Tektronix®

PRISM
Media Analysis Platform

User Manual

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Tektronix®

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User Manual

This document supports software version 1.6 and above.

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Contacting Tektronix

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USA

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Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, additional information is provided at the end of this section. (See page xi, *Service safety summary*.)

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

To avoid fire or personal injury

Use proper power cord. Use only the power cord specified for this product and certified for the country of use.

Do not use the provided power cord for other products.

Power disconnect. The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to operate the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

Use proper AC adapter. Use only the AC adapter specified for this product.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do not operate without covers. Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Do not operate in wet/damp conditions. Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry. Remove the input signals before you clean the product.

Provide proper ventilation. Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment. Always place the product in a location convenient for viewing the display and indicators.

Avoid improper or prolonged use of keyboards, pointers, and button pads.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use only the Tektronix rackmount hardware specified for this product.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock. Do not touch exposed connections.

Do not service alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power. To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Verify safety after repair. Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in this manual

These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Symbols and terms on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbol(s) may appear on the product:

CAUTION
Refer to Manual

Compliance information

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies. This product is intended for use by professionals and trained personnel only; it is not designed for use in households or by children.

Questions about the following compliance information may be directed to the following address:

Tektronix, Inc.
PO Box 500, MS 19-045
Beaverton, OR 97077, USA
www.tek.com

EMC compliance

EU EMC Directive

Meets intent of Directive 2014/30/EU for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 55032. Electromagnetic compatibility of multimedia equipment - Emission requirements [1] [2]

Class A radiated and conducted emissions

EN 55103-2. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use - Part 2 Immunity. [2]

Environment E2 – commercial and light industrial

- IEC 61000-4-2. Electrostatic discharge immunity
- IEC 61000-4-3. RF electromagnetic field immunity
- IEC 61000-4-4. Electrical fast transient / burst immunity
- IEC 61000-4-5. Power line surge immunity
- IEC 61000-4-6. Conducted RF Immunity
- IEC 61000-4-11. Voltage dips and interruptions immunity
- EN 55103-2 Annex A. Radiated magnetic field immunity
- EN 55103-2 Annex B. Balanced ports common mode immunity

EN 61000-3-2. AC power line harmonic emissions

EN 61000-3-3. Voltage changes, fluctuations, and flicker

1 This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

2 For compliance with the EMC standards listed here, high quality shielded interface cables that incorporate low impedance connection between the cable shield and the connector shell should be used.

Australia / New Zealand EMC

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- EN 55032. Radiated and conducted emissions, Class A.

Safety compliance

This section lists the safety standards with which the product complies and other safety compliance information.

EU low voltage directive

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:

Low Voltage Directive 2014/35/EU.

- EN 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

U.S. nationally recognized testing laboratory listing

- UL 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

Canadian certification

- CAN/CSA-C22.2 No. 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

Additional compliances

- IEC 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

Equipment type

Test and measuring equipment.

Safety class

Class 1 – grounded product.

Pollution degree descriptions

A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.

- Pollution degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
- Pollution degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
- Pollution degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
- Pollution degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.

Pollution degree rating

Pollution degree 2 (as defined in IEC 61010-1). Rated for indoor, dry location use only.

IP rating

IP20 (as defined in IEC 60529).

Measurement and overvoltage category descriptions

Measurement terminals on this product may be rated for measuring mains voltages from one or more of the following categories (see specific ratings marked on the product and in the manual).

- Category II. Circuits directly connected to the building wiring at utilization points (socket outlets and similar points).
- Category III. In the building wiring and distribution system.
- Category IV. At the source of the electrical supply to the building.

NOTE. *Only mains power supply circuits have an overvoltage category rating. Only measurement circuits have a measurement category rating. Other circuits within the product do not have either rating.*

Mains overvoltage category rating

Overvoltage category II (as defined in IEC 61010-1).

Environmental considerations

This section provides information about the environmental impact of the product.

Restriction of hazardous substances

Complies with RoHS2 Directive 2011/65/EU.

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

Equipment recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.

This symbol indicates that this product complies with the applicable European Union requirements according to Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Tektronix Web site (www.tek.com/productrecycling).

Battery recycling. This product contains a small installed lithium metal button cell. Please properly dispose of or recycle the cell at its end of life according to local government regulations.

Perchlorate materials. This product contains one or more type CR lithium batteries. According to the state of California, CR lithium batteries are classified as perchlorate materials and require special handling. See www.dtsc.ca.gov/hazardouswaste/perchlorate for additional information.

Transporting batteries

The small lithium primary button cell contained in this equipment does not exceed 1 gram of lithium metal content per cell, and the cell type has been shown by the manufacturer to comply with the applicable requirements of the UN Manual of Tests and Criteria Part III, Sub-section 38.3. Consult your carrier to determine which lithium battery transportation requirements are applicable to your configuration, including to its re-packaging and re-labeling, prior to reshipment of the product by any mode of transport.

Preface

This manual contains information to help you use the Tektronix PRISM Media Analysis Platform. This information includes the following:

- How to operate the instrument using the front panel, external mouse/keyboard/display, or remote connection.
- How to use the various displays for monitoring SDI or IP video signals.
- How to capture display data.
- How to set up error logging and alarms.
- How to navigate instrument menus.

Where to find more information

The full **User Manual**, **Release Notes**, and other information about your product are available for download at www.tek.com/downloads. The following table lists all the documentation for the PRISM Media Analysis Platform.

Table i: Product documentation

Document	Manual type	Part number	Description
User Manual	Primary User	077-1290-xx	Provides detailed operating information.
Release Notes	Release Notes	077-1293-xx	Describes the new features, improvements, and limitations of the instrument firmware.
Installation and Safety Instructions	User	071-3500-xx	Describes how to install a PRISM MPI instrument and provides basic safety and operating information (included with instrument).
	User	071-3549-xx	Describes how to install a PRISM MPX instrument and provides basic safety and operating information (included with instrument).
Specifications and Performance Verification	Performance Verification	077-1291-xx	Lists the product specifications and provides procedures for verifying product performance.
MPI Dual Rack Cabinet and Extender Installation Instructions	Field Install Instructions	071-3577-xx	Describes how to install a MPI instrument in a 19" equipment rack using the optional MPI-RACK-MM or MPI-RACK-MW dual rack cabinet.
MPX Rackmount Slides and Rails Installation Instructions	Field Install Instructions	071-2746-xx	Describes how to install a MPX instrument in a 19" equipment rack

Table i: Product documentation (cont.)

Document	Manual type	Part number	Description
Field Upgrade Kit Instructions	Field Install Instructions	075-1095-xx	Describes how to install post-purchase field upgrades in the instrument.
API commands	NA	NA	The PRISM API Documentation Web page lists GET and POST commands that can be used to configure the signal inputs and select the active input. See the *Remote control via API commands* section of the User Manual (077-1290-xx) for access instructions.

Searching for documents on www.tek.com/downloads

The fastest way to find a document on tek.com is through filtering. Using the filtering options on the left side of the Web page will help narrow down your choices until you find the correct documentation.

The following example lists six steps on searching for the lateset User Manual:

1. Go to www.tek.com/downloads and search for PRISM.
2. Filter by **Manual** in the **Filter by Type** menu.
3. Filter by **Primary User** in the **Filter by Manual Type** menu.

NOTE. *The Manual Type for each document is in the second column of the table.*

4. Sort by **Date** above the search bar.
5. The first manual in the list should be the latest PRISM User Manual. Click the link to the manual for additional information and to download.
6. To confirm that you have the correct manual, look at the **P/N** and the **Last Update** date. This information is found below the **Download this manual** link. See the image below for an example of the location.

NOTE. *The first seven numbers of the P/N are the Tektronix part number from the table. The last two numbers are the revision level number.*

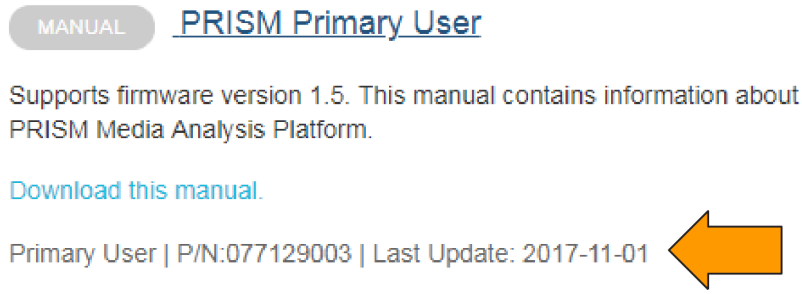


Figure i: Location of the document part number and the date it was last updated.

Conventions used in this manual

The PRISM Media Analysis Platform is also referred to as the “PRISM monitor” throughout this manual.

The terms "press and hold" or “touch and hold” are used throughout this document and applies to touchscreen use with the Prism 3RU half rack with internal touchscreen (MPI) and the Prism 1RU full rack with external display (MPX). If you are using a mouse and keyboard with the instrument you must click and hold the mouse buttons.

Getting started

This section will help you set up and begin to use the PRISM Media Analysis Platform. It is divided into the following subsections:

- **Product description** describes your instrument and provides a list of key features.
- **Controls and connectors** shows you how to verify that you have received all of the parts of your instrument and provides a list of standard and optional accessories and a list of options that are available for your instrument.
- **Network installation** shows you how to set up your instrument on an Ethernet network.

Product description

The PRISM Media Analysis Platform provides flexible options and field-installable upgrades to monitor a diverse variety of SDI and IP statistics as well as video and audio content. The comprehensive feature set, 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 involving compressed/uncompressed video transmission 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.

PRISM model form factors

The PRISM Media Analysis Platform is available in two form factors:

- **MPI.** The PRISM MPI is 3RU half rack with integrated 9 inch HD display and touch panel.

- **MPX.** The PRISM MPX is 1RU full rack width. The MPX requires an external monitor or a remote connection, such as VNC.

Features and benefits for analysis of hybrid IP/SDI infrastructures

- A comprehensive analysis and monitoring tool for hybrid IP/SDI broadcast systems that provide system evaluation for long term system quality monitoring and reporting
- 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 rackmount applications
- Extensive IP monitoring solution for SMPTE 2022-6, 2110, PTP, and ASPEN streams
- 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
- Monitor PTP trend graphs to ensure proper IP system setup for robust sync system
- Tektronix patented Timing display showing the relative timing of the input signal and PTP reference that makes facility timing easy
- 1 PPS output when the instrument is locked to a PTP reference
- Seamless switching to ensure proper SMPTE 2022 and 2110 redundant system operation
- 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
- Optional 10 GbE line rate packet capture for offline analysis
- Optional SDI and ST2110 IP signal generators for testing new or changing facility configurations
- The Picture application uses the 9-inch HD screen for confidence monitoring
- NMOS IS-04 / IS-05 support for network discovery and connection management

Features and benefits for production tools supporting 4K/UHD, WCG and HDR content creation

- A comprehensive production tool set supporting 4K / WCG / HDR content creation
- SDI/IP hybrid interface supporting up to 4K resolution, up to 2160p60 format support with 12G-SDI / Quad 3G-SDI interface, and up to 1080p60 format with SMPTE 2022-6/7 and 2110
- Stop display for monitoring video signals with a variety of transfer functions in a consistent manner
- Waveform, Vector, Picture, and Diamond displays are equipped with a transfer function/color space conversion, allowing operators to match skin tones of video signals to standard BT.709 vector locations and verify wide color gamut compatibility to BT.709 color gamut
- 12G-SDI physical layer measurements to check SDI signal quality and integrity (optional)

Rackmount installation

MPI monitor

There are two optional dual rack cabinets (19”, 3RU) available for the PRISM monitor. Each of the cabinet kits include the *PRISM MPI Dual Rack Cabinet and Extender Installation Instructions* document (Tektronix part number 071-3577-xx).

- **MPI-RACK-MM.** Allows you to install one MPI unit or two MPI units side-by-side. Each side of the cabinet front panel has two USB ports and a headphone jack for each MPI unit.
- **MPI-RACK-MW.** Allows you to install one MPI unit or one MPI unit in a side-by-side installation with a Tektronix WFM52x0, WFM7200, WFM8x00 waveform monitor. The left side of the cabinet front panel has two USB ports and a headphone jack for one MPI unit.

MPX monitor

For the PRISM MPX monitor, there is an optional 1RU full-rack kit that can be used for either portable or rackmount applications.

- **MPX RACK.** Allows you to install one PRISM 1RU full width MPX RACK. The MPX RACK rackmount kit includes the *Rackmount Slides and Rails Kit Installation Instructions* document (Tektronix part number 071-2746-xx).

How to install the MPI monitor in a dual rack cabinet

The information on the following pages describes how to install the MPI monitor in one of the optional dual rack cabinets.

Dual rack cabinet versions. There are two versions of the instructions for the MPI-RACK-MM and MPI-RACK-MW dual rack cabinets:

Table 1: PRISM dual rack cabinet documentation

Document	Tektronix Part Number	Description
PRISM MPI Dual Rack Cabinet Version 1 Installation Instructions	071-3501-XX (English)	In version 1 of the instructions, the MPI-RACK-MM and the MPI-RACK-MW cabinets are the same size.
PRISM MPI Dual Rack Cabinet Version 2 Installation Instructions	071-3577-XX (English)	In the second version of the instructions, the MPI-RACK-MW cabinet comes with a removable extender installed that makes it longer than the MPI-RACK-MM cabinet.

Dual rack cabinet cooling and clearance requirements. The MPI monitor has specific cooling and clearance requirements. Make sure that the clearance requirements for proper airflow are met for both the dual rack cabinet and the instrument. See the *PRISM MPI Installation and Safety Instructions* for information about the environmental operating requirements for the instrument.

CAUTION. *To prevent risk of fire, adequate airflow to instrument(s) and rack adapter must be maintained. Failure to provide adequate airflow to instrument(s) could cause an instrument to shut down.*

Inadequate airflow includes placing instrument(s) and rack adapter in any small, enclosed room that lacks a ventilation system, such as a closet. If the airflow is restricted or blocked and the instrument(s) do not shut down, the risk of fire is increased and the instrument(s) could be permanently damaged.

Table 2: Clearance requirements for the dual rack cabinet

Instrument side	Clearance requirement
Top and bottom	None
Left and right sides	2 in (51 mm)
Front	None
Rear	3 in (76 mm)

Recommended tool list. The following table list the recommended tools for installing the MPI monitor into the dual rack cabinet.

Table 3: Recommended tool list

Name	Description
Screwdriver handle	Torque driver handle. Accepts 1/4-in. hex-head driver tips
#2 Phillips tips or PoziDriv tip	Phillips or PoziDriv-driver tip for #2 size screw heads
T-10 TORX tip	Used for removing instrument screws. TORX-driver bit for T-10 size screw heads.
T-15 TORX tip	Used for removing instrument screws. TORX-driver bit for T-15 size screw heads.

Supplied hardware. The following table lists the hardware supplied with the dual rack cabinet kit. The installation instructions includes references to these parts by the item numbers to help in selecting the correct parts.

Table 4: Supplied hardware

Item number	Tektronix part number	Description	Quantity
Hardware kit			
1	381-0251-XX	NUT BAR; 10-32 X 3.0 X 0.375 X 0.120	4
2	212-0577-XX	SCREW, MACHINE; 10-32 X 0.625, TRH, ZINC PLATED STEEL, PHIL	8
3	211-0511-XX	SCREW, MACHINE; 6-32 X 0.5, PNH, STEEL, ZINC PLATED, T15 TORX	8
4	210-1061-XX	WASHER, FLAT; 0.203 ID X 0.625 OD X 0.062, ZINC PLATED STEEL	4
5	210-1298-XX	WASHER; SHOULDER & RETAINER, 0.195 ID X 0.195 THK, PLASTIC, TV GRAY, 6.575 OD	4
6	212-0591-XX	SCREW, MACHINE; 10-32 X 0.750 OVAL HEAD, POZI	4
Guide Bracket			
7	407-3752-XX	BRACKET, EXT; 2.5 X 8.06 X 0.06, STEEL; SAFETY CONTROLLED	2
WFM52x0 Bracket (MPI-RACK-MW only)			
8	407-6011-XX	RACK MOUNT, INSTRUMENT MTG BRACKET, 5000 SERIES	1
9	211-0718-XX	SCREW, MACHINE; 6-32 X 0.312, FLH100, STEEL, ZINC FINISH, T-10 TORX DR	4
Blank panel			
10	200-5432-XX	PANEL, BLANK MPI, WFM, RACK	1
11	211-0734-XX	SCREW, MACHINE; 6-32 X 0.250, FLH100, STEEL, ZINC FINISH, T-10 TORX DR	4

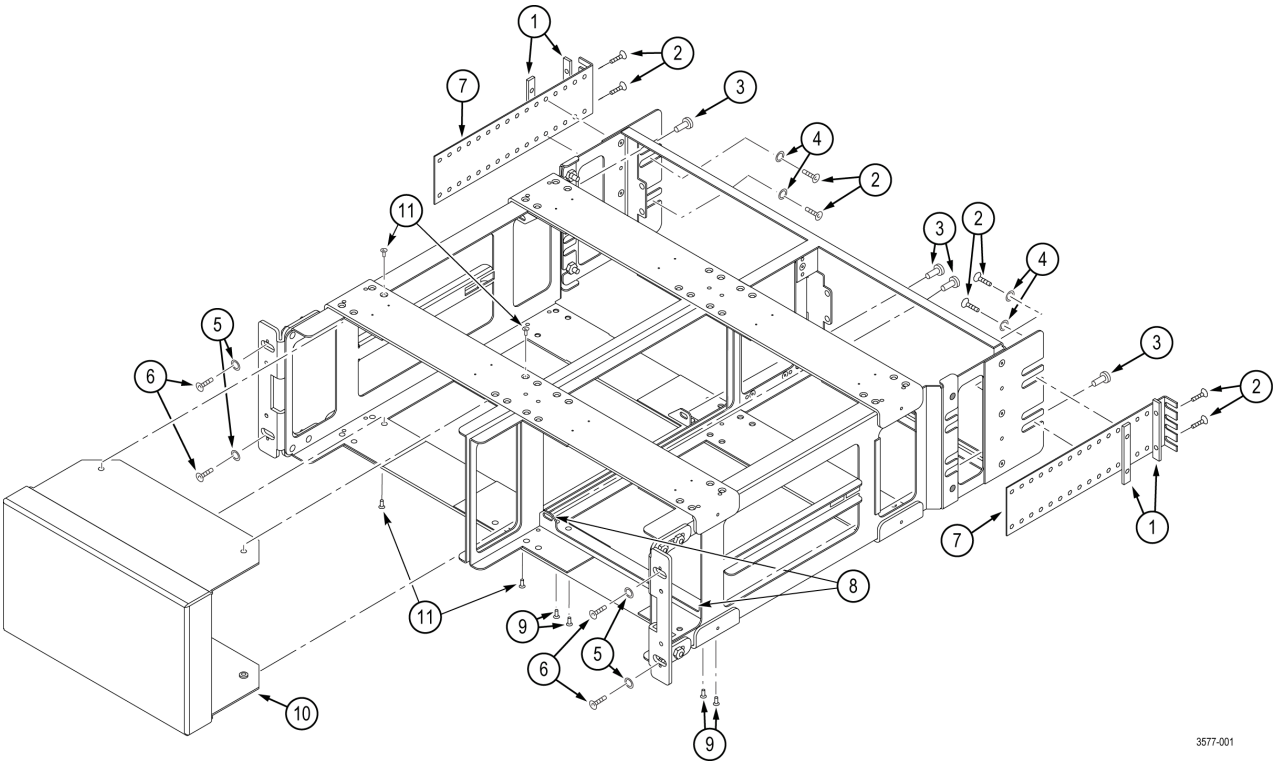


Figure 1: MPI-RACK-MW parts diagram

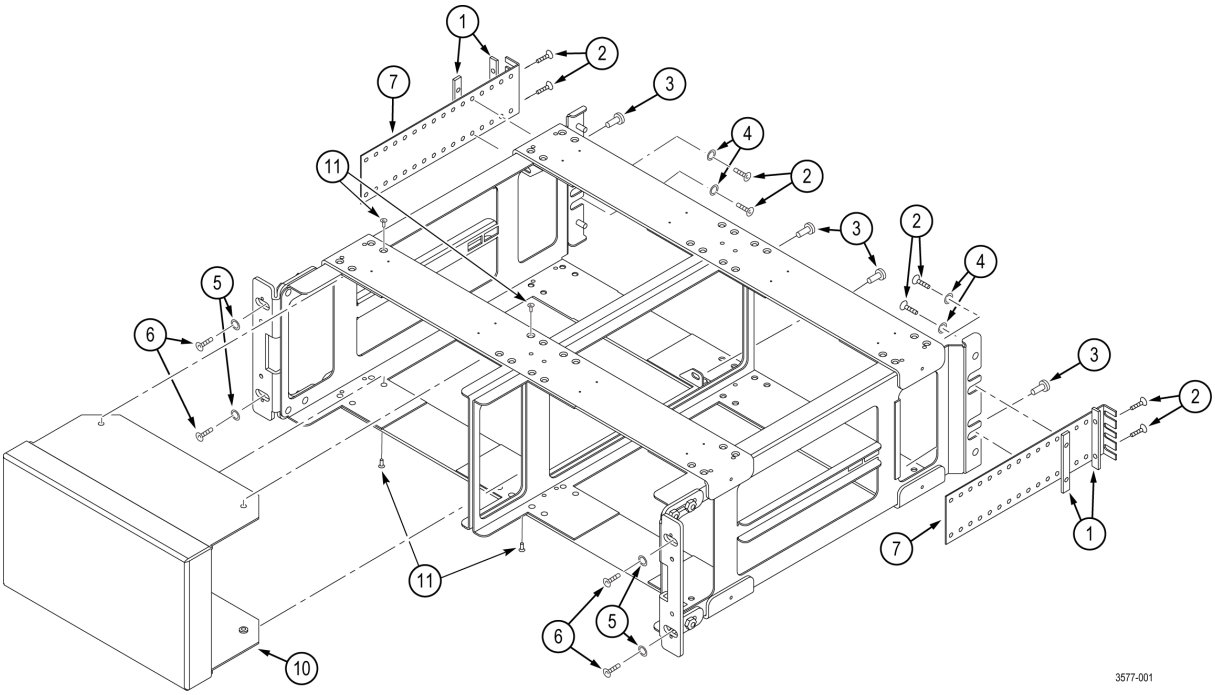


Figure 2: MPI-RACK-MM parts diagram

Install the MPI dual rack cabinet in the equipment rack. Before you install an instrument into the rack adapter, install the adapter into the rack using the following steps:

1. Position the dual rack cabinet so that the headphone jack(s) on the front of the cabinet is on the bottom. (See Figure 3.)

NOTE. *The MPI-RACK-MM cabinet has headphone jacks on both sides of the cabinet; the MPI-RACK-MW cabinet has one headphone jack on the left side of the cabinet.*

---

2. **MPI-RACK-MW only**: Perform the following steps if you are installing a WFM52x0 waveform monitor in a MPI-RACK-MW cabinet:
   a. Install the WFM52x0 bracket (item 8 in Table 4) in the right side of the cabinet as shown. (See Figure 3.)
   b. Use a screwdriver with a TORX T-10 tip to attach the WFM52x0 bracket to the cabinet with four 6-32 X 0.312 screws (item 9 in Table 4).
3. If desired, you can adjust the position of the handle brackets to mount the adapter flush with other equipment in the rack. To do this, loosen the nuts that attach the handle brackets to the rack adapter, adjust the position of the handle brackets as desired, and then tighten the nuts securely. (See Figure 4.)
4. Use a screwdriver with a PosiDriv tip to attach the rack adapter assembly to the front frame of the rack with four 10-32 X 0.750 screws (item 6 in Table 4) and four shoulder washers (item 5 in Table 4).
5. Use a screwdriver with a Phillips tip to install one guide bracket (item 7 in Table 4) to one side of the rear frame of the rack with two 10-32 X 0.625 screws (item 2 in Table 4) and one nut bar (item 1 in Table 4) as shown. (See Figure 3.)
6. Use a screwdriver with a Phillips tip to attach the guide bracket to the cabinet with two 10-32 X 0.625 screws (item 2 in Table 4), two washers (item 4 in Table 4) and one nut bar (item 1 in Table 4). Use the holes in the bracket that will accommodate the depth of the instrument rack frame being used. Leave the screws loose.
7. Repeat steps 5 and 6 to install the second guide bracket to the other side of the cabinet.
8. Tighten all of the attaching screws that were left loose in the previous steps.

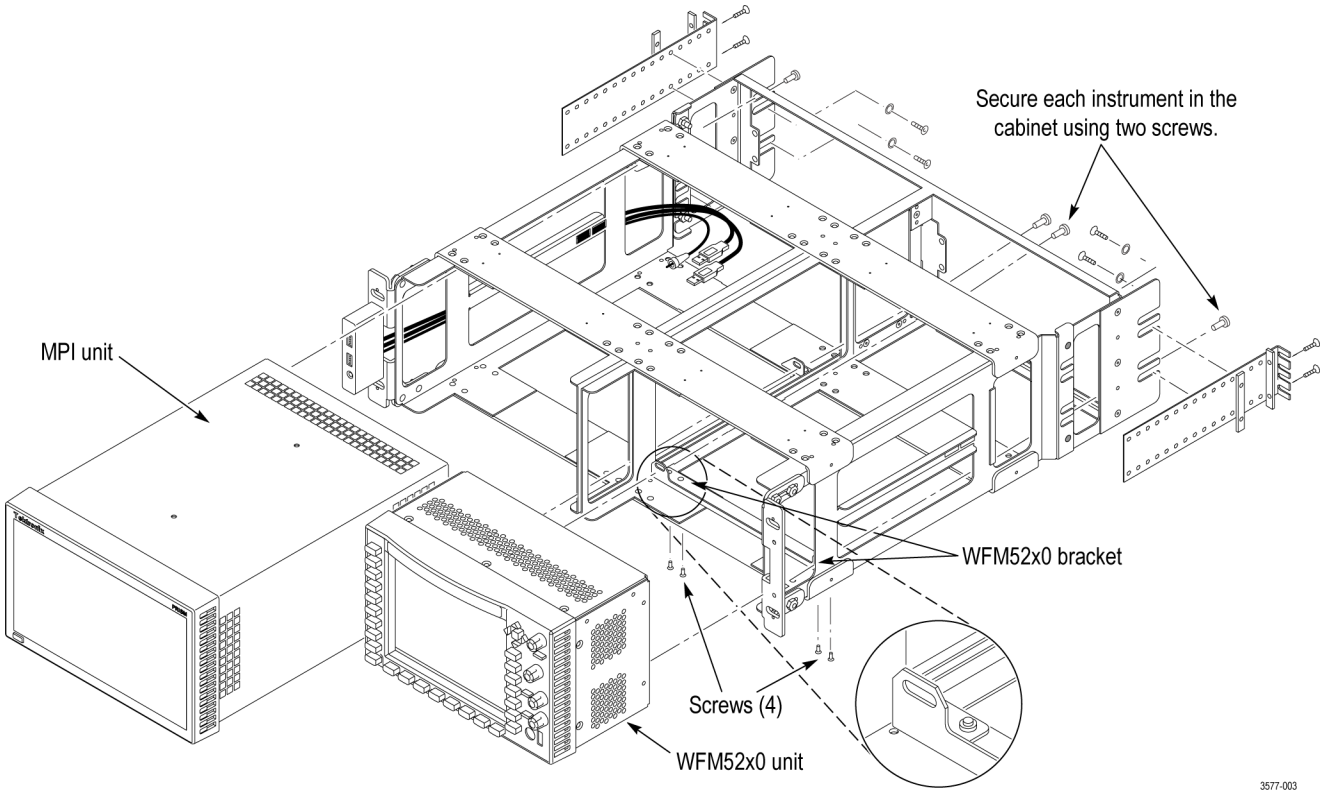


Figure 3: Installing one MPI monitor and one WFM52x0 waveform monitor in the MPI-RACK-MW dual rack cabinet

NOTE. *If only one instrument is installed in the MPI-RACK-MW dual rack cabinet, a blank panel can be attached to the front of a empty slot on either side of the cabinet. The blank panel (item 10 in Table 4) and four 6-32 X 0.250 screws (item 11 in Table 4) used to attach it to the front frame are supplied in the rack kit.*

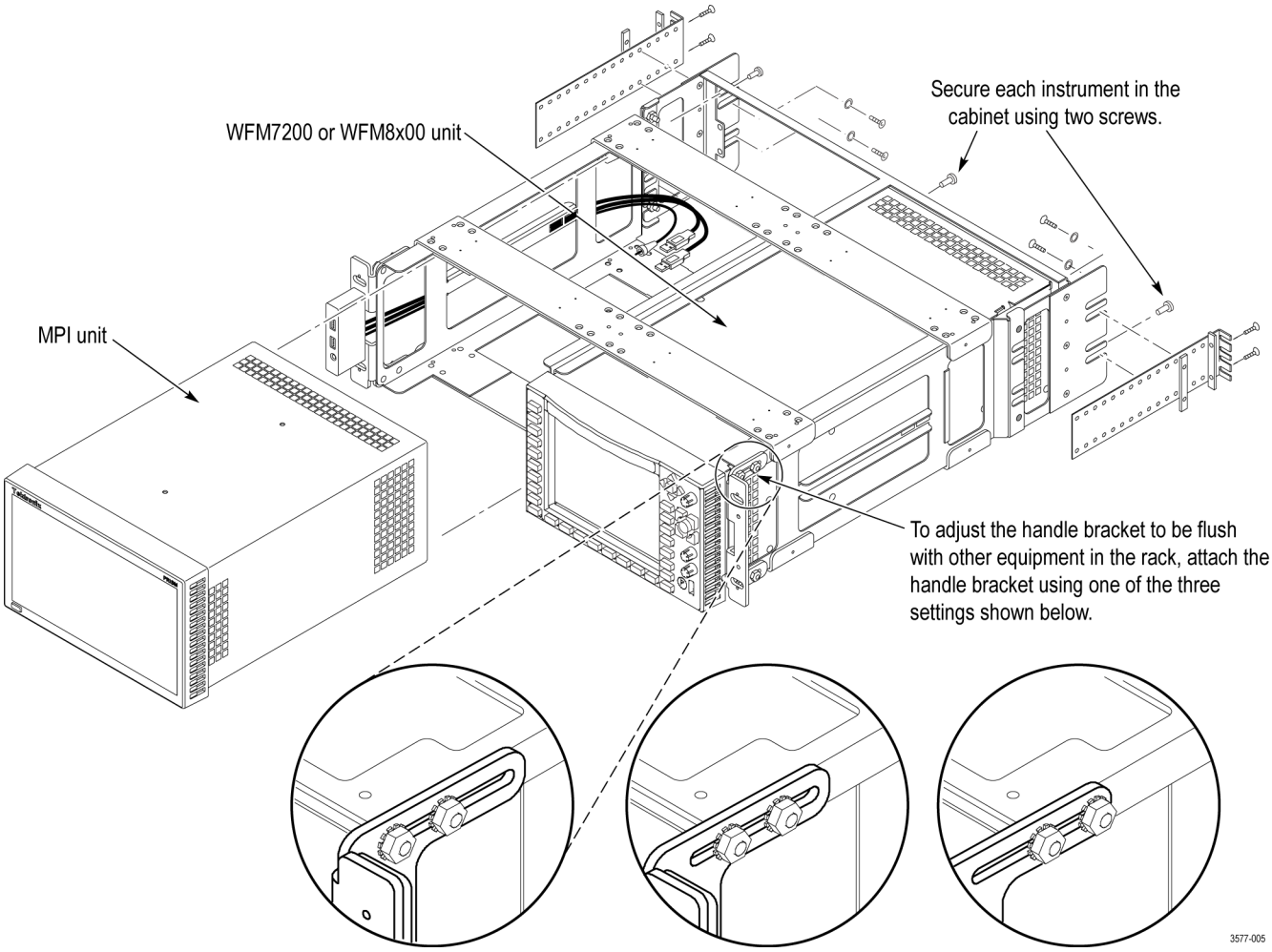


Figure 4: Installing one MPI monitor and one WFM7200 or WFM8x00 waveform monitor in the MPI-RACK-MW dual rack cabinet

NOTE. *If only one instrument is installed in the MPI-RACK-MW dual rack cabinet, a blank panel can be attached to the front of a empty slot on either side of the cabinet. The blank MPI panel (item 10 in Table 4) and four 6-32 X 0.250 screws (item 11 in Table 4) used to attach it to the front frame are supplied in the rack kit.*

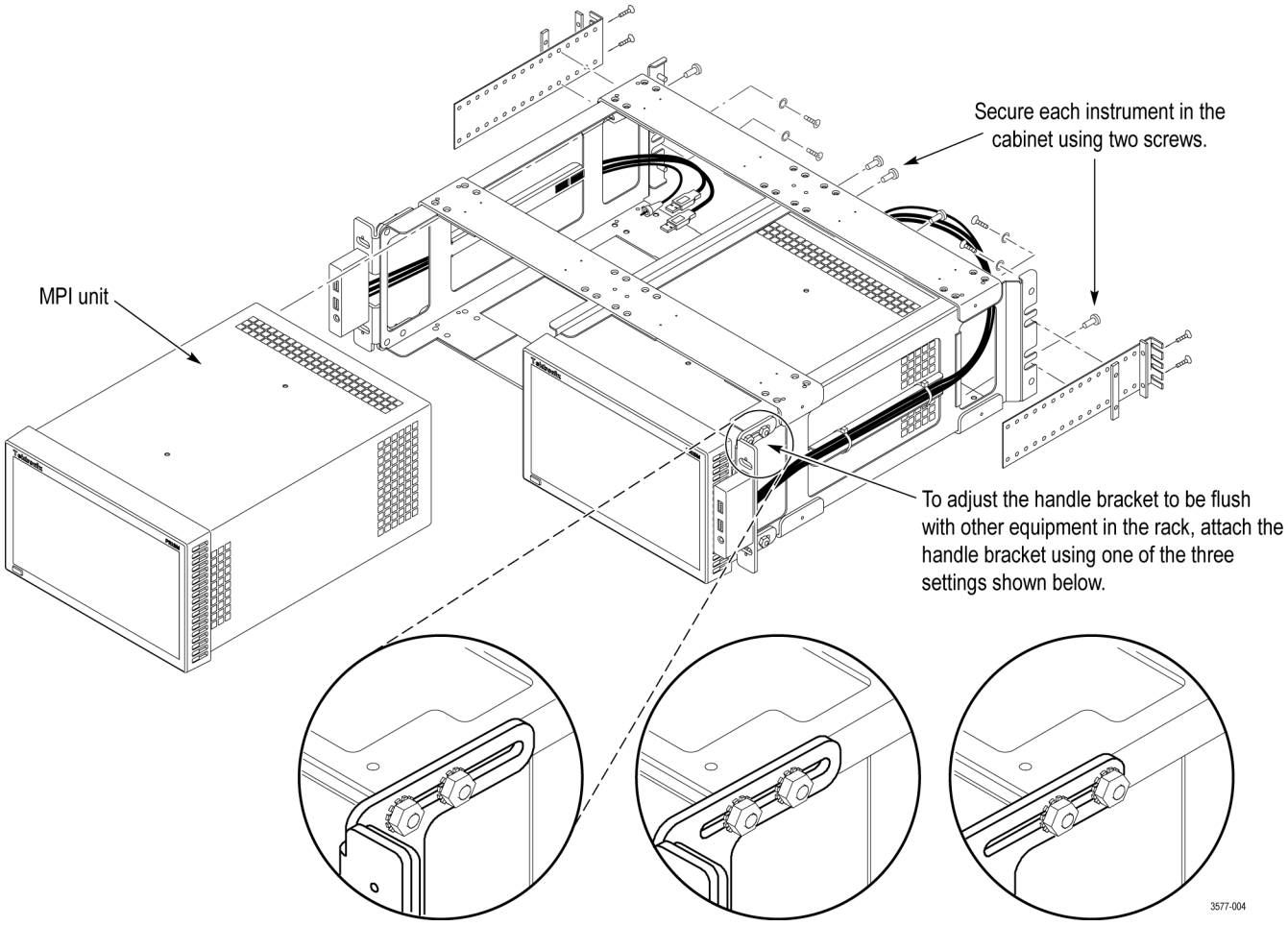


Figure 5: Installing two MPI monitors in the MPI-RACK-MM dual rack cabinet

NOTE. *If only one instrument is installed in the MPI-RACK-MM dual rack cabinet, a blank panel can be attached to the front of a empty slot on either side of the cabinet. The blank MPI panel (item 10 in Table 4) and four 6-32 X 0.250 screws (item 11 in Table 4) used to attach it to the front frame are supplied in the rack kit.*

Install instrument(s) in the MPI dual rack cabinet. After you install the dual rack cabinet in the equipment rack, perform the following steps to install instrument(s) in the cabinet:

CAUTION. *To prevent the USB and headphone cables from being damaged, make sure the cables are not in the way as you slide the instrument into the rack cabinet.*

1. Install an MPI monitor in the dual rack cabinet: (See Figure 3.) (See Figure 4.) (See Figure 5.)

   a. Slide an MPI monitor into the left slot in the dual rack cabinet.

   NOTE. *For the MPI-RACK-MW cabinet, the MPI monitor must be installed in the left slot of the cabinet. For the MPI-RACK-MM cabinet, you can install the MPI monitor in the left or right slot of the cabinet.*

   b. Use a screwdriver with a TORX T-15 tip to secure the instrument in the dual rack cabinet with two 10-32 X 0.625 screws (item 3 in Table 4). The screws attach to the top right and bottom left holes in the instrument chassis as viewed from the rear.

   c. Connect the cables from the USB ports and headphone jack on the dual rack cabinet to the rear of the instrument. (See Figure 6.) You can connect the USB cables to either set of USB ports on the rear panel.

   d. Connect power, signal, and Ethernet cables to the instrument as needed. See the *PRISM Installation and Safety Instructions* manual for information about making signal connections to the instrument.

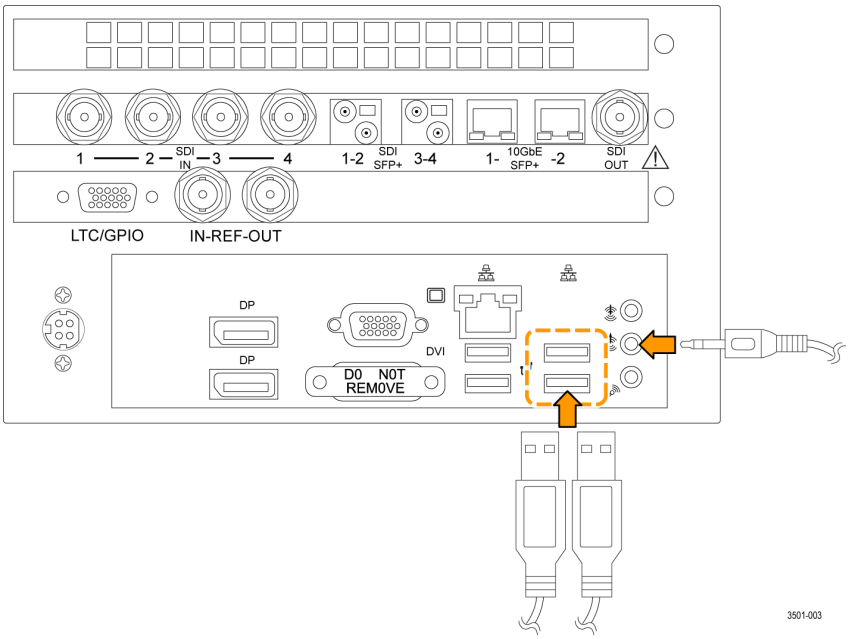


Figure 6: Connecting the rack cabinet USB and audio cables to the MPI monitor

2. For the MPI-RACK-MM cabinet only, repeat step 1 to install a second MPI monitor in the right slot of the dual rack cabinet.
3. For the MPI-RACK-MW cabinet only:
   a. Install a Tektronix WFM52x0, WFM7200, or WFM8x00 waveform monitor in the right slot of the dual rack cabinet. (See Figure 3.) (See Figure 4.)
   b. Use a screwdriver with a TORX T-15 tip to secure the waveform monitor in the dual rack cabinet with two 10-32 X 0.625 screws (item 3 in Table 4). The screws attach to the right and left holes in the middle of the instrument chassis as viewed from the rear.
   c. Connect power and signal cables to the waveform monitor as needed.

NOTE. *See the installation manual for your waveform monitor for information about making power and signal connections to the instrument.*

4. If only one instrument is installed in the MPI-RACK-MM or MPI-RACK-MW dual rack cabinet, use the following steps to attach a blank panel over the front of the empty slot.
   a. Slide the blank MPI panel (item 10 in Table 4) into the empty slot in the rack cabinet.
   b. Use a screwdriver with a TORX T-10 tip to attach the blank panel to the front frame with four 6-32 X 0.250 screws (item 11 in Table 4).

Remove the dual rack cabinet extender (MPI-RACK-MW only). Use the following steps to remove the extender from the back of the MPI-RACK-MW cabinet:

1. Remove the two nuts from the inside of each side of the extender.
2. Slide the extender off the back of the of the dual rack cabinet.

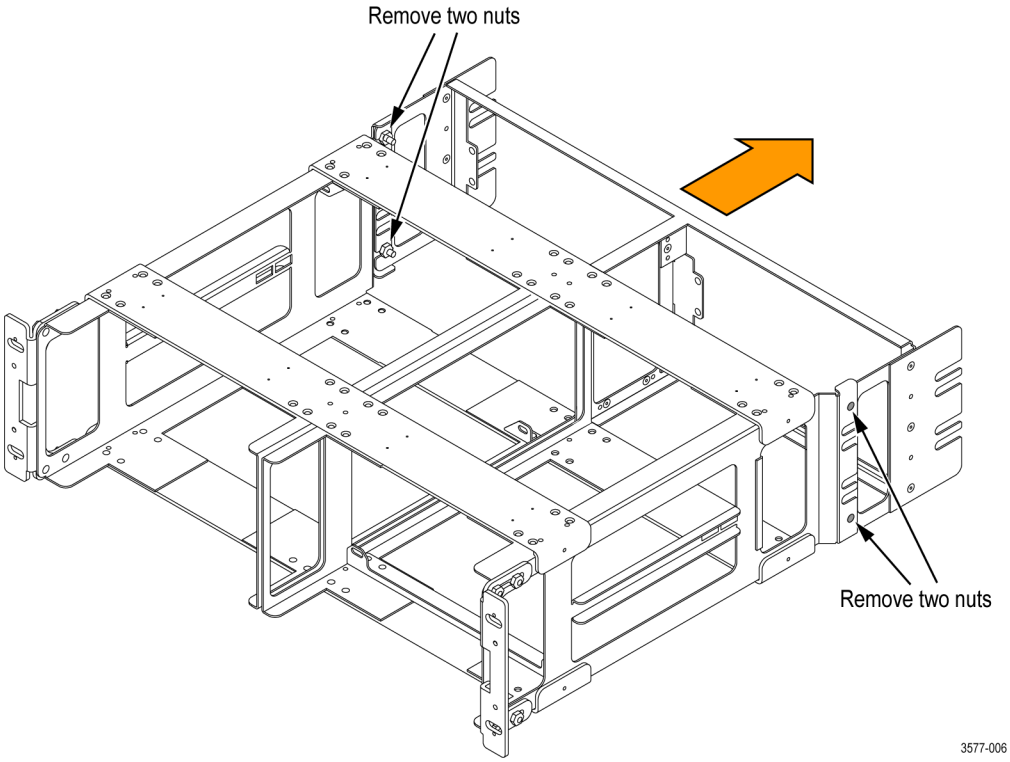


Figure 7: Removing the back extender from the MPI-RACK-MW dual rack cabinet

MPI power-on and power-off procedures

This section describes how to apply power to the MPI monitor and how to power-on and power-off the instrument.

MPI power cord installation

The MPI monitor is powered by the DC output of an AC power adapter. Connect the AC adapter to the power connector on the rear panel of the instrument as shown below. The power connector is keyed to be directional, with the flat portion of the power cord housing facing the left of the instrument (as viewed from the rear). When fully inserted, the power cord housing latches on the instrument power connector.

CAUTION. *To minimize the risk of damage to the instrument, it is strongly recommended that the AC adapter be connected to the MPI monitor before the adapter is connected to the AC power source.*

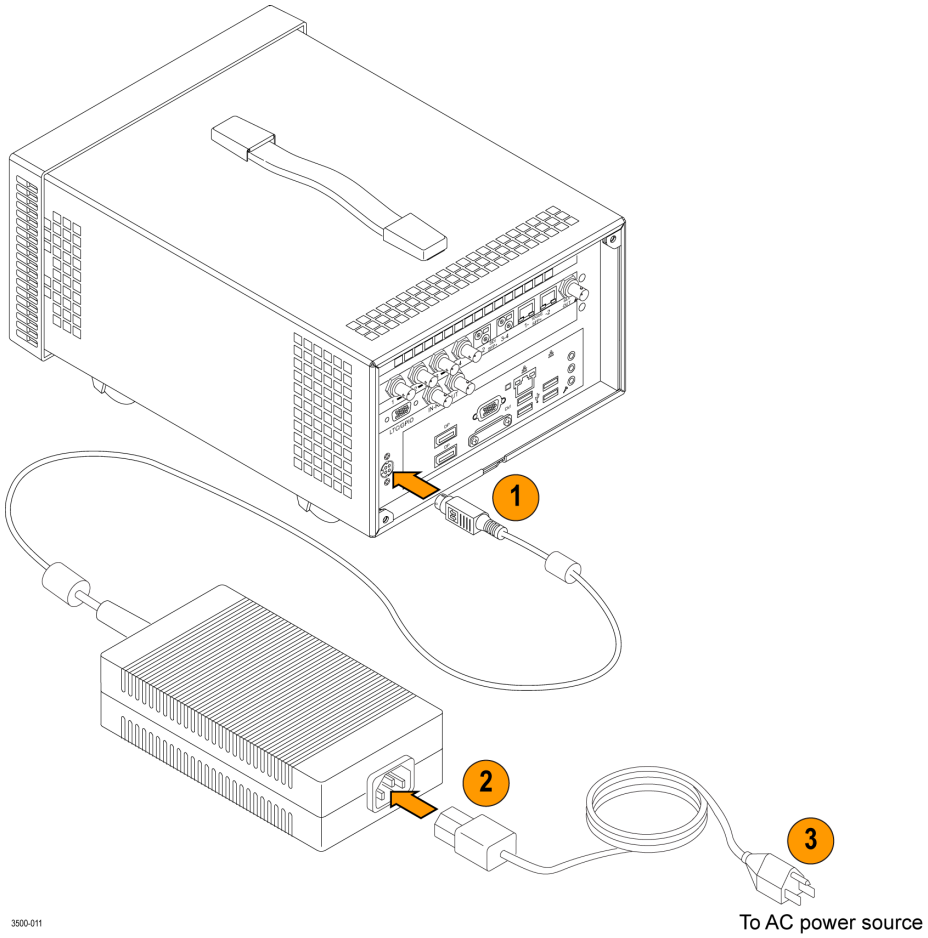


Figure 8: Connecting power to the MPI monitor

MPI power cord removal

The power cord housing latches on the instrument power connector when fully inserted. To remove the power cord, grasp the connector housing as shown below and firmly pull the cord away from the instrument.

CAUTION. *To prevent damage to the power cord or to the instrument power connector, do not attempt to disconnect the power cord by pulling on the cable. You must pull on the connector housing to disengage the locking mechanism.*

To minimize the risk of damage to the instrument, it is strongly recommended that the AC adapter be disconnected from the AC power source before the adapter is disconnected from the instrument.

