Media Analysis Solution for Hybrid IP/SDI Infrastructure

PRISM Datasheet

PRISM provides flexible options and field-installable upgrades to monitor a diverse variety of IP statistics as well as video and audio content. The comprehensive feature set, along with an intuitive and simplified graphical presentation of IP statistics, including video quality and diagnostic information, enables engineers to ensure the delivery of superior Quality of Service (QoS) levels in an increasingly complex broadcast environment through SDI/IP signal paths. PRISM is an ideal solution for monitoring SDI/IP hybrid environments including master control rooms, production studios, OB vans, and signal contribution/distribution centers.

Features and benefits

- Comprehensive SMPTE 2110 Measurement sets:
  - SMPTE2110-10: PTP and RTP-Timestamp based “Stream timing” measurements, SDP Viewer
  - SMPTE2110-20: RTP layer monitoring and Picture decoding
  - SMPTE2110-21: Network compatibility model / Virtual receiver buffer model simulation
  - SMPTE2110-30: RTP layer monitoring and Audio decoding
  - SMPTE2110-40: RTP layer monitoring
  - SMPTE2022-7: Seamless packet reconstruction and Path 1 / 2 timing difference measurements
  - NMOS (IS-04/IS-05) and SDP (RFC4566) for discovery, registration and control
- A comprehensive analysis and monitoring tool for a hybrid IP/SDI broadcast systems that provides system evaluation for long term system quality monitoring and reporting
- Real time IP/SDI analysis and monitoring to quickly identify the issue to determine the root cause
- Graphical displays that show the traffic present in the 10G Ethernet link, allowing engineers to understand what is on their network and to easily select the stream of interest
- Select a stream to view and monitor the content using the Picture, Waveform, and Audio applications, and listen to audio with headphones for conformance monitoring
- Detect IP packet errors, monitor the packet inter arrival time (PIT) and time stamped delay factor (TS-DF) to allow engineers to observe issues that may cause intermittent loss of Video, Audio or Data
- Analysis tools coupled with historical data give engineers the ability to understand and resolve complex and intermittent problems quickly
- Monitor PTP trend graphs to ensure proper sync system setup for a robust IP system
- 1 PPS output when the instrument is locked to a PTP reference
- Tektronix patented Timing display showing the relative timing of the ST2022-6/-7 and ST2110-20 input signals against PTP reference, which makes facility timing easy
- ST2110-21 Network compatibility modeling and virtual receiver buffer modeling help engineers setup packet delivery timing in IP switches/routers and sender devices
- Simultaneous two paths monitoring to ensure proper SMPTE 2022-7 redundant system operation
- NMOS (IS-04/IS-05) discovery and registration support for interoperability in professional networked media environments
- API to control PRISM from system management software
- Multipoint or remote site monitoring allowing one engineer to quickly respond to issues from multiple points in the system
- Build an extensive monitoring solution with the SDI signal decoded from SMPTE 2022-6 streams reconstructed from streams compliant to SMPTE 2022-7
- 10GE line rate packet capture for offline analysis
- Use SDI/ST2110 test signal generation to test the basic functions of networks and receivers
- The Picture application provides a full HD, 9-inch screen that can be used for confidence monitoring
- Two-tile display mode that maximizes trace visibility
- Up to 12Gbps SDI eye-pattern/jitter demodulated waveform display with automatic eye-pattern measurements including eye amplitude,

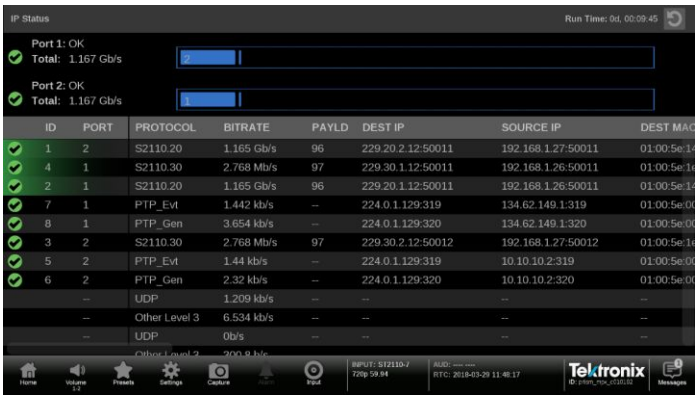
rise/fall time, and overshoot/undershoot measurements as well as jitter measurement

- All-in-one instrument using a 3RU half-rack platform (MPI) or a 1RU full-rack platform (MPX) that can be used for either portable or rack mount applications

Identify the streams in a 10G Ethernet link to set up the system properly

Engineers designing and evaluating a hybrid IP/SDI broadcast system face challenges in determining the status of the system they are building. While an SDI coax system typically carries one signal, a 10G Ethernet link can carry multiple streams and it can be difficult to determine what content is carried on each of the streams within a IP based broadcast system.

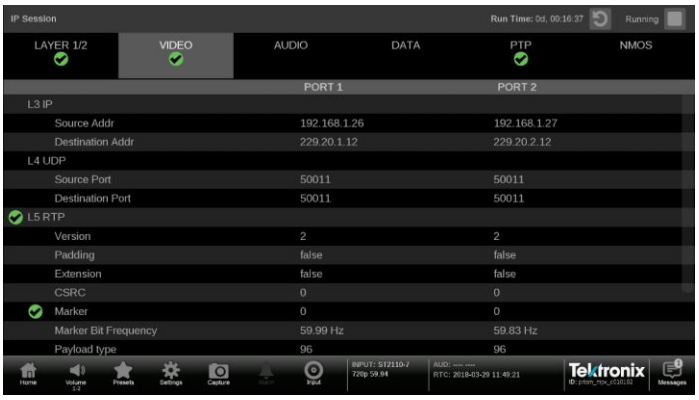
PRISM offers a range of tools to quickly identify the streams in the 10G Ethernet link and the content in each stream. The IP Status application shows the protocol, source IP address and port number, destination IP address and port number, Source MAC, Destination MAC, PTP Domain, RTP Seq Error, RTP Clock Freq, and RTP Marker Freq of all streams available in an incoming 10G Ethernet link.



IP Status application showing all streams in a 10G Ethernet link.

An engineer can view further details using the Video/Audio/Data tabs in the IP Session application, which shows the RTP header information in the selected ST2022-6 or ST2110-20/30/40 streams, including High Bit Rate Media header information for ST2022-6 stream with Green / Red LED error status. The status LED on an application tab indicates the aggregated error status for the monitored items under that tab.

An engineer can determine the number of streams available on the link as well as the quality level of each stream. The selected stream can be decoded to the Picture and Audio applications to let the engineer verify the content in the stream. The selected ST2022-6 stream can also be output through the AUX SDI output with IP/SDI conversion for an extensive monitoring solution.



IP Session application showing the RTP header information in an ST2022-7 configuration.

Monitor and verify PTP system setup to ensure genlock of equipment in the facility

In a hybrid IP/SDI broadcast system, a variety of reference signals may be used to synchronize equipment within the facility. Traditionally, black burst (BB) or tri-level sync (TLS) references have been used for this purpose. For IP networks, PTP (IEEE1588) is used for system synchronization.

PTP uses mechanisms for accurate synchronization, higher system robustness and further flexibility in the system integration. For example, the Best Master Clock Algorithm (BMCA) is used to determine the grandmaster. Another example is the communication model to choose the message transport model to convey the time stamps. However, those mechanisms work as designed only when engineers have set up the system correctly.

In the IP Status application, PRISM displays the PTP traffic with Domain information available in the 10G Ethernet link to let users quickly check for the presence of PTP messages. The PTP tab in the IP Session application provides the lock status, including the phase lag to the grandmaster, and interpretation of the PTP metadata within the Announce Message. The PTP metadata includes the Master ID, PTP time in UTC and master characteristics (clock quality, priority, etc.) to let the engineer ensure the setting of the PTP system is correct.

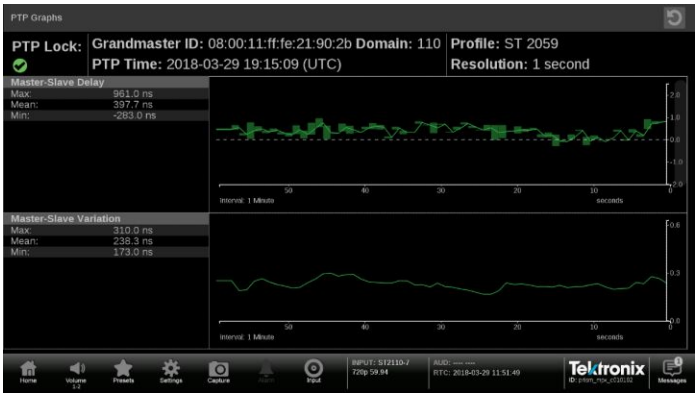
IP Session application showing the PTP lock status and PTP information.

