



**PRISM MPI2-25 and MPX2-25
SDI / IP Waveform Monitor
User Manual**

This document supports software version 2.2.

www.telestream.net

D00010019B

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Important compliance and safety information

United States of America Compliance Notices

Class A Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15, Subpart B of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Safety

UL 61010-1: 2012 R4.16: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements.

Environmental

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 dtsc.ca.gov/perchlorate/ for additional information.

Canada Compliance Notices

Department of Communications Radio Interference Regulations

This digital apparatus does not exceed the Class A limits for radio-noise emissions from a digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications. This Class A digital apparatus complies with Canadian ICES-003.

Règlement sur le brouillage radioélectrique du Quadstere des Communications

Cet appareil numérique respecte les limites de bruits radioélectriques visant les appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique du Quadstere des Communications du Canada. Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

Safety

CAN/CSA-22.2 NO. 61010-1-12 + Gil + G12:: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements.

Sécurité

CAN / CSA-22.2 NO. 61010-1-12 + Gil + G12 :: Exigences de sécurité pour l'électricité Matériel de mesure, de contrôle et d'utilisation en laboratoire - Partie 1: Généralités Exigences.

European Union and European Free Trade Association (EFTA) Compliance Notices

This equipment may be operated in the countries that comprise the member countries of the European Union and the European Free Trade Association. These countries, listed in the following paragraph, are referred to as The European Community throughout this document:

AUSTRIA, BELGIUM, BULGARIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, UNITED KINGDOM, !CELANO, LICHTENSTEIN, NORWAY, SWITZERLAND

Declaration of Conformity

Marking by the “CE” symbol indicates compliance with the Essential Requirements of the EMC Directive of the European Union 2014/30/EU

This equipment meets the following conformance standards:

Safety

EN 61010-1: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements
Low Voltage Directive 2014/35/EU

Emissions

EN 55032: 2012 + AC: 2013, CISPR 32: 2015, EN 61000-3-2: 2014,
EN 61000-3-3: 2013

Immunity

EN 55103-2: 2009, EN 61000-4-2: 2009,
EN 61000-4-3: 2006 + A1: 2008 + A2: 2010, EN 61000-4-4: 2004 + A1: 2010,
EN 61000-4-5: 2006, EN 61000-4-6: 2009, EN 61000-4-11: 2004
Environments: E2

Warnings



Warning! This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.



Achtung! Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.



Attention! Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.

Notes:

1. For Compliance with the EMC standards listed here, high quality shielded interface cables should be used.
2. Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.

Environmental Compliance

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

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 on the product or its packaging 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.



It also indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste for recycling, please contact your local authority, or where you purchased your product.

Battery Recycling

This product may contain a rechargeable battery, which must be recycled or disposed of properly. Please properly dispose of or recycle the battery according to local government regulations.

Transporting Batteries or products with Batteries in them

The capacity of the lithium ion secondary battery shipped with this product is under 100 Wh. The lithium content of the installed primary battery is under 1 g. Each battery meets the applicable requirements of UN Manual of Tests and Criteria Part III Section 38.3. Battery quantity is under the limit for shipment according to Section II of the relevant Packing Instructions from the IATA Dangerous Goods Regulations. Consult your air carrier for applicability and determination of any special lithium battery transportation requirements.

Restriction of Hazardous Substances

This product is classified as an industrial monitoring and control instrument, and is not required to comply with the substance restrictions of the RoHS 3 Directives 2011 /65/EU and EU 2015/863 until July 22, 2021. This product does, however, comply with the RoHS 2 Directive 2011/65/EU.

Korea Compliance Statement

A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A (Broadcasting Communication Equipment for Office Use)	As an electromagnetic wave equipment for office use (Class A), this equipment is intended to use in other than home area. Sellers or users need to take note of this.

Taiwan Compliance Statement

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This is a Class A product based on the standard of the Bureau of Standards, Metrology and Inspection (BSMI) CNS 13438, Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Japan Compliance Statement

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This is a Class A product based on the standard of the VCCI Council (VCCI 32: 2016). If this equipment is used in a domestic environment, radio interference may occur, in which case, the user may be required to take corrective actions.

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, see the Service safety summary that follows the General 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.

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.

Ground the product: This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded. Do not disable the power cord grounding connection.

Power disconnect: The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so 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.

Observe all terminal ratings: To avoid fire or shock hazard, observe all rating 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 manual's installation instructions 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.

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

Use only the Telestream 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 the 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.

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.

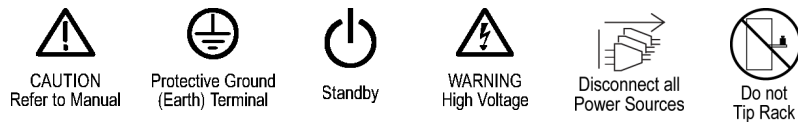
CAUTION indicates a hazard to property including the product.

Symbols on 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:



General Safety Product Specific Statements

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.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

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



CAUTION. *To minimize the risk of damage to the instrument, we strongly recommend the power cord be connected to the instrument before the power cord is connected to the AC power source.*



CAUTION. *To prevent data loss, we strongly recommend you first shut down the instrument before disconnecting the power cord. Press the power button or select **Settings, Utilities, Power**, and then **Power Down Now**.*



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.*



CAUTION. *To prevent static damage to the SFP module, if you remove the SFP module from the instrument, always transport the SFP module in an 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.



CAUTION. *After 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 Telestream factory service center to have the system firmware restored.*

Preface

This manual contains information to help you use the PRISM SDI / IP Waveform Monitor. This information includes:

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 use 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.telestream.net/video/resources.htm. Table 1 lists all the documentation for the PRISM SDI / IP Waveform Monitor.

Table 1: Product documentation

Document	Manual type	Part number	Description
User Manual	Primary User	D00010019x	Provides detailed operating information.
Release Notes	Release Notes	D00010030x	Describes the new features, improvements, and limitations of the instrument firmware.
Installation and Safety Instructions	User	071-3730-00x	Describes how to install a PRISM MPI2-25 instrument and provides basic safety and operating information (included with instrument).
	User	071-3738-00x	Describes how to install a PRISM MPX2-25 instrument and provides basic safety and operating information (included with instrument).
PRISM MPI Dual Rack Cabinet Version 2 Installation Instructions	Field Install Instructions	071-3725-00x	Describes how to install an 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	071-3706-00x	Describes how to install an MPX instrument in a 19" equipment rack
PRISM MPI2-RACK-MD Installation and Safety Instructions	Field Install Instructions	071-3728-00x	Provides installation and safety information for the PRISM MPI2-RACK-MD Rack Cabinet with touch display.
PRISM MPX2-DUALDSP Installation and Safety Instructions	Field Install Instructions	071-3729-00x	Provides installation and safety information for the PRISM MPX2-DUALDSP Dual Display module.

Conventions used in this manual

The PRISM SDI / IP Waveform Monitor is also referred to as the “PRISM monitor” throughout this manual.

Getting started

This section will help you set up and begin to use the PRISM SDI / IP Waveform Monitor. It is divided into 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 SDI / IP Waveform Monitor 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, along with an intuitive and simplified graphical presentation of IP statistics, including video quality and diagnostic information, enables engineers to ensure the delivery of superior 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 SDI / IP Waveform Monitor is available in two form factors:

MPI2-25: The PRISM MPI2-25 is 3RU half rack with integrated 9-inch HD display and touch panel. Option PHY is available to add physical layer measurement sets.



MPX2-25: The PRISM MPX2-25 is 1RU full rack width optional integrated speakers. The MPX2-25 requires an external monitor or a remote connection, such as VNC (a remote connection requires a local monitor or a DisplayPort emulator is connected to the PRISM). Option PHY is available to add physical layer measurement sets. Option RACK is required for rack mount.



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
- Designed to fully support 4K video with 12G SDI and 25GE IP inputs, and 8K video with 12G SDI inputs
- All-in-one instrument using a 3RU half-rack platform (MPI2-25) or a 1RU full-rack platform (MPX2-25) with optional integrated speakers can be used for either portable or rackmount applications
- Extensive IP monitoring solution for SMPTE 2022-6, 2110, PTP, and RTP streams
- Graphical displays that show the traffic present in the 10GE/25GE 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 for 2022-6) 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
- Telestream patented Timing display, the SDI versus Analog reference and ST2022-6 / ST2110-20 / SDI / Analog reference versus PTP reference makes facility timing easy
- 1 PPS output when the instrument is locked to a PTP reference
- Seamless switching to ensure proper SMPTE 2022-6 and 2110 redundancy according to SMPTE 2022-7

- 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 10/25GE 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 (receiver only)
- Optional dual display products (MPI2-RACK-MD and MPX2-DUALDSP) can be used to extend the workspace to a second HD screen.

**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
- Configurable False Color display for easy identification of HDR content.
- Waveform, Vector, Lightning, 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)
- On-screen tools for accessing frequently used settings without opening a separate menu
- Audio volume and balance controls

Software Licenses

- **MP2-25GE** Adds a node-locked license for 25GE support
- **MP2-IP-MEAS** Adds a node-locked license for IP Measurement feature sets, this includes IP/PTP Graph, IP/PTP Session, PIT Histogram, Timing, Stream Timing, and Stream capture applications
- **MP2-FMT-4K** Adds a node-locked license for 4K formats and enables 6G/12G-SDI
- **MP2-FMT-8K** Adds a node locked license for 8K formats, enables 12G-SDI; 25GE upgrade kit is required for MPI2-10 and MPX2-10, MP2-FMT-4K is also required for 4K format support
- **MP2-AUD** Adds a node-locked license for enhanced Audio feature sets, this includes Phase, Session, Correlation, Loudness, and Dolby E status display
- **MP2-DLBY** Adds a node-locked license for Dolby E decoding and Dolby E status display
- **MP2-ENG** Adds a node-locked license for Baseband engineering feature sets, this includes Datalist, CC decode, and ANC Session
- **MP2-QC** Adds a node-locked license for Quality Control feature sets, this includes Datalist, CC decode, and ANC Session
- **MP2-PROD** Adds a node-locked license for Production feature sets, this includes Stop, False Color, Light meter, HDR/WCG Conversion, CIE, and HDR Measurements
- **MP2-GEN** Adds a node-locked license for SDI/IP signal generator, this includes IP/SDI Generator application
- **MP2-EXTNDSP** Adds a node-locked license for enabling extended desktop

Rackmount

MPI2-25 monitor

There are two optional dual rack cabinets (19-inch, 3RU) available for the PRISM monitor. Each of the cabinet kits include the *PRISM MPI Dual Rack Cabinet and Extender Installation Instructions* document (part number 071-3725-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 port 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 WFM52x0, WFM7200, WFM8x00 waveform monitor. The left side of the cabinet front panel has two USB ports and a headphone port for one MPI unit.

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

Table 2: PRISM dual rack cabinet documentation

Document	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	071-3725-00x (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.

MPX2-25 monitor

For the PRISM MPX2-25 monitor, there is an optional 1RU full-rack kit that can be used for either portable or rackmount applications.

MPX2-25 RACK: Allows you to install one PRISM 1RU full width MPX2-25 RACK. The MPX2-25 RACK rackmount kit includes the *Rackmount Slides and Rails Kit Installation Instructions* document (part number 071-3706-xx).

Dual Display monitors

Rack mounted dual display monitors are available for MPI2 and MPX2 to extend the PRISM display to a second HD monitor.

MPI2-RACK-MD: Allows you to install one PRISM MPI2 monitor (not included) next to an external HD display in a 3RU full width rack. A software license is required to enable the extended display feature. For information on how to install and use this extended display, see the *PRISM MPI2-RACK-MD Installation and Safety Instructions*.

MPX2-DUALDSP: Allows you to connect an MPX2 to a 3RU full rack width dual display assembly to serve as a compact primary and extended desktop display system for the MPX2. A software license is required to enable the extended display feature. For information on how to install and use this extended display, see the *PRISM MPX2-DUALDSP Installation and Safety Instructions*.

MPI2-25 power-on and power-off procedures

This section describes how to apply power to the MPI2-25 monitor and how to power-on and power-off the instrument.

MPI2-25 power cord installation

This instrument is powered by an AC power source. Connect the power cord to the power connector on the rear panel of the instrument. (See Figure 1.) 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 onto the instrument power connector.



CAUTION. To minimize the risk of damage to the instrument, we strongly recommend the power cord be connected to the instrument before the power cord is connected to the AC power source.

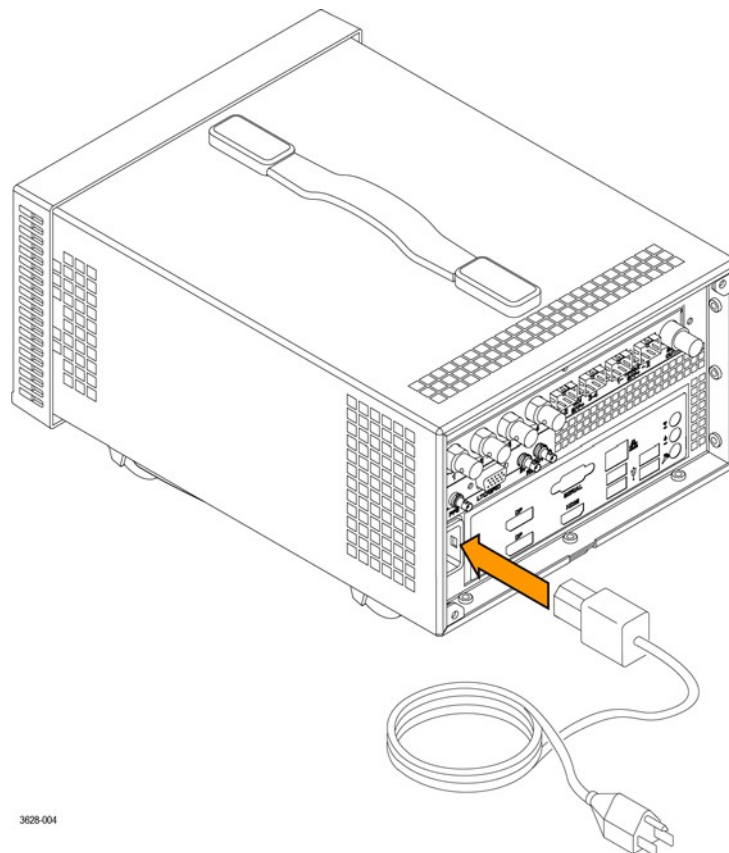


Figure 1: Connecting power to the MPI2-25 monitor

MPI2-25 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, and firmly pull the cord away from the instrument. (See Figure 2.)



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 power cord be disconnected from the AC power source before the power cord is disconnected from the instrument.

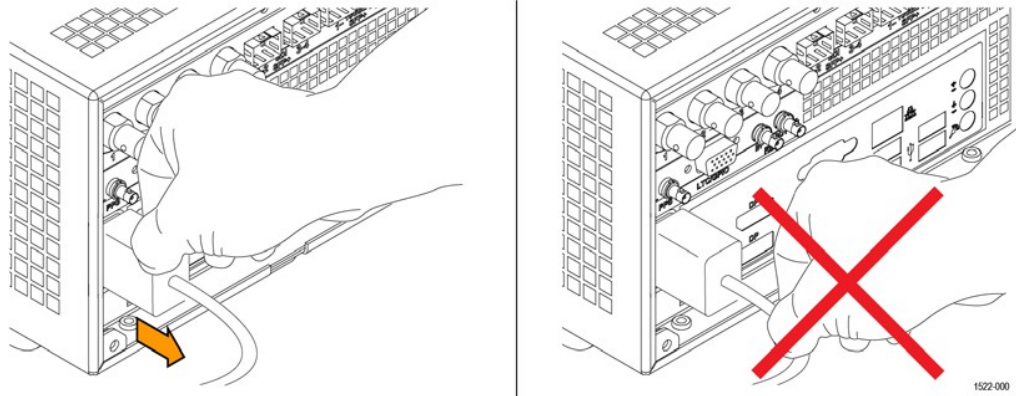


Figure 2: Disconnecting the power cord from the MPI2-25 monitor

MPI2-25 power-on procedure

1. Apply power to the instrument. ([See MPI2-25 power cord installation.](#))

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

2. Press the **Power/Standby** button on the instrument front panel to turn the instrument on. (See Figure 3.)

NOTE. *The MPI Power/Standby button turns red during the power-on sequence and turns white and then turns off in normal operation.*



Figure 3: Front panel of the PRISM with the Power/Standby button marked

MPI2-25 power-off procedure

1. Press the **Power/Standby** button on the instrument front panel to turn the instrument off.
Or in the instrument:
 - a. Select **Settings**.
 - b. Select **Utilities**.
 - c. Select **Power**.
 - d. Select **Power Down Now**.



CAUTION. To prevent data loss, we strongly recommend you first shut down the instrument 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. ([See MPI2-25 power cord removal.](#))

MPX2-25 power-on and power-off procedures

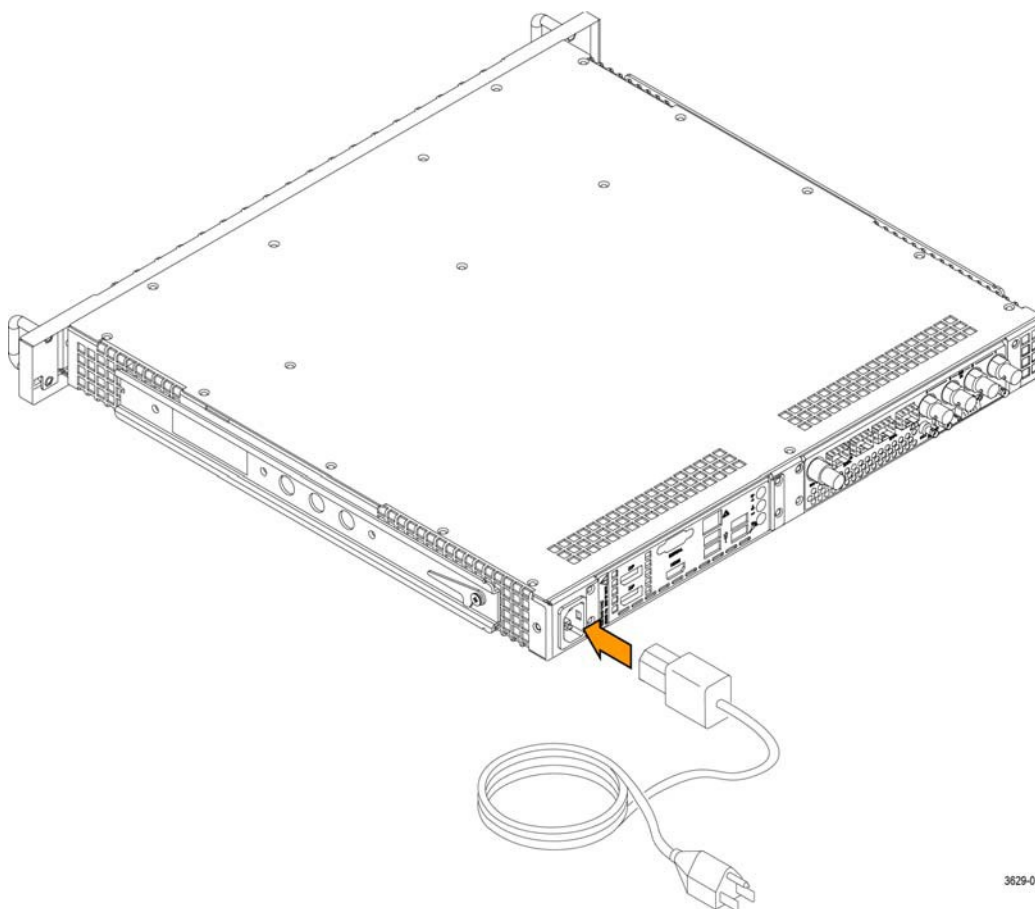
This section describes how to apply power to the MPX2-25 monitor and how to power-on and power-off the instrument.

MPX2-25 power cord installation

This instrument is powered by an AC power source. Connect the power cord to the power connector on the rear panel of the instrument. (See Figure 4.) 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 onto the instrument power connector.



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



3629-05

Figure 4: Connecting power to the MPX2-25 monitor

MPX2-25 power-on procedure

1. Apply power to the instrument. ([See MPX2-25 power cord installation.](#))

NOTE. If the PRISM 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. (See Figure 5.)

NOTE. The MPX Power/Standby button turns red during the power-on sequence and turns green and remains green in normal operation.



Figure 5: Front panel of MPX2-25 with Power/Standby button marked

MPX2-25 power-off procedure

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

Or in the instrument:

- a. Select **Settings**.
- b. Select **Utilities**.
- c. Select **Power**.
- d. Select **Power Down Now**.



CAUTION. To prevent data loss, we strongly recommend you first shut down the instrument 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:

- MP-SFP 10GESR: 10G Ethernet short-range SFP+ transceiver (850 nm)
- MP-SFP 10GELR: 10G Ethernet long-range SFP+ transceiver (1310 nm)
- MP-SFP 25GESR: 25G Ethernet short-range SFP28 transceiver (850 nm)
- MP-SFP 25GELR: 25G Ethernet long-range SFP28 transceiver (1310 nm)

NOTE. *ST2022-7 requires two 10 (or 25) GE SFP modules to be installed. The modules need to be installed in SFP ports 1 and 2.*

MPI2-25 SFP module installation

To install the SFP module on an MPI2-25 monitor, insert the module into the SFP connector. The module latches into place when fully inserted.

NOTE. *There are different types of SFP modules for 10GE and 25GE signals. If the SFP module does not match the unit signal setting (for example, a 25GE SFP module is installed and the unit is set for a 10GE signal), the Link Status (in Network, under Settings) returns “SFP Error.”*

To remove the SFP module, lift *up* on the latch and then pull the module out of the SFP connector.

NOTE. *Different types of SFP modules may have different latching mechanisms.*

MPX2-25 SFP module installation

To install an SFP module on an MPX2-25 monitor, insert the SFP module into the SFP connector. The module latches into place when fully inserted.

NOTE. *There are different types of SFP modules for 10GE and 25GE signals. If the SFP module does not match the unit signal setting (for example, a 25GE SFP module is installed and the unit is set for a 10GE signal), the Link Status (in Network, under Settings) returns “SFP Error.”*

To remove the SFP module, pull *down* on the latch and then pull the module out of the SFP connector.

NOTE. *To ensure you are using the correct SFP connectors, the 10GE, 25GE, and SDI SFP connectors are marked on the back of the MPI2-25 ([See MPI2-25 rear panel connectors.](#)) and MPX2-25. ([See MPX2-25 rear panel connectors.](#))*

Different types of SFP modules may have different latching mechanisms.

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 an 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 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. This section explains how.

Connect 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 6.)
2. Set up the instrument as described in this procedure. Choose 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.

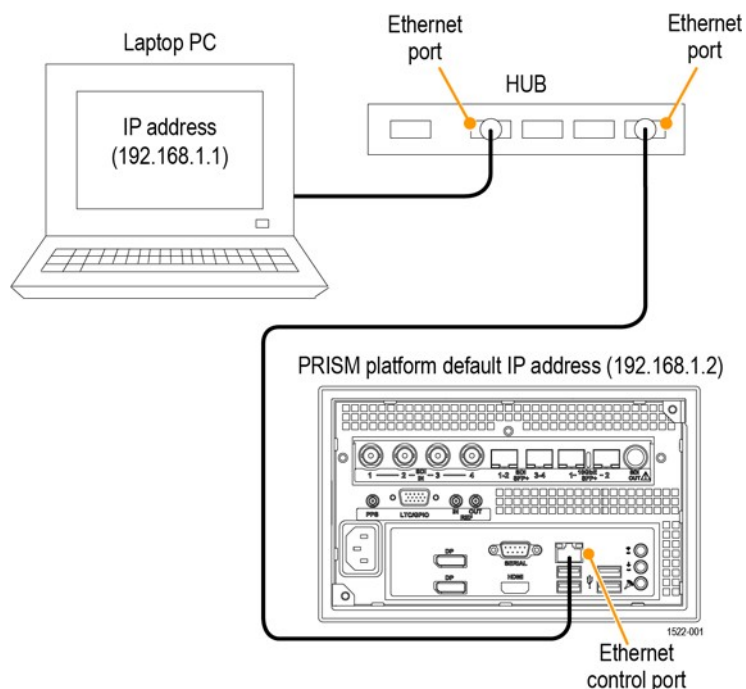


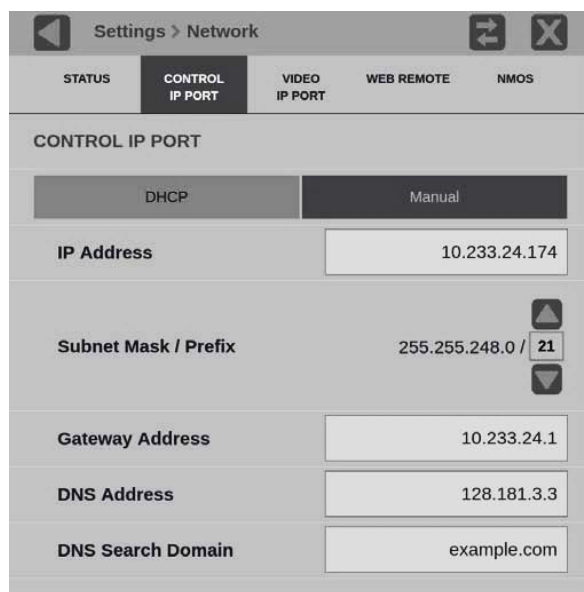
Figure 6: Connecting the instrument to a PC (MPI2-10 monitor shown)

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:

1. On the PRISM monitor, select the **Settings** icon () to display the Settings menu.
2. Select **Network** to open the Network submenu.
3. Select **CONTROL IP PORT** to open the Control IP Port submenu. (See Figure 7.)
4. Depending on your local network requirements, select **DHCP** or **Manual** to select the method for selecting an IP address.



Settings > Network				
STATUS	CONTROL IP PORT	VIDEO IP PORT	WEB REMOTE	NMOS
CONTROL IP PORT				
DHCP		Manual		
IP Address	10.233.24.174			
Subnet Mask / Prefix	255.255.248.0 /		21	
Gateway Address	10.233.24.1			
DNS Address	128.181.3.3			
DNS Search Domain	example.com			

Figure 7: 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, DNS address, and DNS Search Domain parameters you obtained from your LAN administrator. (Be sure to use compatible addresses between the PC and the instrument.)
6. Select an address box to open the address editing tool. Use the editing box as described for editing an IP input address. (See Figure 37.)



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.

7. Select the **Settings** icon () or select the Close icon () to close the Settings menu.

MPI2-25 rear panel connectors

The MPI2–25 rear panel figure shows the external connections to the instrument. (See Figure 8.) A description of each connector is provided.

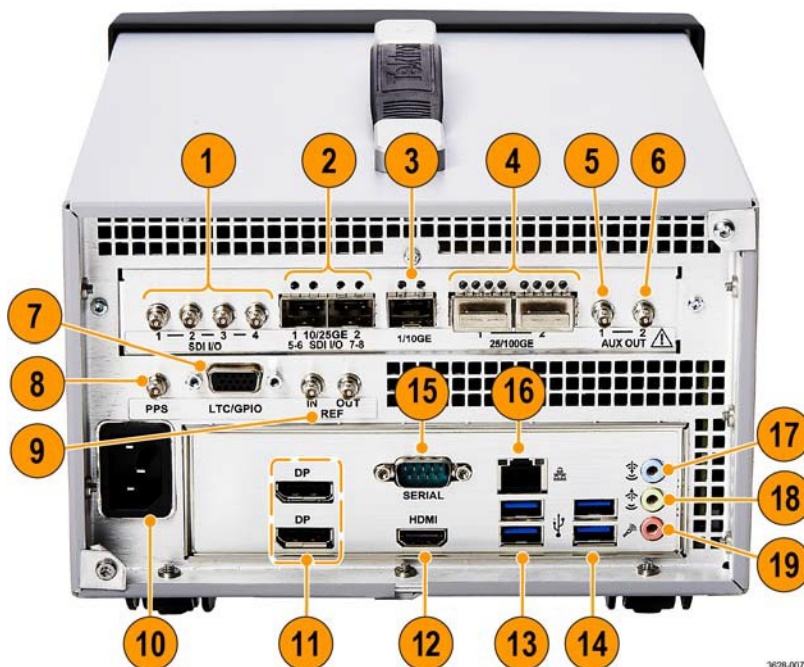
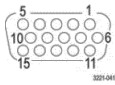
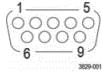


Figure 8: PRISM MPI2-25 rear panel

Table 3: Descriptions of PRISM MPI2-25 rear panel connectors

Item number (See Figure 8.)	Connector label, symbol, or end	Description
1	SDI I/O	Four HD-BNC inputs can operate in 4 modes: - SDI inputs 1-4 support SD/HD/3G/6G/12G signals. - Single SDI link (Option MP2-FMT-4K is required for 6G/12G support), when used as a single link, only one of the SDI 1-4 inputs is active at a time. - Quad 4K links, when used in conjunction with the SDI 1-4 inputs (Option MP2-FMT-4K only). When used as Quad 4K links, all four SDI inputs are active. - Eye diagram is up to 12G on SDI input 1 only for physical layer measurements, including automated measurement of 12G-SDI eye pattern parameters (requires Options MP2-FMT-4K and PHY).
2	10/25GE SDI I/O	Two SFP module slots can be configured for SDI or IP applications. 10/25GE Two optional SFP+ ports are for 10/25GE Ethernet applications. See MP-SFP products for available modules. - SDI I/O Two optional SFP+ ports can provide up to four SDI signal loop-through outputs, up to 12G for future functionality.
3	1/10GE	SFP IP port is for future functionality.
4	25/100GE	Two QSFP28 ports are for future functionality.

Item number (See Figure 8.)	Connector label, symbol, or end	Description
5	AUX OUT 1	SDI output of the selected SDI, ST2022, or ST2110 input: - Quadlink inputs (4k/8k) the Aux out is link 1 - ST2110-20/30 inputs are supported.
6	AUX OUT 2	SDI output of the selected SDI, ST2022, or ST2110 input: - Quadlink inputs (4k/8k) the Aux out is link 1 - ST2110-20/30 inputs are supported.
7	LTC/GPIO	LTC/GPIO is a D-type, 15-pin connector for future functionality.
		
8	PPS	PPS connector outputs a 1 PPS (pulse per second) signal when the instrument is locked to a PTP reference. 3.3v drive. TTL compatible.
9	REF IN – OUT	REF IN is used for analog reference signals black burst and tri-level sync for locking. REF OUT is a pass through of the REF IN.
10		Connector is for an AC power source.
11	DP	Two DisplayPort outputs are for external monitors. The output video format is 1920×1080. ¹ NOTE. An MPI2-25 can use a maximum of 1 external display, DP or HDMI.
12	HDMI	HDMI port output is for an external monitor. The output video format is 1920×1080. ¹ NOTE. An MPI2-25 can use a maximum of 1 external display, DP or HDMI.
13		Two USB 3.0 ports are for connecting a mouse and keyboard, importing or exporting instrument presets, upgrading the instrument firmware, or saving screen and stream captures.
14		Two USB 3.0 ports are for connecting a mouse and keyboard, importing or exporting instrument presets, upgrading the instrument firmware, or saving screen and stream captures.
15	 SERIAL	Serial interface, 9-pin connector, is not used.
16		Ethernet port is a standard RJ-45 connector for 10/100/1000Base-T Ethernet cable.
17		Audio input port is for future use.
18		Audio output (1/8-inch—3.5mm—line out) port is for headphones to listen to the selected audio channel pair. ²
19		Microphone input port is for future use.

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

² Audio output is an 1/8-inch (3.5mm) diameter port for a headset. It has connections for L and R audio channels. Headset plugs that are an 1/8-inch and have an additional contact for a microphone may not work because the headphone ports are not set for the spacing requirements of a third connection on the plug.

MPX2-25 rear panel connectors

The MPX2–25 rear panel figure shows the external connections to the rear panel of the instrument. (See Figure 9.) A description of each connector is provided. [See Front panel controls](#) for information about the front panel connectors.

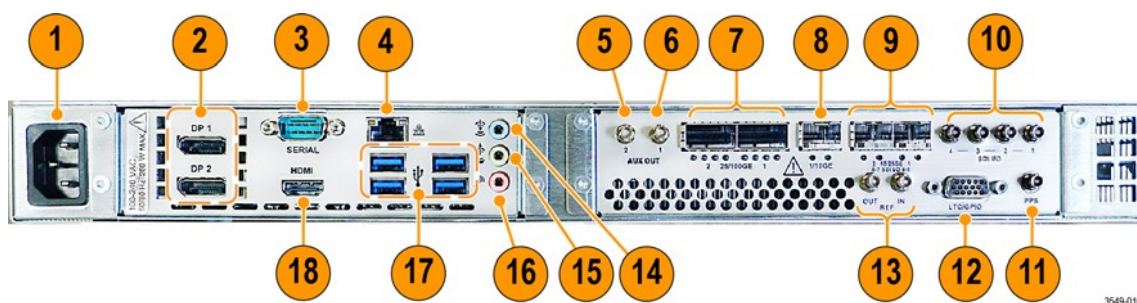
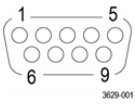
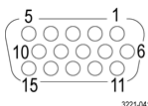


Figure 9: PRISM MPX2-25 rear panel

Table 4: Descriptions of PRISM MPX2-25 rear panel connectors

Item number (See Figure 9.)	Connector label, symbol, or end	Description
1		Connector is for an AC power source.
2	DP	Two DisplayPort outputs are for external monitors. The output video format is 1920×1080. ¹ NOTE. An MPX2-25 can use a maximum of 2 external displays, DP or HDMI.
3	 SERIAL	Serial interface, 9-pin connector, is not used.
4		Ethernet port is a standard RJ-45 connector for 10/100/1000Base-T Ethernet cable.
5	AUX OUT 2	SDI output of the selected SDI, ST2022, or ST2110 input: - Quadlink inputs (4k/8k) the Aux out is link 1 - ST2110-20/30 inputs are supported.
6	AUX OUT 1	SDI output of the selected SDI, ST2022, or ST2110 input: - Quadlink inputs (4k/8k) the Aux out is link 1 - ST2110-20/30 inputs are supported.
7	25/100GE	Two QSFP28 ports are for future functionality.
8	1/10GE	SFP+ IP port is for future functionality.
9	10/25GE SDI I/O	Two SFP+ module slots can be configured for SDI or IP applications. 10/25GE Two optional SFP+ ports are for 10/25GE Ethernet applications. See MP-SFP products for available modules. - SDI I/O Two optional SFP+ ports can provide up to four SDI signal loop-through outputs, up to 12G for future functionality.
10	SDI I/O	Four HD-BNC inputs can operate in 4 modes: - SDI inputs 1-4 support SD/HD/3G/6G/12G signals. - Single SDI link (Option MP2-FMT-4K is required for 6G/12G support), when used

Item number (See Figure 9.)	Connector label, symbol, or end	Description
		as a single link, only one of the SDI 1-4 inputs is active at a time. • Quad 4K links, when used in conjunction with the SDI 1-4 inputs (Option MP2-FMT-4K only). When used as Quad 4K links, all four SDI inputs are active. • Eye diagram is up to 12G on SDI input 1 only for physical layer measurements, including automated measurement of 12G-SDI eye pattern parameters (requires Options MP2-FMT-4K and PHY).
11	PPS	PPS connector outputs a 1 PPS (pulse per second) signal when the instrument is locked to a PTP reference. 3.3v drive. TTL compatible.
12	LTC/GPIO	LTC/GPIO is a D-type, 15-pin connector for future functionality.
		
13	REF IN – OUT	REF IN is used for analog reference signals black burst and tri-level sync for locking. REF OUT is a pass through of the REF IN.
14		Audio input port is for future use.
15		Audio output (1/8-inch—3.5mm—line out) port is for headphones to listen to the selected audio channel pair. ²
16		Microphone input port is for future use.
17		Four USB 3.0 ports are for connecting a mouse and keyboard, importing or exporting instrument presets, upgrading the instrument firmware, or saving screen and stream captures.
18	HDMI	HDMI port output is for an external monitor. The output video format is 1920×1080. ¹

NOTE. An MPX2-25 can use a maximum of 2 external displays, DP or HDMI.

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

² Audio output is an 1/8-inch (3.5mm) diameter port for a headset. It has connections for L and R audio channels. Headset plugs that are an 1/8-inch and have an additional contact for a microphone may not work because the headphone ports are not set for the spacing requirements of a third connection on the plug.

Display elements

The elements of the display figure shows the key elements of the internal monitor. (See Figure 10.) Descriptions of the elements are provided in Table 5:
Descriptions of PRISM display elements.



Figure 10: Elements of the display (MPI2-25 monitor shown)

Table 5: Descriptions of PRISM display elements

Item number (See Figure 10.)	Description
1	Application tile 1 ¹
2	Application tile 2 ¹
3	Application tile 3 ¹
4	Application tile 4 ¹
5	Status bar: The left side of the Status bar has icons with links to various instrument settings including volume (Volume), presets (Presets), global settings (Settings), input type (Input), and the application toolbar (Toolbar). Select the Home icon (Home) to exit any displayed menus. The right side of the status bar lists instrument status such as the selected input, type of input signal, selected signal reference, video/reference signal status, audio channel status, the real time clock setting, and a link to the Activity menu (Activity).
6	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, we strongly recommend you first shut down the instrument before disconnecting the power cord. Press Power/Standby or select Settings, Utilities, Power , and then Power Down Now .
7	Application tabs: Some applications have selectable tabs (highlighted readouts) you can use to display additional information.
8	Application name: Lists the name of the displayed application.

¹ The applications can be in quarter-screen display, half-screen display, or one application in full-screen display.

Activity center

The Activity center tracks messages and devices in the PRISM. For example, you can view messages that allow you to eject devices mounted to the instrument. These steps explain how to eject a USB drive from the instrument using the Activity center.

A number above the Activity icon indicates the number of messages and devices mounted on the instrument. (See Figure 11.)

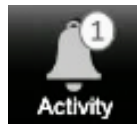


Figure 11: Activity icon with one message

1. Select the **Activity** icon () to view the messages or devices mounted to the instrument. (See Figure 12.)

NOTE. After inserting a USB drive, it must be unmounted using the Activity icon before removing it from the instrument.



Figure 12: Activity center popup window

2. Select the **Eject** icon () to unmount the USB drive from the instrument.
3. Select the **Activity** icon () again to close the window.

Methods of operation

This section describes the primary methods of operating the instrument:

- MPI2-25 front panel touchscreen
- MPX2-25 front panel controls
- External touchscreen display
- Keyboard and mouse
- Remote control using VNC
- Remote control using API commands

MPI2-25 touchscreen operation

The PRISM display in four-tile mode figure shows the instrument display with the application selection menu open. (See Figure 13.)



Figure 13: PRISM display in four-tile mode with the All Applications menu open

Supported touchscreen gestures

Use these touchscreen gestures to control the instrument:

- Touch or tap the screen to select display elements.
- Double tap an application to change the display between a quarter-screen and a full-screen display or between a half-screen tile and a full-screen display of the selected application. Double tap a full-screen display to return to the quarter- or half-screen tile.
- Swipe up or down, or left or right as necessary to move through menus and preset listings and to view additional application information.
- Some applications support pinch and zoom.

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

Select and control an application to display

Open a different application in a tile:

1. Select the **Tiles** icon () to open the Application toolbar. (See Figure 14.)

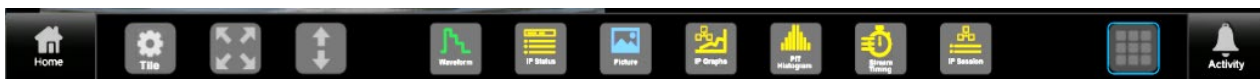


Figure 14: An example of the Application toolbar

NOTE. The applications visible in the Applications toolbar can be changed by the user to any number of applications, up to eight, in any order.

2. Select a tile to replace with a different application
3. Select an application from the application toolbar.
4. If an application is not on the application toolbar, select the All Application menu icon (), on the right of the application toolbar.
5. Select the application from the All Application menu. (See Figure 15.)



Figure 15: An example of the All Application menu

NOTE. The applications in the All Applications menu can vary depending on what options the user has ordered.

Change the applications in the Application toolbar:

1. In the All Applications menu, select **Edit** from the menu header.
 - o Select an application marked with a number to remove it from the application toolbar.

NOTE. Removed applications leave that space open in the Application toolbar only while the menu is in edit mode. If there is a space in the application list when the changes are saved, the applications are consolidated on the left and any spaces are moved to the right.

- Select **Clear All** to remove all the applications from the Application toolbar.
- Select an application that is not marked with a number to add it to an empty space in the application toolbar.

NOTE. The applications are added to the Applications menu from the left. If the number 2 and 3 spaces are empty, the next selected application is added to the number 2 space.

2. Select **Save** in the All Applications menu.

If you do not save the changes (if you select the Close icon () before saving) a warning appears asking if you want to save the changes. Select **Ok** to save the changes or **Cancel** to close the All Applications menu and return the Application toolbar to the layout before you selected Edit.

3. Select the Close icon ()

Access an application settings menu:

1. Select the tile with the application.
2. Select the **Tiles** icon () on the left of the application toolbar.
3. Select the **Tile** icon ()

The application Settings menu opens.

Change the design of the interface:

- In the All Applications menu header, select the Colored Icons **On-Off** button to turn the color of the application icons on or off (this includes the applications in the All Applications menu and the Applications menu).
- In the All Applications menu header, select **Border Color** to pull down the menu of color options for the border that highlights the selected tile. Select Blue, White, or Yellow as the color.

Change the size of a tile:

- Select the Full-screen icon () in the menu bar to change the selected application display to full screen, or double tap a tile.

When a tile is in full-screen-mode, select the Reduce icon () in the menu bar to return to quarter- or half-screen mode. Double tap a full-screen application to return it to a quarter- or half-screen tile.