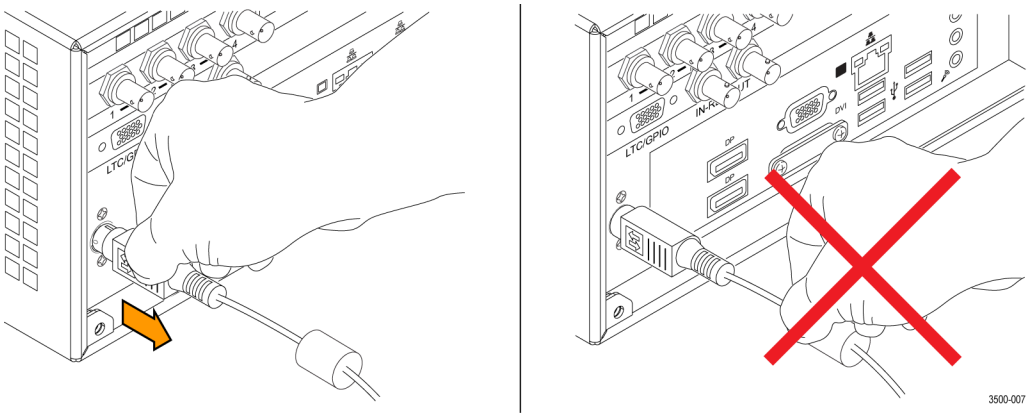


Figure 9: Disconnecting the power cord from the MPI monitor

MPI power-on procedure

1. Apply power to the instrument. (See page 16, *MPI power cord installation*.)

NOTE. *If the MPI monitor was previously powered off by a power interruption or by removing the power cord from the rear of the instrument, the instrument will power on when power is reapplied.*

2. Press the **Power/Standby** button on the instrument front panel to turn the instrument on.

NOTE. *The Power/Standby button illuminates during the power-on sequence and then turns off during normal instrument operation.*

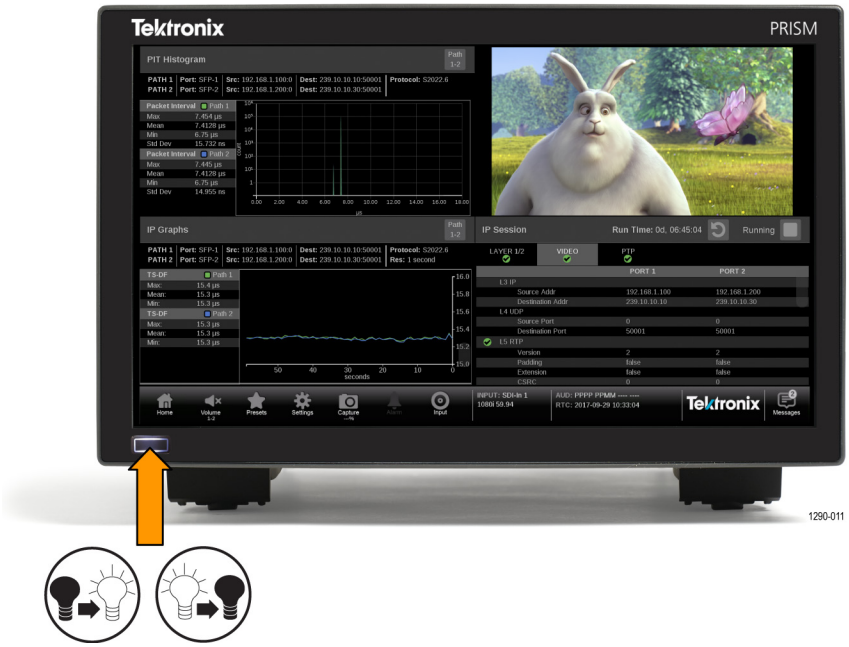


Figure 10: MPI Power/Standby button

MPI power-off procedure

1. Press the **Power/Standby** button on the instrument front panel to turn the instrument off.

CAUTION. *To prevent data loss, it is strongly recommended that you first shut down the instrument using the power button or the Settings > Utilities > Power submenu before disconnecting the power cord.*

To minimize the risk of damage to the instrument, it is strongly recommended that the AC adapter be disconnected from the AC power source before the adapter is disconnected from the instrument.

2. To completely remove power from the MPI monitor, disconnect the power cord from the instrument. (See page 17, *MPI power cord removal*.)

MPX power-on and power-off procedures

This section describes how to apply power to the MPX monitor and how to power-on and power-off the instrument.

MPX power cord installation

The MPX monitor is powered by an AC power source. Connect the power cord to the power connector on the rear panel of the instrument as shown below. The power connector is keyed to be directional, with the flat portion of the power cord housing facing the left of the instrument (as viewed from the rear). When fully inserted, the power cord housing latches on the instrument power connector.

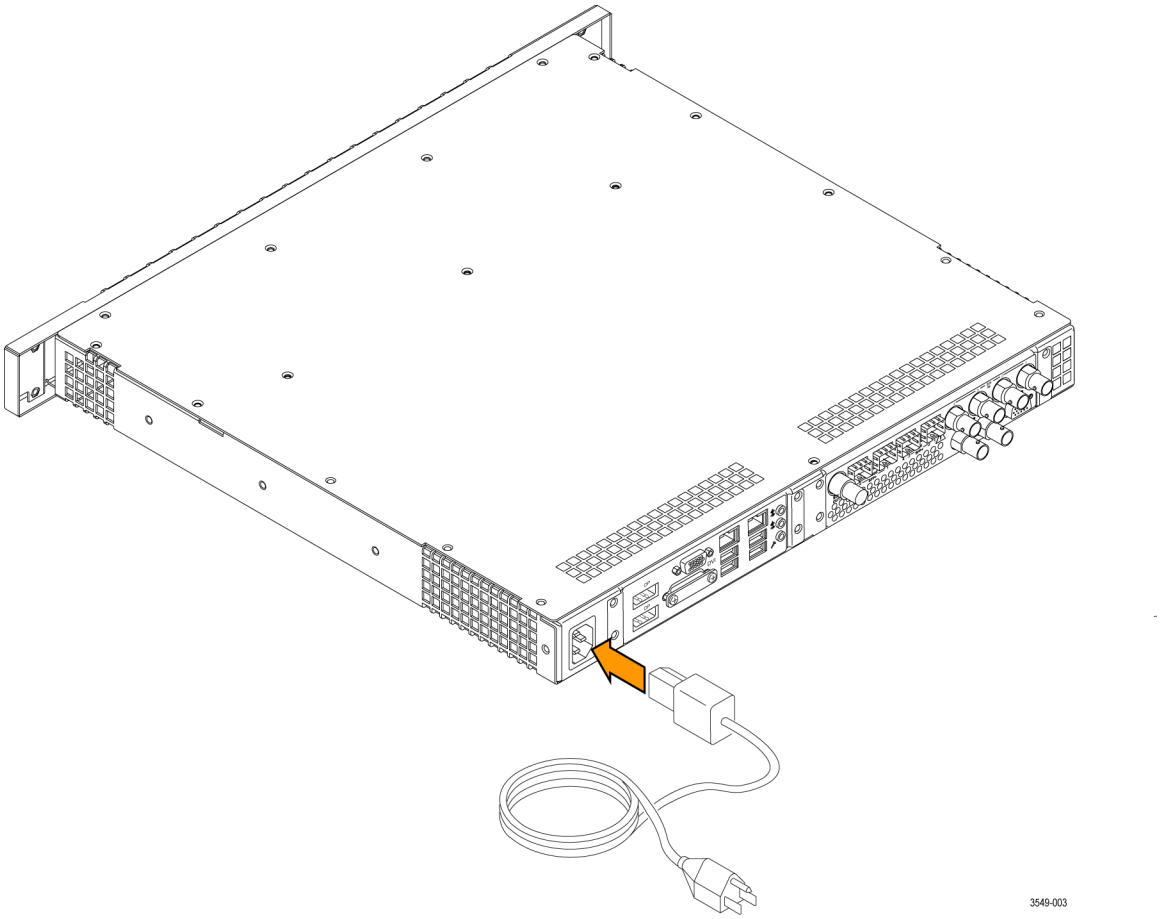


Figure 11: Connecting power to the MPX monitor

MPX power-on procedure

1. Apply power to the instrument. (See page 19, *MPX power cord installation*.)

NOTE. *If the MPX monitor was previously powered off by a power interruption or by removing the power cord from the rear of the instrument, the instrument will power on when power is reapplied.*

2. Press the **Power/Standby** button on the instrument front panel to turn the instrument on.

NOTE. *The Power/Standby button illuminates during the power-on sequence and then turns off during normal instrument operation.*

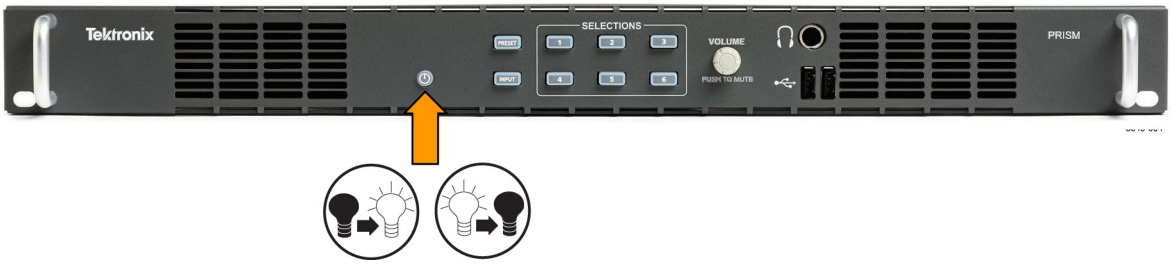


Figure 12: MPX Power/Standby button

MPX power-off procedure

1. Press the **Power/Standby** button on the instrument front panel to turn the instrument off.

CAUTION. *To prevent data loss, it is strongly recommended that you first shut down the instrument using the power button or the Settings > Utilities > Power submenu before disconnecting the power cord.*

2. To completely remove power from the instrument, disconnect the power cord from the instrument. The power cord has a locking mechanism to keep it attached to the instrument. Push the button on the cord housing to release the locking mechanism.

SFP+ module installation

There are several types of optional SFP+ modules available:

- SD/HD/3G-SDI optical transmitter
- SD/HD/3G-SDI DIN transmitter
- SD/HD/3G-SDI HD-BNC transmitter
- 10G Ethernet short range transceiver (850 nm)
- 10G Ethernet long range transceiver (1310 nm)

NOTE. *ST2022-7 requires two 10 GbE SFP modules to be installed. The modules need to be installed in 10 GbE SFP+ ports 1 and 2.*

MPI SFP+ module installation

To install the SFP+ module on an MPI monitor, insert the module into the SFP+ connector as shown below (optical SFP+ module shown). The module will latch into place when fully inserted.

To remove the optical SFP+ module, lift up on the latch and then pull the module out of the SFP+ connector as shown above (optical SFP+ module shown).

NOTE. *An optical SFP+ module is shown below. Other types of SFP+ modules may have different latching mechanisms.*

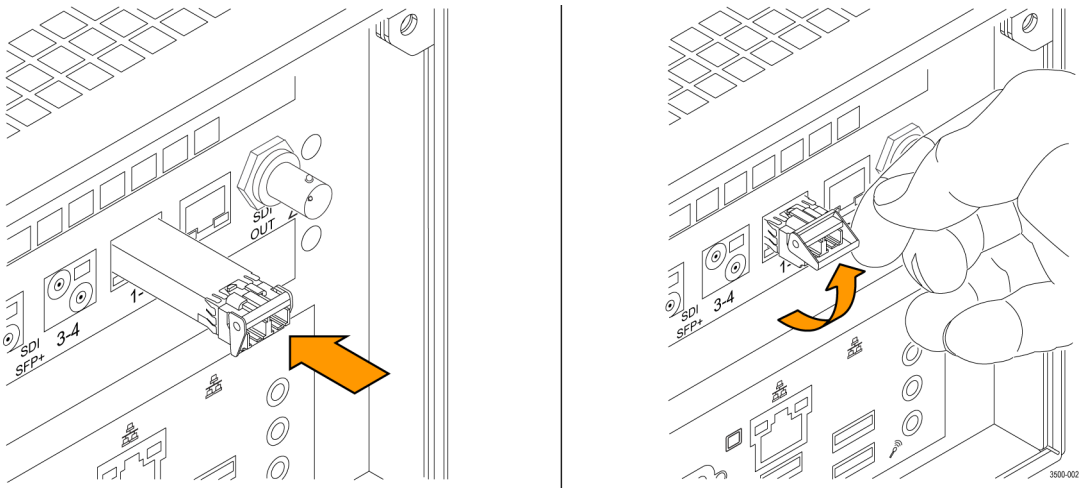


Figure 13: Installing and removing an optical SFP+ module on an MPI monitor

MPX SFP+ module installation

To install an SFP+ module on an MPX monitor, insert the SFP+ module into the SFP+ connector. The module will latch into place when fully inserted.

To remove the SFP+ module, pull down on the latch and then pull the module out of the SFP+ connector. (optical SFP+ module shown).

NOTE. *To ensure you are using the correct SFP+ connectors, the 10 GbE and SDI SFP+ connectors are marked on the back of the MPI (See page 25, MPI rear panel connectors.) and MPX. (See page 27, MPX rear panel connectors.)*

An optical SFP+ module is shown above. Other types of SFP+ modules may have different latching mechanisms.

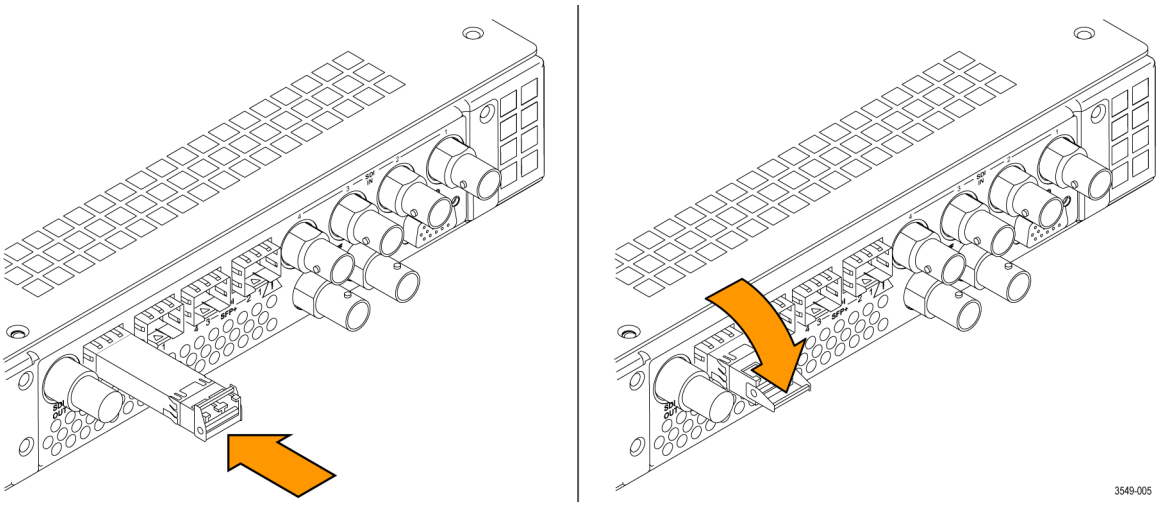


Figure 14: Installing and removing an optical SFP+ module on an MPX monitor

SFP+ module transportation

CAUTION. *To prevent static damage to the SFP+ module, if you remove the SFP+ module from the instrument, always transport the SFP+ module in a anti-static bag or container.*

To prevent possible damage to the PRISM monitor and SFP+ modules, remove the SFP+ modules before transporting the PRISM monitor.

Network installation

See the *PRISM Installation and Safety Instructions* manual that shipped with your instrument for basic installation instructions.

After your instrument is physically installed, you might want to connect it directly to a PC or to a network. The following information can help you do that.

Connecting directly to a PC

The following procedure will help you connect your instrument directly to a PC:

1. Connect the instrument directly to a PC with an Ethernet cable. You can also use an Ethernet Switch. (See Figure 15.)
2. Set up the instrument as described in the following procedures, choosing Manual IP mode to set the IP address manually. Be sure to set an address that is compatible with the setting of your PC. The default IP address of the PRISM monitor is 192.168.1.2.

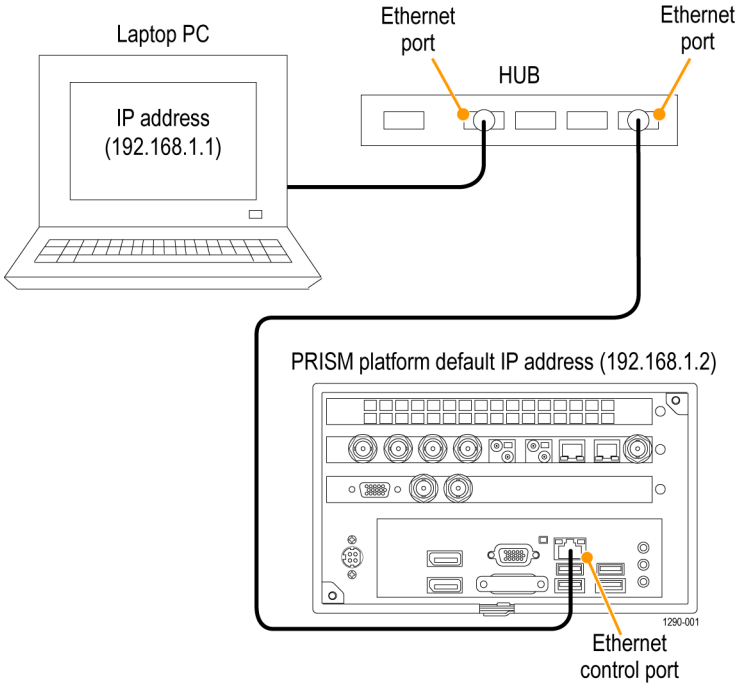


Figure 15: Connecting the instrument to a PC (MPI monitor shown)

Connecting to a network

To allow network access to the instrument, you must set the IP address. Network addresses can be assigned either automatically (DHCP) or manually. If your network does not use DHCP, you will have to manually enter the address for the instrument. To get a fixed address, talk to your LAN administrator. The default IP address of the PRISM monitor is 192.168.1.2.

To connect your instrument to a network and access it with a remote PC, do the following:

1. On the PRISM monitor, touch the **Settings** icon to display the Settings menu.
2. Touch **Network** to open the Network submenu.
3. Touch **CONTROL IP PORT** to open the Control IP Port submenu.
4. Depending on your local network requirements, touch **DHCP** or **Manual** to select the method for selecting an IP address.

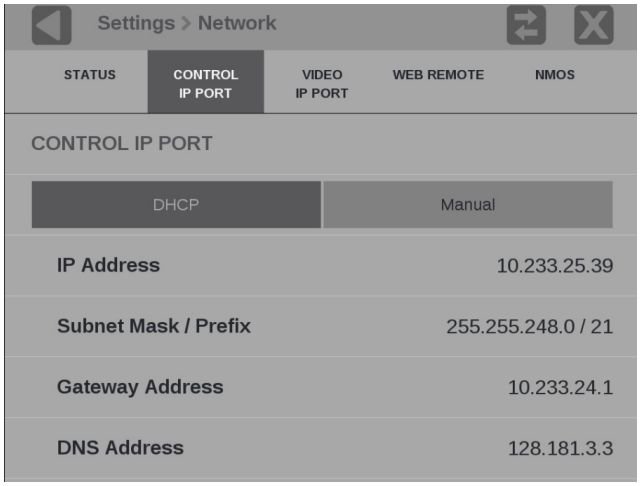


Figure 16: Setting network parameters

5. If you cannot use DHCP and you selected Manual, use the Manual submenu to set the IP address, subnet mask, gateway address and DNS address network parameters you obtained from your LAN administrator. (Be sure to use compatible addresses between the PC and the instrument.) Touch an address box to open the address editing tool. Use the editing box as described for editing an IP input address. (See Figure 36 on page 54.)

CAUTION. *Do not configure your control and/or your Video IP ports to addresses on the same subnet. This may cause a non-deterministic operation, such as IGMP leaves failing or other network connectivity issues.*

6. Touch the **Settings** icon or touch the icon to close the Settings menu.

MPI rear panel connectors

The following figure shows the external connections to the instrument. A description of each connector is provided in the following table.

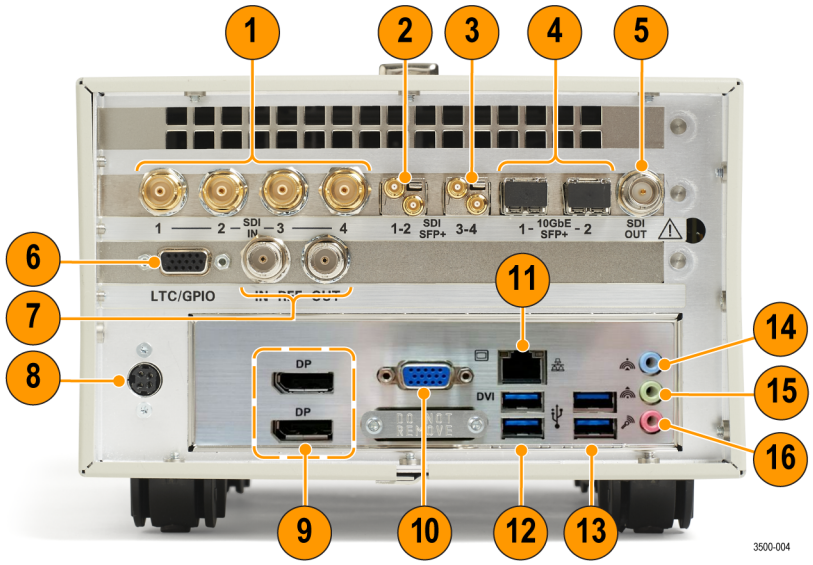
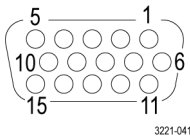
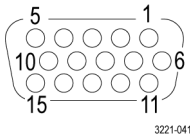


Figure 17: PRISM MPI rear panel

Item number (See Figure 17.)	Description
1	**SDI IN 1-4.** The BNC inputs that can operate in the following modes: ■ SDI inputs 1 and 3 support SD/HD/3G/12G signals. SDI inputs 2 and 4 support SD/HD/3G signals. ■ Single SDI link (Option MP-FMT-4K is required for 12G support). When used as a single link, only one of the SDI 1-4 inputs is active at a time. ■ Eye diagram up to 12G on SDI input 1 only for physical layer measurements, including automated measurement of 12G-SDI eye pattern parameters (requires Options MP-FMT-4K and PHY-12G). ■ Quad 4K links when used in conjunction with the SDI 1-4 inputs (Option MP-FMT-4K only). When used as Quad 4K links, all four SDI inputs are active.
2	**SDI SFP+ 1-2.** Two optional SFP+ outputs for SDI signals (HD-BNC transmitter SFP+ modules shown). SDI SFP+ outputs 1 and 2 supports HD/3G signals.
3	**SDI SFP+ 3-4.** Two optional SFP+ outputs for SDI signals (HD-BNC transmitter SFP+ modules shown). SDI SFP+ outputs 3 and 4 supports HD/3G signals.
4	**10GbE SFP+ 1-2.** Two optional SFP+ ports for 10GbE Ethernet applications.
5	**SDI OUT.** SDI output of the selected SDI or ST2022-6 IP input.

Item number (See Figure 17.)	Description
6  	**LTC/GPIO.** 15-pin, D-type connector is for future functionality.
7	**IN – REF – OUT.** The REF IN connector is for future use. The REF OUT connector outputs a 1 PPS (Pulse Per Second) signal when the instrument is locked to a PTP reference.
8	**DC power input.** Power connector for 48 VDC input.
9	**DisplayPort (DP).** Two DisplayPort outputs for external monitors. The output video format is 1920×1080. [1]
10  	**PC MONITOR.** 15-pin, D-type connector for 1920×1080 analog video output of the instrument display. [1] ■ Pin 1: Red video ■ Pin 2: Green video ■ Pin 3: Blue video ■ Pin 4: Not connected ■ Pin 5: GND ■ Pin 6: Red GND ■ Pin 7: Green GND ■ Pin 8: Blue GND ■ Pin 9: Not connected ■ Pin 10: Not connected ■ Pin 11: Not connected ■ Pin 12: VGA_b_DDAT ■ Pin 13: Horizontal sync ■ Pin 14: Vertical sync ■ Pin 15: VGA_b_DCLK
11	**Ethernet port 1.** Standard RJ-45 connector for 10/100/1000Base-T Ethernet cable.
12	**USB ports.** USB 3.0 ports for connecting a mouse and keyboard, importing or exporting instrument presets, upgrading the instrument firmware, or saving screen and stream captures.
13	**USB ports.** USB 3.0 ports for connecting a mouse and keyboard, importing or exporting instrument presets, or for upgrading the instrument firmware.
14	**Audio input.** This connector is for future use.
15	**Audio output.** 3.5 mm line out port for using headphones to listen to the selected audio channel pair.
16	**Mic input.** This connector is for future use.

[1] When connecting to an external monitor, a monitor with a 1920×1080 capable display works best with the instrument.

MPX rear panel connectors

The following figure shows the external connections to the rear panel of the instrument. A description of each connector is provided in the following table. See *Front panel controls and connectors* for information about the front panel connectors. (See page 35.)

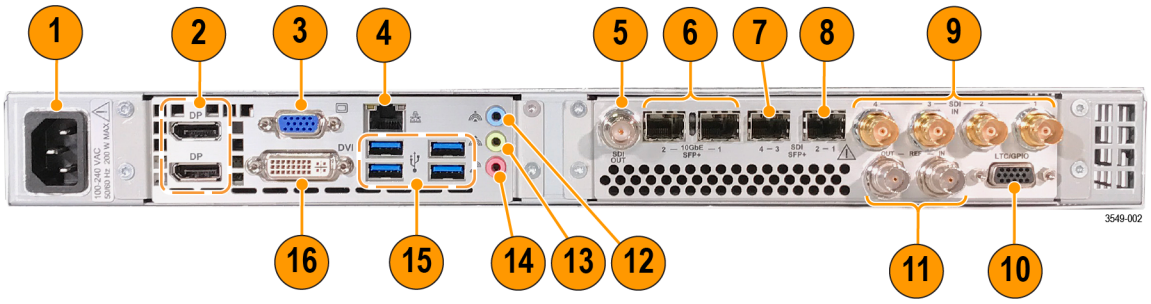
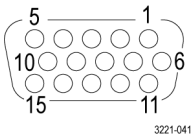
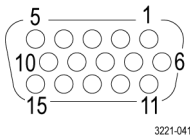


Figure 18: PRISM MPX rear panel

Item number (See Figure 18.)	Description
1	**AC power input.** Connector for AC power source.
2	**DisplayPort (DP).** Two DisplayPort outputs for external monitors. The output video format is 1920×1080. [1]
3	**PC MONITOR.** 15-pin, D-type connector for 1920×1080 analog video output of the instrument display. [1]  ■ Pin 1: Red video ■ Pin 2: Green video ■ Pin 3: Blue video ■ Pin 4: Not connected ■ Pin 5: GND ■ Pin 6: Red GND ■ Pin 7: Green GND ■ Pin 8: Blue GND ■ Pin 9: Not connected ■ Pin 10: Not connected ■ Pin 11: Not connected ■ Pin 12: VGA_b_DDAT ■ Pin 13: Horizontal sync ■ Pin 14: Vertical sync ■ Pin 15: VGA_b_DCLK

Item number (See Figure 18.)	Description
4	**Ethernet port.** Standard RJ-45 connector for 10/100/1000Base-T Ethernet cable.
5	**SDI OUT.** SDI output of the selected SDI or ST2022-6 IP input.
6	**10 GbE SFP+ 1-2.** Two optional SFP+ ports for 10 GbE Ethernet applications.
7	**SDI SFP+ 3-4.** Two optional SFP+ outputs for SDI signals. SDI SFP+ outputs 3 and 4 supports HD/3G signals.
8	**SDI SFP+ 1-2.** Two optional SFP+ outputs for SDI signals. SDI SFP+ outputs 1 and 2 supports HD/3G signals.
9	**SDI IN 1-4.** The BNC inputs that can operate in the following modes: ■ SDI inputs 1 and 3 support SD/HD/3G/12G signals. SDI inputs 2 and 4 support SD/HD/3G signals. ■ Single SDI link (Option MP-FMT-4K is required for 12G support). When used as a single link, only one of the SDI 1-4 inputs is active at a time. ■ Eye diagram up to 12G on SDI input 1 only for physical layer measurements, including automated measurement of 12G-SDI eye pattern parameters (requires Options MP-FMT-4K and PHY-12G). ■ Quad 4K links when used in conjunction with the SDI 1-4 inputs (Option MP-FMT-4K only). When used as Quad 4K links, all four SDI inputs are active.
10	**LTC/GPIO.** 15-pin, D-type connector is for future functionality. 
11	**IN – REF – OUT.** The REF IN connector is for future use. The REF OUT connector outputs a 1 PPS (Pulse Per Second) signal when the instrument is locked to a PTP reference.
12	**Audio input.** This connector is for future use.
13	**Audio output.** 3.5 mm line out port for using headphones to listen to the selected audio channel pair.
14	**Mic input.** This connector is for future use.
15	**USB ports.** Four USB 3.0 ports for connecting a mouse and keyboard, importing or exporting instrument presets, upgrading the instrument firmware, or saving screen and stream captures.
16	**DVI port.** DVI port output for an external monitor. The output video format is 1920×1080. [1]

[1] When connecting to an external monitor, a monitor with a 1920×1080 capable display works best with the instrument.

Display elements

Figure 19: Elements of the display (MPI monitor shown)

Item number	Description
1	Application name. Lists the name of the displayed application.
2	Application tile 1. [1]
3	Application tile 3. [1]
4	Status bar. The right side of the status bar lists instrument status such as the selected input, type of input signal, selected signal reference, audio channel status, the real time clock setting, and the message center. The left side of the Status bar has icons with links to various instrument setting menus, presets, audio volume control, and status readouts. Use the Home icon to exit any displayed menus.
5	Power / Standby button. Press the button to turn the instrument on or off. To completely remove power from the instrument, remove the power cord. ***CAUTION.*** *To prevent data loss, it is strongly recommended that you first shut down the instrument using the power button or the Settings > Utilities menu before disconnecting the power cord.*
6	Application tabs. Some applications have selectable tabs (highlighted readouts) you can use to display additional information.
7	Application tile 4. [1]
8	Application tile 2. [1]

[1] The application panels can be shown in four-tile mode, two-tile mode, or in full screen mode.

Diagnostics report

You can download a .zip file containing a service report of instrument diagnostics using the Settings menu. Should your instrument need service, you may be asked to provide the Diagnostics file to Tektronix to aid in troubleshooting problems with the instrument.

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Utilities** to open the Utilities submenu.
3. Select **Diagnostics** to open the Diagnostics submenu.
4. Insert a USB device into one of the USB ports on the PRISM monitor.
5. Select **Save Diagnostics** to save the diagnostics report to the USB device.

Message center

The Message center enables you to view messages. For example, you can view messages that allow you to eject devices mounted to the instrument. The following steps show you how to eject a USB stick from the instrument using the Message Center:

1. A number above the icon indicates the number of messages on the instrument.

Figure 20: Messages icon with one message

2. Select the **Messages** icon to view the messages or devices mounted to the instrument.

NOTE. *After using a USB stick, it must be unmounted using the Message Center before removing it from the instrument.*

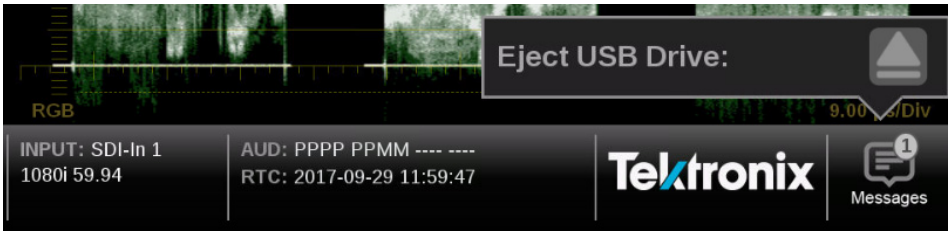


Figure 21: Message center popup window

3. Select the **Eject** icon ( ) to unmount the USB stick from the instrument.
4. Select the **Messages** icon again to hide the Message Center popup window.

Methods of operation

This section describes the primary methods of operating the instrument:

- MPI front panel touchscreen
- MPX front panel controls
- External touchscreen display
- Keyboard and mouse
- Remote control via VNC
- Remote control via API commands

MPI touchscreen operation

The following figure shows the instrument display with the application selection menu open in tile four.

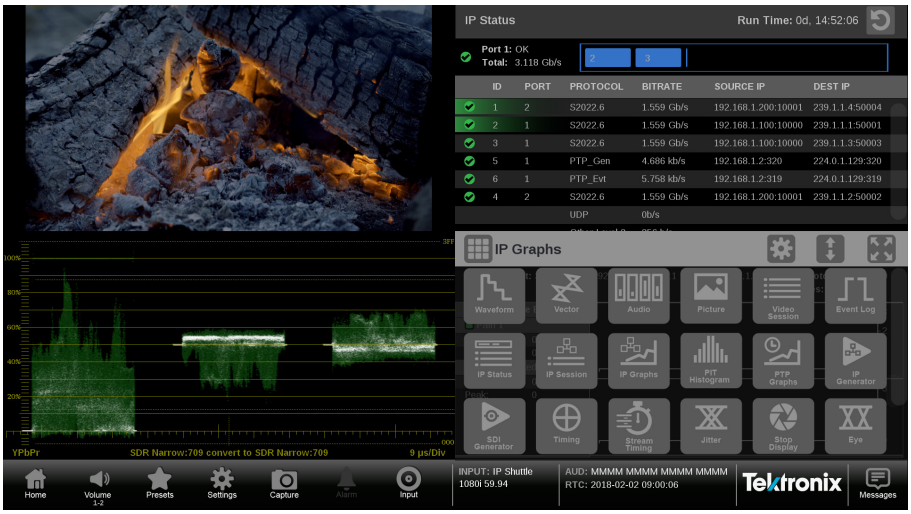


Figure 22: PRISM display in four-tile mode

Supported touchscreen gestures

You can use the following touchscreen gestures to control the instrument:

- Touch or tap the screen to select display elements.
- Press and hold on a tile to open the application banner to access the application controls or switch applications.
- Double tap an application banner to toggle the display between four-tile and a full-screen display of the selected application.

- Swipe up/down or left/right as necessary to navigate menus and preset listings and to view additional application information.
- Some applications support pinch and zoom.

NOTE. *The terms "press and hold", " tap", "swipe", and "pinch" apply to the touchscreen on the instrument. If you are using a mouse and keyboard you must "click and hold", "click", "scroll" and use the scroll wheel on the mouse.*

How to select and control an application to display

1. Press and hold on an open application to open the application menu.
2. If necessary, touch the icon to open the list of available applications. (See Figure 22 on page 33.)
3. Press, hold, and drag an application icon to reorder the application list to best match your workflow.

NOTE. *This reorder operation requires a mouse.*

If a preset is saved your application icon list order will be saved as well. Each presets can have different configuration of the application list.

4. Touch the desired application icon to display that application.
5. If available, touch or tap the icon in the menu bar to open the settings menu for the application.
6. Touch or tap the icon in the menu bar to change the selected application display to full screen.
7. Touch or tap the icon in the menu bar to change the selected application display to vertical extended mode. The vertical extended mode is useful for when you want to view two application displays side-by-side. When an application display is in vertical extended mode, touch or tap the icon in the menu bar to return to quarter tile mode.
8. If available, touch or tap the icon to clear or reset the selected display.

MPX front panel controls

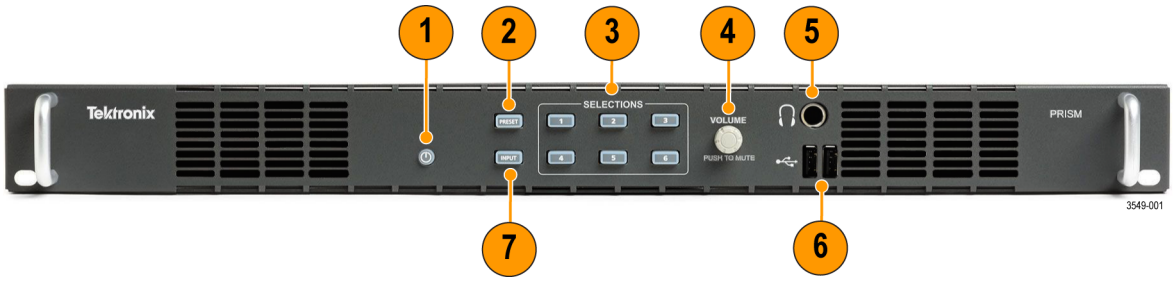


Figure 23: MPX front panel controls

Item number (See Figure 23.)	Description
1	**Power / Standby button.** Press the button to turn the instrument on or off. To completely remove power from the instrument, remove the power cord. ***CAUTION.*** *To prevent data loss, it is strongly recommended that you first shut down the instrument using the power button or the Settings > Utilities menu before disconnecting the power cord.*
2	**PRESET button.** Press the button once to prepare the instrument for a preset selection from preset Group A using the SELECTIONS buttons (1-6). Press the button repeatedly to select preset Group B-F. [1]
3	**SELECTIONS buttons.** After pressing the PRESET or INPUT button, press one of the SELECTIONS buttons (1-6) to recall an instrument preset or to select an input to monitor.
4	**VOLUME control.** Turn the VOLUME control to adjust the volume on the front and rear-panel headphone outputs. Push the VOLUME control to mute or unmute the audio. [1]
5	**Headphone jack.** 1/4 inch headphone jack for listening to the selected audio channel pair.
6	**USB ports.** Two USB 2.0 ports for connecting a mouse and keyboard, importing or exporting instrument presets, or upgrading the instrument firmware. ***NOTE.*** *It is strongly recommended you do NOT use the front USB 2.0 ports for stream captures. Using a USB 2.0 port for stream captures will take an excessive amount of time. Use the rear panel USB 3.0 ports for stream captures.*
7	**INPUT button.** Press the button to prepare the instrument for an input selection using the SELECTIONS buttons (1-6). [1]

[1] When you use the PRESET and INPUT buttons, the associated menus appear on the display. The menus close after a short time-out period. Similarly, when you use the VOLUME control, the volume slider and mute controls appear on the display and close after a short time-out period.

MPX front panel operation

You can use the instrument front panel to perform the following functions:

- Recall instrument presets
- Select an input to monitor
- Control or mute the volume on the headphone outputs
- Connect a mouse and keyboard
- Connect a USB drive to upgrade the instrument firmware or save screen and stream captures

NOTE. *It is strongly recommended you do NOT use the front USB 2.0 ports for stream captures. Using a USB 2.0 port for stream captures will take an excessive amount of time. Use the rear panel USB 3.0 ports for stream captures.*

How to recall instrument presets (MPX). Perform the following steps to recall instrument presets using the front panel:

1. Press the **PRESET** button once to prepare the instrument for a preset selection from preset Group A using the SELECTIONS buttons (1-6).
2. Press the **PRESET** button repeatedly to select preset Group B-F. The selected preset group will be displayed.
3. After you select the desired preset group, press the **SELECTIONS numbered button** corresponding to the preset in that group you want to recall (1-6).

NOTE. *When you use the PRESET and INPUT buttons, the associated menus appear on the display. The menus close after a short time-out period. Similarly, when you use the VOLUME control, the volume slider and mute controls appear on the display and close after a short time-out period.*

How to select an input to monitor (MPX). Perform the following steps to recall instrument presets using the front panel:

1. Press the **INPUT** button to prepare the instrument for an input selection.
2. Press the **SELECTIONS numbered button** corresponding to the input you want to monitor.

Keyboard and mouse operation

You can use a USB keyboard and mouse to operate the instrument. The mouse must have a scrolling wheel to access all of the menu selections. Click or click and hold on applications to perform actions like you would on the touch panel.

Connect the keyboard and mouse as follows:

- Use the USB ports on the rear panel of the instrument (MPI) or front panel (MPX)
- Use the USB port on the front of the optional dual rack cabinet (MPI-RACK-MM or MPI-RACK-MW)
- Connect the external monitor to any of the available display outputs, including VGA, Display Port, or DVI (MPX)

Keyboard controls

Home icon. The ESC key on the keyboard is mapped to function as the Home icon, which closes any displayed menus.

Volume control. If your keyboard has volume control keys, you can use them to control the volume of the audio output on the instrument.

Input and preset selection. The following table lists the keyboard controls that allow you to quickly select between the SDI inputs and to select from instrument presets 1 through 6.

Table 5: Keyboard controls for selecting SDI inputs and instrument presets

Action	Keyboard control	Result
Input	ALT+i	Prepares the instrument for an input selection.
Preset	ALT+p	Prepares the instrument for a preset selection from preset Group A. Repeat 2-5 times to select preset Group B-F.
Select 1	1	Selects Input 1 or selects Preset 1 from the selected preset group.
Select 2	2	Selects Input 2 or selects Preset 2 from the selected preset group.
Select 3	3	Selects Input 3 or selects Preset 3 from the selected preset group.
Select 4	4	Selects Input 4 or selects Preset 4 from the selected preset group.
Select 5	5	Selects Input 5 or selects Preset 5 from the selected preset group.
Select 6	6	Selects Input 6 or selects Preset 6 from the selected preset group.

To select an SDI input or instrument preset.

1. On the keyboard, do one of the following:
   - While pressing the **ALT** key, press **i** to enable an input selection change.
   - While pressing the **ALT** key, press **p** once to recall a preset from Preset Group A. Repeat 2-5 times to select a preset from another Preset Group (B-F). For example, press ALT+p three times to make a selection from Preset Group C.
2. Press a number from **1** to **6** to select the desired input or to select a preset from the selected Preset Group (A-F).

External touchscreen display operation

You can use an external touchscreen display to control the instrument. Two connections are required:

- Connect the Display Port output from the PRISM monitor to the input on the external device.
- Connect the output of the external device to one of the USB ports on the PRISM monitor.

NOTE. *A monitor with a 1920×1080 capable display works best with the instrument.*

It is recommended that you reboot the instrument after connecting a external touchscreen.

Manage the tile display

Each application can be independently changed to quarter, half, or full screen based on your requirements. The default for the PRISM instrument is to display four quarter screen tiles. The following configurations show how to expand the applications to half or full screen tiles and collapse them back to a quarter of the screen.

Half screen tiles

The following figures show different half screen configurations. (See Figure 24.) (See Figure 25.)

Press and hold on a tile to open the application banner and use the expand icon ( ) to expand the tiles vertically.

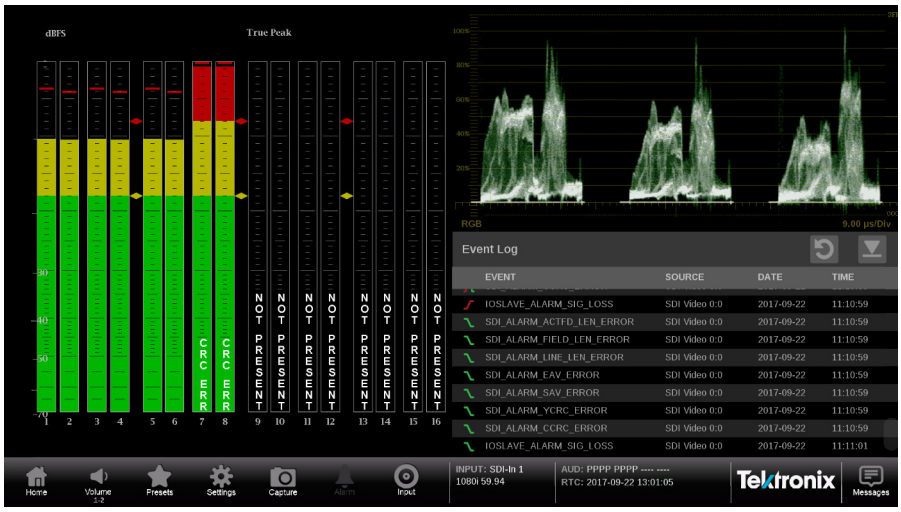


Figure 24: One half screen tile and two quarter screen tiles

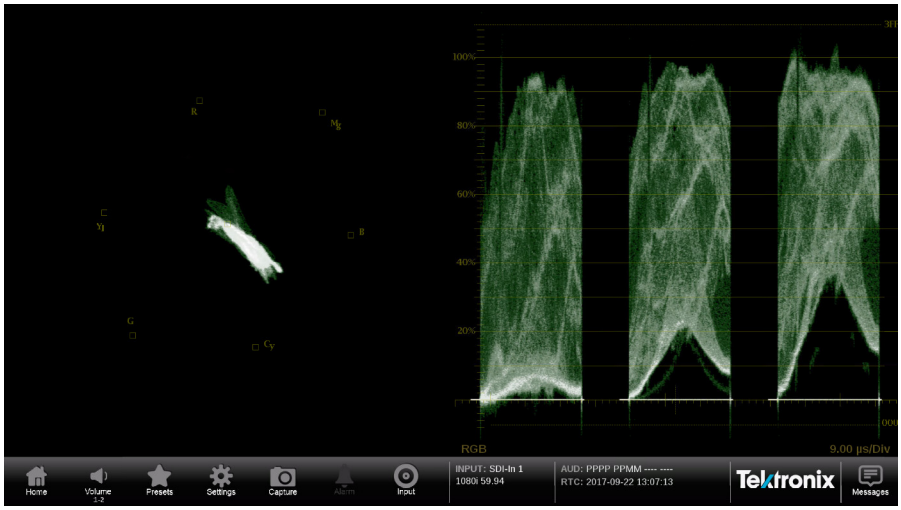


Figure 25: Two half screen tiles showing vector and waveform displays.

Full screen tile

The following figure shows a full screen display. One tile has expanded to use the entire PRISM monitor.

Double tap on the application to toggle it between full screen and quarter/half screen mode. Alternately, press and hold one tile to open the application banner and use the maximize icon ( ) to expand the tile to the full screen.

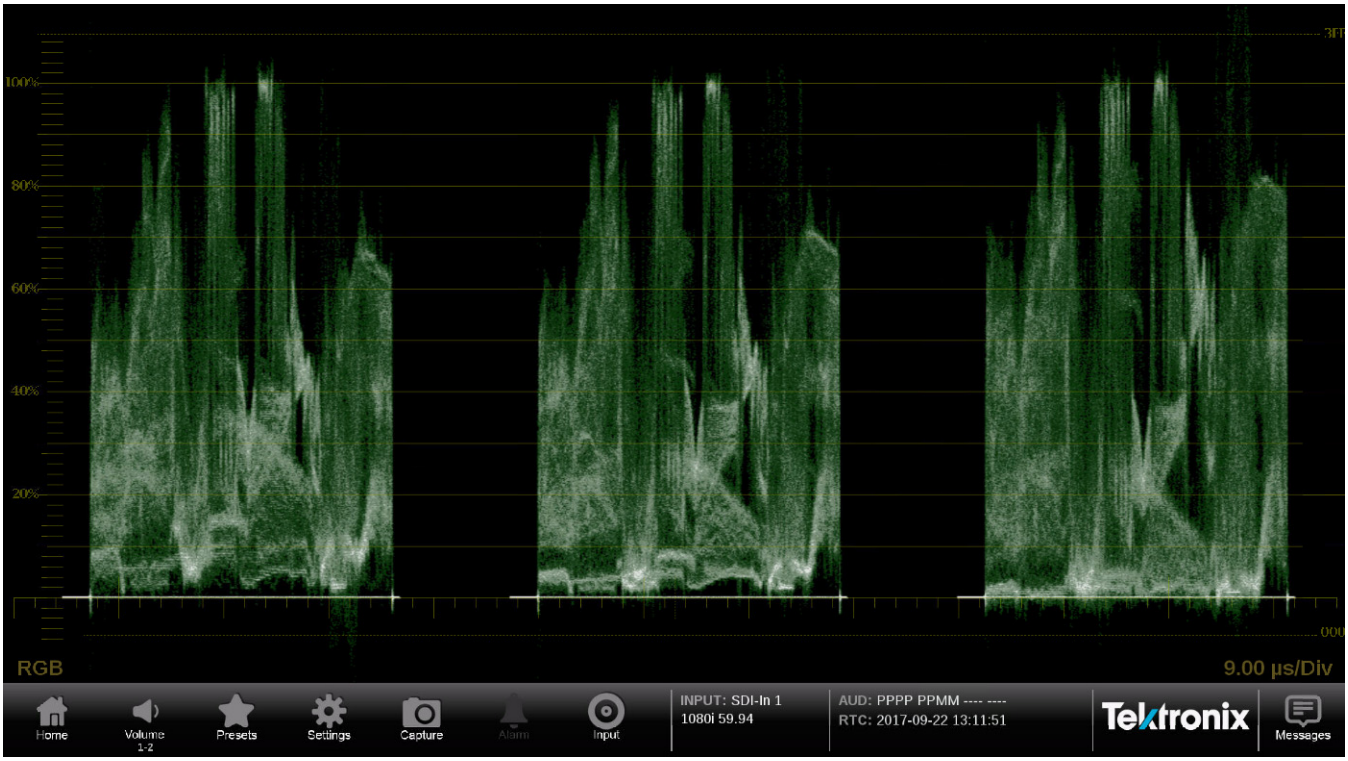


Figure 26: Full screen tile

Quarter screen tiles

The following figure shows a display with quarter screen tiles. Sizing tiles to a quarter screen allows you the flexibility to view up to four tiles at once.