In the PTP Graphs application, PRISM plots the network delay, network delay variation, and Master/Slave phase lag. The network delay and network delay variation plots are available for both signal directions on the network, Master to Slave (Tms) and Slave to Master (Tsm). The network delay values are calculated directly from the PTP message time stamps, while the variation numbers are calculated from the delay as per RFC1889. The phase lag is the filtered difference Tsm-Tms, and is used to adjust the local PTP clock. Therefore, as PRISM locks to the PTP master unit, it will adjust to minimize the phase lag and make Tsm and Tms equal.

The PTP graphs show the effects of both network delay and adjustments to the slave unit timing. However, since the contribution from the adjustment is low after establishing a lock to the PTP master unit, the PTP network delay becomes dominant in the graphs.

In the ideal PTP system, Tms / Tsm network delay should be constant and identical. The variations in real applications, however, may impact the PTP lock process in the slave unit and could cause a PTP unlock situation if they are excessive.

The PTP graphs allow the detection of adverse network conditions, such as too much traffic on the PTP ports.



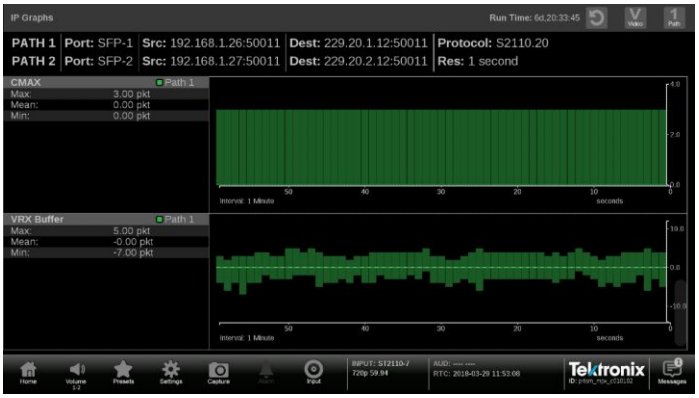
Master-Slave Delay and Master-Slave Variation graphs.

ST2110-21 Buffer modeling

ST2110-21 specifies a timing model for ST2110-10 video RTP streams with the following parametric models:

- A network compatibility model to regulate the burst characteristics of senders, which promotes the compatibility with the switches
- A virtual receiver buffer model to ensure there is no buffer overflow/ underflow in the receiver that could cause the packet loss and picture quality degradation

The IP Graphs display provides a trend graph with both types of modeling to help engineers properly setup the packet delivery timing in the RTP packet sender.

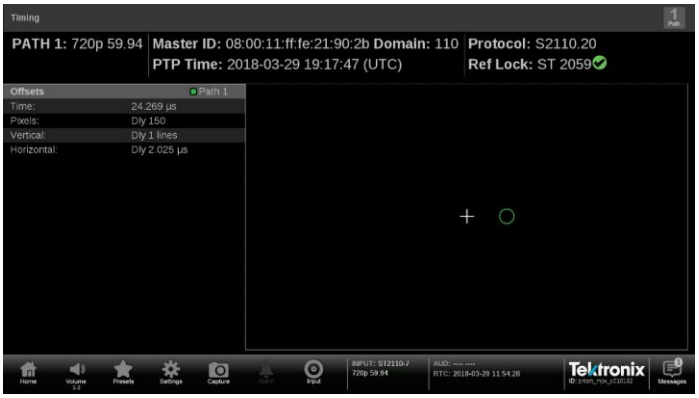


CMAX / VRX Buffer trend graph

Facility timing made easy

The importance of timing adjustment in an IP broadcast facility is unchanged. As the alignment mechanism uses the timestamp in the streams, correct time stamping at the source device is important. The variance of transmission time at the mixing point, such as a production switcher, needs to be less than the buffer size chosen for the minimum latency.

The Tektronix-patented Timing application makes facility timing easy through a simple graphical representation, which shows the relative timing of the SMPTE 2022-6 stream and the PTP reference on an X-Y axis and visualizes the one-dimensional time delay in terms of the picture parameters. This allows timing adjustment in units of lines and microseconds.



ST2110-20 timing against the PTP reference.

Since ST 2022-6 streams are complete SDI signals encapsulated in IP, the timing measurement treats these IP signals as if they were SDI. Therefore, the timing system detects the start of the IP frame, and then extrapolates to the 0h point of the encapsulated SDI. Then using PTP as the reference, the ideal alignment point for that frame rate is calculated based on the PTP epoch. Finally, the offset between the ST 2022-6 signal and the ideal alignment is displayed. The display shows both the absolute time and the time parsed into lines or horizontal delay as time and pixels.

One use for the Timing application is to measure the delay in a gateway and network. If a properly timed SDI signal is applied to a gateway, then the timing measurement on the resulting IP flow will display the combined latency in the gateway and the network. Another use is to measure multiple signals and compare the relative timing.

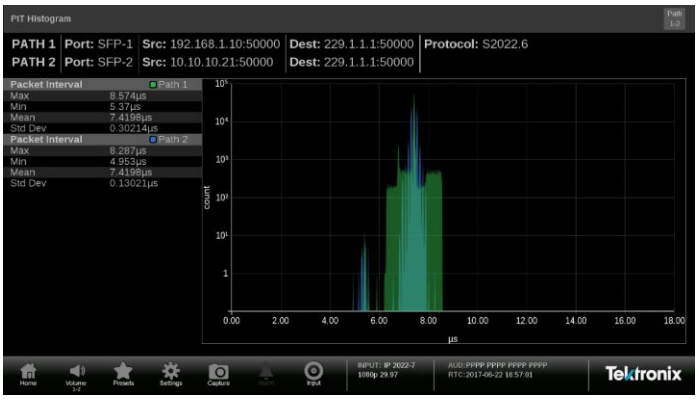
In the ST2110 system, the timing of receiving packets of each element is critical because they have to be presented to the viewers in a time-aligned manner based on the time stamp. The Timing application displays the timing of the Video stream against PTP and the Stream Timing application shows the timing of the Video, Audio and Data as it was received relative to the embedded RTP time stamps. It also shows the relative delay between Audio/Video and the Data/Video, which is the amount of delay needed to re-align the two essence types. Video engineers use this information to make sure the packets of all the elements are received in the tolerance of the receiving buffer. They can then align the timing of each stream based on the time stamp in RTP packet header.

ST2110-20 timing against PTP and packet latency trend graph.

Monitor the quality level to keep the facility on air

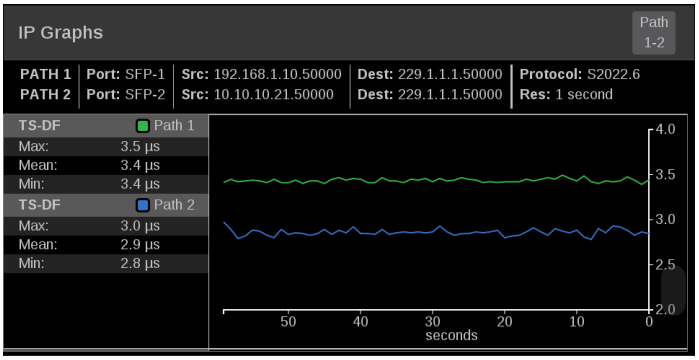
The asynchronous nature of an IP system can produce a wide variety of bandwidth usage; in extreme cases this can result in the loss of packets. Therefore it is important to be able to monitor the network traffic and engineers need tools to evaluate packet loss.

PRISM provides a Packet Interval Time (PIT) histogram and trend graph for ST2110 and ST2022-6 streams. It also provides the trend graph of Time Stamped Delay Factor (TS-DF) standardized in EBU-TECH 3337 for the ST2022-6 stream to help engineers determine how the packet interarrival time from a sender is affected in the system. These measurements can help engineers determine the root cause when packet loss has occurred.



PIT Histogram application for monitoring the range of PIT variance.

PIT trend graph for monitoring the trend of PIT variance over time.

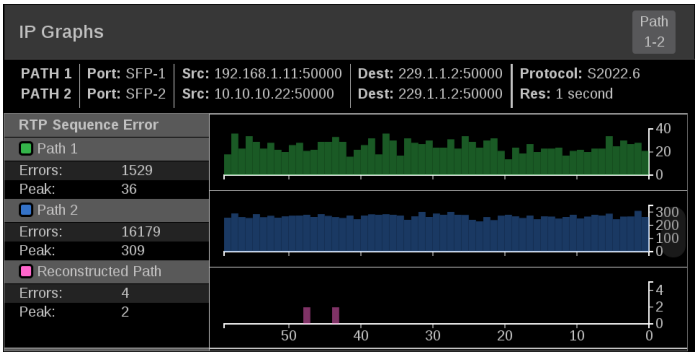


TS-DF trend graph for monitoring the trend of TS-DF variance over time (ST2022-6).