- Select the Half-screen icon () in the menu bar to change the selected tile to vertical extended mode. The tile increases to the height of the screen, covering the second tile above or below it.

The vertical extended mode is useful for when you want to view two application displays side-by-side.

When a tile is in vertical extended mode, select the Compress icon () in the menu bar to return to quarter-screen mode.

- If available, select the Reset icon () to clear or reset the selected display.

Use on-screen tools

Some settings for the Waveform, Vector, Lightning, and Stop Display applications are available outside the settings menu through on-screen tools. Applications with on-screen tools enabled have buttons on the top and bottom of the display that allow you to adjust the application settings. (See Figure 16.) When first selecting one of the displays, a highlighted ring appears around each available on-screen tool such as Gain, Format, Sweep, Cursors and Position. For instructions on how to use each on-screen tool, see these application sections:

- Waveform ([See Waveform application on-screen tools.](#))
- Vector ([See Vector application on-screen tools.](#))
- Lightning ([See Lightning application on-screen tools.](#))
- Stop Display ([See Stop Display application on-screen tools.](#))

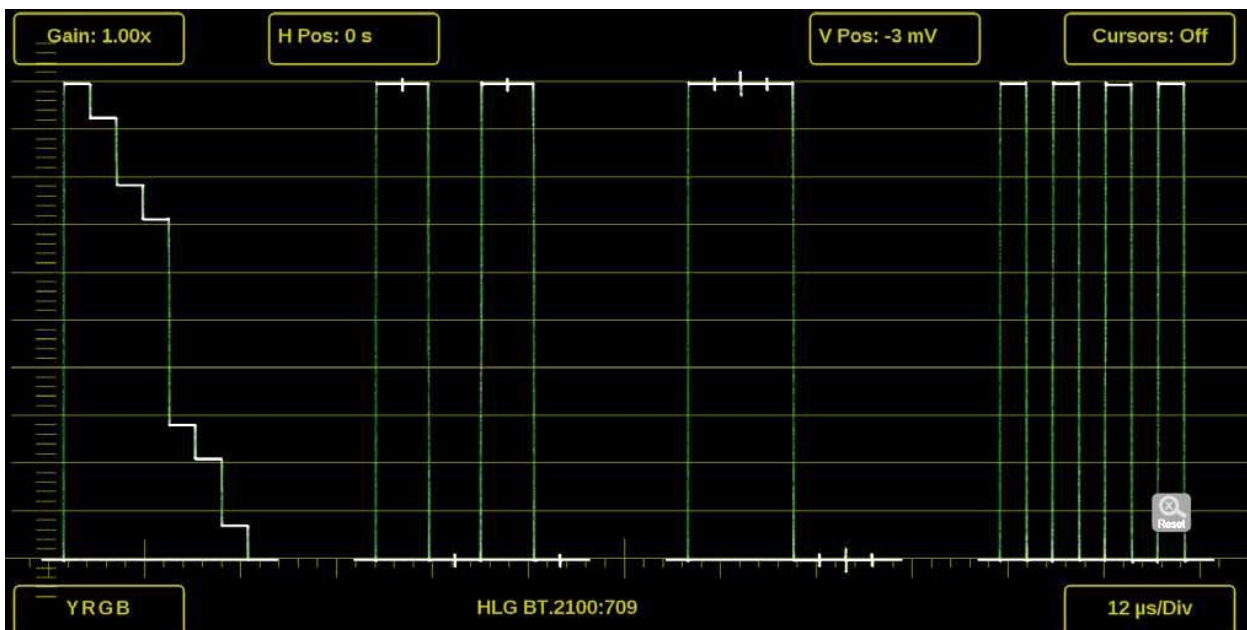


Figure 16: Waveform on-screen tools

MPX2-25 front panel controls

The MPX2-25 front-panel controls figure shows the key controls on the front panel. (See Figure 17.) Descriptions of the elements are provided.



Figure 17: MPX2-25 front-panel controls

Table 6: Descriptions of PRISM MPX2-25 front-panel controls

Item number (See Figure 17.)	Description
1	Power / Standby button: Press to turn the instrument on or off. To completely remove power from the instrument, remove the power cord.
	CAUTION. To prevent data loss, we strongly recommend you first shut down the instrument before disconnecting the power cord. Press Power / Standby or select Settings, Utilities, Power , and then Power Down Now .
2	BALANCE control: Turn to adjust the balance on the front and rear panel headphone and optional speaker outputs. Push the BALANCE control to re-center the balance. ¹
3	PRESET button: Press one time 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
4	SELECTIONS buttons (1-6): 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.
5	VOLUME control: Turn to adjust the volume on the front and rear-panel headphone outputs. Push the VOLUME control to mute or unmute the audio. ¹
6	Audio output: (1/4-inch—6.35mm—line out) port is for using headphones to listen to the selected audio channel pair.
7	USB ports: There are two 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.
8	INPUT button: Press to prepare the instrument for an input selection using the SELECTIONS buttons (1-6). ¹
9	Speakers: There are two integrated 2.1 speakers for listening to the selected audio channel pair. Requires Option SPKR.

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 or BALANCE control, the volume or balance slider and mute controls appear on the display and close after a short time-out period.

MPX2-25 front panel operation

Use the instrument front panel to perform these functions:

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

Recall instrument presets: To recall instrument presets using the front panel:

1. Press the **PRESET** button one time 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 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.

Select an input to monitor: To select an input to monitor 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 on applications to perform actions like you would on the touch panel.

Connect the keyboard and mouse:

- Use the USB ports on the rear panel of the instrument (MPI2-25) or front panel (MPX2-25).
- 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 Display Port or HDMI (MPX2-25).

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: Table 7 lists the keyboard controls to quickly select between the SDI inputs and to select from instrument presets 1 through 6.

Table 7: 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 these two options:
 - Press **ALT** and **i** at the same time to make an input selection change.
 - Press **ALT** and at the same time press **p** one time to recall a preset from Preset Group A. Press **p** 2-5 times to select a preset from another Preset Group (B-F). For example, press ALT and at the same time and press p three times to make a selection from Preset Group C.
2. Press a number from **1** to **6** to select the 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.*

We recommend you reboot the instrument after connecting an external touchscreen.

Manage 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. These 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

There are several half screen configurations. (See Figure 18 and Figure 19.)

Select the **Tiles** icon () and then select the Half-screen icon () to expand the tiles vertically.

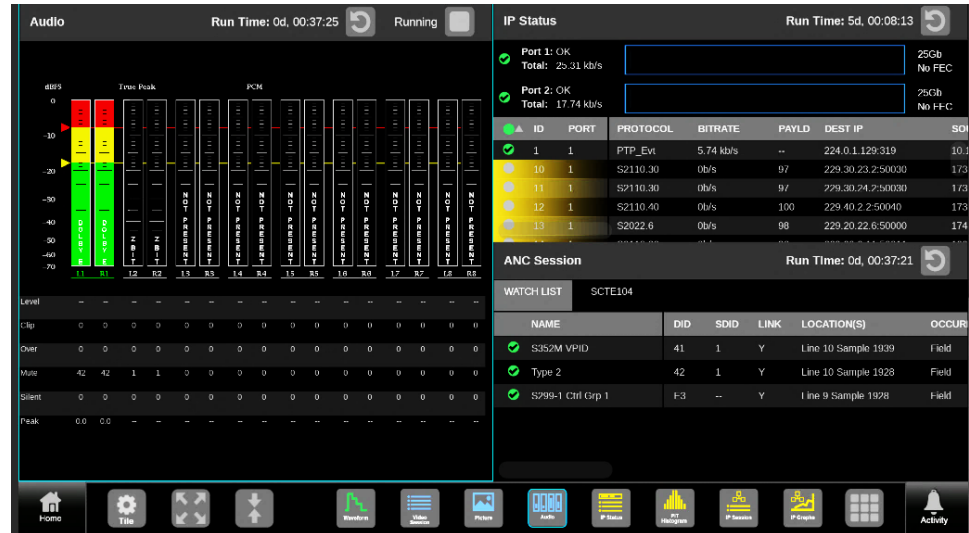


Figure 18: One half screen application and two quarter screen applications

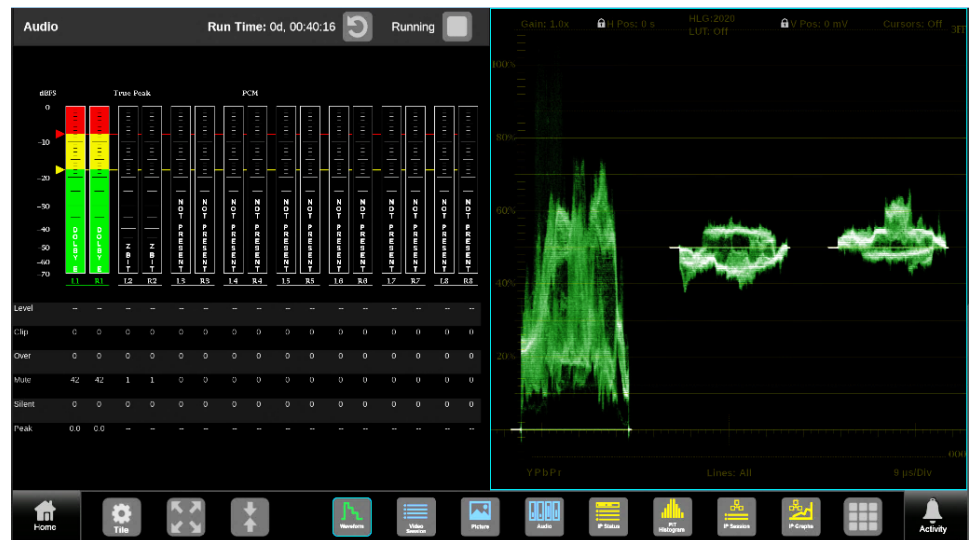


Figure 19: Two half screen applications: Audio and Waveform displays.

Full-screen tile

Figure 20 shows a full-screen display. One tile has expanded to use the entire PRISM monitor. There are two methods to change to and from full-screen mode.

- Double tap on the application to change it between full-screen and quarter- or half-screen mode.
- Select the **Tiles** icon (🧩) to open the application toolbar and select the Reduce icon (🔍) or the Full-screen icon (🖥️) to change between modes.

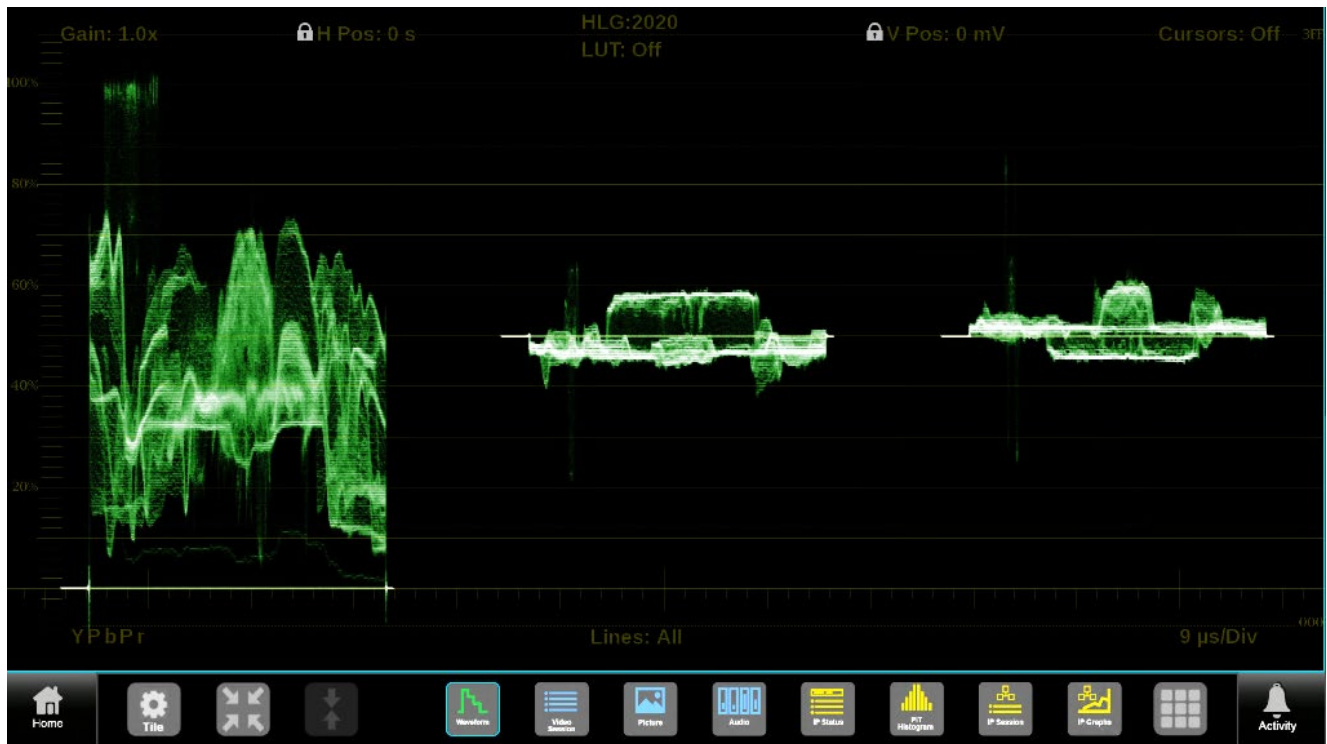


Figure 20: Full screen tile

Quarter screen tiles

Figure 21 shows a display with quarter screen tiles. Sizing tiles to a quarter screen allows you the flexibility to view up to four tiles at the same time. There are two ways to change between full-screen and quarter-screen modes:

- Double click or double tap an application to change between quarter-screen tile and full-screen mode.
- Select the **Tiles** icon (🧩) to open the application toolbar and select the Reduce icon (🔍) or the Full-screen icon (🖼️) to change between modes.

To extend a tile vertically: In the application toolbar, select the Half-screen icon (📺) to expand the tile vertically; select the Compress icon (📺) to collapse the tile to a quarter-screen.

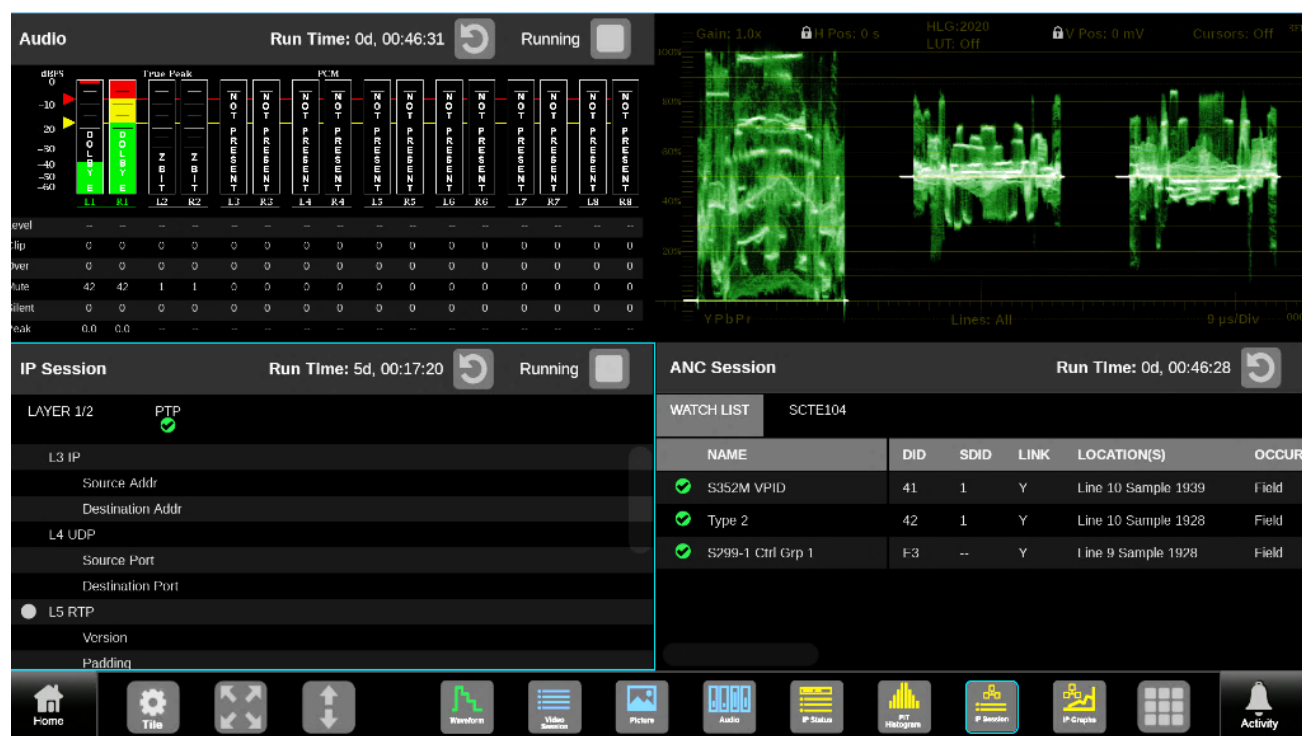


Figure 21: Four quarter-screen tiles

Remote control through 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. Connect to the PRISM monitor by using VNC:

VNC client: When using VNC for extended periods of time, we recommend using a VNC client:

1. On the PRISM monitor to connect to, select the **Settings** icon () and then select **Network**.
2. Find the Control IP Port IP address of the instrument.
3. On your computer, open your VNC client and enter the IP address from the Control IP Port of the instrument in the VNC Server search bar.

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

NOTE. A unique PRISM hostname can be used instead of the IP address.

To set a hostname:

1. Sign into the unit.
2. Select the **Settings** icon () , select **Network**, and then select the **WEB REMOTE** tab.
3. Enter the new hostname.in the Hostname field.

Web browser: To connect to the instrument through a web browser:

1. On the PRISM monitor to connect to, select the **Settings** icon () , then select **Network**, and find the Control IP Port IP address of the instrument.
2. Enter the hostname or IP address in a web browser.

The PRISM HOME page opens.

3. Select **noVNC Access**.

A login webpage opens. (See Figure 22.)



Figure 22: PRISM noVNC web page

4. In the Control bar, select the Settings icon () to open the Settings menu. (See Figure 23.)
5. In the Settings menu, use the Scaling Mode drop-down list to select **Local Scaling**, and then select **Apply**.

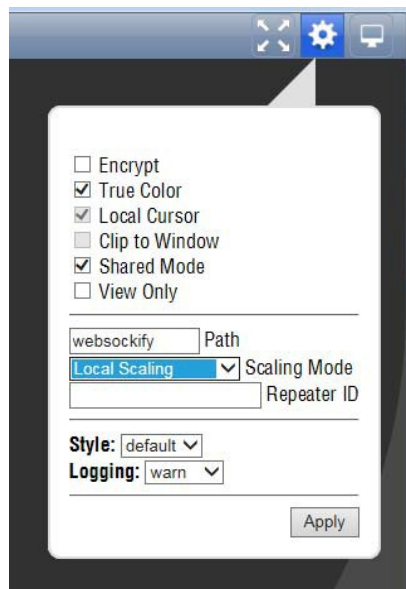


Figure 23: Settings menu with Local Scaling selected

6. In the Control bar, select the Connect icon () to open the Connect menu. (See Figure 24.)
7. In the Settings menu, enter the password for the PRISM, and then select **Connect**.

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. To change the default password for the remote web connection, in the PRISM Settings, in the Network menu, open the WEB REMOTE tab.

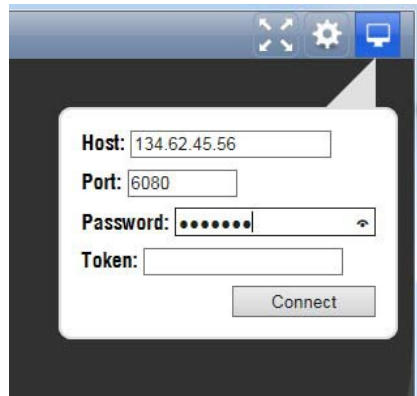


Figure 24: Settings menu with the password entered

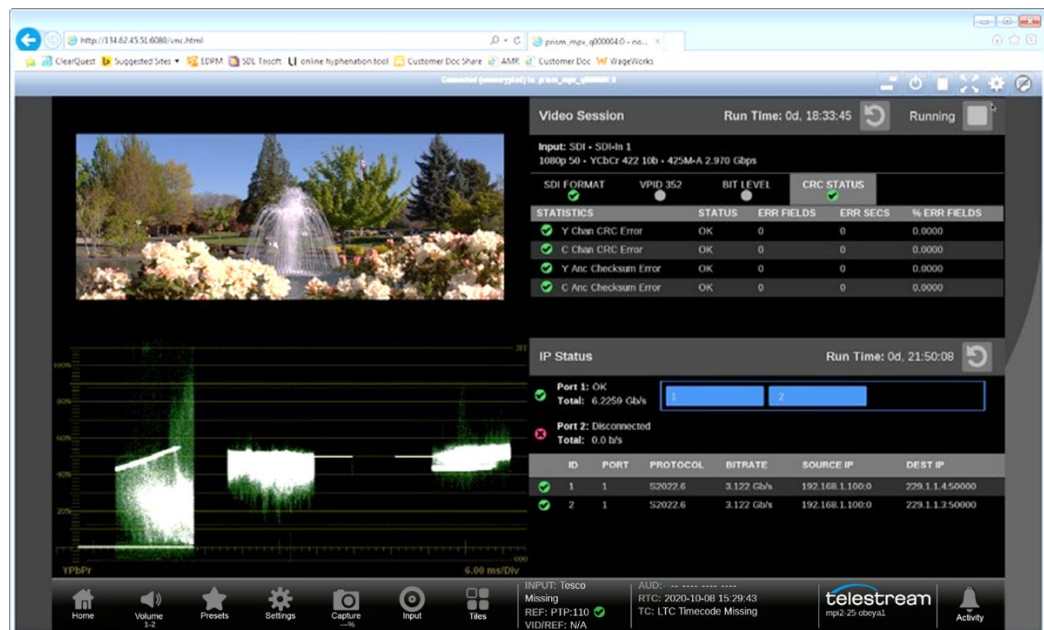


Figure 25: Sample web browser with an instrument displayed

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 through API commands

The PRISM monitor has a 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.

To access the API documentation:

1. Find the PRISM hostname: on the Status bar, under the Telestream logo, next to the Activity icon. (See Figure 26.)

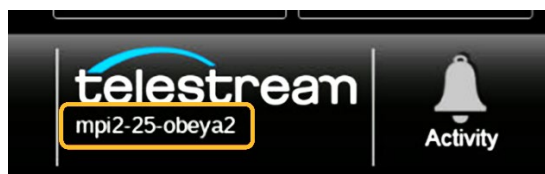


Figure 26: Status bar with sample hostname marked

Or find the IP address: select **Settings**, then **Network**, and under CONTROL IP PORT find the IP Address.

2. Enter the hostname or IP address in a web browser.
The PRISM HOME page opens.
3. Select **API Help Page**.
4. If you have set a unique hostname for the instrument, enter it in the browser address bar and select the API Help Page link.

A PRISM API Documentation web page similar to Figure 27 opens.

PRISM API DOCUMENTATION



Choosing a Scope:

To send a scope with an API request add a slash followed by the desired scope to the URL.

Example: localhost:9000/api/API_NAME/SCOPE

Selecting a field in a returned object:

If a GET request returns an object, a specific member can be selected by adding a field query to the URL. To access a member enter the path to it, starting with "object" and separated by "." .

Example: localhost:9000/api/API_NAME?field=object.parent1.parent2.target

NAME	MODE	DATATYPE/PARAMETERS	DESCRIPTION
anc_session_control	GET / POST	ints	Reset anc session. Option: ANC_ENGINE_SESSION_CONTROL_RESET.
audio_ballistic	GET / POST	ints	Ballistic Type for Audio Bars. Available Options: AUDIO_BALLISTIC_PPM_1, AUDIO_BALLISTIC_PPM_2
loudness_loud_level	GET / POST	floats	Loudness loud level, valid range is in between 0 to -30
loudness_quiet_level	GET / POST	floats	Loudness quiet level, valid range is in between 0 to -60
loudness_target_level	GET / POST	object	Loudness target levels as part of JSON Object. An example of Loudness target levels <pre>{ "target" : Target threshold in LKFS (Loudness units), Valid Range is in between 0 to -31dB "targetLow" : Relative Offset below the target level, (In Loudness Unit(LU): Ranges from 0.0 to -1.0) "targetHigh" : Relative Offset above the target level, (In Loudness Unit(LU): Ranges from 0.0 to 1.0) }</pre>
audio_program_surround_order	GET / POST	ints	Select audio program surround order. Available Options: AUDIO_PROGRAM_SURROUND_ORDER_0, AUDIO_PROGRAM_SURROUND_ORDER_1

Figure 27: API documentation web page

How to configure the instrument

Most of the instrument settings are controlled using the Settings menu. To access the global settings menu, select the **Settings** icon () in the status bar. This section describes how to configure these instrument settings:

- Signal inputs ([See Configure and select signal inputs.](#))
- HDR monitoring ([See Configure the instrument for HDR/WCG monitoring.](#))
- PTP reference settings ([See Configure reference settings.](#))
- Presets ([See Set and recall instrument presets.](#))
- Internal time and date ([See Set time and date.](#))
- Firmware upgrade ([See Upgrade instrument firmware.](#))
- Installed software and hardware versions ([See Verify the firmware upgrade.](#))

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.

Configure and select signal inputs

The PRISM monitor allows you to configure multiple signal inputs.

Select **Settings**, and then select **Inputs** menu to:

- configure SDI inputs,
- configure IP stream inputs, including ST2022-6 and ST2110-20/30/40 IP streams,
- modify input names,
- enable ST2022-7 Seamless Switching.

The input selection of the PRISM is displayed in the middle of the status bar. The first line is the user defined name and the second line is the format.



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

Quad link SDI is only available when software option MP2-FMT-4K or MP2-FMT-8K is present. If this option is not present, only a single-link input can be configured.

Single link input configuration:

1. Select the **Settings** icon () to open the Settings menu.
2. Select **Inputs** to open the Inputs submenu. (See Figure 28.)



Figure 28: Sample Settings inputs menu

NOTE. *The virtual inputs can be given any meaningful name.*

3. Select an SDI input. (See Figure 29.)

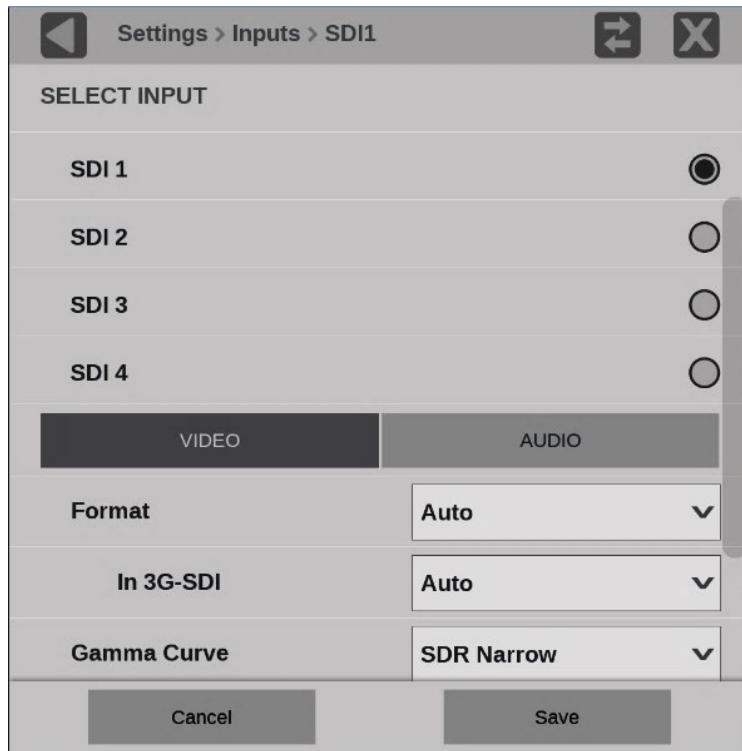


Figure 29: Settings inputs submenu

4. Select **Single** for the Input Configuration and select one of the four physical SDI inputs to monitor. (See Figure 30.)



Figure 30: Single SDI signal configuration, SDI 1 input selected

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

NOTE. The 8K format trace applications—Waveform, Stop, Vector, Diamond, and Lightning Displays, enabled by MP2-FMT-8K—are rendered based on the resized 8K signal and are suitable for operational applications such as setting camera exposure for live programming. However, this approach may not be suitable for some engineering applications. This approach only impacts 8K formats and not SD/HD/3G/4K formats in either operations or engineering.

Quad Link input configuration

NOTE. All four SDI inputs must be connected to a cable on the back of the PRISM to use Quad Link Inputs.

1. Select the **Settings** icon (⚙️) to open the Settings menu.
2. Select **Inputs** to open the Inputs submenu.
3. Select an input and then select **SDI**.
4. Confirm the 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
5. Select **Quad Link** for the Input Configuration. SDI 1-4 (Link A-D) is selected by default. (See Figure 31.)



Figure 31: Quad Link SDI signal configuration

NOTE. The Quad Link and UHD/4K Mode buttons are only available when software option MP2-FMT-4K is present.

6. 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.

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

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

NOTE. *The preferred setting for all video options is Auto. At this setting the PRISM determines the correct settings from the signal or any metadata (if present).*

1. Select **Video**. (See Figure 32.)

VIDEO	AUDIO
Format	Auto ▼
In 3G-SDI	Auto ▼
Gamma Curve	Auto ▼
Structure	Auto ▼
Color Gamut	Auto ▼
Cancel Save	

Figure 32: Video Signal Options

2. Choose the Format option from the drop-down menu:
 - Auto: The system selects the correct setting based on the information in the incoming signal.
 - 525I
 - 625I
 - 720P
 - 1080I
 - 1080PsF
 - 1080P
 - 2160P
3. If a 3-gigabit transport is being used, select the In 3G-SDI drop-down menu and choose:
 - Auto: The system selects the correct setting based on the information in the incoming signal.

- Level A
 - Level B
4. Choose the Gamma Curve selection from the drop-down menu. The selection characterizes the video signal on each virtual input.
- **Auto:** The system selects the setting based on ST352 VPID. If ST352 VPID is not present, SDR Narrow is selected.
 - **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 is defined in ITU-R BT.1886 with gamma of 2.4.

The Narrow scaling places the extremes of the nonlinear color value from zero to unity at code words 40h(64) and 3Ach(940) in a 10bit representation for 0% Black to 100% White.
 - **SDR Full:** 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 full scaling places the extremes of the nonlinear color value from zero to unity at code words 0d and 1023d in 10bit representation and 0d and 4095d in 12bit representation for 0% black and 100% white, respectively.
 - **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 narrow scaling places the extremes of the nonlinear color value from zero to unity at code words 40h(64) and 3Ach(940) in a 10bit representation for 0% Black to 100% White.
 - **PQ Full:** 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 full scaling places the extremes of the nonlinear color value from zero to unity at code words 0d and 1023d in 10bit representation and 0d and 4095d in 12bit representation for 0% black and 100% white, respectively.
 - **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 OETF (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.

5. Choose the Structure option from the pull-down menu:
 - Auto: The system selects the correct setting based on ST352 VPID. If VPID is not present, YCbCr 422 10bit is selected.
 - YCbCr 4:2:2 10bit
 - YCbCr 4:2:2 12bit
 - RGB 4:4:4 10bit
 - RGB 4:4:4 12bit
6. Choose the Color Gamut option from the drop-down menu to select the color space of the video signal selection:
 - **Auto:** The system selects the setting based on ST352 VPID. If ST352 VPID is not present, Rec. 709 is selected.
 - **Rec. 709:** Standard for HD
 - **Rec. 2020:** Standard for 4K

NOTE. Rec. 709 gamut is automatically selected when the SD format is detected / selected in the video signal

Audio settings: The Audio settings describe how the audio is embedded in the SDI input signal.

1. Select **AUDIO**. (See Figure 33.)

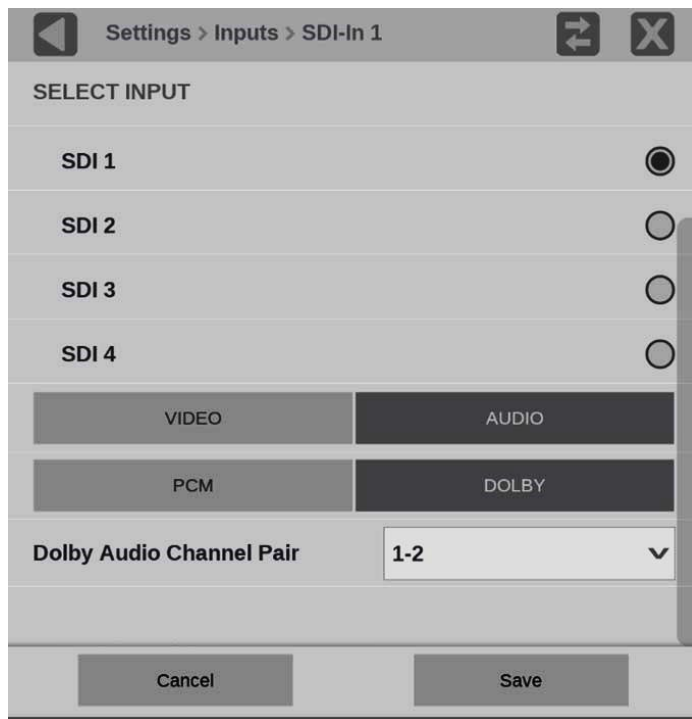


Figure 33: Audio signal settings

2. Choose the type of audio. [Select PCM](#) or [Select DOLBY](#) (use of Dolby requires the MP2-DLBY license).

Select PCM:

- a. Select **Program Configuration**.
- b. Move the Program Configuration slider to **On**. (See Figure 34.)
- c. Select **Edit**.



Figure 34: Program Configuration settings

- d. Select the type of program (mono, stereo, etc.) and select the audio channel to assign it. Repeat until all the audio in the current input signal have programs assigned to channels.
 - **M** is mono, 1 channel.
 - **ST** is stereo, 2 channels.
 - **5.1** is surround sound, 6 channels.
 - **7.1** is surround sound, 8 channels.
 - **Unassigned** removes an assignment from a channel. Click **Unassigned** and click any block in an assignment, for example the middle of a 7.1 assignment, the entire assignment is removed and is not displayed on the Audio application.
 - **Default** resets the channels to 8 stereo pairs.
 - **Clear** removes all assignments, including the default.
- e. Select **Save** and close the menu.

NOTE. You must save the program configuration to update the programs in the audio bars and loudness meter.

Select DOLBY:

- a. In the Dolby Audio Channel Pair menu, select the audio channel pair that contains Dolby audio.

Dolby audio in the selected channels are then decoded. Only Dolby E decode is supported.

- b. Select **Save** and close the menu.

NOTE. Audio programs configured in the Program Configuration menu are used to select a program for measurement by the Loudness application, to display audio bars in the Audio application, and to monitor with headphones. When all the channels are unassigned, all the channels are treated as stereo pairs. The audio programs in the Dolby E stream are automatically set up based on the Dolby E metadata.

Rename a signal input.

1. Select the **Name** box to open the text editing display, as shown in Figure 35.

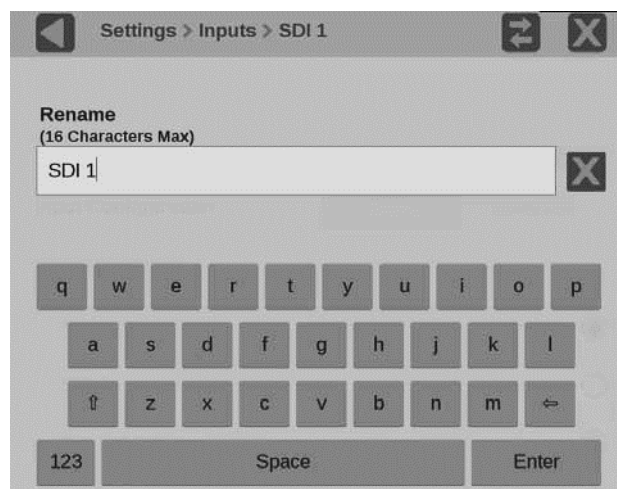


Figure 35: Renaming a signal input

2. Use the editing controls to enter a new name for the input. Some notes on using the text editor:
 - Enter a name with a maximum of 16 characters.
 - Select the Clear icon (X) next to the input box to remove 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-abc** key to change between accessing letters and numbers/symbols.
3. When you are done editing the input name, select the **Enter** key.
4. When you are done editing the input, select **Save** to save your changes.

Configure IP stream inputs

To configure an IP stream:

1. Select the **Settings** icon (⚙️) to open the Settings menu.
2. Select **Inputs** to open the Inputs submenu.
3. Select the input from the list.
4. Select **IP**. (See Figure 36.)

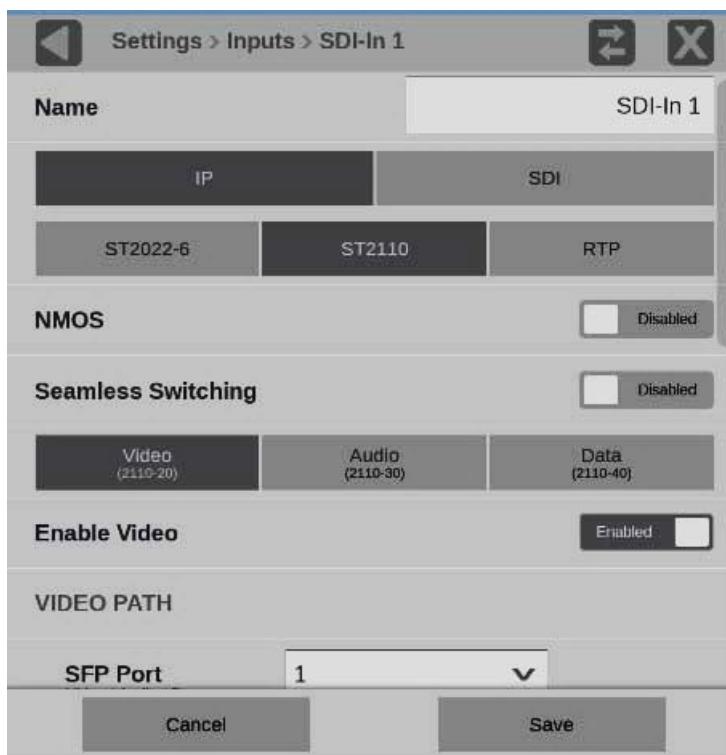


Figure 36: IP input protocols

Configure ST2022: To monitor ST2022 streams:

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 10/25GE signal. Path 1 and Path 2 are the signal paths to be used for seamless switching. This differentiation is being made because it is possible for both Path 1 and Path 2 to use a single port.

NOTE: With ST2022-7 seamless switching, a reconstructed output stream is created from the two input streams. The reconstructed stream is used downstream for various display tiles like Picture. The buffer size to absorb the packet reception time difference between Path1 and Path2 is 10ms. The output stream reconstruction will not work properly for streams on Path1 and Path2 with skew greater than 10ms. This error makes tiles show the wrong images and information.

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

NOTE. Path 2 is only available if ST2022-7 Seamless Switching is enabled. You may have to scroll down to see Path 2.

4. To have the instrument ignore a parameter, select the **Unmasked** control next to the parameter to change the state to Masked.
5. To edit one of the parameter values, select inside the parameter box to open the editing display, as shown in Figure 37.

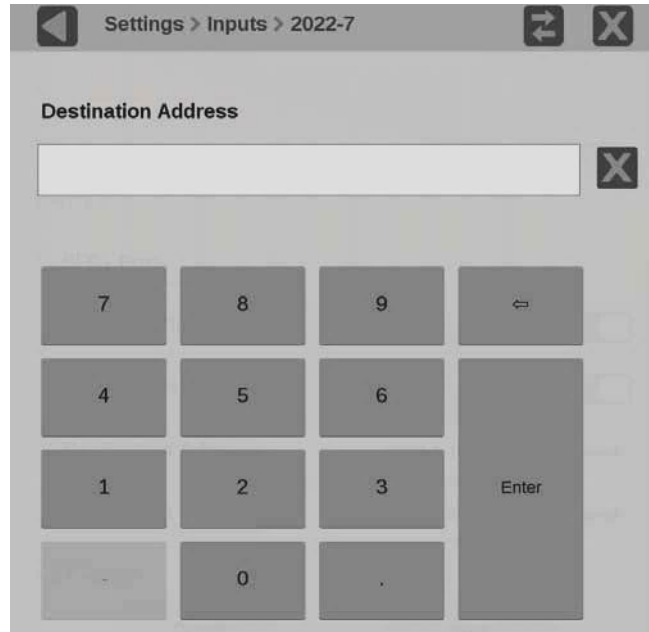


Figure 37: Editing parameter fields

6. When you are done editing, select **Enter**.
7. Scroll down to enter the Source and Destination information for Path 2.

NOTE. Path 2 is only available if ST2022-7 Seamless Switching is enabled.

8. Select the Gamma and Color Gamut settings for the video stream. [See Video IP input settings](#) for available Gamma and Gamut selections.
9. Select **Save** and close the menu.
10. Configure the data rate. ([See Configure the data rate.](#))
11. To begin monitoring this input, select the configured input. ([See Input selection.](#))

Configure ST2110: To monitor ST2110 streams:

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 Enable NMOS discovery and registration.](#))

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

NOTE. For Seamless Switching, the two Path 1 and Path 2 streams should be identical. If the streams are not identical, error messages are shown in the Status Bar.

There is a difference between “port” and “path”. The port is the physical SPF port that is used to input the 10GE signal. Path 1 and Path 2 are the signal paths to be used for seamless switching.

NOTE: With Seamless Switching, a reconstructed output stream is created from the two input streams. The reconstructed stream is used downstream for various display tiles like Picture. The buffer size to absorb the packet reception time difference between Path1 and Path2 is 10ms. The output stream reconstruction will not work properly for streams on Path1 and Path2 with skew greater than 10ms. This error makes Picture tiles show the wrong image.

