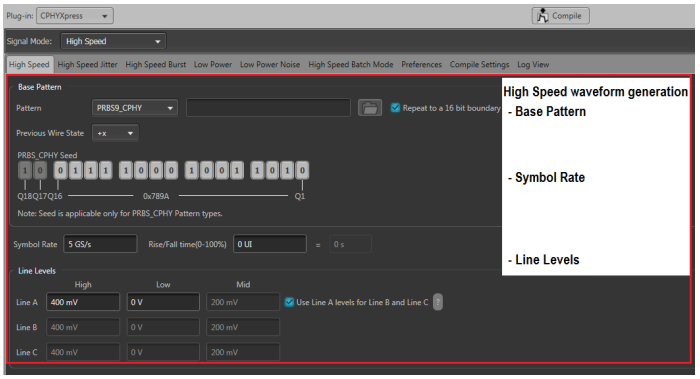
- Generate a test signal to emulate the transmitter, including channel and noise impairments.
- Calibrate the signal as per the CTS requirement.
- Set up the Device for receiver test.
- Determine the Bit Error Rate in the given test condition.

The C-PHYXpress application addresses the first two steps and are described below:

Step 1: Generate a test signal to emulate the transmitter, including channel and noise impairments

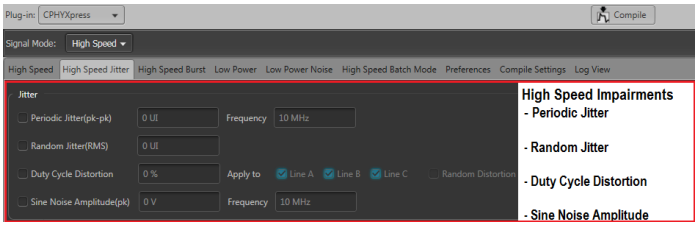
The C-PHYXpress supports waveform generation for High Speed, Low Power, and Low Power-High Speed (LP-HS) mode as per C-PHY specification v1.1.

High Speed mode: The C-PHY v1.1 specification data rate is up to 3.5 Gbps in High Speed mode. As per the CTS, you need to emulate the channel effect in High Speed mode. C-PHYXpress application allows you to edit the data rate, rise time, pattern type, voltage level, and impairments to emulate the channel effect.

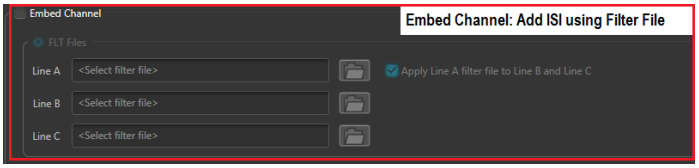


High Speed Mode

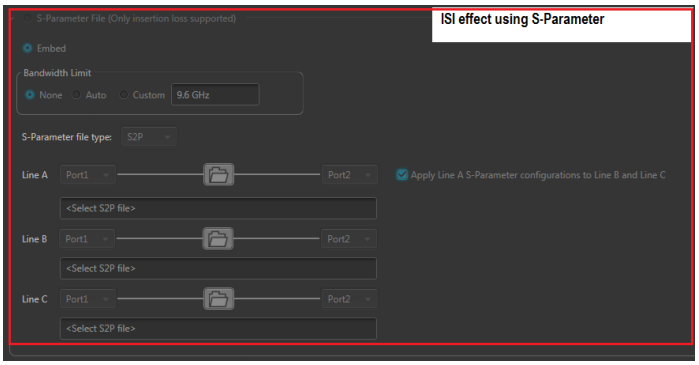
In High Speed mode, you can add various channel effects such as: Periodic Jitter (Pj), Random Jitter (Rj), Dynamic Skew (DCD), Sine Noise Amplitude, De-Emphasis, and S-Parameter file of Channel for Data signal.