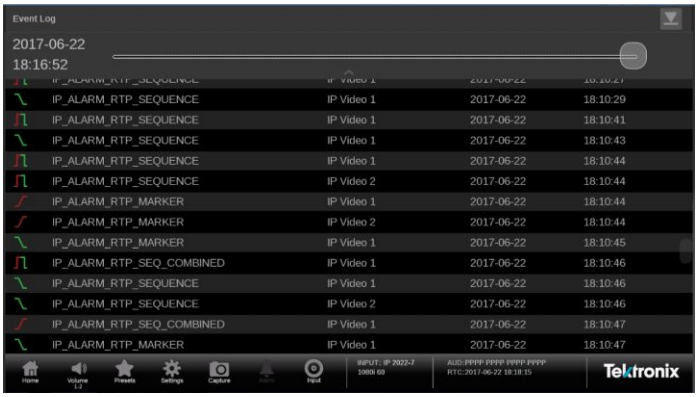
Debug a hybrid IP/SDI broadcast system to isolate the root cause

Engineers debugging a hybrid IP/SDI system first need to isolate the root cause of the error to find whether the error is in the IP layer or in the content layer. Details of the error can then be determined by examining the identified layer. PRISM offers error detection feature sets in both the IP and content layers using the Event Log application.

The graphical displays show the error trend correlated to historical data. In these displays, the errors detected in both IP and content layers are time correlated, which allows the engineer to verify the error in the IP or content layer. For example, if an error is detected in the content layer but not in the IP layer, then the error may have happened before the content was wrapped by the IP headers.



RTP Sequence Error incident graph for monitoring the errors detected over time.



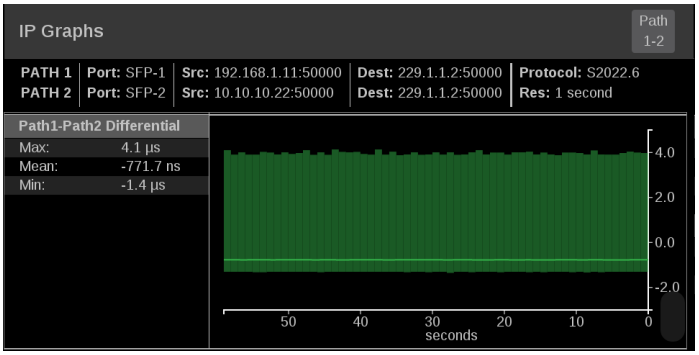
Event Log application for checking the details of error events.

SMPTE 2022-7 monitoring for robust IP broadcast operation

For broadcasters that are committed to their clients, ensuring 24/7 quality broadcasting is a minimum requirement. SMPTE 2022-7 was standardized to build and operate a redundant IP system for broadcasters. PRISM provides the broadcast engineers a monitoring solution to properly setup the redundant ST2110 system.

When an input configured with SMPTE 2022-7 enabled is selected, the difference in the receive time of datagrams on path number 1 / 2 is monitored to help engineers determine the signal path and buffer setting in the receiver. PRISM also offers packet header interpretation and error detection for the two paths simultaneously.

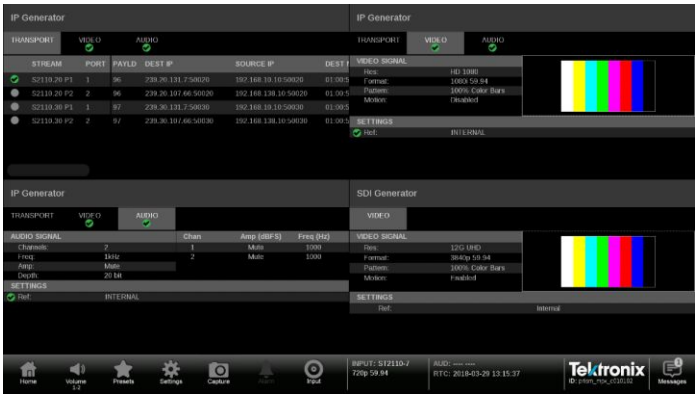
The reconstructed output stream is fed to the content layer applications, such as Picture and Waveform, and to the AUX SDI output in case of a ST2022-6 input.



Path 1 – Path 2 Delay graph. A positive number indicates that Path 2 arrived first and a negative number indicates that Path 1 arrived first.

Known good signal to check the receiver devices and the signal path

Finding a known good signal in the broadcast facility for a quick test can be time consuming. PRISM provides ST2110 -20/-30 with ST2022-7 and 12G-SDI test signals that can be used to quickly check the receiver device and the signal path in complex IP/SDI facilities.



IP Generator and SDI Generator application displays.

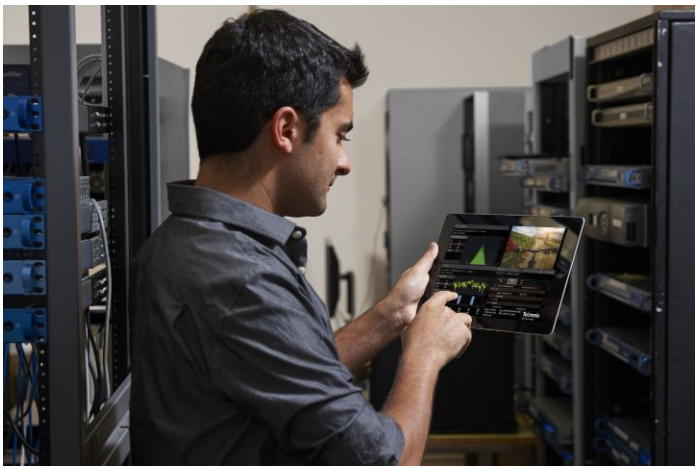
Monitor the quality of content with familiar feature sets

In any broadcasting system, ensuring the quality of Video and Audio is the most important task for broadcast engineers. The Picture, Waveform, Audio and Video Session applications are available for engineers who need the familiar feature sets to instantly check the quality of content.

Picture, Waveform, Audio, and Video Session applications provide content conformance monitoring tools.

Operate PRISM remotely to provide immediate facility assistance

Within a hybrid IP/SDI facility, there are a wide variety of tasks an engineer needs to perform to troubleshoot issues. One such task is to quickly provide assistance to an operator to help meet a deadline for production or to keep the facility on-air. The remote control feature in PRISM allows the engineer to remotely access the unit with a Web browser application running on a PC or tablet computer. This allows the engineer to immediately provide assistance by starting to diagnose the problem from their desk, minimizing down time, and helping to isolate the cause of the problem.

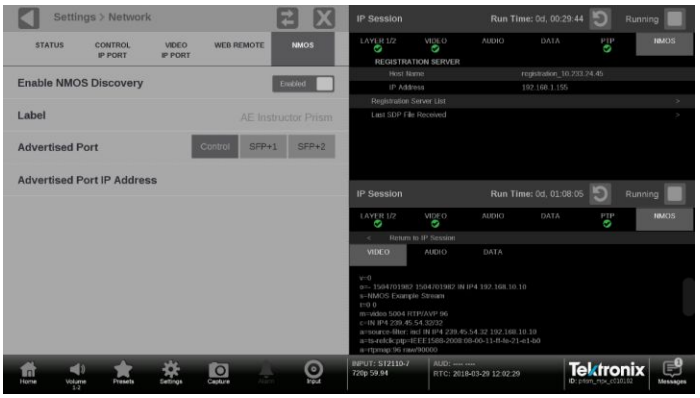


Remote monitoring using a Web browser.

Control PRISM from system management software using NMOS/SDP and API

Operators in SDI facilities have used SDI router control panels to select the SDI source to monitor on a waveform monitor. In an SDI/IP hybrid facility, the system integrators prepare the same capability for the operators. This requires system management software to discover and register the end point equipment and send commands so they can subscribe to streams through IGMP V3.

The NMOS/SDP and API allows system integrators to build an IP system with PRISM being managed by system management software. The software discovers, registers, configures inputs, and selects the active input for monitoring.



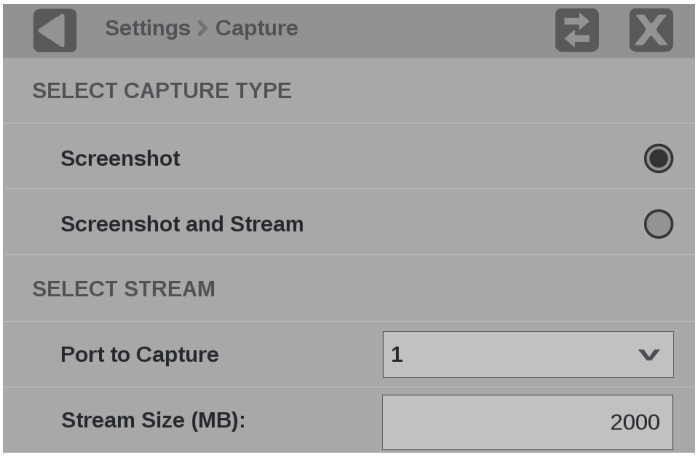
NMOS setup menu and Registration Server / SDP Reader display.