Press and hold a tile to open the application banner and use the following icons to re-size the application.

- Use the minimize icon ( ) to exit full screen mode.
- Use the collapse icon ( ) to collapse the tile vertically.

Figure 27: Four quarter screen tiles

Remote control via VNC operation

When the PRISM monitor is connected to an Ethernet network, you can use a computer connected to the same network to remotely control the instrument in a Web browser or in a VNC client such as VNC Viewer. Use the following steps to connect to the PRISM monitor via VNC:

VNC client. When using VNC for extended periods of time, it is recommended to use a VNC client.

1. On the PRISM monitor, open the **Settings** > **Network** page to view the **Control IP Port** address of the instrument to which you are going to connect.
2. On your computer, open your VNC client and enter the IP address of the Control IP Port of the instrument in the VNC Server search bar.

NOTE. *A unique PRISM **Hostname** can be used instead of the IP address. To set a Hostname, open the **Settings** > **Network** menu and go to the **Web Remote** tab.*

3. The VNC client connects to the instrument in a separate window that appears exactly like the instrument display.

Web browser. Use the following steps to connect to the instrument through a Web browser.

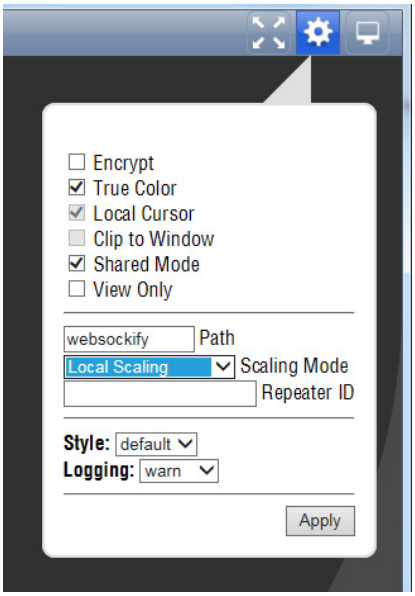
1. On the PRISM monitor, open the **Settings** > **Network** page to view the **Control IP Port** address of the instrument to which you are going to connect.
2. On your computer, enter the following in the URL box of your Web browser, where xxx.xxx.xxx.xxx is the IP address of the Control IP Port of the instrument.

   http://xxx.xxx.xxx.xxx:6080/vnc.html

NOTE. *If you have set a unique Hostname for the instrument, enter it in the browser address bar and select the **NoVNC Access** link.*

3. This opens a login Web page as shown below.

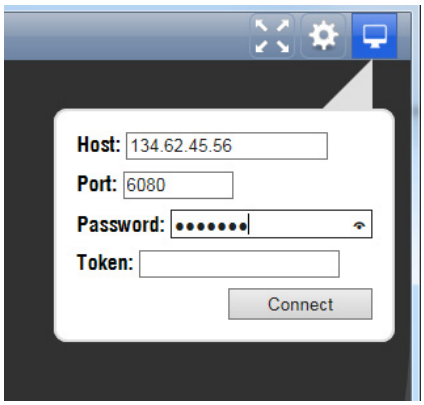
4. In the Control bar, click the **Settings** icon to open the Settings dialog.
5. In the Settings dialog, use the Scaling Mode drop-down list to select **Local Scaling**, and then click **Apply**.



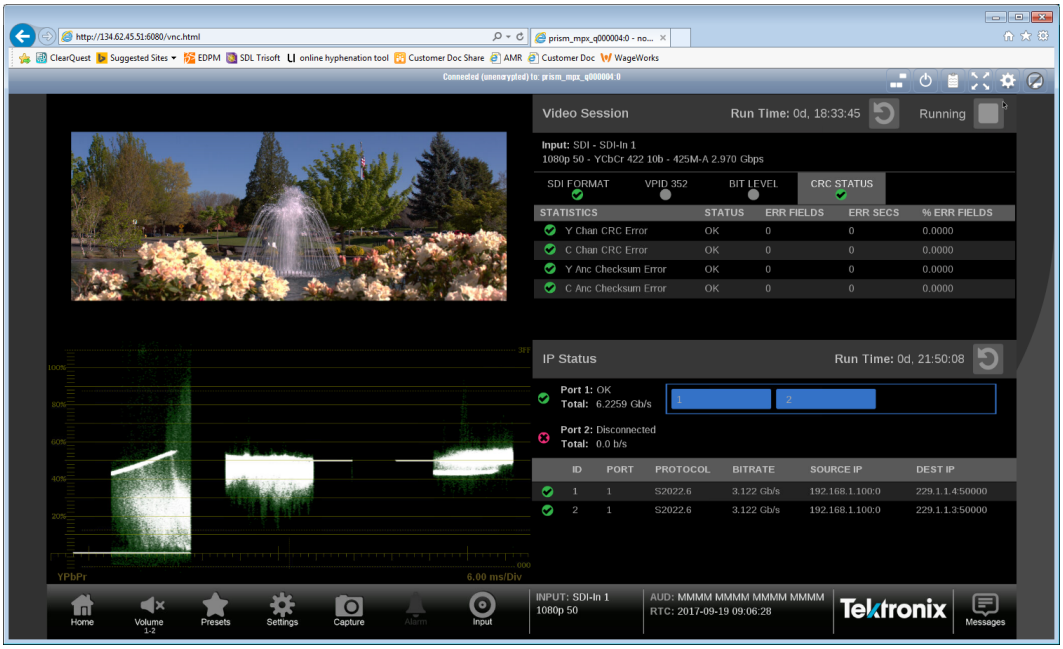
6. In the Control bar, click the **Connect** icon to open the Connect dialog.

7. In the Settings dialog, enter the default password **PRISM**, and then click **Connect**.

NOTE. *You can use the WEB REMOTE tab of the PRISM Settings > Network menu to change the default password for the remote Web connection.*



8. The Web browser connects to the instrument with the browser display appearing exactly like the display on the external monitor, but with a slower update rate.



NOTE. *If the correct Scaling Mode to Local Scaling is not selected, you will have to disconnect using the computer icon at the top of the viewer to gain access the Settings menu.*

Remote control via API commands

The PRISM monitor has a limited command set for controlling the instrument using REST-style API commands. You can use GET and POST commands to configure the signal inputs and to select the active input.

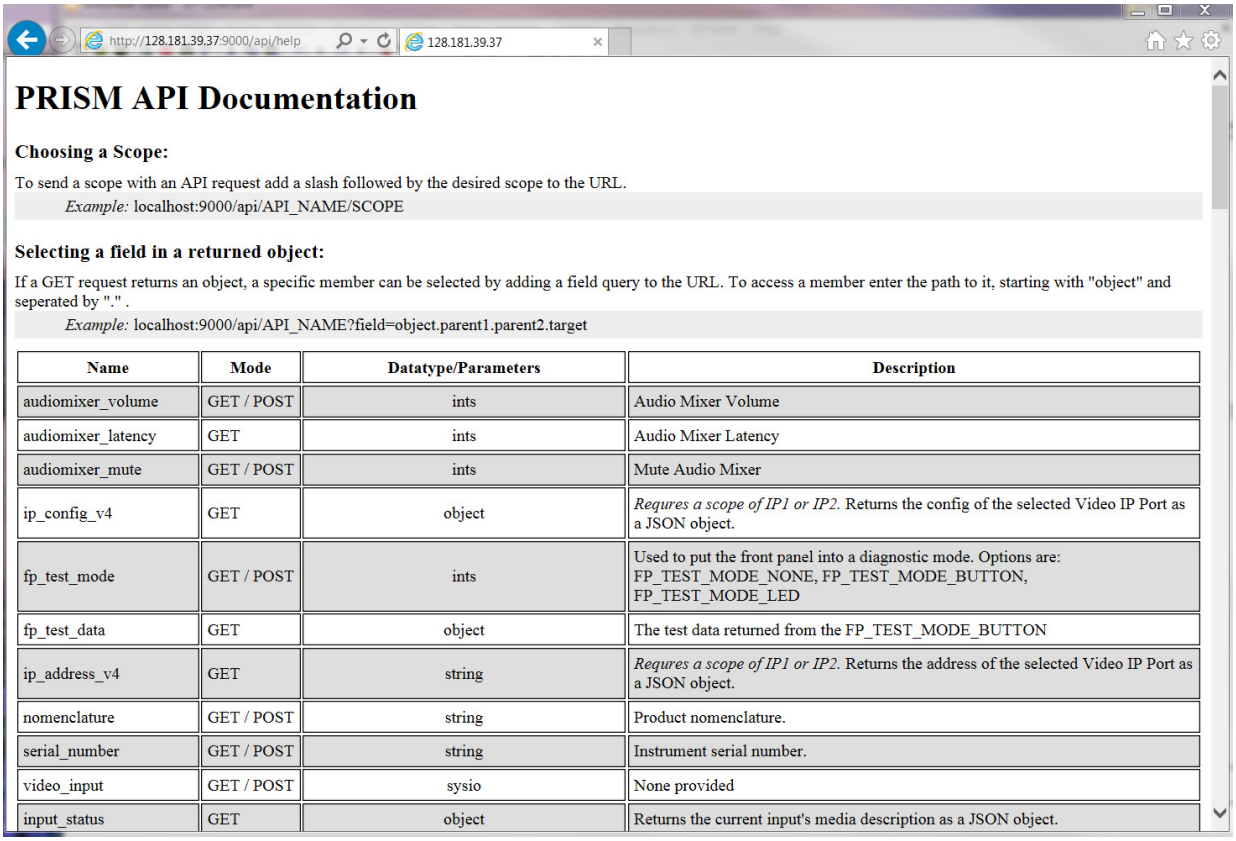
Use the following steps to access the API documentation:

1. On the PRISM monitor, open the **Settings** > **Network** page to view the **Control IP Port** address of the instrument to which you are going to connect.
2. On your computer, enter the following in the URL box of your Web browser, where xxx.xxx.xxx.xxx is the IP address of the Control IP Port of the instrument.

   http://xxx.xxx.xxx.xxx:9000/api/help

NOTE. *If you have set a unique Hostname for the instrument, enter it in the browser address bar and select the* ***API Help Page*** *link.*

3. This opens a PRISM API Documentation Web page as shown below.



Name	Mode	Datatype/Parameters	Description
audiomixer_volume	GET / POST	ints	Audio Mixer Volume
audiomixer_latency	GET	ints	Audio Mixer Latency
audiomixer_mute	GET / POST	ints	Mute Audio Mixer
ip_config_v4	GET	object	*Requres a scope of IP1 or IP2.* Returns the config of the selected Video IP Port as a JSON object.
fp_test_mode	GET / POST	ints	Used to put the front panel into a diagnostic mode. Options are: FP_TEST_MODE_NONE, FP_TEST_MODE_BUTTON, FP_TEST_MODE_LED
fp_test_data	GET	object	The test data returned from the FP_TEST_MODE_BUTTON
ip_address_v4	GET	string	*Requres a scope of IP1 or IP2.* Returns the address of the selected Video IP Port as a JSON object.
nomenclature	GET / POST	string	Product nomenclature.
serial_number	GET / POST	string	Instrument serial number.
video_input	GET / POST	sysio	None provided
input_status	GET	object	Returns the current input's media description as a JSON object.

Figure 28: API documentation Web page

How to configure the instrument

Most of the instrument settings are controlled using the Settings menu. You can access the global settings menu by touching the Settings icon. This section describes how to configure the following instrument settings:

- Signal inputs (See page 46, *How to configure and select signal inputs*.)
- HDR monitoring (See page 61, *How to configure the instrument for HDR / WCG monitoring*.)
- PTP reference settings (See page 66, *How to configure PTP reference settings*.)
- Presets (See page 68, *How to set and recall instrument presets*.)
- Internal time and date (See page 39, *Manage the tile display*.)
- Firmware upgrade (See page 79, *How to upgrade the instrument firmware*.)
- Installed software and hardware versions (See page 88, *How to verify the installed software and hardware versions*.)

NOTE. *Some of the configuration settings require you to enter values. A USB keyboard can be used to enter these values instead of using the touchscreen keypad on the instrument.*

How to configure and select signal inputs

The PRISM monitor allows you to configure multiple signal inputs. Use the Settings > Inputs menu to:

- Configure SDI inputs
- Configure IP stream inputs, including ST2022-6, ST2110-20/30/40, and ASPEN IP streams
- Modify input names
- Enable ST2022-7 Seamless Switching

CAUTION. *IGMP communications can fail when the Video IP Ports are configured for the same IP Address. The control port and both video ports should always have different IP addresses and be on different subnets.*

Configuring SDI inputs

The Single and Quad link buttons are only available when software option MP-FMT-4K is present. If this option is not present, only a single link can be configured.

Single link input configuration. Perform the following procedures to configure a Single link:

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Inputs** to open the Inputs submenu.

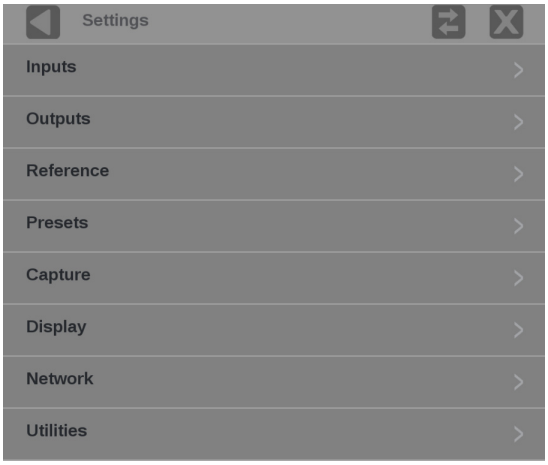


Figure 29: Settings menu

NOTE. *In the following figure are six virtual inputs to choose from. Inputs can be given any meaningful name, (See page 52, To rename a signal input.)*

Figure 30: Settings inputs submenu

3. Select an SDI input.

4. Select **Single** for the Input Configuration and select one of the four physical SDI inputs to monitor. The example shows the SDI 1 input being selected.

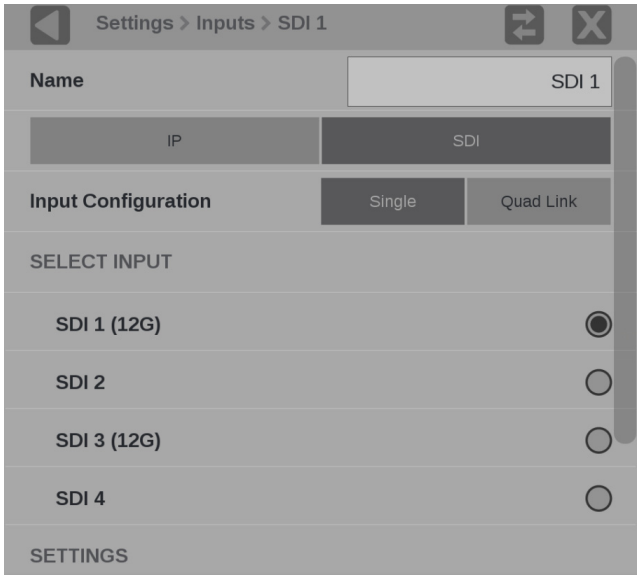


Figure 31: Single SDI signal configuration

5. Select **Save** and close the menu.

Quad Link input configuration. Follow the steps 1 through 3 in Single link input configuration procedure and then perform the following steps to configure a Quad Link input:

NOTE. *All four SDI inputs must be connected to a cable on the back of the instrument to use the Quad Link Input Configuration.*

1. Confirm that Quad Link cables are connected to the back of the instrument.
   - Quad Link A is connected to SDI-IN 1
   - Quad Link B is connected to SDI-IN 2
   - Quad Link C is connected to SDI-IN 3
   - Quad Link D is connected to SDI-IN 4

2. Select **Quad Link** for the Input Configuration. SDI 1-4 (Link A-D) is selected by default.

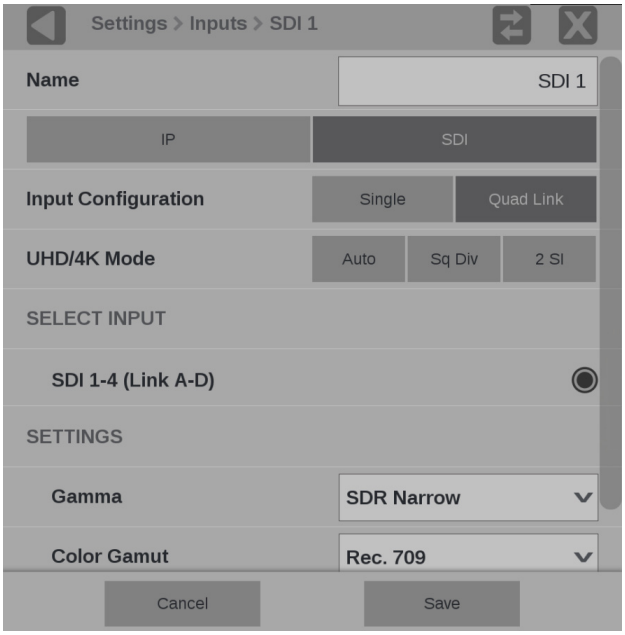


Figure 32: Quad Link SDI signal configuration

NOTE. *The Quad Link and UHD/4K Mode buttons are only available when software option MP-FMT-4K is present.*

3. Use the **UHD/4K Mode** buttons to select **Auto**, **Sq Div** (Square Division) or **2 SI** (Two Sample Interleave).

NOTE. *In AUTO mode, the instrument defaults to Two Sample Interleave mode if the Video Payload Identifier (VPID) complies with SMPTE 425.3 or SMPTE 425.5. The instrument defaults to Square Division mode if the VPID complies with SMPTE 292.1, SMPTE 372, SMPTE 425.1, or a quad-HD signal is present and VPID is missing. VPID in the signal is required for this option to operate properly.*

4. Select **Save** and close the menu.

SDI input settings. The following settings are the same for Single and Quad Link input configurations. The Gamma and Color Gamut settings define the characteristics of the video signal.

1. Choose the appropriate **Gamma** selection from the drop-down menu. The selection characterizes the video signal on each virtual input.

   - **SDR Narrow**. The reference OETF (Optical to Electrical Transfer Function) is defined in ITU-R BT.709 with gamma of 0.45 and the reference EOTF (Electrical to Optical Transfer Function) is defined in ITU-R BT.1886 with gamma of 2.4.

     The scaling places the extrema of the nonlinear color value from zero to unity at code words 40h(64) and 3ACh(940) in a 10-bit representation.

   - **PQ Narrow**. The reference OETF with a high luminance range capability of 0 to 10,000 cd/m2 standardized in SMPTE2084. The EOTF is the inverse of OETF.

     The scaling places the extrema of the nonlinear color value from zero to unity at code words 40h(64) and 3ACh(940) in a 10-bit representation.

   - **HLG**. The reference OETF is standardized in ARIB B67 and the reference EOTF is standardized in ITU BT.2100 at the nominal display peak luminance of 1000 nits.

   - **S-Log2**. The reference OETF is defined as Sony S-Log2. The EOTF is the inverse of OETF.

   - **S-Log3**. The reference OETF is defined as Sony S-Log3. The EOTF is the inverse of OETF.

   - **S-Log3 (Live HDR)**. The reference OOTF (Optical to Optical Transfer Function) is defined as Sony S-Log3.

   - **Log C**. The reference OETF is defined as ARRI Log C. The EOTF is the inverse of OETF.

2. Select the color space of the video signal using the **Color Gamut** drop-down menu.
   - **Rec. 709**. Standard for HD.
   - **Rec. 2020**. Standard for 4K.

NOTE. *Rec. 601 gamut is automatically selected when the SD format is detected / selected in the video signal.*

Figure 33: SDI signal settings

3. Select **Save** and close the menu.

To rename a signal input.

1. To rename the input to a meaningful name, touch the **Name** box to open the text editing display shown below.

Figure 34: Renaming a signal input

2. Use the editing controls to enter a new name for the input. Here are some notes on using the text editor.
   - Enter a name with a maximum of 16 characters.
   - Use the icon next to the input box to clear the existing name.
   - Use the **shift** key to access capital letters.
   - Use the **backspace** key to delete characters by backspacing over them.
   - Use the **123** and **abc** keys to toggle between accessing letters and numbers/symbols.
3. When you are done editing the input name, touch the **Enter** key.
4. When you are done editing the input, touch **Save** to save your changes.

Configure IP stream inputs

To configure an IP stream, perform these steps:

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Inputs** to open the Inputs submenu.
3. Select the desired input from the list.
4. Select **IP**.

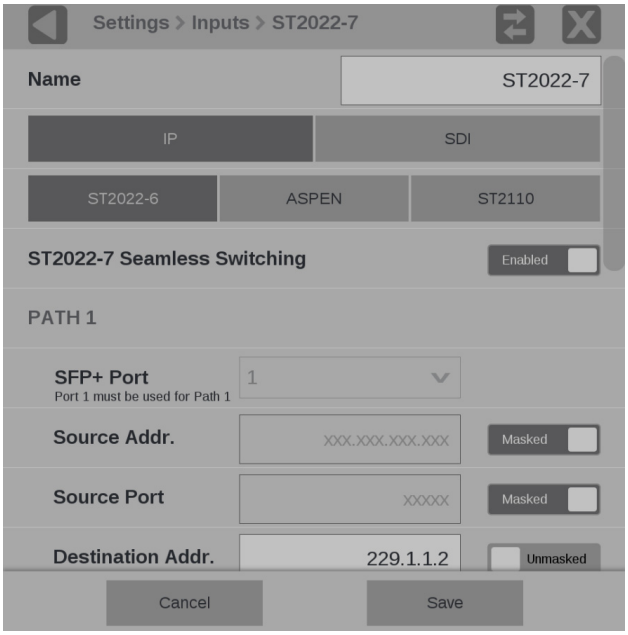


Figure 35: IP input protocols and ST2022-7 seamless switching

Configure ST2022. If you will be monitoring ST2022 streams, follow the instructions (See page 60, *Input selection*.) and then:

1. Select ST2022-6.
2. Slide the **ST2022-7 Seamless Switching** control to **Enabled** or **Disabled**.

NOTE. *There is a difference between "Port" and "Path". The Port is the physical SPF port that is used to input the 10GbE signal. Path 1 and Path 2 are the signal paths to be used for seamless switching. This differentiation is being made since it is possible for both Path 1 and Path 2 to use a single Port.*

3. Enter the Source and Destination information for Path 1 and Path 2, if applicable.

NOTE. *You may have to scroll down to see Path 2.*

4. To have the instrument ignore a parameter, touch the **Unmasked** control next to the parameter to toggle the state to **Masked**.

5. To edit one of the parameter values, touch inside the parameter box to open the editing display shown below.

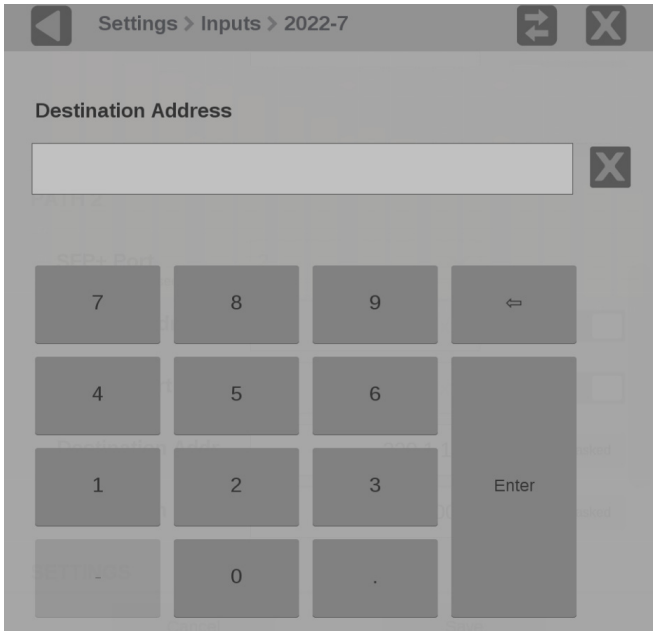


Figure 36: Editing parameter fields

6. When you are done editing touch the **Enter** key.

7. Scroll down to enter the Source and Destination information for Path 2.

NOTE. *If ST2022-7 Seamless Switching is set to Disabled only Path 1 is available.*

8. Select **Save** and close the menu.

Configure ASPEN. If you will be monitoring ASPEN (Adaptive Sample Picture Encapsulation) streams, follow the instructions (See page 60, *Input selection*.) and then:

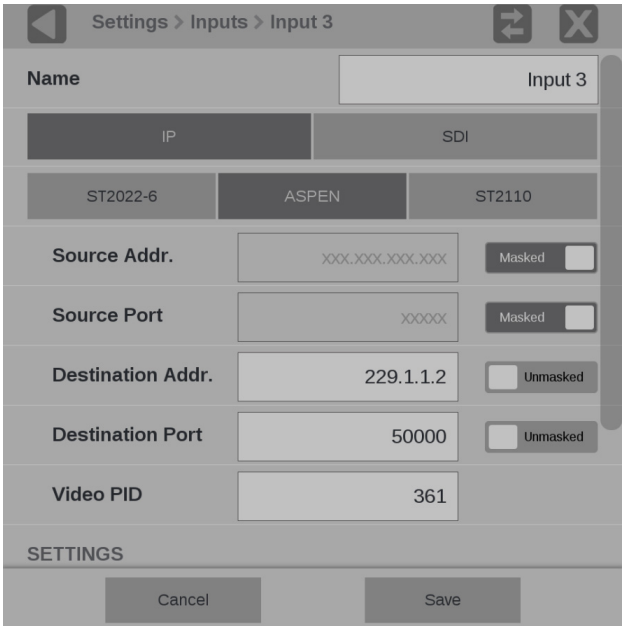


Figure 37: Configure ASPEN stream

1. Select **ASPEN**.
2. Enter the Source and Destination information.
3. Enter the Video PID, the default is 361.
4. Select **Save** and close the menu.

Configure ST2110. If you will be monitoring ST2110 streams, follow the instructions (See page 60, *Input selection*.) and then:

1. Select **ST2110**.
2. Slide the **NMOS** control to **Enabled** or **Disabled**. Enabling NMOS allows system management software to discover, register, configure the input, and select the active input for monitoring.

NOTE. *NMOS Discovery and Registration must be enabled in the network settings for this control to be available. (See page 64.)*

3. Slide the **ST2022-7 Seamless Switching** control to **Enabled** or **Disabled**.

NOTE. *There is a difference between "Port" and "Path". The Port is the physical SPF port that is used to input the 10 GbE signal. Path 1 and Path 2 are the signal paths to be used for seamless switching. This differentiation is being made since it is possible for both Path 1 and Path 2 to use a single Port (not currently supported).*

4. Select the **Video (2110-20)**, **Audio (2110-30)**, and **Data (2110-40)** steam tabs and slide the control to **Enabled** or **Disabled**. Enabling each of the stream types allows for path configuration.

   To configure the Video (2110-20) stream tab use the following steps:

   a. Slide the **Enable Video** slider to **Enabled** to begin configuration.

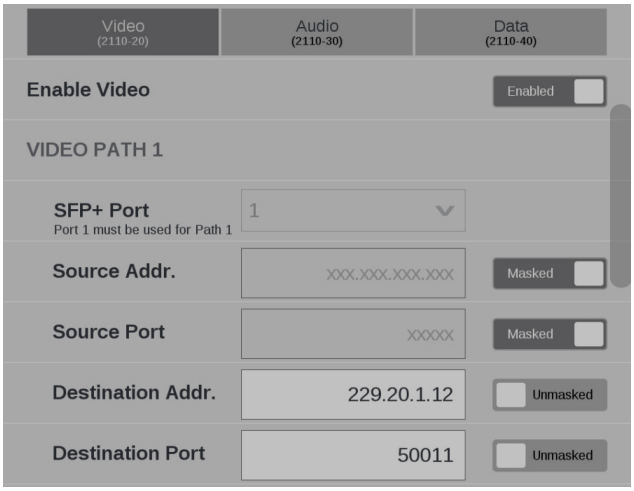


Figure 38: Enabling a ST2110-20 video stream

   b. Enter the Source and Destination information for each video stream.

   c. Set the **RTP Payload Type** for the between 96 to 127 for each of the enabled streams.

NOTE. *The RTP Payload Type number must be unique for each IP stream. The RTP Payload Type is displayed in the IP Status application.*

   d. Set the **Packet Read Schedule (PRS)** to **Gapped**, **Narrow Linear**, or **Wide Linear**.

   e. Select the **Gamma** and **Color Gamut** settings for the video stream.

To configure the Audio (2110-30) stream tab use the following steps:

a. Slide the **Enable Audio** slider to **Enabled** to begin configuration.

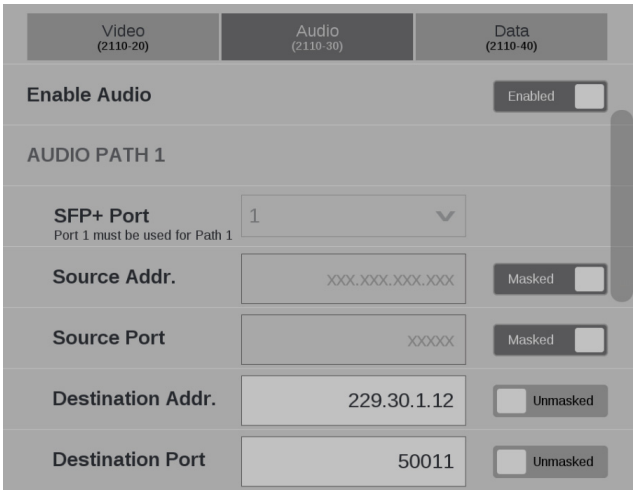


Figure 39: Enabling a ST2110-30 audio stream

b. Enter the Source and Destination information for each audio stream.

c. Set the **RTP Payload Type** for the between 96 to 127 for each of the enabled streams.

NOTE. *The RTP Payload Type number must be unique for each IP stream. The RTP Payload Type is displayed in the IP Status application.*

d. Set the number of channels. Bit Depth is always 24.

NOTE. *If the audio bars are flashing in the audio display, it is possible that the audio input configuration is not set up correctly. Check the IP address, port, and payload type from the IP session display and make sure to select the correct number of audio channels.*

To configure the Data (2110-40) stream tab use the following steps:

a. Slide the **Enable Data** slider to **Enabled** to begin configuration.

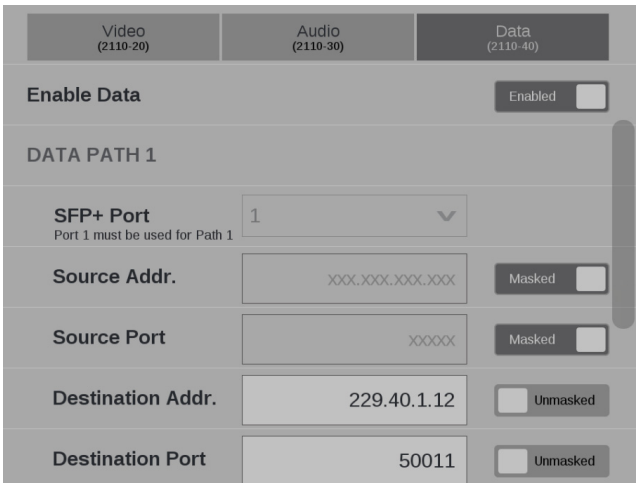


Figure 40: Enabling a ST2110-40 data stream

b. Enter the Source and Destination information for each data stream.

c. Set the **RTP Payload Type** for the between 96 to 127 for each of the enabled streams.

NOTE. *The RTP Payload Type number must be unique for each IP stream. The RTP Payload Type is displayed in the IP Status application.*

5. Select **Save** and close the menu.

IP input settings. The following settings are the same for ST2022-6, ASPEN, and ST2110 video stream configurations. The Gamma and Color Gamut settings define the characteristics of the video signal.

1. Choose the appropriate **Gamma** selection from the drop-down menu. The selection characterizes the video signal on each virtual input.

   - **SDR Narrow**. The reference OETF (Optical to Electrical Transfer Function) is defined in ITU-R BT.709 with gamma of 0.45 and the reference EOTF (Electrical to Optical Transfer Function) is defined in ITU-R BT.1886 with gamma of 2.4.

     The scaling places the extrema of the nonlinear color value from zero to unity at code words 40h(64) and 3ACh(940) in a 10-bit representation.

   - **PQ Narrow**. The reference OETF with a high luminance range capability of 0 to 10,000 cd/m2 standardized in SMPTE2084. The EOTF is the inverse of OETF.

     The scaling places the extrema of the nonlinear color value from zero to unity at code words 40h(64) and 3ACh(940) in a 10-bit representation.

   - **HLG**. The reference OETF is standardized in ARIB B67 and the reference EOTF is standardized in ITU BT.2100 at the nominal display peak luminance of 1000 nits.

   - **S-Log2**. The reference OETF is defined as Sony S-Log2. The EOTF is the inverse of OETF.

   - **S-Log3**. The reference OETF is defined as Sony S-Log3. The EOTF is the inverse of OETF.

   - **S-Log3 (Live HDR)**. The reference OOTF (Optical to Optical Transfer Function) is defined as Sony S-Log3.

   - **Log C**. The reference OETF is defined as ARRI Log C. The EOTF is the inverse of OETF.

2. Select the color space of the video signal using the **Color Gamut** drop-down menu.

   - **Rec. 709**. Standard for HD.

   - **Rec. 2020**. Standard for 4K.

NOTE. *Rec. 601 gamut is automatically selected when the SD format is detected / selected in the video signal.*

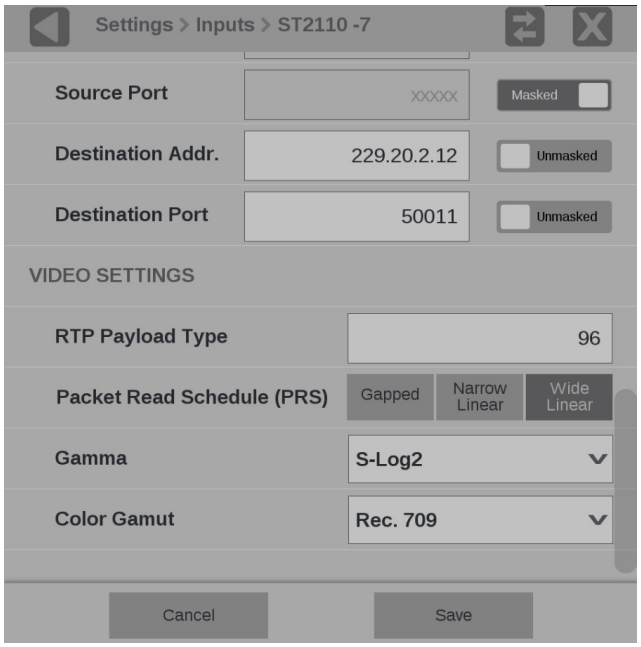


Figure 41: IP signal settings

3. Select **Save** and close the menu.

Input selection

To select a configured input, perform these steps:

1. Touch the **Input** icon ( ) from the Status bar at the bottom of the PRISM monitor.
2. Select a configured input from list in the bottom bar.

Figure 42: List of the configured inputs

3. Touch the **Home** icon ( ) or touch anywhere within an application tile to close the Input selection controls.

How to configure the instrument for HDR / WCG monitoring

PRISM provides HDR / WCG monitoring features that set up and balance cameras in HDR / WCG during content creation. Before using these features, configure the signal input (See page 46, *How to configure and select signal inputs*.) Use the **Gamma** and **Color Gamut** drop-down menus to adjust the PRISM monitor settings to reflect the input signal properties.

The following applications and features are used to configure the instrument for HDR / WCG monitoring.

Waveform display

In the Waveform display application, use the **Graticule** drop-down menu to select the graticule that fits your application. The trace represents the video data in the vertical axis. (See page 97, *Waveform display application* .)

- **%**, **mV**, and **Code Value** are fixed graticules. They are compatible with the traditional waveform scales.
- The **Reflectance** and **Stop** graticules vary depending on the Gamma selection in the Input Settings menu. These are the Scene light graticules that are used for scene setting and camera exposure adjustment.
- The **Nits** graticule varies depending on the Gamma selection in Input Settings menu. This is the Display light graticule and is used for mastering the content for a targeted HDR system.

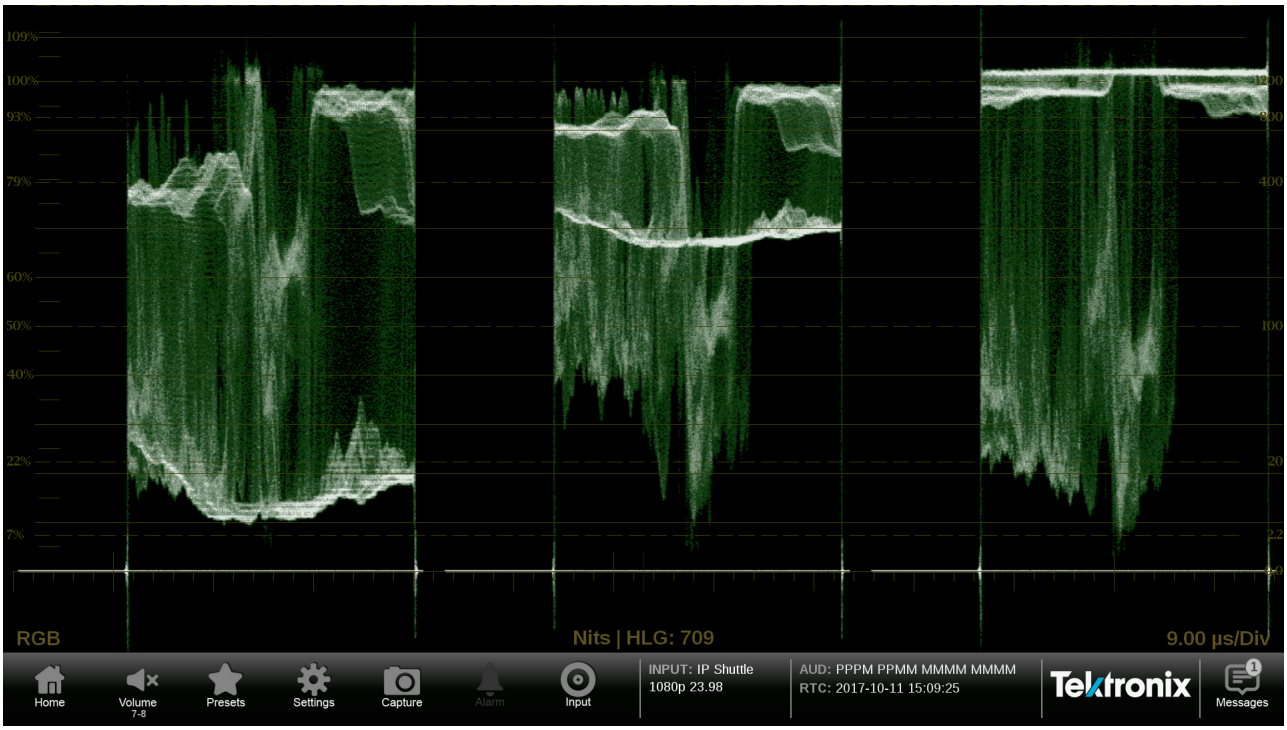


Figure 43: Waveform display with nits scale

Stop Display (Option MP-PROD only)

In the Stop Display application settings menu (press and hold in the application tile and select the gear icon), select **Display light** or **Scene light** from the Reference setting depending on your application. The trace represents light level in the vertical axis. (See page 100, *Stop Display application* .)

- **Scene Light** shows a Stop graticule in the vertical axis and is fixed regardless of the selected Gamma. It is used for scene setting and camera exposure adjustment.
- **Display Light** show a Nits graticule in the vertical axis and is fixed regardless Gamma selected. It is used for mastering the content for a targeted HDR system.

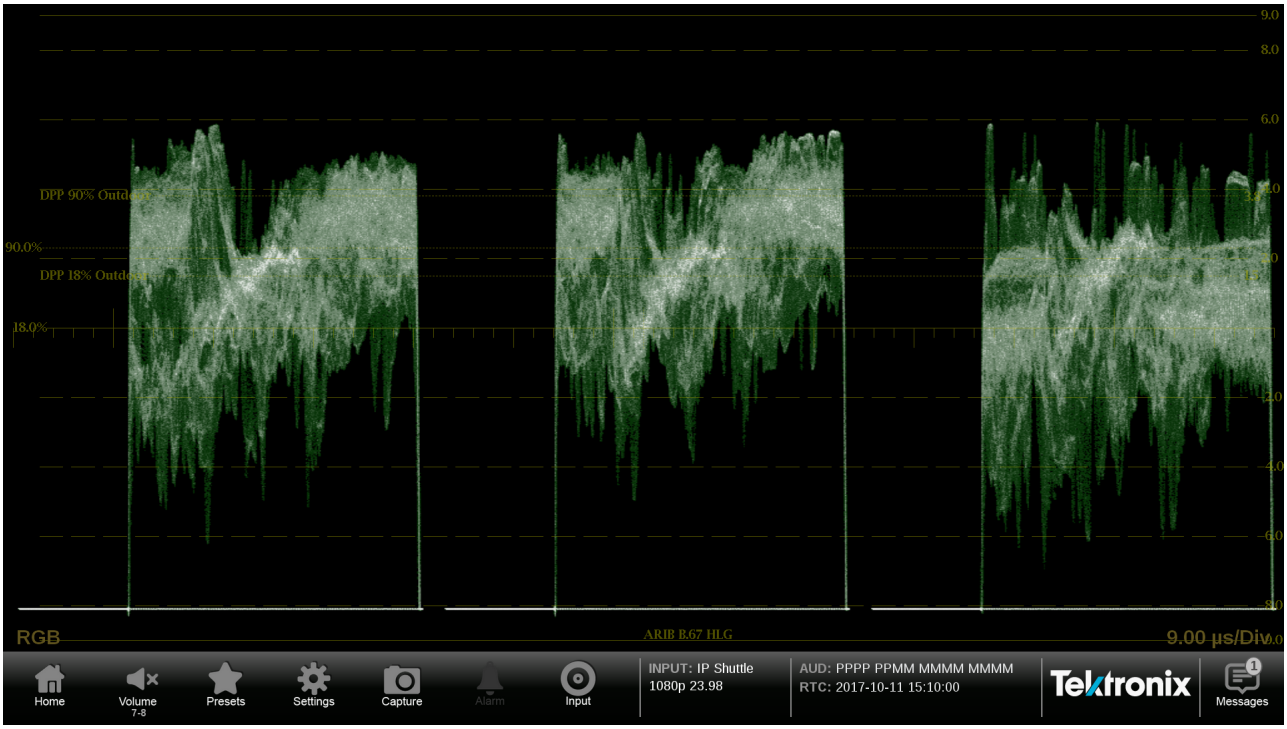


Figure 44: Stop Display with Stop scale

Transfer function/color space conversion (Option MP-PROD only)

Transfer function/color space conversion is available in Waveform, Vector, Diamond, and Picture applications. Use the **Convert to Rec. 709** button to convert the Gamma / Gamut settings for the signal to the BT. 709 Gamma / Gamut signal. This feature allows you to match the skin tone and the color in BT. 709 Gamma / Gamut displays. The conversion between input video and linear light is processed in Scene light.

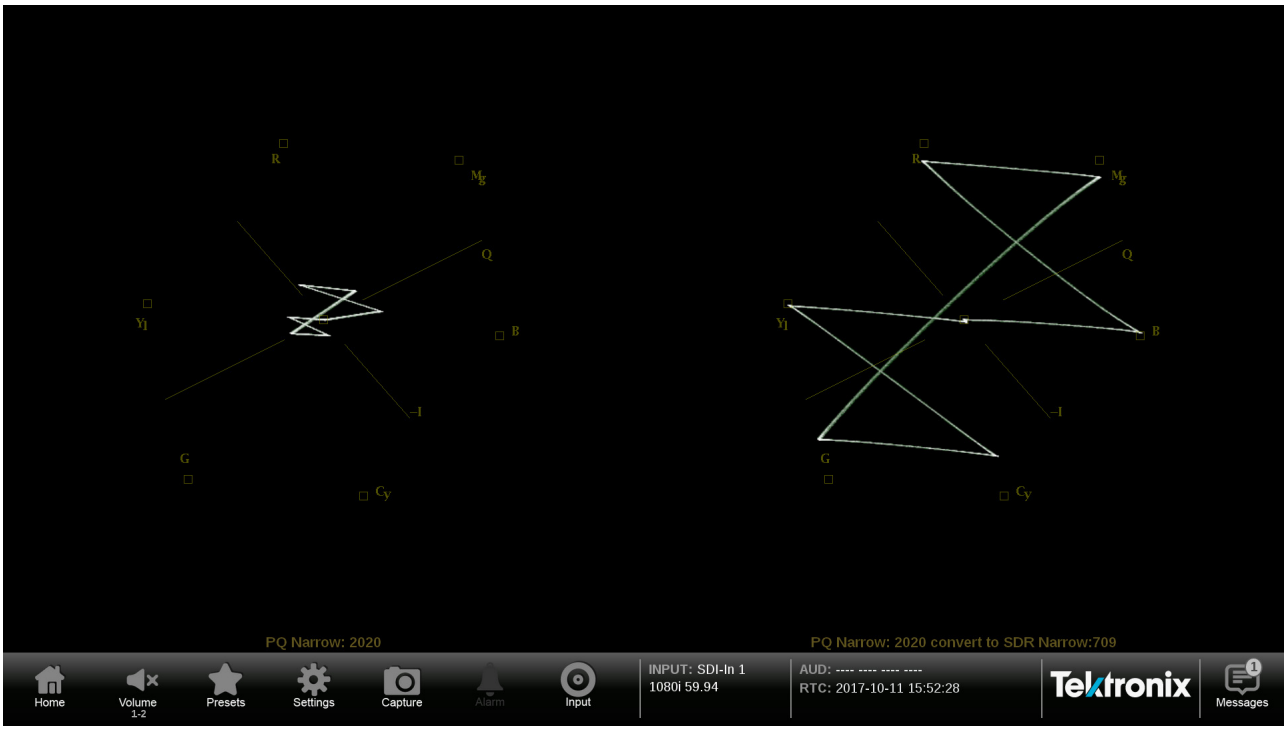


Figure 45: Vector display with (right) and without (left) Convert to Rec. 709 enabled, 100% color bar in PQ/BT.2020

How to enable NMOS discovery and registration

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. To enable NMOS on your instrument use the following steps.

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Network** to open the Network submenu.
3. Slide the **Enable NMOS Discovery & Registration** control to **Enabled** or **Disabled**.
4. Close the Network menu.

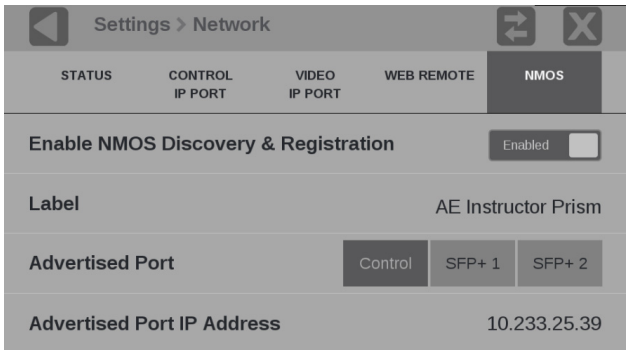


Figure 46: NMOS discovery and registration enabled

NOTE. *The **Advertised Port** is the physical port on the back of the instrument. The **Control** selection is for the RJ-45 10/100/1000Mbps ethernet port.*

How to configure the instrument outputs

PRISM allows you to set the SDI output to **Loop-through** or **Generator**. Use the following steps to change the SDI output.