4. Configure the Video (2110-20) stream tab:
 - a. Select the **Video** tab.
 - b. Move the Enable Video slider to **Enabled** to begin configuration. (See Figure 38.)

Figure 38: Enable a ST2110-20 video stream

- c. Enter the information in SFP Port, Source Addr, Source Port, Destination Addr., and Destination Port for each video stream.
 - d. Set the RTP Payload Type between 96 and 127.
 - e. Set the Packet Read Schedule (PRS) to Gapped, Narrow Linear, or Wide Linear to correctly measure the CMAX and VRX buffer measurements in the IP graphs.

NOTE. The PIT Histogram can be used to determine if the signal is a gapped, narrow-linear, or wide-linear stream.

- f. Set the TR Offset, which defines the timing reference offset of the sender for network delays. Select Auto to provide an offset based on the current video standard.
 - g. Select the Gamma Curve and Color Gamut settings for the video stream. [See Video IP input settings](#) for available Gamma and Gamut selections.
5. Configure the Audio (2110-30) stream tab:
- a. Select the **Audio** tab.
 - b. Select the stream to configure (1-4). (See Figure 39.)

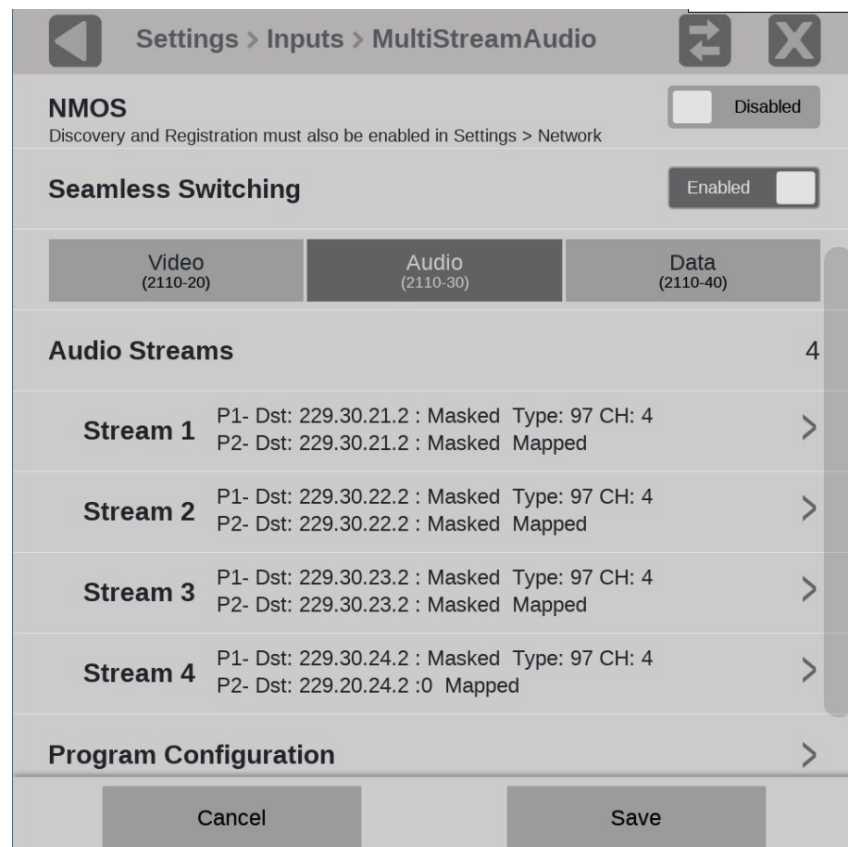


Figure 39: Select an ST2110-30 audio stream

- c. Move the Enable Audio Stream slider to **Enabled** so the audio stream is subscribed from the media switch.
- d. Move the Map Stream 1 slider to **Enabled** so the audio stream appears in the Audio applications. (See Figure 40.)
- e. Enter the information in SFP Port.

NOTE: The SFP (physical) Port configuration is common for Video, Audio and Data.

- f. Enter the Destination Addr., which must be unique for each audio IP stream.

NOTE: The Source Addr, Source Port, and Destination Port are optional if the IP stream is uniquely specified.

- g. Set the RTP Payload Type between 96 and 127.

NOTE. The RTP Payload Type is displayed in the IP Status application.

- h. Set the number of channels in the audio stream between 2 and 16, the number of channels must be an even number (2, 4, 6, etc.). Any channels above 16 are ignored.

NOTE. The Bit Depth is already set to 24.

- i. Select **Save Stream #**.

The screenshot shows a configuration window for 'Stream 2'. The breadcrumb path is '... > Inputs > 8k > Stream 2'. The window title is 'Stream 2'. Below the title, it shows 'P1- Dst: xxx.xxx.xxx.xxx : Masked Type: 97 CH: 16' and 'P2- Dst: 0.0.0.0 :0 Mapped'. There are two 'Enabled' checkboxes: 'Enable Audio Stream 2' and 'Map Stream 2'. Below these is a section titled 'AUDIO PATH 1'. It contains a dropdown for 'SFP Port' set to '1'. Below that are four rows, each with a label, a masked input field, and a 'Masked' checkbox: 'Source Addr.' (xxx.xxx.xxx.xxx), 'Source Port' (xxxxx), 'Destination Addr.' (xxx.xxx.xxx.xxx), and 'Destination Port' (xxxxx). At the bottom are 'Cancel' and 'Save Stream 2' buttons.

Figure 40: Enter information for an audio stream

- j. Repeat all of step 5 (a -i) for each stream to configure. You may configure from 0 to 4 audio streams as required.

NOTE. The number of audio streams and channels determines the content and order of audio channels embedded in the AUX OUT.

NOTE. If the audio bars are flashing in the audio display, or sounds are garbled or the wrong pitch, 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.

A guideline for the number of audio channels (assuming 24bit 48khz audio) is approximately 1 to 1.5 Mb/s per channel. See the IP Status Bitrate column.

6. Configure the **Data (2110-40)** stream tab:

- a. Select the **Data** tab.
- b. Move the Enable Data slider to **Enabled** to begin configuration. (See Figure 41.)

The screenshot shows the 'Data (2110-40)' configuration tab. At the top, there are three tabs: 'Video (2110-20)', 'Audio (2110-30)', and 'Data (2110-40)'. The 'Data' tab is selected. Below the tabs, there is a section titled 'Enable Data' with a slider set to 'Enabled'. Below this is a section titled 'DATA PATH'. It contains several fields: 'SFP Port' (a dropdown menu showing '1'), 'Source Addr.' (a text field with a masked value 'xxx.xxx.xxx.xxx' and a 'Masked' checkbox), 'Source Port' (a text field with a masked value 'xxxxx' and a 'Masked' checkbox), 'Destination Addr.' (a text field with an unmasked value and an 'Unmasked' checkbox), and 'Destination Port' (a text field with an unmasked value and an 'Unmasked' checkbox').

Figure 41: Enable an ST2110-40 data stream

- c. Enter the information in SFP Port, Source Addr, Source Port, Destination Addr., and Destination Port for each data stream.
- d. Set the **RTP Payload Type** between 96 and 127.

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

7. Select **Save** and close the menu.
8. Configure the data rate. ([See Configure the data rate.](#))
9. To begin monitoring this input, select the configured input. ([See Input selection.](#))

Configure RTP: Monitoring general purpose RTP streams allows you to see physical and IP layer measurements, but none of the video, audio, and data payload is decoded and displayed.

To monitor general purpose RTP streams:

1. Select **RTP**. (See Figure 42.)

The screenshot shows a configuration window titled 'Settings > Inputs > SDI-In 1'. It has a 'Name' field with the value 'harmonic'. Below this are two tabs: 'IP' and 'SDI', with 'SDI' being the active tab. Under the 'SDI' tab, there are three sub-tabs: 'ST2022-6', 'ST2110', and 'RTP', with 'RTP' being the active sub-tab. The 'RTP' configuration fields are: 'SFP+ Port' set to '1', 'Source Addr.' set to a masked value 'xxx.xxx.xxx.xxx', 'Source Port' set to a masked value 'xxxxx', 'Destination Addr.' set to '229.20.1.11' (unmasked), and 'Destination Port' set to '50011' (unmasked). At the bottom, there is a 'SETTINGS' section with 'Cancel' and 'Save' buttons.

Figure 42: Configure RTP

2. In **SFP Port** select the port being monitored.
3. Enter Source and Destination information.
4. Set the **RTP Payload Type** between 0 to 127.
5. Select the **Video Format** and corresponding **Frame Rate**.
6. Select **Save** and close the menu.
7. Configure the data rate. ([See Configure the data rate.](#))
8. To begin monitoring this input, select the configured input. ([See Input selection.](#))

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

1. Choose the **Gamma** setting from the drop-down menu. (See Figure 43.) The selection characterizes the video signal on each virtual input.

The screenshot shows a configuration window for 'ST2110 -7'. It has a breadcrumb trail 'Settings > Inputs > ST2110 -7'. The 'Source Port' field is masked with 'xxxxxx'. The 'Destination Addr.' is '229.20.2.12' and 'Destination Port' is '50011'. Under 'VIDEO SETTINGS', 'RTP Payload Type' is '96'. 'Packet Read Schedule (PRS)' has three buttons: 'Gapped', 'Narrow Linear', and 'Wide Linear'. 'Gamma' is set to 'S-Log2' and 'Color Gamut' is set to 'Rec. 709'. 'Cancel' and 'Save' buttons are at the bottom.

Figure 43: Video IP signal settings

- **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 Narrow scaling places the extremes of the nonlinear color value from zero to unity at code words 40h(64) and 3Ach(940) in a 10bit representation for 0% Black to 100% White.

- **SDR Full:** 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 full scaling places the extremes of the nonlinear color value from zero to unity at code words 0d and 1023d in 10bit representation and 0d and 4095d in 12bit representation for 0% black and 100% white, respectively.

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

The narrow Scaling places the extremes of the nonlinear color value from zero to unity at code words 40h(64) and 3Ach(940) in a 10bit representation for 0% Black to 100% White.

- **PQ Full:** The reference OETF (Optical to Electrical Transfer

Function) with a high luminance range capability of 0 to 10,000 cd/m2 standardized in SMPTE2084. The EOTF (Electrical to Optical Transfer Function) is the inverse of OETF.

The Full scaling places the extremes of the nonlinear color value from zero to unity at code words 0d and 1023d in 10bit representation and 0d and 4095d in 12bit representation for 0% black and 100% white, respectively.

- **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 OETF (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 in the **Color Gamut** drop-down menu.
 - **Rec. 709**. Standard for HD.
 - **Rec. 2020**. Standard for 4K.

NOTE. *Rec. 709 gamut is automatically selected when the SD format is detected or selected in the video signal.*

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

Configure the data rate

1. Select the **Settings** icon (⚙️) to open the Settings menu.
2. Select **Network** to open the Network submenu.
3. Select **VIDEO IP PORT** tab to open the submenu. (See Figure 44.)
4. Select the Data Rate option (10Gb or 25Gb). The Data Rate applies to both ports; both ports must be 10Gb or 25Gb.

NOTE. *If the 25Gb button cannot be selected, the MP2-25GE license has not been purchased.*

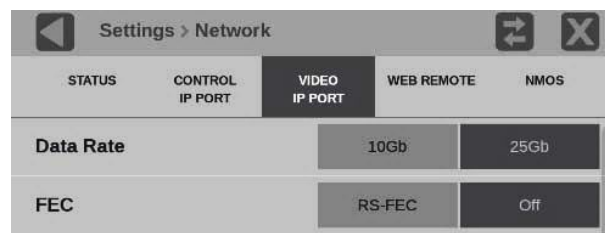


Figure 44: VIDEO IP PORT submenu

- If the instrument can read the multi-source agreement (MSA) data from the installed SFP module, the data rate of the SFP module and the signal frequency is displayed in the SFP Module line (either 10Gb or 25Gb and 850nm or 1310nm). (See Figure 45.)

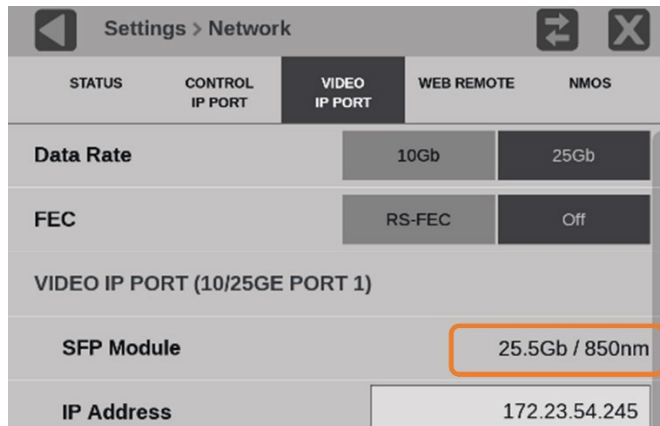


Figure 45: Readable MSA data from a 25Gb SFP module with data rate marked

- If the SFP module speed does not match the Data Rate setting, instead of the data rate and frequency, the message “SFP not compatible with selected Data Rate.” is displayed. (See Table 8.)

If the SFP module does not have readable MSA data, instead of the data rate and frequency, the message “Unknown” is displayed.

NOTE. In the case of missing MSA data, the SFP Module line displays no compatibility warning no matter what type of SFP module is installed or Data Rate setting. The instrument and the SFP module will work, if the SFP module matches the Data Rate setting.

- If no SFP module is installed, instead of data rate and frequency, the message “Disconnected” is displayed.

Table 8: Possible status in the VIDEO IP PORT, SFP Module line

Type of SFP installed	Data Rate setting	
	10Gb setting	25Gb setting
SFP 25Gb module	SFP not compatible...	(Data rate) / (frequency)
SFP 10Gb module	(Data rate) / (frequency)	SFP not compatible...
Unreadable MSA data	Unknown	Unknown
No SFP installed	Disconnected	Disconnected

5. Select **RS-FEC** if Forward Error Correction (FEC) is needed. RS-FEC is specified by IEEE 802.3 Clause 91. (See Figure 46.)

NOTE. FEC is only available when the Data Rate is set to 25Gb. FEC can only be selected for both ports. If it is on for one, it is on for both.

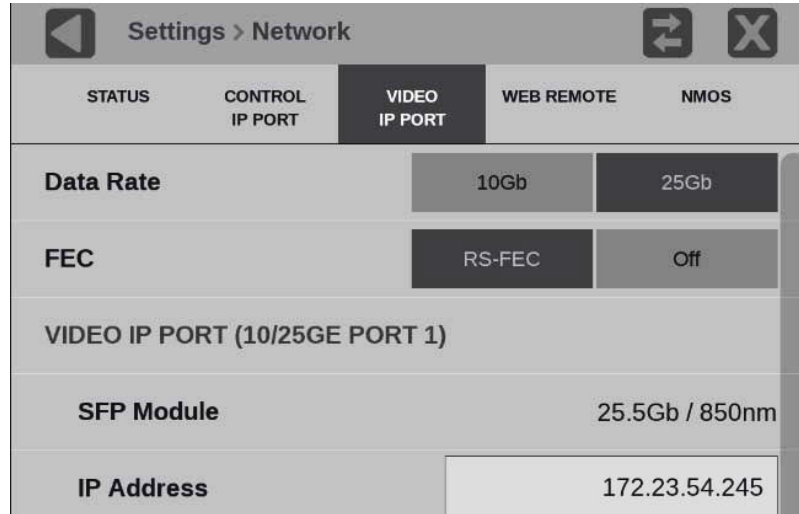


Figure 46: VIDEO IP PORT submenu 1

- The IP Status display shows the Data Rate setting, the FEC setting, and the signal status. (See Figure 47.)

NOTE. If the Data Rate or FEC, are incorrect, a red X appears on the left of the traffic bar, as when the fiber is disconnected.

- The Data Rate setting (10 or 25Gb) is on the right of the network traffic bar.
- The FEC setting is below the data rate.
- The signal status is on the left of the network traffic bar.

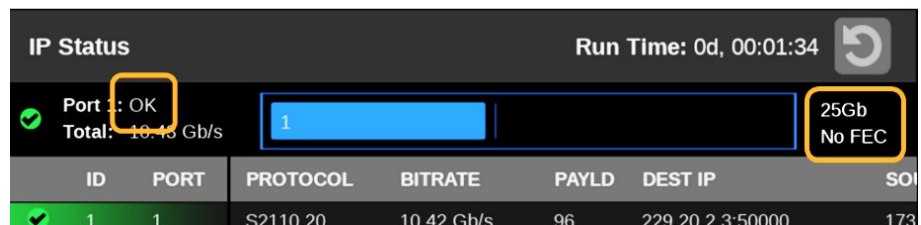


Figure 47: IP Status display port status

Table 9: Possible status of the ports in IP Status

Type of SFP installed	Data rate setting	
	10 Gb setting	25 Gb setting
SFP 25 Gb module	SFP Mismatch	OK
SFP 10Gb module	OK	SFP Mismatch
Unreadable MSA data	Unknown	Unknown
No SFP installed	Disconnected	Disconnected

6. If the IP Status Port displays “SFP Mismatch,” repeat steps 1 through 4 to confirm the Data Rate is set correctly and check the installed SFP module has the expected data rate.

Input selection To select a configured input:

1. Select the **Input** icon () from the Status bar at the bottom of the PRISM monitor.
2. Select a configured input from the list in the bottom bar. (See Figure 48.)



Figure 48: List of the configured inputs

3. Select the **Home** icon () to close the Input selection controls.

Configure 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 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 if they are not automatically selected.

These 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 Waveform display application.](#))

- The %, 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. (See Figure 49.)

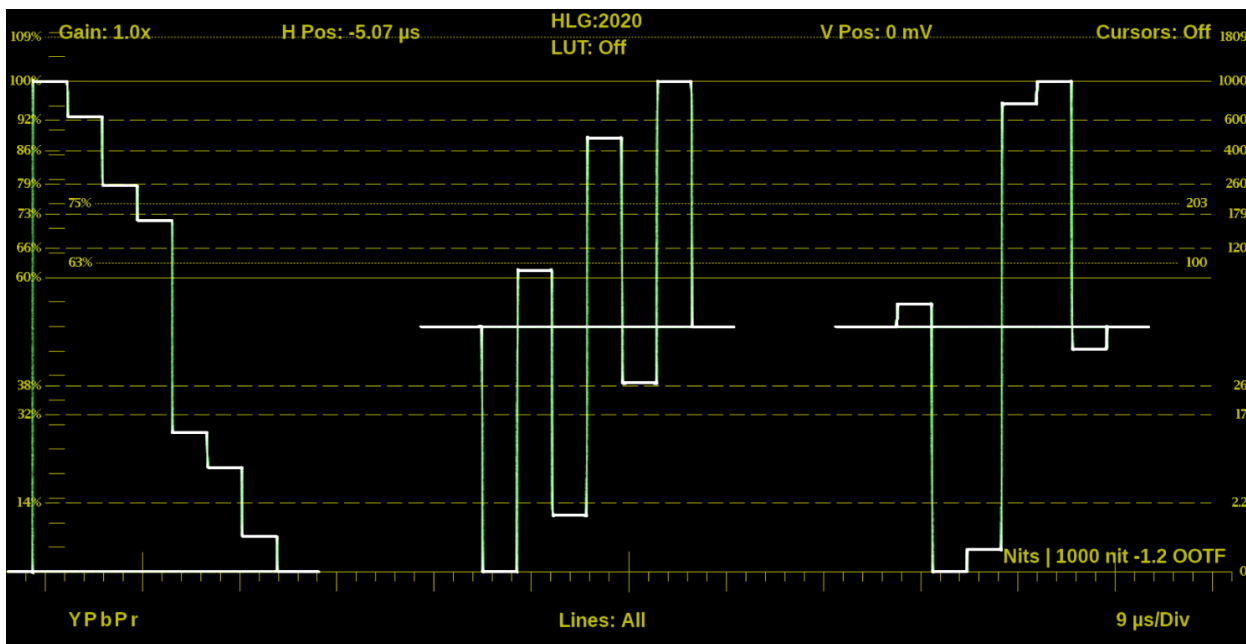


Figure 49: Waveform display with nits scale

Stop Display (Option MP2-PROD only)

In the Stop Display application settings menu (select and hold in the application tile and select the **Settings** 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 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 of Gamma selected. It is used for mastering the content for a targeted HDR system.

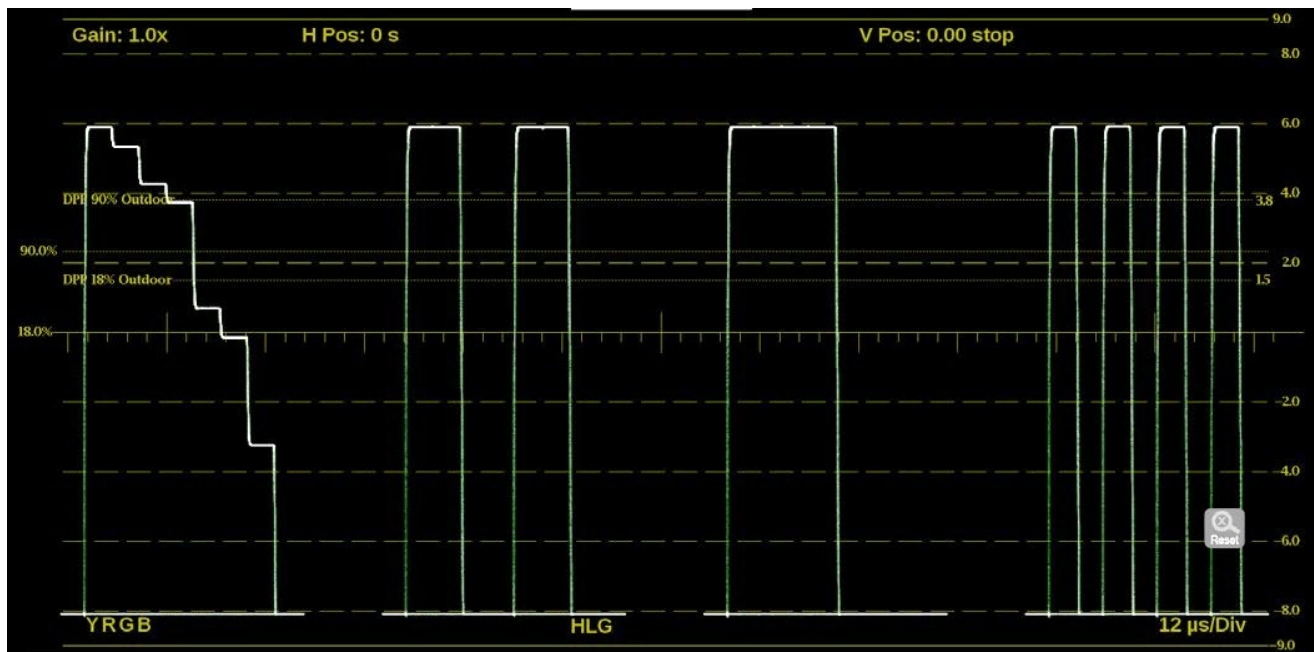


Figure 50: Stop Display with Stop scale

**Transfer function/color
space conversion (Option
MP2-PROD only)**

Transfer function/color space conversion is available in Waveform, Vector, Diamond, and Picture applications. Use the **Convert to Rec. 709** feature 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.

NOTE. *Convert to Rec. 709 mode is not supported for SD signals.*

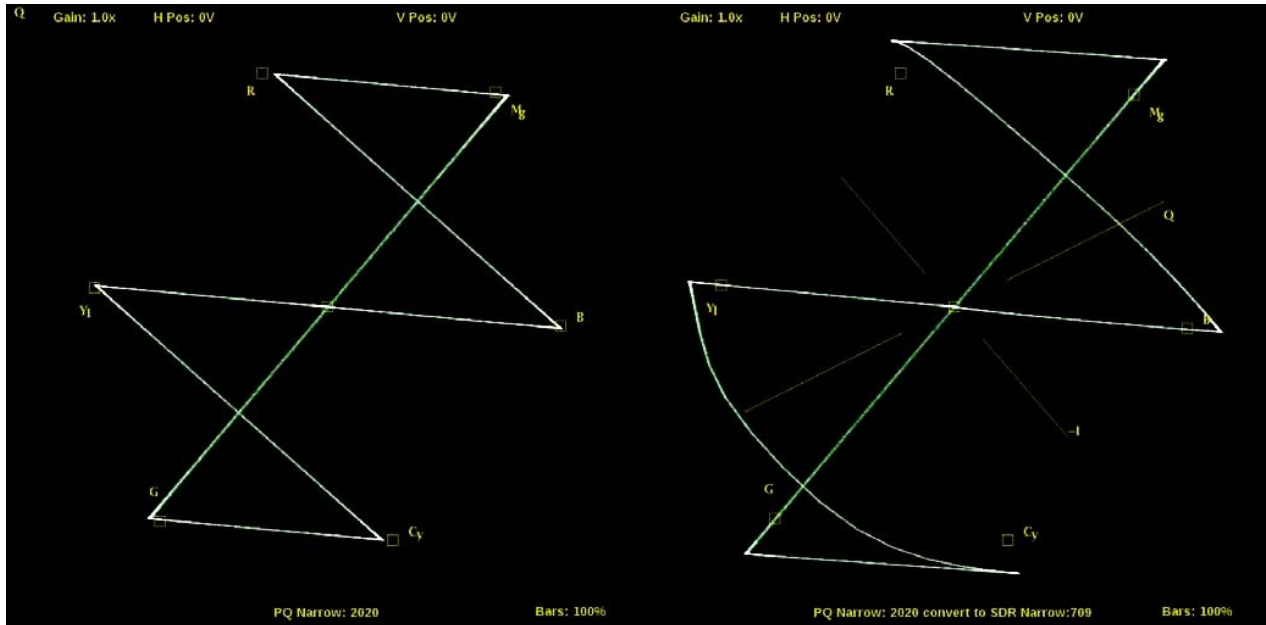


Figure 51: Vector display with (right) and without (left) Convert to Rec. 709 enabled, 100% color bar in PQ/BT.2020

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:

1. Select 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**. (See Figure 52.)
4. Close the Network menu.

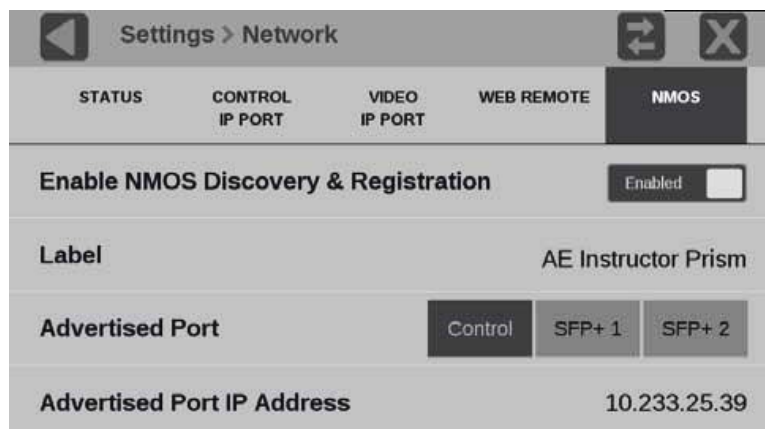


Figure 52: NMOS discovery and registration enabled

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.

NOTE. When changes are made to the control port IP address or the label of the instrument and NMOS is being used for configuration, we recommend rebooting the instrument to update the NMOS registration server.

Adjust Loudness Display

The Loudness Meter is a part of the Audio App in PRISM and is configured in the Settings menu. The Audio Loudness Display allows you to view audio loudness values associated with audio loudness measurements. This instrument maintains a running audio loudness session.

Turn on the Loudness Display:

1. Open the Audio app.
2. In the application toolbar, select the **Tile** icon () to open the Audio Application Settings.
3. Set Loudness Display to **On**. (See Figure 53.)

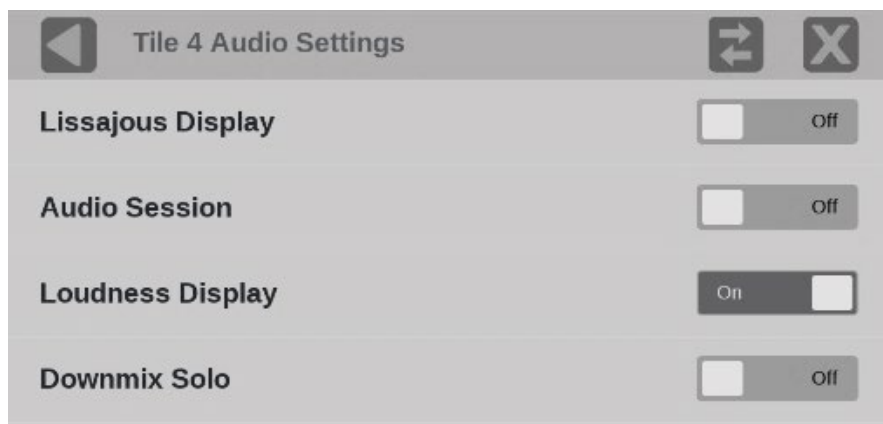


Figure 53: Audio Settings with the Loudness Display turned on

The Loudness Display appears in the right half of the tile. (See Figure 54.)

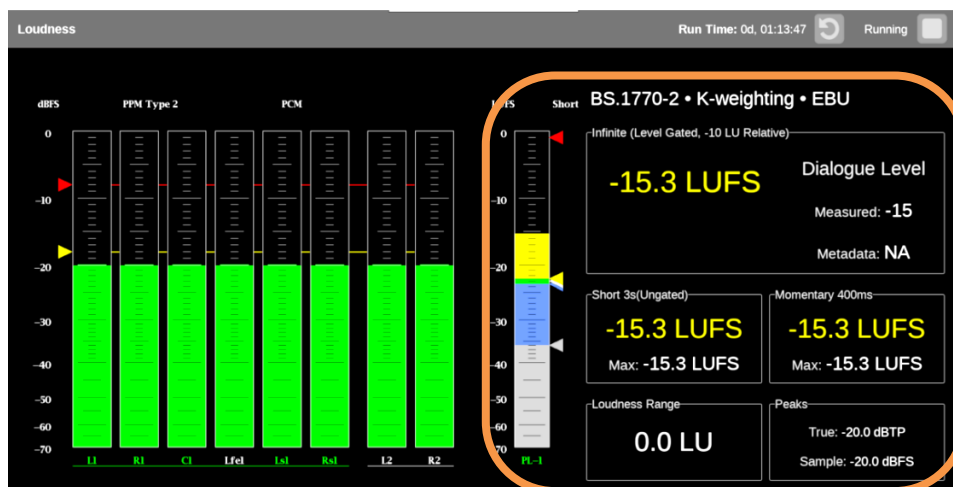


Figure 54: Loudness Display on the left of the Audio tile

NOTE. The view varies based on the visibility selection of other auxiliary audio displays including Audio Session or Lissajous Display.

Configure the Loudness meter:

1. Select the **Settings** icon (⚙️) from the status bar.
2. Select **Audio** to open the Audio submenu.
3. Select **Loudness Settings**. (See Figure 55.)

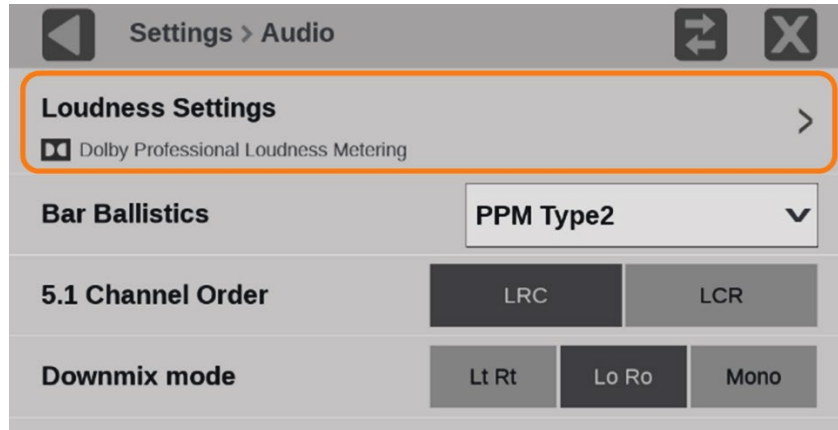


Figure 55: Audio submenu with the Loudness Settings marked

4. Load a standard preset: Select **EBU R128:2014** or **ATSC A/85:2014** for a pre-defined set of loudness metering configuration. (See Figure 56.)

Or customize the Loudness meter configuration according to the metering measurement goal or audio content type (dialogue, music, or movie). Table 10 shows the available configuration parameters.

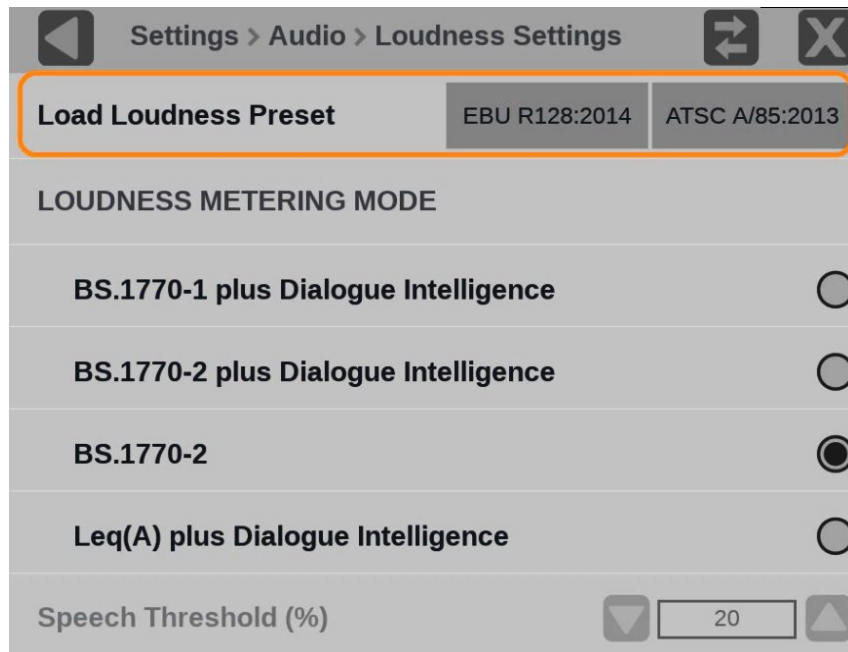


Figure 56: Loudness Settings with the Loudness preset options marked

Table 10: Configuration Parameters for Loudness Meter Configuration

Parameter	Available Configurations	Remarks
Metering Mode	BS.1770-1 with DI ¹ , BS.1770-2 with DI, Leq(A) with DI, BS.1770-2 w/o DI	Modes implies a weighting function (A-weighting or K-weighting) and gating technique(s) when performing loudness metering
Speech Threshold	0 to 100 %	Threshold above which the Speech Gating will be turned on in the DI enabled Metering modes.
Loudness Ballistics	Short Average, Long Average, EBU R128 M	Sets the response of the Loudness meter bar
Loudness Thresholds	Loud is 0 to -30 and Quiet 0 to -60 Full Scale Loudness	Sets the limits to trigger in-bar status for quiet and loud level.
Target Loudness	0 to -31LKFS with 0 to 10LU tolerance	Sets the intended target loudness (to be highlighted in the Loudness display with appropriate color code)
Short-Term Gating Window	EBU R128(3s), Legacy(10s)	Duration of the sliding windows for short-term loudness measurement
Full-Scale Units	LKFS or LUFS	Region specific selection; has no effect on measurement
True Peak DC Block and Emphasis Filter	Enable or Disable	DC block simulates the effect of downstream devices that remove DC. The emphasis filter compensates for dispersion effects from Nyquist filters in the broadcast chain that make it difficult to measure and control the peak levels of high-frequency signals.

¹ Dialogue Intelligence enabled

NOTE. The dialogue intelligence algorithm in PRISM introduces a latency of 2.048s in the effective measurement of the short-term and infinite Loudness. Other Loudness measurement parameters are not affected by the latency.

NOTE. The Loudness measurements are updated every 500ms in the user interface.

NOTE. Maximum short-term Loudness level can be considered as an alternative to using Loudness range for short audio clips.

Change the channels the Loudness meter measures. (See Figure 57.)

Select the correct program labels at the bottom of the level bars (green letters are selected) and the Loudness meter measures the levels based on that audio program.

Changing the Audio program also resets the Loudness measurement.

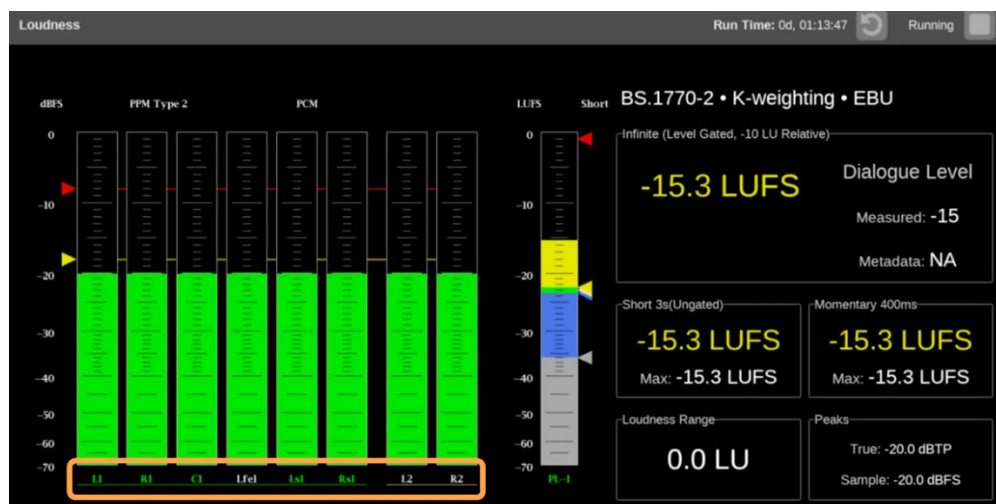


Figure 57: Audio tile with the program labels marked

Loudness meter labels: (See Figure 58.)

- The labels at the bottom of the audio bars (marked as 1) in this example means it is program 2 and there is a left and a right channel.
- The label at the bottom of the Loudness bar (marked as 2) means it is measuring program 2.
- The green letters in the status bar (marked as 3) mark the channels the Loudness display is measuring and where they are in the channel series.

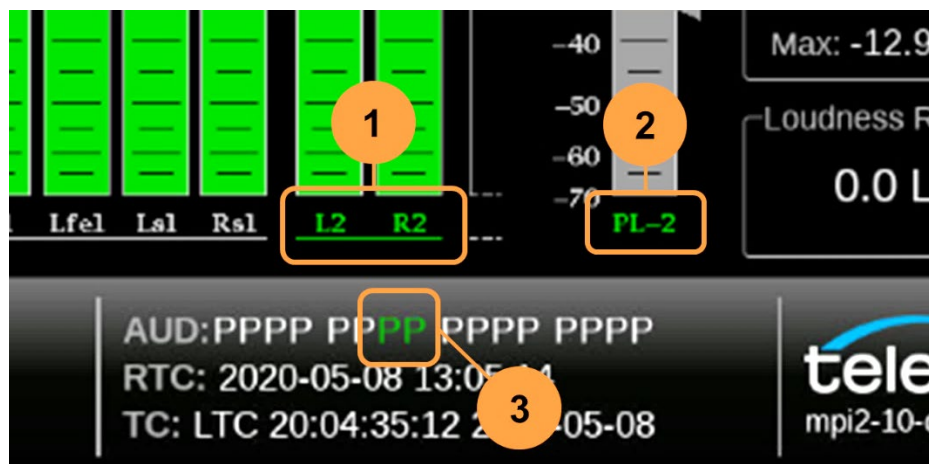


Figure 58: Program labels marked at the bottom of audio bars and in the status bar

Meter controls:

- To start and stop the loudness meter: select the  or  button. (See Figure 59.)
- To reset the measurement run time: select the  button.

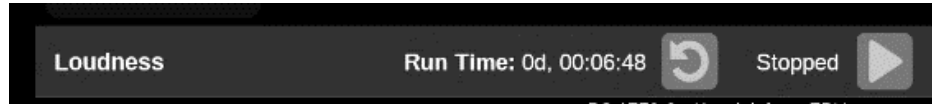


Figure 59: Loudness Display header

- The Audio Session and Loudness measurements can be independently stopped, started, and reset with the controls. (See Figure 60.)



Figure 60: Audio Session and Loudness Display headers

Downmix mode, with the downmix parameters set (see [To access the downmix control](#)), select one of the 3 options in Audio:

- **Lt Rt:** Reduces the stream to 2 channels. The center channel is reduced 3dB, the surround channels are added together to create a single signal and reduced 6dB, and the LFE is muted. The surround signal is added 180 degrees out of phase to the left-and-center signal, making up the left-total channel. The surround signal is added *in* phase (0 degrees) to the right-and-center signal, making up the right-total channel.
- **Lo Ro:** Reduces the stream to 2 channels. The center channel is reduced 3dB, both surround channels are reduced 3dB, and LFE is muted. The center channel is added to the left-and-left-surround signal to make the left-only channel. The center channel is added to the right-and-right-surround signal to make the right-only channel.
- **Mono:** Reduces the stream to one channel. The center channel is reduced 3dB, the surround channels are each reduced 3dB, and the LFE is muted. All 6 channels are combined.

Configure instrument outputs

PRISM allows you to set the SDI OUT connector to Loop-through or Generator.