Example API commands

Function	Mode
/api/configureInput	GET
/api/configureInput	POST
/api/activeInput	GET
/api/activeInput	POST
/api/help	GET

Easy offline analysis with 10G Ethernet packet capture

When engineers require detailed analysis with an offline tool, the IP capture feature in PRISM allows them to quickly access the stream they need to analyze. The 2 GB capture capability can create a pcap file of up to 1.6 seconds at 10 Gbps.

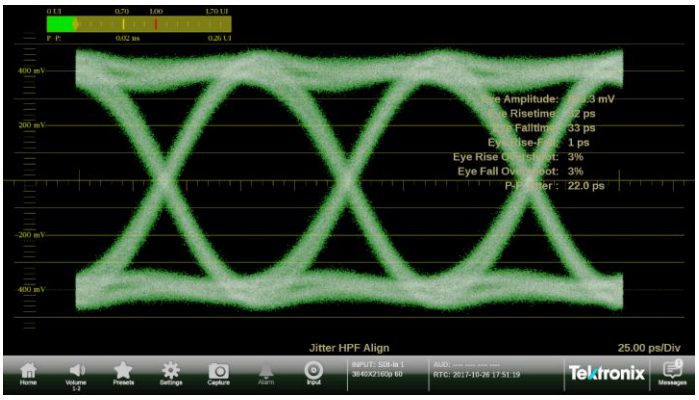


Capture settings menu.

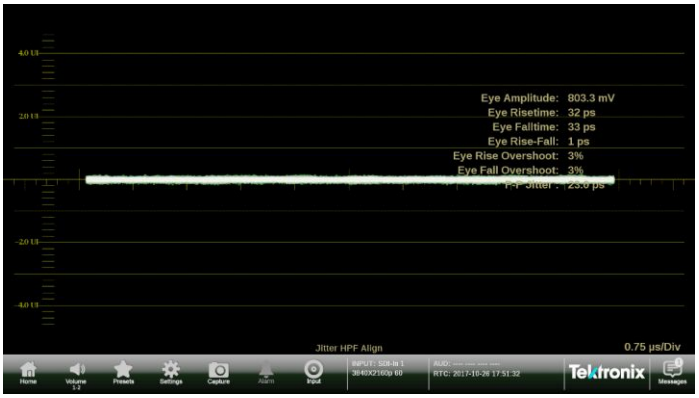
Most advanced SDI physical layer measurement solutions

In an SDI video system, checking SDI signal quality and integrity is one of the most important tasks before starting to shoot a show. PRISM provides unique capabilities such as providing various jitter filters from 10 Hz to 100 kHz for SD/HD/3G/12G-SDI signals.

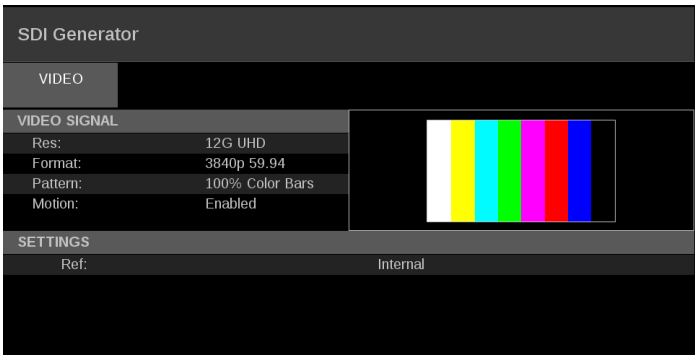
In addition, PRISM can also perform automated eye amplitude, automated rise/fall time, and automated overshoot/undershoot measurements. All of these capabilities, along with the integrated SDI signal generation feature, help broadcasters and network operators detect and diagnose signal quality problems quickly and efficiently.



12G-SDI Eye pattern display with Automatic measurements.



12G-SDI Jitter display.



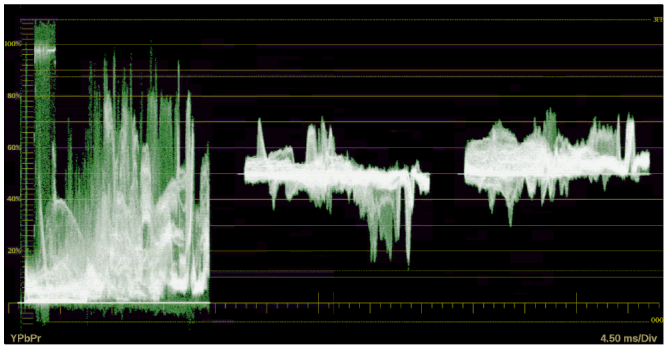
Integrated SDI signal generator.

Flexible installation options

PRISM offers two platform options: 3RU half-rack width (MPI) and 1RU full-rack width (MPX). The MPI platform with the optional portable cabinet allows users to move the unit between different locations. The MPI platform with the optional rack mount kits allows users to install the unit in an equipment rack.

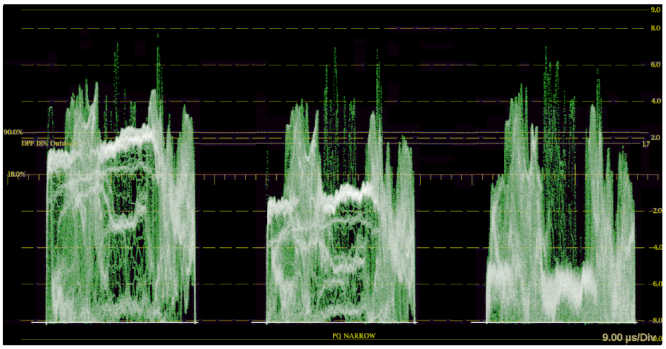
The MPX platform is intended for applications where space in an equipment rack needs to be minimized, for applications where an external touch panel display is going to be used, for KVM operation or for applications where remote monitoring is preferred.

Applications



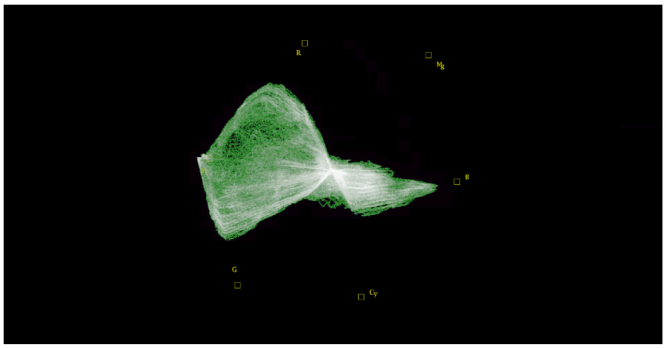
Waveform

- YCbCr, YRGB, RGB, Y Only mode
- mv, %, reflectance %, Code Value, Nits, Stop graticules
- Transfer function / color space conversion for HDR/WCG monitoring (option MP-PROD)



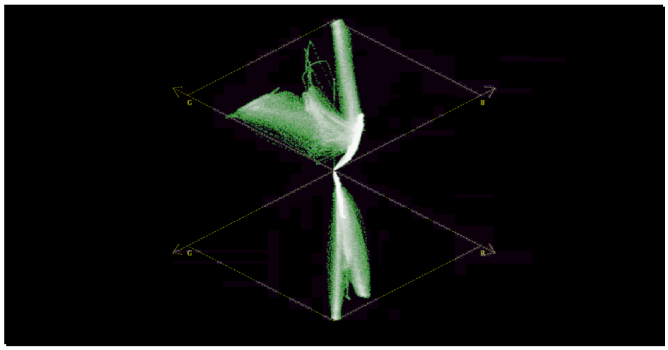
Stop Display (requires option MP-PROD)

- Stop graticule for Scene light, Nits graticule for Display light
- Balance cameras with different gamma
- Real time reflectance light meter to aid scene lighting



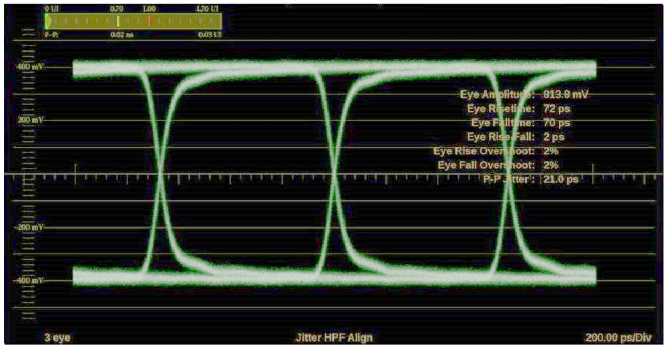
Vector

- XY trace with Cb / Cr component
- I axis for skin tone adjustment, white / black\balancing
- Transfer function / color space conversion for HDR/WCG monitoring (option MP-PROD)