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Outputs** to open the Outputs submenu.
3. Set the SDI output to **Loop-through** or **Generator**.

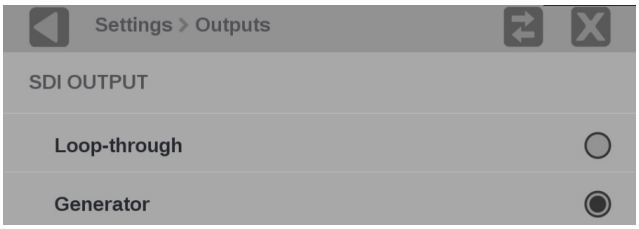


Figure 47: SDI output configuration

4. Close the Outputs menu.

SFP Loop-through. Full time loop-through outputs are available through the SDI SFP modules installed in the SDI SFP slots.

NOTE. *SFP modules are available in two speed ranges, SD-3G and SD-12G.*

How to configure PTP reference settings

Perform the following steps to configure the PTP reference settings:

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Reference** to open the PTP settings submenu shown below.

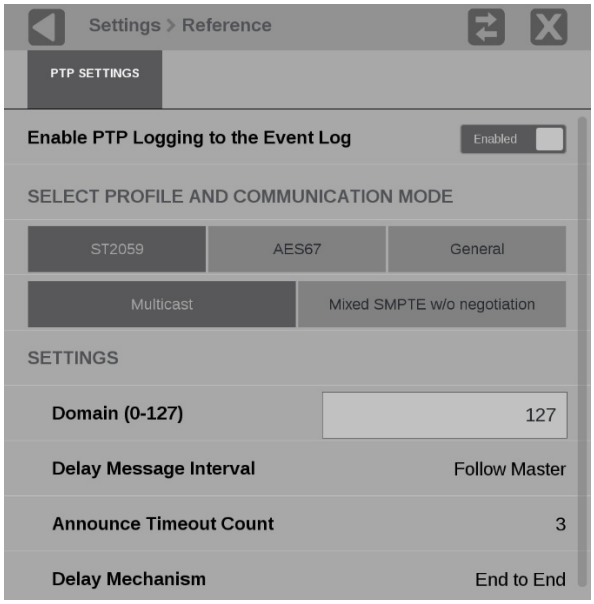


Figure 48: Editing PTP reference settings

3. To enable or disable PTP logging to the Event Log, touch the control box to toggle the setting to the desired state.
4. Select the profile to configure: **ST2059**, **AES67** or **General**. The default communication mode for each profile is **Multicast**.
5. If you selected the ST2059 profile, select **Mixed SMPTE w/o negotiation** if the communication mode will be a mixture of Multicast and Unicast.

NOTE. *On the SMPTE profile mixed mode, the PTP Announce and Sync messages are sent as Multicast. However, the Delay request and Delay Response messages are sent as Unicast.*

6. Touch the **Domain (0-127)** box to open the editing display shown below.

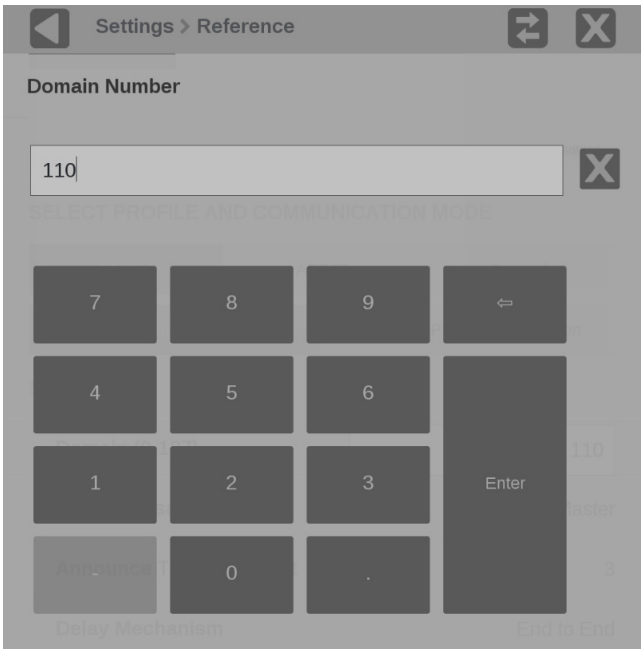


Figure 49: Editing the PTP domain setting

7. Use the editing controls to enter a new domain number. Here are some notes on using the editor:
   - Use the icon to clear the existing domain number.
   - Use the **backspace** key to delete characters by backspacing over them.
8. When you are done editing the domain number, touch the **Enter** key.
9. Repeat steps **4** to **6** for each PTP profile.

How to set and recall instrument presets

Instrument setups can become complex as you tailor them to monitor various parameters. To save set up time and ensure consistency, you can save and quickly access instrument setups in your instrument using the **Presets** icon on the instrument display.

NOTE. *For the MPX monitor, you can recall instrument presets from the front panel.* *(See page 36, How to recall instrument presets (MPX).)*

The instrument can store up to 36 separate instrument presets. The presets are divided into six groups, A through F, with each group containing 6 preset storage locations. The default preset names are A1 – A6, B1 – B6, C1 – C6, D1 – D6, E1 – E6, and F1 – F6.

All instrument settings except those set in the Utilities and Network Settings submenus of the Configuration menu are saved in a Preset. Settings that are not saved are those such as the clock setting, IP configuration, and network address. The following is an overview of the settings saved in a Preset. Some settings are option dependant.

- Application assigned to each tile
- Application icon order in the application selector list
- Application specific settings
- Input selection and configuration
- PTP reference settings
- PTP reference settings
- SDI Generator and IP Generator settings

How to save and rename presets

Perform the following steps to save a preset and to assign a user-defined name to the preset:

1. Set up the instrument exactly as you want to have it configured. This includes selecting the application display for each tile, configuring inputs and the PTP reference settings.
2. Save the instrument settings as a preset:
   a. Touch the **Presets** ( ) icon to open the Preset selection controls at the bottom of the PRISM display.

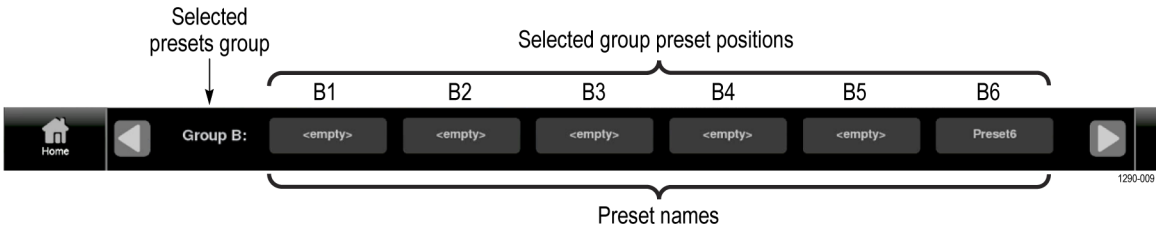


Figure 50: Preset selection controls (Group B shown)

   b. Locate the Preset button icon you want to use for the current instrument configuration. You can use the and arrow buttons or swipe left/right to navigate to the desired preset group (A–F).

NOTE. *When a preset has no content,* ***<empty>*** *is displayed on the preset button icon.*

---

   c. When you have located the desired preset group, touch and hold the preset button you want to assign the current instrument configuration. The selected preset button will highlight and a confirmation box will appear. In the example shown below, the Group B preset B6 is being saved.

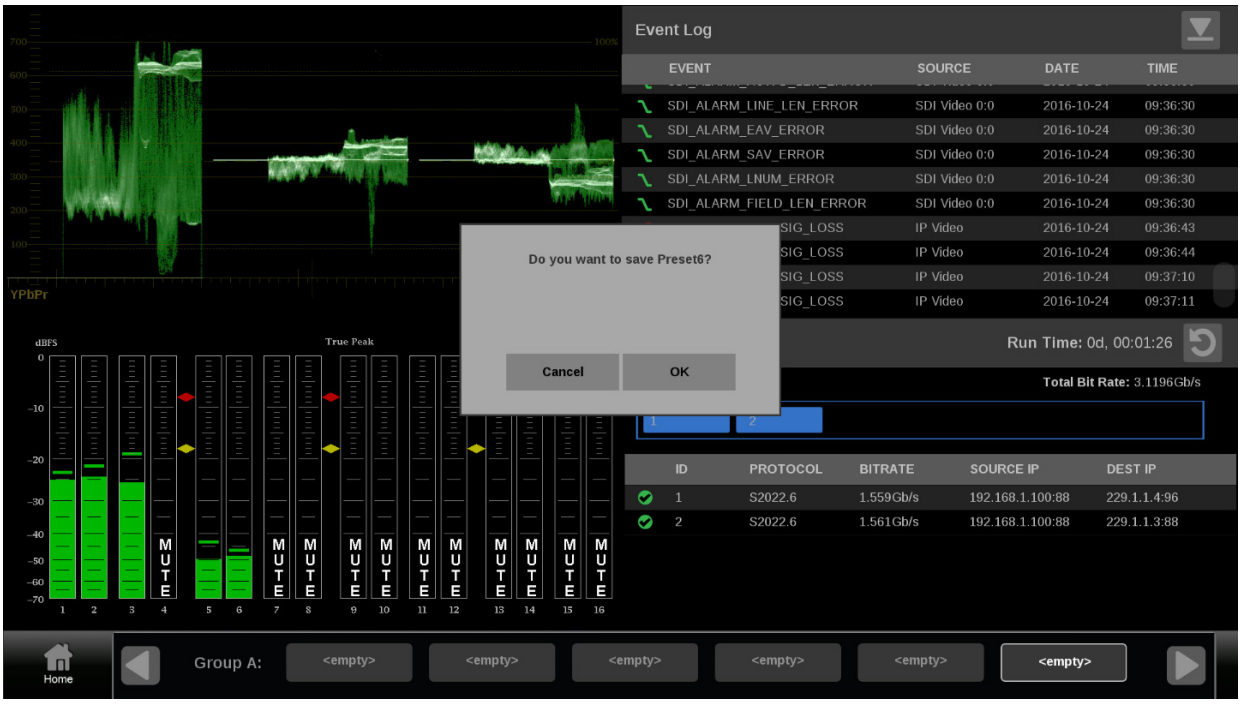


Figure 51: Assigning a preset

d. Touch **OK** to assign the preset or touch **Cancel** to cancel the operation.

e. When you select OK, the preset name changes from **<empty>** to **Preset<number>**, where the number is the preset position within the preset group. (See Figure 54.)

f. Touch the Home icon ( ) or touch anywhere within an application tile to close the Preset selection controls.

3. Assign a user-defined name to a preset:

   a. Touch the Settings icon ( ) to open the Settings menu.

   b. Select **Presets** to open the Presets submenu.

   c. Select **Rename** to open the Presets Rename submenu shown below.

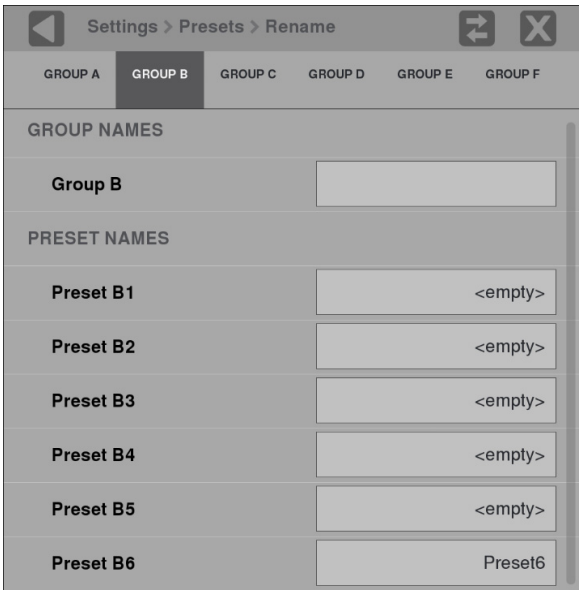


Figure 52: Presets Rename submenu

   d. Select the Preset group at the top of the submenu that corresponds to the preset you just saved. The example above shows Group B being selected.

e. Touch the preset name box you want to change to open the editing display shown below.

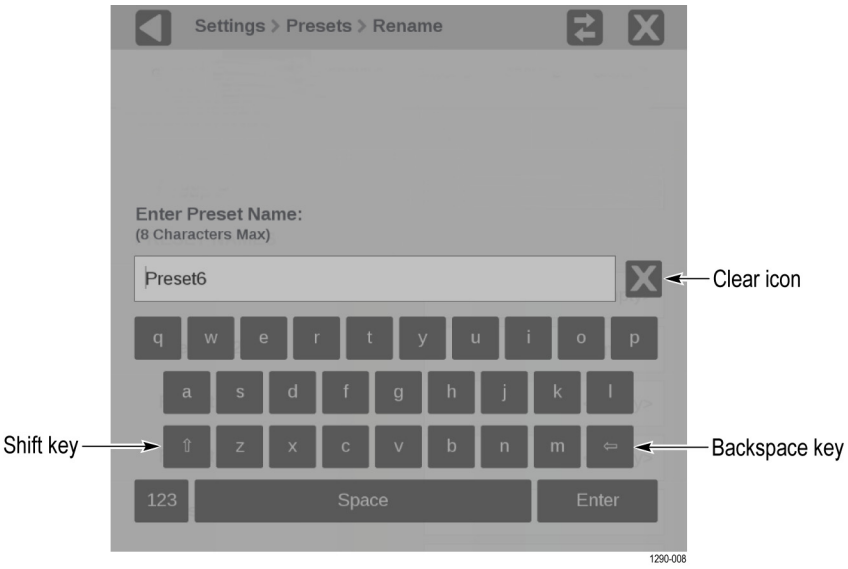


Figure 53: Editing a Preset name

f. Use the editing controls to enter a new name for the preset. Here are some notes on using the text editor:

- Enter a name with a maximum of 8 characters.
- Use the icon to clear the existing name.
- Use the **shift** key to access capital letters.
- Use the **backspace** key to delete characters by backspacing over them.
- Use the **123** and **abc** keys to toggle between accessing letters and numbers/symbols.

g. When you are done editing the preset name, touch the **Enter** key.

NOTE. *You can also assign a user-defined name to the selected preset group by touching inside the Group Name box.*

How to recall user-defined presets

Perform the following steps to recall a user-defined preset:

1. Touch the **Presets** ( ) icon to open the Preset selection controls at the bottom of the PRISM display.

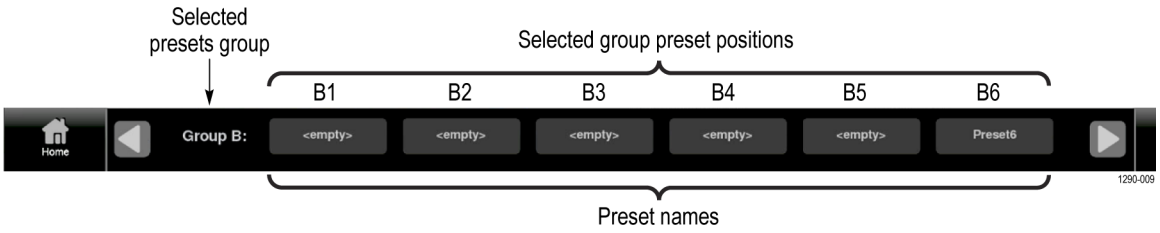


Figure 54: Preset selection controls (Group B shown)

2. Locate the Preset you want to recall by using the and arrow buttons or by swiping left/right to navigate to the desired preset group (A–F).

NOTE. *When a preset has no content,* ***<empty>*** *is displayed on the preset button icon.*

---

3. When you have located the desired preset group, touch the preset button you want to recall. The selected preset button will highlight and the instrument settings will change to those assigned to the selected preset.

4. Touch the Home icon ( ) or touch anywhere within an application tile to close the Preset selection controls.

How to recall the Factory preset

Perform the following steps to recall the Factory preset:

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Presets** to open the Presets submenu.
3. Select **Recall Factory Preset**. A confirmation box opens as shown below.

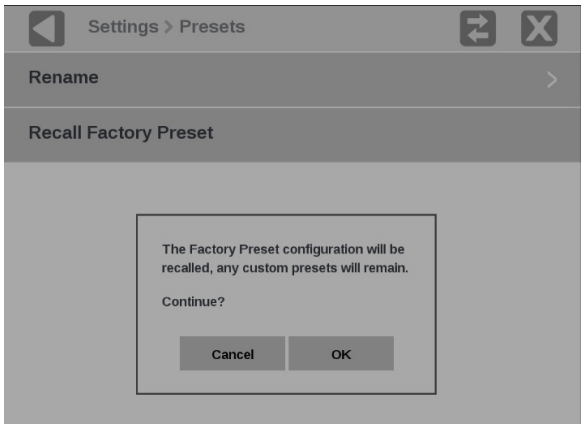


Figure 55: Presets Rename submenu

4. Select **OK** to confirm the selection and to reset the instrument settings to the factory defaults.

The following table lists the instrument settings that are reset by recalling the Factory preset.

Table 6: Instrument settings that are reset by recalling the Factory preset

Item	Setting
Tile 1 application	Waveform
Tile 2 application	Video Session
Tile 3 application	Picture
Tile 4 application	Audio
SDI-In 1 input configuration	
Input name	SDI-In 1
Input type	SDI
Input connector	SDI 1
SDI-In 2 input configuration	
Input name	SDI-In 2
Input type	SDI
Input connector	SDI 2

Table 6: Instrument settings that are reset by recalling the Factory preset (cont.)

Item	Setting
SDI-In 3 input configuration	
Input name	SDI-In 3
Input type	SDI
Input connector	SDI 3
SDI-In 4 input configuration	
Input name	SDI-In 4
Input type	SDI
Input connector	SDI 4
SDI-SFP+ 1 input configuration	
Input name	SDI-SFP+ 1
Input type	SDI
Input connector	None selected
SDI-SFP+ 2 input configuration	
Input name	SDI-SFP+ 2
Input type	SDI
Input connector	None selected
PTP reference configuration	
PTP Logging to the Event Log	Enabled
Selected Profile	ST2059
ST2059 domain	127
ST2059 communication mode	Multicast
SDI Generator configuration	
Enable SDI Generator	Disabled
Reference	Internal
IP Generator configuration	
Enable IP ST2110 Generator	Disabled
Reference	Internal

How to manage trace and graticule intensity

The brightness of an applications graticule and trace can be adjusted with the intensity sliders in the Display settings menu. To adjust graticule and trace intensity use the following steps.

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Display** to open the Display submenu.
3. Use the plus icon ( ) to increase intensity or the minus icon ( ) to decrease intensity of the trace or graticules.

NOTE. *The intensity can also be adjusted by touching anywhere in the slider or touching and dragging the slider circle in either direction.*

4. Close the Display settings menu.

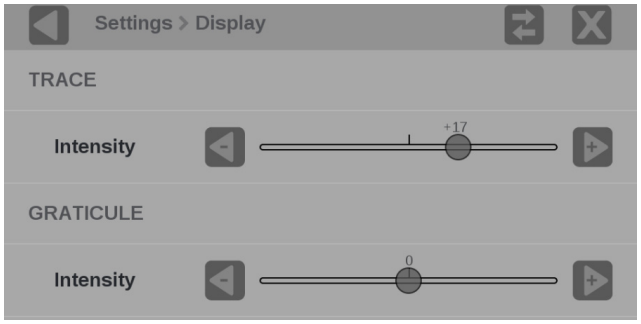


Figure 56: Trace and graticule intensity sliders

How to set the time and date

Perform the following steps to set the internal time and date used by the instrument to record events.

NOTE. *When the time and date settings are changed, the instrument must be rebooted to implement the changes.*

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Utilities** to open the Utilities submenu.
3. Select **Time and Date** to open the submenu shown below. The submenu has two tabs: **TIME ZONE** and **TIME AND DATE**.

WARNING. *Excess time changes can cause the loss of all license files. If the instrument license files are lost servicing will be required. Time should only be changed less than ± 1 hour. Use the TIME ZONE tab to set the local time.*

4. Touch TIME ZONE to open the submenu shown below.

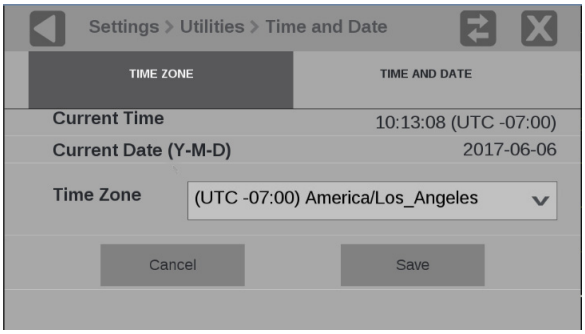


Figure 57: Time Zone submenu

5. Use the **Time Zone** drop-down list to select the correct time zone offset for your location. The selection names include the time offset from UTC and also major cities within those time zones.
6. In the TIME AND DATE tab, adjust the time and date using the up and down arrows to adjust each parameter as needed. The time setting uses a 24 hour clock, so no AM/PM setting is required.

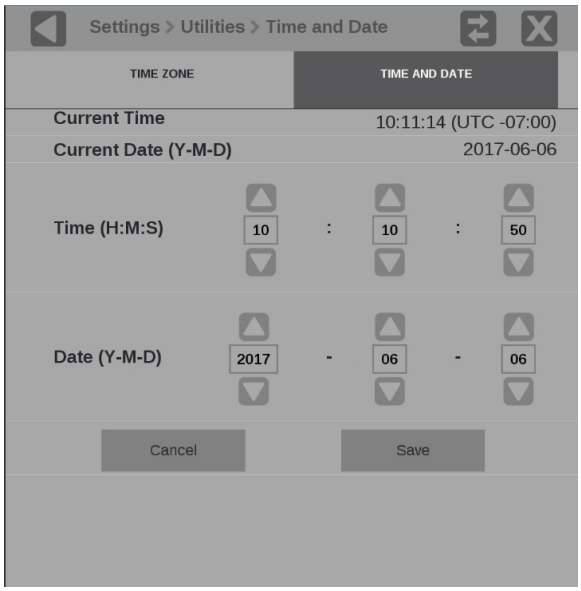


Figure 58: Time and Date submenu

7. When you are done setting the time and date parameters, touch **Save**.
8. The message box shown below opens asking whether you want to reboot the instrument now or later to implement the time and date changes. Perform one of the following actions:
   - Touch **OK** to reboot the instrument immediately and implement the changes.
   - Touch **Cancel** to cancel the operation.

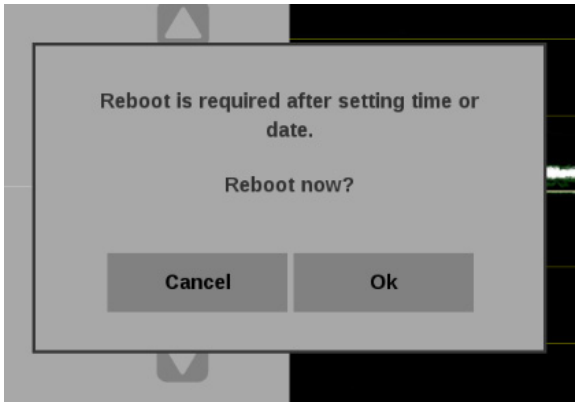


Figure 59: Time and date change reboot message

How to upgrade the instrument firmware

Before you begin

Tektronix releases updates to product firmware to add new features or to fix reported problems. You should check the Tektronix Web site regularly for new firmware releases.

You do not need to perform a firmware upgrade if your instrument has the latest version of firmware already installed. Perform the following steps to determine if the firmware on your instrument must be upgraded:

1. Power on the instrument.
2. Verify the current software version installed on the instrument:
   a. Touch the **Settings** icon to open the Settings menu.
   b. Touch **Utilities** icon to open the Utilities submenu.
   c. Touch **Version** to open the Version display.
   d. In the Software section, make a note of the version number installed on the instrument.

Instrument Firmware version number	

3. Verify the latest version of firmware at the Tektronix Web site:
   a. Use the Web browser on a PC to navigate to the following Tektronix Web site:

      `http://www.tektronix.com/downloads`

   b. On the Downloads Finder Web page, search by model number (such as PRISM) and filter by software and software type to locate the software-upgrade package for the instrument.
   c. Note the latest version number of the software-upgrade package(s).

Web site Firmware version number	

4. If the latest firmware version at the Web site is newer than the version on your instrument, you should upgrade the firmware.
5. Download the latest version to your PC.
6. After the firmware package is downloaded, click the self-extracting archive to extract the upgrade file(s) into the directory of your choice. The upgrade file will have a .bin file extension and there may also be a readme.txt file.

The time required to complete the upgrade is about 15 minutes.

CAUTION. *Once the instrument has started the upgrade process, DO NOT remove power from the instrument. If you do so, the instrument flash will be corrupted. The instrument will have to be sent to a Tektronix factory service center to have the system firmware restored.*

NOTE. *If power to the instrument is lost before it begins erasing the internal flash, you can restart the firmware upgrade after the instrument reboots.*

Firmware upgrade procedure

Perform the following steps to upgrade the instrument firmware:

1. Copy the upgrade file with a .bin file extension from the upgrade package onto a USB memory device. You will need approximately 320 MB of available space on the USB device.

NOTE. *If the upgrade package included a readme.txt file, read the file before performing the upgrade. The file will contain important information about the firmware release.*

2. Insert the USB memory device into a USB port on the PRISM monitor.
3. On the PRISM monitor, touch the **Settings** icon to open the Settings menu.
4. Touch **Utilities** icon to open the Utilities submenu.
5. Touch **Firmware Upgrade**. After the USB device has been scanned, the display will list all of the files on the USB device with a .bin file extension.
6. Touch the desired file in the list to select it, and then touch **Install** to start the upgrade.

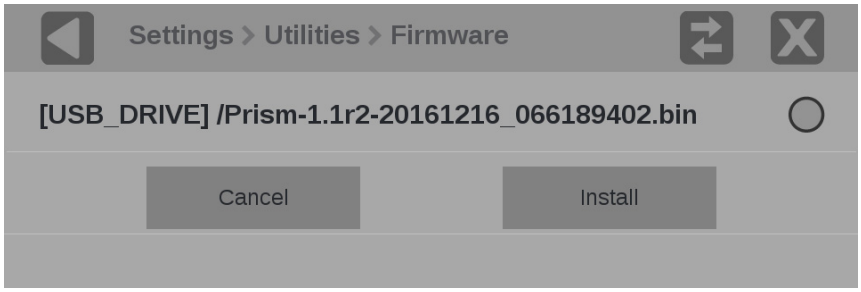


Figure 60: Selecting the firmware upgrade file

7. While the upgrade is in process, the message box shown below appears stating that the firmware installation is in progress.

WARNING. *To prevent upgrade failure, do not remove the USB device or power off the instrument until the upgrade is complete. The upgrade may take up to 5 minutes.*

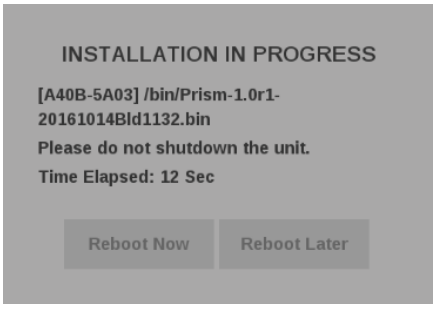


Figure 61: Upgrade Installation In Process message box

8. When the upgrade is complete, the following message box appears. Perform one of the following actions:
   - Touch **Reboot Now** to reboot the PRISM monitor and complete the installation of the upgrade.
   - Touch **Reboot Later** to maintain instrument operation with the older version of firmware. The upgraded firmware will be automatically installed the next time the instrument is rebooted.
9. Remove the USB device from the PRISM monitor.

Verify the firmware upgrade

Perform the following procedure to verify the firmware upgrade:

1. Touch the **Settings** icon to open the Settings menu.
2. Touch **Utilities** icon to open the Utilities submenu.
3. Touch **Version** to open the Version display.
4. Verify that the displayed firmware version number matches the version of the firmware upgrade package you installed.

How to upgrade the software license

A software license upgrade allows you to add optional software features to your instrument. The following license upgrades are available:

- **MP-IP-STD-UP**. Adds SMPTE 2022-6 and PTP (IEEE1588, SMPTE 2059-2) support, includes IP Status application – NODE LOCKED LICENSE.
- **MP-IP-MEAS-UP**. Requires Option MP-IP-STD. Adds node locked license for IP Measurement feature sets: IP Graph, IP/PTP Session, and IP PIT Histogram applications (SMPTE 2022-6 and PTP).
- **MP-IP-CAP-UP**. Requires Option MP-IP-MEAS. Adds node locked license for IP stream capture.
- **MP-PROD-UP**. Adds node locked license for Production Tools (Stop display, transfer function/color space function).
- **MP-FMT-4K-UP**. Enables 12G-SDI. Adds node locked license for 4K formats.
- **MP-GEN-UP**. Adds 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)

Obtain the software license upgrade file

Perform the following procedure to obtain a software license upgrade file from Tektronix:

1. On the PRISM monitor you want to upgrade, make a note of the instrument serial number. The serial number is located on the instrument rear panel.

NOTE. *If the serial number is not easily located (for example, if the instrument is installed in an equipment rack), you can view it in the* ***Instrument Serial*** *field under* ***Setting*** *>* ***Utilities*** *>* ***Version****. You can also obtain the serial number by performing steps 1 to 4 in the Install the software license upgrade procedure.* *(See page 84.)*

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2. Provide the serial number of the PRISM monitor you are upgrading when you contact Tektronix to place your software license upgrade order. After your upgrade order is processed, you will be sent a notification e-mail with details on how to download the software license upgrade file.
3. Follow the e-mail instructions to download the upgrade file. As noted in the e-mail, you must access your MyTek account to download the upgrade file.

Install the software license upgrade

Perform the following procedure to install the software license upgrade:

1. On the PRISM monitor, open the **Settings** > **Network** menu page to view the **Control IP Port** address of the instrument which you are going to upgrade.
2. Copy the software license upgrade file you downloaded to a location on the hard drive of your computer.
3. On your computer, enter the following in the URL box of your Web browser, where xxx.xxx.xxx.xxx is the IP address of the Control IP Port of the instrument you are upgrading. The IP address is case sensitive.

   `http://xxx.xxx.xxx.xxx`
4. Select the **License Portal** link from the Tektronix PRISM Home Web page.
5. This opens the Tektronix PRISM License Installation Web page as shown below. The Web page shows the Host ID (a string that uniquely identifies the instrument) and the instrument serial number.

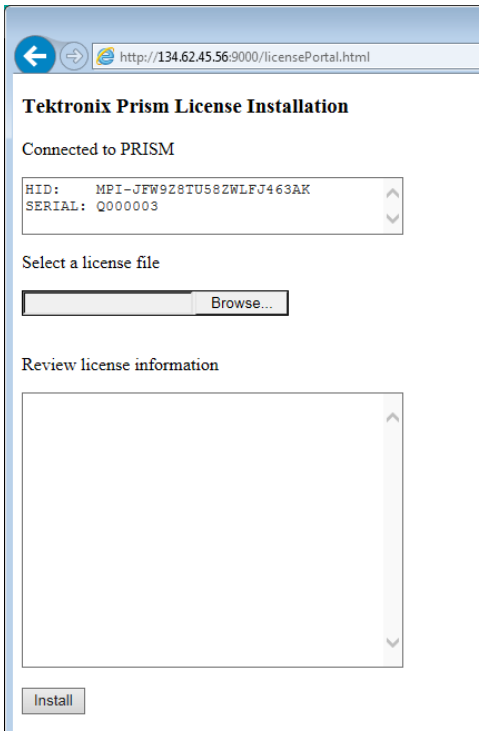


Figure 62: PRISM License Installation Web page – initial view

6. Click the **Browse...** button, and then navigate to the location of the software license file.
7. Select the software license file and click **Open**.
8. The license installation Web page displays the new license information in the **Review license information** box. The example below shows an instrument that is being upgraded with two software options: MP-IP-STD and MP-IP-MEAS.

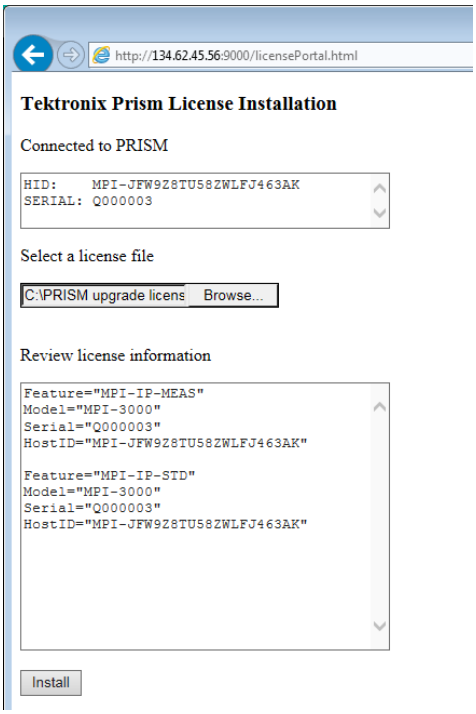


Figure 63: PRISM License Installation Web page – license upgrade information review

9. If the license information is correct, click **Install** to start the license installation.

10. When the license(s) is installed, the bottom of the license installation Web page displays a message that the license was installed successfully.

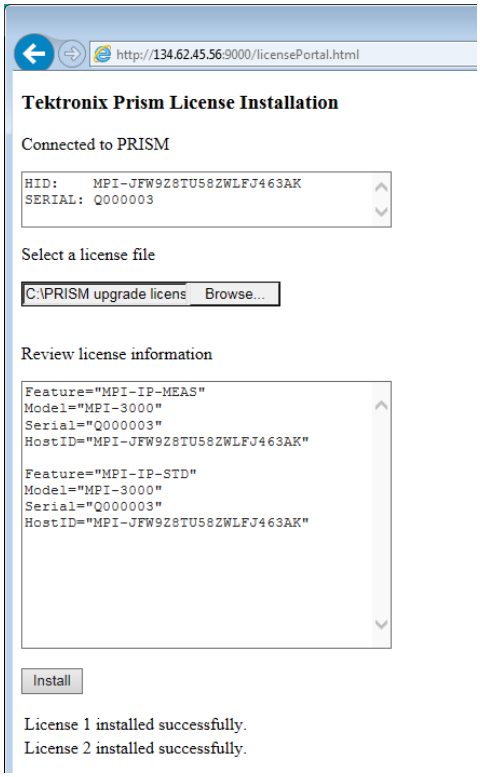


Figure 64: PRISM License Installation Web page – license install message

11. After the upgrade is installed, close the PRISM License Installation Web page.

Verify the software license upgrade

Perform the following procedure to verify the software license upgrade:

1. Touch the **Settings** icon to open the Settings menu.
2. Touch **Utilities** icon to open the Utilities submenu.
3. Touch **Options** to open the Options display.
4. Verify that the displayed option(s) match the option(s) you installed.

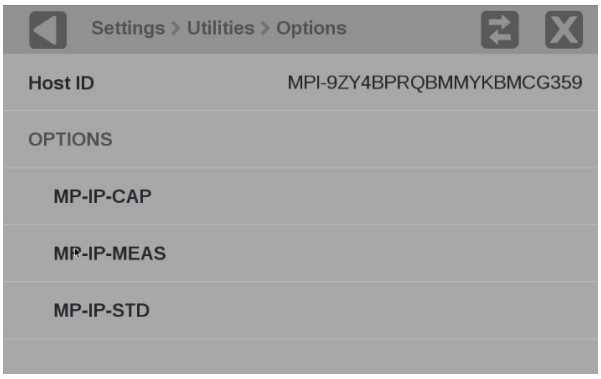


Figure 65: Verifying the software license upgrade

How to verify the installed software and hardware versions

The PRISM monitor allows you to view all the installed software and hardware versions on the instrument. Use the following steps to access this information:

NOTE. *When contacting Tektronix Service you might be asked to supply information from the Version window.*

1. Touch the **Settings** icon ( ) to open the Settings menu.
2. Select **Utilities** to open the Utilities submenu.
3. Select **Version** to open the Version submenu.

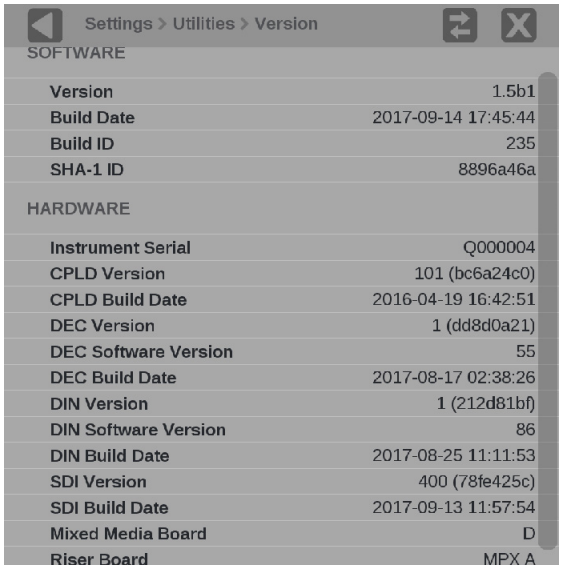


Figure 66: Utilities Version submenu

NOTE. *The preceding figure is the version information for the PRISM MPX.*

4. Use the icon to close the Version submenu.

Functions

This section describes additional functions available on the PRISM monitor.

- Headphone/speaker volume and source adjustment
- Stream Capture

Headphone/speaker volume and source adjustment

Headphones or speakers can be connected to the PRISM MPI Monitor or the MPX.

To access the volume control and source:

1. Select the volume icon.
2. Select the source from the list of available channel pairs.
3. Use the slider or arrow buttons to turn the volume up or down
4. Use the mute button to mute the volume.

Figure 67: Volume control

WARNING. *To avoid damaging your hearing, always turn the volume down to the minimum before you put on headphones, and then turn the volume up slowly.*

Capture

The Capture feature has two modes: Screenshot and Stream. Screenshot capture will capture the entire screen and save to a USB device. Stream capture will create a PCAP file and store the file on a USB device for later recall to the instrument or for further analysis. Both modes are useful for comparing sources or capturing transient events.

Requirements to use the Capture feature:

- **MP-IP-CAP** option must be installed for stream captures.
- USB 3.0 stick connected to the rear panel of the PRISM monitor.

NOTE. *A USB 3.0 stick, plugged into one of the USB 3.0 ports is strongly recommended when using the Stream Capture feature. Use the USB ports on the rear panel of the instrument. Using a USB 2.0 stick or USB 2.0 ports can cause the stream capture to take an extended period of time.*

NOTE. *Stream Capture PCAP files are approximately 2GB in size.*

How to take a screenshot capture

1. From the Settings menu, select **Capture**.

NOTE. *If the Capture configuration menu does not appear under the Settings menu, option MP-IP-CAP is not installed, however screen captures are still functional.*

2. Select **Screenshot** under Capture Type.

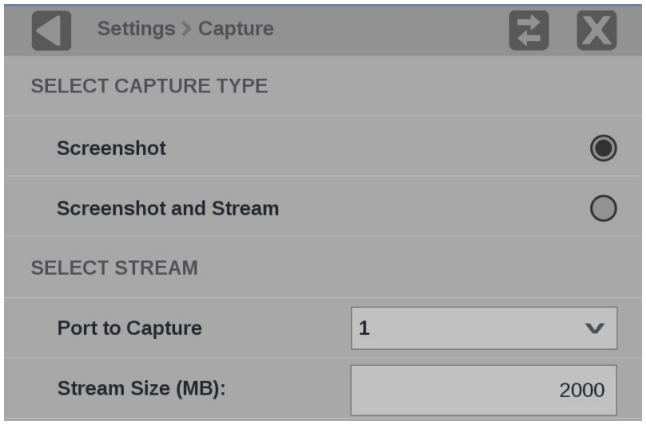


Figure 68: Selecting Screenshot

3. On the application bar select the Capture icon. A screenshot is saved to the device.

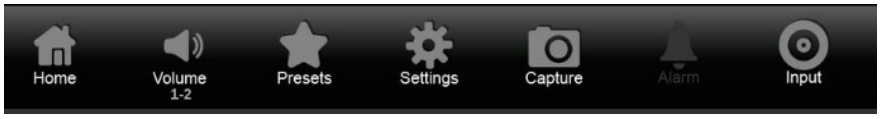


Figure 69: Application bar – Capture

How to take a stream capture

1. Verify there is a USB stick connected to the PRISM monitor.
2. Select the Settings icon.
3. From the Settings menu, select **Capture**.

NOTE. *If the Capture configuration menu does not appear under the Settings menu, option MP-IP-CAP is not installed and stream captures are disabled.*

4. Select **Screenshot and Stream** under Capture Type.
5. Use the **Port to Capture** drop-down menu to select from inputs 10G SFP+ **1** or **2**.

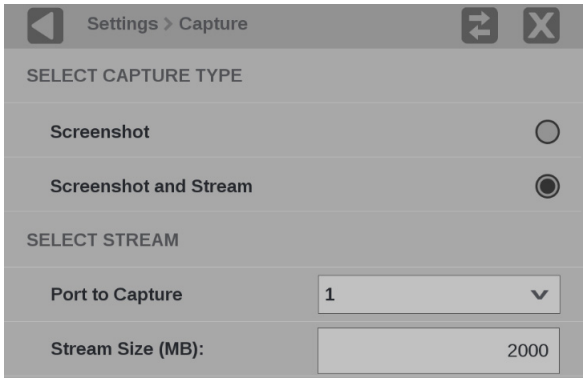


Figure 70: Selecting Screenshot and Stream

6. Select **Stream Size (MB)** to set the size of the capture.

NOTE. *The minimum stream size is 1MB and the maximum size is 2000MB.*

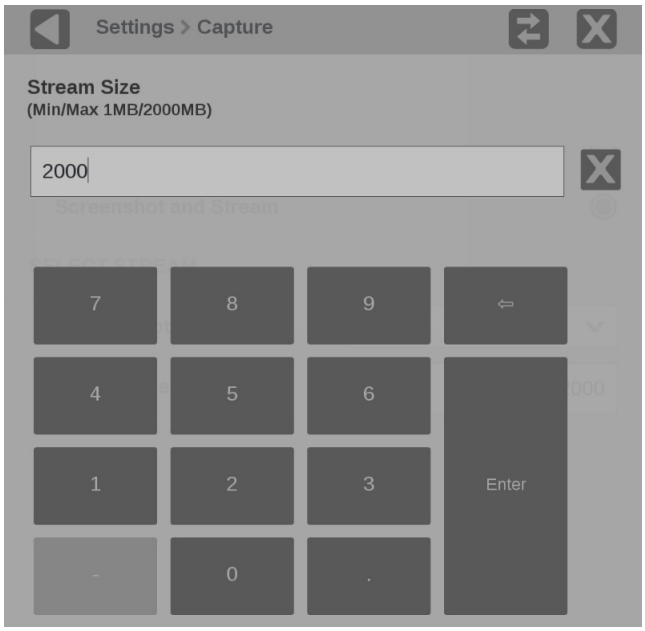


Figure 71: Stream Size settings

7. Select to close settings.

8. Select the **Capture** icon on the application bar to start the process. When the capture type is Screenshot and Stream a percentage will be displayed under the Capture icon.

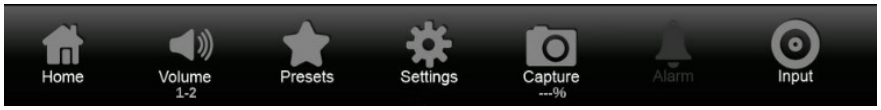


Figure 72: Stream capture icon with percentage shown

NOTE. *Select the Capture icon again to stop the stream capture early. The Capture icon is the only element you can interact with on the PRISM monitor while the capture and save are taking place.*

9. A screenshot and .pcap file are saved to an attached USB device. The monitor will display the name of the file and the path to the file on the USB device upon completion.

10. Select **OK** to close the dialog box.

Application information

This section describes the monitoring and measurement applications available on the PRISM monitor. Each of these applications can be viewed in four-tile, half-tile, or full screen mode, simply double tap in the application to toggle between modes.

Press and hold on an application tile to show the menu banner and the application selector icon. Selecting this icon or touching the banner again will display all of the available application icons.

NOTE. *Some displays require a specific option to be installed. For example, the IP Status display is not accessible unless you have Option MP-IP-STD.*

Base instrument applications

The following applications are available on every PRISM monitor:

Application icons	Description
	Waveform application. Use this application to view the voltage versus time display of the video signal. (See page 97.)
	Vector application. Use this application to call up the Vector, which plots color difference signals for viewing hue and amplitude, but not luminance. (See page 103.)
	Audio application. Use this application to view a level meters display of the audio in the monitored signal using True Peak ballistics. Also included are Test level and Peak program level indicators. (See page 111.)
	Picture application. Use this application to view the picture generated by the video signal. (See page 109.)
	Video Session application. Use this application to view various performance parameters of the SDI video signal or the decoded IP stream. (See page 119.)
	Event Log application. Use this application to view a log of detected errors. (See page 125.)

Option MP-IP-STD application

The following additional application is available when Option MP-IP-STD is installed:

Application icons	Description
	IP Status application. Use this application to see an overview of the monitored IP stream and see the status of each program in the stream. (See page 129.)

Option MP-IP-MEAS applications

The following additional applications are available when Option MP-IP-MEAS is installed (requires Option MP-IP-STD):

Application icons	Description
	IP Session application. Use this application to view various performance parameters of the IP stream including Layer 2, video and PTP parameters. (See page 133.)
	IP Graphs application. Use this application to view trend graphs of various performance parameters of the IP stream including total bit rate, session bit rate, PIT, RTP sequence errors, video CRC errors, and TS-DF (Time Stamped Delay Factor). (See page 152.)
	PIT Histogram application. Use this application to view a histogram of the PIT (Packet Interval Time) to monitor network delay variation statistics. (See page 159.)
	PTP Graphs application. Use this application to view trend graphs of various performance parameters of the PTP signal include Master-to-Slave and Slave-to-Master delays and variances. (See page 162.)
	Timing application. Use this application to view timing offsets between the incoming 2022-6 and 2110-20 video signals and PTP signals. (See page 181.)
	Stream Timing application. Use this application to view the timing of the ST2110 video, audio and data as it was received relative to the embedded RTP time stamps. (See page 169.)

Option MP-GEN applications

The following additional applications are available when Option MP-GEN is installed:

Application icons	Description
	IP Generator application. Use this application to provide a IP test signal to check the receiver device and signal path. (See page 174.)
	SDI Generator application. Use this application to provide a SDI test signal to check the receiver device and signal path. (See page 181.)

Option PHY-12G applications

The following additional applications are available when Option PHY-12G is installed (Software option MP-FMT-4K required for 12G support):

Application icons	Description
	Jitter Display application. Use this application to display the wave shape of the jitter and allows you to view additional time-domain information. (See page 117.)
	Eye Display application. Use this application to view an eye pattern diagram of the SDI input only. (See page 114.)

Option MP-PROD applications

The following additional applications are available when Option MP-PROD is installed:

Application icons	Description
	Stop Display application. Use this application to monitor video signals with a variety of transfer functions in a consistent manner. (See page 100.)
	Diamond application. Use this application to reliably detect invalid colors. (See page 105.)

Optional features

The following features are only available when specific options are installed:

- **Convert to Rec. 709**. Use this setting to allow the trace displays to convert camera logs to Rec. 709. The Convert to Rec. 709 settings is available when Option MP-PROD is installed.
- **IP Stream Capture**. Use this application to capture IP streams to a PCAP file. The maximum capture size is 2 GB, which allows for the capture of 10 seconds of HD video. IP Stream Capture is available when Option MP-IP-CAP is installed (requires Option MP-IP-MEAS).