To change the SDI output:

1. Select 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**. (See Figure 61.)

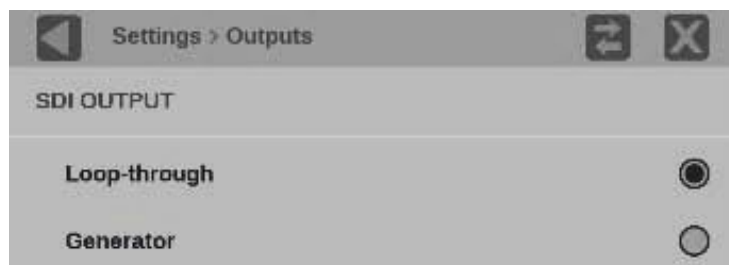


Figure 61: SDI output configuration

4. Close the Outputs menu.

SDI OUT loop-through of IP inputs is available for SDI, ST2022-6, and ST2110-20/30 (refer to [Configure the Audio \(2110-30\) stream tab](#) for audio configuration details) including embedded audio streams.

See the SDI Generator applications for instructions on how to configure the SDI Generator signal.

Configure to decode Timecode

Timecode: Decodes and displays ST 12-1:2014 Ancillary Timecode on the Status bar. ANC LTC (linear time code), ANC VITC (vertical interval time code), and Date Readout are supported.

1. Select the **Settings** icon (⚙️) to open the Settings menu.
2. Select **Anc Data** to open the Anc Data submenu. (See Figure 62.)
3. In Timecode Format select **LTC** or **VITC** as needed and close the menu.

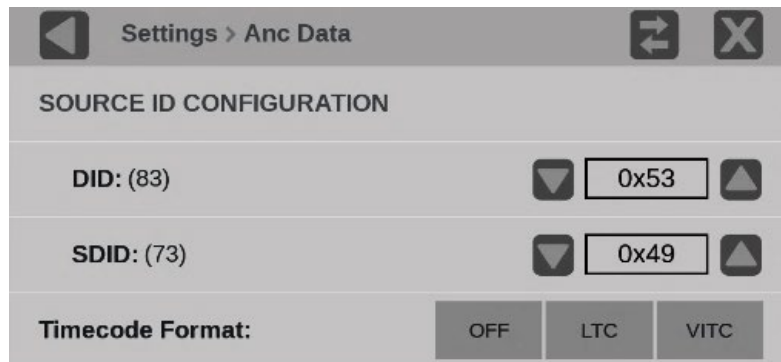


Figure 62: Reference configuration Anc Data

The selected timecode appears in the bottom border of the Status frame. (See Figure 63.)

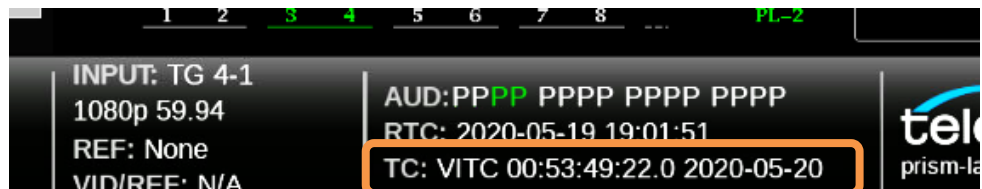


Figure 63: Status bar with VITC timecode marked

Configure reference settings

The reference configuration of the PRISM is displayed in the middle of the status bar. The third line is the reference type and the fourth line displays the Video versus Reference lock indication. This indication shows if the signal is N/A, Mismatched, Drifting, or Locked. (See Figure 64.)

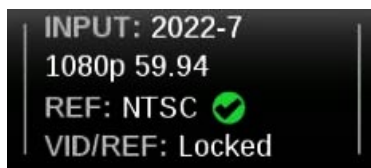


Figure 64: Reference configuration status

Choose the reference

The Timing application supports SDI timing against Analog external reference, Analog external reference timing against PTP, SDI timing against PTP, and IP timing against PTP.

To choose the external reference:

1. Select the **Settings** icon (⚙️) to open the Settings menu.
2. Select **Reference** to open the Reference submenu. (See Figure 65.)



Figure 65: Input Reference options

3. Select one of these reference options:
 - **Internal:** The timing is based on an internal clock.
 - **Analog:** Refers to a Black Burst (BB) or Tri-Level Sync (TLS) external reference. An analog external reference is connected to the REF BNC input on the back panel.
 - **PTP:** Refers to Precision Timing Protocol (PTP) external reference. PTP external reference must come through the 10/25GE SFP Port 1 input on the back panel.

NOTE. When a reference selection is made the reference changes in the status bar and in the Timing application.

Configure the analog reference settings

- 1. Select the **Settings** icon (⚙️) to open the Settings menu.
- 2. Select **Reference** to open the Reference submenu and select the **Analog Ref Setting** submenu. (See Figure 66.)



Figure 66: Analog reference settings configuration

- 3. Select from one of these reference I/O options:
 - **Loop-Through:** The REF input is looped out the REF output BNC.
 - **Terminate Input:** The REF input is terminated at the REF input BNC. There is no signal at REF output BNC.

Configure the PTP reference settings

- 1. Select the **Settings** icon (⚙️) to open the Settings menu.
- 2. Select **Reference** to open the Reference submenu and select the **PTP Settings** submenu. (See Figure 67.)

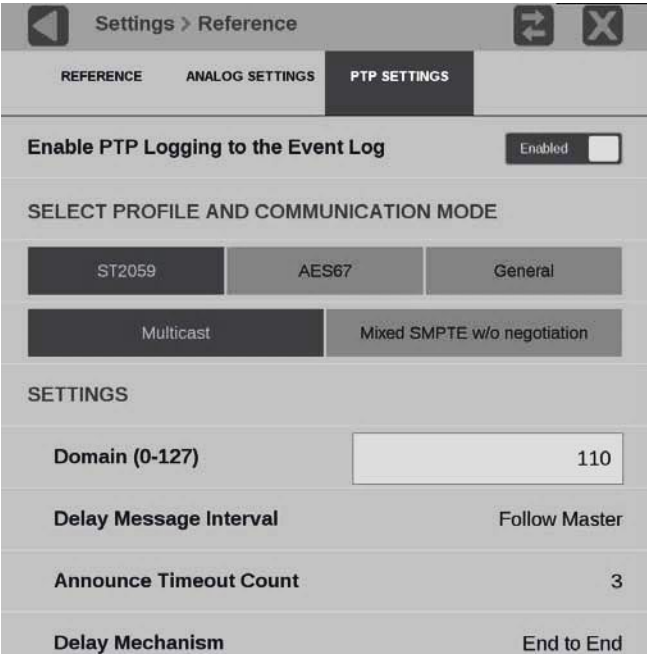


Figure 67: Editing PTP reference settings

3. To enable or disable PTP logging to the Event Log, select the control box to change the setting to the 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 and the communication mode will be a mixture of Multicast and Unicast, select **Mixed SMPTE w/o negotiation**.

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. Select the **Domain (0-127)** box to open the editing display. (See Figure 68.)

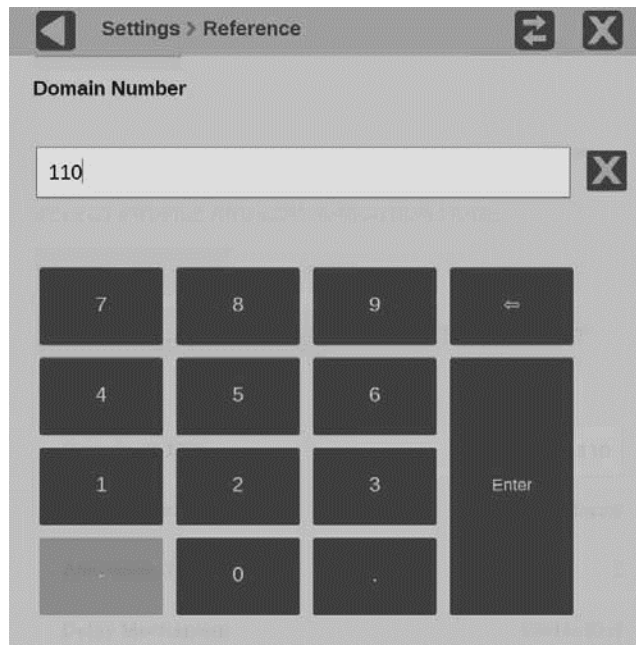


Figure 68: Editing the PTP domain setting

7. Use the editing controls to enter a new domain number. When using the editor:
 - Select the Clear icon (X) to remove the existing domain number.
 - Select the **backspace** key to delete characters by backspacing over them.
8. When you are done editing the domain number, select the **Enter** key.
9. Repeat steps 4 to 6 for each PTP profile.

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 MPX2-25 monitor, you can recall instrument presets from the front panel. ([See Recall instrument presets.](#))

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. This is an overview of the settings saved in a Preset. Some settings are option dependent.

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

Turn on Edit Mode

When Edit mode is on, selecting a preset button opens a menu to allow changes to that preset button (Rename and Save as) you can also recall the existing settings (Recall). (See Figure 69.) When edit mode is off, selecting a preset button only recalls the preset settings assigned to that button, with no confirmation.

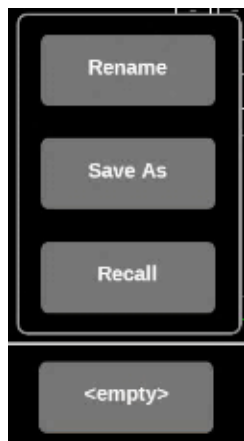


Figure 69: Preset button with edit menu open

When Edit mode is on, you can assign any preset button with any configuration of applications, outputs, and inputs.

1. Select the **Settings** icon (⚙️) to open the Settings menu.
2. Select **Presets** to open the Presets submenu.
3. Set Edit Mode to **On**.

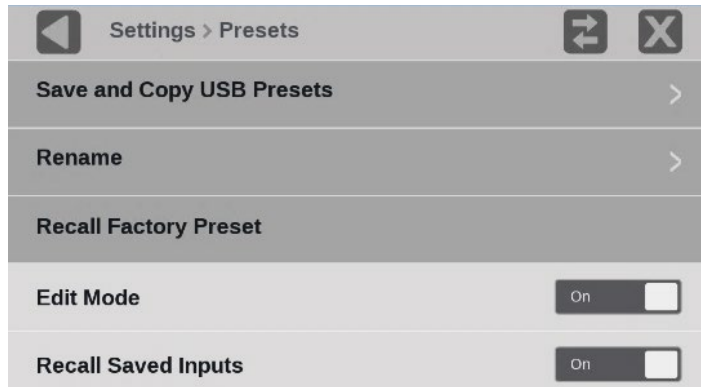


Figure 70: Presets submenu with Edit Mode set to On

Save presets

To save a preset with a user-defined name and settings, or to reassign a named preset with new name and settings:

1. Set up the instrument exactly as you want it configured. This includes selecting the application display for each tile and configuring inputs and the PTP reference settings.
2. [Turn on Edit Mode](#).
3. Select the **Presets** icon (★) to open the Preset selection menu at the bottom of the PRISM display. (See Figure 71.)

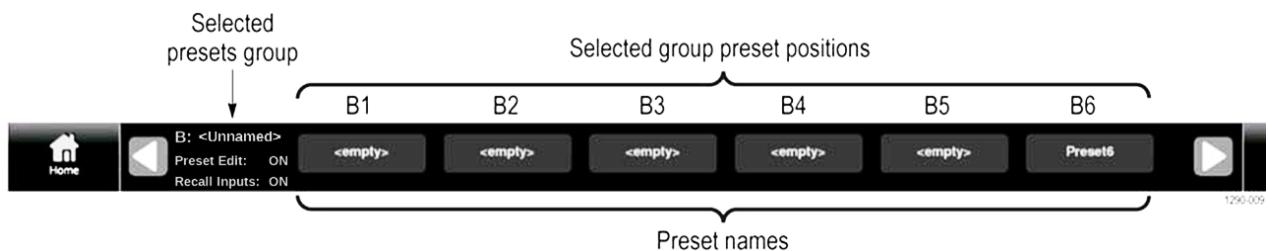


Figure 71: Preset selection controls (Group B shown)

4. Locate the Preset button you want to save with the current instrument configuration. There are 6 presets in each of 6 groups. Use the arrow buttons (▶️ and ◀️) or swipe left or right to move to the preset group (A–F).

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

- When you have found the preset to assign the settings (this includes choosing an assigned preset and overwriting the existing settings), select the preset button.

A menu opens. (See Figure 72.)

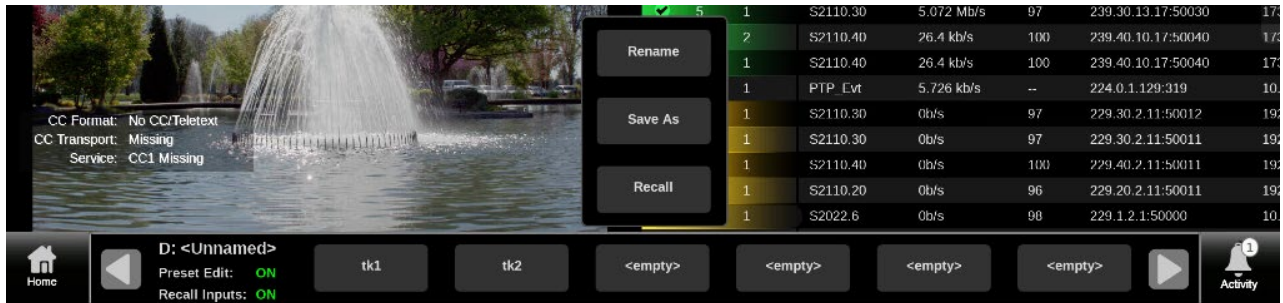


Figure 72: An example of an open preset menu, in Group D, the unassigned preset D3 is selected

- Select **Save As** to save the existing settings to the highlighted preset button and name it. (See Figure 72.)

An on-screen keyboard appears.

- If the preset button name is <empty> or you want to change the name, use the keyboard. If you do not want to change the name, select **Save**.

A confirmation window opens.

- Select **OK** to save the preset.

The preset name changes from <empty> or a name to the entered name. The number is the preset position in the preset group. (See Figure 73.)

- Select the **Home** icon (🏠) to close the Preset selection menu.

Rename PRISM presets

To rename a preset without changing any settings.

- [Turn on Edit mode.](#)
- Select the preset to rename.
- Select **Rename** and use the keyboard to enter a new name. (See Figure 72.)

If Rename does not appear, Edit mode is not on.

- Select **Save**.

Rename group of presets

- Select the **Settings** icon (⚙️) to open the Settings menu.
- Select **Presets** to open the Presets submenu.
- Select **Rename** to open the Presets Rename submenu. (See Figure 73.)
- Select the Preset group, at the top of the submenu, to select the group with the preset to rename (this includes naming an <empty> preset).

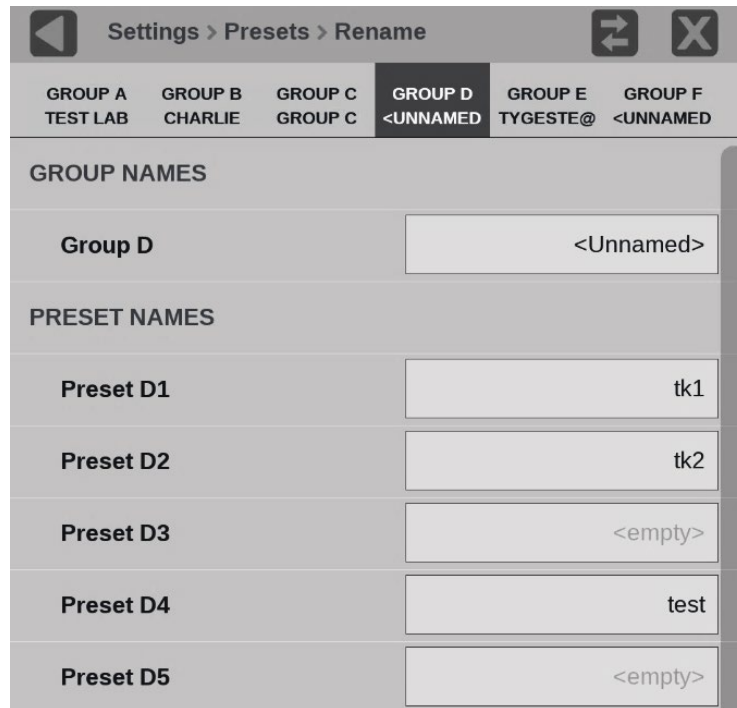


Figure 73: Presets Rename submenu with group D selected

5. Select the name box of the preset you want to name or rename.
An on-screen keyboard opens. (See Figure 74.)

NOTE. You can also rename a preset group by selecting a group name box.

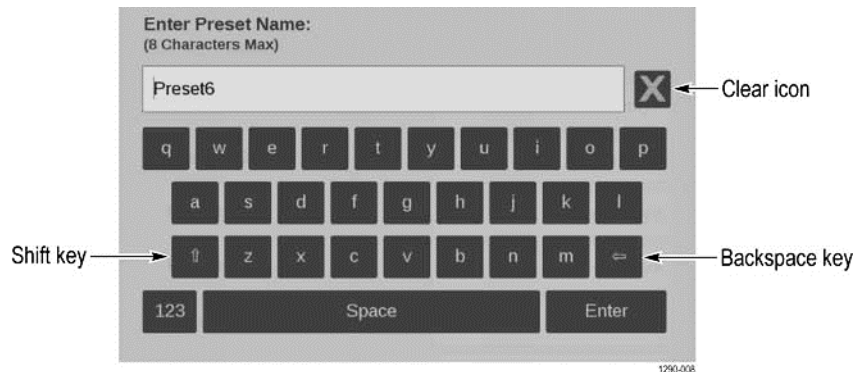


Figure 74: On-screen keyboard for editing a Preset name

6. Use the on-screen keyboard to enter a new name for the preset. When renaming a preset:
 - Enter a name with a maximum of 8 characters.
 - Select the Clear icon (X) to remove the existing name.
 - Select the Shift key to access capital letters.
 - Select the Backspace key to delete characters by backspacing over them.

- Select the 123-abc key to change between the letter keyboard and the numbers-symbols keyboard.

7. When the preset name is correct, select **Enter**.

NOTE. If the Edit Mode is on, you can rename a preset through the Preset selections menu. Select the preset to rename and then select **Rename**, and rename the preset just as in the Presets Rename submenu.

Download and upload PRISM presets

To download the presets of an entire PRISM (clone the presets) and upload them to another PRISM, there are two methods: [Download the presets to a USB memory drive](#) or [Download a file of presets locally](#).

Download the presets to a USB memory drive:

1. Insert a USB drive into the PRISM with the presets.
2. Select the **Settings** icon (⚙️) to open the Settings menu.
3. Select **Presets** to open the Presets submenu.
4. Select **Save and Copy USB Presets** and then select **SAVE TO USB**. (See Figure 75.)
5. Select the USB drive and select **Save**.

A copy of the presets is downloaded to the USB drive.

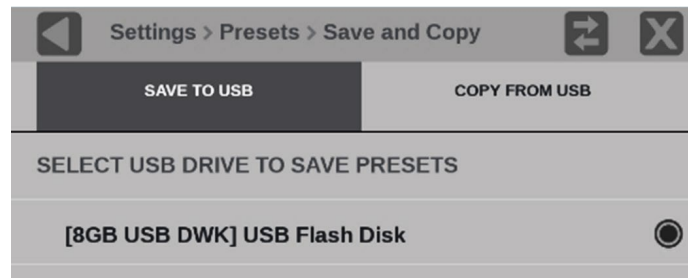


Figure 75: PRISM Settings in the Save and Copy USB Presets submenu with SAVE TO USB selected

6. Select the Activity icon (📡) and then select the **Eject** icon (🗑️) to unmount the USB drive from the instrument.
7. Remove the USB drive with the presets from the PRISM.
8. To upload the presets to another PRISM, go to [Upload presets from a USB memory drive](#).



Upload the presets from a USB memory drive:

CAUTION. This overwrites all existing presets in the PRISM:

1. Insert a USB drive with PRISM presets into the PRISM to upload the presets.
2. Select the **Settings** icon (⚙️) to open the Settings menu.
3. Select **Presets** to open the Presets submenu.

4. Select **Save and Copy USB Presets** and then select **COPY FROM USB**. (See Figure 76.)
5. Select the USB memory drive and select **Copy**.

The downloaded presets are uploaded to the PRISM.

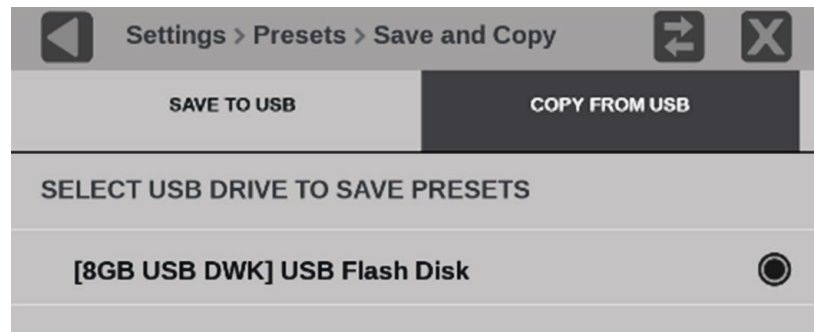


Figure 76: PRISM Settings in the Save and Copy USB Presets submenu with COPY FROM USB selected

6. Select the Activity icon (Activity icon) and then select the **Eject** icon (Eject icon) to unmount the USB drive from the instrument.
7. Remove the USB drive with the presets from the PRISM.
8. Select the Close icon (Close icon) to close the Save and Copy USB Presets submenu.
9. Repeat steps 1 to 9 for any other PRISMs to copy the presets.

Download a file of presets locally:



CAUTION. This overwrites all existing presets in the PRISM uploading the presets.

1. Go to the PRISM HOME page for the PRISM with the presets. (See Figure 77.)
2. Select **Preset Download and Upload**.

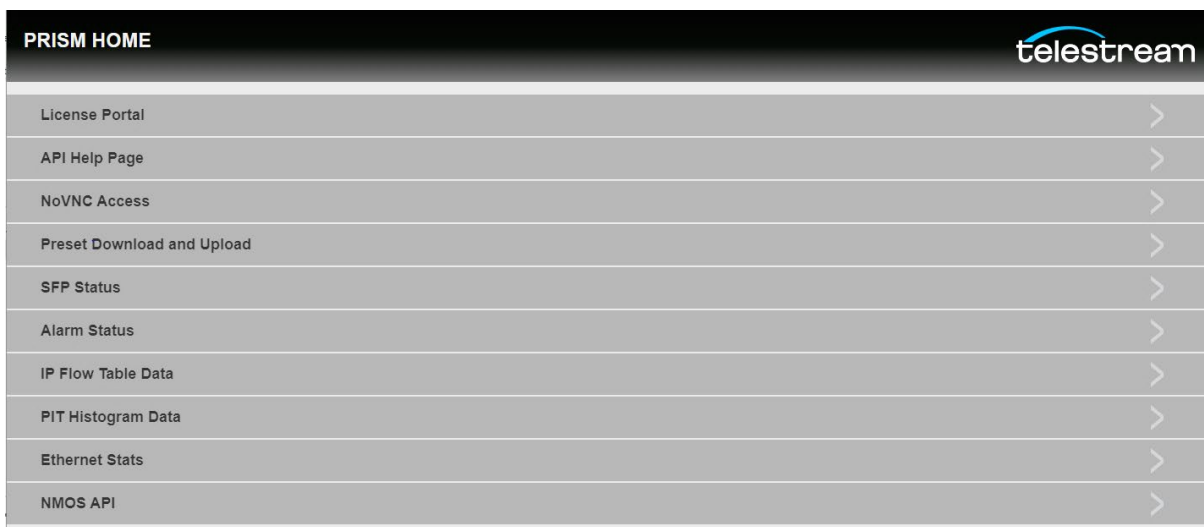


Figure 77: PRISM HOME page

3. Select **Download from PRISM** and then select **Download**. (See Figure 78.)
A copy of the presets is downloaded to your local computer with the name of the PRISM and a timestamp, or you can rename the presets file.
4. To upload the presets to another PRISM, go to [Upload the presets through the PRISM homepage](#).

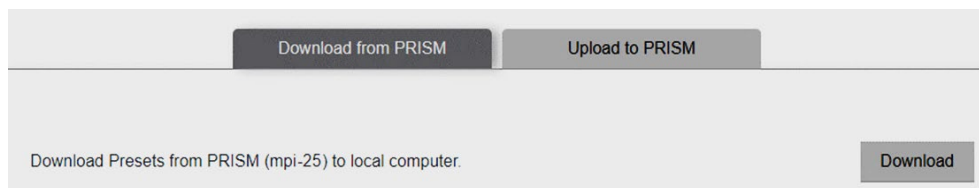


Figure 78: PRISM web presets page with Download from PRISM selected

Upload the presets through the PRISM homepage:



CAUTION. *This overwrites all existing presets in the PRISM uploading the presets:*

1. With presets file downloaded locally, go to the PRISM HOME page for the PRISM to upload the presets.
2. Select **Preset Download and Upload**.
3. Select **Upload to PRISM** and then select **Browse**. (See Figure 79.)

A file explorer window opens.

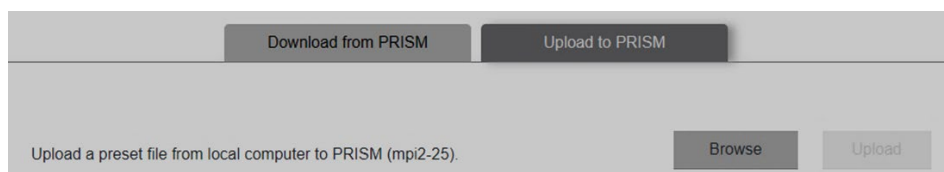


Figure 79: PRISM web presets page with Upload to PRISM selected

4. Find the saved preset (.prst) file, select it, and select **Open**.
The file explorer window closes and the preset file is listed on the PRISM HOME page.
5. Select **Upload**.
The downloaded presets are uploaded to the PRISM.
6. Repeat steps 1 through 5 for any other PRISMs to receive the same presets.
7. Select the browser back button to return to the PRISM HOME page.

Recall user-defined presets

1. Select the **Presets** icon () to open the Preset selection menu. (See Figure 80.)

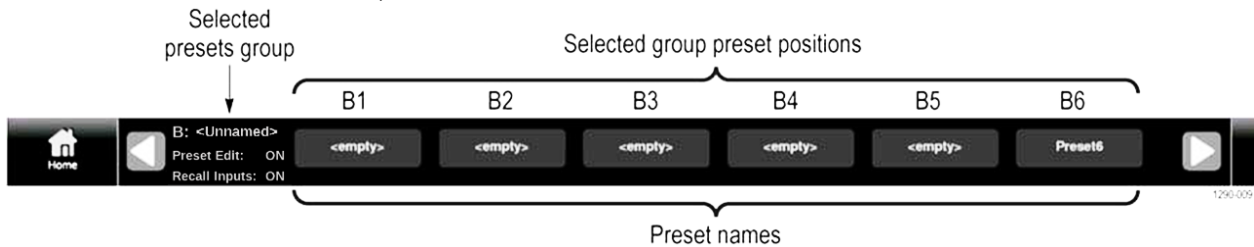


Figure 80: Preset selection controls (Group B shown)

2. Find the preset to recall. Use the  and  arrow buttons or swipe left or right to move to the preset group (A–F).

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

3. Select the preset button to recall.

The selected preset button is highlighted and the instrument settings change to those assigned to the selected preset.

4. Select the **Home** icon () to close the Preset selection menu.

NOTE. If the Edit Mode is on, select the preset to recall and then select **Recall** from the menu.

Recall presets without inputs

Presets contain all PRISM settings including input configuration. Turning off the Recall Saved Inputs setting allows the presets to be recalled without recalling any of the input settings (video, audio, data). In this mode only the application and other settings are recalled.

NOTE. The preset still has all of the input settings, they are just not applied when the Recalled Saved Inputs setting is off.

1. Select the **Settings** icon () to open the Settings menu.
2. Select **Presets** to open the Presets submenu.
3. Set the Recall Saved Inputs to **Off**. (See Figure 81.)

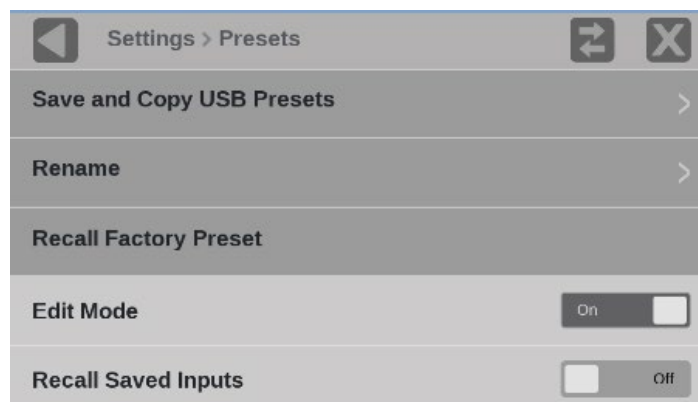


Figure 81: Presets submenu with Recall Saved Inputs set to Off

Recall factory preset

1. Select 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. (See Figure 82.)

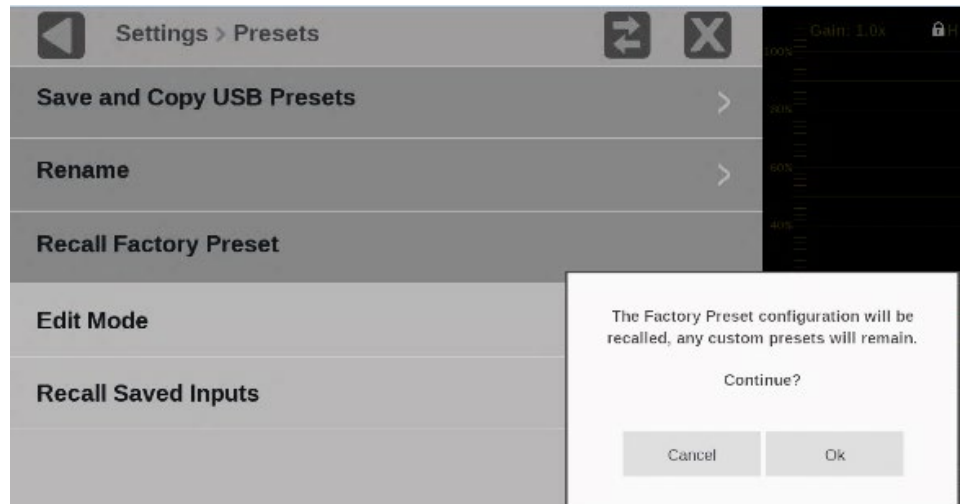


Figure 82: Presets Rename submenu

4. Select **OK** to confirm the selection and to reset the instrument settings to the factory defaults. Table 11 lists some of the settings that are reset.

NOTE. Custom presets are still available after recalling the factory preset.

Table 11: 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
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

Item	Setting
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
IP Generator configuration	
Enable IP ST2110 Generator	Disabled
Reference	Internal

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:

1. Select the **Settings** icon (⚙️) to open the Settings menu.
2. Select **Display** to open the Display submenu.
3. Use the ➡️ icon to increase intensity or the ⬅️ icon to decrease intensity of the trace or graticules. (See Figure 83.)

NOTE. The intensity can also be adjusted by selecting anywhere in the slider or selecting and dragging the slider circle left or right.

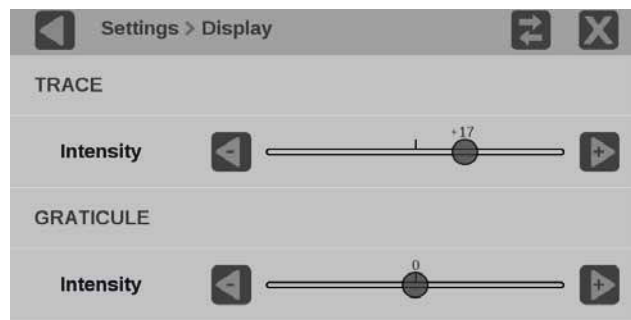


Figure 83: Trace and graticule intensity sliders

4. Close the Display settings menu.

Set time and date

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. Select 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. 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 is required. Time should be changed less than ± 1 hour. Use the TIME ZONE tab to set the local time.

4. Select **TIME ZONE** to open the submenu. (See Figure 84.)

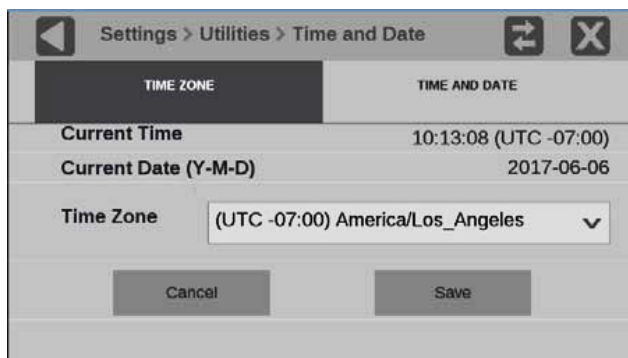


Figure 84: Time Zone submenu

5. Select 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 major cities in those time zones.
6. Select **TIME AND DATE** to open the submenu.
7. Adjust the time and date using the up and down arrows as needed. The time setting uses a 24-hour clock, so no AM/PM setting is required. (See Figure 85.)

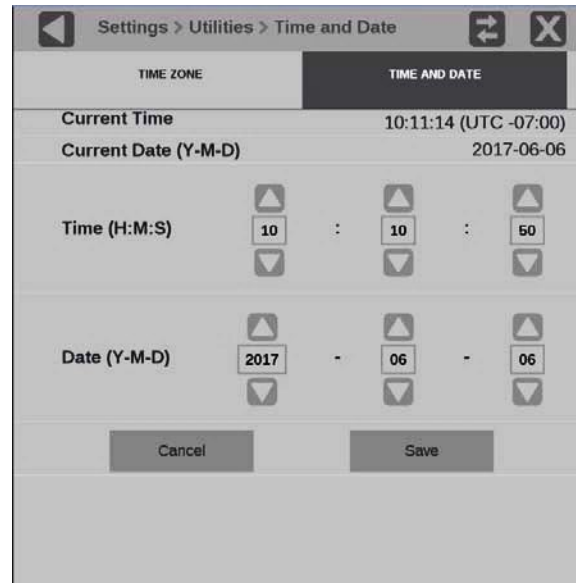


Figure 85: Time and Date submenu

8. When you are done setting the time and date, select **Save**.
9. The message box, shown in Figure 86, opens and asks whether you want to reboot the instrument now or later to implement the time and date changes. Select one of the options:
 - Select **OK** to reboot the instrument immediately and implement the changes.
 - Select **Cancel** to end the operation.

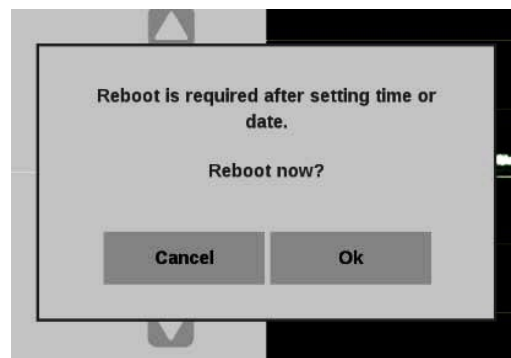


Figure 86: Time and date change reboot message

Upgrade instrument firmware

Before you begin

Telestream releases updates to product firmware to add new features or to fix reported problems. Check the Telestream website 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. 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. Select the **Settings** icon () to open the Settings menu.
 - b. Select **Utilities** to open the Utilities submenu.
 - c. Select **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 Telestream website:
 - a. Use a web browser and go to the Telestream website software page: www.telestream.net/video/resources.htm#Software.
 - b. Click the product and model title that best matches your instrument (such as PRISM) and in the list, find the software-upgrade package for your instrument.
 - c. Note the latest version number of the software-upgrade package(s).

Website firmware version number

4. If the latest firmware version at the website is newer than the version on your instrument, you should upgrade the firmware.
5. Click the Firmware Release version for your instrument to download the update.



CAUTION. After 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 Telestream factory service center to have the system firmware restored.

6. Go to the [Upgrade the firmware procedure](#).

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

If you want the details of what has changed in the release, download the Release Notes for the version.

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.

Upgrade the Firmware

1. Copy the upgrade file with a .bin file extension from the upgrade package onto a USB memory device. You need approximately 1 GB 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 contains 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, select the **Settings** icon () to open the Settings menu.
4. Select **Utilities** to open the Utilities submenu.
5. Select **Firmware Upgrade**. After the USB device has been scanned, the display lists all of the files on the USB device with a .bin file extension.
6. Select the file in the list and then select **Install** to start the upgrade. (See Figure 87.)

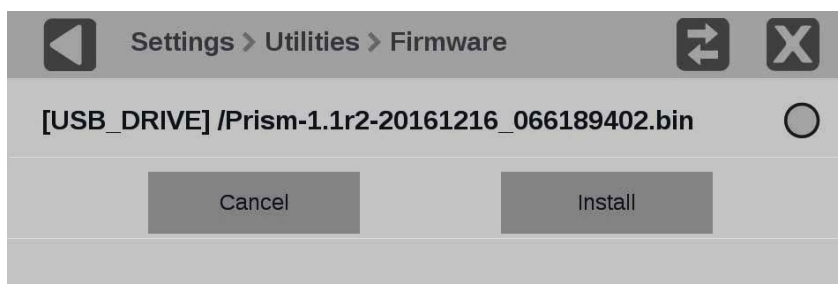


Figure 87: Select the firmware upgrade file

While the upgrade is in process, a message box appears stating that the firmware installation is in progress. (See Figure 88.)



CAUTION. Removing the USB device or powering off the instrument before the upgrade is complete can cause upgrade failure. To prevent upgrade failure, wait until the Installation Complete message box is displayed before performing these actions.

NOTE. The upgrade may take up to five minutes.

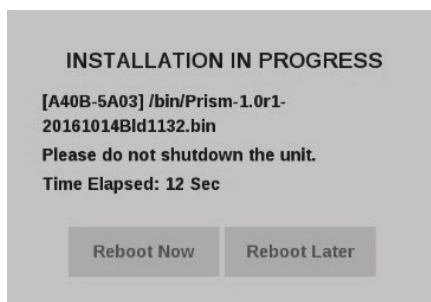


Figure 88: Upgrade Installation-In-Process message box

7. Select the **Activity** icon () to view the devices mounted to the instrument.
8. Select the **Eject** icon () to unmount the USB drive from the instrument.
9. Remove the USB device from the PRISM monitor.

Verify the firmware upgrade

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

Upgrade software license

A software license upgrade allows you to add optional software features to your instrument. Go to www.telestream.net for the latest list of features that can be licensed

Install the software license upgrade

To activate your licenses your instrument must be accessible by another computer on your local network. Your instrument does not need to access the internet.

To activate your licenses:

1. Connect your PRISM instrument to a local network and turn on power.
2. After the instrument has booted, find the IP address: select **Settings**, then **Network**, and finally select the **STATUS** tab.
3. Copy the IP address of the instrument under the CONTROL IP PORT heading.
4. Enter the IP address in a web browser.
5. Select **License Portal** and follow the instructions on the page.

For further assistance, contact our technical support team:
www.telestream.net/telestream-support/video/support.htm.

Verify the software license upgrade

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

Troubleshooting

Create a diagnostics report

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

1. Select 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.

Functions

This section describes additional functions available on the PRISM monitor.

- Headphone and speaker volume, balance, and source adjustment
- Stream Capture

Headphone/speaker volume, balance, device, and source adjustment

In addition to the optional integrated speakers on MPX2-25, headphones can be connected to MPI2-25 or MPX2-25 products.

- MPI2-25 audio output rear panel connector (See Figure 8.)
- MPX2-25 audio output rear panel connector (See Figure 9.)
- MPX2-25 front panel headphone port

To access the volume, balance, and source controls, select the **Volume** icon ().

The available options:

- Select the audio device to use.
- Select the source from the list of available channel pairs.
- Use the slider or arrow buttons to turn the volume up or down
- Use the slider or arrow buttons to adjust the audio balance left or right
- Select the mute button to mute the audio.
- Select the downmix button to listen to a downmixed group of channels.

If the downmix button is not visible (see Figure 89), the Program configuration might not be on or set.



Figure 89: Volume menu with the downmix button visible

To enable the downmix button:

NOTE. The Dolby program is configured automatically, based on metadata.

1. Select the **Settings** icon () to open the Settings menu.
2. Select **Inputs** to open the Inputs submenu.
3. Select the input with the channels to downmix.
 - a. If the input is SDI, select **AUDIO**.

- b. If the input is 2022, select **AUDIO**.

NOTE. If the input is 2110-30 with multiple audio streams, Downmix is available for a single audio stream. See [To access the downmix control for input 2110-30](#).

4. Check the Program Configuration is on and configured for the input. For more details about configuring the input, see [Select PCM](#).
5. Select **Save**.
6. Select the **Volume** icon (). The downmix button is visible (see Figure 92).

To access the downmix control for input 2110-30 with multiple audio streams:

1. Select the **Settings** icon () to open the Settings menu.
2. Select **Inputs** to open the Inputs submenu
3. Select the input to downmix.
4. Select **IP**, then select **ST2110**, and finally select **Audio (2110-30)**.
5. If there are multiple enabled audio streams, disable all the streams except the stream you want to downmix (see Figure 90):

Video (2110-20)	Audio (2110-30)	Data (2110-40)
Audio Streams		4
Stream 1	P1- Dst: 239.30.14.17 :50030 Type: 97 CH: 8 Mapped	>
Stream 2	P1- Dst: 239.30.11.17 : Masked Type: 97 CH: 8 Mapped	>
Stream 3	Not Enabled Mapped	>
Stream 4	Not Enabled Mapped	>

Figure 90: Two enabled audio streams

- a. Select a stream you do *not* want to hear and set Enable Audio Stream to **Disabled** (see Figure 91).