High Speed with Jitter parameters



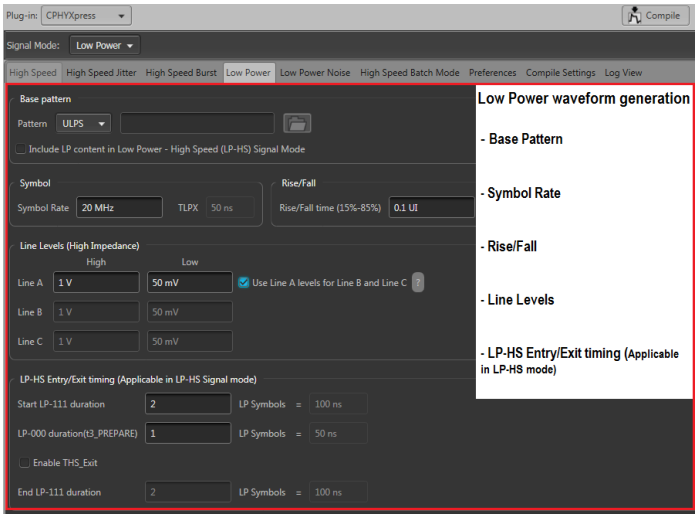
High Speed Jitter - Embed Channel effect



High Speed Jitter Mode - S-Parameter File

Low Power Mode

The C-PHY v1.1 specification data rate is up to 100 MHz in Low Power mode. The C-PHYXpress application allows you to edit the data rate, rise time, pattern type, voltage level, and impairments to emulate the channel effect.

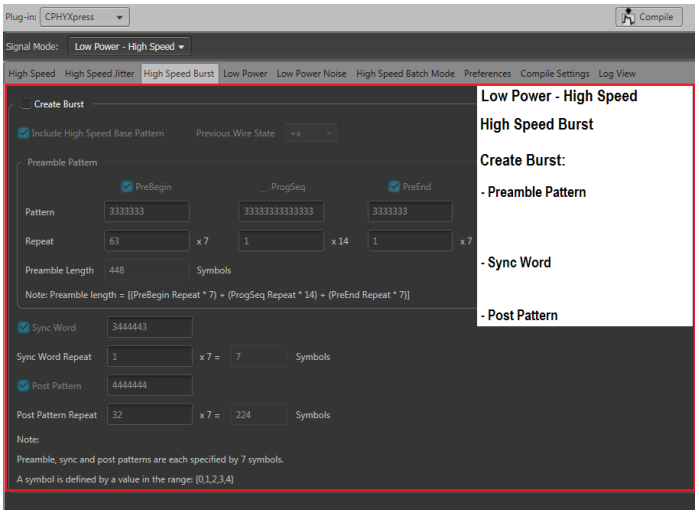


Low Power Mode

The C-PHY v1.1 specification requires Sine/Square noise with eSpike noise.

LP-HS Mode:

The C-PHYXpress allows you to add Sync Word as per the specification with the timing parameters for Data.



LP-HS Mode

Calibrate the signal as per CTS requirement:

Calibration of signal impairments provides calibration routines that are C-PHY standard specific. The objective of calibration is to compensate the patterns for specific jitter parameters. The typical parameters are Random, Periodic Jitter, and Amplitude. The procedure sequences through all the patterns and each pattern is calibrated independently. These values are used for the Jitter- controlled generation of patterns and are injected into the DUT during loopback.

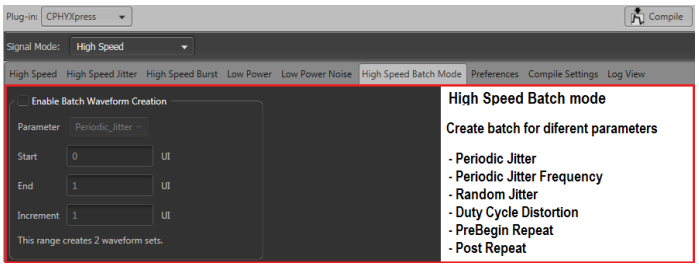
For more details regarding calibration, refer to MOI document available in http://www.tek.com/mipi-0.

Test Coverage

For more details, refer to the *Receiver test specification* table later in this document.

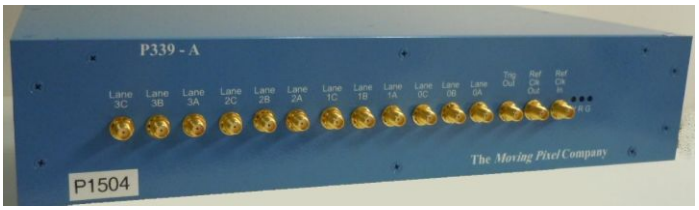
Batch Mode

Batch mode allows you to create a library of compiled waveforms with incremental jitter values with a single click.