Viewing installed options

To view options installed on the instrument, select Settings > Utilities > Options.

Status indicators

Many of the application displays include status icons, which provide a quick method for viewing signal status. The following icons may appear:

- : Indicates that the signal parameter has not been in an error condition.
- : Indicates that the signal parameter was in an error condition but the error has now cleared.
- : Indicates that the signal parameter is currently in an error condition.
- : Indicates that the signal parameter is not being monitored for an error condition.

Waveform display application

The Waveform display is a voltage versus time display of the video signal.

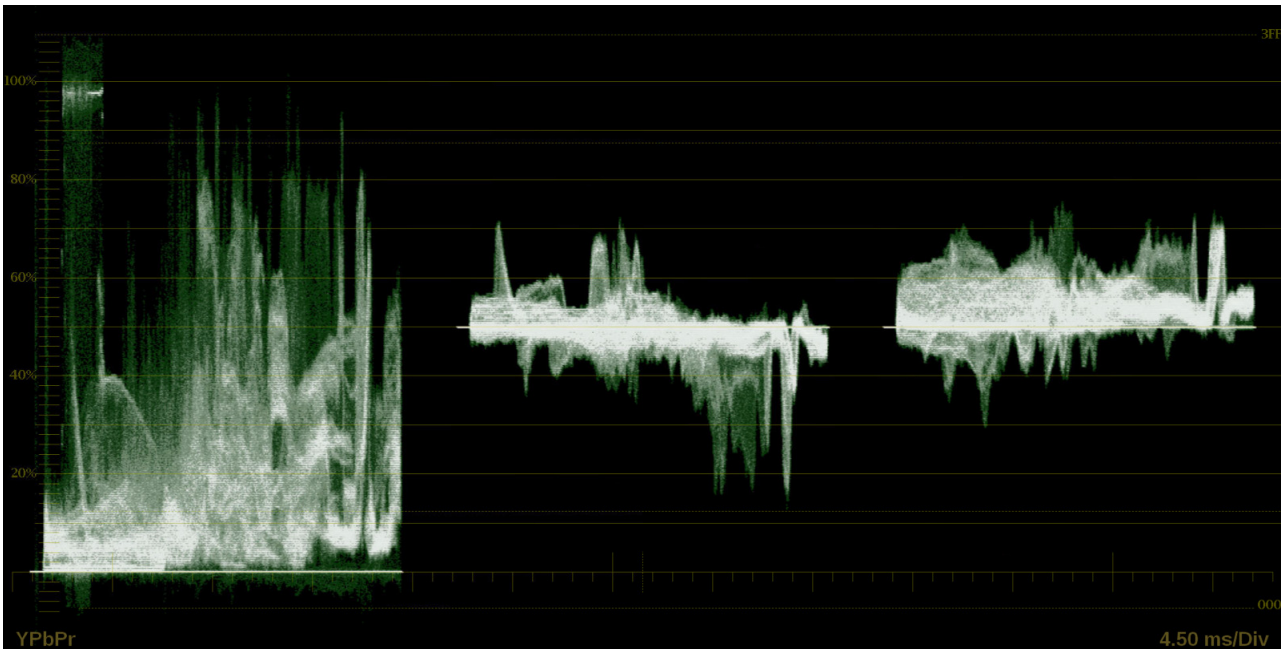


Figure 73: Waveform display application

Waveform application banner

The following figure shows the available options after pressing and holding anywhere on the Waveform application tile.

Figure 74: Waveform application banner

The following options adjust how the waveform is displayed:

- The maximize icon ( ) expands the Waveform application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the Waveform application settings menu to adjust the tile settings.

NOTE. *After the Waveform application settings menu is opened, a move icon ( ) is displayed. Pushing this icon moves the settings menu horizontally.*

Waveform application settings menu

The following figure shows the different choices in the Waveform application settings menu.

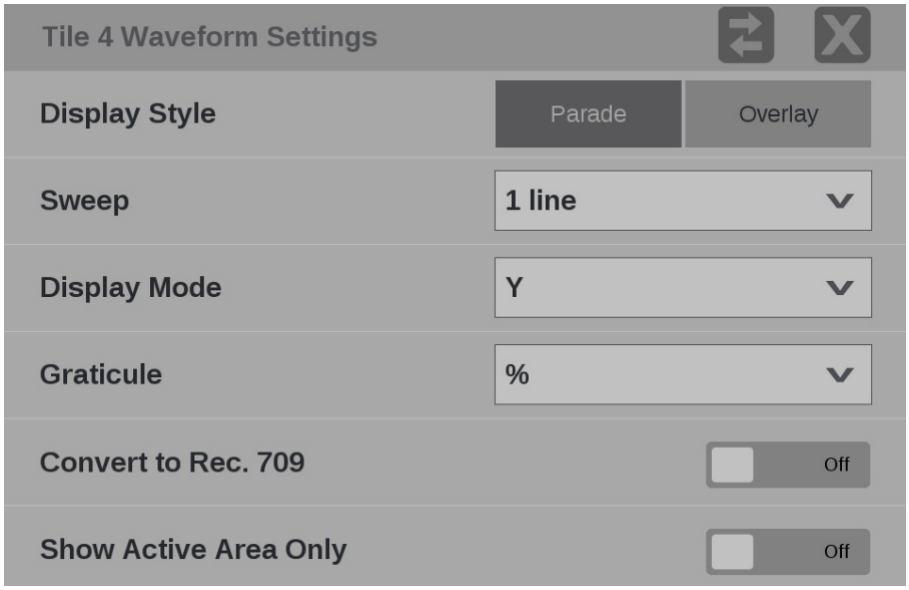


Figure 75: Waveform application settings menu

Display Style. Choose how the signal components are displayed in the active tile; use the Display Style buttons to select:

- **Parade**. All the components are shown one beside the other.
- **Overlay**. All the components are drawn at the same location so that they appear one on top of the other.

Sweep. Use the drop-down menu to select the waveforms to view between the lines or fields. The available sweep options depend on which display style is active.

- When the Parade display style is active you can select from **1 line** or **1 field**.
- When Overlay display style is active you can select from **1 line**, **2 line**, **1 field**, or **2 field**.

Display Mode. Use the drop-down menu to select from the following the choices (only available while displaying SDI inputs) in the menu:

- **Y**. Displays the input as Luma (Y) components.
- **RGB**. Displays the input as Red (R), Green (G), and Blue (B) components.
- **YPbPr**. Displays the input as Luma (Y) and color difference (Pb, Pr) components.
- **YRGB**. Displays the input as Luma (Y), Red (R), Green (G), and Blue (B) components.

Graticule. Use the drop-down menu to change the vertical scale value to **%**, **mV**, **Code Value**, **Stop**, **Reflectance**, or **Nits**.

NOTE. *The Code Value vertical unit is a hex value. The Stop, Reflectance and Nits scale are drawn differently depending on the Gamma setting in the input menu.*

Convert to Rec. 709. Turn this setting **On** to allow the trace displays to convert the Gamma and Color Gamut settings for the signal to SDR Narrow and BT. 709 (requires Option MP-PROD).

NOTE. *Convert to Rec. 709 automatically converts to BT.709, otherwise the graticule selection must be manually changed (See page 61, How to configure the instrument for HDR / WCG monitoring.)*

Show Active Area Only. Use the button to turn **Show Active Area Only On** or **Off**. When the option is **On** it removes the trace of vertical / horizontal blanking data.

Stop Display application

The Stop Display provides a tool to monitor video signals with a variety of transfer functions in a consistent manner. It also helps the DP, Cinematographer and Light engineer communicate to create a scene.

NOTE. *Stop Display is enabled with Option MP-PROD and is effected by the Gamma and Color Gamut settings. For additional information regarding these settings, refer to the How to configure signal inputs section (See page 46.)*

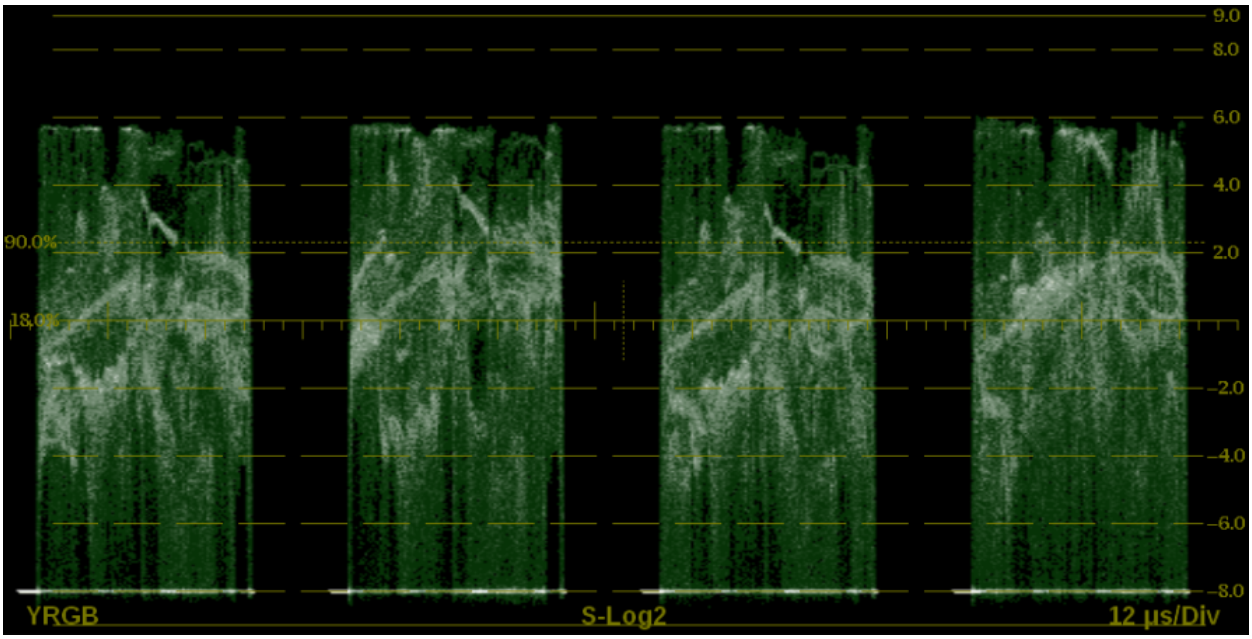


Figure 76: Stop Display application

Stop Display application banner

The following figure shows the available options after pressing and holding anywhere on the Stop Display application tile.

Figure 77: Stop Display application banner

The following options adjust the Stop Display application:

- The maximize icon ( ) expands the Stop Display application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the Stop Display application settings menu to adjust the tile settings.

NOTE. *After the Stop Display application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

Stop Display application settings menu

The following figure shows the different choices in the Stop Display application settings menu.

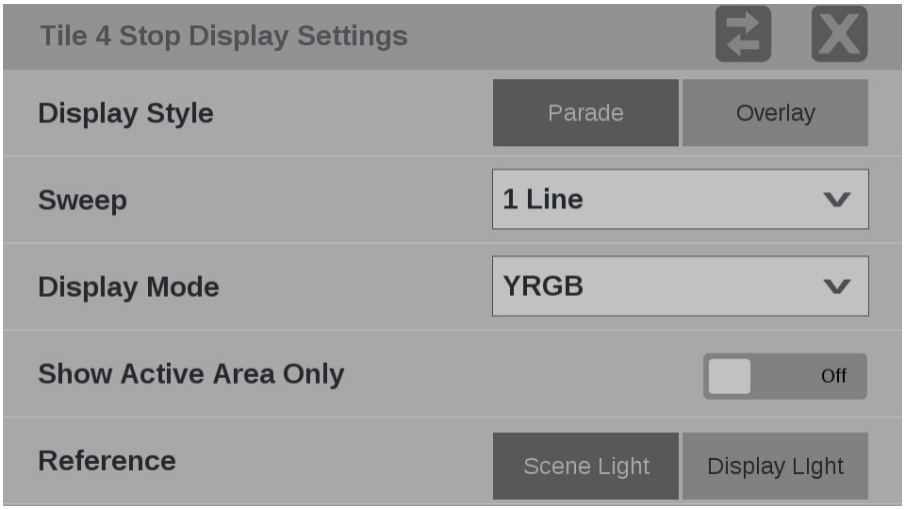


Figure 78: Stop Display application settings menu

Display Style. Choose how the signal components are displayed in the active tile, use the Display Style buttons to select:

- **Parade**. All the components are shown one beside the other.
- **Overlay**. All the components are drawn at the same location so that they appear one on top of the other.

Sweep. Use the drop-down menu to select the waveforms to view between the lines or fields and/or make timing measurements on them. The available sweep options depend on which display style is active.

- When the Parade display style is active you can select from **1 line** or **1 field**.
- When Overlay display style is active you can select from **1 line**, **2 line**, **1 field**, or **2 field**.

Display Mode. Use the drop-down menu to select from the following the choices (only available while displaying SDI inputs) in the menu:

- **Y**. Displays the input as Luma (Y) components.
- **RGB**. Displays the input as Red (R), Green (G), and Blue (B) components.
- **YRGB**. Displays the input as Luma (Y), Red (R), Green (G), and Blue (B) components.

Show Active Area Only. Use the button to turn **Show Active Area Only On** or **Off**. When the option is **On** it removes the trace of vertical / horizontal blanking data.

Reference. Use the reference buttons to choose between **Scene Light** (Stops) and **Display Light** (Nits).

Vector application

The Vector application provides an X-Y plot of color difference signals allowing the operator to match skin tones and color of ITU-R BT 709 or 2020 color space. With Option MP-PROD, transfer function/color space conversion allows for a ITU-R BT 709 color space to verify wide color gamut compatibility.

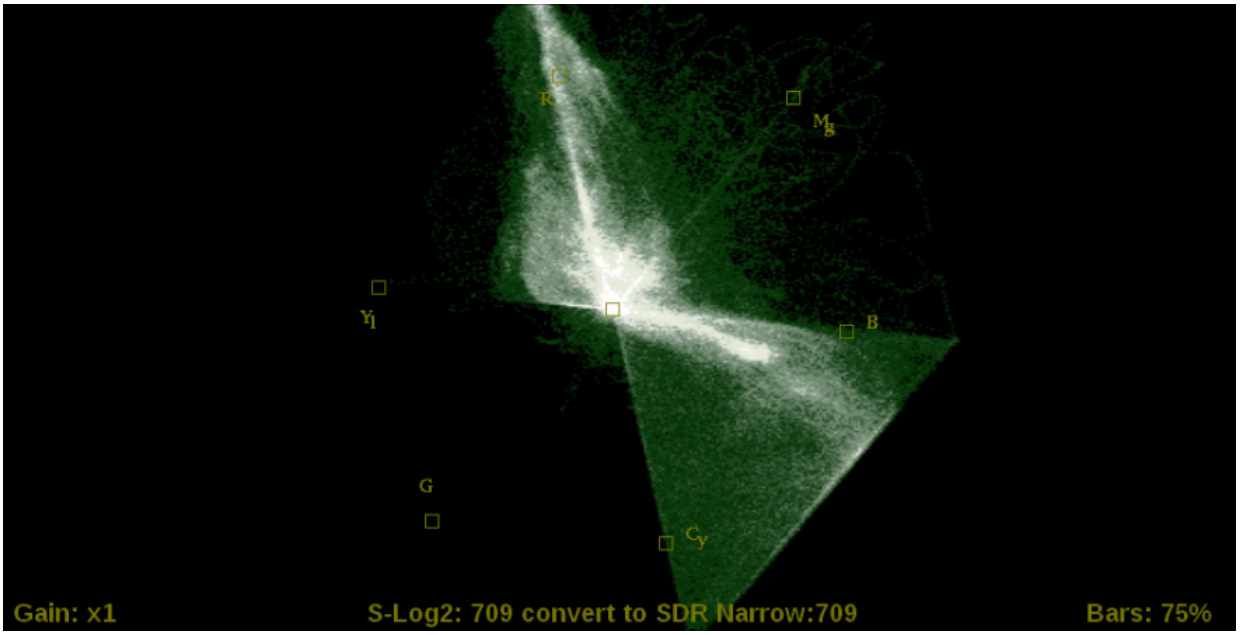


Figure 79: Vector application display

Vector application banner

The following figure shows the available options after pressing and holding anywhere on the Vector application tile.

Figure 80: Vector application banner

The following options adjust how the Vector application is displayed:

- The maximize icon ( ) expands the Vector application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the Vector application settings menu to adjust the tile settings.

NOTE. *After the Vector application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

Vector application settings menu

The following figure shows the different choices in the Vector application settings menu.

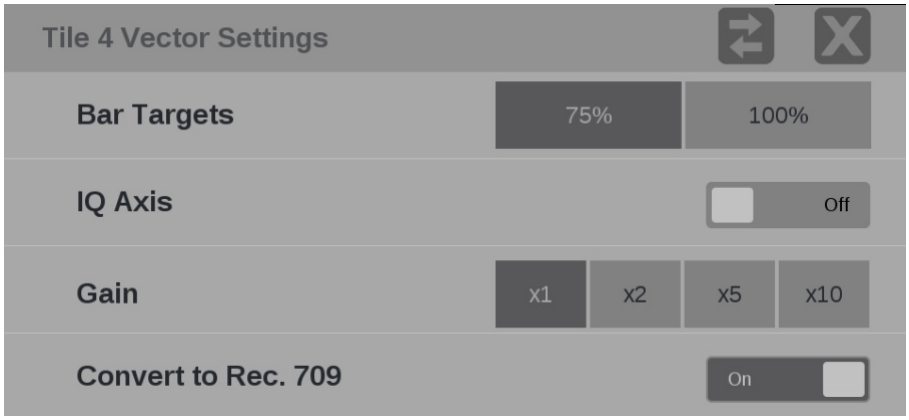


Figure 81: Vector application settings menu

Bar Targets. Use this setting to choose 75% or 100% scaling.

IQ Axis. Use the button to turn the **IQ Axis On** or **Off**.

Gain. Use this setting to select one of the following trace vector magnifications: **x1**, **x2**, **x5** or **x10**.

Convert to Rec. 709. Turn this setting **On** to allow the trace displays to convert the Gamma and Color Gamut settings for the signal to SDR Narrow and BT. 709 (requires Option MP-PROD).

NOTE. *Convert to Rec. 709 auto converts to BT.709, otherwise the graticule selection must be manually changed (See page 61, How to configure the instrument for HDR / WCG monitoring.)*

Diamond display application

The Diamond application provides a tool for white and black balancing at camera setup and for color gamut adjustment at color editing and QC. For additional information on how to use the Diamond display application refer to the Checking gamut section. (See page 107.)

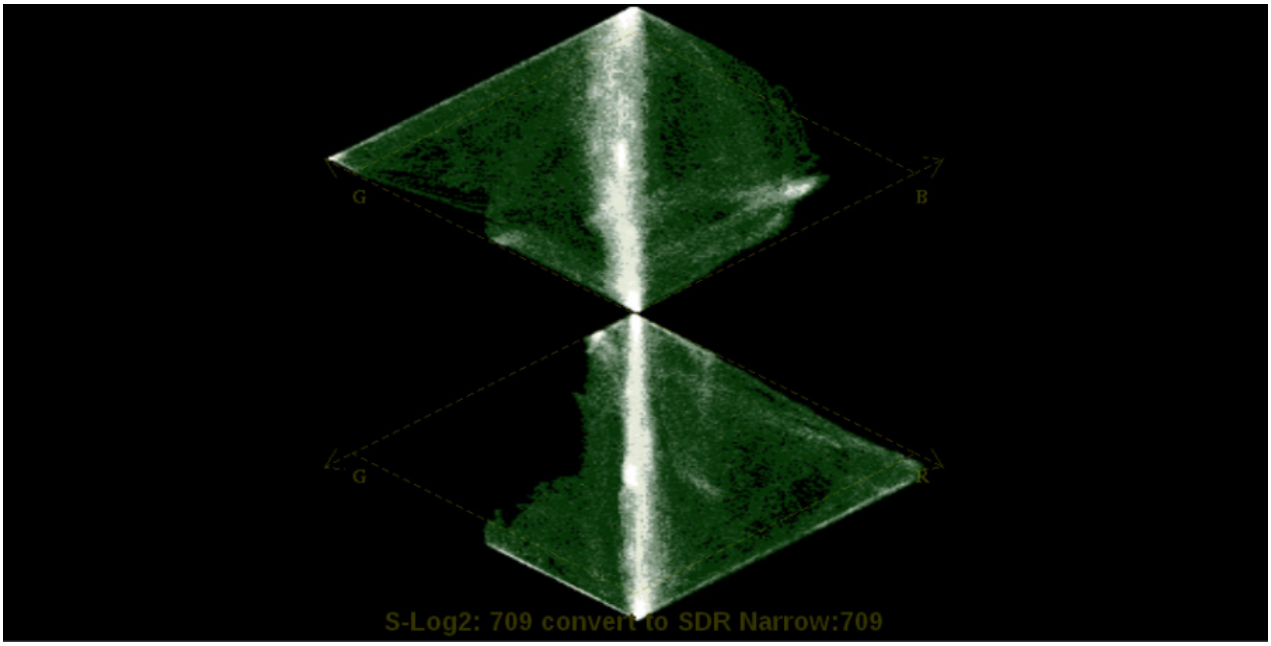


Figure 82: Diamond display application

Diamond application banner

The following figure shows the available options after pressing and holding anywhere on the Diamond application tile.

Figure 83: Diamond application banner

The following options adjust how the Diamond application is displayed:

- The maximize icon ( ) expands the Diamond application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the Diamond application settings menu to adjust the tile settings.

NOTE. *After the Diamond application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

Diamond application settings menu

The following figure shows the different choices in the Diamond application settings menu.

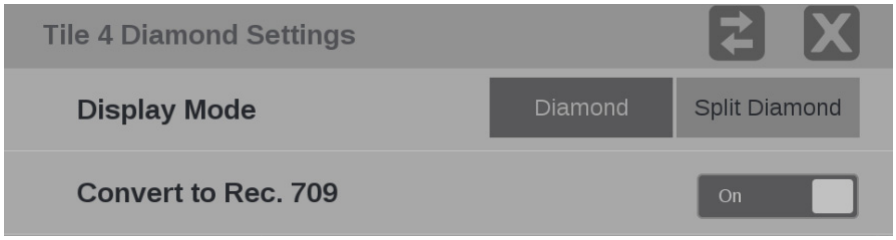


Figure 84: Diamond application settings menu

Display Mode. Select one of the following selections:

- **Diamond**. The Normal Diamond display shows Gamut violations of the SDI input if translated to RGB color space.
- **Split Diamond**. The Split Diamond display offsets the two halves of the Diamond to allow you to better see negative RGB Gamut errors.

Convert to Rec. 709. Turn this setting **On** to allow the trace displays to convert the Gamma and Color Gamut settings for the signal to SDR Narrow and BT. 709 (requires Option MP-PROD).

NOTE. *Convert to Rec. 709 auto converts to BT.709, otherwise the graticule selection must be manually changed (See page 61, How to configure the instrument for HDR / WCG monitoring.)*

Checking gamut

The Diamond display effectively shows how the R, G, and B signals relate. The Diamond display is a good tool for detecting gamut errors.

To form the Diamond display, the instrument converts the Y, P_b, and P_r components recovered from the serial signal to R, G, and B. To predictably display all three components, they must lie between peak white, 700 mV, and black, 0 V.

For a signal to be in gamut, all signal vectors must lie within the G-B and G-R diamonds. Conversely, if a signal vector extends outside the diamond, it is out of gamut. The direction of an excursion out of gamut indicates which signal is excessive. Errors in green amplitude affect both diamonds equally, while blue amplitude errors affect only the top diamond and red errors affect only the bottom diamond. (See Figure 85.)

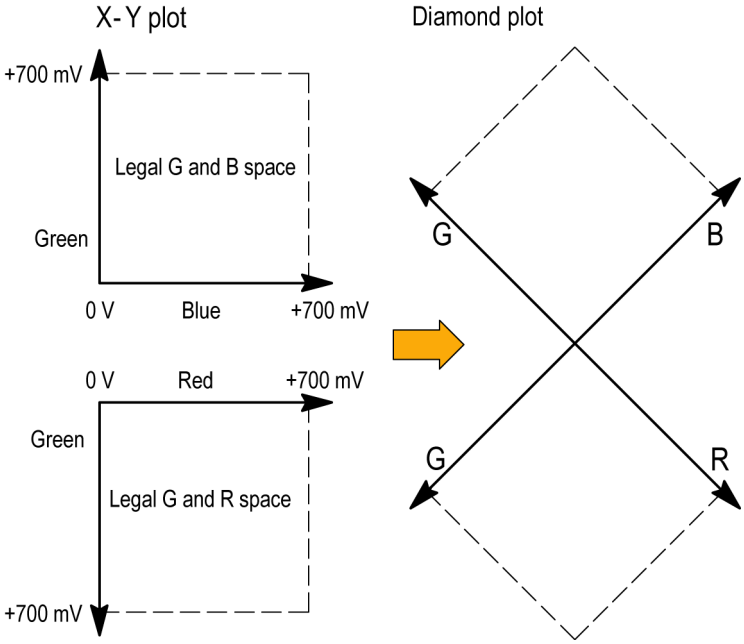


Figure 85: Diamond display plot

Compare the signal to the display to determine out-of-gamut components. Note the following:

- The intensity of a vector indicates its duration.
- A momentary out-of-gamut condition appears as a faint trace. Long duration violations show as a bright trace.

When evaluating out-of-gamut components, consider the following examples. (See Figure 86.)

- Example A:
  R - Ok
  G > 700 mV
  B - Ok
- Example B:
  R - Ok
  G - Ok
  B > 700 mV
- Example C:
  R - Ok
  G - Ok, 350 mV
  B < 0 mV

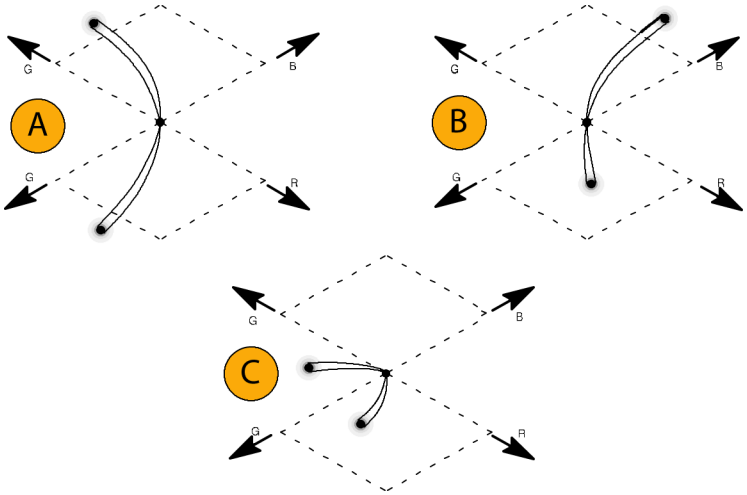


Figure 86: Out-of-gamut examples

NOTE. *Bending of the transitions indicates timing delays. When a color bar signal is applied, the vertical axis becomes an indicator of delay errors.*

Monochrome signals appear as vertical lines. Nonlinear component processing, such as from a gamma corrector that alters white balance, can cause deviations along the vertical axis.

Picture application

The Picture display lets you see the picture generated by the video signal.

Figure 87: Picture application display (Copyright 2008, Blender Foundation / www.bigbuckbunny.org)

Picture application banner

The following figure shows the available options after pressing and holding anywhere on the Picture application tile.

Figure 88: Picture application banner

The following options adjust the Picture application:

- The maximize icon ( ) expands the Picture application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the Picture application settings menu that allows you to turn on convert to Rec. 709.

NOTE. *After the Picture application settings menu is opened, a move icon ( ) is displayed. Pushing this icon moves the settings menu horizontally.*

Picture application settings menu

Figure 89: Picture application settings menu

Convert to Rec. 709. Use this setting **On** to allow the trace displays to convert camera logs to Rec. 709 (requires Option PROD).

NOTE. *In full screen mode, there is no cropping. Pictures are decimated horizontally or vertically to obtain the correct aspect ratio. This decimation may cause some artifacts.*

Audio application

The Audio application provides a level meters display using True Peak ballistics for monitoring audio signals. Also included are Test level and Peak program level indicators.

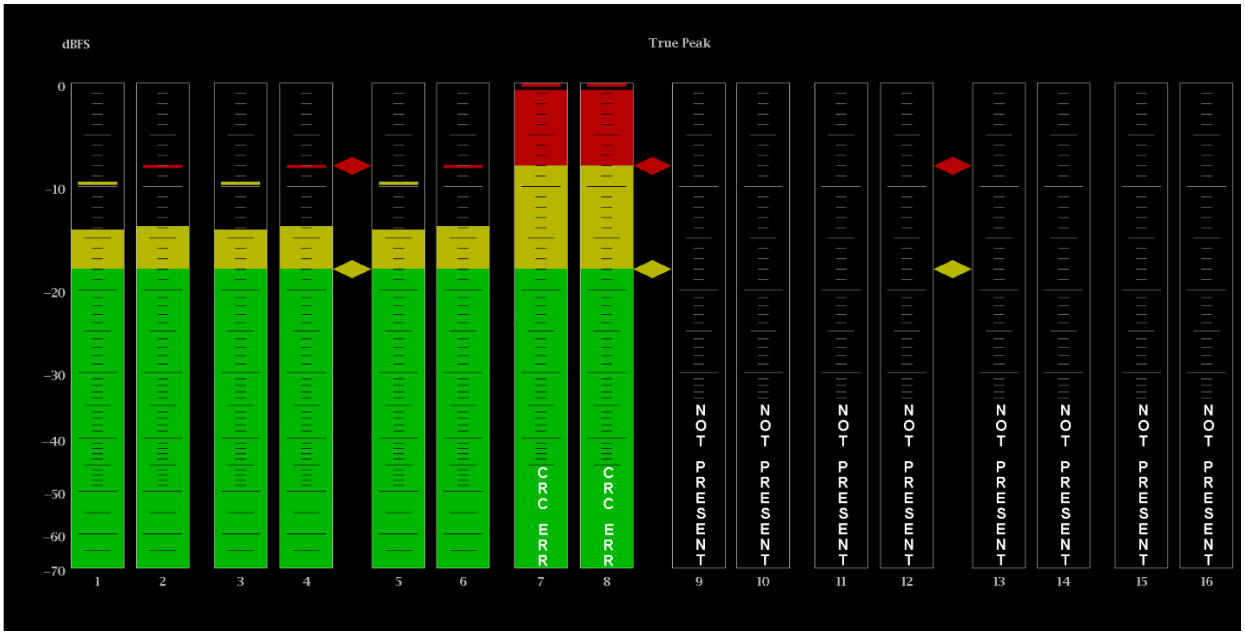


Figure 90: Audio application display

Audio application banner

The following figure shows the available options after pressing and holding anywhere on the Audio application tile.

Figure 91: Audio application banner

The following options adjust the Audio application tile:

- The maximize icon ( ) expands the Audio application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.

Elements of the Audio application display

- **True Peak**: Displays the default level meter dynamic response characteristic (ballistics type). You cannot change the ballistics type.
- **Level meters**: Level meters are vertical bar graphs on which the height of the bar indicates the amplitude of the audio program in the corresponding input channel. The meter levels are color coded based on their relationship to the Test Level and Peak Program level indicators as follows.
  - Below the Test level, the meter bars are displayed in a green color.
  - Between the Test level and the Peak Program level, the meter bars are displayed in a yellow color.
  - Above the Peak Program level, the meter bars are displayed in a red color.
- **Test level and Peak program level indicators**: Diamond-shaped markers between the level bars indicate the default Test Level and Program level limits for the display. Test level is also known as Reference level or Line-up level.
- **Level meter scale and units**: By default, the units are in dB relative to full scale (dBFS). The 0 dB mark is digital Full scale.

In-bar warning messages

This instrument displays warning messages within the level meter bars. The warning messages that can appear are shown below in order of priority.

- **UNLOCKED**. The instrument is not locked to an incoming signal on the indicated input channel. Data cannot be decoded and all data and other errors are ignored. This means that if an AES input is selected, nothing recognizable is present on the input, or if embedded audio is selected, the VIDEO input is unrecognizable.
- **AES PARITY.** The incoming subframe does not have even parity as specified by the digital audio standards. The data sample is unreliable and is ignored. The level meters treat the sample as a zero sample.
- **AES CRC ERROR.** The CRC code in the AES channel status packet is incorrect. Sometimes the CRC code is set to zero, indicating that the signal is missing; when this is the case, this message is not displayed.
- **MUTE.** The number of consecutive all-zero samples equals or exceeds the # Samples for Mute setting.
- **SILENCE.** The signal is at or below the specified Silence Level for a time exceeding the Duration for Silence setting.
- **DISABLED.** Indicates that an audio bar is not active.
- **AES V BIT.** Indicates that the Validity bit is set high for one or more data samples. In the AES/EBU standard, a set validity bit indicates that the sample is not suitable for conversion to audio. By default, the level meter bars and Lissajous display treat the affected samples as zero samples.
- **NO AUDIO.** Indicates that an AES or embedded input has the Non audio bit set.
- **NOT PRESENT.** Indicates that an audio bar is not present in the current audio input. For example, if a Dolby Digital input has a coding mode indicating a reduced number of channels.

Eye Display application

The Eye Display presents an eye pattern diagram of the SDI signal to verify electrical characteristics of the SDI transport layer. Use this application to make automated eye measurements on SD, HD, and 4K SDI signals.

NOTE. *This application requires hardware option PHY-12G and software option MP-FMT-4K to enable 12G-SDI. This application is only valid on SDI 1.*

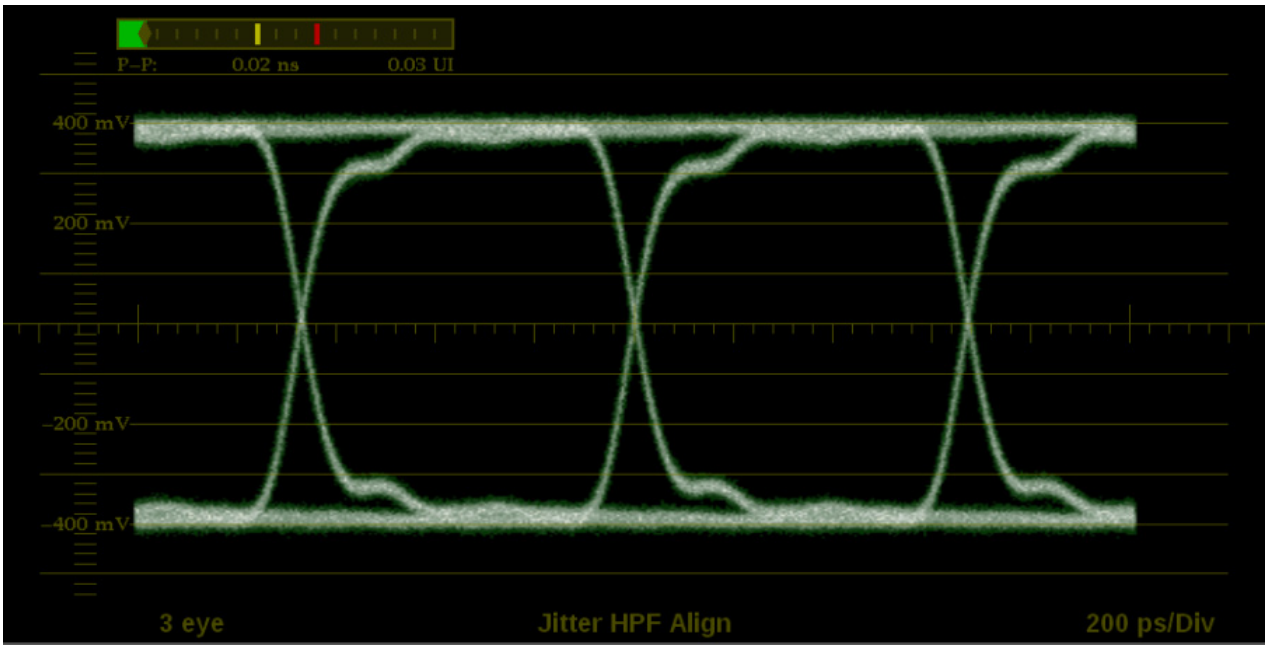


Figure 92: Eye Display application display

Eye Display application banner

The following figure shows the available options after pressing and holding anywhere on the Eye Display application tile.

Figure 93: Eye Display application banner

The following options adjusts the Eye Display application:

- The maximize icon ( ) expands the Eye Display application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

NOTE. *The display readouts will only display when the tile is expanded to full screen.*

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the Eye Display application settings menu to adjust the tile settings.

NOTE. *After the Eye Display application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

Eye Display application settings menu

The following figure shows the different choices in the Eye Display application settings menu.

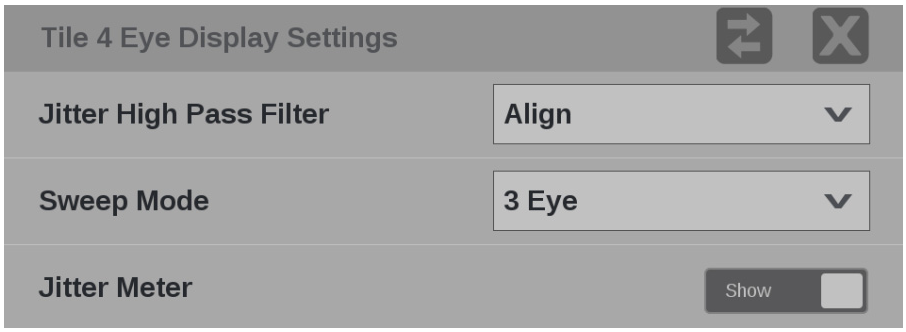


Figure 94: Eye Display application settings menu

Jitter High Pass Filter. Use the drop-down menu to select the high pass filter to **Timing**, **Align**, **10 Hz**, **100 Hz**, **1 kHz**, **10 kHz**, or **100 kHz**.

NOTE. *For multi-piece displays, the filter setting applies to both pieces.*

Sweep Mode. Use the drop-down menu to select **3 Eye**, **20 Eye**, **1 Field**, or **2 Field**.

Jitter Meter. Use the button to **Hide** or **Show** the jitter meter above the eye pattern.

NOTE. *Eye measurements are displayed when the Eye Display application is in full screen mode.*

Jitter Display application

The Jitter Display application shows the wave shape of the jitter and allows you to view additional time-domain information, such as whether there are jitter components that are synchronous or nearly synchronous to the video line or frame.

NOTE. *This application requires hardware option PHY-12G and software option MP-FMT-4K to enable 12G-SDI. This application is only valid on SDI 1.*

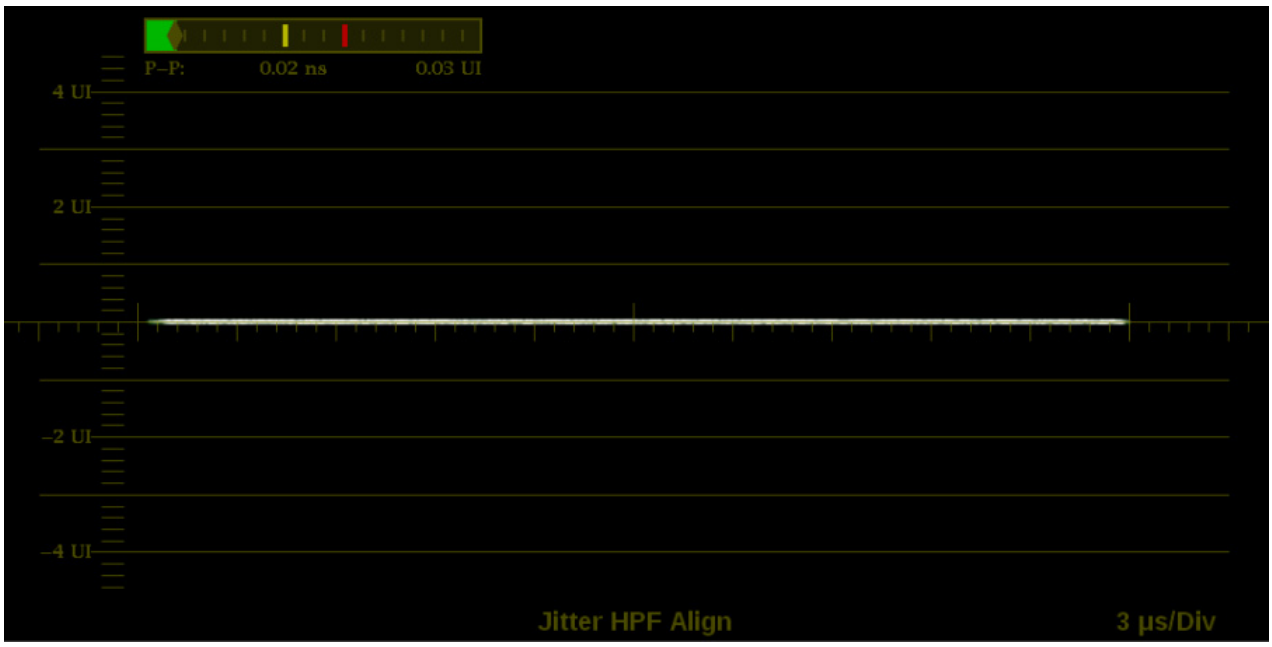


Figure 95: Jitter Display application display

Jitter Display application banner

The following figure shows the available options after pressing and holding anywhere on the Jitter Display application tile.

Figure 96: Jitter Display application banner

The following options adjust the Jitter Display application:

- The maximize icon ( ) expands the Jitter Display application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

NOTE. *The display readouts will only display when the tile is expanded to full screen.*

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the Jitter Display application settings menu to adjust the tile settings.

NOTE. *After the Jitter Display application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

Jitter Display application settings menu

The following figure shows the different choices in the Jitter Display application settings menu.

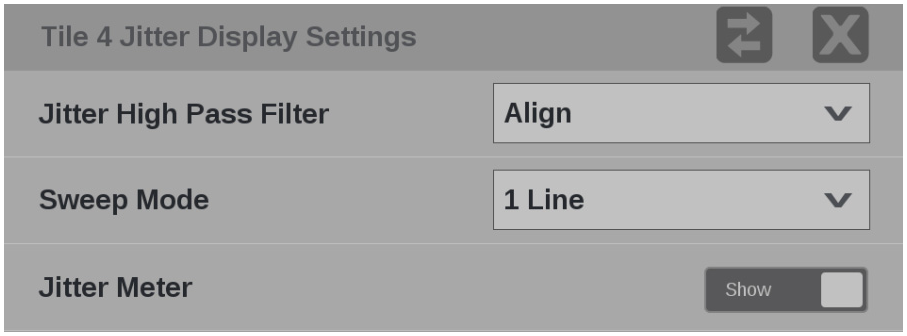


Figure 97: Jitter Display application settings menu

Jitter High Pass Filter. Use the drop-down menu to select the high pass filter to **Timing**, **Align**, **10 Hz**, **100 Hz**, **1 kHz**, **10 kHz**, or **100 kHz**.

Sweep Mode. Use the drop-down menu to select **1 Line**, **2 Line**, **1 Field**, or **2 Field**

Jitter Meter. Use the button to **Hide** or **Show** the jitter meter at the top of the display.

NOTE. *Eye measurements are displayed when the Jitter Display application is in full screen mode.*

Video Session application

Use this application to view various performance parameters of the SDI video signal or the decoded IP stream. Touch any of the four tab titles to view the associated information: SDI Format, VPID 352, Bit Level, or CRC Status.

Figure 98: Video Session application – SDI FORMAT tab display

Video Session application banner

The following figure shows the available options after pressing and holding anywhere on the Video Session application tile.

Figure 99: Video Session application banner

The following options adjust the Video Session application tile:

- The maximize icon ( ) expands the Video Session application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.

Elements of the top-level Video Session application display

The elements at the top of the Video Session application are shared between the four tabs:

- **INPUT**: Shows the selected input source on the top line and shows the detected format, sample structure, and transport of the input signal on the second line.
- **Display tabs**: Click one of the four tabs to view the associated display. Each of the tabs has a status indicator to provide a quick view of the status of the parameters contained in each tab.
  - **SDI FORMAT**. Use this tab to view the status of various SDI signal parameters on the input signal.
  - **VPID 352**. Use this tab to view the status of the SMPTE352M VPID on the input signal. For 3G-SDI signals, VPID is required on the primary link (Link A).
  - **BIT LEVEL**. Use this tab to view if there are any stuck bits in the input signal.
  - **CRC STATUS**. Use this tab to view the status of CRC and Checksum errors in the video signal.
- **Run Time**. The instrument maintains a running monitoring session for the Video Session application. The Run Time readout displays the amount of time that has elapsed during the current monitoring session. The time is displayed as "DD, HH:MM:SS", where DD is the number of days, HH is the number of hours, MM is the number of minutes, and SS is the number of seconds.
- **Clear icon**. Use the icon to clear or reset the monitoring session.
- **Running / Stopped icons**. When the monitoring session is running (collecting error data), use the icon to stop the session. When the monitoring session is stopped (no error data collection and no display updates), use the icon to restart the session.

SDI FORMAT tab display

Use the SDI FORMAT tab display to view the status of various SDI signal parameters on the input signal. (See Figure 98 on page 119.)

Elements of the SDI FORMAT tab display.

- **SAV Place Err**: Indicates whether a Start-of-Active-Video Placement Error has occurred.
- **EAV**: Indicates whether an End-of-Active-Video Placement Error has occurred.
- **Field Length Err**: Indicates whether a Field Length Error has occurred.
- **Line Length Err**: Indicates whether a Line Length Error has occurred.

- **Ancilliary Data**: Indicates whether Ancillary Data is present in the video signal. The displayed values are either Present or None for SD signals, or Y and C Present and None for HD and 3 Gb/s signals.
- **Statistics**: This section of the display shows the status and statistical values for certain errors. For information about the errors in this section, view the help file in your instrument: while the Video Session is active in a tile, press the HELP button.
- **Status**: Shows the status of the associated error as either OK, Invalid, Missing, or Error.

VPID 352 tab display

Use the VPID 352 tab display to view the VPID values of the SMPTE352M payload. For 3G-SDI signals, VPID is required on the primary link (Link A).

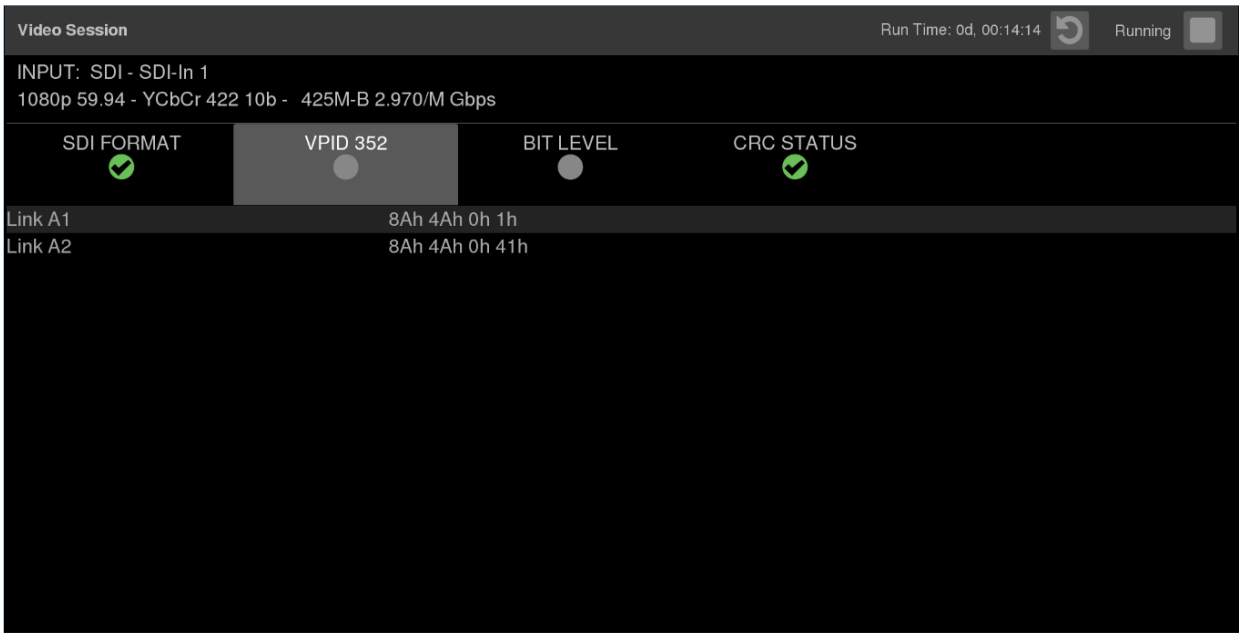


Figure 100: Video Session application – VPID 352 tab display for 3G-SDI Level B signal

Elements of the VPID 352 tab display. The number of links depend on the type of input signal.