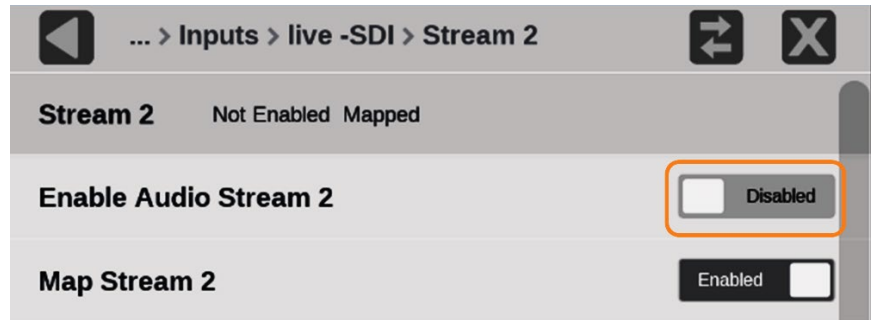


Figure 91: Stream Enable Audio Stream set to Disabled

- b. Select **Save Stream**.
- c. Repeat steps *a* and *b* for all enabled streams except the stream you want to downmix.

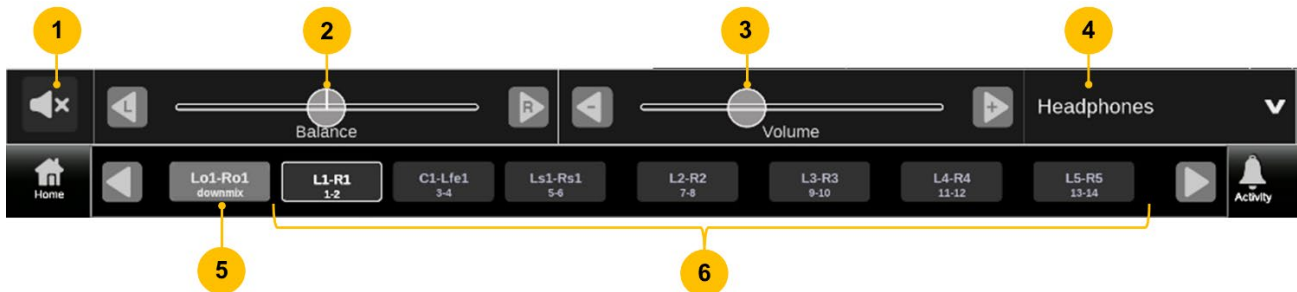


Figure 92: Mute, balance, volume, device selection, downmix, and other source controls

Table 12: Audio control features and descriptions

Number	Description
1	Mute: Mute or Unmute Audio
2	Balance: Left / right balance control of selected audio pair
3	Volume: Volume control of selected audio pair
4	Audio device: Output audio device to control. This can be headphones using the audio ports or USB inputs, or the internal speakers on MPX2-25 (requires option SPKR). The name of the audio device in the list will depend on what port is used and the device itself: • Speakers: MPX2-25 integrated speakers • Headphones: Headphones plugged into the front or rear panel audio ports • USB AUDIO DAC: Headphones plugged into the MPX2-DUALDSP external display product audio ports • Unknown: Unidentified audio device plugged into the front or rear panel USB ports If a USB audio device supports device descriptors, the vendor supplied device name appears in the list.
5	Downmix: Audio channel group to monitor channels mixed down to stereo or mono (visible when only Program Configuration is on and set)
6	Audio source: Audio channels to monitor



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 takes an image of the entire screen and saves it to a USB device.

Stream capture creates a PCAP file capturing up to 2GB of data on a USB device for further analysis. Both modes are useful for comparing sources or capturing transient events.

Requirements to use the Capture feature:

- MP2-IP-MEAS option installed
- USB 3.0 drive connected to the rear panel of the PRISM monitor

NOTE. For the fastest capture rate with the Stream Capture, we recommend using a USB 3.0 drive, plugged into one of the USB 3.0 ports on the rear panel of the instrument. Using a USB 2.0 drive or USB 2.0 ports can cause the stream capture to take longer.

NOTE. Maximum stream capture PCAP files are approximately 2GB in size.

Capture a screenshot

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

NOTE. If the Capture configuration menu does not appear under the Settings menu, option MP2-IP-MEAS is not installed, but screen captures are still functional.

2. Select **Screenshot** under SELECT CAPTURE TYPE. (See Figure 93.)

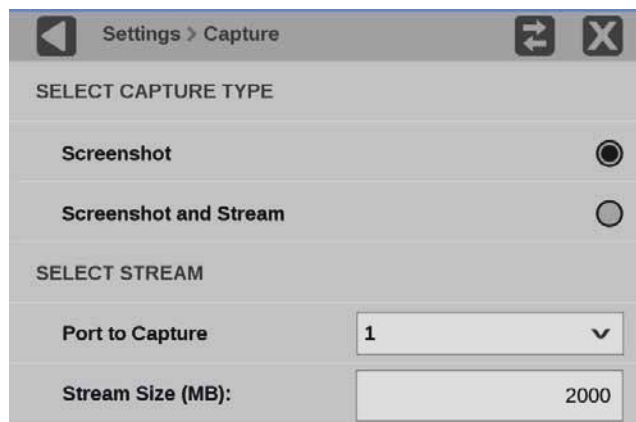


Figure 93: Select Screenshot

3. On the application bar select the **Capture** icon ()

A screenshot is saved to the device. (See Figure 94.)

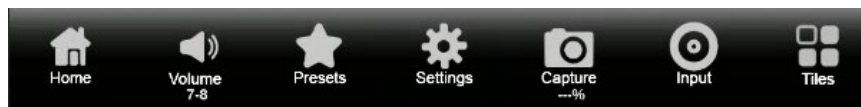


Figure 94: Application bar – Capture

Take a stream capture

1. Verify there is a USB drive 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 MP2-IP-MEAS is not installed and stream captures are disabled.

4. Select **Screenshot and Stream** under SELECT CAPTURE TYPE. (See Figure 95.)
5. Use the **Port to Capture** drop-down menu to select from inputs 10/25GE SFP 1 or 2.

NOTE. When capturing on a port configured for 25 Gb data rate, the maximum total bitrate on the port must be less than 15 Gbps. Data packets captured in the PCAP file may be dropped if the total bitrate exceeds this limit.

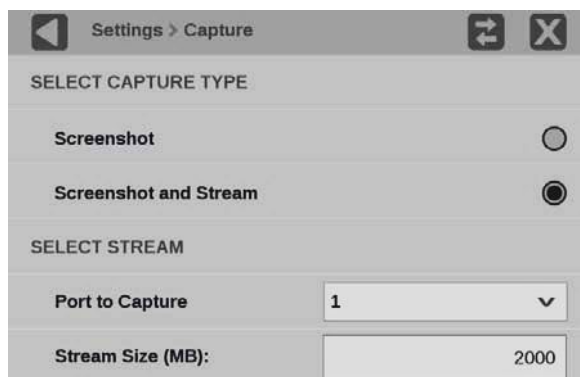


Figure 95: Select Screenshot and Stream

6. Select **Stream Size (MB)** to set the size of the capture. (See Figure 96.)

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

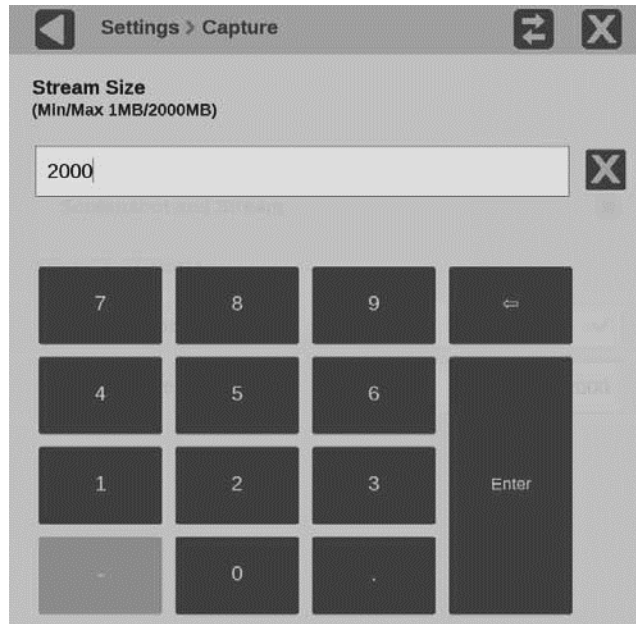


Figure 96: Stream Size settings

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. (See Figure 97.)

NOTE. During capture the Aux Out signal will be turned off, and Pictures and Traces will be blanked.

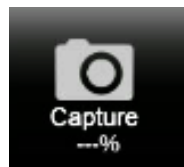


Figure 97: Sample Stream capture icon with percentage

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 the attached USB device. The name of the file and the path to the file on the USB device are displayed after the save is complete.
10. Select **OK** to close the menu.

Application information

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

To see the All Application menu, select the **Tiles** icon () and then select the All Application menu icon (.

NOTE. Some displays require a specific option to be installed. For example, the IP Graph display is not accessible unless you have Option MP2-IP-MEAS.

Base instrument applications

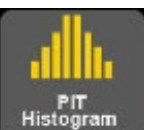
These applications are available on every PRISM monitor, unless otherwise noted:

Application icons	Description
	Waveform application: Use this application to view the voltage versus time display of the video signal.
	Vector application: Use this application to call up the Vector, which plots color difference signals for viewing hue and amplitude, but not luminance.
	Audio application: Use this application to view a level meter display of the audio in the monitored signal, along with a Lissajous display and Channel Correlation meter for monitoring two channel audio phase (Lissajous, Channel Correlation, and Audio Session require Option MP2-AUD). Also included are Test level and Peak program level indicators.
	Picture application: Use this application to view the picture generated by the video signal.
	Video Session application: Use this application to view timing offsets between the incoming SDI video signals and Black Burst/Tri-Level Sync external reference signals.

Application icons	Description
 Timing	Timing application : Use this application to view timing offsets between the incoming SDI video signals and Black Burst / Tri-Level Sync external reference signals.
 Event Log	Event Log application : Use this application to view a log of detected errors.
 IP Status	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.

Option MP2-IP-MEAS applications

These additional applications are available when Option MP2-IP-MEAS is installed:

Application icons	Description
 IP Session	IP Session application : Use this application to view various performance parameters of the IP stream including Layer 2, video and PTP parameters.
 IP Graphs	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).
 PIT Histogram	PIT Histogram application : Use this application to view a histogram of the PIT (Packet Interval Time) to monitor network delay variation statistics.
 PTP Graphs	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.

Application icons	Description
	Timing application : Adds features to standard Timing application including to view timing offsets between the incoming 2022-6 and 2110-20 video signals and PTP signals.
	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.

Option MP2-GEN applications

These additional applications are available when Option MP2-GEN is installed:

Application icons	Description
	IP Generator application : Use this application to provide an IP test signal to check the receiver device and signal path.
	SDI Generator application : Use this application to provide an SDI test signal to check the receiver device and signal path.

Option MP2-ENG and MP2-QC applications

These additional applications are available when Option MP2-ENG or MP2-QC is installed:

Application icons	Description
	Datalist application : Use this application to see the digital data contained in SDI frames to perform in-depth monitoring and analysis of incoming SDI data
	ANC (Ancillary Data) Session application : Allows you to monitor all ancillary data present in a signal.

Option PHY applications

These additional applications are available when Option PHY is installed (software option MP2-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.
	Eye Display application : Use this application to view an eye pattern diagram of the SDI input only.

Option MP2-PROD applications

These additional applications are available when Option MP2-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.
	Diamond Display application : Use this application to reliably detect invalid colors.
	Lightning Display application : Use this application to show luma and chroma amplitudes and verify component timing using a color-bar signal.
	CIE application : Use this application to check the chromaticity of the video against various color gamut limits.

Option MP2-DLBY and MP2
AUD applications

This additional application is available when Option MP2-DLBY or MP2-AUD is installed:

Application icons	Description
	Dolby Status application . Use this application to show metadata content in the selected Dolby audio stream.

NOTE: Of the trace applications (Waveform, Vector, Stop, Diamond, Lightning, and CIE) up to 4 can be displayed at the same time in formats:

- SD
- HD 720p, 1080p, 1080i
- 3G Level A

All other formats can display up to 2 trace applications at a time.

Optional features

These features are 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 MP2-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 MP2-IP-MEAS is installed.

Viewing installed options

To view options installed on the instrument, select **Settings**, then **Utilities**, and then **Options**.

Status indicators

Many of the application displays include status icons, which provide a quick method for viewing signal status. These 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 signal-level versus time display of the video signal.
(See Figure 98.)

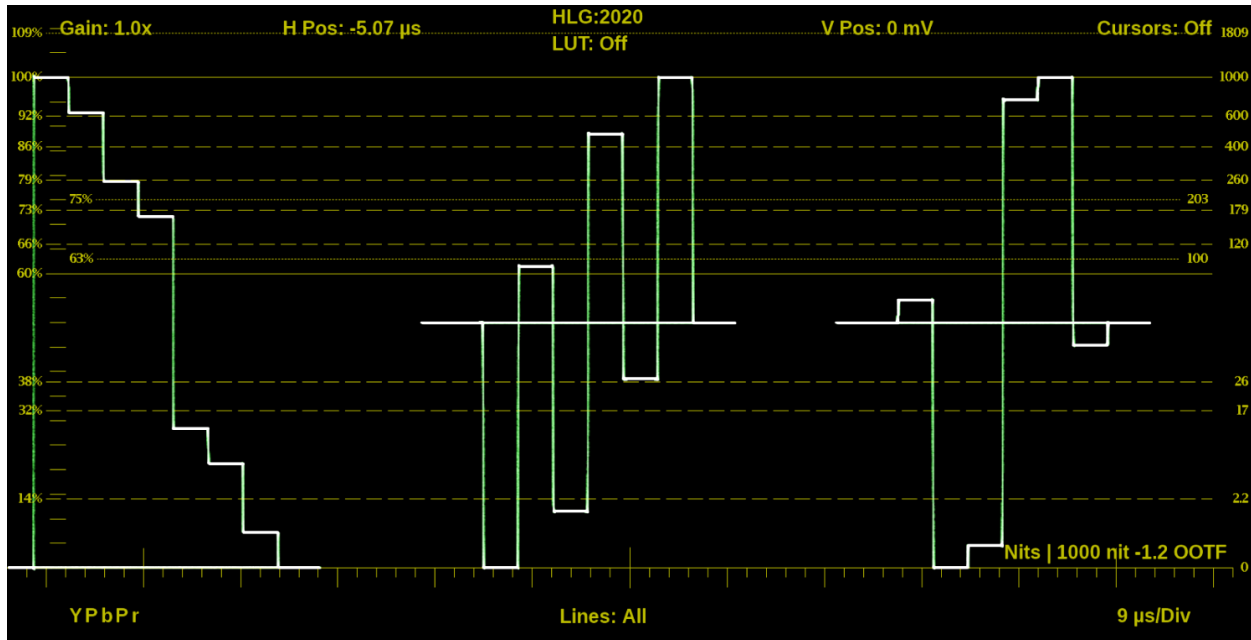


Figure 98: Waveform display application

NOTE. After the Waveform application settings menu is opened, the Move icon (↔) appears. Select this icon to move the settings menu left or right.

Waveform application settings menu

The Waveform application settings menu figure shows the available options. (See Figure 99.)



Figure 99: Waveform application settings menu

Display Style: Select one of the buttons to choose how the signal components are displayed in the active tile:

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

Sweep: Select 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: Select the drop-down menu to select from these 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.

Filter: Select one of the buttons to set the waveform filter. This is useful for isolating a specific characteristic of the input. For example, you may enable a Low Pass filter for quick camera exposure setting.

These filters are available:

- **Flat:** Display with the full available bandwidth
- **Low Pass:** Display only the low frequency part of the signal

Graticule: Select the drop-down menu to choose a vertical scale value: %, 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: Move this slider to **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 MP2-PROD).

NOTE. *Conversion to Rec. 709 automatically converts to BT.709, otherwise the graticule selection must be manually changed. ([See Configure instrument for HDR/WCG monitoring.](#))*

Conversion to Rec. 709 mode is not supported for SD signals.

Line Select: Move the slider to On to select 1 Line or Off to select All Lines.

If **1 Line** is selected, the display only shows results for the selected line in the picture. The line can be selected using the on-screen tools. ([See Line Select function.](#)) Or the line can be selected directly on the Picture.

Show Active Area Only: When the option is on it removes the trace of vertical / horizontal blanking data.

Gain: Use the button to change the gain to x1, x2, x5, or x10.

Magnification: Use the button to change the magnification to Best View, x1, x10, x20, x25, or x50.

Waveform application on- screen tools

You can change the gain, horizontal position, vertical position, cursors, display mode, display format, and selected line, without opening the Waveform settings menu, through on-screen tools. Select the tool/button for the setting you want to adjust. All the available tools are located on the top and bottom of the display and are highlighted for a few seconds when the application is first opened or if you select anywhere in the middle of the application tile. (See Figure 100.)

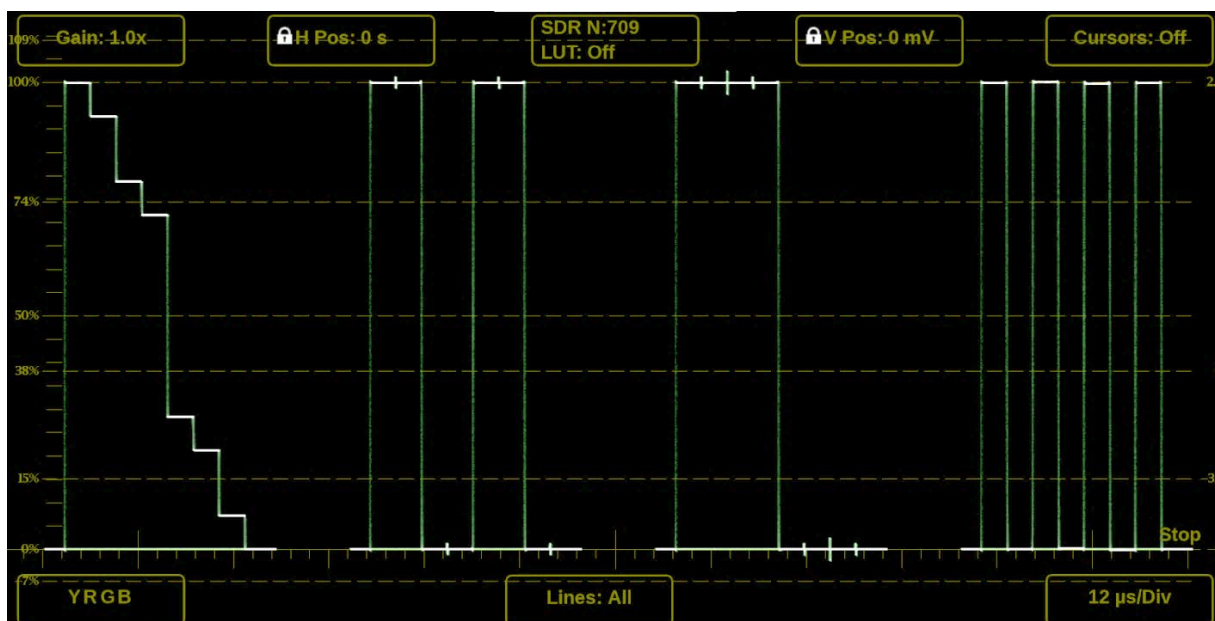


Figure 100: Available on-screen tools for the Waveform application

Gain: Increase or decrease the magnification of the trace display.

1. Select the **Gain** button to expand the available magnification options drop down list. (See Figure 101.)
2. Select one of the preset magnifications for fixed gain.
3. Select Variable Gain; select **VAR: Off**, this changes it to VAR: On. Variable gain allows you flexibility in changing the gain factor between 0.5x to 20.0x.

The limits of the variable gain change depending on the gain factor you select.

- 1.0x has a range of 0.25x to 2.00x gain.
- 2.0x has a range of 0.50x to 4.00x gain.
- 5.0x has a range of 1.25x to 10.00x gain.
- 10.0x has a range of 2.50x to 20.00x gain.

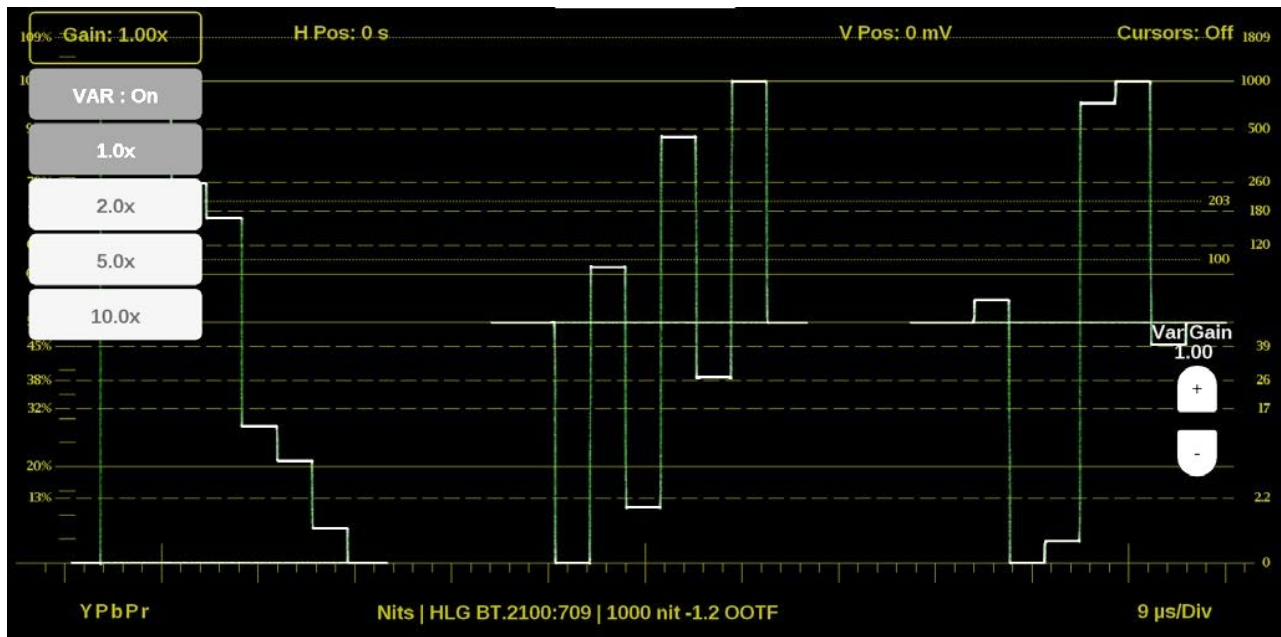


Figure 101: Waveform on-screen tools – Gain

To adjust the gain:

- On a touchscreen, use a pinch gesture to change the scale of the trace for large increments.
- For fine increments, select the plus or minus buttons to adjust the gain.
- The scroll wheel on a mouse adjusts the variable gain.
- Use the **Reset** icon (Reset) to remove variable gain adjustments.

Horizontal and vertical position: Adjust the position of the trace display.

1. Select the **H Pos** button to allow incremental adjustment of the horizontal trace. (See Figure 102.)
 - Select and drag to move the trace on the touchscreen. This method can be performed without using the button.
 - Use a mouse scroll wheel to move the trace.
 - For incremental adjustments, use the plus or minus buttons to adjust the horizontal position.
 - Select the **Reset** icon (Reset) to reset the horizontal position adjustment to default.

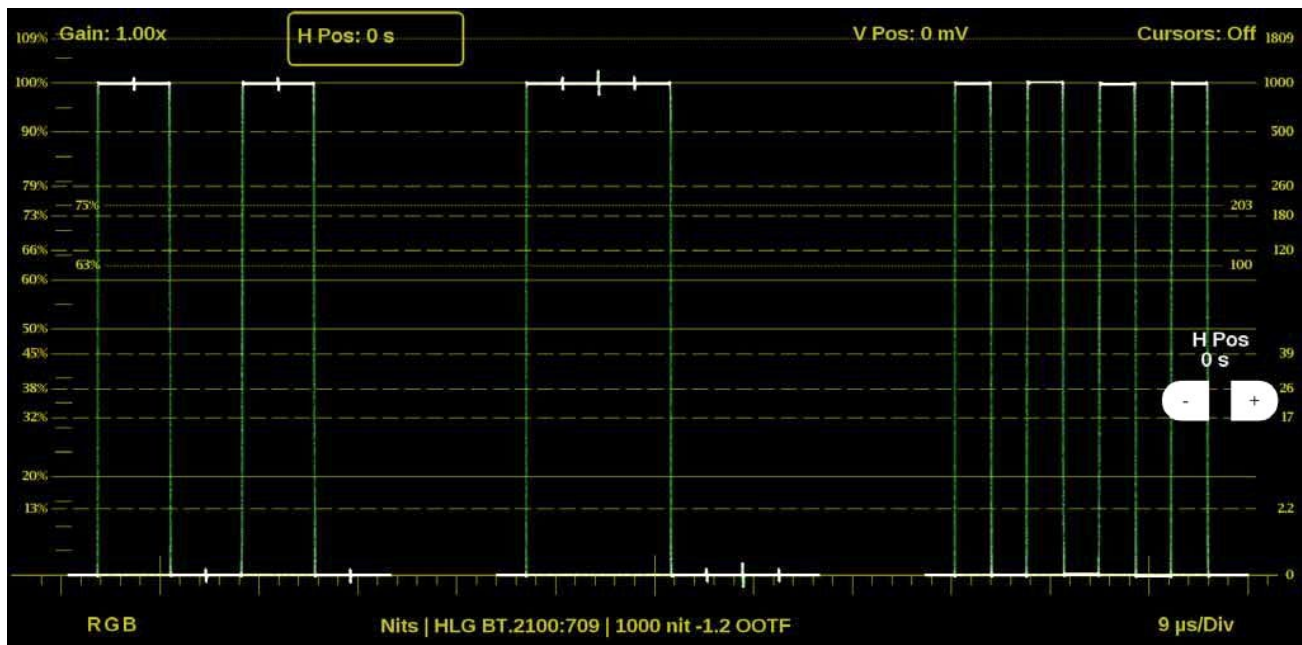


Figure 102: Waveform on-screen tools – horizontal position

2. Select the **V Pos** button to adjust the vertical trace. (See Figure 103.)
 - Select and drag to move the trace on the touchscreen. This method can be performed without using the button.
 - Use a mouse scroll wheel to move the trace.
 - For incremental adjustments, use the plus or minus button to adjust the vertical position.
 - Use the **Reset** icon () to reset the vertical position adjustment to default.

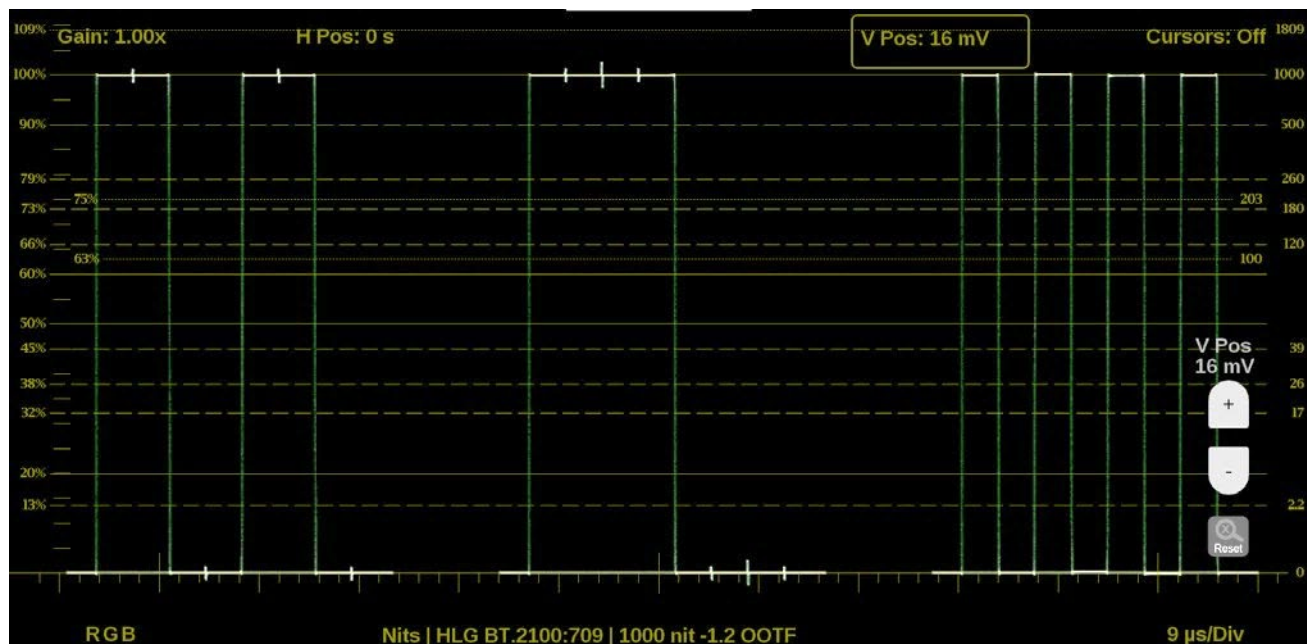


Figure 103: Waveform on-screen tools – vertical position

Cursors: Make precise measurements with time and voltage cursors.

1. Select the **Cursors** button to show the time and voltage cursor options.
(See Figure 104.)
2. Select the **T** button to **On** to display two time cursors.
3. Select anywhere on the display to hide the **T** and **V** buttons.
4. Select and drag anywhere on the T1 or T2 cursor to mark exact times in the trace. The cursors highlight yellow when moved. The timestamp of each cursor and the delta are displayed on the right side of the application.

NOTE. The cursor tab provides an easy way to adjust each cursor.

5. Change the **V** button to **On** to display two voltage cursors.
6. Select the **V Units** button to change the voltage units between percentage (%), millivolts (mv), or code value (CV).
7. Select anywhere on the display to hide the buttons.
8. Select, hold, and drag anywhere on the V1 or V2 cursor to mark exact times in the trace. The cursors highlight yellow when moved. The voltage measurement at each cursor and the delta are displayed on the right side of the application.

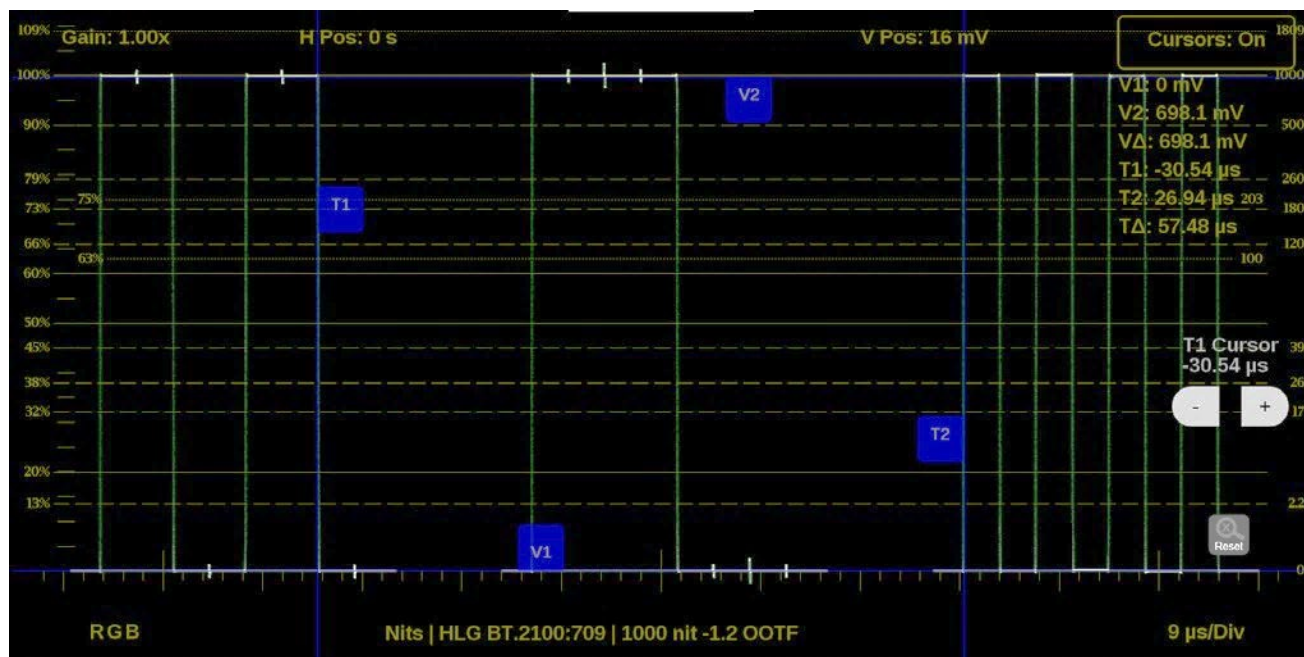


Figure 104: Waveform on-screen tools – time and voltage cursor values and deltas

NOTE. The time and voltage cursor positions are retained if the trace is moved horizontally or vertically, or if the gain is adjusted.

Display Mode: Change how the waveforms are displayed.

1. Select the button in the bottom left corner of the application to expand the available display options. (See Figure 105.)
2. Select one of the display options.
3. Each option can be filtered by the individual waveforms to display.
 - Select **YPbPr** to display any combination of the Y, Pb, and Pr waveforms.
 - Select **RGB** to display any combination of the R, G, and B waveforms.
 - Select **YRGB** to display any combination of the Y, R, G, and B waveforms.

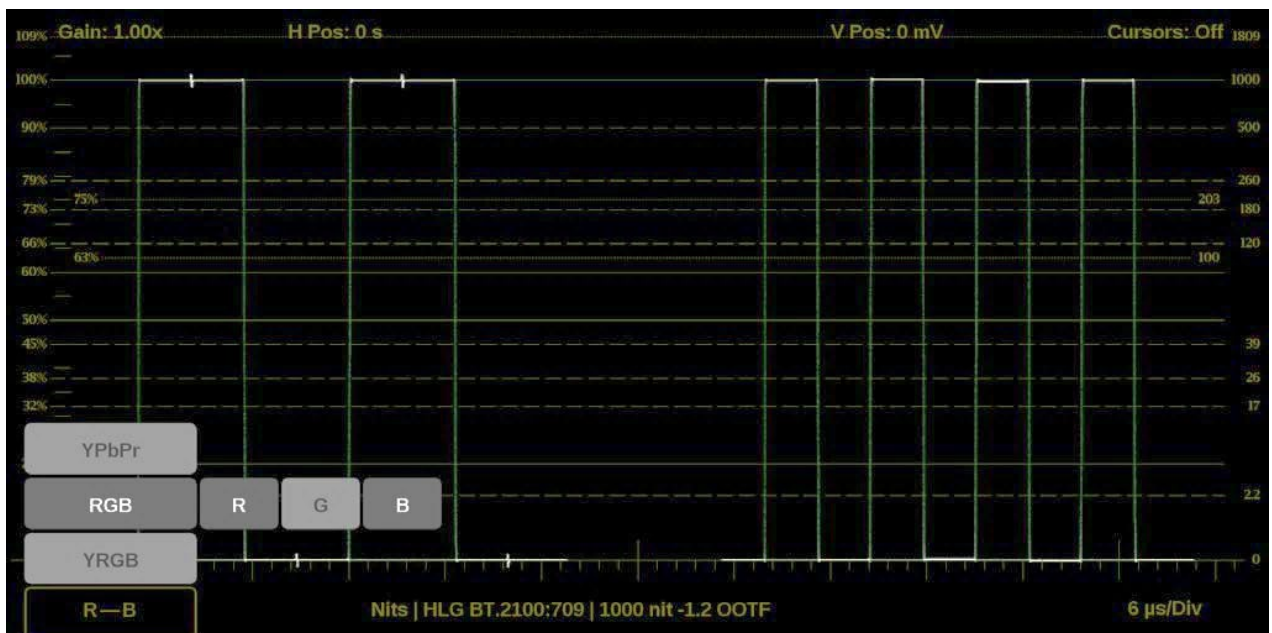


Figure 105: Waveform on-screen tools – Display Mode

Display format: Change the Display Style, Sweep, and Magnification of the waveform.

1. Select the button in the bottom right corner of the application to expand the available display format options. (See Figure 106.)
2. Select the **Mag** option to adjust the magnification to Best View, x1, x10, x20, x25, or x50.
3. Select the Display Style option to switch between Parade or Overlay.
4. The 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.

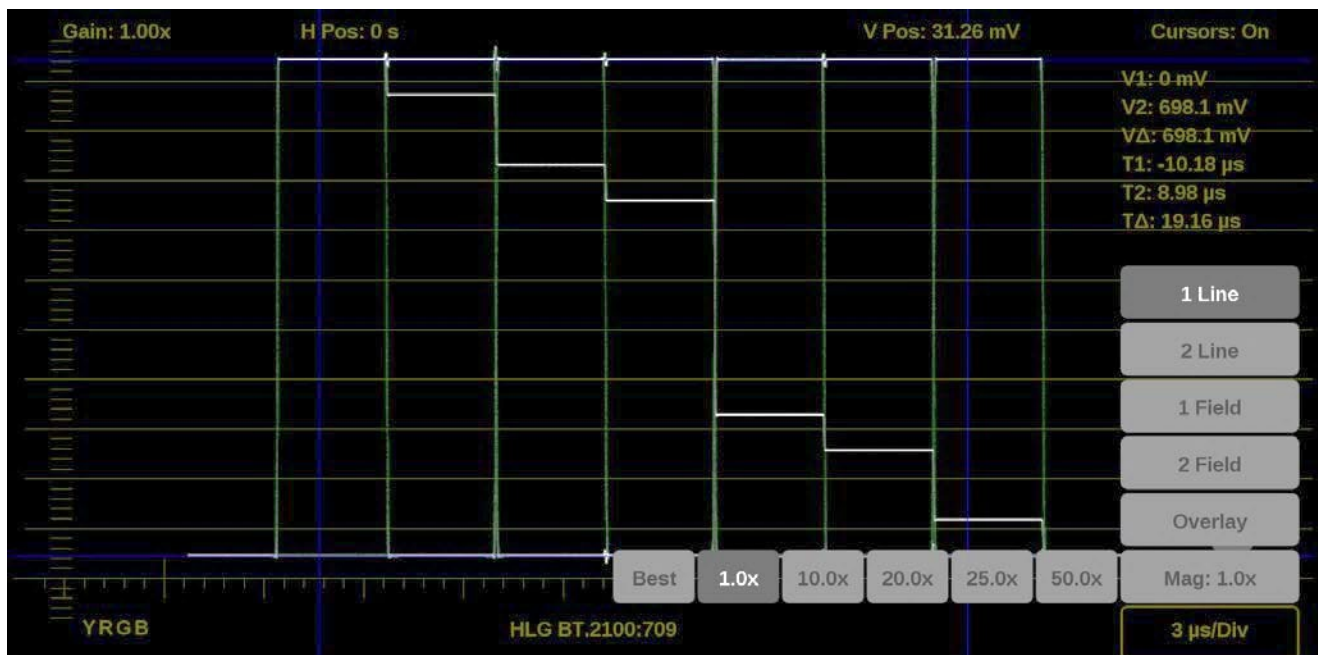


Figure 106: Waveform on-screen tools – display format

Line Select function: Line Select allows you to select a single picture line to monitor in the display. By default All Lines is selected and all lines are monitored.

NOTE. The same line is selected in any trace display if line select is enabled.

To turn on Line Select (and choose the line to monitor):

1. Select the **Lines** button at the bottom of the tile. (See Figure 107.)
2. Select **1 Line**.
 - To scroll through lines, select the + and – buttons.
 - To enter a specific line to monitor:

- select **Line Sel.** and enter the line on the keypad,
- or in the Picture application, use the line-select cursor (for active lines).

Depending on the resolution in the signal, the Line Select provides different information.

- If a signal is SD, HD, 3G (see Figure 107):
 - the *Line* number is the selected line, including vertical blanking,
 - if the signal is interlaced format, the *Fields* readout is below the Line number,
 - the *Pic Line* number is next to Line; the Pic Line is the active line number, or numbers, selected.
- If a signal is UHD, 4K (see Figure 108):
 - the *Line* number is the selected raster line,
 - the *SDI Line* is the selected line including vertical blanking,
 - the *link* number appears below the SDI Line.

NOTE. In link, the letters (A, B, C, or D) refers to the physical links.

The numbers (1, 2, 3, or 4) refers to the virtual links.

For example, A3/62 indicates it is physical link 1 and virtual link 3 (in a 2-sample interleave, 12G transport).