Batch Mode

C-PHY Protocol generator



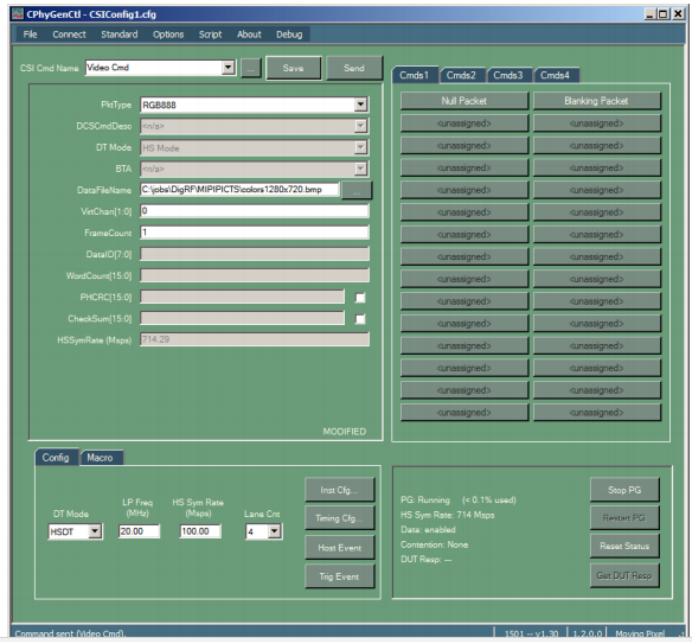
C-PHY pattern generator

The P339 is a stand-alone C-Phy Pattern Generator that features four data lanes made by The Moving Pixel Company (TMPC). Data rate operation is up to 2.5 Gb/s per wire and supports up to 12 wires. LP Voh, LP Vol, HS Voh, and Vol are adjustable. It is designed to run in conjunction with the CPhyGenCtl software.

The CPhyGenCtl application is the controlling software for the P339 CPhy Generator, made by The Moving Pixel Company (TMPC). Using the P339 C-Phy Pattern Generator, you can generate CSI protocol and pattern stimulus on a MIPI CPhy bus for receiver testing. This datasheet describes the use and operation of CPhyGenCtl and the corresponding behavior of the CPhy generator.

The CPhy generator is connected through USB to a host computer that runs the CPhyGenCtl software. It has the following capabilities:

- Supports one to four CPhy lanes, supporting frequencies up to 2.6 Gsym/s.
- Contains an internal pattern generator with 2 GB of program memory.
- Provides up to 15 ns of integer symbol lane skew, with fractional symbol lane skew below 1.5 Gsym/s.
- Provides real-time, per-lane, high and low voltage, and fine-adjustments for both LP and HS signals.
- Supports fine adjustment of CPhy bus timing.
- Provides 4 KB receive buffer for DUT LP response capture.
- Supports lane 0 LP contention detection.
- Implements arbitrary logical-to-physical lane output mapping.
- Comprehensive video support:
  - Support for 3D stereoscopic frame construction (DSI 1.2).
  - Purchase option for encoding and sending of DSC video frames (DSI 1.2).
  - Common source input image file formats (jpg, png, tiff, gif), used for both video-mode and write memory commands.
  - Automatic resizing of input images (in software) to fit the display or camera dimensions.
  - Convenient image preview function in the GUI.
  - Automated CSI/DSI video-mode frame generation based on user frame timing.
  - Automatic partitioning of a single Write Memory command into multiple Write Memory command sequences.
  - Video-mode frames can be added to the macros.
  - Video-mode frames can be constructed with a single-bit error at a given line and bit position.
- Generic file command support:
  - Uses a text file description to describe mixed low-level LP/HS transitions and packet definitions.
  - Allows arbitrary data lane signal generation for conformance testing.
  - Provides higher-level embedded commands for easy command definition, including HS burst entry and HS burst exit sequences. Includes automatic ECC and CRC generation.
- Support for low-level CPhy testing:
  - Low-level test HS burst sequences using user-defined or PRBS data.
  - Comprehensive CPhy protocol configuration for setting preamble, postamble, and sync sequences for each lane. Provides configuration for user bus timings, such as HSPreare, HSExit.
  - Flexible bus timing specification in component units of ns, UI, and TLPX, allowing for frequency agile configurations.
- Powerful and easy-to-use GUI controls for command manipulation:
  - Simple definition, naming, and sending of commands, including video-mode commands.
  - Push-button interface for assigning and organizing commands, which are available for single-click sending.
  - Macro definition for building and complex command sequences.