- **Link A1**: Indicates the presence and status of a SMPTE 352M payload on Link A1 and lists the VPID values in hex.
- **Link A2**: Appears only for 3G-SDI Level B signals. Indicates the presence and status of a SMPTE 352M payload on Link A2 and lists the VPID values in hex.

BIT LEVEL tab display

Use the BIT LEVEL tab display to view if there are any stuck bits in the input signal.

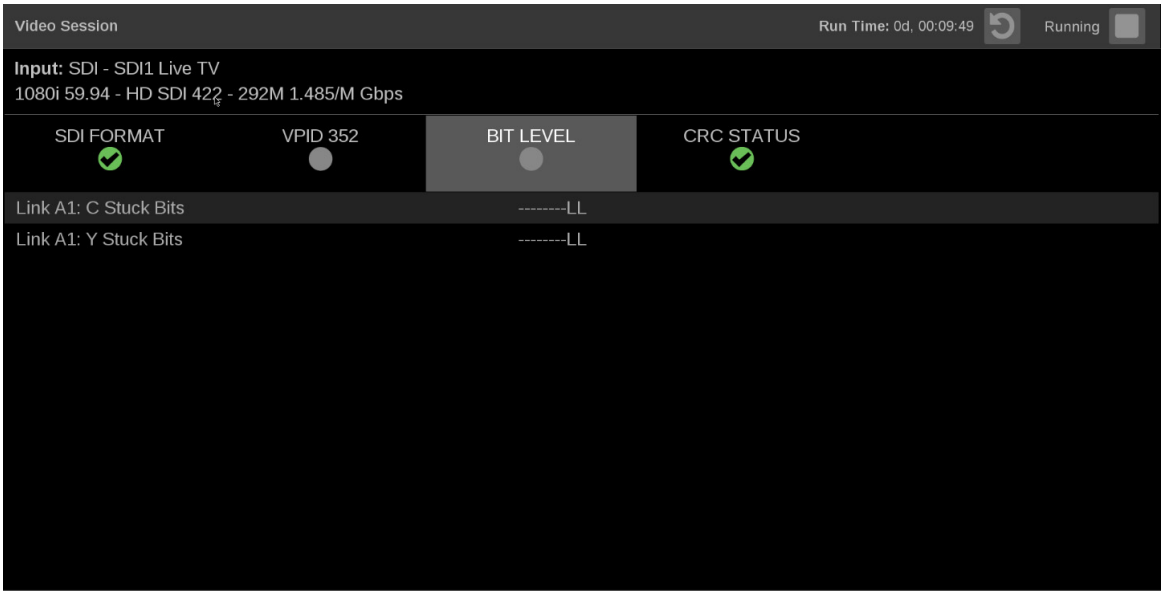


Figure 101: Video Session application – BIT LEVEL tab display

Elements of the BIT LEVEL tab display.

- **Y Stuck Bits**: Displays which of the luminance video bits are stuck. If the readout is "--------", then none of the bits are stuck.

NOTE. *For 8-bit video, since the unused bits are always low, "--------LL" is displayed when no other bits are stuck.*

- **C Stuck Bits**: Displays which of the chrominance video bits are stuck. If the readout is "--------", then none of the bits are stuck.

CRC STATUS tab display

Use the CRC STATUS tab display to view the status of CRC and Checksum errors in the video signal.

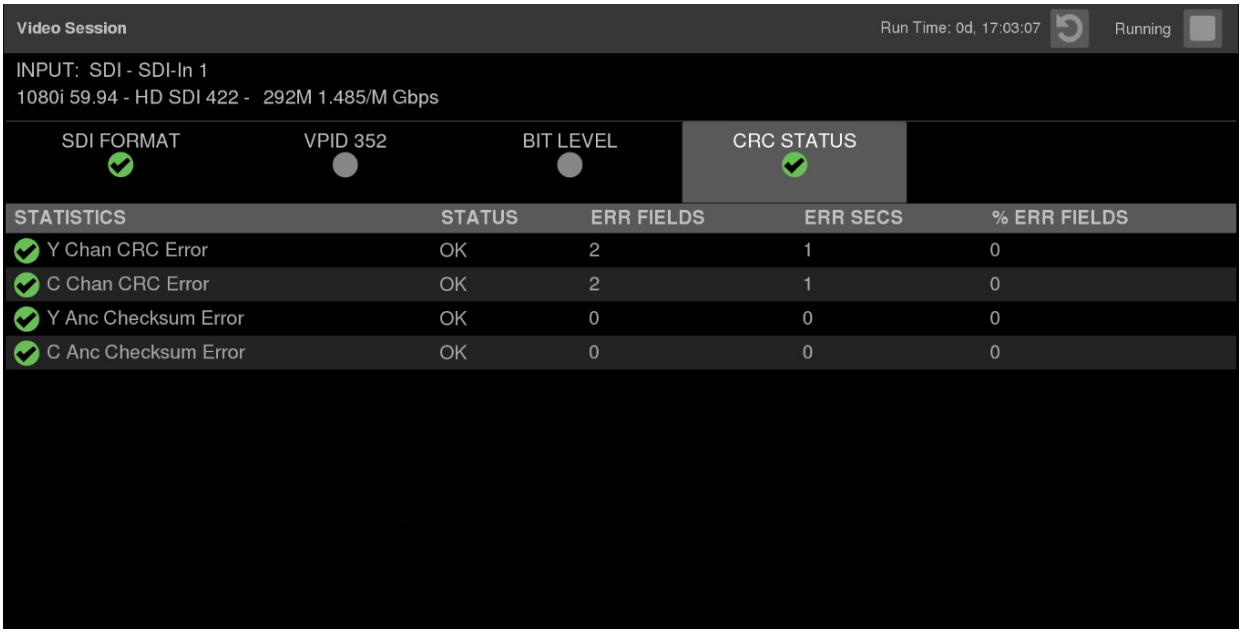


Figure 102: Video Session application – CRC STATUS tab display

Elements of the CRC STATUS tab display.

NOTE. *The instrument uses the SMPTE RP165 standard for error checking. For HD and 3 Gb/s signals, the CRCs change on every video line.*

- **Y Chan CRC Error**: Displays the status of the Y channel embedded CRC (Cyclical Redundancy Check) that was calculated for the video signal. Using a known test signal, the CRC status can be used to verify integrity through a system. An error means that the Y Channel embedded CRC value does not match the calculated CRC value, which indicates that a transmission error has occurred.
- **C Chan CRC Error**: Displays the status of the C channel embedded CRC (Cyclical Redundancy Check) that was calculated for the video signal. Using a known test signal, the CRC status can be used to verify integrity through a system. An error means that the C Channel embedded CRC value does not match the calculated CRC value, which indicates that a transmission error has occurred.

- **Y Anc Checksum Error**: Displays the status of the Y channel ancillary embedded checksum value that was calculated for the video signal. Using a known test signal, the checksum status can be used to verify integrity through a system. An error means that the Y Channel embedded checksum value does not match the calculated checksum value, which indicates that a transmission error has occurred.
- **C Anc Checksum Error**: Displays the status of the C channel ancillary embedded checksum value that was calculated for the video signal. Using a known test signal, the checksum status can be used to verify integrity through a system. An error means that the C Channel embedded checksum value does not match the calculated checksum value, which indicates that a transmission error has occurred.

The CRC Status display is also divided into the following four columns:

- **Status**: Shows the status of the associated error:
  - **OK**: No error is currently detected.
  - **Invalid**: The data for the item is currently invalid.
  - **Missing**: The data for the item is currently missing.
  - **Error**: The associated error is currently in an error state.
- **Err Fields**: The number of fields, since the last reset, that contained at least one error.
- **Err Secs**: The number of seconds, since the last reset, that contained at least one error.
- **% Err Fields**: Shows a calculated number showing the percentage of all fields since the last reset that contained at least one error.

Event Log application

The Event Log application provides a view of detected errors. The display buffer for the application shows 1000 log entries.

Figure 103: Event Log application display

Event Log application banner

The following figure shows the available options after pressing and holding anywhere on the Event Log application tile.

Figure 104: Event Log application banner

The following options adjust the Event Log application tile:

- The maximize icon ( ) expands the Event Log application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.

Event Log application settings menu

Figure 105: Event Log application settings menu

Undo Reset. Use this button to undo the last reset of the logged events.

Elements of the Event Log application display

- **Reset icon**. Use the icon to hide old log items. Press the icon once to hide all log items, so only new log items will be displayed. Use the **Undo Reset** button in the settings menu to display the log items that were previously hidden.
- **Go to Bottom icon**. Use the icon to go to the end of the currently displayed Event Log buffer where you can monitor any new events. The most recent events are at the bottom of the event list.

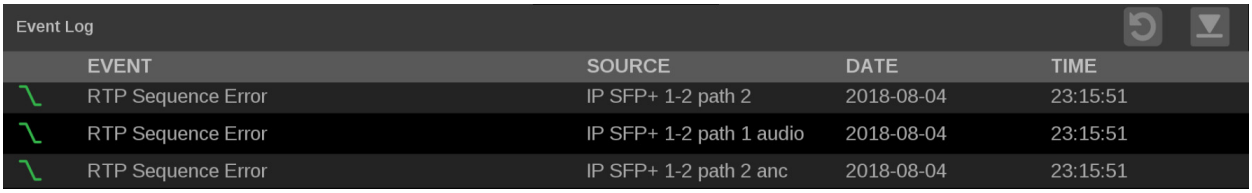


Figure 106: Event application Go to Bottom icon

The Error Log is also divided into the following four columns:

- **Event**: Shows the current state of the log entries:
  - **Red** (rising edge) items are detected errors.
  - **Green** (falling edge) items are errors that have cleared.
  - **Red / Green** (rising and falling edge) items indicate a momentary error that requires no action.
  - **White** items are informational and identify a change in instrument state.
- **Source**: Shows the inputs on which the errors have occurred.
- **Date**: Shows the date and time, according to the internal clock, that the error occurred in the form YYYY-MM-DD.
- **Time:** Shows the time, according to the internal clock, that the error occurred in the form HH:MM:SS.

Alert messages

The following table lists the different types of alarms in the Event Log of the instrument and a description of what causes each alarm.

Alarm Type	Description
Video signal lost	This alarm indicates a missing or unlocked video signal regardless of IP or SDI. ***NOTE.*** *The video stream may be not decodable or corrupted.*
Format unsupported	This alarm indicates an unsupported video format.
Standard definition detected	This alarm indicates the presence of standard definition video.
Video format changed	This alarm indicates the detection of a video format change.
Video format mismatch	This alarm indicates a mismatch between the detected and the configured video format.
RTP Sequence Error	This alarm indicates that a sequence error was detected in incoming RTP stream. ***NOTE.*** *Sequence errors can be caused by dropped, out of order, or duplicated packets. A sequence error can also be triggered when the sequence number within a flow will not increment.*
RTP Header Invalid	This alarm indicates an error was detected in RTP header.
RTP Timestamp Error	This alarm indicates that the RTP timestamp is corrupt or is not updating at the correct frequency for the specified media type.
RTP Marker Frequency Error	This alarm indicates that RTP marker bit is not designated at the correct frequency for the specified media type. ***NOTE.*** *If this alarm is present the frequency off is off by ± 1 Hz.*
HBRMT Sequence Error	This alarm indicates a sequence error was detected in SMPTE 2022.6 HBRMT header. ***NOTE.*** *This alarm will not trigger with 2110. HBRMT has its own sequence header and clock.*
HBRMT Header Invalid	This alarm indicates an error was detected in the S2022.6 HBRMT header.
HBRMT Timestamp Error	This alarm indicates an error was detected in the S2022.6 HBRMT Timestamp.
S2022.7 path missing	This alarm indicates that one of the datapaths in a S2022.7 seamless switching configuration is missing.
Combined RTP sequence error	This alarm indicates that an RTP sequence error was detected in the combined output of a media stream protected using RTP packet reordering or S2022.7 seamless switching.
Data rate invalid or unstable	This alarm indicates that the detected data rate of a video input is unstable or nonstandard. ***NOTE.*** *If this alarm is triggered the hardware has indicated that the AUX out cannot lock. The Incoming video data rate is unstable or off.*
PTP Unlocked	This alarm indicates that Precision Time Protocol is unlocked or missing.
SDI active field length error	This alarm indicates that the active field length of SDI video is incorrect.
SDI total field length error	This alarm indicates that the total field length of SDI video is incorrect.
SDI EAV placement error	This alarm indicates an incorect total line length (EAV-EAV).
SDI SAV placement error	This alarm indicates an incorrect active line length (SAV-EAV).
SDI line number error	This alarm indicates an incorrect encoded transport line number was detected.
SDI Y-channel CRC error	This alarm indicates a SDI line checksum error was detected on the Y channel.
SDI C-channel CRC error	This alarm indicates a SDI line checksum error was detected on the C channel.

Alarm Type	Description
SDI Y-channel ANC checksum error	This alarm indicates an ancillary data checkusm error was detected on the Y channel or in SD video.
SDI C-channel ANC checksum error	This alarm indicates an ancillary data checkusm error was detected on the C channel.
SMPTE 352M payload ID missing	This alarm indicates a mandatory SMPTE352M video payload identifier packet is missing.
Inter-link format mismatch	This alarm indicates a multi-link SDI signal has incompatible formats on one or more links.
SDI AUX out unlocked	This alarm indicates the SDI auxiliary output is unlocked.

IP Status application

The IP Status application provides an overview of the monitored IP stream and shows the status of each program in the stream. Once the input signals have been subscribed to using the input settings menu, the traffic on the SFP ports can be viewed using the IP Status application. Depending on the network switch deployed, the traffic may not appear in the IP Status application immediately.

NOTE. *IP Status is available only with Option MP-IP-STD installed.*

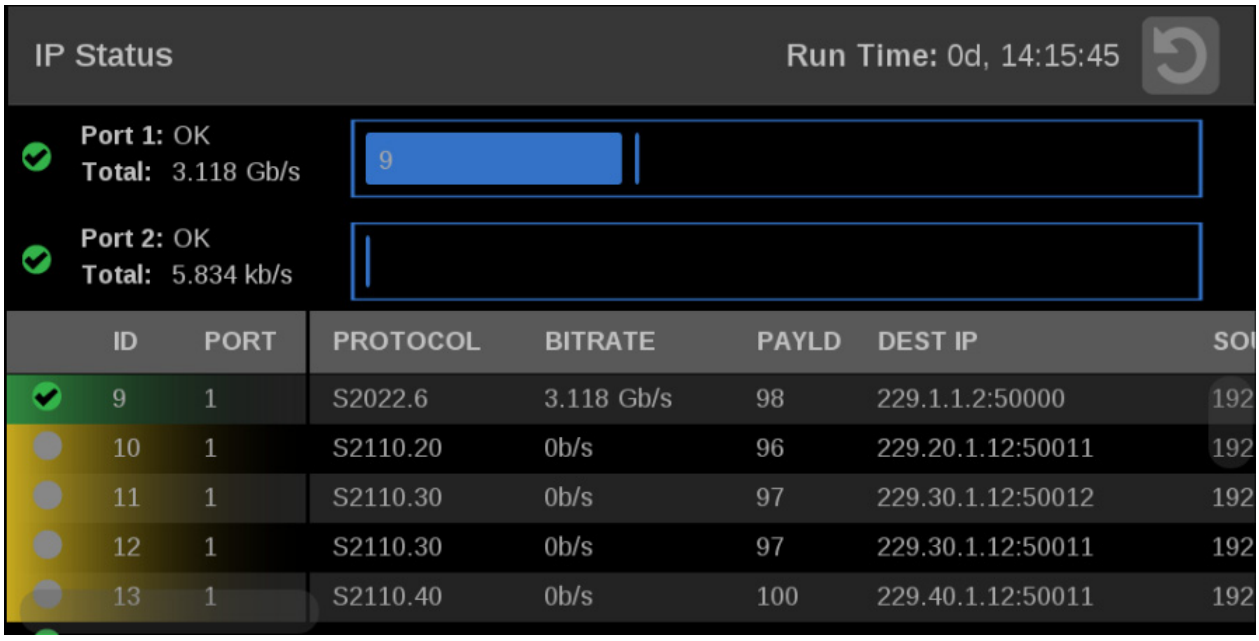


Figure 107: IP Status application display

IP Status application banner

The following figure shows the available options after pressing and holding anywhere on the IP Status application tile.

Figure 108: IP Status application banner

The following options adjust the IP Status application:

- The maximize icon ( ) expands the IP Status application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the IP Status application settings menu. Use this menu to select Port 1, Port 2 or Both.

NOTE. *After the IP Status application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

To view Port 1 and Port 2

1. Launch the IP Status application in one of the tiles (press/hold in the tile and select from the list of applications).
2. Open the IP Status settings menu by press/hold in the tile and select the icon.
3. In the IP Status settings menu select “Both” to monitor both Port 1 and Port 2.

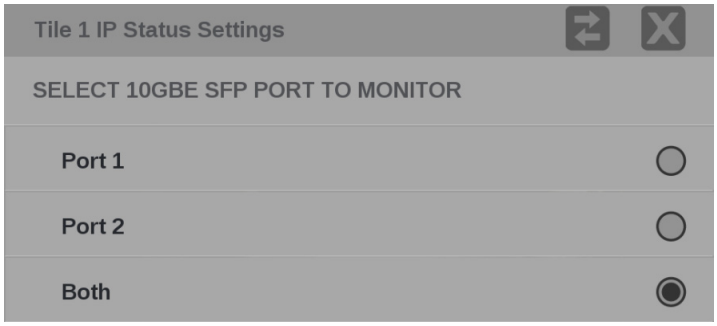
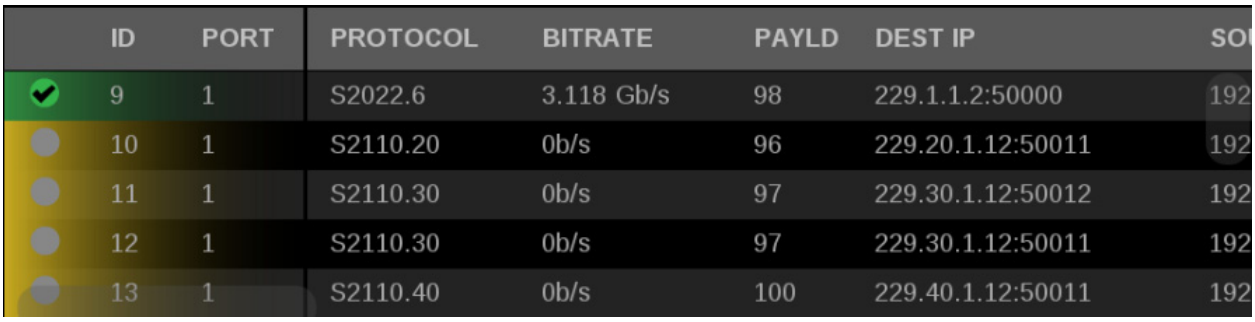


Figure 109: IP Status port settings

With both ports selected there will be two traffic bars showing the amount of traffic on each port, as well as a traffic table that now indicates a “Port” column.

- The active monitored streams are always displayed at the top of the list.
- The columns are sortable.
- The selected input is now highlighted in the ID column.
- When the row has a yellow gradient it indicates a signal that was present and is now gone. Press the reset button at the right side of the banner (at top) to clear the signals that are no longer there.



	ID	PORT	PROTOCOL	BITRATE	PAYLD	DEST IP	SO
✓	9	1	S2022.6	3.118 Gb/s	98	229.1.1.2:50000	192
	10	1	S2110.20	0b/s	96	229.20.1.12:50011	192
	11	1	S2110.30	0b/s	97	229.30.1.12:50012	192
	12	1	S2110.30	0b/s	97	229.30.1.12:50011	192
	13	1	S2110.40	0b/s	100	229.40.1.12:50011	192

Figure 110: IP Status application with yellow and green gradients

Status indicators

- : Indicates that the signal parameter has not been in an error condition.
- : Indicates that the signal parameter was in an error condition but the error has now cleared.
- : Indicates that the signal parameter is currently in an error condition.
- : Indicates that the signal parameter is not being monitored for an error condition.

Elements of the IP Status application display

- **Port 1 and Port 2**: Status of Port 1 and Port 2.
- **Total**: Shows the total bit rate of the video in the IP stream.
- **IP stream bandwidth bar**: The blue bar outline at the top of the display represents the total bandwidth of the 10 GbE pipe (10.3125 Gb/s). The blue bars inside the outline show the relative bandwidth size of items in the IP stream compared to the total available bandwidth of the stream. Numbers inside the blue bars correspond to the ID numbers listed in the display.
- **Run Time**. The instrument maintains a running IP Status Session. The Run Time readout displays the amount of time that has elapsed during the current IP Status Session. The time is displayed as "DD, HH:MM:SS", where DD is the number of days, HH is the number of hours, MM is the number of minutes, and SS is the number of seconds.
- **Clear icon**. Use the icon to reset the status session. After a reset, items will appear in the list in the order they are detected.

- **Yellow gradient**: When an item in the list has a yellow gradient it indicates the item was previously detected in the stream but is no longer present. The yellow gradient can also indicate messages, which occur only for a few seconds. Use the icon to reset the display to view only the items currently in the stream. See (See Figure 110.)
- **Green gradient**: When an item in the list has a green gradient it indicates the item is a currently monitored stream. Use the icon to reset the display to view only the items currently in the stream. See (See Figure 110.)

The IP Status application is also divided into the following five columns:

- **ID**: Shows the ID number of each item in the IP stream. The ID numbers correspond to the numbers in the blue bar at the top of the display.
- **Port**: Shows the Port number being monitored.
- **Protocol**: Shows the protocol being used by each item in the IP stream.
- **Bitrate**: Shows the bitrate of each item in the IP stream.
- **Payld**: Shows the RTP Payload Type number of each IP stream.
- **Dest IP**: Shows the destination IP address and port number of the monitored stream in the form <destination IP address>:<port number>.
- **Source IP**: Shows the source IP address and port number of the monitored stream in the form <source IP address>:<port number>.
- **Dest MAC**: Shows the destination MAC address of the monitored stream.
- **Source MAC**: Shows the destination MAC address of the monitored stream.
- **PTP Dom**: Shows the PTP domain of the monitored stream.
- **Seq Err**: Shows the number of sequencing errors in the monitored stream.
- **RTP Clk**: Shows the RTP clock of the monitored stream.
- **RTP Mark**: Shows the RTP marker frequency of the monitored stream.

IP Session application

The IP Session application uses three tabs to display status of various IP stream parameters. Touch any of the tab titles to view the associated information: Layer 1/2, Video, Audio, Data, PTP, or NMOS.

NOTE. *Option MP-IP-MEAS must be installed to use the IP Session application.*

The display will show only Path 1 unless you enable ST2022-7 Seamless Switching, (See page 61, How to configure the instrument for HDR / WCG monitoring.)

There is a difference between "Port" and "Path". The Port is the physical SPF port that is used to input the 10 GbE signal. Path 1 and Path 2 are the signal paths to be used for seamless switching. This differentiation is being made since it is possible for both Path 1 and Path 2 to use a single Port.

Figure 111: IP Session application display

IP Session application banner

The following figure shows the available options after pressing and holding anywhere on the IP Session application tile.

Figure 112: IP Session application banner

The following options adjust the IP Session application:

- The maximize icon ( ) expands the IP Session application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.

Elements of the top-level IP Session application display

The elements at the top of the IP Session application are shared between the three tabs:

- **Display tabs**: Click one of the three tabs to view the associated display. Each of the tabs has a status indicator to provide a quick view of the status of the parameters contained in each tab.
  - **Layer 1/2**. Use this tab to view the status of various signal parameters in the physical and link layers.
  - **Video**. Use this tab to view the status of the video in the stream.
  - **Audio**. Use this tab to view the status of the audio in the stream.
  - **Data**. Use this tab to view the status of the data in the stream.
  - **PTP**. Use this tab to view PTP parameters.
  - **NMOS**. Use this tab to view information on the registration server and the last Session Description Protocol (SDP) files received.
- **Run Time**. The instrument maintains a running monitoring session for the IP Session application. The Run Time readout displays the amount of time that has elapsed during the current monitoring session. The time is displayed as "DD, HH:MM:SS", where DD is the number of days, HH is the number of hours, MM is the number of minutes, and SS is the number of seconds.
- **Clear icon**. Use the icon to clear or reset the monitoring session.
- **Running / Stopped icons**. When the monitoring session is running (collecting error data), use the icon to stop the session. When the session is stopped (no error data collection and no display updates), use the icon to restart the session.

LAYER 1/2 tab display Use this tab to view the status of the following signal parameters:

Figure 113: IP Session application – Layer 1/2 tab display

Elements of the Layer 1/2 tab display.

- **Layer 1:**
  - **10GbE Link:** Shows the status of the link connection.
    - **Disconnected**: No SFP module present.

      No Signal: No input signal detected.

      OK: Locked to input signal.
  - **SFP Loss of Signal (LOS)**
    - **Disconnected**: No SFP module present.

      OK: Locked to input signal.

NOTE. *Functionality of this signal will vary depending on the brand of SFP installed. The signal is intended as a preliminary indication that the received signal strength is below a range specified by the SFP vendor. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.*

- **Layer 2:**
  - **Lock**: Shows the lock status of the link:
    - **OK**: The 10G Ethernet Phy Rx port is successfully locked to the inbound Ethernet signal.
    - **ERROR**: The 10G Ethernet Phy Rx port lost lock to the incoming Ethernet signal during the last second. This indicates there is likely a physical layer problem with the link.
  - **CRC Error** columns:
    - **STATUS**: There have been no overflow errors in the Ethernet MAC during the last second.
    - **ERR SECS**: An errored second is an interval of a second during which any error has occurred, regardless of whether that error was a single bit error, or a complete loss of communication for that entire second.
- **Layer 2 Metrics**
  - **Rx Bytes**: A count of the number of bytes received.
  - **Rx BER High**: Indicates that the Sync Header BER is greater than 10^-4.
  - **Rx CRC Errors**: A count of the number of CRC errors detected.
  - **Rx Frames Ok**: A count of the number of Ethernet frames received without error.
  - **Rx Frames Errored**: A count of the number of Ethernet frames received with errors detected.
  - **Rx Undersize Packets**: A count of the number of Ethernet frames received that are less than 64 bytes long.
  - **Rx Oversize Packets**: A count of the number of Ethernet frames received that are greater than 1522 bytes long.
  - **Tx Bytes**: A count of the number of bytes transmitted.
  - **Tx Frames Ok** : A count of the number of Ethernet frames transmitted without error.
  - **Tx Frames Errored**: A count of the number of Ethernet frames transmitted with errors detected.

VIDEO tab display Use this tab to view the status of the video in the stream.

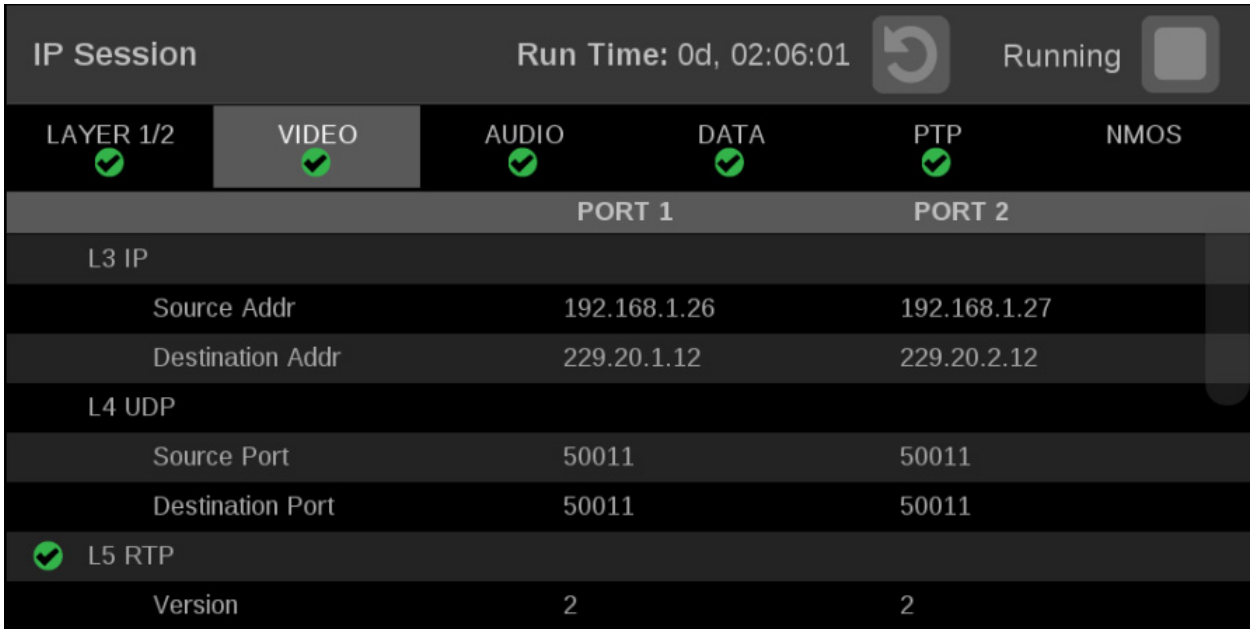


Figure 114: IP Session application – VIDEO tab display

Elements of the VIDEO tab display.

- **L3 IP**
  - **Source Addr**: Lists the source addresses for the L3 IP layer.
  - **Destination Addr**: Lists the destination addresses for the L3 IP layer.
- **L4 UDP**
  - **Source Port**: Lists the source ports for the L4 UDP layer.
  - **Destination Port**: Lists the destination ports for the L4 UDP layer.

- **L5 RTP**: Lists the following parameters of the L5 RTP (Real Time Protocol) layer. RTP Datagrams are defined in IETF RFC 3550.
  - **Version**: Identifies the version of RTP and should be a value of 2.
  - **Padding**: Indicates whether padding bytes are present. Possible values are:
    - **false**: Indicates no extra padding bytes are at the end of the RTP packet.
    - **true**: Indicates that padding octets have been added to the RTP packet that are not part of the payload.
  - **Extension**: Indicates whether an extension is present. Possible values are:
    - **false**: Indicates no extension is present.
    - **true**: Indicates an extension is present.
  - **CSRC**: Identifies the Contributing Source IDs. This value should be set to zero.
  - **Marker**: This value should be set to 1 to indicate the last Media Datagram of the video frame. The value is set to 0 for all other Media Datagrams and should be 0 for most packets.

NOTE. *For 2022-6 signals, the status indicator will turn red if the Marker Bit Frequency does not match the frame rate indicated in the HBRMT header. For 2110 signals, the status indicator will turn red if the Marker Bit Frequency does not match the measured field rate of the detected format.*

  - **Payload type**: Identifies the type of RTP payload:
    - **98**: Indicates a SMPTE 2022.6 High Bit-rate Media transport.
    - **99**: Indicates a SMPTE 2022.5 High Bit-rate Media Forward Error Correction (FEC) payload.
    - **33**: Indicates a SMPTE 2022.2 Constant Bit Rate MPEG-2 Transport Stream Adaptive Sample Picture Encapsulation (ASPEN) payload.
  - **Sequence number**: RTP sequence counter that increments by one for each RTP Media Datagram that is sent.

NOTE. *The status indicator will turn red if the received RTP sequence numbers do not continuously increment by 1 on every packet.*

- **Time Stamp**: The timestamp reflects the sampling instant of the first octet in the RTP datagram. This value can be used to determine packet sequence errors and jitter calculations to be made.

NOTE. *For 2022-6 signals, the status indicator will turn red if the Time Stamp field does not increment at the rate of 27 MHz on every packet. For 2110 signals, the status indicator will turn red if the Time Stamp field does not increment at the start of every field or frame at the rate of 90 kHZ on every packet.*

- **SSRC**: Identifies the Synchronization Source ID and is set in compliance with RFC3550. This identifier is chosen randomly and should be unique so that no two SSRC have the same value with an RTP session.

- **Interface Sampling Frequency Error**: This error indicates that the incoming video is arriving at a frequency outside of the supported range to maintain stable video lock. The signal on the SDI Out video connector may be affected.

NOTE. *The status indicator will turn red if the received frame rate is not stable enough during conversion to SDI. Marker Bit Frequency Errors can also trigger this indicator.*

- **HBRMT**: Lists the following parameters of the High Bit Rate Media Payload Header:

NOTE. *The HBRMT parameters do not apply to ASPEN or ST2110-20 streams.*

  - **Video Source Format**: Identifies whether source formatting is present:
    - **Not Present**: Indicates no Source Format information is present.
    - **Present**: Indicates source formatting is present.
  - **Video Source ID**: Identifies the video source:
    - **Primary (0x0)**: Indicates a primary stream.
    - **Protect (0x1)**: Indicates a protected stream.
    - **Reserved (n)**: When *n* is a number other than 0 or 1, indicates that a reserved value is being used.

- **Frame Count**: The Video Frame counter increments in value for the next RTP sequence and rolls over after 255.

NOTE. *The status indicator will turn red if the frame count field does not increment by 1 at the start of every frame.*

- **Reference for time stamp**: Identifies the time stamp reference:
  - **Unlocked (0x0)**: Indicates the time stamp is not locked to any particular source.
  - **Reserved (0x1)**: Indicates an illegal value.
  - **UTC (0x2)**: Indicates the time stamp is locked to a UTC time source.
  - **Private (0x3)**: Indicates the time stamp is locked to a private time source.
- **Video Payload Scrambling**: Identifies the payload scrambling status:
  - **Unscrambled (0x0)**: Indicates the payload is not scrambled.
  - **Reserved (n)**: When *n* is a number other than 0, indicates a reserved value is being used.
- **FEC usage**: Identifies the FEC usage status:
  - **No FEC (0x0)**: Indicates no forward-error correction is being used.
  - **Column (0x1)**: Indicates column FEC is being used.
  - **Col/Row (0x2)**: Indicates column and row FEC are being used.
  - **Reserved (n)**: When *n* is a number greater than 2, indicates a reserved value is being used.
- **Clock Frequency**: Identifies the video word clock frequency of the payload video. Possible values are: No Timestamp (0x0), 27 MHz (0x1), 148.5 MHz (0x2), 148.5/M MHz (0x3), 297 MHz (0x4), 297/M MHz (0x5), or Reserved (n).
- **Reserved**: This value should be set to 0.
- **Video Source Format fields**: The following Video Source Format field values are displayed:
  - **MAP**: Identifies which SMPTE mapping scheme is used. Possible values are: Direct (0x0), LevelB (0x1), 2xHD (0x2), or Reserved (n).
  - **FRAME**: Identifies the raster size. Possible values are: Unspecified (0x0), 720x480i (0x10), 720x576i (0x11), 1920x1080i (0x20), 1920x1080p (0x21), 1920x1080sf (0x22), 2048x1080p (0x23), 2048x1080sf (0x24), or 1280x720p (0x30).

- **F rate**: Identifies the frame rate. Possible values are: Unspec(2.97 G) (0x0), Unspec(2.97/M G) (0x1), Unspec(1.485 G) (0x2), Unspec(1.485/M G) (0x3), Unspec(270 M) (0x4), 60FPS (0x10), 59.94FPS (0x11), 50FPS (0x12), 48FPS (0x14), 47.96FPS (0x15), 30FPS (0x16), 29.97FPS (0x17), 25FPS (0x18), 24FPS (0x1A), or 23.98FPS (0x1B).
- **Sample**: Identifies the pixel sampling/quantization scheme. Possible values are: Unspecified (0x0), 4:2:2/10bit (0x1), 4:4:4/10bit (0x2), 4:4:4:4/10bit (0x3), 4:2:2/12bit (0x5), 4:4:4/12bit (0x6), 4:4:4:4/12bit (0x7), or 4:2:2:4/12bit (0x8).
- **Fmt-Reserve**: This bit is reserved for future use and is set to 0.

- **Video TimeStamp**: Shows the value of a free running counter that is synchronous with the interface word clock of the encapsulated video. This timestamp is fixed at the transmitter to the first information contained in the datagram.
- **Header Extension**: Indicates the number of 4-octet Header Extension words which follow the HBRMT payload.

Audio tab display Use this tab to view the status of the audio in the stream.

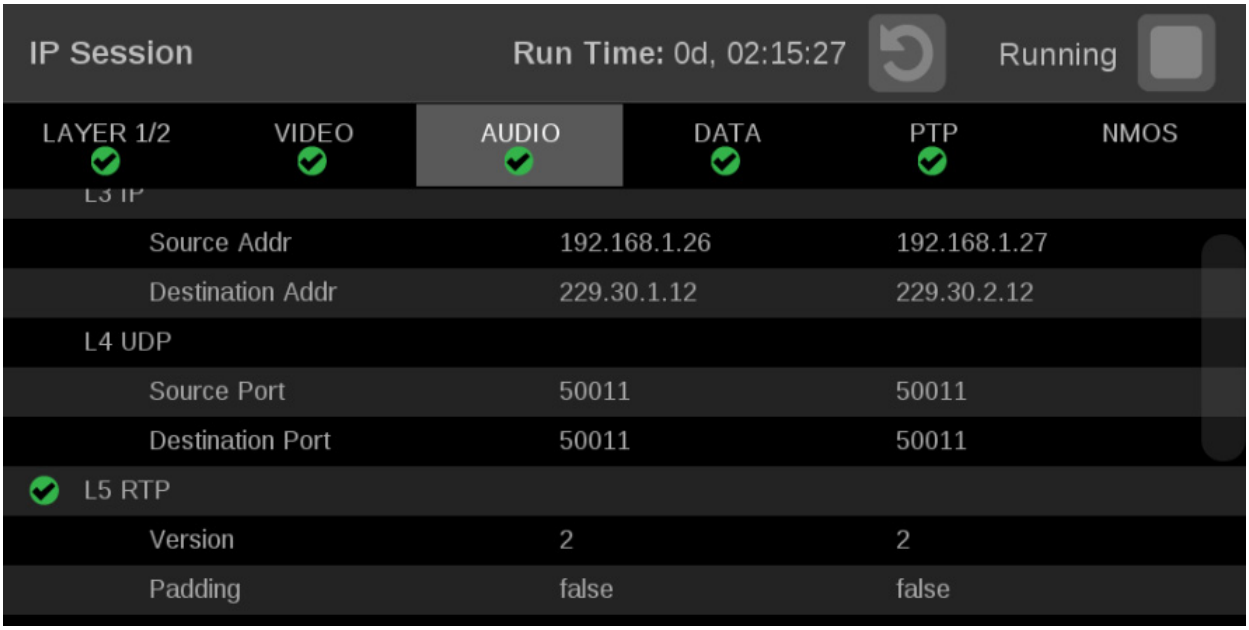


Figure 115: IP Session application – AUDIO tab display

Elements of the AUDIO tab display.

- **L3 IP**
  - **Source Addr**: Lists the source addresses for the L3 IP layer.
  - **Destination Addr**: Lists the destination addresses for the L3 IP layer.
- **L4 UDP**
  - **Source Port**: Lists the source ports for the L4 UDP layer.
  - **Destination Port**: Lists the destination ports for the L4 UDP layer.
- **L5 RTP**: Lists the following parameters of the L5 RTP (Real Time Protocol) layer. RTP Datagrams are defined in IETF RFC 3550.
  - **Version**: Identifies the version of RTP and should be a value of 2.
  - **Padding**: Indicates whether padding bytes are present. Possible values are:
    - **false**: Indicates no extra padding bytes are at the end of the RTP packet.
    - **true**: Indicates that padding octets have been added to the RTP packet that are not part of the payload.

- **Extension**: Indicates whether an extension is present. Possible values are:
  - **false**: Indicates no extension is present.
  - **true**: Indicates an extension is present.
- **CSRC**: Identifies the Contributing Source IDs. This value should be set to zero.
- **Marker**: This value should be set to 1 to indicate the last Media Datagram of the video frame. The value is set to 0 for all other Media Datagrams and should be 0 for most packets.
- **Payload type**: Identifies the type of RTP payload.
- **Sequence number**: RTP sequence counter that increments by one for each RTP Media Datagram that is sent.

NOTE. *The status indicator will turn red if the received RTP sequence numbers do not continuously increment by 1 on every packet.*

- **Time Stamp**: The timestamp reflects the sampling instant of the first octet in the RTP datagram. This value can be used to determine packet sequence errors and jitter calculations to be made.

NOTE. *The status indicator will turn red if the Time Stamp field does not increment at 48 kHZ rate on every group of audio samples.*

- **SSRC**: Identifies the Synchronization Source ID and is set in compliance with RFC3550. This identifier is chosen randomly and should be unique so that no two SSRC have the same value with an RTP session.

Data tab display Use this tab to view the status of the data in the stream.

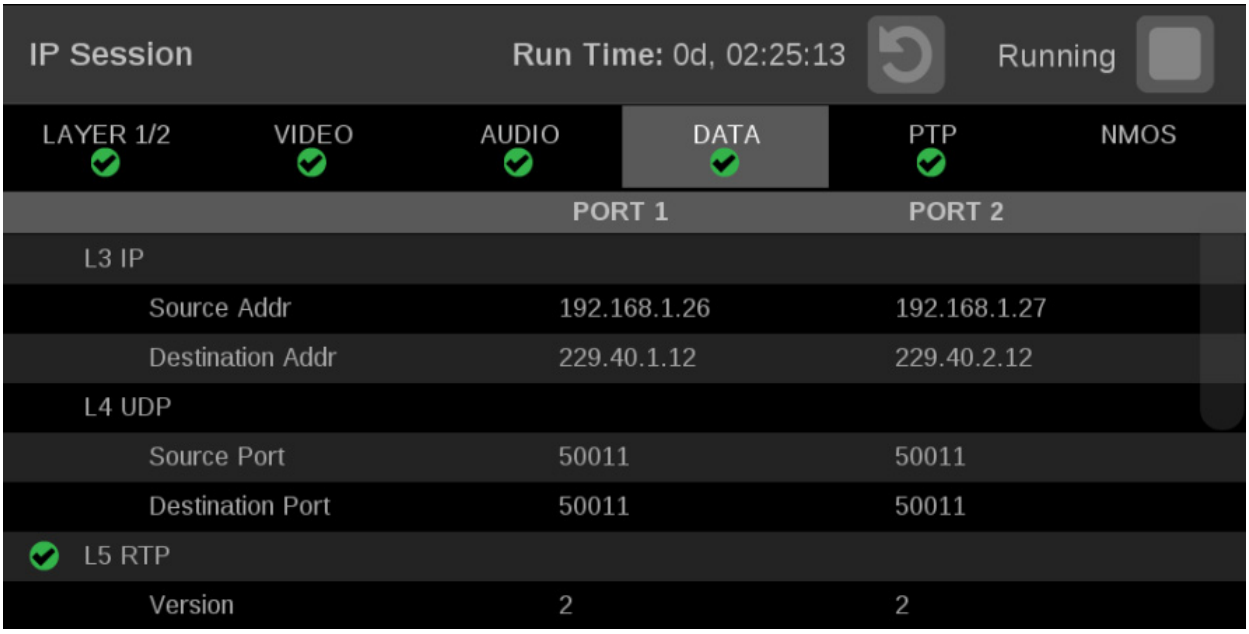


Figure 116: IP Session application – DATA tab display

Elements of the DATA tab display.

- **L3 IP**
  - **Source Addr**: Lists the source addresses for the L3 IP layer.
  - **Destination Addr**: Lists the destination addresses for the L3 IP layer.
- **L4 UDP**
  - **Source Port**: Lists the source ports for the L4 UDP layer.
  - **Destination Port**: Lists the destination ports for the L4 UDP layer.
- **L5 RTP**: Lists the following parameters of the L5 RTP (Real Time Protocol) layer. RTP Datagrams are defined in IETF RFC 3550.
  - **Version**: Identifies the version of RTP and should be a value of 2.
  - **Padding**: Indicates whether padding bytes are present. Possible values are:
    - **false**: Indicates no extra padding bytes are at the end of the RTP packet.
    - **true**: Indicates that padding octets have been added to the RTP packet that are not part of the payload.

- **Extension**: Indicates whether an extension is present. Possible values are:
  - **false**: Indicates no extension is present.
  - **true**: Indicates an extension is present.
- **CSRC**: Identifies the Contributing Source IDs. This value should be set to zero.
- **Marker**: This value should be set to 1 to indicate the last Media Datagram of the video frame. The value is set to 0 for all other Media Datagrams and should be 0 for most packets.

NOTE. *For 2022-6 signals, the status indicator will turn red if the Marker Bit Frequency does not match the frame rate indicated in the HBRMT header. For 2110 signals, the status indicator will turn red if the Marker Bit Frequency does not match the measured field rate of the detected format.*

- **Payload type**: Identifies the type of RTP payload.
- **Sequence Number**: RTP sequence counter that increments by one for each RTP Media Datagram that is sent.
- **Time Stamp**: The timestamp reflects the sampling instant of the first octet in the RTP datagram. This value can be used to determine packet sequence errors and jitter calculations to be made.

NOTE. *For 2022-6 signals, the status indicator will turn red if the Time Stamp field does not increment at the rate of 27 MHz on every packet. For 2110 signals, the status indicator will turn red if the Time Stamp field does not increment at the start of every field or frame at the rate of 90 kHZ on every packet.*

- **SSRC**: Identifies the Synchronization Source ID and is set in compliance with RFC3550. This identifier is chosen randomly and should be unique so that no two SSRC have the same value with an RTP session.

PTP tab display

Use this tab to view the status of the PTP elements in the stream. PTP is currently only supported on 10 GbE SFP Port 1, for instructions on locking to PTP, (See page 66, *How to configure PTP reference settings*.)

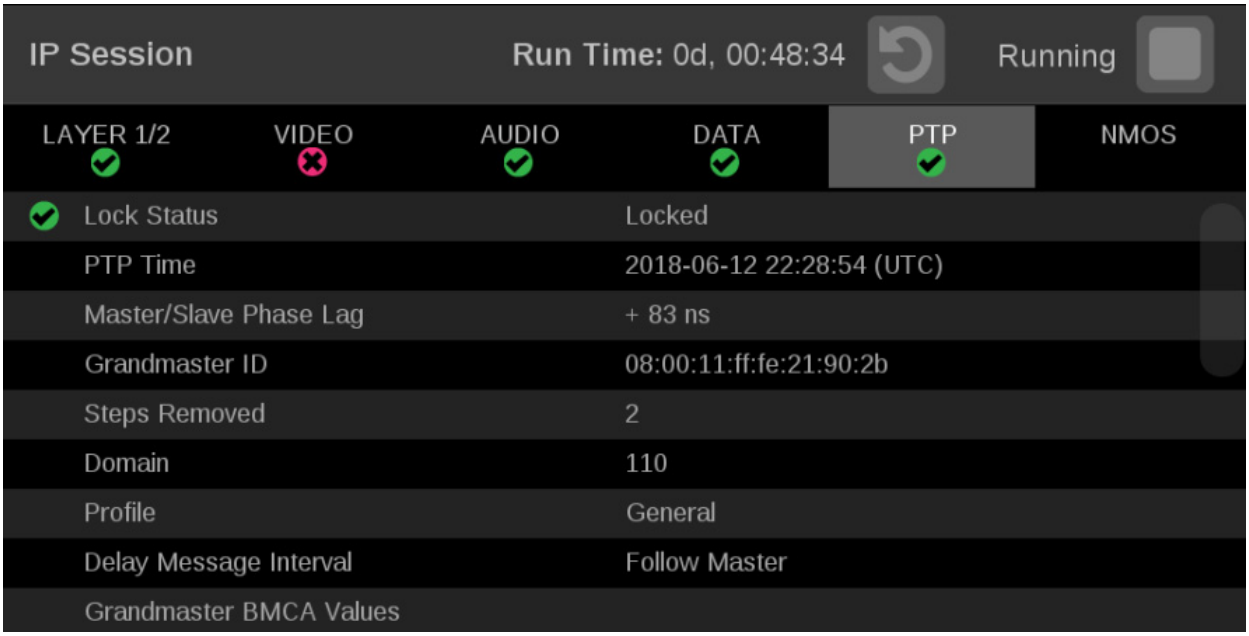


Figure 117: IP Session application – PTP tab display

Elements of the PTP tab display.