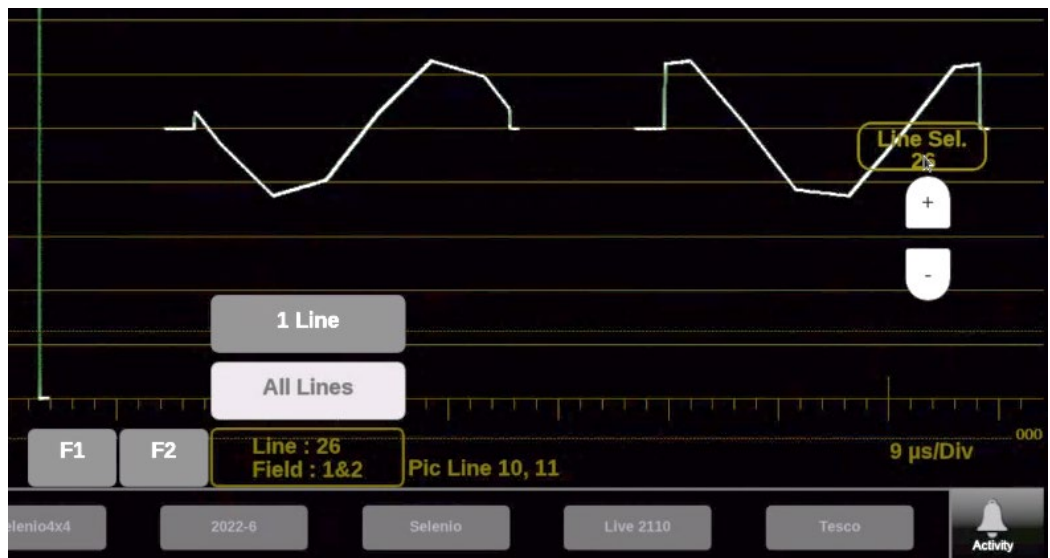


Figure 107: Waveform on-screen tools – Pic Line number

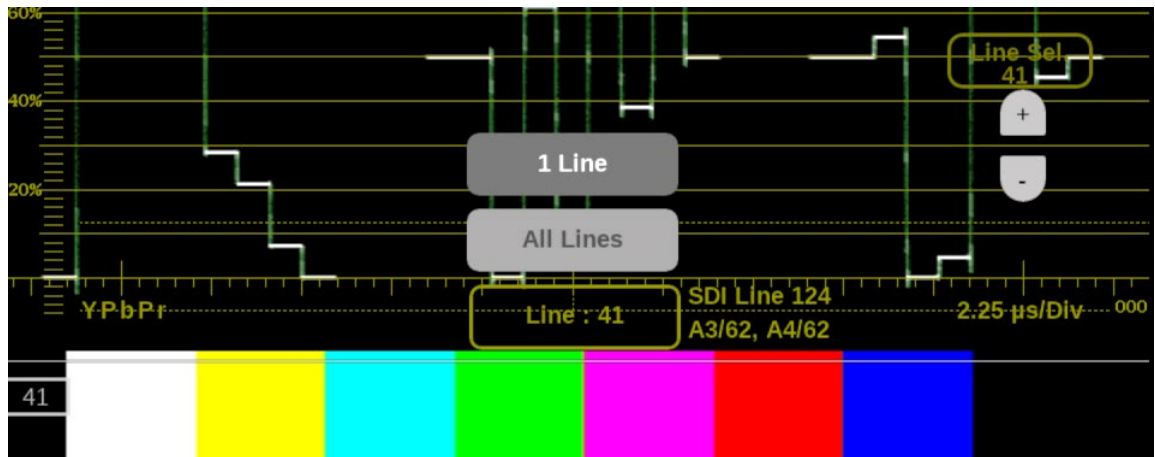


Figure 108: Waveform on-screen tools – SDI Line number

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 MP2-PROD, transfer function/color space conversion allows for an ITU-R BT 709 color space to verify wide color gamut compatibility.

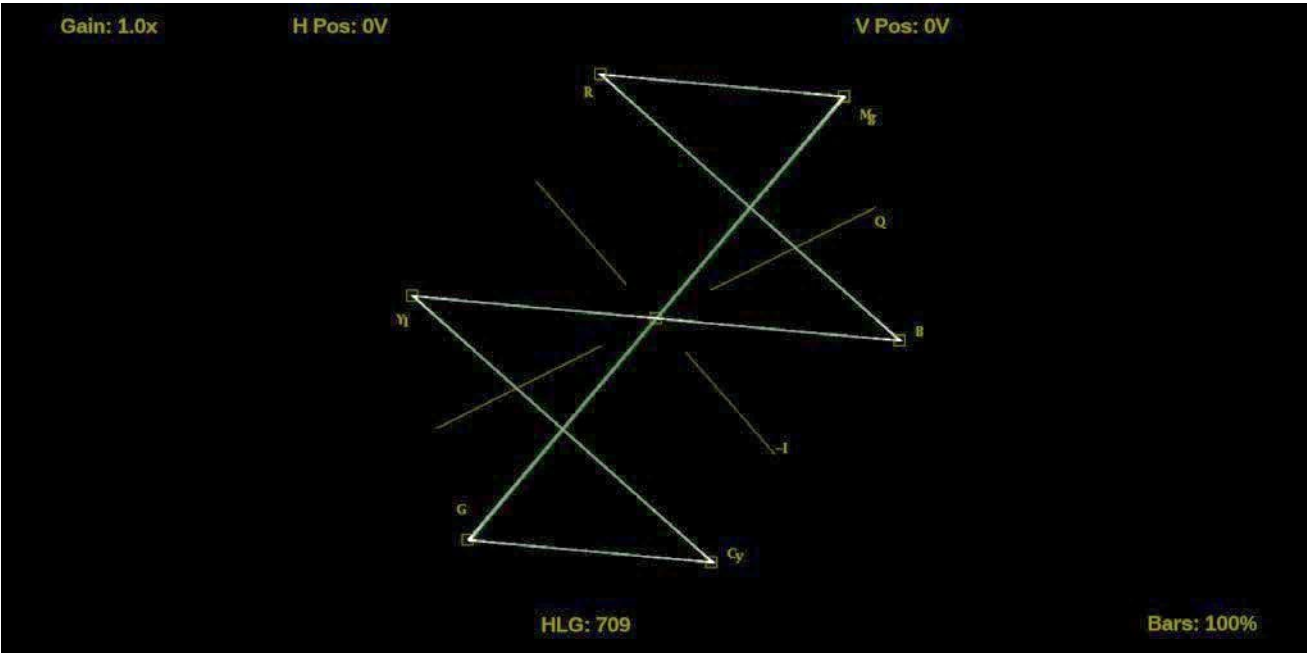


Figure 109: Vector application display

NOTE. After the Vector application settings menu is opened, the Move icon (↔) appears. Select this icon to move the settings menu left or right.

Vector application settings menu

The Vector application settings menu figure shows the available options. (See Figure 110.)

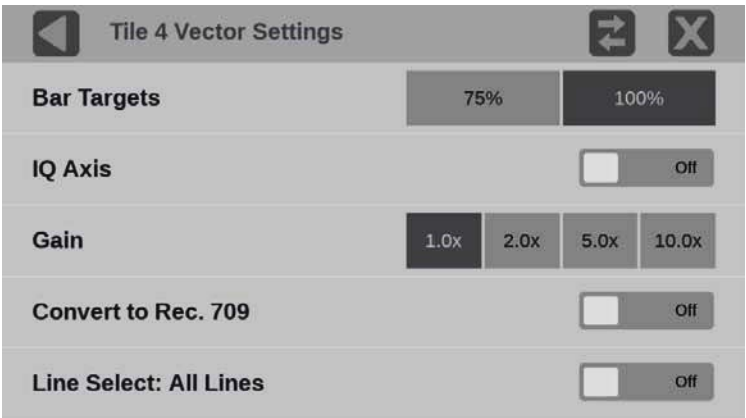


Figure 110: Vector application settings menu

Bar Targets: Select between 75% or 100% scaling.

IQ Axis: Select this to turn the IQ Axis On or Off.

Gain: Select one of the 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 MP2-PROD).

NOTE. Set Convert to Rec. 709 to On to automatically convert settings to BT.709, otherwise the graticule selection must be manually changed. ([See Configure the instrument for HDR/WCG monitoring.](#))

Convert to Rec. 709 mode is not supported for SD signals.

Line Select: Line Select allows you to choose the picture lines to monitor in the display. Either **All Lines** or **1 Line** can be selected.

If **1 Line** is selected then the display only shows results for the selected line in the picture. The line can be selected using the on-screen tools. ([See Line Select function.](#)) Or the line can be selected directly on the Picture.

Vector application on-screen tools

You can change the gain, horizontal position, vertical position, and bar targets without opening the Vector settings menu through on-screen tools. Select the tool/button for the setting you want to adjust. All the available tools are located on the top and bottom of the display and are highlighted for a few seconds when the application is first opened or if you select anywhere in the middle of the application tile.

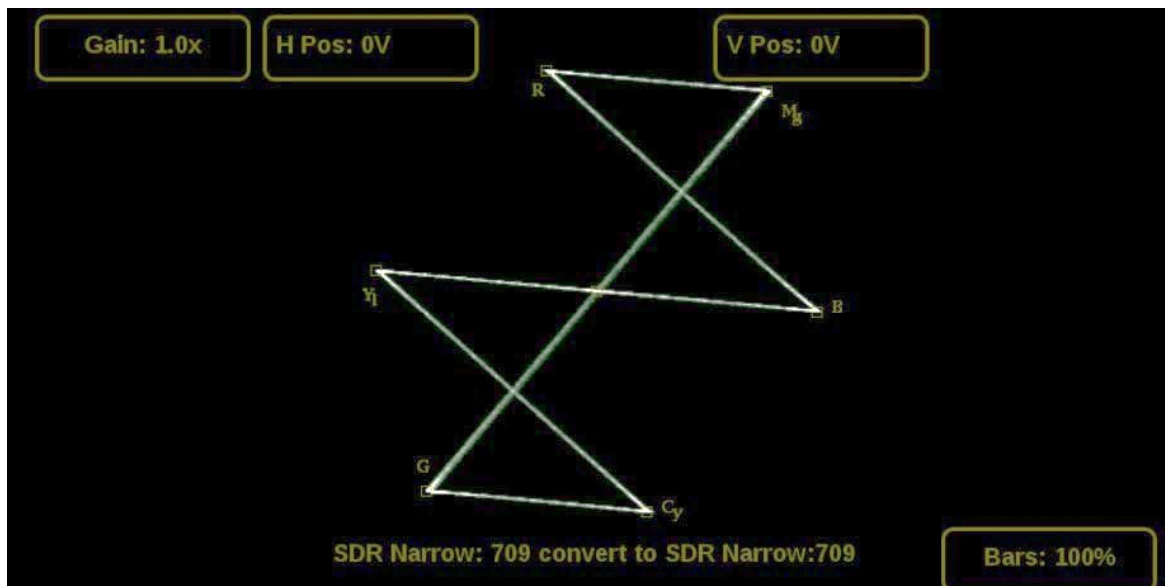


Figure 111: Available on-screen tools for the Vector application

Gain: Increase or decrease the magnification of the trace display.

1. Select the **Gain** button to expand the available magnification options drop down list. (See Figure 112.)
2. Select one of the preset magnifications for fixed gain.
3. Select Variable Gain; select **VAR: OFF** to change it to VAR: On. Variable gain allows you flexibility in changing the gain factor between 0.5x to 20.0x.

The limits of the variable gain change depending on the gain factor you select.

- 1.0x has a range of 0.25x to 2.00x gain.
- 2.0x has a range of 0.50x to 4.00x gain.
- 5.0x has a range of 1.25x to 10.00x gain.
- 10.0x has a range of 2.50x to 20.00x gain.

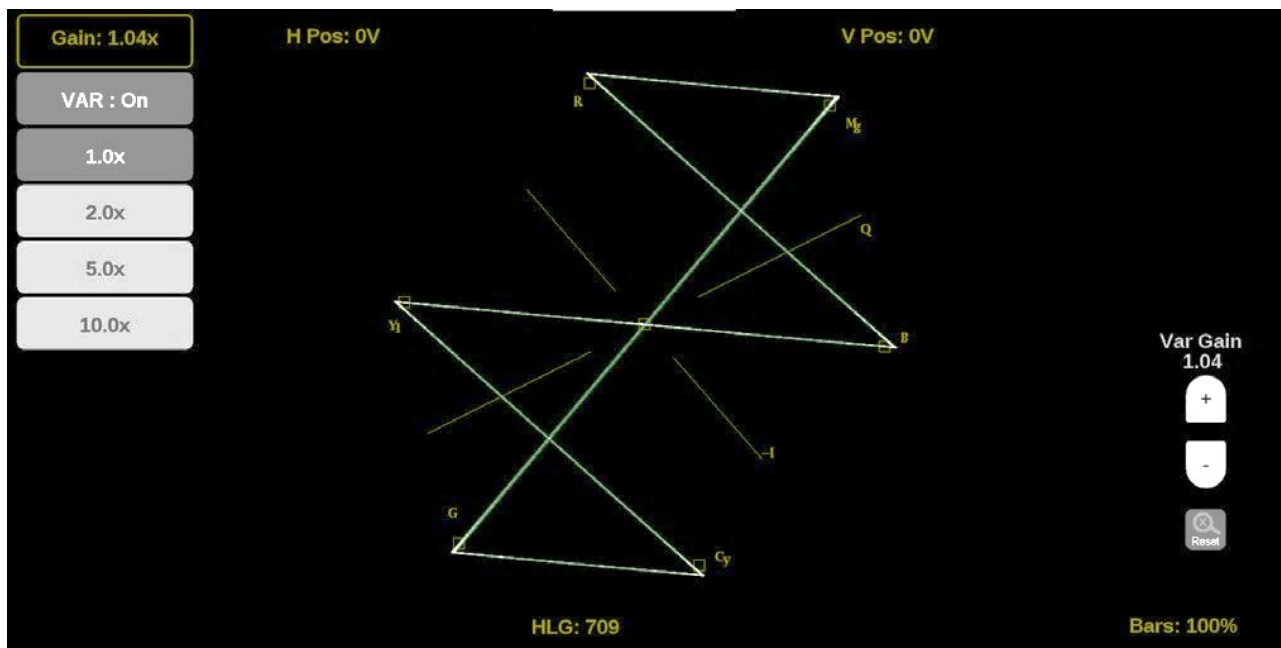


Figure 112: Vector on-screen tools – Gain

Use these methods to adjust the gain:

- On a touchscreen, use a pinch gesture to change the scale of the trace for large increments.
- For fine increments, select the plus or minus button to adjust gain. The scroll wheel on a mouse will adjust the variable gain.
- Select the **Reset** icon (Reset) to remove variable gain adjustments.

Horizontal and vertical position: Adjust the position of the trace display.

1. Select the **H Pos** button to allow adjustment of the horizontal trace. (See Figure 113.)
 - Select and drag to move the trace on the touchscreen. This method can be performed without using the button.
 - Use a mouse scroll wheel to move the trace.
 - For incremental adjustments, use the plus or minus button to adjust the horizontal position.
 - Select the **Reset** icon (Reset) to reset the horizontal position adjustment to default.

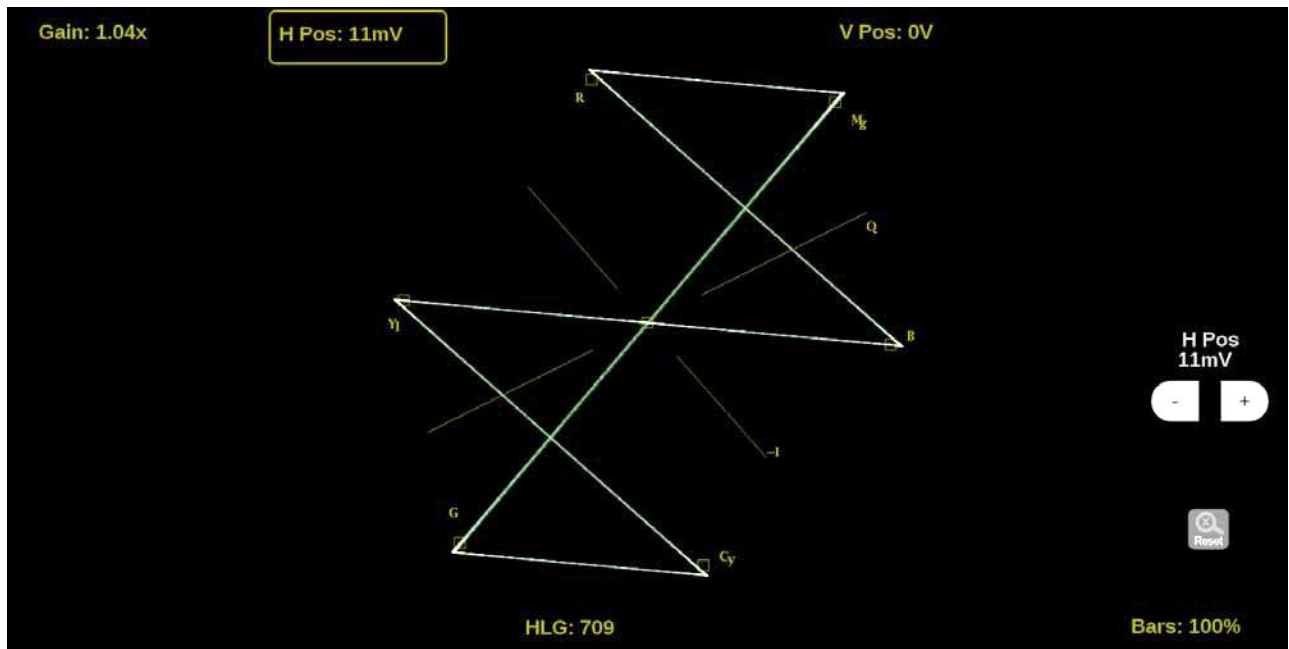


Figure 113: Vector on-screen tools – horizontal position

2. Select the **V Pos** button to allow adjustment of the vertical trace. (See Figure 114.)
- Select and drag to move the trace on the touchscreen. This method can be performed without using the button.
 - Use a mouse scroll wheel to move the trace.
 - For incremental adjustments, use the plus or minus button to adjust the vertical position.
 - Select the **Reset** icon () to reset the vertical position adjustment to default.

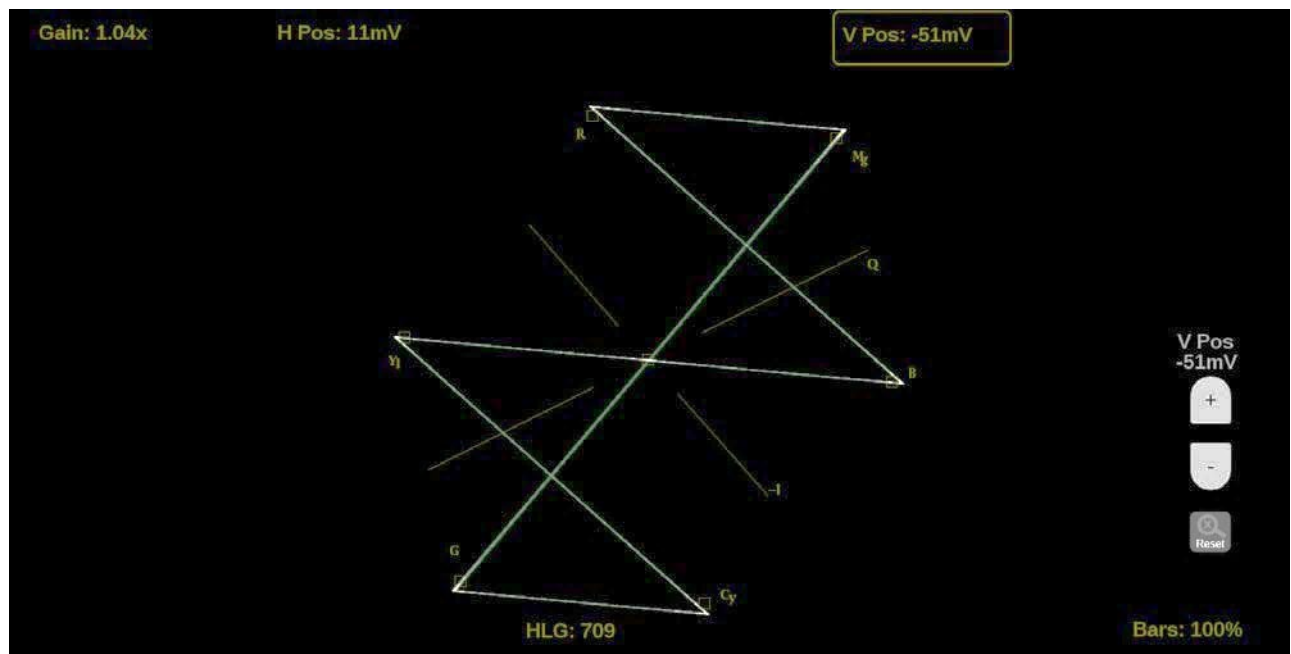


Figure 114: Vector on-screen tools – vertical position

Bar Targets: Change the scaling of the Vector display.

1. Select the **Bars** button in the bottom right corner of the application to expand the available options. (See Figure 115.)
2. Select either 75% or 100% scaling.

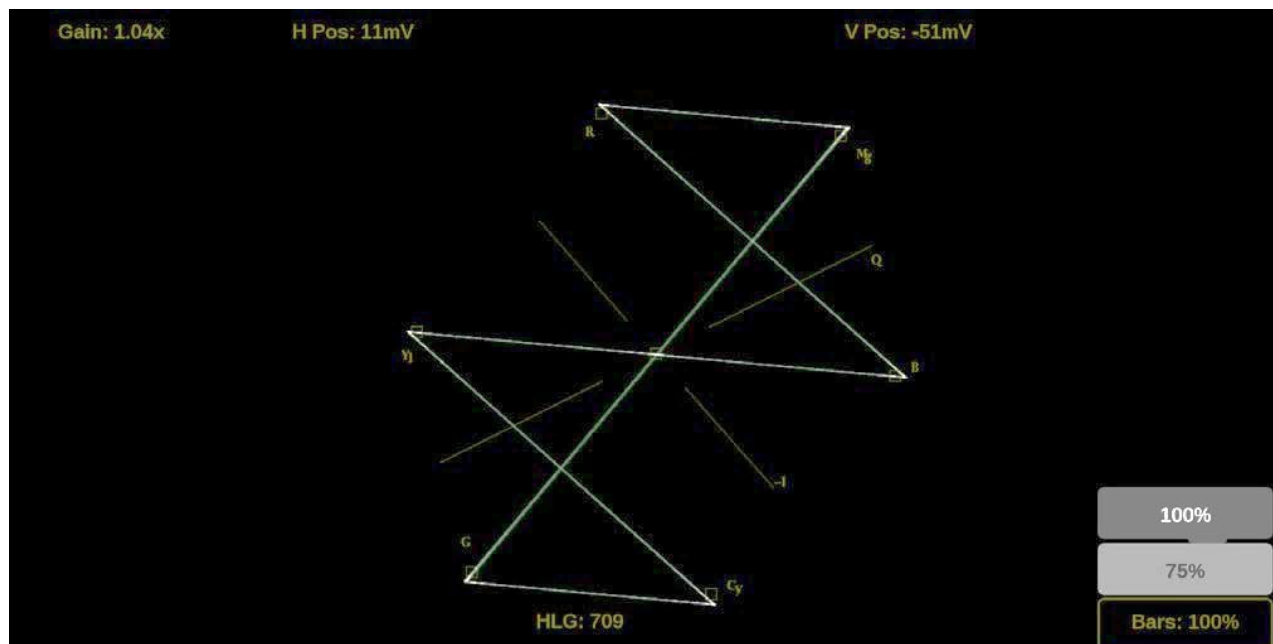


Figure 115: Vector on-screen tools – Bar Targets

Line Select function: Line Select allows you to select a single picture line to monitor in the display. By default All Lines is selected and all lines are monitored.

NOTE. *The same line is selected in any trace display if line select is enabled.*

To turn on Line Select (and choose the line to monitor):

1. Select the **Lines** button at the bottom of the tile. (See Figure 116.)
2. Select **1 Line**.
 - To scroll through lines, select the + and – buttons.
 - To enter a specific line to monitor:
 - select **Line Sel.** and enter the line on the keypad,
 - or in the Picture application, use the line-select cursor (for active lines).

Depending on the resolution in the signal, the Line Select provides different information.

- If a signal is SD, HD, 3G (see Figure 116):
 - the *Line* number is the selected line, including vertical blanking,

- if the signal is interlaced format, the *Fields* readout is below the Line number,
 - the *Pic Line* number is next to Line; the Pic Line is the active line number, or numbers, selected.
- If a signal is UHD, 4K (see Figure 117):
 - the *Line* number is the selected raster line,
 - the *SDI Line* is the selected line including vertical blanking,
 - the *link* number appears below the SDI Line.

NOTE. In link, the letters (A-D) refers to the physical links.

The numbers (1-4) refers to the virtual links.

For example, A3/62 indicates it is physical link 1 and virtual link 3 (in a 2-sample interleave, 12G transport).



Figure 116: Vector on-screen tools – Pic Line number

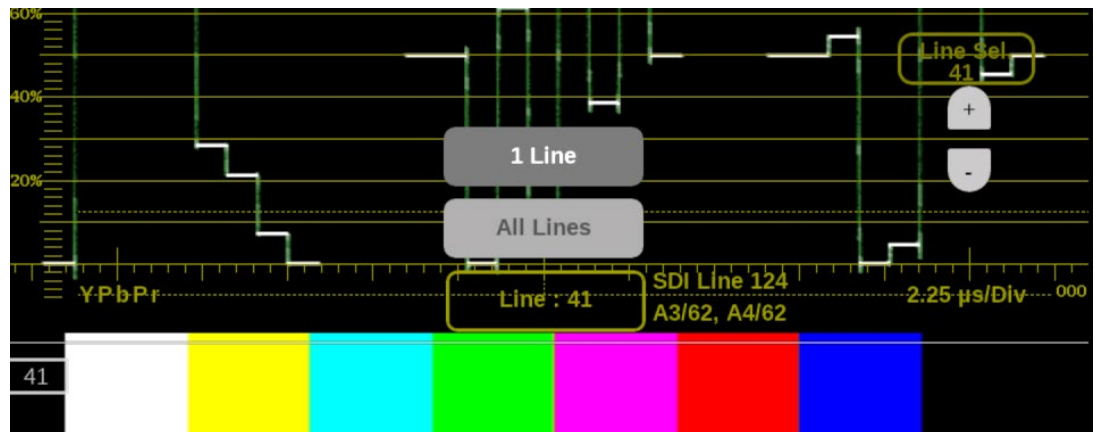


Figure 117: Vector on-screen tools – SDI Line number

Audio application

The Audio application provides a level meter display with multiple ballistic settings, and optional Audio Session and Lissajous with Channel Correlation displays. Audio Session shows instantaneous measurements of the level meters and the Lissajous and Channel Correlation displays show audio phase information. Dolby E decoding can be performed on a specified SDI input channel pair.

NOTE. The Lissajous, Channel Correlation meter, and Audio Session displays require software option MP2–AUD. Dolby E decoding requires option MP2–DLBY. The 32-channel audio support requires option MP2-FMT-8K.

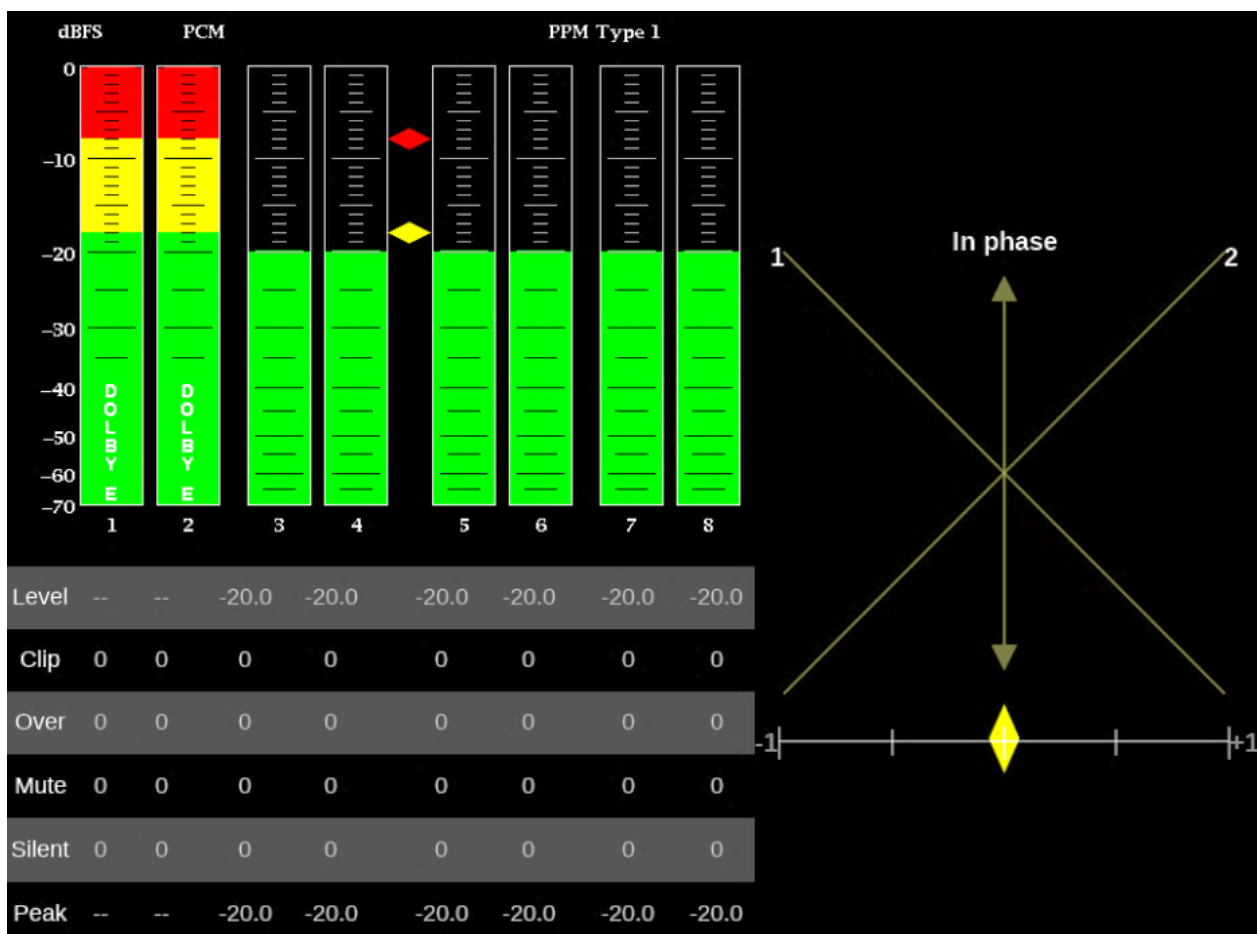


Figure 118: Audio application display

Audio application settings menu

NOTE. After the Audio application settings menu is opened, the Move icon (📏) appears. Select this icon to move the settings menu left or right.

The Audio application settings menu shows the available options. (See Figure 119.)

1. Open the Audio application in a tile.
2. With the Audio application highlighted, select the **Tile** icon (⚙️).

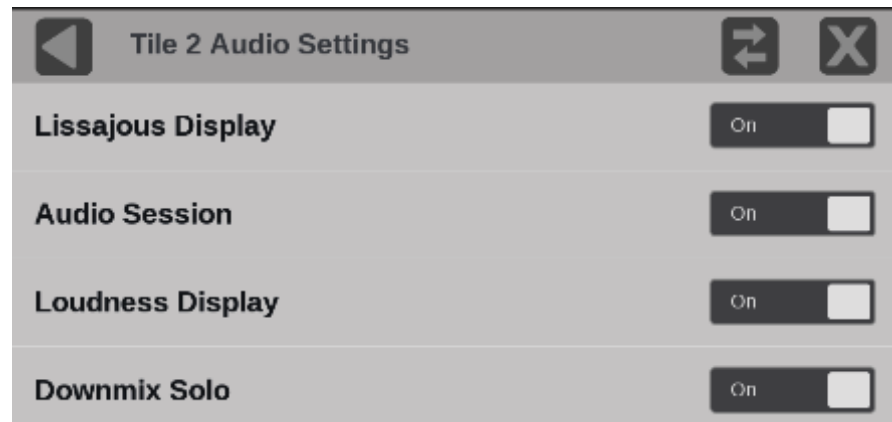


Figure 119: Audio application settings

Lissajous Display: Turns on a visual of a user-specified pairing of channel inputs with a channel correlation meter. (See Figure 120.)

Audio Session: Turns on several performance parameters for an overview of the audio input signal.

Loudness Display: Turns on a visual of the audio loudness measurements.

Downmix Solo: Turns on an option to select any channel from a downmixed stream, to hear that channel separately.

NOTE. The Reset and Run-Stop buttons on the left of the tile border are for the Audio Session. The buttons on the right control the Loudness display.

NOTE. The number of audio bars is time code depending on the enabled AUX audio features. When no AUX audio feature is enabled, up to 16 channel bars are displayed and 8 channel bars are shown when any AUX audio feature is enabled.

To see the hidden audio bars:

1. Click in the Audio bar area.
Arrows appear on both sides of the Audio bars.
2. Click the left or right arrow to see the hidden Audio bars.

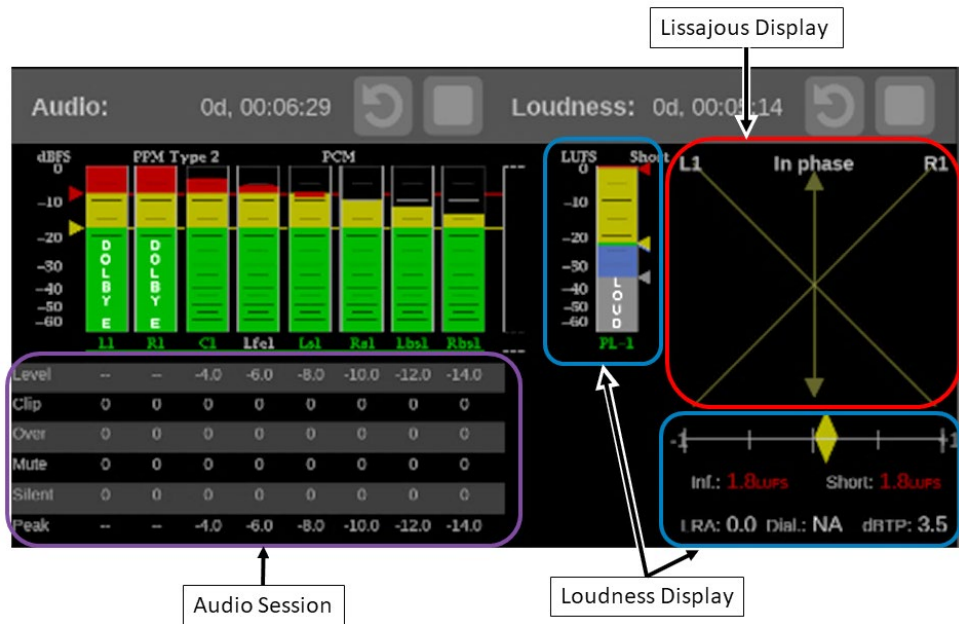


Figure 120: Elements of the Audio application display

When Audio Session is enabled, the Audio application banner appears. The banner includes controls for run and pause and run-time reset of the Audio Session data. (See Figure 121.)

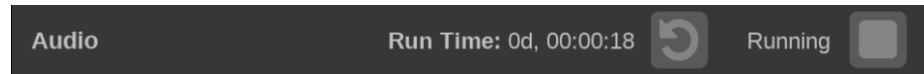


Figure 121: Audio Session controls

NOTE. Dolby E decoding is performed when the SDI input settings indicate that Dolby audio is available and the channel pair is specified. ([See Configure SDI inputs.](#))

In-bar messages

Ballistics: Displays the selected ballistics for the level meter dynamic response. Go to Audio in the global Settings menu to change the ballistics.

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:

- The meter bars are displayed below the Test level in a green color.
- Between the Test level and the Peak Program level, the meter bars are displayed in yellow.
- Above the Peak Program level, the meter bars are displayed in red.

Test level and Peak Program level indicators: Diamond-shaped markers between the level bars indicate the default Test level (-18 dBFS) and Peak level (-8 dBFS) 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.

Lissajous display: The phase of a selected pair of audio channels is plotted on a soundstage plot. Soundstage plots the two channels at 45-degree angles, with the mono combination appearing on the vertical axis, much like a left-right image in a studio.

To select the audio channel pair to plot on the Lissajous display, select the **Volume** icon () on the Status Bar and choose from the list of available channel pairs.

Channel Correlation meter: Displays the channel correlation under the Lissajous display.

- For identical or highly correlated signals, the indicator is white and moves to the far right (+1).
- For highly correlated signals, the indicator is green and moves to the right (towards +1).
- For uncorrelated signals, the indicator is yellow and tends to stay in the middle (around 0).
- For anti-correlated signals (one goes up when the other goes down), the indicator is red and moves to the left (towards -1).

This instrument displays messages within the level meter bars. These are messages that can appear and are shown 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 input is selected, nothing recognizable is present on the input, or if embedded audio is selected, the VIDEO input is unrecognizable.

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 and Lissajous display treat the sample as a zero sample.

CRC ERR: The CRC code in the 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.

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

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.

DOLBY E: Indicates that Dolby E encoded audio is present on the channel.

CLIP: Indicates the number of times the audio level was at the digital code for the maximum amplitude for ten consecutive samples.

OVER: Indicates the number of times the audio level exceeded 0dB for over-level duration of 1 second.

NOTE. The 32-channel audio is supported with MP2-FMT-8K license. In 8K video with Quad 12G-SDI connection, the first 16 channels (of 32 channels) comes from the link A1 and the second 16 channel comes from the link B1. The two Audio applications must be selected in two tiles to display the 32-channel audio bars.

Downmix Solo

Allows you to select any one channel of a downmixed 5.1 or 7.1 stream and listen to it alone. This helps to isolate and identify an unexpected noise in a stream.

To use Downmix Solo:

1. Set up a 5.1 or 7.1 stream for downmix. (See [access the Downmix control.](#))
2. Select the Audio application in a tile and select the **Tile** icon ().
3. Move the Downmix Solo slider to **On**.
4. Select the Audio application (see Figure 122):
 - To change the solo channel, select a channel in the downmixed stream.
 - To return to the entire downmixed stream (without turning Downmix Solo off), select the marked channel again.

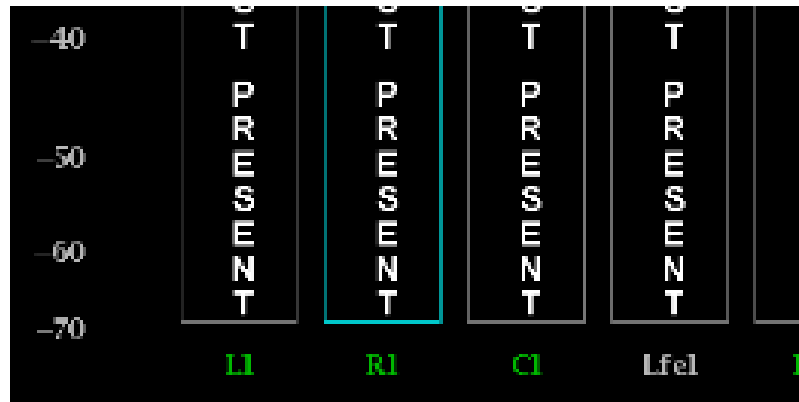


Figure 122: Downmixed 5.1 stream with a solo channel marked (in blue)

Picture application

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



Figure 123: Picture application display (Copyright 2008, Blender Foundation / www.bigbuckbunny.org)

NOTE. After the Picture application settings menu is opened, the Move icon (📏) appears. Select this icon to move the settings menu left or right.

Picture application settings menu

The Picture application settings menu shows the available options. (See Figure 124.)



Figure 124: Picture application settings menu

Convert to Rec. 709. Set to **On** to allow the trace displays to convert camera logs to Rec. 709 (requires Option MP2-PROD).

NOTE. Convert to Rec. 709 mode is not supported for SD signals. 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.

Format Overlay: Set to **On** to display the format information on top of the picture. Select and drag the format information window to set the location.

Source ID Overlay: Provides an overlay of the video source on the Picture application. The source data carries ANC data conforming to SMPTE 291M. The default DID is 0x53 and SDID is 0x49. Set them as required. The source ID is limited to a maximum 15 ASCII characters.

To enable the Source ID Overlay, open the Picture Setting menu and then set the

Source ID Overlay to **On**. Select and drag the overlay to the correct location on the application.

Line Select: Allows you to select the picture line to monitor a line in the available trace displays, including Waveform, Stop, Vector, Diamond, Lightning, and CIE. Either All Lines (Line Select is Off) or 1 Line (Line Select is On) can be selected.

If 1 Line is selected then a horizontal line appears on the picture. Select and drag the line to choose a line to monitor. The selected line number is noted on the line.

Closed Caption. Settings for closed captions/subtitles formats and services. See Closed Caption for more information about this feature.

Measurements Overlay: The visibility of the available picture measurements can be adjusted by selecting this menu item. See Picture Measurements for more information about this feature.

Measurement Thresholds: Threshold for the HDR picture measurements are made in this menu. See Picture Measurements for more information about this feature.

Lightmeter: Displays the light level (in nits or stops) at the point marked by the Lightmeter cursor in the Picture display. (See [Configure the Lightmeters.](#))

Input Gamma: Reports the input Gamma set in the **Settings** menu for the selected input.

False Color: Three false-color displays are available, which apply a color palette to the picture to highlight attributes associated with images.

- **Gamut:** Used for a quick check of gamut compliance to Rec. 709 and P3 gamut limits.
- **% Area:** A fixed false-color palette is applied to regions of the picture: Brightest, Area, and Darkest.
- **Luminance:** Create a user defined false color palette based on luminance values. (See [Luminance False Color.](#))

Closed Caption/Subtitles

Tools for closed captions/subtitles decode and display.

- **CC information overlay:** Provides closed captions/subtitles format, and service/page and presence.
- **CC/Teletext:** Selects the closed captions/subtitles format and service.

To turn on the CC Information Overlay:

Select **Closed Caption** from the Picture Settings menu and set the CC Information Overlay to **On**. (See Figure 125.) The overlay provides closed captions/subtitles format and service information. To move the overlay, select and drag it to the new location.

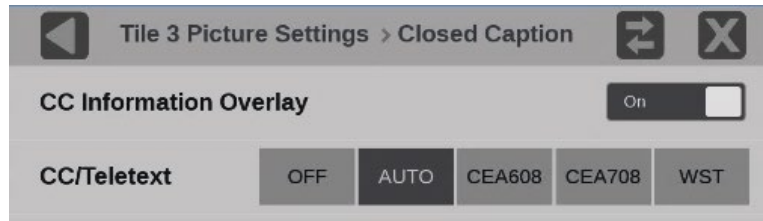


Figure 125: Closed Caption settings with CC Information Overlay turned on

To set the CC/Teletext:

Select a format to decode and open the service options.

- **OFF:** Turns off the closed caption decoding. The overlay remains in the Picture tile if it is on.
- **Auto:** Detects and selects the closed captions/subtitles format in the signal and presents the service options. Select the appropriate input.
- **CEA 608:** A standard format of closed captions/subtitles data used in the U.S., Canada, and Mexico for analog TV transmissions. If a service has no activity for 10 seconds, it is considered missing.