CPHY Gen

C-PHY oscilloscope-based decoder

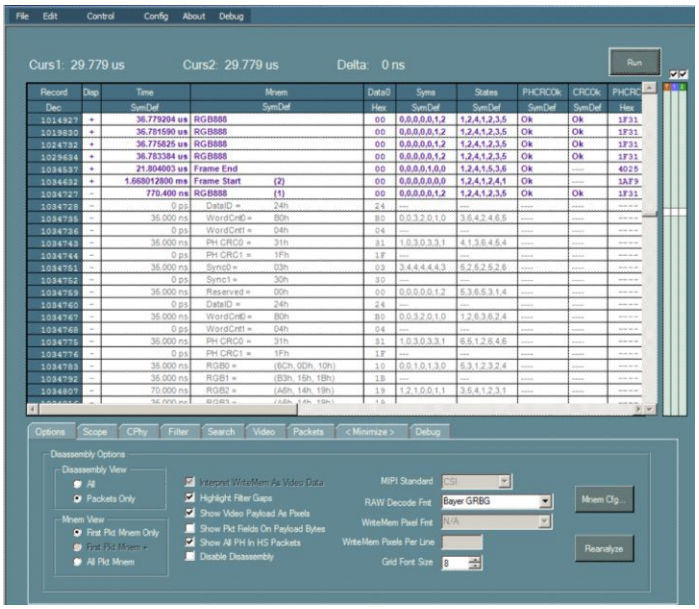
The Moving Pixel Company CPhy Scope Decoder software is a single-lane CPhy and CSI2 protocol decoder from CPhy signal acquisitions from an oscilloscope.

The software runs on a Microsoft Windows 7 host connected to the oscilloscope, using the remote-control capability of the oscilloscope to control real-time acquisition.

The main functions of this software include:

- Provides real-time oscilloscope acquisition and control of one CPhy lane using three channels. The saved binary waveform files can be loaded and disassembled.
- Post-process the acquisition data to provide DPhy/DSI/CSI2 protocol disassembly views of communication on the link.
- Provides the views which are similar in look-and-feel to a logic analyzer type display.
- Provides extensive functions and manipulations for viewing, filtering, and searching the captured data.
- Builds video frames from decoded packets, including a frame summary listing that provides statistics, navigation, viewing, and saving of images.
- Checks and reports many types of errors, including illegal state transitions, invalid symbol sequences, packet header, and payload CRC errors.
- Correlate any event in the disassembly back to acquired waveforms on the oscilloscope using the zoom window and cursors.

C-PHY Signal Capture on an oscilloscope



Frame summary

Specifications

All specifications apply to all models unless noted otherwise.

Test parameters

Test parameters

Parameter group	Parameter name	Range	Default	Units
Ref levels	Reference levels	Absolute, Percentage	Percentage	NA
	Reference level-High (%)	70 to 90 (in %) 40 to 60 (in Absolute)	80 (in %) 58 (in Absolute)	% or V
	Reference level-Low (%)	10 to 30 (in %) -60 to -40 (in Absolute)	20 (in %) -58 (in Absolute)	
	Reference level-Hysteresis (%)	5 to15 (in %) 5 to 25 (in Absolute)	10 (in %) 10 (in Absolute)	
Clock Settings	Clock recovery method	EXPEDGE EXPPLL	EXPEDGE	NA
	Signal Type	CLOCK DATA AUTO	CLOCK	
	Clock Edge	RISE FALL BOTH	RISE	
	Loop bandwidth (MHz)	1 to 10	4	MHz
	MaskHitType	Auto Manual	Auto	NA
Others	Accumulation	True False	True	NA
	Eye Height Percentage	10 to 90	50	%
	Hysteresis	5 to 15	10	%

Minimum system requirements

Operating system

Windows 7, 64-bit

Firmware

DPO/MSO TekScope v7.3.0.9 or later and DPOJET version is 6.2.1.8 and above

Software requirements

Microsoft .NET 4.0 Framework

Microsoft Excel 2002 or above

Microsoft Internet Explorer 6.0 SP1 or later

Adobe Reader 7.0 or equivalent software for viewing portable document format (PDF) files

If TekExpress is installed on a Tektronix oscilloscope, TekExpress uses a virtual GPIB port to communicate with oscilloscope applications. If external GPIB communication devices such as USB-GPIB HS or equivalent are used for instrument connectivity make sure that the Talker Listener utility is enabled in the DPO/DSA/MSO oscilloscope GPIB menu. For ease of use, connect to an external (secondary) monitor.