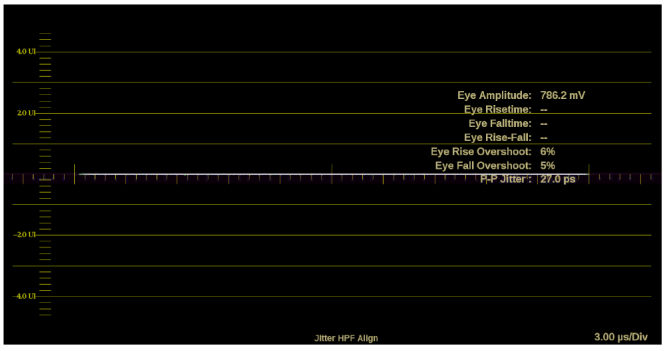
Diamond (requires option MP-PROD)

- G / R XY trace and G / B XY trace
- Gamut error monitoring, white balance and gray-scale tracking (gamma-curve matching)
- Transfer function / color space conversion for HDR/WCG monitoring



Eye Display (requires option MPI PHY-12G / MPX PHY-12G)

- SD / HD / 3G / 12G-SDI
- Automatic parameter measurements
- Characterize the SDI output of source instrument



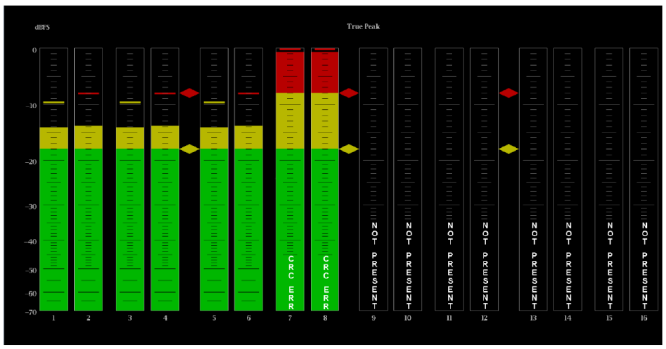
Jitter Display (requires option MPI PHY-12G / MPX PHY-12G)

- SD / HD / 3G / 12G-SDI
- Measures more than 1UI jitter
- Characterize the SDI output of source instrument

Applications

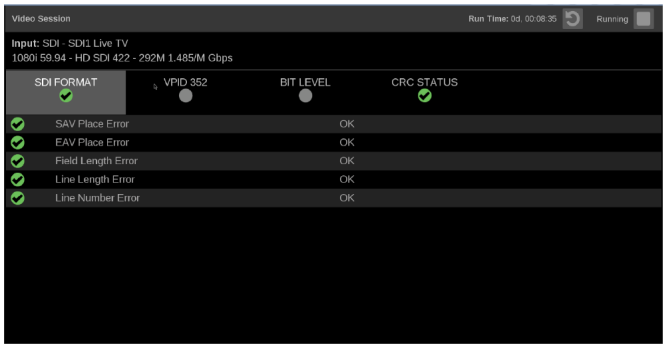
Picture

- Checking composition, level and color at production
- Conformance monitoring
- Transfer function / color space conversion for HDR/WCG monitoring (MP-PROD)



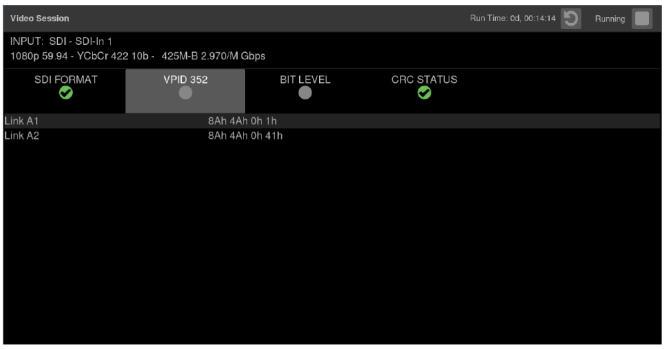
Audio

- SDI Embedded, ST2022-6 and ST2110-30 (AES67)
- Up to 16ch audio level monitoring, peak level meter



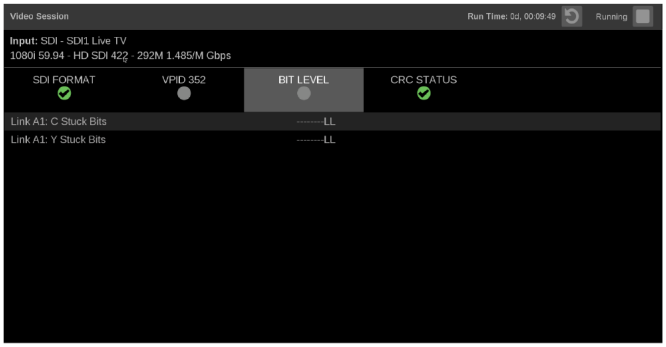
Video Session

- SAV/EAV placement, Field / Line length Error detection



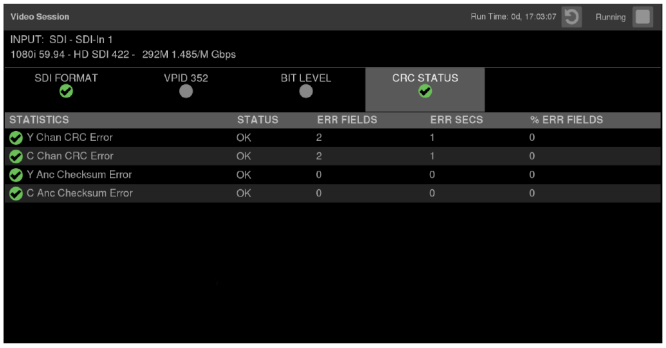
Video Session: VPID 352

- VPID information



Video Session: Bit Level

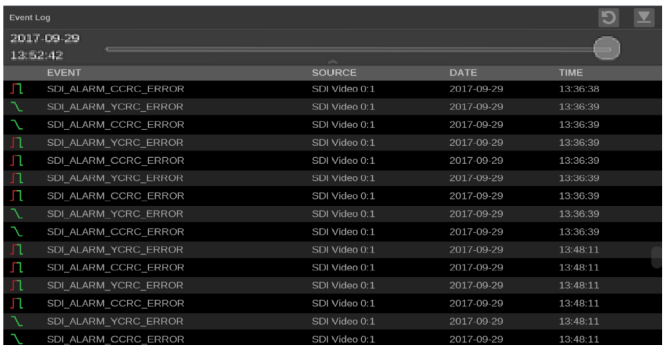
- Bit Activity



Video Session: CRC Status

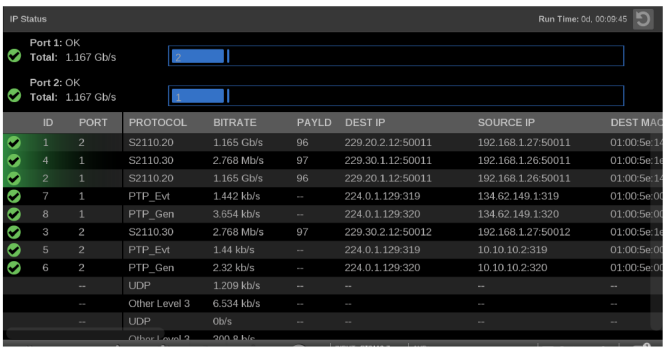
- CRC Error detection

Applications



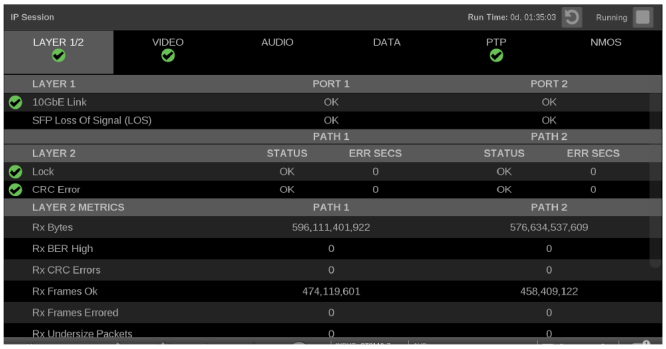
Event Log

- Event / Error log with the source and time information



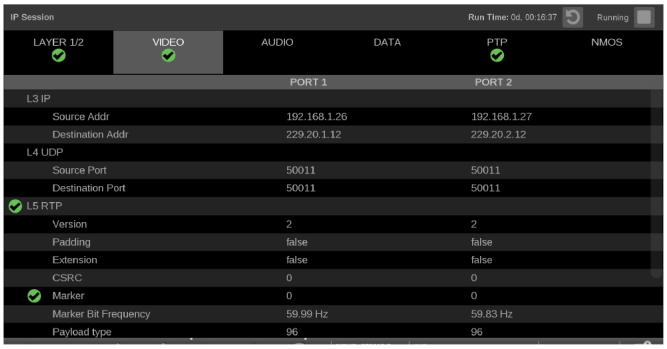
IP Status (requires option MP-IP-STD)