- **Lock Status**: Indicates whether the instrument PTP slave is locked to the master PTP signal for the selected domain. The following values may appear:
  - **No master present**: Indicates that the master PTP clock has not been detected on the selected domain.
  - **Locked**: Indicates that the master PTP clock is detected and there is less than 1000 ns of phase lag between the master clock and the instrument.
  - **Unlocked**: Indicates that the master PTP clock is detected and there is greater than 1000 ns of phase lag between the master clock and the instrument.
- **PTP time**: Shows the time derived from the PTP Master as UTC (Coordinated Universal Time).
- **Master/Slave Phase Lag**: Shows the detected offset between the master and slave clocks.
- **Grandmaster ID**: Shows the MAC Address of PTP Master with the bytes "ff:fe" inserted in the middle. This ID is also used in the BMCA as a tiebreaker when all of the parameters match down through priority 2.

- **Steps Removed**: Shows the number of communication paths traversed between the local clock and the Grandmaster clock.
- **Domain**: Shows the domain being used. Domains allow multiple PTP services to coexist simultaneously on one physical Ethernet connection.
- **Profile**: Shows the profile being used: General, AES67, or ST2059. This is the user-selected profile set on the Settings > Reference configuration menu page and is not detected on the input.
- **Delay Message Interval**: For Multicast communication mode, the only delay message interval allowed is "Follow Master". In this mode, the slave will set the delay request rate according to the information sent by the master in the delay response message.

NOTE. *The PRISM monitor currently supports Multicast communication mode and SMPTE mixed mode without negotiation. In later firmware releases, other communication modes will be supported.*

- **Grandmaster BCMA Values**: Lists the following values for the Grandmaster BCMA (Best Master Clock Algorithm) in order of precedence:
  - **Priority 1**: This parameter defines which clocks are allowed to be considered as masters. To be considered as a master, the value should be set to 128 or less. Priority 1 is the first criteria in the BMCA, so if Priority 1 is set to a lower value than other devices on the system, then it will be chosen even if the clock quality is poor. Typically, all the masters in a domain should have the same value for the Priority 1 parameter.
  - **Clock Class**: This value characterizes the TAI (International Atomic Time) traceability. The clock class value varies to indicate the type of reference in use by the Grandmaster clock. For example, when locked to GPS the PTP grandmaster will report a class 6. However, if in holdover mode after locking to GPS, then it will report a class of 7.
  - **Clock Accuracy**: This value characterizes the clock accuracy for the purpose of determining the best master clock.
  - **Clock Variance**: This value is reported by the PTP master to indicate the variance of the clock over a one second interval. A lower number indicates a more stable clock and will be preferred by the BMCA.
  - **Priority 2**: This parameter is used to break the tie between masters that have the same clock quality. Several values may be used to define a hierarchy of devices. Most profiles use 128 as a default, so a value of 127 or lower would indicate a preferred master.
- **Clock Source**: The clock source field is not used by the BMCA. The field is set to indicate the type of reference in use by the Grandmaster clock.

- **Communication Mode**: There are three basic message modes for PTP: Multicast, Unicast, and mixed Multicast and Unicast. For full Multicast or Unicast modes, all of the PTP messages are sent in the selected mode type.

NOTE. *The PRISM monitor currently supports Multicast communication mode and SMPTE mixed mode without negotiation. In later firmware releases, other communication modes will be supported.*

For some profiles, such as some telecom profiles and the SMPTE ST2059 profile, a mixture of Multicast and Unicast are allowed. On the SMPTE profile unique mixed mode, the Announce and Sync messages are sent as multicast. However, the Delay request and Delay Response messages are sent as Unicast.

Some points to understand about communication modes:

- Whatever mode is chosen, the master and slave must match or be compatible
- Multicast and Mixed mode may need IGMP joins and leaves
- Full Unicast must have the master address in all slave AMTs
- Unicast without negotiation does not allow master to regulate load
- Two masters can be used on different domains to serve slaves on different communication modes

- **Delay Mechanism**: Shows the delay mechanism mode being used:

NOTE. *The PRISM monitor currently supports only the End-to-End delay mechanism.*

- **End-to-End**: In this mode, the sync, follow up, delay request and delay response messages go through the network all the way between the master and slave. End-to-End mode is useful in PTP networks where some or all devices are not PTP aware.
- **Peer-to-Peer**: In this mode, the Pdelay request and Pdelay response messages are local to each link in the network. Each device determines the local link and device delays. The sync message from the master then collects the corrections as it propagates from the master to slave. Peer-to-Peer mode is useful in PTP networks where the routing configuration changes. For Peer-to-Peer mode to work well, all of the devices need to be PTP aware.

- **Message rates:**
  - **Announce**: Displays the rate of the Announce messages received from the master. Typical values are 1 to 4 messages a second but a wide range is allowed by some profiles. If the value is lower than expected then it may indicate a problem in the network or the master.
  - **Sync**: Displays the rate of the Sync messages received from the master. Typical values are 1 to 16 messages a second, but some profiles allow much higher rates. If the value is lower than expected then it may indicate a problem in the network or the master.
  - **Delay Request**: Displays the rate of the Delay Request messages sent by the slave. In multi-cast mode, the Delay Request rate is required to be set in response to a field in the Delay Response message from the master. Typically the master will set this field such that the Delay Request message rate is equal to the Sync message rate.

NOTE. *For SMPTE mixed mode, PRISM sets the delay Request rate equal to the Sync message rate received from the master.*

  - **Delay Response**: Displays the rate of the Delay Response messages received from the master. Each Delay Request should have a matching Delay Response, so if the value is lower than expected then it may indicate a problem in the network or the master

NMOS tab display

Use this tab to view the registration server information, server list and the last SDP file received.

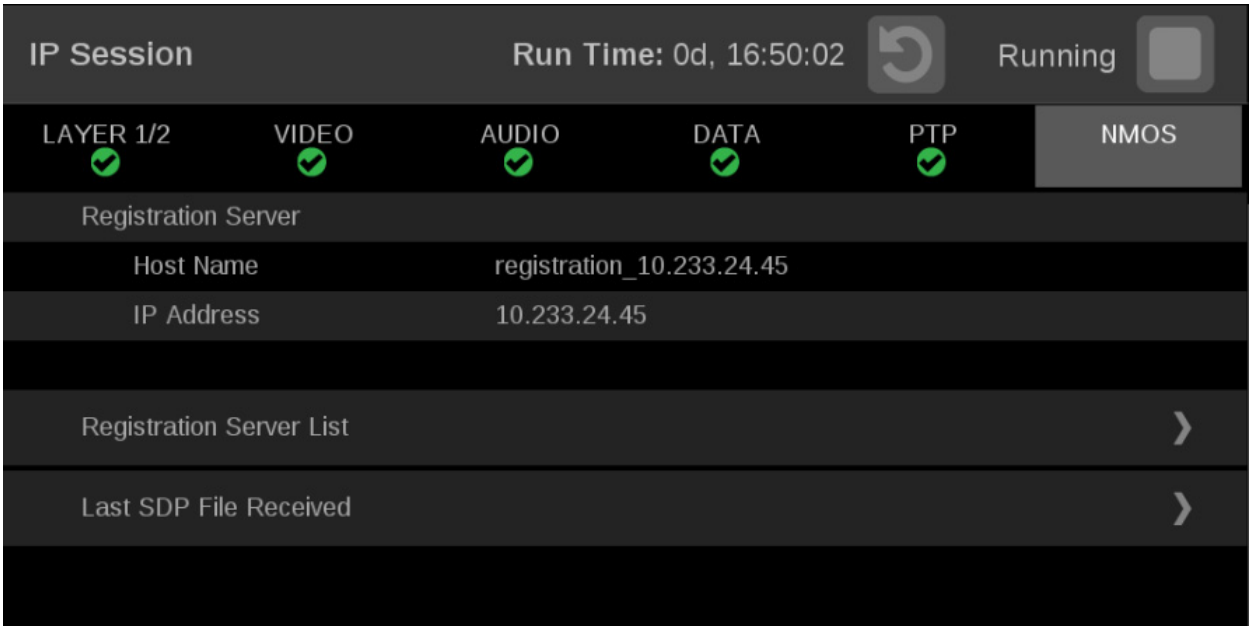


Figure 118: IP Session application – NMOS tab display

Elements of the NMOS tab display.

- **Registration server**: Shows the **Host Name** and **IP Address** of the registration server.
- **Registration Server List**: Select the Registration Server List tab to view the Host Name, IP Address and Priority of the servers registered to this instrument using NMOS.

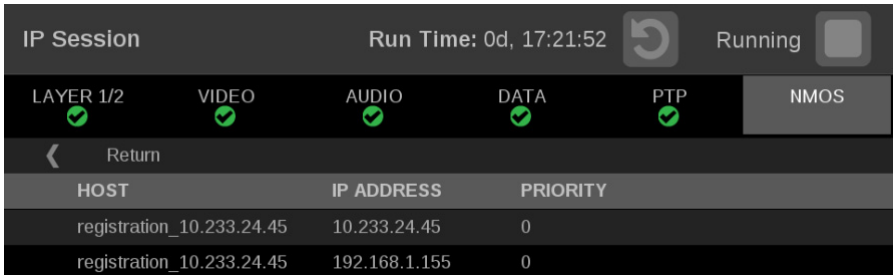


Figure 119: Registration Server List display

NOTE. *Touch* ***Return*** *to go back to the main IP Session NMOS menu.*

- **Last SDP File Received**: Select the Last SDP File Received tab view video, audio, and data SDP files. These files contain information used to configure input signals from the registration servers.

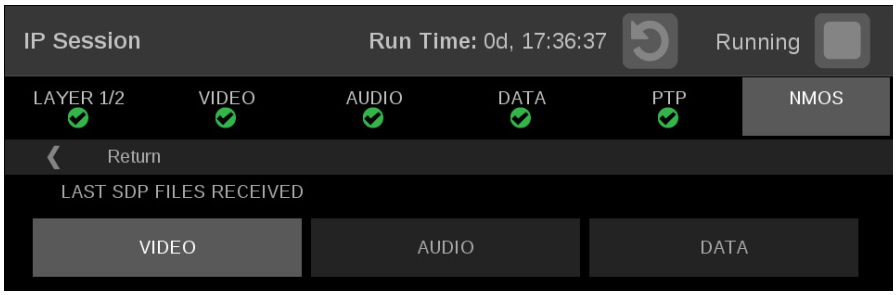


Figure 120: Last SDP File Received display

NOTE. *Touch* ***Return*** *to go back to the main IP Session NMOS menu.*

IP Graphs application

Use the IP Graphs application to view various graphs that show aspects of the IP stream. As you scroll through the various graphs, the top of the selected graph will jump to the top of the display area to aid in viewing the complete graph. The displayed graph will be included in a saved preset.

NOTE. *Option MP-IP-MEAS must be installed to use the IP Graphs application.*

The IP Graphs application has been enhanced to include Path 1 and Path 2, if ST2022-7 monitoring is configured. The graph data can be switched between viewing only Path 1, Path 2, or both by using the **Path** button in the upper right of the screen.

NOTE. *The Path button only works with 2022-7 seamless switching enabled in input configuration.*

IP Graphs application banner

The following figure shows the available options after pressing and holding anywhere on the IP Graphs application tile.

Figure 121: IP Graphs application banner

The following options adjust the IP Graphs application:

- The maximize icon ( ) expands the IP Graphs application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the IP Graphs application settings menu. Use this menu to adjust Trend Interval.

NOTE. *After the IP Graphs application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

IP Graphs application settings menu

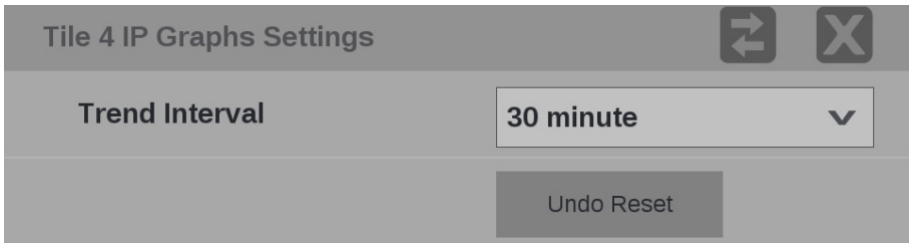


Figure 122: IP Graphs application settings menu

Trend Interval. Use the drop-down menu to change the interval to **1 minute**, **5 minute**, **10 minute**, **30 minute**, **1 hour**, **3 hour**, **6 hour**, **12 hour**, **1 day** or **7 day**.

NOTE. *The menu option for a 7 day trend interval has been removed. This option will be reinstated in a future firmware release. Any presets that have been saved with the 7 day trend interval will be changed to use the 1 day trend interval setting.*

Elements of the top-level IP Graphs application display

The elements at the top of the IP Graphs application are shared between all graphs:

NOTE. *Only Path 1 will display unless you enable ST2022-7 Seamless Switching, (See page 61, How to configure the instrument for HDR / WCG monitoring.)*

- **Port 1 and Port 2**: Shows the physical port(s) on the instrument.
- **Src/Dest**: Lists the source and destination addresses of the IP stream.
- **Protocol**: Lists the protocol being used by the monitored stream.
- **PRS**: Shows the Packet Read Schedule (PRS) defined in the input video settings.
- **Clear icon**. Use the icon to clear or reset the monitoring session.
- **Path button**: Use the Path button to switch between Path 1, Path 2, or both Path 1 and Path 2.
- **Stream type button**: Use this button to switch between the video, audio, or data stream IP graphs.
- **Res**: Lists the resolution of the graph display.

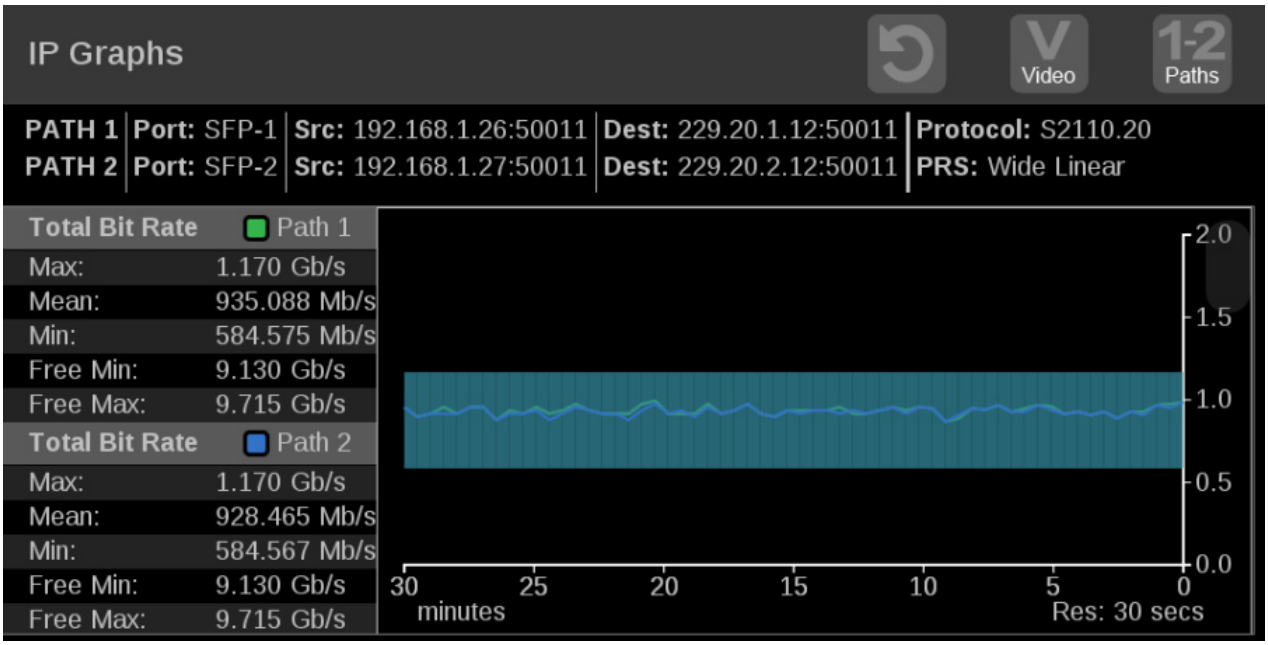


Figure 123: IP Graphs application display

Total Bit Rate graph

The Total Bit Rate graph shows the total bit rate currently on the 10 GbE input. The maximum available bandwidth is 10.3 Gb/s.

The following readouts appear:

- **Max**: Shows maximum bandwidth used during the time window.
- **Mean**: Shows the mean bandwidth used during the time window.
- **Min**: Shows the minimum bandwidth used during the time window.
- **Free Min/Max**: Shows the minimum and maximum available bandwidth that is not being consumed.

Session Bit Rate graph

The Session Bit Rate graph shows the data rate of the currently selected input stream.

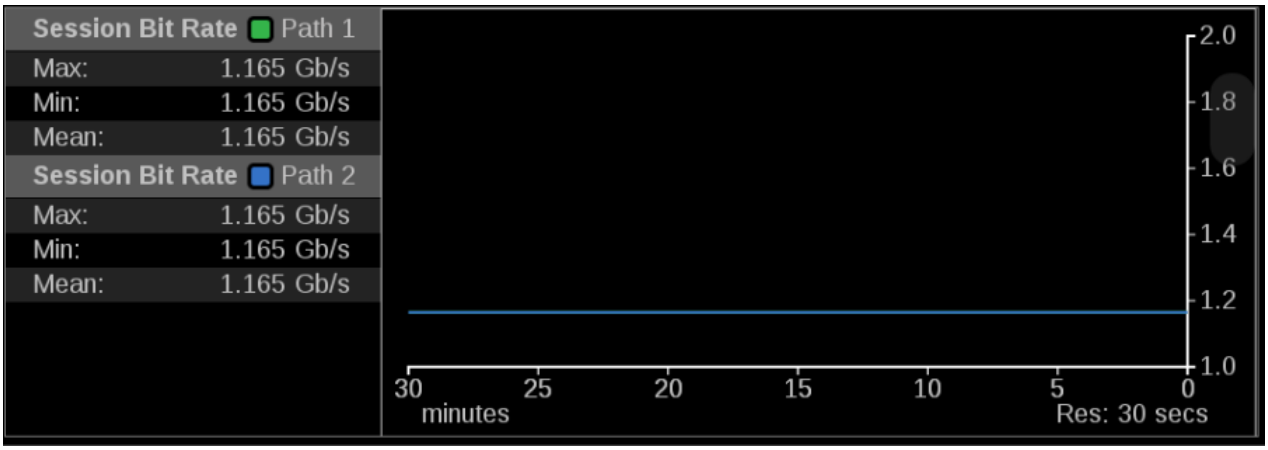


Figure 124: IP Graphs application – Session Bit Rate graph

PIT graph

The PIT (Packet Interval Time) graph shows the difference in arrival time between sequential packets of the active stream. This is one indication of the packet jitter and dropped packet rate. The colored bars represent the range from minimum to maximum for all of the packets within that time interval.

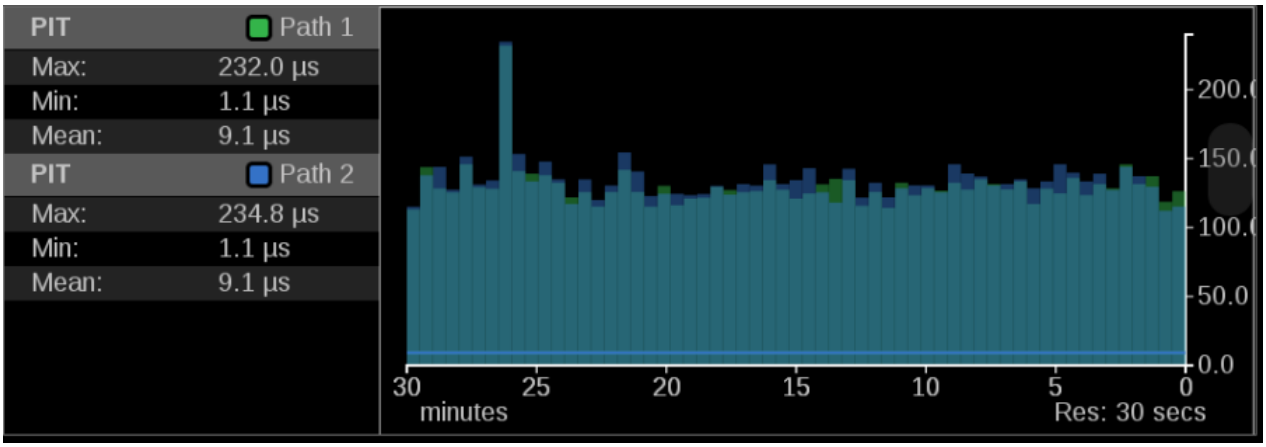


Figure 125: IP Graphs application – PIT graph

RTP Sequence Error graph

The RTP Sequence Error: Shows the RTP sequence information and reports if any packet is received out of order.

Reconstructed path errors: In addition to counting Path 1 and Path 2 RTP sequence errors, the number of packets that could not be corrected is shown. An output packet could be uncorrected if it is dropped on both paths or there is too much skew between the paths resulting in a buffer overflow.

The number of reconstructed path errors also applies to situations when ST2022-7 is turned off. Packets could pass uncorrected if they are dropped or if reordering results in an input buffer overflow.

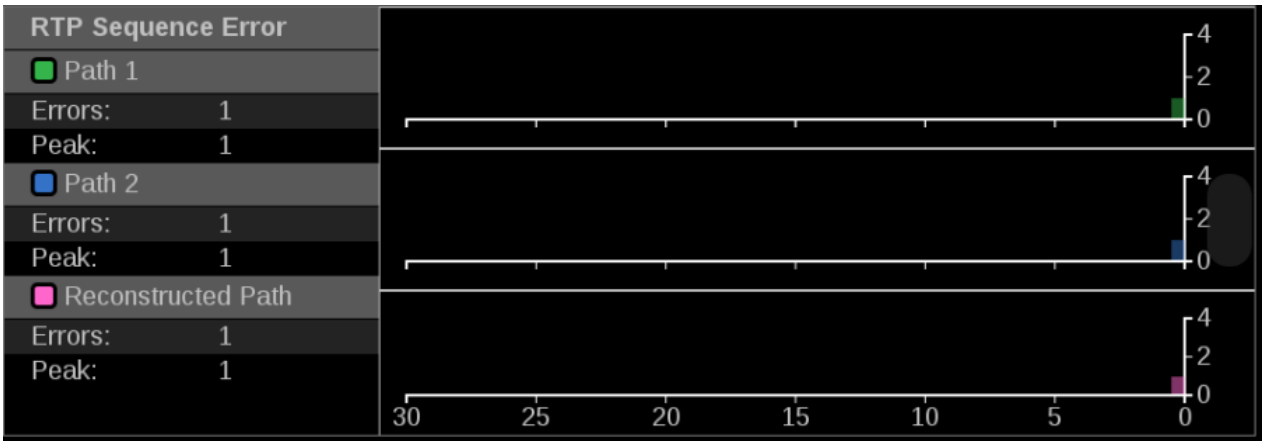


Figure 126: IP Graphs application – RTP Sequence Error graph

Path1–Path2 Differential graph

Path Differential represents the time difference between the Path 1 and Path 2 streams in a ST2022-7 system. As the path differential gets larger, it becomes more difficult for equipment receiving the data to properly process both paths, depending on the size of the input buffer in the equipment.

The ST2022-7 specification defines Path Differential as an absolute value, but the Path1-Path2 Differential graph shows the signed value of Path 1 minus Path 2. A positive value means that Path 2 is lagging Path 1.

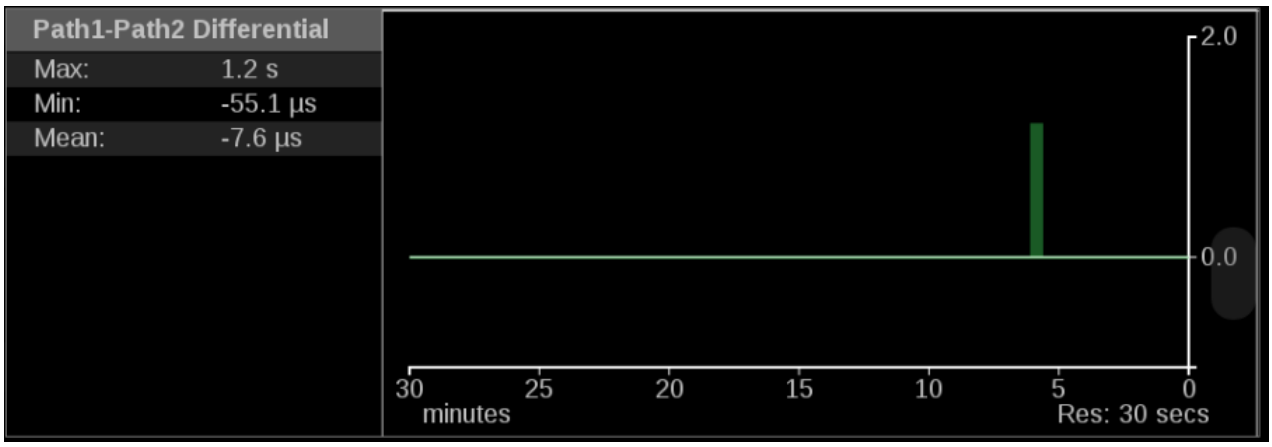


Figure 127: IP Graphs application – Path1–Path2 Differential graph

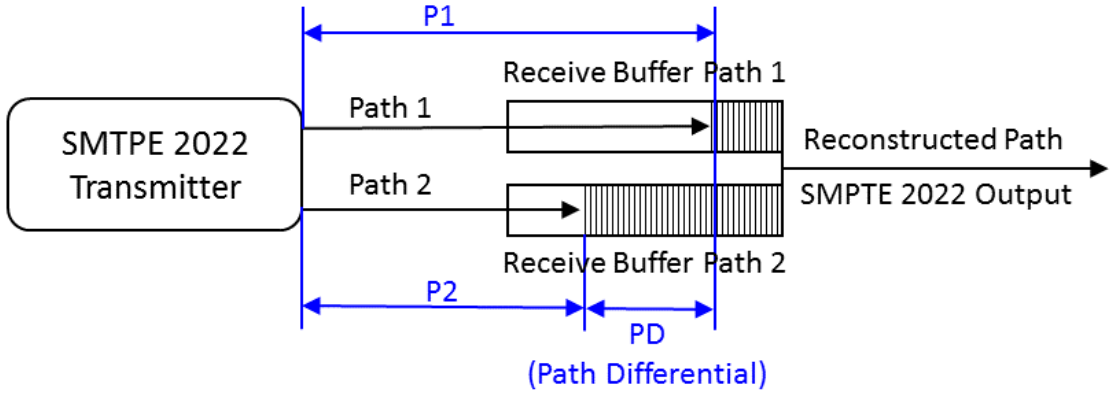


Figure 128: Seamless protection switching of SMPTE ST-2022-7 IP stream

CMAX and VRX Buffer graph

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. The **CMAX** section provides a trend graph for this type of modeling.
- 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 **VRX Buffer** section provides a trend graph for this type of modeling.

Both trend graphs help engineers properly setup the packet delivery timing in the RTP packet sender.

NOTE. *The CMAX and VRX trend graphs are only available for video IP streams.*

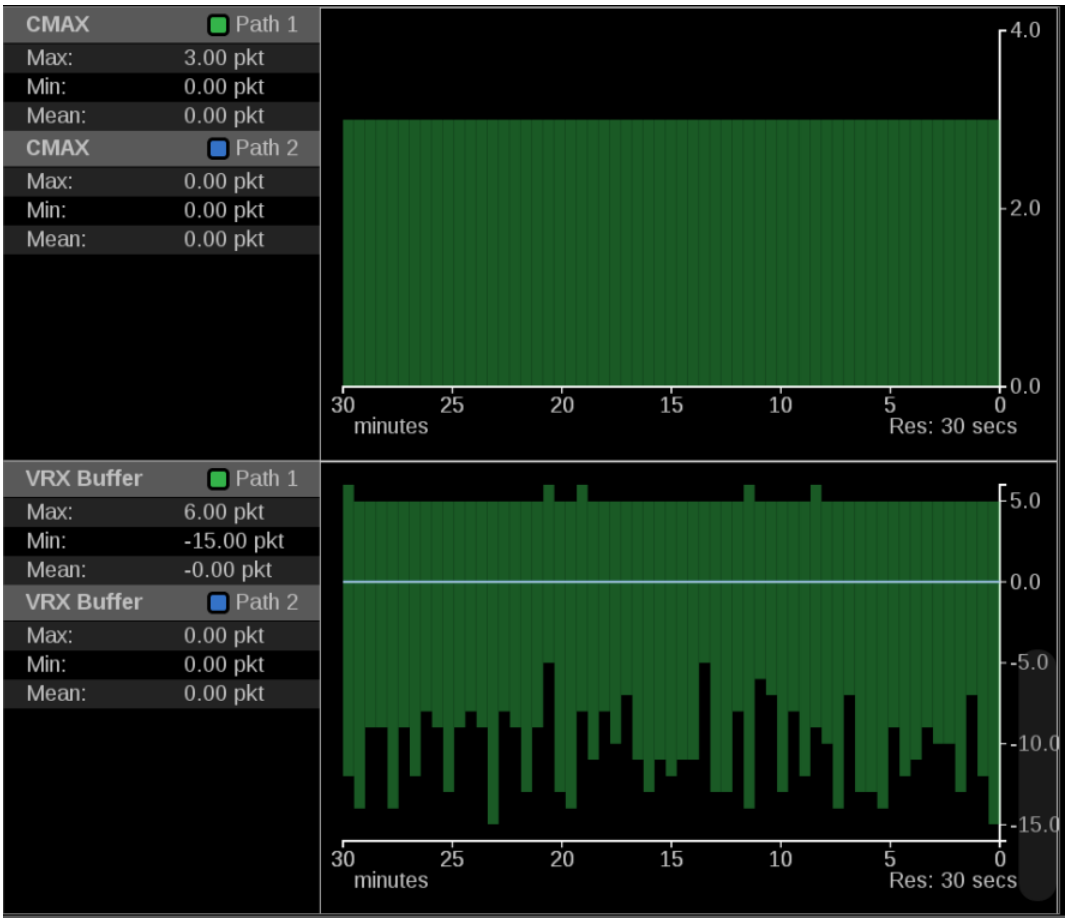


Figure 129: IP Graphs application – CMAX and VRX Buffer graph

PIT Histogram application

Use the PIT (Packet Interval Time) Histogram application to monitor the network delay variation statistics.

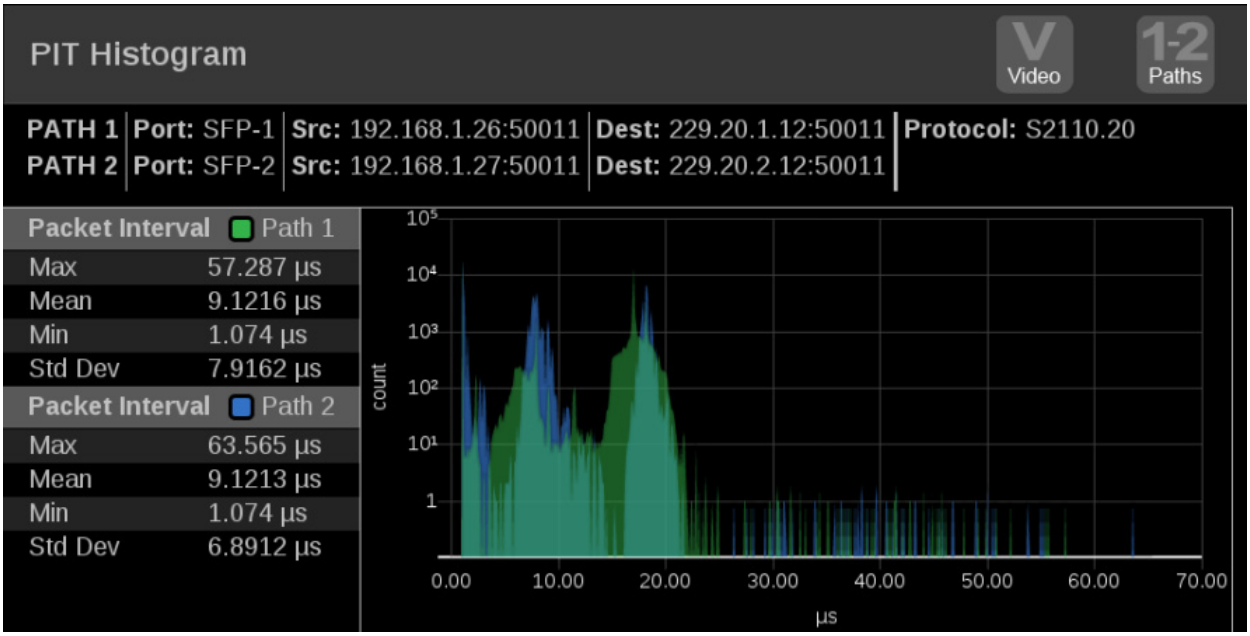


Figure 130: PIT Histogram application display

PIT Histogram application banner

The following figure shows the available options after pressing and holding anywhere on the PIT Histogram application tile.

Figure 131: PIT Histogram application banner

The following options adjust the PIT Histogram application:

- The maximize icon ( ) expands the PIT Histogram application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the PIT Histogram application settings menu. Use this menu set the y-axis scaling.

NOTE. *After the application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

PIT Histogram application settings menu

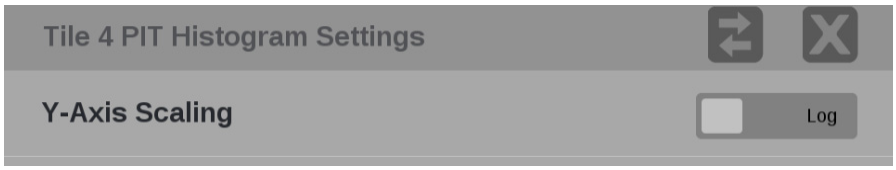


Figure 132: PIT Histogram application settings menu

Y-Axis Scaling. Use this option to switch the y-axis scaling between **Log** and **Linear**.

Elements of the PIT Histogram application

- **Port 1 and Port 2**: Shows the physical port(s) on the instrument.
- **Src/Dest**: Lists the source and destination addresses of the IP stream.
- **Protocol**: Lists the protocol being used by the monitored stream.
- **Path button**: Use the Path button, in the upper right corner of the tile, to switch between Path 1 only (green), Path 2 only (blue), or both Path 1 and Path 2 data (cyan where Path 1 and 2 are overlapped).

NOTE. *The Path button only works with 2022-7 seamless switching enabled in input configuration.*

- **Stream type button**: Use this button to switch between the video, audio, or data stream IP graphs.

NOTE. *The stream type button is only available with 2110 streams.*

- **Packet Interval information**:
  - **Max**: Shows maximum packet interval time.
  - **Mean**: Shows the mean packet interval time.
  - **Min**: Shows the minimum packet interval time.
  - **Std Dev**: Shows the standard deviation of the packet interval time.
- **Pinch and zoom control**: Use the pinch-out gesture on the graph to zoom in. After using the zoom in gesture, the text **Zoomed** will be displayed on the x axis of the graph.

NOTE. *When using an keyboard and mouse, click and drag to zoom in.*

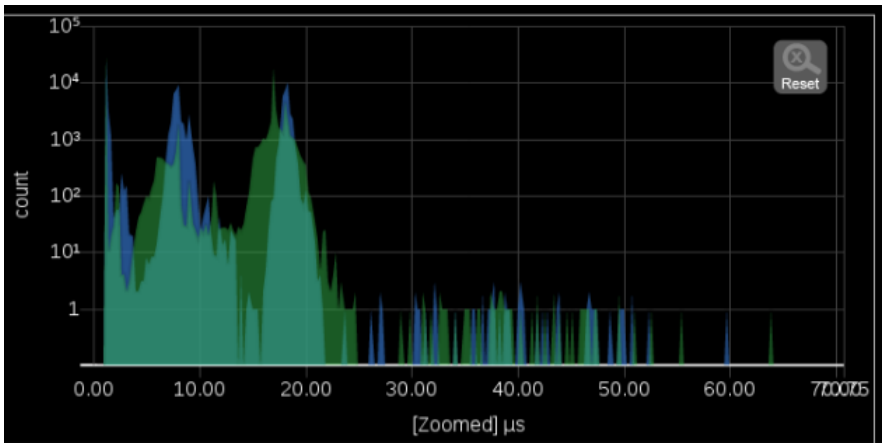


Figure 133: Zooming in on the PIT Histogram graph

Use the Reset button

to set the graph back to autoscale mode.

NOTE. *The Reset button is only displayed after zooming in.*

PTP graphs application

Use the PTP Graphs application to monitor the message timing between Master and Slave in a PTP network.

For more information on PTP operations and settings, (See page 66, *How to configure PTP reference settings*.) and (See page 184, *PTP introduction*.)

NOTE. *Option MP-IP-MEAS must be installed to use the PTP Graphs application.*

PTP Graphs application banner

The following figure shows the available options after pressing and holding anywhere on the PTP Graphs application tile.

Figure 134: PTP Graphs application banner

The following options adjust the PTP Graphs application:

- The maximize icon ( ) expands the PTP Graphs application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the PTP Graphs application settings menu. Use this menu to adjust the PTP Trend Interval.

NOTE. *After the PTP Graphs application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

PTP graphs application settings menu

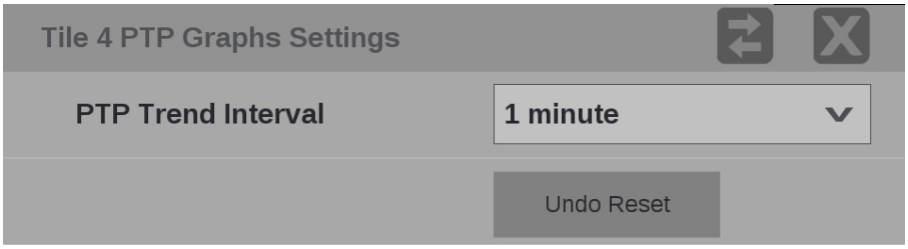


Figure 135: PTP Graphs application settings menu

Trend Interval. The PTP Trend Interval setting is the extent of the horizontal axis on the graph. Use the drop-down menu to change the interval to **1 minute**, **5 minute**, **10 minute**, **30 minute**, **1 hour**, **3 hour**, **6 hour**, **12 hour**, **1 day** or **7 day**.

NOTE. *The menu option for a 7 day trend interval has been removed. This option will be reinstated in a future firmware release. Any presets that have been saved with the 7 day trend interval will be changed to use the 1 day trend interval setting.*

Elements of the PTP Graph

The PTP graphs are useful in observing the effects of traffic on the PTP messages and the operation of transparent and boundary clocks. Non-PTP aware switches may have significant PTP delay variations, while transparent and boundary clocks will have much less variation and total delay.

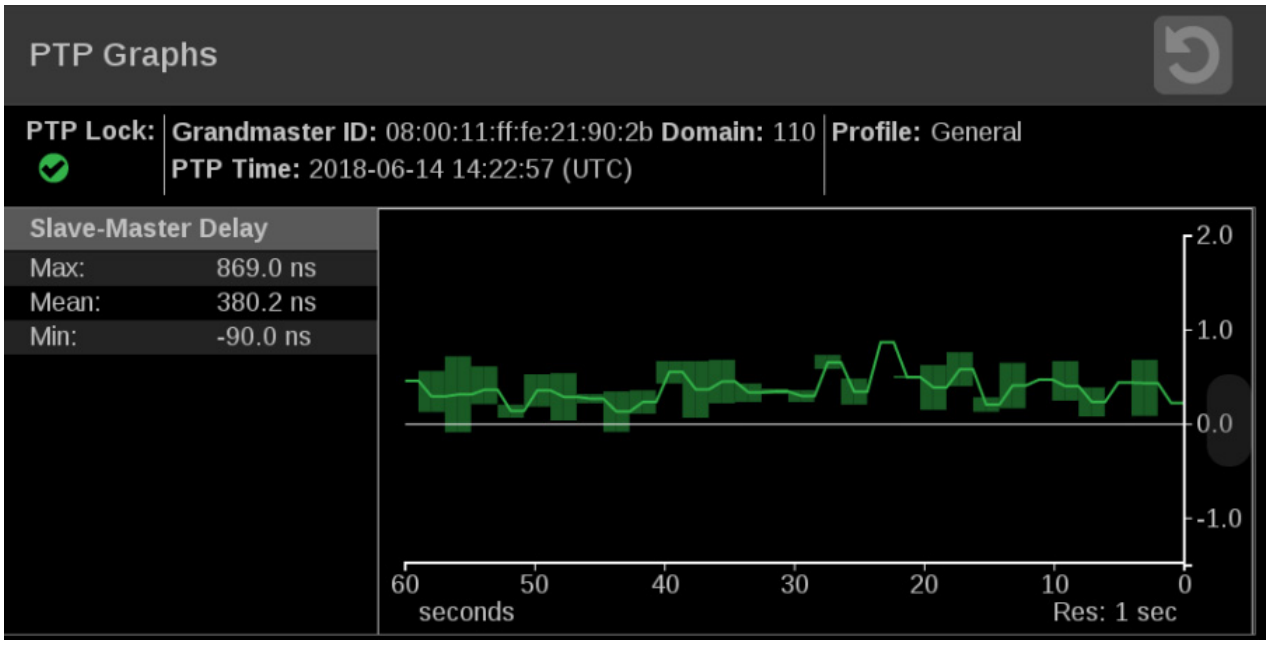


Figure 136: PTP Master-Slave Delay and Variation graphs

- Top of the display:
  - **PTP Lock**: Shows the status of the PTP lock.
  - **Grandmaster ID**: Displays the reference Source and Domain.
  - **PTP Time:** Time of day derived from the PTP signals.
  - **Profile**: Shows the profile which has been selected in the reference settings menu. This is not detected from the incoming PTP messages.
  - **Resolution**: The time increment for each bar on the display. Longer graph settings collect data into larger bins to be displayed. This range and resulting resolution are selected in the setting menu for PTP graphs.
- **Trace Types**: There are four displays available. For each one, the Max, min and average are show on the left, while the traces vs time is shown on the right. The traces indicate the Max, and Min envelop, as well as the average for each time bin. The time scale can be adjusted in the settings menu – touch and hold the menu bar to access this menu. The data is logged for 7 days so one can go back and look at long term trends.

  Use the slider to move the displays up or down.
  - **Master Slave Delay graph**: This indicates the difference in the time stamps for the PTP Sync messages which go from the master to the slave. So this display will indicated effects of the downstream network delay and adjustments made to the slave clock. After the slave is locked and the timing is stable, then the perturbation on this graph are largely due to network variations. Traffic will often cause some messages to be delayed so then the maximum delay will increase.

    As the PTP is locking, the slave clock will be adjusted, so the trace may have large swings or jumps. As the system locks the Master to Slave and Slave to master delays should converge on the same value. This value represents the average network delay between the master and slave for the traffic in both direction.

    If the network delay is too unstable, then the PTP may never be able to lock. This will appear as large variations on this trace.
  - **Master Slave Variation graph**: The master to slave variation, is derived from the same data as the master to slave delay. The absolute value of the changes in delay are filtered according to RFC1889 and displayed. This display then shows a measure of the variation of the network delay. A low value will indicate that a PTP slave will have an easy time locking, a large value will indicate it may be challenging for a PTP slave to get a good lock.

- **Slave to Master Delay graph**: This indicates the difference in the time stamps for the PTP Delay Request messages which go from the slave to the master. So this display will indicated effects of the upstream network delay and adjustments made to the slave clock. After the slave is locked and the timing is stable, then the perturbation on this graph are largely due to network variations. Traffic will often cause some messages to be delayed so then the maximum delay will increase.

  As the PTP is locking, the slave clock will be adjusted, so the trace may have large swings or jumps. As the system locks the Master to Slave and Slave to master delays should converge on the same value. This value represents the average network delay between the master and slave for the traffic in both direction.

  If the network delay is too unstable, then the PTP may never be able to lock. This will appear as large variations on this trace.

- **Slave to Master Variation graph**: The master to slave variation, is derived from the same data as the master to slave delay. The absolute value of the changes in delay are filtered according to RFC1889 and displayed. This display then shows a measure of the variation of the network delay. A low value will indicate that a PTP slave will have an easy time locking, a large value will indicate it may be challenging for a PTP slave to get a good lock.

- **PTP Phase Lag graph**: The PTP phase lag is the error in the slave clock phase as measured by the PTP timestamps. This value is used to adjust the slave clock to drive the error toward zero.

  It is the phase error of the phase locked loop, which controls the slave clock. The phase lag is a reasonable estimate of how well the PTP slave is locked to the master, however the phase lag does not indicate if there is any asymmetry in the network.

Timing application

The timing application uses PTP as a reference to evaluate the timing of IP inputs of either ST2022-6 or ST2110 format. The timing of the input is compared to the expected frame time according to the PTP epoch-based alignment. When an input is configured for ST2022-7 style redundant streams, circles for Path 1 (green) and Path 2 (blue) will appear, otherwise only a single path will display. When the input signal is fully aligned with PTP, both circles will be in the center of the display indicated by the "+" symbol.

NOTE. *PTP must be locked to use the Timing application.*

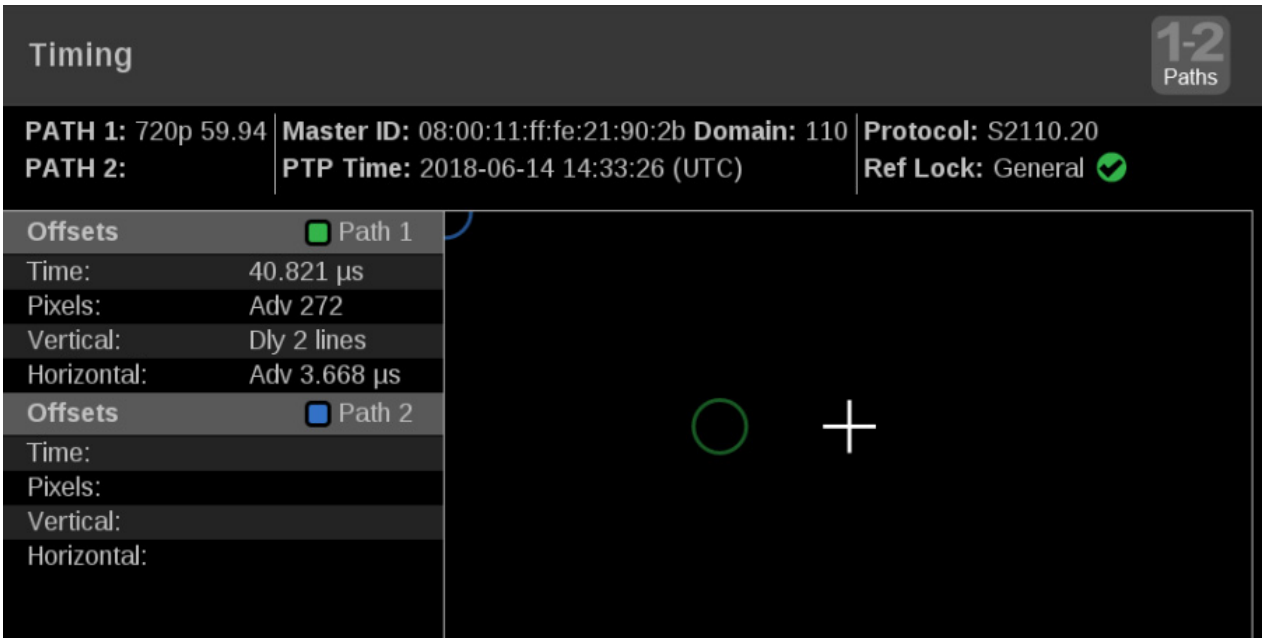


Figure 137: Timing application display

Timing application banner

The following figure shows the available options after pressing and holding anywhere on the Timing application tile.