Transmitter test specification

C-PHY base specification	Revision 1.0
C-PHY conformance specification	Revision 1.0
Measurements	**High Speed Essentials**
1	Rise Time
2	Fall Time
3	Eye Diagram
4	DC Common Mode measurement
5	AC Common Mode Mismatch measurement
6	AC Common Mode Level Variation between 50 MHz and 450 MHz
7	AC Common Mode Level Variation above 450 MHz
8	IntraPair Skew

Receiver test specification

C-PHY conformance specification	Revision 1.1
C-PHY base specification	Revision 1.1
Group 1 tests	**LP-RX VOLTAGE AND TIMING REQUIREMENTS**
2.1.1	LP-RX Logic 1 Input Voltage (VIH)
2.1.2	LP-RX Logic 0 Input Voltage, Non-ULP State (VIL)
2.1.4	LP-RX Input Hysteresis (VHYST)
2.1.5	LP-RX Minimum Pulse Width Response (TMIN-RX)
2.1.6	LP-RX Input Pulse Rejection (eSPIKE)
Group 2 tests	**LP-RX BEHAVIORAL REQUIREMENTS**
2.2.1	LP-RX Initialization period (TINIT)
2.2.2	ULPS Exit: LP-RX TWAKEUP Timer Value
2.2.3	Data Lane LP-RX Invalid/Aborted Escape Mode Entry
2.2.4	Data Lane LP-RX Invalid/Aborted Escape Mode Command
2.2.5	Data Lane LP-RX Escape Mode, Ignoring of Post-Trigger-Command Extra Bits
2.2.6	Data Lane LP-RX Escape Mode Unsupported/Unassigned Commands
Group 3 tests	**HS-RX VOLTAGE AND JITTER REQUIREMENTS**
2.3.1	HS-RX Amplitude Tolerance (VCPRX(DC), VIHHS, VILHS)
2.3.2	HS-RX Differential Input High/Low Thresholds (VIDTH, VIDTL)
2.3.3	HS-RX Jitter Tolerance
Group 4 tests	**HS-RX TIMER REQUIREMENTS**
2.4.1	HS-RX T3-TERM-EN Duration
2.4.2	HS-RX T3-PREPARE Tolerance
2.4.3	HS-RX T3-PREBEGIN Tolerance
2.4.4	HS-RX T3-PROGSEQ Tolerance
2.4.5	HS-RX T3-POST Tolerance
Test procedure	Refer to MOI document for detailed test procedure.

Ordering information

C-PHY Essentials Transmitter Test licensing

Option	Description
Opt. C-PHY	C-PHY Essentials Transmitter Solution (Node Locked)
DPO-FL-C-PHY	C-PHY Essentials Transmitter Solution (Floating)
DPO-UP C-PHY	C-PHY Essentials Transmitter Solution
TMPC-CPHYVIEW	C-PHY Scope based Single Lane Decoder

Required instruments and accessories

Nomenclature	Description	Number
DPO/MSO70000C/DX/SX, Option DJA	6 GHz and above real-time oscilloscope	1
P7313 or P7700 (C-PHY Essentials only)	Differential active probes	3
TMPC-CTB	C-PHY termination board (supports up to 4 lanes)	1

CPHYXpress receiver setup

Model	Description
AWG70002A Options: 01/03/225 Option PRECOMFL-SS01 or PRECOMNL-SS01 on AWG	10 bit, 2 G Samples record length, two channel arbitrary waveform generator.
AWGSYNC01DPO-UP	Hub for synchronizing multiple AWGs
TMPC-MDC4500-4B	MIPI signal conditioning accessory for the AWG 70000
DPO70000C with opt DJA , Probe, and Termination Board (For calibration purpose)	6 GHz and above real-time scope is required for Calibration
CPHYNL-SSV1	C-PHY synthesis software on AWG
PSPL 5915 with Opt.100PS	100 ps Filter (SMA male-to SMA male)
SMA cables	174-6606-00
Phase-matched SMA cable	174-5771-xx

CE Marking Not Applicable.

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit www.tek.com.

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