- List the streams and communications in 10GE cables
- Simultaneously monitoring two ports for ST2022-7
- Error detection, Protocol, Bit rate, IP Address / Port and more



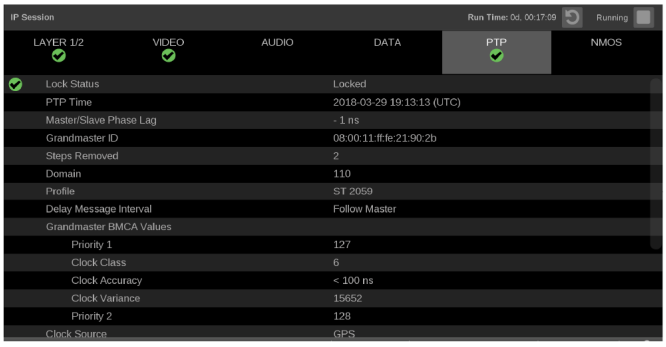
IP Session: Layer 1/2 (requires option MP-IP-MEAS)

- Layer 1, Layer 2 session display
- Simultaneously monitoring two ports for ST2022-7
- Link / SFP information, Rx Bytes, CRC Errors, Frame count



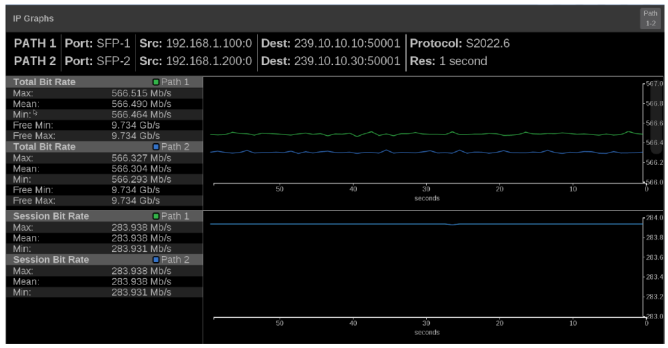
IP Session: Video (requires option MP-IP-MEAS)

- IP / UDP / RTP layer session display
- Simultaneously monitoring two ports for ST2022-7
- Error detection, HBRMT (ST2022-6) decoding



IP Session: PTP (requires option MP-IP-MEAS)

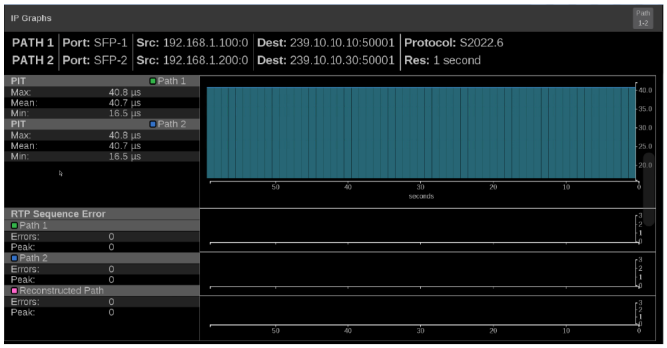
- PTP lock status and session display
- PTP time, Master / Slave phase lag, Grandmaster ID
- Interpretation of Announce Message



IP Graphs : Bit rate (requires option MP-IP-MEAS)

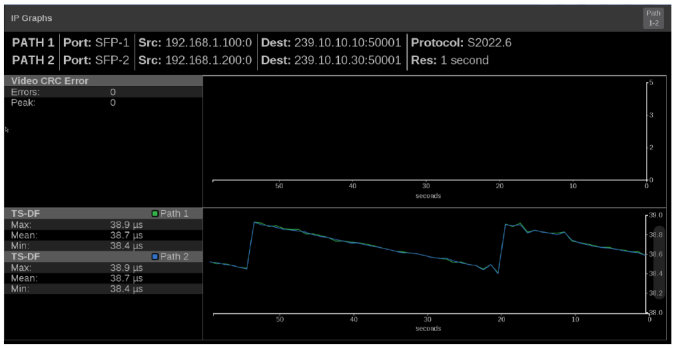
- Total bit rate, Session bit rate
- Max/Mean/Min value in the selected time window
- Simultaneously monitoring two ports for ST2022-7

Applications



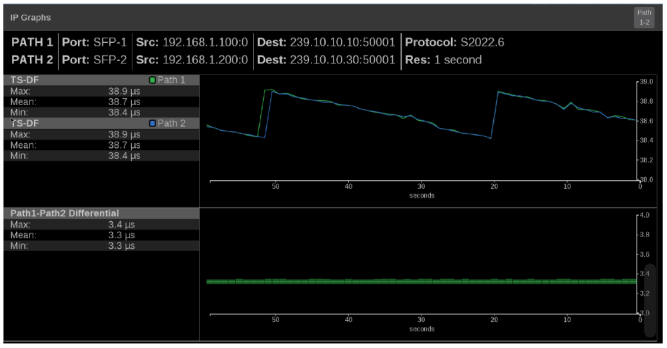
IP Graphs: PIT and RTP Sequence Error
(requires option MP-IP-MEAS)

- Detect intermittent packet loss in the trend graph
- Time correlated trend graphs for root cause isolation
- 2 paths and reconstructed path monitoring for ST2022-7



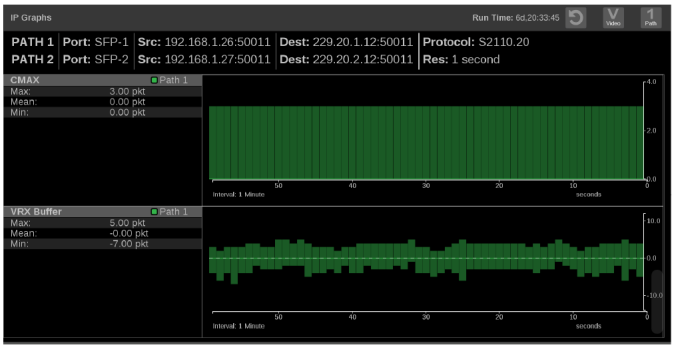
IP Graphs: Video CRC Error and TS-DF
(requires option MP-IP-MEAS)

- Time correlated trend graphs for root cause isolation
- TS-DF standardized in EBU-TECH 3337 (ST2022-6)
- Video CRC detection in ST2022-6



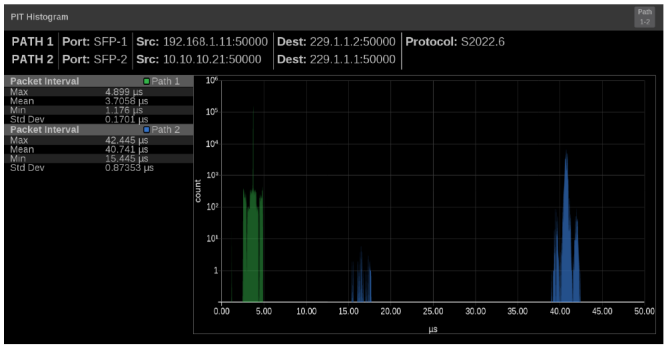
IP Graphs: Path1-Path2 Differential
(requires option MP-IP-MEAS)

- Packet arrival time difference in ST2022-7
- Ensure the proper packet reconstruction



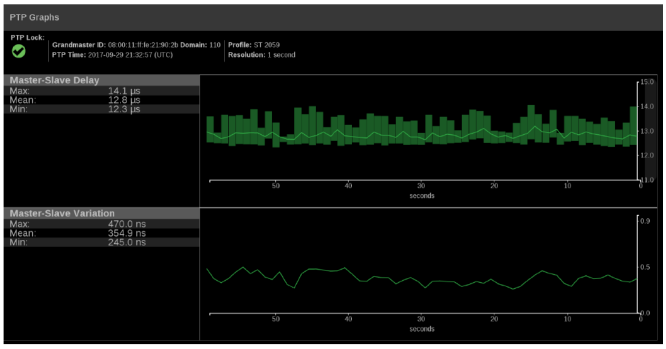
IP Graphs: CMAX, VRX Buffer
(requires option MP-IP-MEAS)

- ST2110-21 simulation
- CMAX: Network compatibility model
- VRX: Virtual Receiver buffer model



PIT Histogram (requires option MP-IP-MEAS)