In the CEA608 Channel, select, from 1 to 4, the appropriate input.

- **CEA 708:** A standard format of closed captions/subtitles data in the U.S. and Canada for digital TV transmissions. If a service has no activity for 10 seconds, it is considered missing.

In the CEA708 Service, select, from 1 to 6, the appropriate input.

- **WST:** Also called Teletext, it is a standard format of closed captions/subtitles used in many parts of the world. Support includes OP-47 and 2031.

In Teletext Page, set the page number: Select the up or down arrow, or select the number and use the pop-up keypad, to enter the page number for your region.

NOTE. Each Picture tile can select a closed caption format and a service.

Picture measurements

An overlay containing a selectable set of picture measurements can be shown on the picture application, including HDR measurements. (See Figure 126.)

Select and drag the measurement overlay to set the location.



Figure 126: False Color display with Picture Measurements Overlay

Select Picture Measurements:

1. Select the Picture application, and in the Applications menu, select the **Tile** icon ().
2. Select the **Measurements Overlay** menu item.
3. Set Measurements Overlay to **On**. (See Figure 127.) This turns on the measurements overlay in the Picture application. After it is visible, the overlay window can be dragged to any location in the Picture tile.

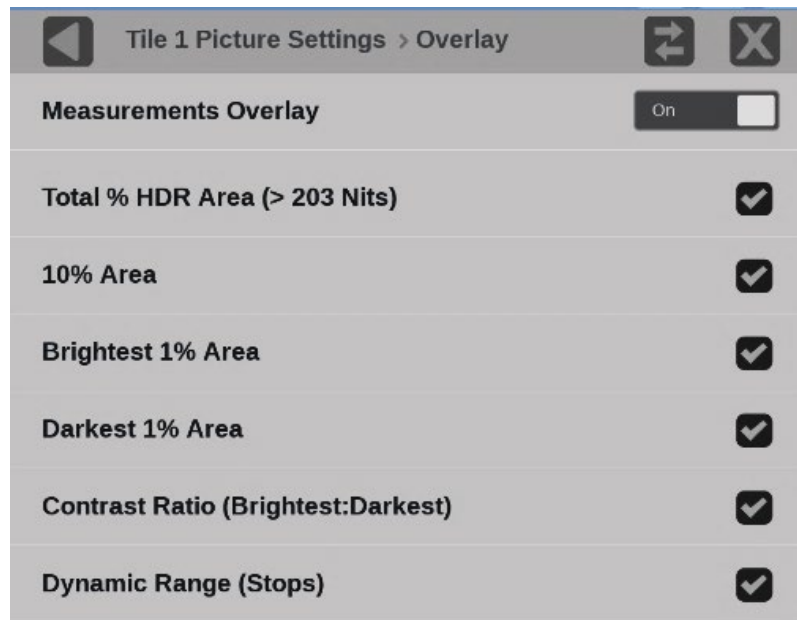


Figure 127: Picture Settings with Measurement Overlay menu

Select the picture measurements to see in the overlay. For many of the parameters a threshold setting is required. See the Measurement Threshold menu for setting these thresholds. (See Figure 128.)

These measurements are available. Settable thresholds are indicated by x:

- Total % HDR area the Nits threshold for this measurement can be set.

- X% area, in nits
- Brightest x% area, in Nits
- Darkest x% Area, in Nits
- Contrast Ratio (Brightest:Darkest)
- Dynamic Range (stops = $\text{Log2}(\text{Brightest } x\% / \text{Darkest } x\%)$).

Set Picture Measurement Thresholds: To select the thresholds for those picture measurements that require them:

1. Select the Picture app and then, in the applications menu, select the **Tile** icon ().
2. Select the **Measurement Thresholds** menu item. (See Figure 128.)

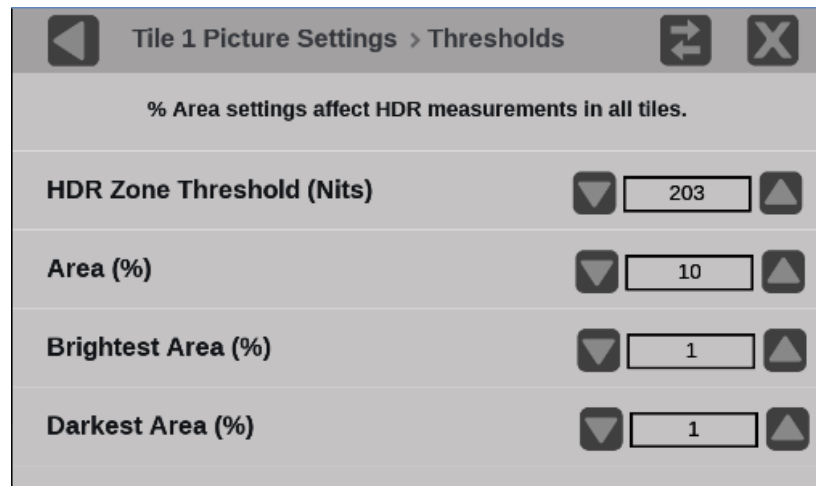


Figure 128: Picture Settings with Measurement Threshold menu

The threshold settings:

- **HDR Zone Threshold (Nits):** Any picture value higher than this threshold, in Nits, is considered in the HDR zone.
- **Area (%):** Defines the brightest percentage of the picture used to determine the bright threshold in Nits.
- **Brightest Area (%):** Defines the brightest percentage of the picture used to determine the HDR threshold in Nits.
- **Darkest Area (%):** Defines the darkest percentage of the picture used to determine the dark threshold in Nits.

Configure the Lightmeters

The Lightmeters measure the light level, in Nits or stops, at the point marked by the Lightmeter cursor in the Picture application. Proper operation requires selecting the appropriate Gamma Curve in the input settings. ([See Choose the appropriate Gamma Curve.](#))

NOTE. The readout is the average luminance of a 5x5 pixel area in a 1920x1080 picture, a 10x10 pixel area in a 3840x2160 picture, and a 20x20 pixel area in a 7680x4320 picture.

To turn on or change the Lightmeters:

1. Open the Picture Settings menu and select **Lightmeter**.
2. Set the Lightmeter Overlay to **On**.
3. Select the number of needed Lightmeter cursors (up to 5). (See Figure 129.)

NOTE. The Lightmeters all use the same method for measurements. The color of the Lightmeter cursor is just for identification.



Figure 129: Lightmeter overlay menu and available cursors

The Lightmeters are visible in the Picture application. (See Figure 130.)



Figure 130: Lightmeter cursors in the Picture tile

To adjust the Lightmeters cursors:

- To move the Lightmeter cursors, select any part of the crosshairs or the measurement numbers and drag the target to the new location. The measurement updates automatically.
- To remove a selected Lightmeter cursor from the Picture, unselect the color in the Settings menu.
- To remove all the Lightmeters cursors from the Picture, unselect all of the Lightmeter colors or set the Lightmeter Overlay to **Off**.

Luminance False Color

The Luminance False Color display replaces pixels that fall within a specified range of nits or stops values to a color that you specify. Up to 9 configurable ranges can be defined. For example, you can use the Luminance False Color display to tag pixels that are within a specified HDR range.

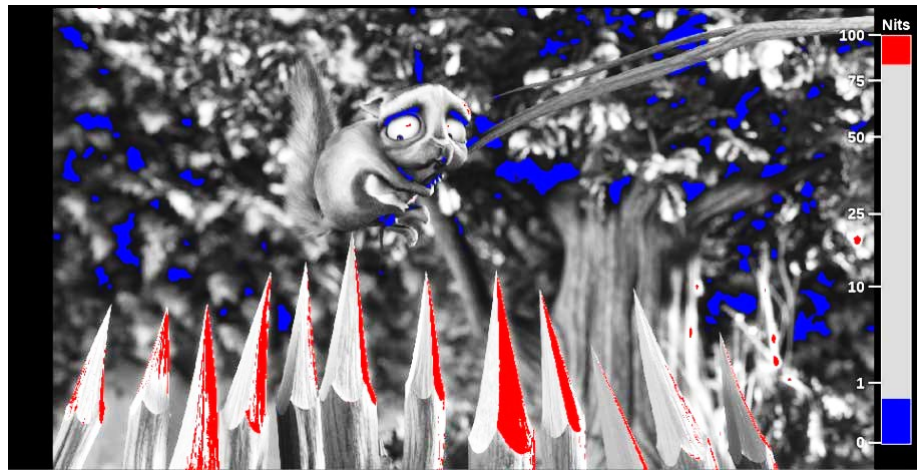


Figure 131: Luminance False Color display with Meter Overlay

The false color ranges are defined in nits or stops depending on the gamma curve set up in the input (select **Settings** and then **Input**). If a camera-based gamma curve is set, such as S-Log2, the false color ranges will be in stops. If a display-based gamma curve is set, such as SDR Narrow, the false color ranges will be in Nits.

These controls adjust the Luminance False Color display:

Meter Overlay: Set to **On** to enable the Meter Overlay in the Picture application. The overlay shows the false color definitions in nits or stops made in the Luminance False Color table at the bottom of the menu. The overlay can be moved to the right, bottom, left, or top of the image by dragging the meter with a mouse or by touch.

Default: By default, the false colors are defined according to the BT.2408 specifications if a display-based gamma curve is set for the input, or a typical camera specification if a camera-based gamma curve is set for the input. If changes are made to the false color ranges in the Luminance False Color table, an

indication that the default settings have changed is shown. Select the **Default** button to reset the ranges to their default settings.

Luminance False Color table: The Luminance False Color table allows you to customize up to 9 different false color ranges as defined by a minimum and maximum Nits or Stops value. The pixel values are displayed in either Code Value or Percent but selecting the readout in the table header.

Specific colors can be displayed by selecting the check box in the Enable column of the table. (See Figure 132.) You can change the Nits or Stops range even if the check box is not set.

To adjust the Nits or Stops range, tap anywhere in the row you want to change. You can adjust the Minimum and Maximum value in the range using the up and down arrow keys, or select in the number field and a numeric entry keypad appears. Enter the line number and select **Enter** to close. The false colors in the Picture and the Meter Overlay are updated as adjustments are made.

If the range for one color overlaps the range for another color, the color that is higher in the table overlaps the colors lower in the table.

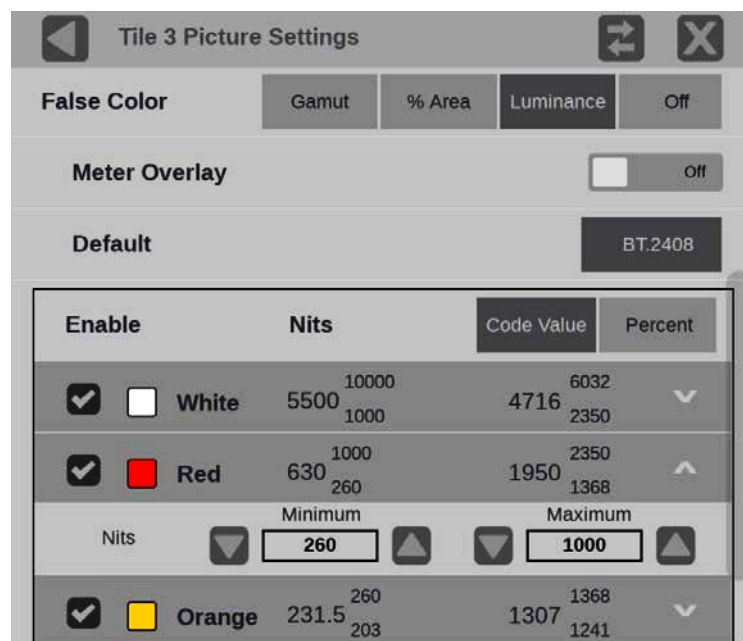


Figure 132: Picture settings with the Luminance False Color table

Video Session application

Use this application to view various performance parameters of the SDI video signal or the decoded IP stream. Select any of the four tab titles to view the associated information: SDI Format, VPID 352, Bit Level, or CRC Status. (See Figure 133.)



Figure 133: Video Session application – SDI FORMAT tab display

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. 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:** Select the Clear icon () to reset the monitoring session.
- **Run / Stop icons:** When the monitoring session is running (collecting error data), select the Stop icon () to stop the session. When the monitoring session is stopped (no error data collection and no display updates), select the Play 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.

Elements of the SDI FORMAT tab display:

- **SAV Place Err:** Indicates whether a Start-of-Active-Video Placement error has occurred.
- **EAV Place Err:** 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.
- **Line Number Err:** Indicates whether a Line Number error has occurred.
- **Ancillary 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: When the Video Session is active in a tile, select 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). (See Figure 134.)



Figure 134: Video Session application — VPID-0352 tab display for 3G-SDI Level B signal

Elements of the VPID 352 tab display. The VPID 352 tab consists of two panes:

- **Left pane:** Indicates the presence of a SMPTE 352M payload. The number of data streams determines the number of links, with the VPID values shown in hex. You may select a link to display the decoded VPID information in the right pane.
- **Right pane:** Contains the decoded VPID of the selected link.

BIT LEVEL tab display

Use the BIT LEVEL tab display to view if there are any stuck bits in the input signal. (See Figure 135.)

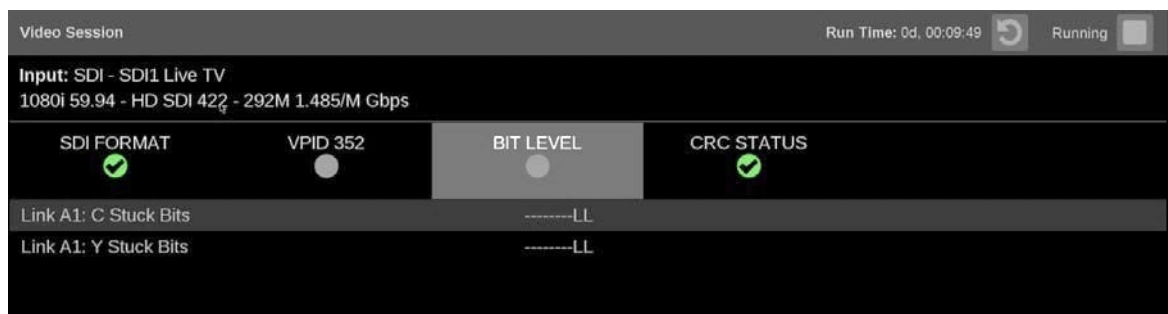


Figure 135: Video Session application – BIT LEVEL tab display

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 8bit 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. (See Figure 136.)

Video Session				
Run Time: 0d, 17:03:07 Running				
INPUT: SDI - SDI-In 1 1080i 59.94 - HD SDI 422 - 292M 1.485/M Gbps				
SDI FORMAT	VPID 352	BIT LEVEL	CRC STATUS	
STATISTICS	STATUS	ERR FIELDS	ERR SECS	% ERR FIELDS
Y Chan CRC Error	OK	2	1	0
C Chan CRC Error	OK	2	1	0
Y Anc Checksum Error	OK	0	0	0
C Anc Checksum Error	OK	0	0	0

Figure 136: 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 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.

Timing application

The Timing application uses a reference to evaluate the timing of the input of single-link SDI, quad-link SDI, or IP formats (ST2022-6 or ST2110-20). The timing of the input is compared to the expected frame time according to the reference alignment.

SDI versus Black Burst is available in standard. SDI versus PTP, IP versus PTP, Black Burst versus PTP requires Option MP2-IP-MEAS.

For analog references (Black Burst or Tri-Level sync) the relative position of the horizontal and vertical sync pulses are compared to the input signal. In the case of PTP the current time is obtained and compared to the SMPTE Epoch. 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. (See Figure 137.) When the input signal is fully aligned with the reference, both circles will be in the center of the display indicated by the + symbol.

NOTE. PTP must be locked to use the Timing application with PTP references.

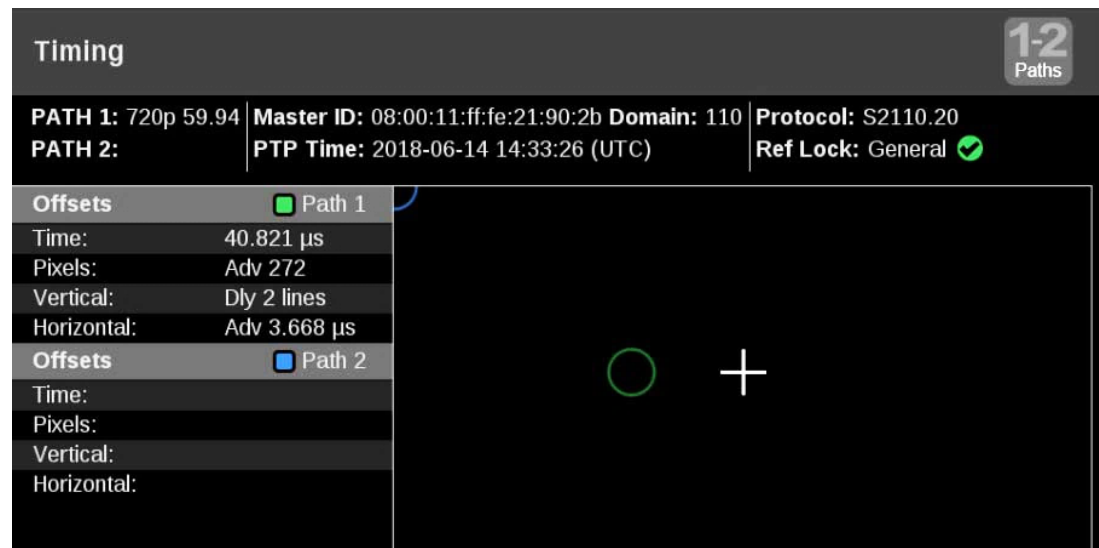


Figure 137: Timing application display for IP signals

Timing application settings menu

Measurement Mode: Use the menu to change the measurement mode between options. (See Figure 138.)

- **Video to Reference:** The input video signal (SDI or IP) is compared relative to the reference input (analog or PTP).
- **Analog to PTP:** Used in a hybrid system to compare the analog reference to the PTP reference to ensure synchronization.

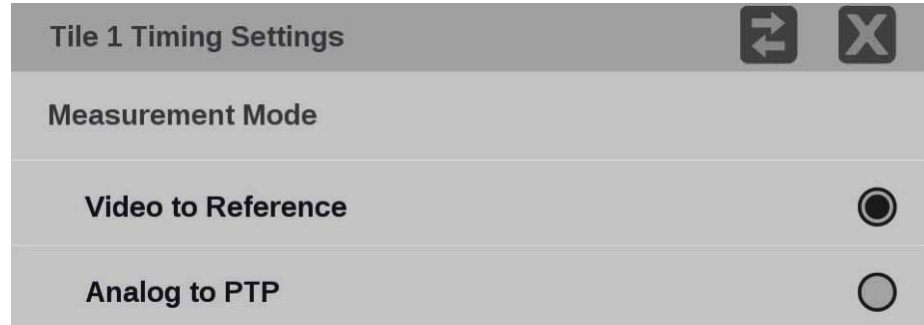


Figure 138: Timing application settings menu

Elements of the Timing application display

- **Path 1 and Path 2:** Displays the IP video format if an IP input signal is selected.

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 and Domain:** Displays the reference Source and Domain.
- **PTP Time:** Time of day derived from the PTP signals.
- **Protocol:** Displays the input protocol.
- **Ref Lock:** A  (check in green) indicates the PRISM is locked to the reference. A  (x in red) indicates the PRISM is not locked to the reference.
- **Reference Indicator:** A cross-hair indicator 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 $\pm \frac{1}{2}$ 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 $\pm \frac{1}{2}$ field for progressive signals and $\pm \frac{1}{2}$ 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 $\pm \frac{1}{2}$ a line for the input format.

Additional offset displays are available for Quad Link SDI signals (See Figure 139.):

- **Link Offsets:** Time delays of Links B, C, and D relative to Link A. These time delays are also shown graphically under the timing display window.
- **Max Link Offset:** Maximum time delay between any two links.

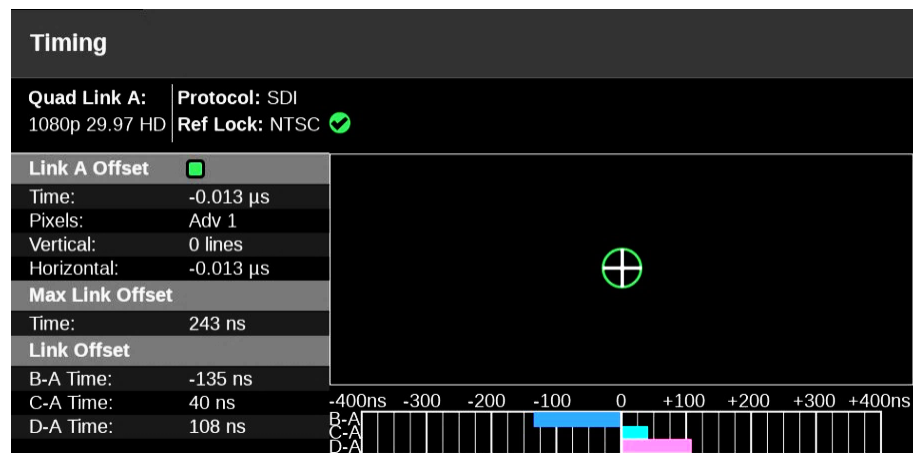


Figure 139: Timing application display for Quad Link SDI signals

Timing offsets for IP signals

Because ST2022-6 streams are complete SDI signals encapsulated in IP, the timing measurement treats these IP signals as if they were SDI. So the timing system detects the start of the IP frame, then extrapolates to the 0h point of the encapsulated SDI. Then using PTP as the reference, the ideal alignment point for that frame rate is calculated based on the PTP epoch. Finally, the offset between the ST2022-6 signal and the ideal alignment is displayed. The display shows both absolute time and the time parsed into lines or horizontal delay as time and pixels.

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 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.

Event Log application

The Event Log application provides a view of detected errors. (See Figure 140.) The display buffer for the application shows 1,000 log entries.

Event Log				
	EVENT	SOURCE	DATE	TIME
	RTP Sequence Error	IP SFP+ 1-2 path 2	2018-08-04	23:15:51
	RTP Sequence Error	IP SFP+ 1-2 path 1 audio	2018-08-04	23:15:51
	RTP Sequence Error	IP SFP+ 1-2 path 2 anc	2018-08-04	23:15:51
	RTP Sequence Error	IP SFP+ 1-2 path 1 anc	2018-08-04	23:15:51
	RTP Sequence Error	IP SFP+ 1-2 path 1	2018-08-04	23:15:51
	RTP Marker Frequency Error	IP SFP+ 1-2 path 2 video	2018-08-04	23:18:20
	RTP Sequence Error	IP SFP+ 1-2 path 2 video	2018-08-04	23:18:20
	RTP Sequence Error	IP SFP+ 1-2 path 2 audio	2018-08-04	23:18:20
	RTP Sequence Error	IP SFP+ 1-2 path 1 audio	2018-08-04	23:18:20
	RTP Sequence Error	IP SFP+ 1-2 path 2 anc	2018-08-04	23:18:21
	RTP Sequence Error	IP SFP+ 1-2 path 1 anc	2018-08-04	23:18:21
	RTP Marker Frequency Error	IP SFP+ 1-2 path 1 video	2018-08-04	23:18:21
	RTP Sequence Error	IP SFP+ 1-2 path 1 video	2018-08-04	23:18:21
	RTP Sequence Error	IP SFP+ 1-2 path 2 video	2018-08-04	23:18:22
	RTP Sequence Error	IP SFP+ 1-2 path 2 audio	2018-08-04	23:18:22

Figure 140: Event Log application display

Event Log application settings menu

Undo Reset: Use this button to undo the last reset of the logged events. (See Figure 141.)



Figure 141: Event Log application settings menu

Elements of the Event Log application display

- Reset icon:** Select the Reset icon () to hide old log items. Select the icon to hide all log items, so only new log items are displayed. Select **Undo Reset** in the settings menu to display the log items that were previously hidden.
- Go to Bottom icon:** Select the Go-to-bottom icon () to go to the end of the currently displayed Event Log buffer where you can monitor any new events. (See Figure 142.) The most recent events are at the bottom of the event list.

Event Log				
EVENT	SOURCE	DATE	TIME	
 RTP Sequence Error	IP SFP+ 1-2 path 2	2018-08-04	23:15:51	
 RTP Sequence Error	IP SFP+ 1-2 path 1 audio	2018-08-04	23:15:51	
 RTP Sequence Error	IP SFP+ 1-2 path 2 anc	2018-08-04	23:15:51	

Figure 142: Event application Go-to-Bottom icon

The Error Log is also divided into 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

Table 13 lists the types of alarms in the Event Log of the instrument and a description of what causes each alarm.

Table 13: Event log alarm types

Alarm Type	Description
Video signal lost	Indicates a missing or unlocked video signal regardless of IP or SDI. NOTE. The video stream may be not decodable or corrupted.
Format unsupported	Indicates an unsupported video format.
Standard definition detected	Indicates the presence of standard definition video.
Video format changed	Indicates the detection of a video format change.
Video format mismatch	Indicates a mismatch between the detected and the configured video format.
RTP Sequence error	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 change.
RTP Header invalid	Indicates an error was detected in RTP header.
RTP Timestamp error	Indicates the RTP timestamp is corrupt or is not updating at the correct frequency for

Alarm Type	Description
	the specified media type.
RTP Marker Frequency error	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	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	Indicates an error was detected in the S2022.6 HBRMT header.
HBRMT Timestamp error	Indicates an error was detected in the S2022.6 HBRMT Timestamp.
S2022.7 path missing	Indicates one of the datapaths in a S2022.7 seamless switching configuration is missing.
Combined RTP sequence error	Indicates 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	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	Indicates that Precision Time Protocol is unlocked or missing.
SDI active field length error	Indicates the active field length of SDI video is incorrect.
SDI total field length error	Indicates the total field length of SDI video is incorrect.
SDI EAV placement error	Indicates an incorrect total line length (EAV-EAV).
SDI SAV placement error	Indicates an incorrect active line length (SAV-EAV).
SDI line number error	Indicates an incorrect encoded transport line number was detected.
SDI Y-channel CRC error	Indicates an SDI line checksum error was detected on the Y Luma channel.
SDI C-channel CRC error	Indicates an SDI line checksum error was detected on the C Chroma channel.
SDI Y-channel ANC checksum error	Indicates an ancillary data checksum error was detected on the Y Luma channel or in SD video.
SDI C-channel ANC checksum error	Indicates an ancillary data checksum error was detected on the Chroma channels.
SMPTE 352M payload ID missing	Indicates a mandatory SMPTE352M video payload identifier packet is missing.
Inter-link format mismatch	Indicates a multi-link SDI signal has incompatible formats on one or more links.
SDI AUX out unlocked	Indicates the SDI auxiliary output is unlocked.
External reference lost	Indicates the external reference signal is not detected.
Drifting	Indicates Timing drift and is displayed in the status bar next to VID/REF.

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. (See Figure 143.) After 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.



Figure 143: IP Status application display

NOTE. After the IP Status application settings menu is opened, the Move icon (📏) appears. Select this icon to move the settings menu left or right.

To view Port 1 and Port 2

- 1. Open the IP Status application in one of the tiles.
- 2. Open the IP Status settings menu and then select the **Tile** icon (⚙️).
- 3. In the IP Status settings menu select **Both** to monitor both Port 1 and Port2. (See Figure 144.)



Figure 144: IP Status port settings

With both ports selected there are two traffic bars that show the amount of traffic on each port and a traffic table with a Port column. (See Figure 145.)

- 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. Select the reset button at the right side of the banner (at the top) to clear the signals that are no longer there.

	ID	PORT	PROTOCOL	BITRATE	PAYLD	DEST IP	SOURCE
✓	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 145: 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 GE 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:** Select the Clear 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.

Select the Clear icon () to reset the display to view only the items currently in the stream.

- **Green gradient:** When an item in the list has a green gradient, it indicates the item is a currently monitored stream.

Select the Clear icon () to reset the display to view only the items currently in the stream.

The IP Status application is also divided into these 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 format *<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 several tabs to display status of various IP stream parameters. Select any of the tab titles to view the associated information: Layer 1/2, Video, Audio, Data, PTP, or NMOS. (See Figure 146.)

NOTE. Option MP2-IP-MEAS must be installed to use the IP Session application.

The display shows only Path 1 unless you enable ST2022-7 Seamless Switching, [\(See Configure the instrument for HDR/WCG monitoring.\)](#)

There is a difference between “Port” and “Path”. The Port is the physical SPF port that is used to input the IP 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.

IP Session		Run Time: 0d, 15:11:29		Running ☐	
LAYER 1/2	VIDEO	AUDIO-1	DATA	PTP	NMOS
☒	☒	☒	☒	☒	
LAYER 1		PORT 1		PORT 2	
☒	25GbE Link	OK		OK	
	SFP Loss Of Signal (LOS)	OK		OK	
		PATH 1		PATH 2	
LAYER 2		STATUS	ERR SECS	STATUS	ERR SECS
☒	Lock	OK	6	OK	6
☒	CRC Error	OK	0	OK	0
LAYER 2 METRICS		PATH 1		PATH 2	
	Rx Bytes	7,616,937,904,320		7,418,943,349,696	
	Rx BER High	0		0	
	Rx CRC Errors	0		0	
	Rx Frames Ok	5,809,973,672		5,674,135,783	
	Rx Frames Errored	0		0	
	Rx Undersize Packets	0		0	
	Rx Oversize Packets	0		0	
	Tx Bytes	8,950,951,217,367		1,143,995	
	Tx Frames Ok	6,745,804,060		12,989	
	Tx Frames Errored	0		0	

Figure 146: IP Session application display

Elements of the IP Session application Display header

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

- **Display tabs:** Select one of the 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:** Select this tab to view the status of various signal parameters in the physical and link layers.
 - **Video:** Select this tab to view the status of the video in the stream.
 - **Audio:** Select this tab to view the status of the audio in the stream.
 - **Data:** Select this tab to view the status of the data in the stream.
 - **PTP:** Select this tab to view PTP parameters.
 - **NMOS:** Select 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:** Select the Clear icon () to reset the monitoring session.
- **Running / Stopped icons:** When the monitoring session is running (collecting error data), select the Stop icon () to stop the session. When the session is stopped (no error data collection and no display updates), select the Play icon () to restart the session.

LAYER 1/2 tab display

Select the LAYER 1/2 tab to view the status of these signal parameters. (See Figure 147.)

IP Session		Run Time: 0d, 02:01:23		Running 	
LAYER 1/2 	VIDEO 	AUDIO 	DATA 	PTP 	NMOS
LAYER 1		PORT 1		PORT 2	
10GbE Link		OK		OK	
SFP Loss Of Signal (LOS)		OK		OK	
PATH 1		PATH 2			
LAYER 2	STATUS	ERR SECS	STATUS	ERR SECS	
 Lock	OK	0	OK	0	
 CRC Error	OK	0	OK	0	
LAYER 2 METRICS		PATH 1		PATH 2	
Rx Bytes		1,011,850,536,954		1,015,520,405,677	

Figure 147: IP Session application – Layer 1/2 tab display

Elements of the Layer 1/2 tab display.

- **Layer 1:**

- **10GbE Link or 25GbE 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 10/25G Ethernet Phy Rx port is successfully locked to the inbound Ethernet signal.
 - **ERROR:** The 10/25G 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 Select the VIDEO tab to view the status of the video in the stream. (See Figure 148.)

IP Session		Run Time: 0d, 02:06:01		 Running 	
LAYER 1/2	VIDEO	AUDIO	DATA	PTP	NMOS
					
PORT 1			PORT 2		
L3 IP					
Source Addr		192.168.1.26		192.168.1.27	
Destination Addr		229.20.1.12		229.20.2.12	
L4 UDP					
Source Port		50011		50011	
Destination Port		50011		50011	
	L5 RTP				
Version		2		2	

Figure 148: 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 these 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 turns 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.

NOTE. The Payload type for ST2110 streams should be between 96 and 127. The Payload type is set by the user/device.

- **Sequence number:** RTP sequence counter that changes by one for each RTP Media Datagram that is sent.

NOTE. The status indicator turns red if the received RTP sequence numbers do not change 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 turns red if the Time Stamp field does not change at the rate of 27 MHz on every packet. For 2110 signals, the status indicator turns red if the Time Stamp field does not change 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 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. Possible interface sampling frequency declaration in stream header is incorrect for the stream type being carried.

NOTE. The status indicator turns 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 these parameters of the High Bit Rate Media Payload Header:

NOTE. The HBRMT parameters do not apply to 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 changes in value for the next RTP sequence and rolls over after 255.

NOTE. The status indicator turns red if the frame count field does not change 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, it 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:
 - **0000:** No time stamp
 - **0001:** 27 MHz
 - **0010:** 148.5 MHz
 - **0011:** 148.5 /1.001 MHz
 - **0100:** 297 MHz
 - **0101:** 297/1.001 MHz
 - **0110-1111:** Reserved
- **Reserved:** This value should be set to 0.
- **Video Source Format fields:** These 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: Unknown/Unspecified frame rate 2.970 GHz signal (0x00), Unknown/Unspecified frame rate 2.970/1.001 GHz signal (0x01), Unknown/Unspecified frame rate 1.485 GHz signal

(0x02), Unknown/Unspecified frame rate 1.485/1.001 GHz signal (0x03), Unknown/Unspecified frame rate 0.270 GHz signal (0x04), Reserved (0x04-0x0f), 60 (0x10), 60/1.001 (0x11), 50 (0x12), Reserved (0x13), 48 (0x14), 48/1.001 (0x15), 30 (0x16), 30/1.001 (0x17), 25 (0x18), Reserved (0x19), 24 (0x1A), 24/1.001 (0x1B), Reserved (0x1C-0xFF).

- **Sample:** Identifies the pixel sampling/quantization scheme. Possible values are: Unspecified (0x0), 4:2:2/10bit (0x1), 4:4:4/10bit (0x2), 4:4:4/10bit (0x3), 4:2:2/12bit (0x5), 4:4:4/12bit (0x6), 4:4:4/12bit (0x7), or 4:2:2/12bit (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 that come after the HBRMT payload.

Audio tab display

Select the AUDIO tab to view the status of the audio in the stream. (See Figure 149.)

IP Session		Run Time: 0d, 15:19:45		Running	
LAYER 1/2	VIDEO	AUDIO-1	DATA	PTP	NMOS
PORT 1			PORT 2		
L3 IP					
Source Addr		173.100.1.2		173.100.1.2	
Destination Addr		229.30.21.2		229.30.21.2	
L4 UDP					
Source Port		50000		50000	
Destination Port		50030		50030	
	L5 RTP				
Version		2		2	

Figure 149: IP Session application – AUDIO tab display

To set the audio stream

1. Select the **Tile** icon () in the application toolbar to open the IP Session Settings menu.
2. In the Audio drop-down menu, select the stream number to monitor.

The selected audio stream is noted in the AUDIO tab. (See Figure 150.)

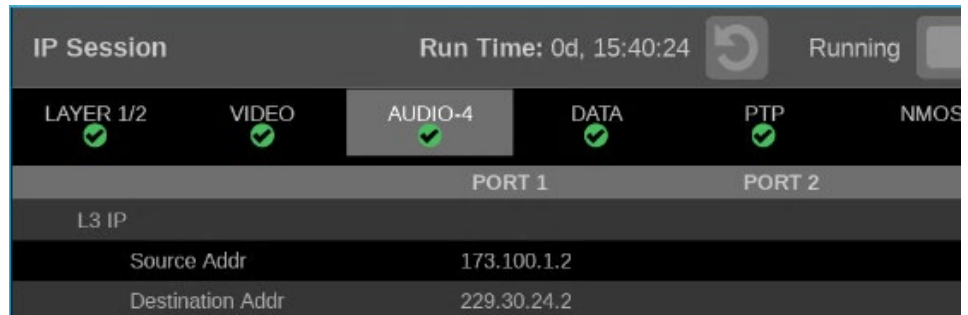


Figure 150: Updated AUDIO tab (now AUDIO-4) display

3. Close the settings menu.

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 these 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 changes by one for each RTP Media Datagram that is sent.

NOTE. The status indicator turns red if the received RTP sequence numbers do not change 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 turns red if the Time Stamp field does not change 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 no two SSRC have the same value with an RTP session.

Data tab display Select the DATA tab to view the status of the data in the stream. (See Figure 151.)

IP Session		Run Time: 0d, 02:25:13		 Running 	
LAYER 1/2	VIDEO	AUDIO	DATA	PTP	NMOS
					
PORT 1			PORT 2		
L3 IP					
Source Addr		192.168.1.26		192.168.1.27	
Destination Addr		229.40.1.12		229.40.2.12	
L4 UDP					
Source Port		50011		50011	
Destination Port		50011		50011	
	L5 RTP				
Version		2		2	

Figure 151: 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 these 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 turns 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 changes in increments of 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 turns red if the Time Stamp field does not change at the rate of 27 MHz on every packet. For 2110 signals, the status indicator turns red if the Time Stamp field does not change 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 no two SSRC have the same value with an RTP session.

PTP tab display

Select the PTP tab to view the status of the PTP elements in the stream. (See Figure 152.) PTP is currently only supported on 10/25 GE SFP Port 1, for instructions on locking to PTP [see Configure the reference settings.](#)

IP Session

Run Time: 0d, 00:48:34

Running

LAYER 1/2	VIDEO	AUDIO	DATA	PTP	NMOS
Lock Status	Locked				
PTP Time	2018-06-12 22:28:54 (UTC)				
Master/Slave Phase Lag	+ 83 ns				
Grandmaster ID	08:00:11:ff:fe:21:90:2b				
Steps Removed	2				
Domain	110				
Profile	General				
Delay Message Interval	Follow Master				
Grandmaster BMCA Values					

Figure 152: 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. These 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 if 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 sets 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 these 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 is 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, 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, 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

Select the NMOS tab to view the registration server information, server list and the last SDP file received. (See Figure 153.)

To enable and configure NMOS, see [Enable NMOS discovery and registration](#).

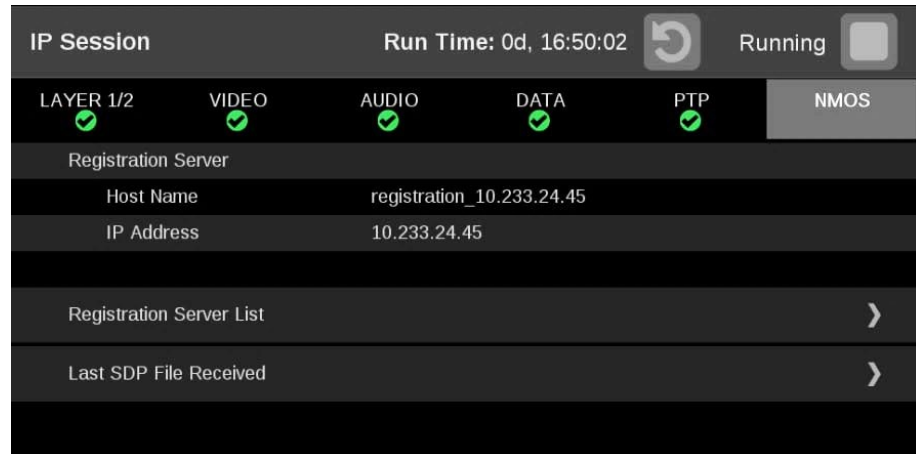


Figure 153: IP Session application – NMOS tab display

Elements of the NMOS tab display.

- **Registration server:** Shows the Host Name and IP Address of the registration server. (See Figure 154.)
- **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.

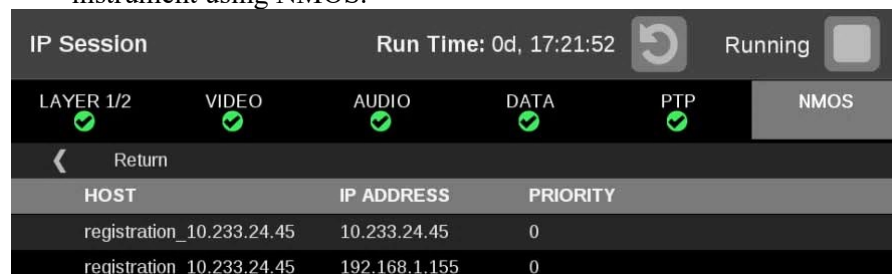


Figure 154: Registration Server List display

NOTE. Select **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. (See Figure 155.)

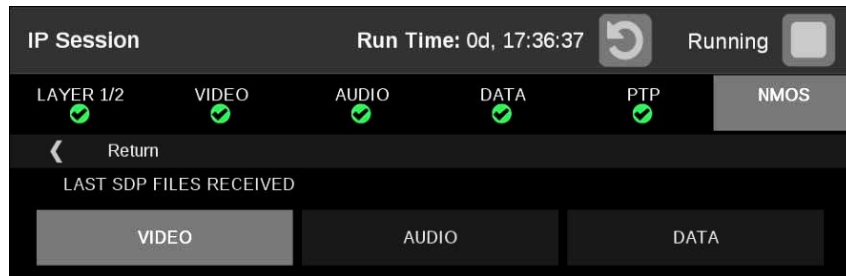


Figure 155: Last SDP File Received display

NOTE. Select **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 moves to the top of the display area to help view the complete graph. The displayed graph is included in a saved preset.

NOTE. Option MP2-IP-MEAS must be installed to use the IP Graphs application.

If ST2022-7 monitoring is configured, the IP Graphs application includes Path 1 and Path 2. The graph data can be switched between viewing only Path 1, only Path 2, or both by selecting 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.

NOTE. If 2110 monitoring is configured, you can select Video, Audio (1 stream at a time, selectable in Tile Settings), or Data.

NOTE. After the IP Graphs application settings menu is opened, the Move icon () appears. Select this icon to move the settings menu left or right.

If ST2022-6 monitoring is configured, the IP Graphs include:

Video CRC Error graph: The Video CRC Error graph shows any present CRC errors in the currently decoded signal and can be compared to other time graphs such as RTP Sequence Errors.