Figure 138: Timing application banner

The following options adjust the Timing application tile:

- The maximize icon ( ) expands the Timing application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.

Elements of the Timing application display

- **Path 1 and Path 2**: Displays the video format.

NOTE. *You can switch between Path 1, Path 2, or both Path 1-2 using the Path button at the top right of the application display.*

- **Master ID**: Displays the reference Source and Domain.
- **PTP Time**: Time of day derived from the PTP signals.
- **Protocol** : Displays the input protocol.
- **Ref Lock**: A indicates the PRISM is locked to PTP. A indicates the PRISM is not locked to PTP.
- **Reference Indicator**: A cross-hair indictor centered in the display represents the reference signal.
- **Circle**: The circle represents the timing of the input signal. A signal that is early will be above or to the left of the cross hair. A signal that is late will be below or to the right.

- **Offsets**: The difference in timing between the input and reference. A positive number, or "delayed" value, means the input occurs after the reference. A negative number, or "advanced" value, means the input occurs before the reference.
  - **Time**: The total difference in frame timing between the input and reference
  - **Pixels**: The timing difference between the reference and input signal, expressed as in pixels, instead of time units, after the vertical offset has been removed. This has a range of +-1/2 a line for the input format.
  - **Vertical Offset:** The timing difference between the reference and input signal, expressed as the number of lines of delay for the input video format. This has a range of +-1/2 field for progressive signals and +-1/2 frame for interlace signals.
  - **Horizontal Offset:** The timing difference between the reference and input signal, expressed as the line time which remains from the total delay after the vertical offset has been removed. This has a range of +-1/2 a line for the input format.

Timing offsets for IP signals

For ST2110-20 streams, the Timing application displays the time of the first packet of the frame. Since ST2110 does not include blanking, the first packet is nominally coincident with the first active line in the SDI raster. This means that it is normal for the ST2110 streams to be delayed by the lines in the vertical blanking of a given format. This value varies up to 42 lines for some formats. According to ST2110-21, both gapped and linear flows should have the start of frame delayed by the equivalent of vertical blanking.

Use cases for measuring timing

One use case 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.

Each ST2110 stream also carries time stamps. The Stream Timing application allows for the analysis of these time stamps.

Stream Timing application

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 realign the two essence types.

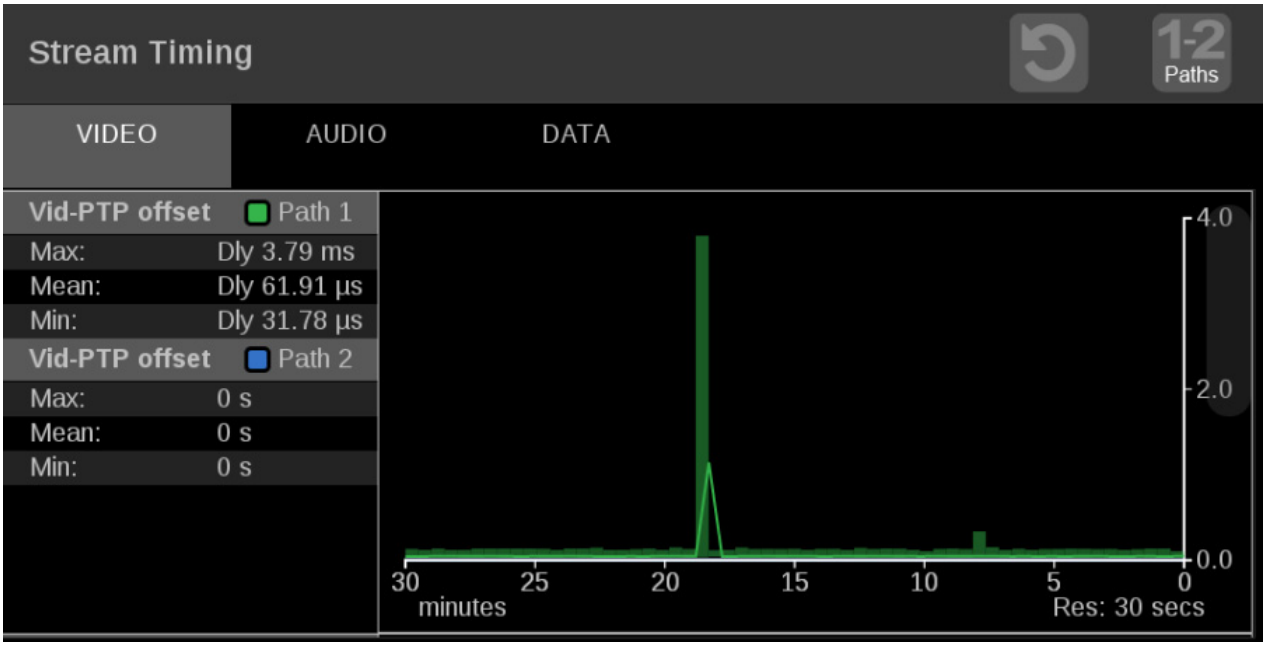


Figure 139: Stream Timing application display

Stream Timing application banner

The following figure shows the available options after pressing and holding anywhere on the Stream timing application tile.

Figure 140: Stream Timing application banner

The following options adjust the Stream Timing application:

- The maximize icon ( ) expands the application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.

- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.
- The gear icon ( ) opens the application settings menu.

NOTE. *After the application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

Stream Timing application settings menu

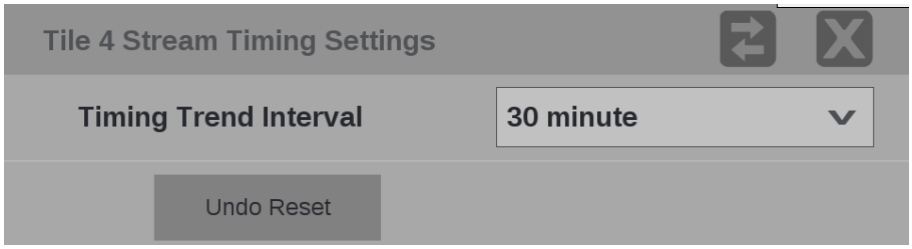


Figure 141: Stream Timing application settings menu

Trend Interval. Use the drop-down menu to change the interval to **1 minute**, **5 minute**, **10 minute**, **30 minute**, **1 hour**, **3 hour**, **6 hour**, **12 hour**, **1 day** or **7 day**.

NOTE. *The menu option for a 7 day trend interval has been removed. This option will be reinstated in a future firmware release. Any presets that have been saved with the 7 day trend interval will be changed to use the 1 day trend interval setting.*

Elements of the Stream Timing application display

The elements at the top of the Stream Timing application are shared between all graphs:

NOTE. *Only Path 1 will display unless you enable ST2022-7 Seamless Switching, (See page 61, How to configure the instrument for HDR / WCG monitoring.)*

- **Clear icon**. Use the icon to clear or reset the monitoring session.
- **Path button**: Use the Path button to switch between Path 1, Path 2, or both Path 1 and Path 2.
- **Stream type tabs**: Use these tabs to switch between the video, audio, or data stream offset graphs.
- **Res**: Lists the resolution of the graph display.

Video offset tab

The **Vid-PTP offset** graph shows timing of the video stream as it was received against the PTP. This data is the same as the data used in the Timing display, but it is graphed versus time.

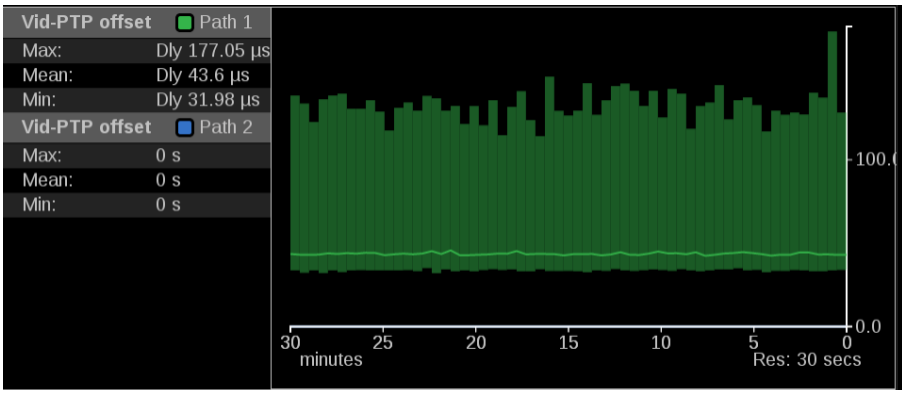


Figure 142: Stream Timing application – Video to PTP graph

The **Vid-RTP offset** graph shows timing of the video stream as it was received relative to the embedded RTP time stamps.

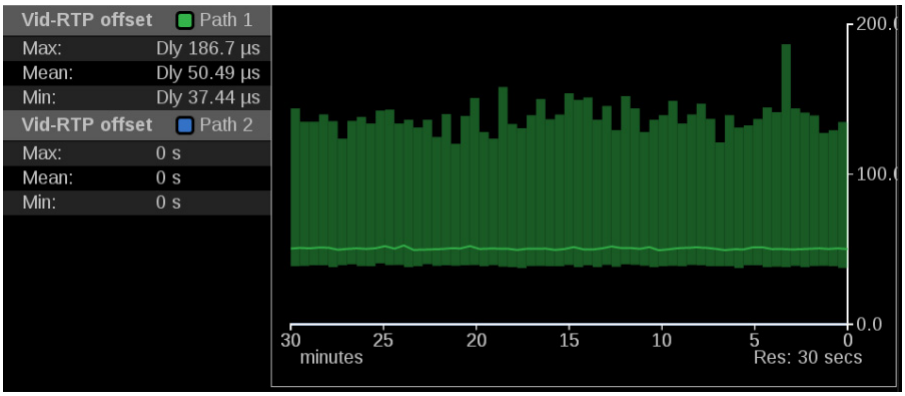


Figure 143: Stream Timing application – Video to RTP graph

Audio offset tab

The **Aud-Vid offset** graph shows the relative delay between audio and video streams. This value indicates the amount of delay that must be applied to realign the signals according to the time stamps.

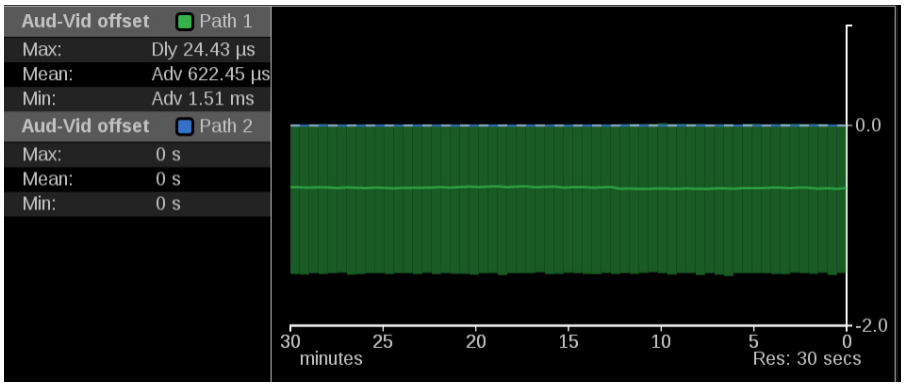


Figure 144: Stream Timing application – Audio to Video graph

The **Aud-RTP offset** graph shows timing of the audio stream as it was received relative to the embedded RTP time stamps.

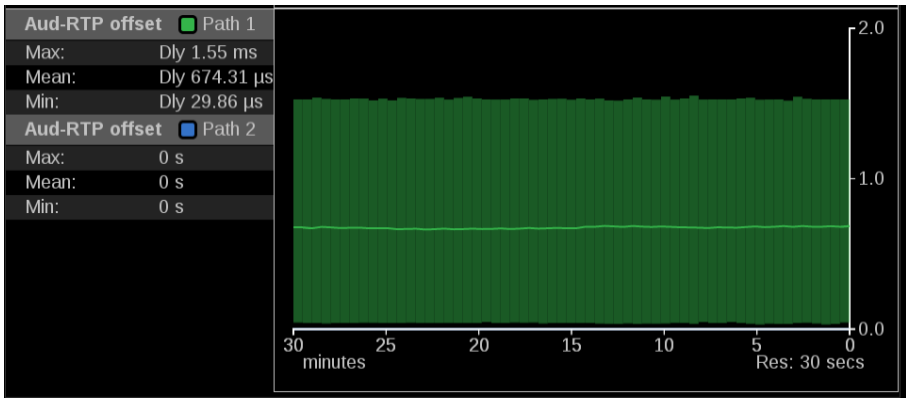


Figure 145: Stream Timing application – Audio to RTP graph

Data offset tab

The **Data-Vid offset** graph shows the relative delay between data and video streams. This value indicates the amount of delay that must be applied to realign the signals according to the time stamps.

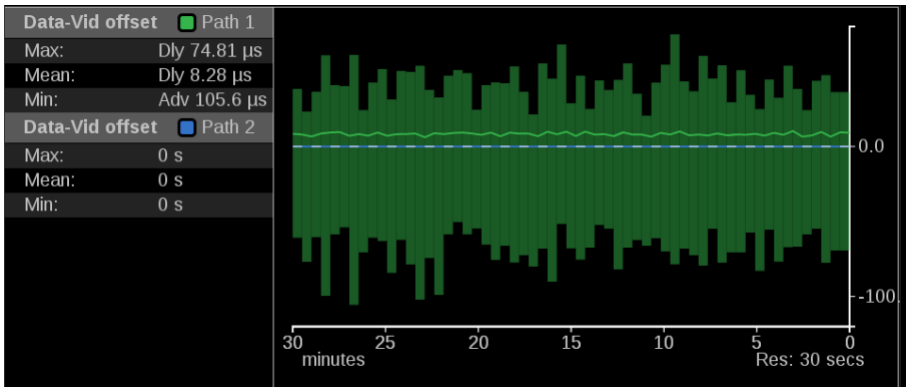


Figure 146: Stream Timing application – Data to Video graph

The **Data-RTP offset** graph shows timing of the data stream as it was received relative to the embedded RTP time stamps.

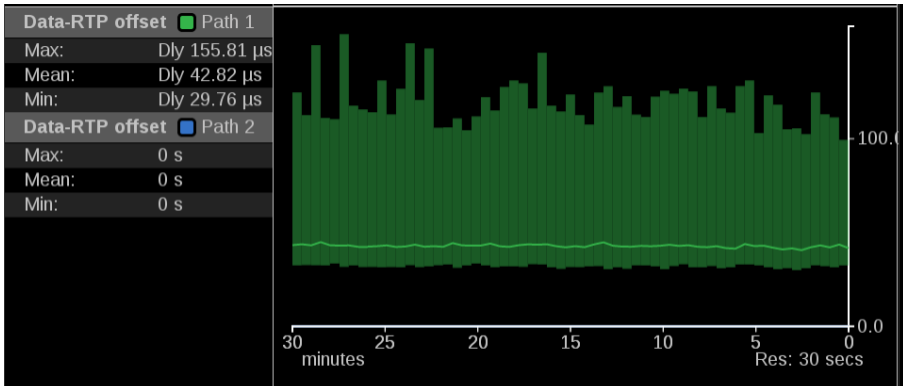


Figure 147: Stream Timing application – Data to RTP graph

IP Generator application

The IP Generator application provides ST2110 -20/-30 with ST2022-7 test signals that can be used to check the receiver device and the signal path.

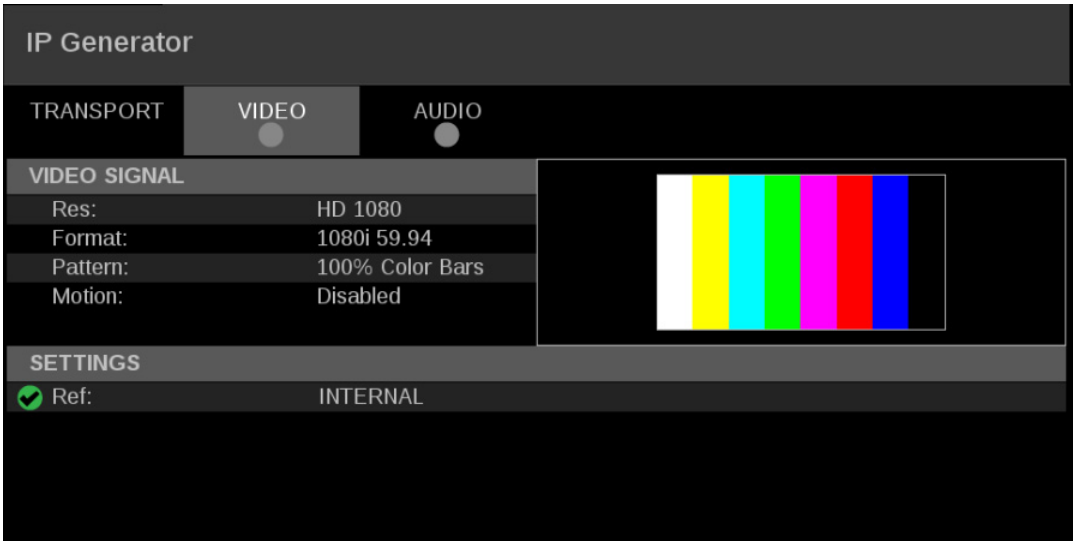


Figure 148: IP Generator application display

IP Generator application banner

The following figure shows the available options after pressing and holding anywhere on the IP Generator application tile.

Figure 149: IP Generator application banner

The following options adjust the IP Generator application tile:

- The maximize icon ( ) expands the application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.

  The gear icon ( ) opens the IP Generator application settings menu.

NOTE. *After the application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

IP Generator application settings menu

Use the following options to configure the video and audio IP Generator settings.

NOTE. *Press the **Save** button at the bottom of the window to save your configuration.*

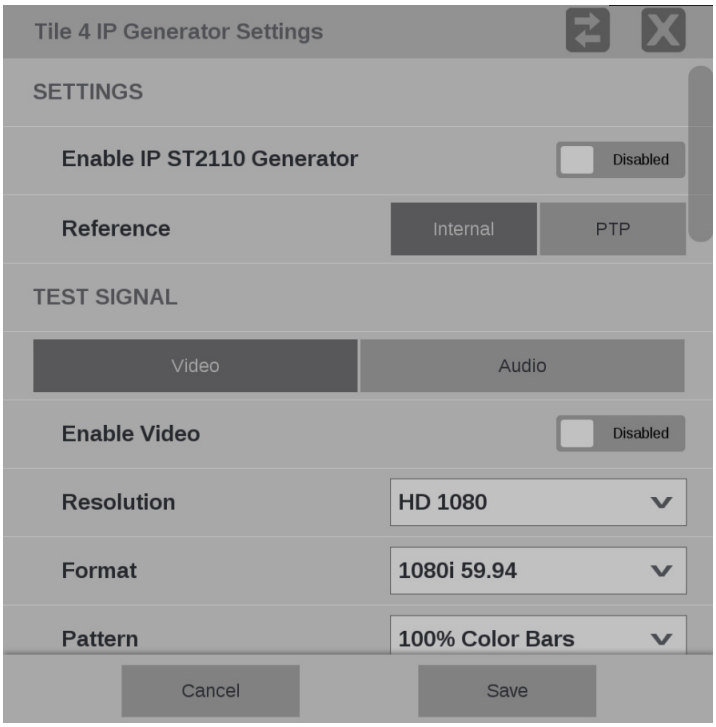


Figure 150: IP Generator application settings menu

Enable IP ST2110 Generator. Use this button to set the IP ST2110 Generator to **Enabled** or **Disabled**.

Reference. Use this option to set the IP Generator reference to **Internal** or **PTP**.

Video test signal options

The following options are available when the **Video** button under the Test Signal settings is selected.

- **Enable Video**: Use this button to enable or disable the video test signal.
- **Resolution**: Use this drop down list to select from the following resolutions: **SD**, **HD 720**, **HD 1080**, or **3G LevelA**.
- **Format**: Use this drop down list to select from the following formats:
  - **525i 59.94**: available for format SD only
  - **625i 50**: available for format SD only

- **720p 50**: available for format HD 720 only
- **720p 59.94**: available for format HD 720 only
- **720p 60**: available for format HD 720 only
- **1080i 50**: available for format HD 1080
- **1080p 50**: available for format 3G LevelA
- **1080i 59.94**: available for format HD 1080
- **1080p 59.94**: available for format 3G LevelA
- **1080i 60**: available for format HD 1080
- **1080p 60**: available for format 3G LevelA

- **Pattern**: Use this drop down list to select from the following patterns: **Black** or **100% Color Bars**.
- **Motion**: Use this button to enable or disable horizontal motion of the color bars.

NOTE. *The Motion option is unavailable when Pattern is set to Black.*

Video Transport. The following options are available under the Video Transport settings.

- **Packing Mode**: Use this option to select one of the following packing modes:
  - **Block**: Block Packing Mode is based on 180 byte blocks and supports many formats.
  - **General**: General Packing Mode follows the open packing standards of RFC 4175.
- **RTP Payload Type**: Use this setting to give the generated IP stream a RTP Payload Type number between 96 to 127.

NOTE. *Each generated IP stream must have a unique RTP Payload Type number.*

- **Packet Read Schedule (PRS)**: Use this option to select one of the following read schedules:
  - **Gapped**: Gapped PRS reads packets at an equally spaced sequence throughout the active field or frame interval and accounts for vertical blanking (gaps).
  - **Narrow (Linear)**: Narrow (linear) PRS reads the packets at an equally spaced sequence throughout a video frame.

Video Port SFP+ 1 and SFP+ 2. When the **Video** button under the Test Signal settings is selected video port SFP+ 1 and SFP+ 2 can be **Enabled** or **Disabled** using the button next to name of each port.

When enabled, each port is configured using the **Destination Address** and **Destination Port**.

NOTE. *The Source IP Address, Source Port, Source MAC Address, and Destination MAC Address will be automatically configured based on the Destination Address and Destination Port.*

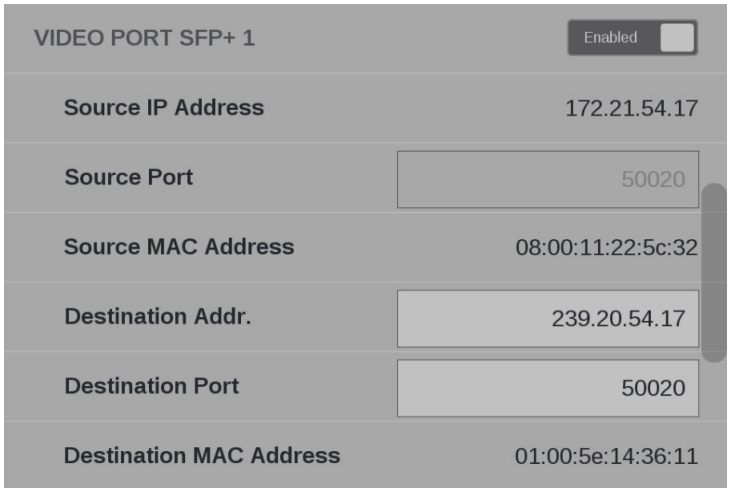


Figure 151: Video Port SFP+ configuration

Audio test signal options

The following options are available when the **Audio** button under the Test Signal settings is selected.

- **Enable Audio**: Use this button to enable or disable the audio test signal.
- **Channels**: Use this setting to select either **2** or **8** channels.
- **Frequency**: Use this setting to select a **1 kHz** frequency or **Multiple** frequencies.
- **Amplitude**: Use this setting to choose from the following selections:
  - **Mute**: always available
  - **-20 dBFS**: available when Frequency is set to 1 kHz
  - **-18 dBFS**: available when Frequency is set to 1 kHz
  - **Multiple**: available when Frequency is set to Multiple
- **Sample Depth (all Channels)**: This setting lists the sample depth of all channels.

The audio test signal will have the following values per channel when the Frequency and Amplitude is set to Multiple in the settings menu.

Table 7: Multiple frequencies and levels per channel

Chan	Amp (dBFS)	Freq (Hz)
1	-18	240
2	-22	480
3	-20	360
4	-28	120
5	-24	600
6	-26	1200
7	-30	1800
8	-32	2400

Audio Transport. The following options are available under the Audio Transport settings.

- **Packet Time**: Use this option to select between **125 µs** or **1 ms** packet times.
- **RTP Payload Type**: Use this setting to give the generated IP stream a RTP Payload Type number.

NOTE. *Each generated IP stream must have a unique RTP Payload Type number.*

Audio Port SFP+ 1 and SFP+ 2. When the **Audio** button under the Test Signal settings is selected audio port SFP+ 1 and SFP+ 2 can be **Enabled** or **Disabled** using the button next to name of each port.

When enabled, each port is configured using the **Destination Address** and **Destination Port**.

NOTE. *The Source IP Address, Source Port, Source MAC Address, and Destination MAC Address will be automatically configured based on the Destination Address and Destination Port.*

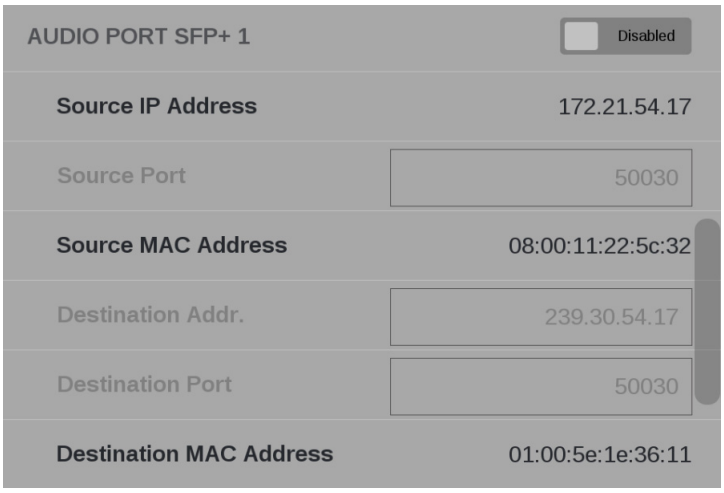


Figure 152: Audio port configuration

Elements of the IP Generator application display

Three display tabs provide information regarding the generated IP streams. Press one of the tabs to view the associated display.

TRANSPORT tab display. Use the TRANSPORT to view the status of the generated IP streams.

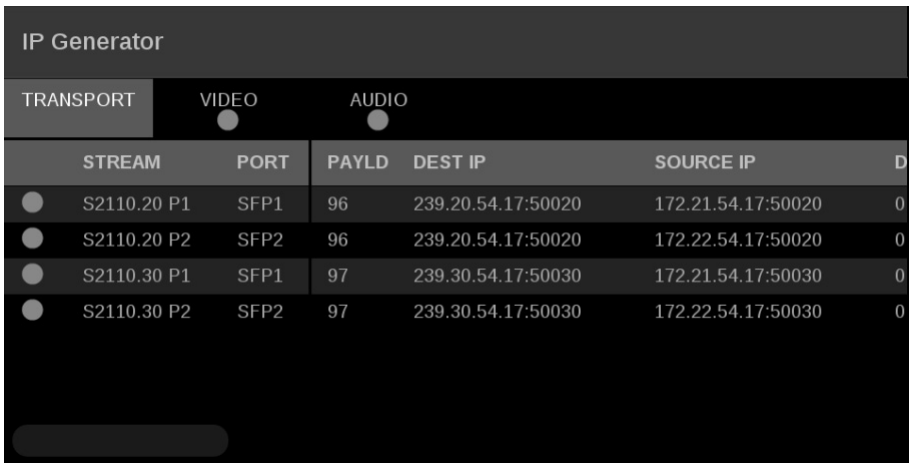


Figure 153: IP Generator application – TRANSPORT tab display

VIDEO tab display. Use this tab to view the settings of the generated video stream.

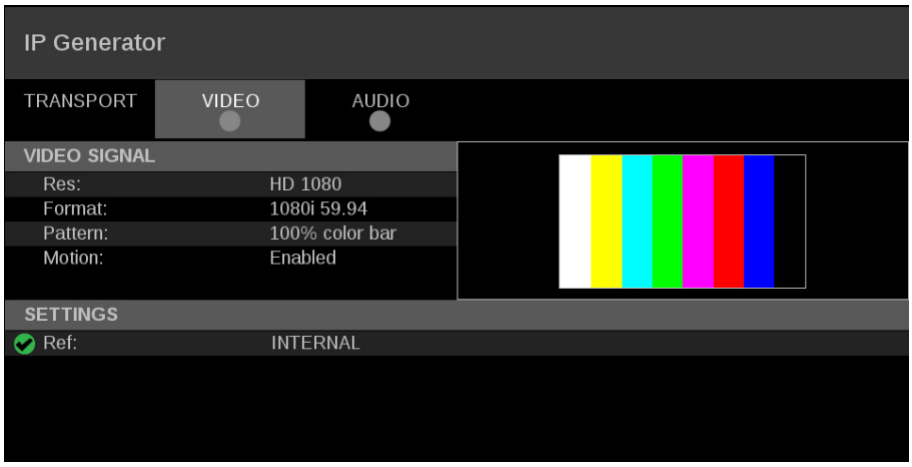


Figure 154: IP Generator application – VIDEO tab display

AUDIO tab display. Use this tab to view the settings of the generated audio stream.

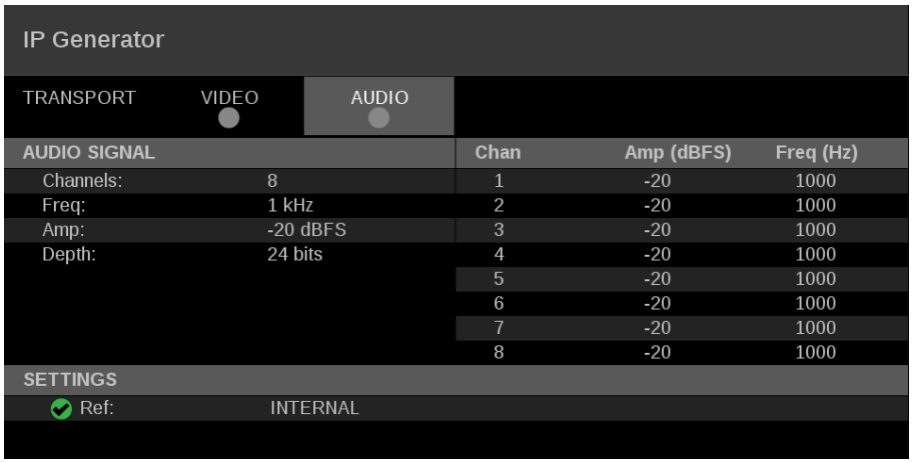


Figure 155: IP Generator application – AUDIO tab display

SDI Generator application

The SDI Generator application provides SDI video signals that can be used to check the receiver device and the signal path.

Figure 156: SDI Generator application display

SDI Generator application banner

The following figure shows the available options after pressing and holding anywhere on the SDI Generator application tile.

Figure 157: SDI Generator application banner

The following options adjust the SDI Generator application tile:

- The maximize icon ( ) expands the application tile to the full screen. The minimize icon ( ) collapse the tile back to its original size.
- The expand icon ( ) expands or collapses the tile vertically. If the tile expands it will cover the tile above or below, depending on whether you are expanding the top or bottom quarter tile. Use the collapse icon ( ) to bring the tile back to its original size.

  The gear icon ( ) opens the SDI Generator application settings menu.

NOTE. *After the application settings menu is opened, a move icon ( ) is displayed. Press this icon to move the settings menu horizontally.*

SDI Generator application settings menu

Use the following options to configure SDI Generator settings.

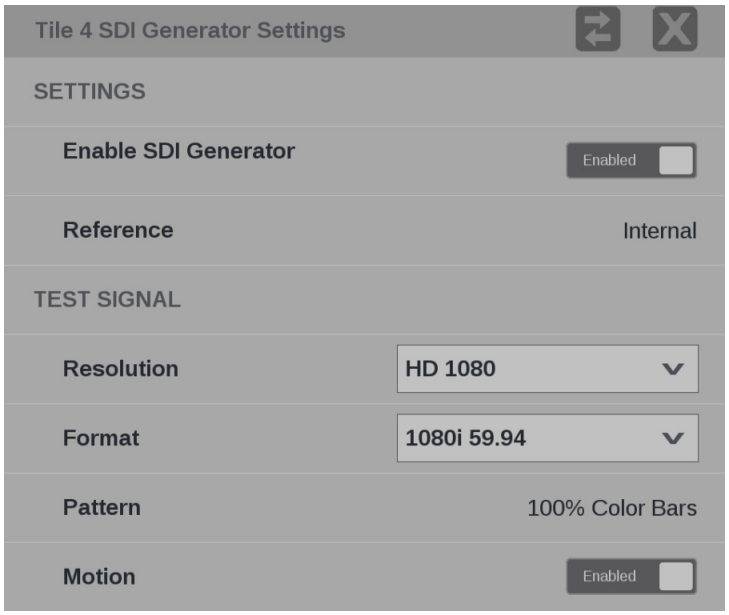


Figure 158: SDI Generator application settings menu

Enable SDI Generator. Use this button to set the SDI Generator to **Enabled** or **Disabled**.

Reference. The SDI Generator uses a internal reference.

Test signal options

The following options are available to configure the test signal.

- **Resolution**: Use this drop down list to select from the following resolutions: **SD**, **HD 720**, **HD 1080**, **3G LevelA**, **3G LevelB**, or **12G UHD**.
- **Format**: Use this drop down list to select from the following formats:
  - **525i 59.94**: available for format SD only
  - **625i 50**: available for format SD only
  - **720p 50**: available for format HD 720 only
  - **720p 59.94**: available for format HD 720 only
  - **720p 60**: available for format HD 720 only
  - **1080i 50**: available for format HD 1080 only
  - **1080p 50**: available for format 3G LevelA or 3G LevelB only
  - **1080i 59.94**: available for format HD 1080 only
  - **1080p 59.94**: available for format 3G LevelA or 3G LevelB only

- **1080i 60**: available for format HD 1080 only
- **1080p 60**: available for format 3G LevelA or 3G LevelB only
- **3840p 50**: available for format 12G UHD only
- **3840p 59.94**: available for format 12G UHD only
- **3840p 60**: available for format 12G UHD only

- **Pattern**: The only pattern available is **100% Color Bars**.
- **Motion**: Use this button to enable or disable horizontal motion of the color bars.

Elements of the SDI Generator application display

Use the **VIDEO** tab to view the settings of the generated SDI stream.

NOTE. *SDI audio and data generation is not yet available.*

PTP operational overview

This section provides an overview of PTP network operation. Not all of the functionality described is currently available in the PRISM monitor.

PTP introduction

PTP master selection

In a PTP network, all the masters on the network are evaluated by the Best Master Clock Algorithm (BMCA). The BMCA runs on all devices, and chooses a master based on several parameters. Some of the parameters relate to clock quality; conversely the Priority 1 and Priority 2 parameters are set by the user to influence the choice of a master:

NOTE. *The PRISM monitor has no role in setting the priority parameters or in providing information to the BMCA.*

- Priority 1. This parameter defines which clocks are allowed to be considered as masters. To be considered as a master, the value should be set to 128 or less. Priority 1 is the first criteria in the BMCA, so if Priority 1 is set to a lower value than other devices on the system, then it will be chosen even if the clock quality is poor. Typically, all the masters in a domain should have the same value for the Priority 1 parameter.
- Priority 2. This parameter is used to break the tie between masters that have the same clock quality. Several values may be used to define a hierarchy of devices. Most profiles use 128 as a default, so a value of 127 or lower would indicate a preferred master.
- The final tie-breaker in the BMCA is the clock ID. This is usually the MAC address so it provides a unique value by which the BMCA can choose.

Network topology

In a typical IEEE1588 PTP network, many devices may be either masters or slaves. If the current master stops working, all the devices that are capably of being a master broadcast their clock quality and a new master is selected.

For video networks it may make sense to depart from the telecom-style PTP topology and dedicate devices to be only masters or slaves. This is the approach supported by the PRISM monitor, which allows for a more traditional primary and backup master structure controlling a range of slave devices. The BMCA is still used to select the active master and the network still takes the place of the ECO in the legacy Black-burst/Tri-level network. The PRISM monitor is a slave-only device.

The five basic PTP timing messages

The five basic timing messages in a PTP system are described below. Other messages are present in some instances. For example, grant requests and responses appear in unicast systems, and Type Length Value (TLV) management messages appear in SMPTE ST2059 profile systems.

Announce message

The Announce message is sent by the master to advertise its capability. This message contains the clock quality and priority settings needed for the BMCA to evaluate which device is the best master.

Sync message

The Sync message is sent by the master and is used to measure the propagation delay from the master to slave. The sync message may contain the timestamp indicating when it was sent, or that time may be in the Follow-up message. The receiver must timestamp the sync message upon receipt. These two timestamps are usually called “t1” and “t2” and provide the first delay measurement.

Follow-up message

The Follow-up message is sent only in cases where the PTP network hardware is not capable of inserting the timestamp or corrections into the Sync message. (See page 187, *One-step and two-step operation*.)

Delay request message

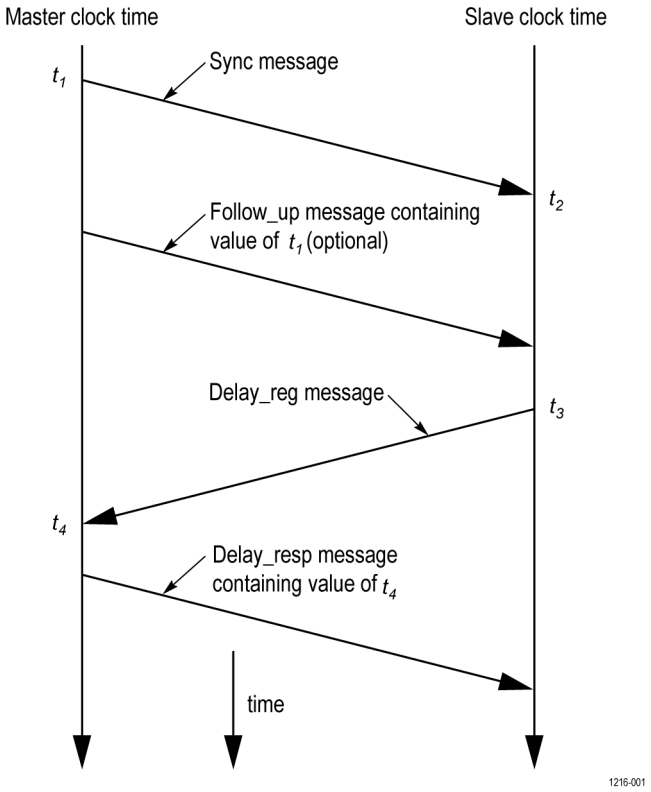
The Delay request is sent by the slave. The time at which it is sent is noted by the slave, but is not included in the message. This time is usually called “t3.” When the delay request is received by the master, the master timestamps the receive time. This timestamp is usually called “t4.”

Delay response message

The delay response is sent from the master to the slave. The response contains the t4 time stamp from when the master received the delay request. Once the slave receives the delay response, it has the second pair of timestamps needed to calculate the second delay measurement of the slave to master delay.

Message timing

The following figure show the relationships between the five PTP timing messages.



Profiles and domains

Multiple domains and profiles can coexist on the same network.

Profiles

The IEEE1588 standard defines multiple parameters, such as the rates for Sync and Announce messages, and optional functions such as grandmaster clusters. Specific industries wanting to use PTP are encouraged to define their own "profile," which allows the PTP standard to be tuned for specific applications. The profile defines the default and range of each parameter, and defines with options are required, allowed or prohibited.

In the Prism monitor, the user should select the PTP profile (General, ST2059, or AES67). The user can then modify the profile parameters and save as part of an instrument preset. The allowed range of the parameters is restricted to that which is allowed for the selected profile type.

Domains

The IEEE1588 standard defines "domains," which allow multiple PTP services to coexist simultaneously on one physical Ethernet connection. For example, on a given network one master and several slaves can be using domain 0 while a second master and other slaves are using domain 1. These two PTP services are independent. One use for this is to have masters on different domains provide PTP on different profiles. For example, domain 0 might be an AES67 profile, domain 1 could be a master using the AVB (802.1AS) profile, and domain 127 could be a master on the SMPTE ST2059 profile.

One-step and two-step operation

Some PTP messages have a time stamp associated with them. This time stamp indicates the time of the local clock when the message was sent or received. In some cases, the hardware is capable of embedding the time stamp in the message as it is sent. This is known as "one-step" mode since the message and its associated time are sent together.

In other cases, the hardware is not capable of inserting the time into the message, so instead it is sent in a second follow-up message. This is called "two-step" mode since there are two messages.

It is interesting to note that in End-to-End mode, only the Sync message is effected by the one-step and two-step setting since it is the only message that needs the transmit time stamp inserted. In a similar fashion, Peer-to-Peer mode has some messages that may require follow-up support.

The IEEE1588 standard specifies that all slaves are required to operate with either one-step or two-step message types. One type of device which often requires two-step operation is a Transparent Clock, since it has to calculate the residence time of a message and insert that time into the message or the follow up message.

Multicast, Unicast, and Mixed Communication modes

There are three basic message modes for PTP: Multicast, Unicast, and mixed Multicast and Unicast. For full Multicast or Unicast modes, all of the PTP messages are sent in the selected mode type.

For some profiles, such as some telecom profiles and the SMPTE ST2059 profile, a mixture of Multicast and Unicast are allowed. On the SMPTE profile unique mixed mode, the Announce and Sync messages are sent as multicast. However, the Delay Request and Delay Response messages are sent as Unicast.

Some points to understand about communication modes:

- Whatever mode is chosen, the master and slave must match or be compatible
- Multicast and Mixed mode may need IGMP joins and leaves
- Full Unicast must have the master address in all slave AMTs
- Unicast without negotiation does not allow master to regulate load
- Two masters can be used on different domains to serve slaves on different communication modes

All of the master and slave devices on a given domain must use compatible communication modes. For most profiles, this means the master and slave communication modes need to match exactly. On the SMPTE profile, the Multicast and Mixed modes are compatible, so a master in any of these modes should work with a slave in any of those modes.

Multicast system messages

Multicast messages are broadcast and so they can be received without knowing the address of the sender. This allows a slave to hook up to the network, receive the announce messages and discover the identity of the master. Multicast in some networks requires the devices to use IGMP to join and leave the multicast group.

In Multicast PTP systems, the master sets the rate of the announce and sync messages. The master also sends the maximum allowed delay request rate in the delay response message. Ideally, the slave will use that value to set the delay request rate although some slave set this rate independently. The delay request rate is typically the same as the sync rate, but may be higher or lower.

Unicast system messages

Unicast messages require the address of the master be entered into the Acceptable Master Table (AMT) in each slave. If there are multiple masters, the IP address for each master must be entered in the AMTs of all the slaves.

In Unicast PTP systems, the slave must have the address of the master in its acceptable master table because the slave initiates the communication with the master. The slave sends several grant requests to the master requesting specific rates for each message type. If the master accepts the grant requests, it will send grant acknowledges. If the master denies the grant, the slave may send a new grant request at a lower rate. This process may continue for several iterations until the master and slave agree on a rate. The master and slave will then start exchanging the PTP messages. If the master cannot support any of the rates requested by the slave, then the slave will not be able to lock to the master.

Mixed mode system messages

In Mixed Mode systems, some messages are Multicast and some are Unicast. For the SMPTE ST2059 profile, the Announce and Sync messages are sent as Multicast. This allows devices to discover the active master. The Delay Request messages are configured as Unicast, in some case with negotiation, and in other cases without negotiation.

SMPTE profile system messages

For SMPTE profile systems, a given domain must use one type of message for all Announce, Sync and Follow up messages. Therefore, all masters and slaves on that domain must be configured for either Multicast or they all must be configured for Unicast.

For SMPTE mixed mode, the Announce, Sync, and Follow up messages are configured as Multicast, whereas the delay requests can be Multicast, Unicast, or Unicast without negotiation. To use this combination with a Tektronix SPG8000A master clock generator, set the master and slave to any of the modes: Multicast, Mixed, or Mixed without negotiation. The masters will support all of the slave modes simultaneously.

BMCA operation

The Best Master Clock Algorithm (BMCA) is used to choose the active master on the domain. This is partially explained in the introduction to this document. The BMCA operation varies somewhat as function of communication mode.

Multicast mode

In Multicast mode, the active master sends announce messages which all other masters and slaves can receive. So all devices can evaluate the BMCA and decide on the best master. If any device detects that its BMCA rating is better than the current master, it will send an announce and take over as the active master.

Unicast mode

In Unicast mode, slaves only get Announce messages if they establish a grant from the master. Therefore, each slave must set up a grant with every device in its AMT. Since the masters do not set up grants from other masters, they do not have the information to evaluate the BMCA and know if they are the active master. It is up to the slaves to evaluate the BMCA based on the announce message they get from each master in their AMT. Each slave then decides which master is the best and then set up grants for the other message types. If slaves on a given network have a different list of masters in their AMT, then they may choose a different master.

Mixed mode

In a SMPTE ST2059 mixed environment, the announce message is Multicast. Therefore, the BMCA can follow the Multicast conventions.

Compensating for causes of asymmetric delay

Several factors can cause the PTP message delay to be different for the messages sent from the master to slave as opposed to the messages the other direction from the slave to master. Unless corrected, this propagation delay asymmetry will cause an offset in the clock phase equal to ½ the difference in the two path delays. There are 4 main causes of asymmetric delay: Rate mismatch in the ports on a switch, Traffic mismatch on the two paths, message type mismatch, and cable delay variation. The paragraphs below contain hints on how to design the system to minimize the delay asymmetry. Alternatively, some slaves provide a way to manually enter a correction value to cancel the delay error.

Rate mismatch

Rate mismatch in a switch causes a delay asymmetry because the switch does a “store and forward” on messages. This means the entire message must be stored in the buffer before it starts to be “forwarded” or sent out. For example, for a 100 Mb input and 1 Gb output, the switch must wait for the entire message to clock in at the slow rate before it can start outputting the message at the high rate. Conversely for a 1 Gb/s input and 100 Mb/s output, the entire packet is quickly read in at the faster rate, so then the output can start sooner, albeit at a lower rate.

While the total time is the same for both directions, the delay on the fast-in, slow-out direction is shorter on the packets which contain the PTP timestamps. This effect is significant on a 100 Mb/1 Gb rate mismatch, but much less significant on a 1 G/10 G switch since the message time at 1 Gb/s is quite short. If the switch supports Transparent Clock (TC) mode, then this rate mismatch delay effect is corrected by the TC delay correction.

Traffic mismatch

Another cause of asymmetric delay is traffic mismatch on the two paths. If there is a high percentage of traffic utilization on the master to slave path, then most of the PTP messages may be delayed significantly. If the traffic on the other direction is significantly different, then the messages on the path may not suffer the same delay.

This effect can be quite large depending on the traffic, the quality of the switch, and the number of switches in the network. To reduce this effect, a user should avoid large loading on the PTP network, use high-quality switches that avoid this delay variance, or use PTP Transparent mode switches which will insert residence time information to allow the slave to correct for this delay.

Setting the Diff Serve QoS on the switch and configuring the PTP messages with an appropriate DSCP can also mitigate the effects of traffic delay.

Message type mismatch

Another cause of delay asymmetry is message type mismatch. For example, if the sync message is Multicast and the delay request is Unicast, then some switches may process the messages differently and cause a differential delay. Since the SMPTE profile allows a mixed mode operation, switches should be evaluated to ensure they do not have this effect. If transparent mode switches are used, then this effect should be corrected by the slave.

Cable delay variation

The actual propagation delay through Cat 5 cable can be significantly different in one direction versus the other direction. This can be due to the twist rate on the pairs, routing inside the sheath, material differences, etc. The PTP system is incapable of removing this effect, so the best way to prevent this is to use high-quality cable with a minimum variation in the physical propagation delay.

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