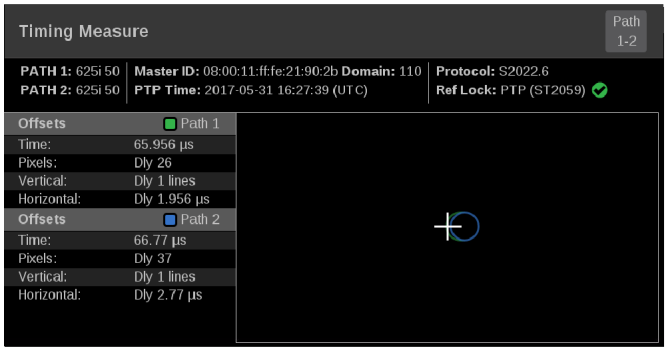
- ST2022-6, ST2110
- Simultaneously monitoring two ports for ST2022-7
- Balance the packet loss probability and the system latency



PTP Graph (requires option MP-IP-MEAS)

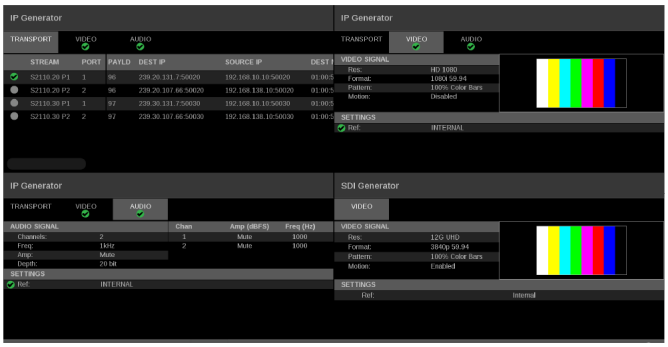
- Master / Slave Delay, Delay variance and Phase lag
- Ensure proper PTP system setting
- Detect intermittent PTP locking issue

Applications



Timing (requires option MP-IP-MEAS)

- ST2022-6, ST2110 stream against PTP
- Simultaneous 2 streams monitoring for ST2022-7
- Adjust the timing to minimize the system latency



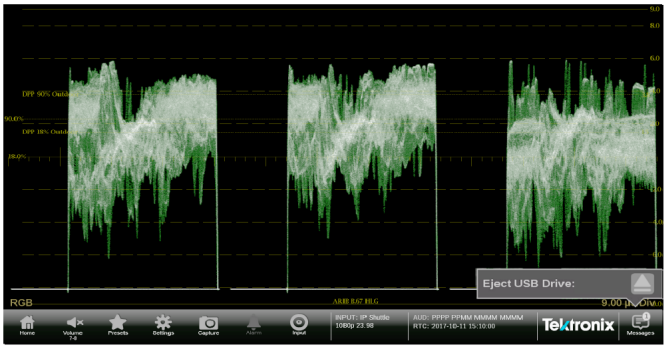
Generators (requires option MP-GEN)

- ST2110-20, -30 and 12G-SDI
- Basic test pattern to check signal path
- PTP locked ST2110 streams, good for timing / latency measurements

Stream Timing (requires option MP-IP-MEAS)

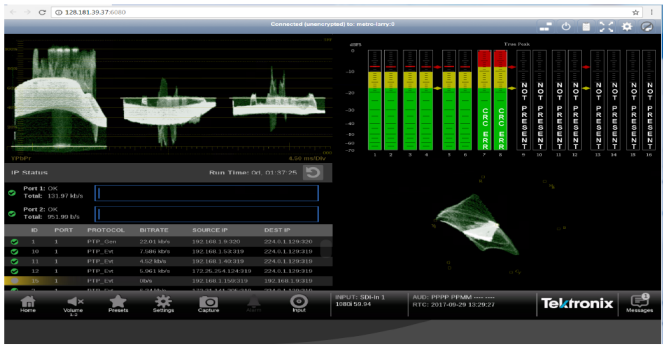
- Video stream timing against PTP
- Video / Audio / Data packet latency
- Video / Audio, Video / Data timing difference

Features



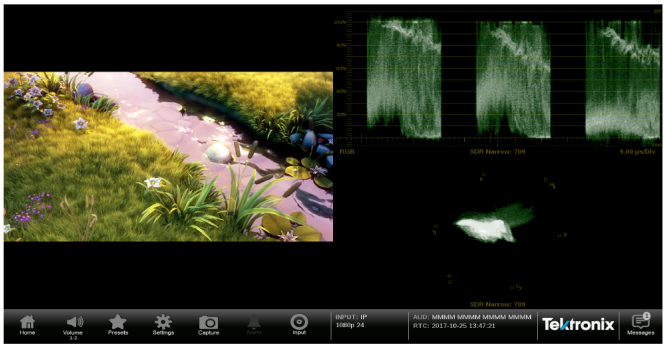
Message Center

- Intuitive navigation



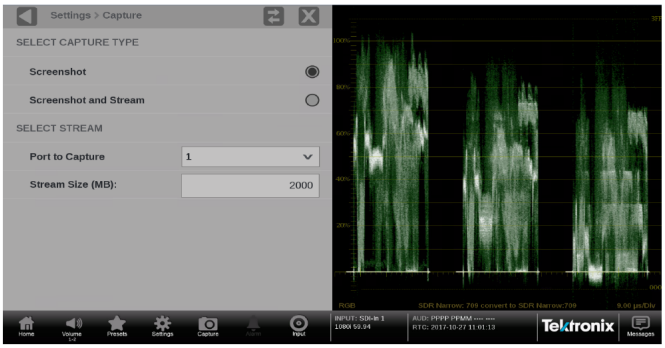
Remote VNC

- Support VNC Client software
- Manage multiple PRISM units from remote location



Fullscreen, 2, 3 and 4 Tile Display

- Flexible tile configuration
- Configure the display to best fit to your application



Screen and Stream Capture

- Screen capture to create the QC report
- Stream capture for further analysis with an offline tool (requires option MP-IP-CAP)

Touchscreen / Mouse

- Intuitive / quick operation with pinch and swipe action
- Easy navigation
- Higher flexibility in user interaction

Application selection menu

- Faster access to the most used applications with a customizable application selection menu

Supported formats

Supported IP formats

Format	Description	Option
SMPTE 2022-6, SMPTE 2022-7		MP-IP-STD
SMPTE 2110-20, SMPTE 2110-30, SMPTE 2110-40 [1]		MP-IP-STD
ASPEN (video content only) [1]	SMPTE RDD-37	MP-IP-STD
PTP	IEEE1588, SMPTE2059-2 (Multicast, Mixed SMPTE w/o negotiation)	MP-IP-STD

Supported SDI formats

Link	Format	Sample Structure		Bits	Frame/field rate	Option
SD-SDI	525i	4:2:2	YCbCr	10b	59.94	Base instrument
	625i	4:2:2	YCbCr	10b	50	Base instrument
HD-SDI	1920x1080	4:2:2	YCbCr	10b	50/59.94/60i	Base instrument
	1280x720	4:2:2	YCbCr	10b	50/59.94/60p	Base instrument
3G-SDI Level A	1920x1080	4:2:2	YCbCr	10b	50/59.94/60p	Base instrument
3G-SDI Level B	1920x1080	4:2:2	YCbCr	10b	50/59.94/60p	Base instrument
Quad Link 3G-SDI Level A, Square Division [1]	3840x2160	4:2:2	YCbCr	10b	50/59.94/60p	MP-FMT-4K
Quad Link 3G-SDI Level B, Square Division [1]	3840x2160	4:2:2	YCbCr	10b	50/59.94/60p	MP-FMT-4K
Quad Link 3G-SDI Level A, Two Sample Interleave [1]	3840x2160	4:2:2	YCbCr	10b	50/59.94/60p	MP-FMT-4K
Quad Link 3G-SDI Level B, Two Sample Interleave [1]	3840x2160	4:2:2	YCbCr	10b	50/59.94/60p	MP-FMT-4K
12G-SDI [2]	3840x2160	4:2:2	YCbCr	10b	50/59.94/60p	MP-FMT-4K

Supported video formats in SMPTE 2022-6 streams

Link	Format	Sample Structure		Bits	Frame/field rate	Option
SD-SDI	525i	4:2:2	YCbCr	10b	59.94	MP-IP-STD
	625i	4:2:2	YCbCr	10b	50	MP-IP-STD
HD-SDI	1920x1080	4:2:2	YCbCr	10b	50/59.94/60i	MP-IP-STD
	1280x720	4:2:2	YCbCr	10b	50/59.94/60p	MP-IP-STD
3G-SDI Level A	1920x1080	4:2:2	YCbCr	10b	50/59.94/60p	MP-IP-STD
3G-SDI Level B	1920x1080	4:2:2	YCbCr	10b	50/59.94/60p	MP-IP-STD

1 No AUX SDI output is available for this format.

2 12G-SDI support is available in SDI 1 and SDI 3 inputs. 12G-SDI loop through outputs are available through the 12G-SDI SFP modules installed in the SDI SFP slots.

Supported video formats in SMPTE 2110-20 streams

Link	Format	Sample Structure		Bits	Frame/field rate	Option
ST2110-20 [1]	1920x1080	4:2:2	YCbCr	10b	50/59.94/60i	MP-IP-STD
	1280x720	4:2:2	YCbCr	10b	50/59.94/60p	MP-IP-STD
	1920x1080	4:2:2	YCbCr	10b	50/59.94/60p	MP-IP-STD
	525i	4:2:2	YCbCr	10b	59.94i	MP-IP-STD
	625i	4:2:2	YCbCr	10b	50i	MP-IP-STD

Receiver conformance level in SMPTE 2110-30 streams

Conformance level	Description
Conformance level B	Reception of 48 KHz streams with 1 to 8 channels at packet times of 1 ms or 1 to 8 channels at packet times of 125 µs

Supported video formats in ASPEN video

Link	Format	Sample Structure		Bits	Frame/field rate	Option
ASPEN [1]	1920x1080	4:2:2	YCbCr	10b	50/59.94/60i	MP-IP-STD
	1280x720	4:2:2	YCbCr	10b	50/59.94/60i	MP-IP-STD
	1920x1080	4:2:2	YCbCr	10b	50/59.94/60p	MP-IP-STD

Specifications

All specifications apply to all models unless noted otherwise.

MPI power characteristics

Power consumption	
Typical	100 W
Maximum	200 W
Voltage range	100 to 240 VAC ±10%, 50/60 Hz

MPI physical characteristics

Dimensions	
Height (at bezel)	13.34 cm (5.25 in.)
Width (at bezel)	21.91 cm (8.625 in.)
Depth	30.48 cm (12.00 in.)
Weight (net)	3.4 kg (7.45 lbs.)

MPX power characteristics

Power consumption	
Typical	100 W
Maximum	200 W
Voltage range	100 to 240 VAC ±10%, 50/60 Hz

MPX physical characteristics

Dimensions	
Height	4.45 cm (1.75 in.)
Width	48.26 cm (19.00 in.)
Depth	45.72 cm (18.00 in.)
Weight (net)	3.9 kg (8.7 lbs.)

Ordering information

Models

MPI	PRISM Media platform; 3RU half rack with integrated 9 inch HD display and touch panel; 4 SDI Inputs (SD, HD and 3G-SDI)
MPX	PRISM Media platform; 1RU Full rack; 4 SDI Inputs (SD, HD and 3G-SDI)

Options

Hardware options

PHY-12G	Add SDI Physical Layer Measurement Package; includes automated measurement of 12G/3G/HD/SD-SDI Eye pattern parameters; (Option MP-FMT-4K required for 12G support)
MPX RACK	Add rack mount slides and rails kit for MPX

Software options

MP-IP-STD	Add node locked license for SMPTE 2022-6/7, ST2110, NMOS/SDP, and PTP (IEEE1588, SMPTE 2059-2) support; includes IP Status application
MP-IP-MEAS	Add node locked license for IP Measurement feature sets: includes IP/PTP Graph, IP Session, PIT Histogram, Timing, and Stream Timing applications (Option MP-IP-STD required)
MP-IP-CAP	Add node locked license for IP stream capture (Option MP-IP-MEAS required)
MP-FMT-4K	Add node locked license for 4K formats, enable 12G-SDI
MP-PROD	Add node locked license for Production Tools: Stop Display and Diamond applications, Transfer function / Color space conversion
MP-GEN	Add node locked license for SDI/IP signal generator; includes IP/SDI Generator application (Option MP-IP-STD required for IP signal generation, Option MP-FMT-4K required for 4K signal generation)

International power plugs

Opt. A0	North America power plug (115 V, 60 Hz)
Opt. A1	Universal Euro power plug (220 V, 50 Hz)
Opt. A2	United Kingdom power plug (240 V, 50 Hz)
Opt. A3	Australia power plug (240 V, 50 Hz)
Opt. A5	Switzerland power plug (220 V, 50 Hz)
Opt. A6	Japan power plug (100 V, 50/60 Hz)
Opt. A10	China power plug (50 Hz)
Opt. A11	India power plug (50 Hz)
Opt. A12	Brazil power plug (60 Hz)
Opt. A99	No power cord

Service options

Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D1	Calibration Data Report
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. G3	Complete Care 3 Years (includes loaner, scheduled calibration, and more)
Opt. G5	Complete Care 5 Years (includes loaner, scheduled calibration, and more)
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R3DW	Repair Service Coverage 3 Years (includes product warranty period). 3-year period starts at time of instrument purchase
Opt. R5	Repair Service 5 Years (including warranty)
Opt. R5DW	Repair Service Coverage 5 Years (includes product warranty period). 5-year period starts at time of instrument purchase

Post purchase upgrades

MPI-UP PHY-12G	Add SDI Physical Layer Measurement Package to the MPI product; includes automated measurement of 12G/3G/HD/SD-SDI Eye pattern parameters; (Option MP-FMT-4K required for 12G support)
MPX-UP PHY-12G	Add SDI Physical Layer Measurement Package to the MPX product; includes automated measurement of 12G/3G/HD/SD-SDI Eye pattern parameters; (Option MP-FMT-4K required for 12G support)
MPX-UP RACK	Add rack mount slides and rails kit for MPX unit
MP-IP-STD-UP	Add node locked license for SMPTE 2022-6/7, ST2110, NMOS/SDP, and PTP (IEEE1588, SMPTE 2059-2) support; includes IP Status application
MP-IP-MEAS-UP	Add node locked license for IP Measurement feature sets: includes IP/PTP Graph, IP Session, PIT Histogram, Timing, and Stream Timing applications (Option MP-IP-STD required)
MP-IP-CAP-UP	Add node locked license for IP stream capture (Option MP-IP-MEAS required)
MP-FMT-4K-UP	Add node locked license for 4K formats, enable 12G-SDI
MP-PROD-UP	Add node locked license for Production Tools: Stop Display and Diamond applications, Transfer function / Color space conversion
MP-GEN-UP	Add node locked license for SDI/IP signal generator; includes IP/SDI Generator application (Option MP-IP-STD required for IP signal generation, Option MP-FMT-4K required for 4K signal generation)

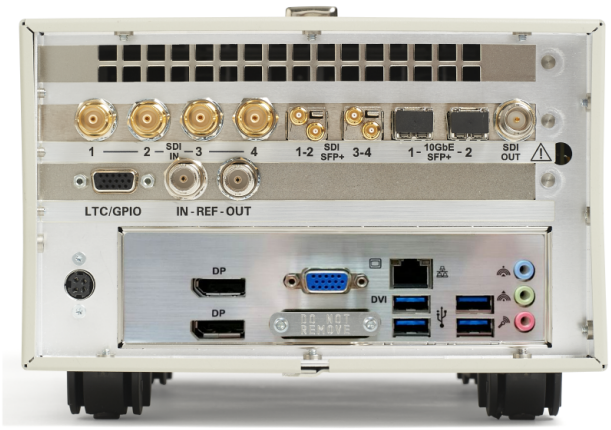
Warranty

Standard product warranty: 1 year; Long-term product support: 5 years

Recommended accessories

MPI-PTBL	Portable cabinet for MPI unit includes handle, feet, tilt bail, and protective front cover

MPI-RACK-MM	19 inch, 3RU dual rack cabinet for one MPI unit or two MPI units in a side-by-side installation, includes front panel USB/headphone connectors for each MPI unit
MPI-RACK-MW	19 inch, 3RU dual rack cabinet for one MPI unit or one MPI unit in a side-by-side installation with a WFM52x0, WFM7200, WFM8x00 instrument, includes front panel USB/headphone connectors for one MPI unit
MP-SFP	
Opt. 3GTO	SD/HD/3G Optical (1310 nm) SDI SFP transmitter module (to be installed into SDI SFP+ cage for optical SDI loop through output)
Opt. 3GTD	SD/HD/3G DIN SDI SFP transmitter module (to be installed into SDI SFP+ cage for SDI loop through output with DIN coaxial connector)
Opt. 3GTH	SD/HD/3G HDBNC SDI SFP transmitter module (to be installed into SDI SFP+ cage for SDI loop through output with HDBNC coaxial connector)
Opt. 10GESR	10G Ethernet short range (850 nm) transceiver module (to be installed into 10GbE SFP+ cage); requires Option MPI-IP-STD
Opt. 10GELR	10G Ethernet long range (1310 nm) transceiver module (to be installed into 10GbE SFP+ cage); requires Option MPI-IP-STD



MPI front and rear panels

MPX front and rear panels

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

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