TS-DF graph: The TS-DF graph shows the Time Stamped Delay Factor, as defined in EBU Tech 3337, which is a method for measuring network jitter in RTP streams.

IP Graphs application settings menu

Select the **Tile** icon () in the application toolbar to open the IP Graphs Settings menu.

Trend Interval: Select 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, or 1 day. (See Figure 156.)

Audio: Select the drop-down menu to select a stream to monitor. The monitored stream is noted in the IP Graphs header, next to the Stream type button.

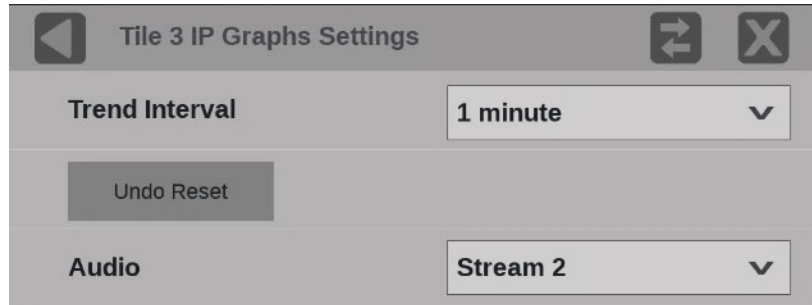


Figure 156: IP Graphs application settings menu

Elements in IP Graphs application display

The elements at the top of the IP Graphs application are shared between all graphs. (See Figure 157.)

NOTE. Only Path 1 will display unless you enable ST2022-7 Seamless Switching, ([See Configure the instrument for HDR/WCG monitoring.](#))

- **PATH 1 and PATH 2:** The description of the two information paths.
- **Port:** Shows the physical port used on the instrument.
- **Src:** Lists the source address of the IP stream.
- **Dest:** Lists the destination address 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.** Select the Clear icon (🔄) to reset the monitoring session.
- **Stream type button:** Select this button to change to Video, Audio, or Data stream IP graphs.
- **Path button:** Select the Path button to change to Path 1, Path 2, or both Path 1 and 2.
- **Res:** Lists the resolution of the graph display at the bottom right of the graph.



Figure 157: IP Graphs application display

Total Bit Rate graph

The Total Bit Rate graph shows the total bit rate currently on the 10/25 GE input. The maximum available bandwidth is 10.3 Gb/s. These 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:** Shows the minimum available bandwidth that is not in use.
- **Free Max:** Shows the maximum available bandwidth that is not in use.

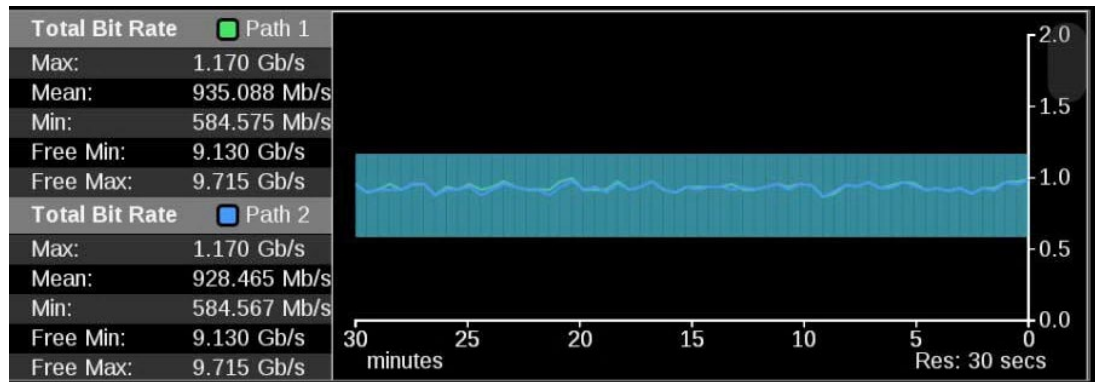


Figure 158: IP Graphs Total Bit Rate graph

Session Bit Rate graph The Session Bit Rate graph shows the data rate of the currently selected input stream. (See Figure 159.)

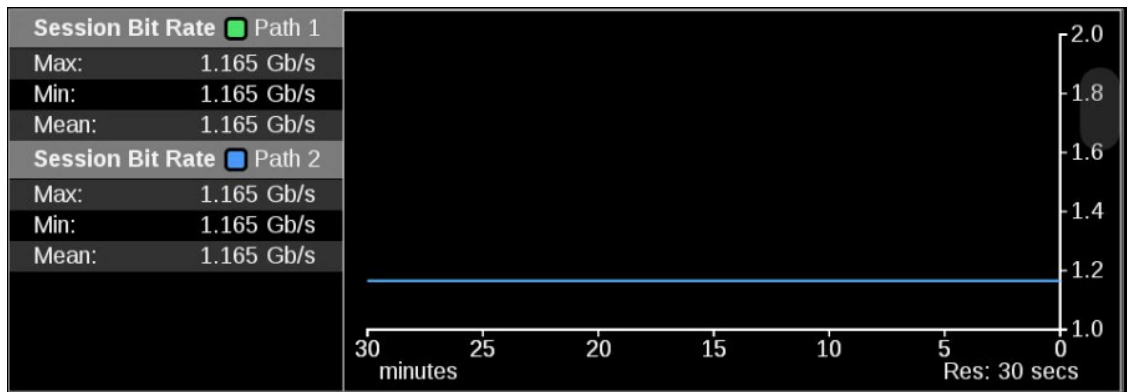


Figure 159: IP Graphs application – Session Bit Rate graph

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. (See Figure 160.)

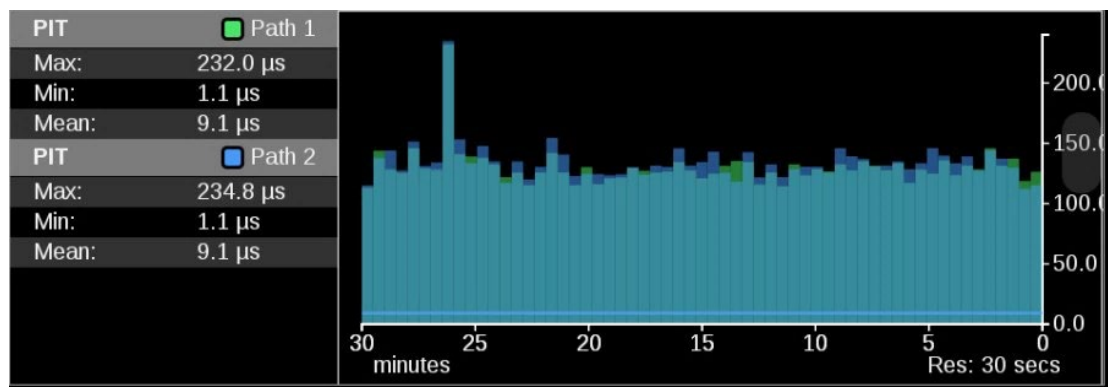


Figure 160: IP Graphs application – PIT graph

RTP Sequence Error graph

The RTP Sequence Error: Shows the RTP sequence information and reports if any packet is received out of order. (See Figure 161.)

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.

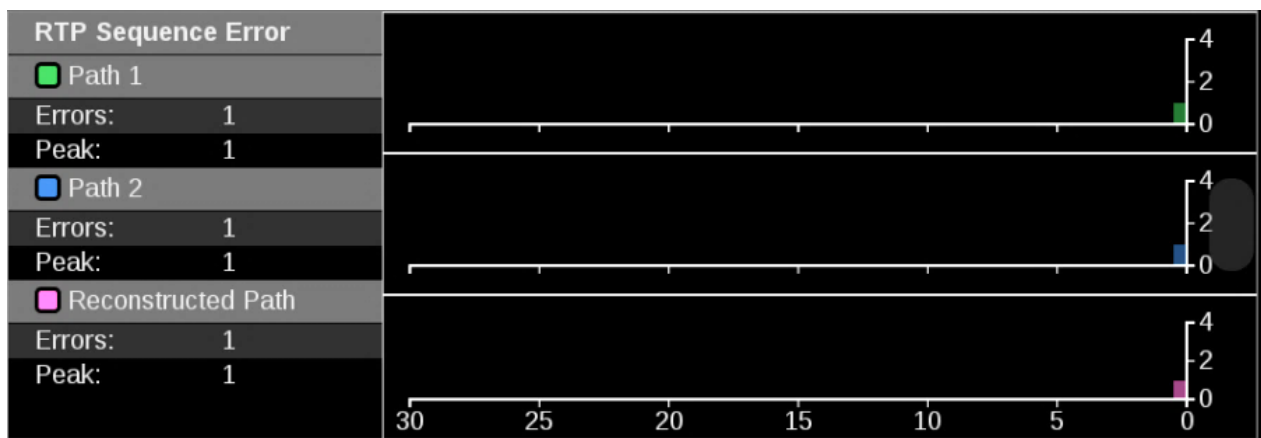


Figure 161: IP Graphs application – RTP Sequence Error graph

Path1–Path2 Differential graph

Path Differential represents the time difference between the Path 1 and Path 2 streams in a ST2022-7 system. (See Figure 162.) 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.

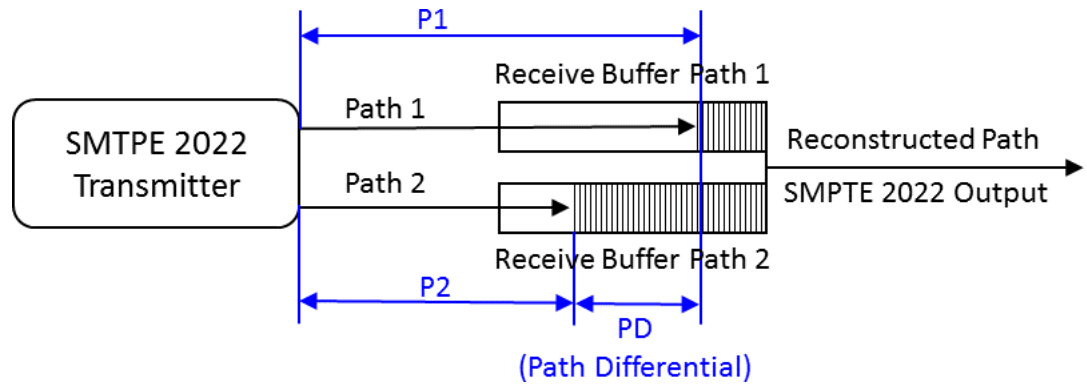


Figure 162: Seamless protection switching of SMPTE ST-2022-7 IP stream

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. (See Figure 163.) 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. (See Figure 162.)

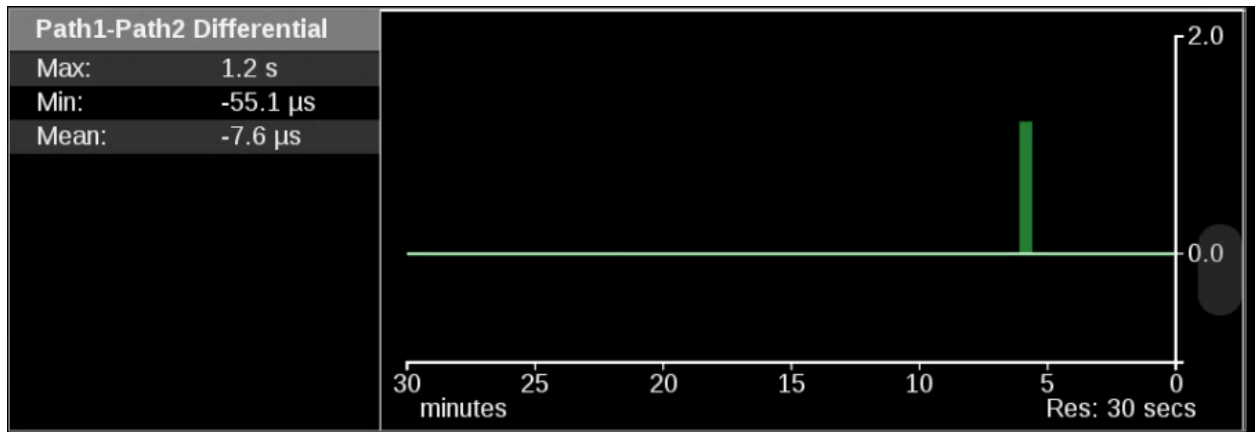


Figure 163: IP Graphs application – Path1–Path2 Differential graph

NOTE. The measurement range of Path1-Path2 differential measurement is 1 second.

NOTE. The Path1-Path2 differential measurement is not supported for ST2110-30.

CMAX and VRX Buffer graph

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

NOTE. The CMAX and VRX trend graphs are only available for 2110 streams.

NOTE. Make sure the input signal and PRISM are locked to PTP for these measurements.

- 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. (See Figure 164.)
- 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.

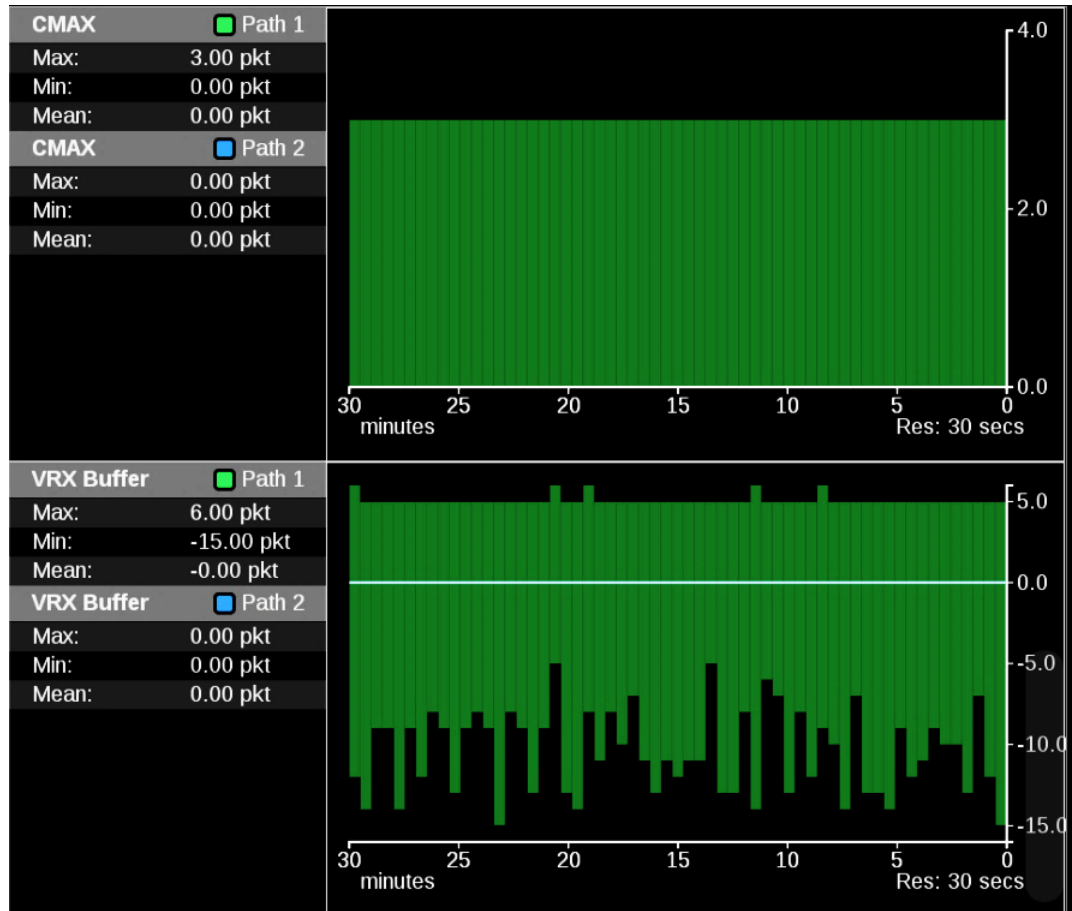


Figure 164: IP Graphs application – CMAX and VRX Buffer graph

PIT Histogram application

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

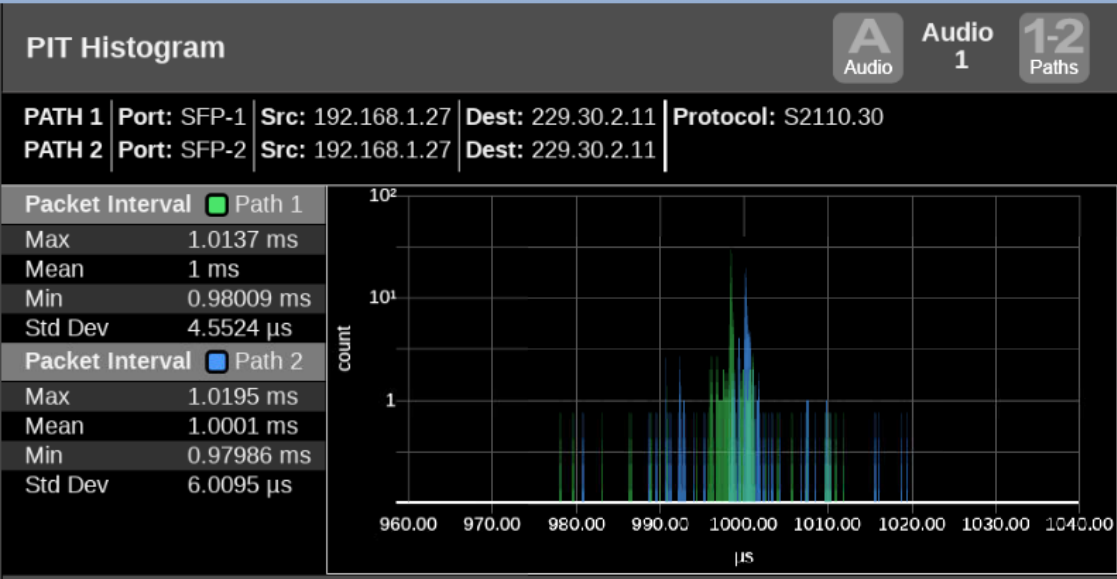


Figure 165.)

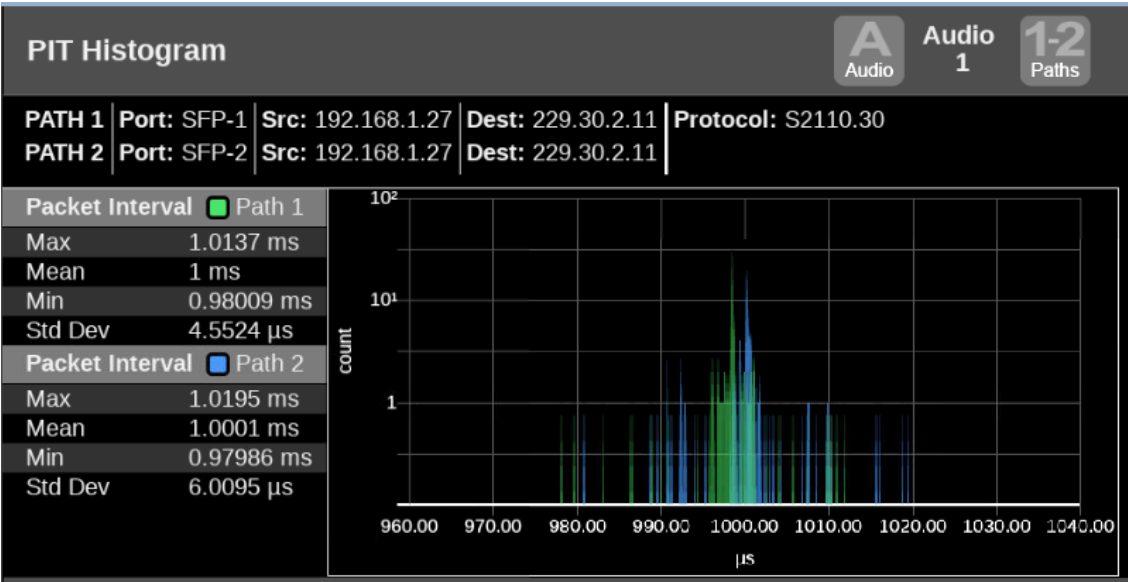


Figure 165: PIT Histogram application display

NOTE. If 2110 monitoring is configured, you can select Video, Audio (1 stream at a time, selectable in Tile Settings), or Data.

NOTE. After the application settings menu is opened, the Move icon (📏) appears. Select this icon to move the settings menu left or right.

PIT Histogram application settings menu

Select the **Tile** icon (⚙️) in the application toolbar to open the PIT Histogram Settings menu.

Y-Axis Scaling: Select Linear or Log for the y-axis scaling. (See Figure 166.)

Audio: Select the drop-down menu to choose the audio stream to monitor. The selected audio stream is noted in the PIT Histogram heading next to the monitored path.

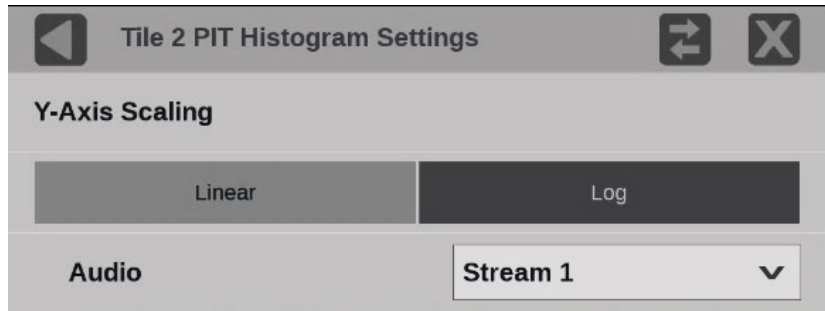


Figure 166: PIT Histogram application settings menu

Elements of the PIT Histogram application

- **Port 1 and Port 2:** Shows the physical ports 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:** Select 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.

To change the selected audio stream

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. (See Figure 167.)

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

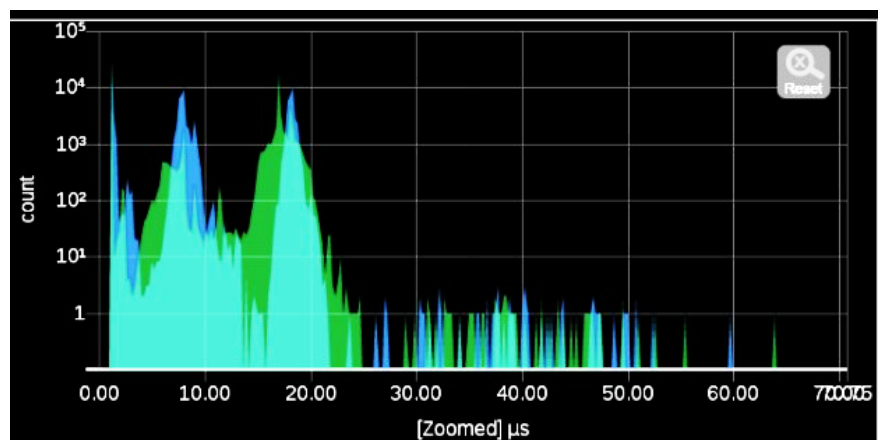


Figure 167: Zooming in on the PIT Histogram graph

Select 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 Configure the reference settings](#) and [PTP introduction](#).

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

NOTE. After the PTP Graphs application settings menu is opened, the Move icon (↔) appears. Select this icon to move the settings menu left or right.

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, or 1 day. (See Figure 168.)

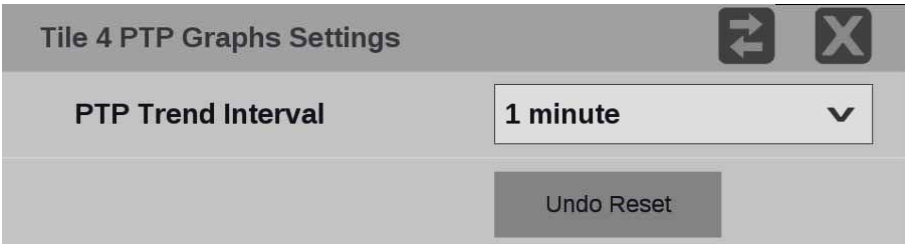


Figure 168: PTP Graphs application settings menu

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. (See Figure 169.)



Figure 169: 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 Mean (average) are shown on the left, while the traces versus time is shown on the right. The traces indicate the Max, and Min envelope, and the Mean (average) for each time bin. The time scale can be adjusted in the settings menu. The data is logged for 1 day so you 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; these go from the master to the slave. This display indicates effects of the downstream network delay and adjustments made to the slave clock. After the slave is locked and the timing is stable, the perturbations on this graph are largely due to network variations. Traffic often causes some messages to be delayed so the maximum delay increases.

As the PTP is locking, the slave clock 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 directions.

If the network delay is too unstable, then the PTP might never lock. This appears 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 indicates a PTP slave is likely to quickly lock, a large value indicates it could be difficult for a PTP slave to lock.
- **Slave to Master Delay graph:** This indicates the difference in the time stamps for the PTP Delay Request messages that go from the slave to the master. This display indicates effects of the upstream network delay and adjustments made to the slave clock. After the slave is locked and the timing is stable, the perturbations on this graph are largely due to network variations. Traffic often causes some messages to be delayed so the maximum delay increases.

As the PTP is locking, the slave clock adjusts, 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 directions.

If the network delay is too unstable, then the PTP might never lock. This appears 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 indicates a PTP slave is likely to quickly lock. A large value indicates it could be difficult for a PTP slave to lock.
- **PTP Phase Lag graph:** The PTP phase lag is the error in the slave clock phase as measured by the PTP time stamps. This value is used to adjust the slave clock to drive the error toward zero.

The PTP phase lag 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.

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. (See Figure 170.) 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.

NOTE. The Stream Timing application requires Option MP2-IP-MEAS.

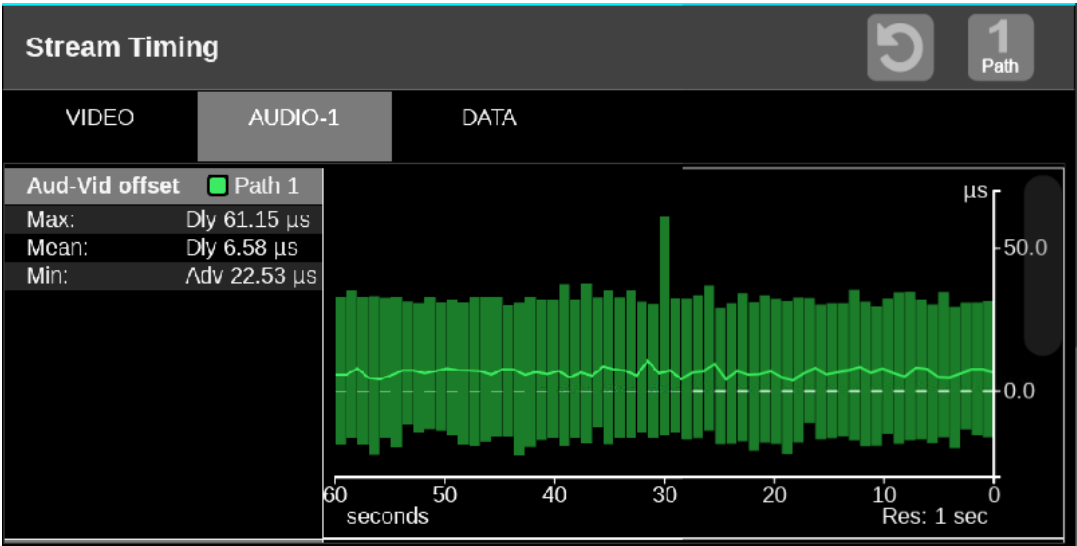


Figure 170: Stream Timing application display

NOTE. After the application settings menu is opened, the Move icon (📏) appears. Select this icon to move the settings menu left or right.

Stream Timing settings menu

Select the Tile icon (⚙️) in the application toolbar to open the Stream Timing Settings menu.

Trend Interval: Select 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, or 1 day. (See Figure 171.)

Undo Reset: Select this button to undo the last clear or reset of the monitoring session.

Audio: Select this drop-down menu to choose the audio stream to monitor. The selected stream is noted in the AUDIO tab label.

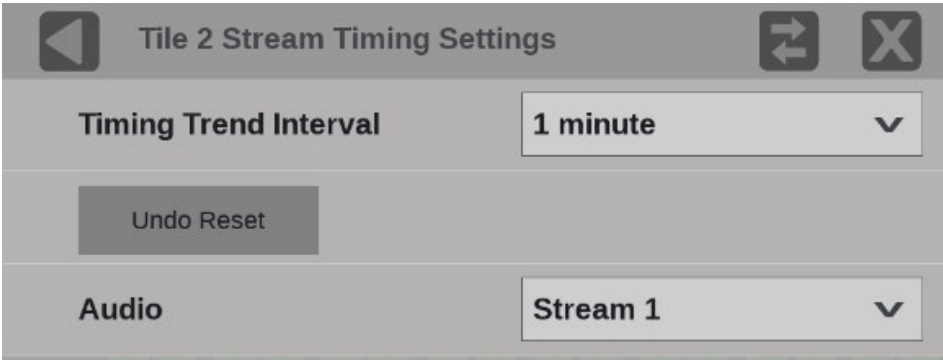


Figure 171: Stream Timing settings menu

**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 [Configure the instrument for HDR/WCG monitoring.](#))

- **Clear icon:** Select the Clear icon (X) to reset the monitoring session.
- **Path button:** Select 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. The number in the AUDIO tab is the selected stream.
- **Res:** Lists the resolution of the graph display.

Video offset tab

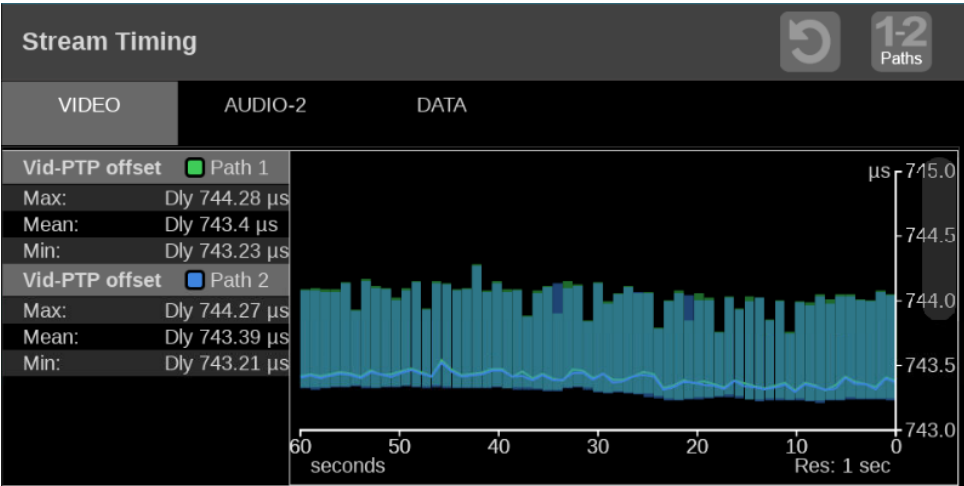


Figure 172: Stream Timing application – Video to PTP graph

Vid-RTP offset: The graph shows timing of the video stream as it was received relative to the embedded RTP time stamps. (See Figure 173.)

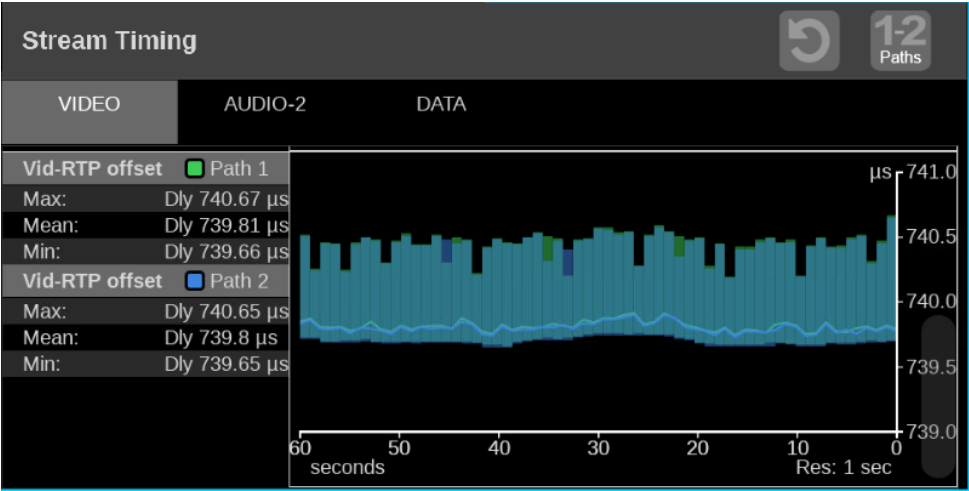


Figure 173: Stream Timing application – Video to RTP graph

Audio offset tab

Aud-Vid offset: The graph shows the relative delay between audio and video streams. (See Figure 174.) This value indicates the amount of delay that must be applied to realign the signals according to the time stamps.

NOTE. The selected stream is indicated in the Audio tab as <1-4>.

To change the monitored stream, open the Tile Settings menu.

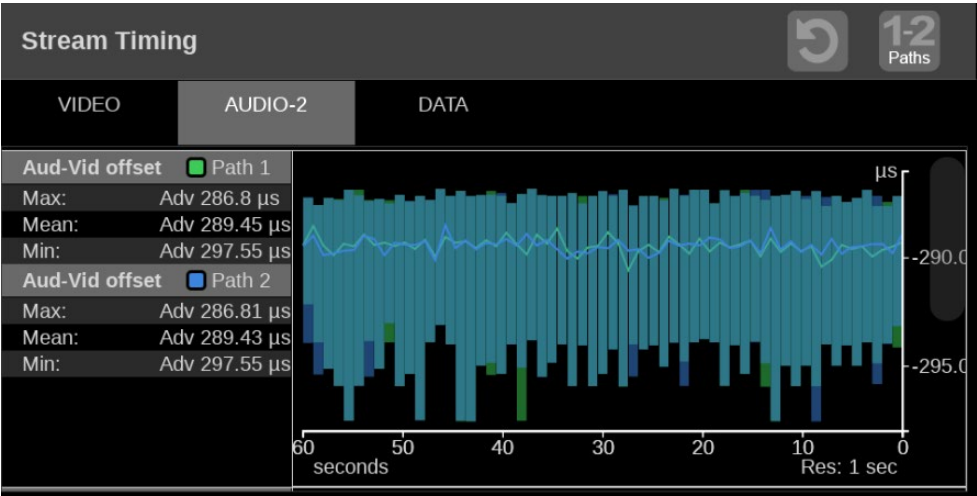


Figure 174: Stream Timing application – Audio to Video graph

Aud-RTP offset: The graph shows timing of the audio stream as it was received relative to the embedded RTP time stamps. (See Figure 175.)

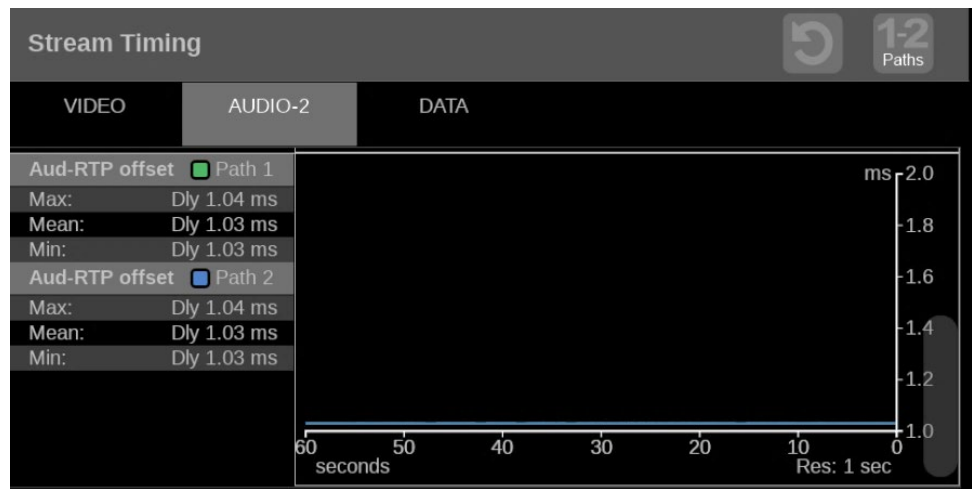


Figure 175: Stream Timing application – Audio to RTP graph

Data offset tab

The Data-Vid offset graph shows the relative delay between data and video streams. (See Figure 176.) This value indicates the amount of delay that must be applied to realign the signals according to the time stamps.

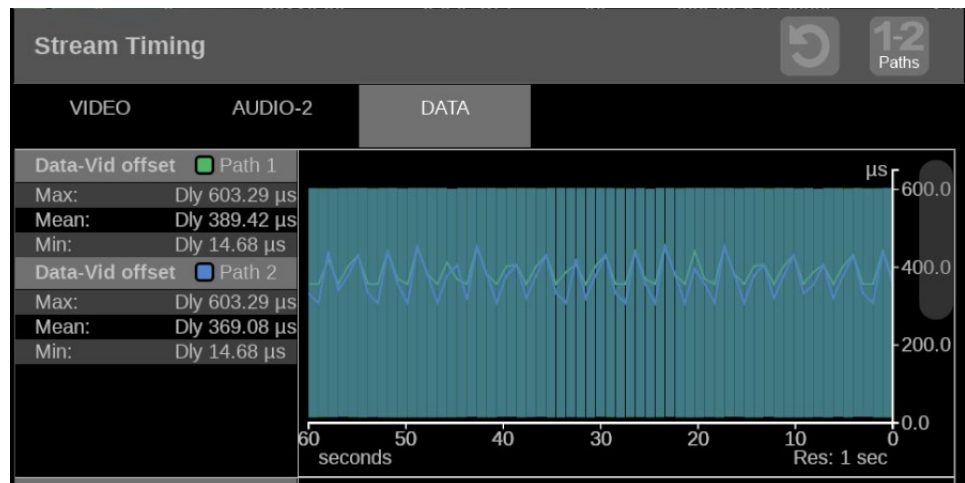


Figure 176: Stream Timing application – Data to Video graph

The Data-RTP offset graph shows timing of the data stream as it was received relative to the embedded RTP time stamps. (See Figure 177.)

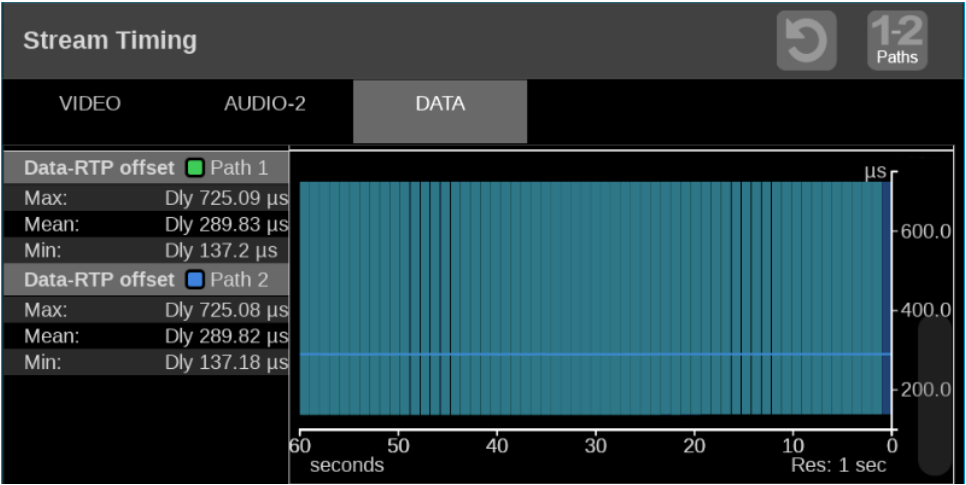


Figure 177: Stream Timing application – Data to RTP graph

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. (See Figure 178.)

NOTE. The IP Generator application requires Option MP2-GEN.

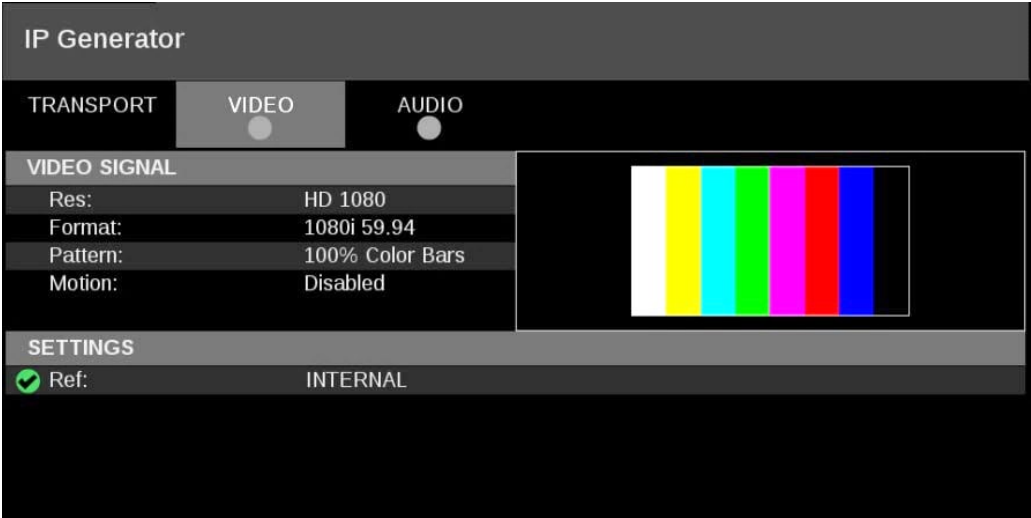


Figure 178: IP Generator application display

NOTE. After the application settings menu is opened, the Move icon (↔) appears. Select this icon to move the settings menu left or right.

IP Generator application settings menu

Use these options to configure the video and audio IP Generator settings. (See Figure 179.)

Select the **Save** button at the bottom of the window to save your configuration.

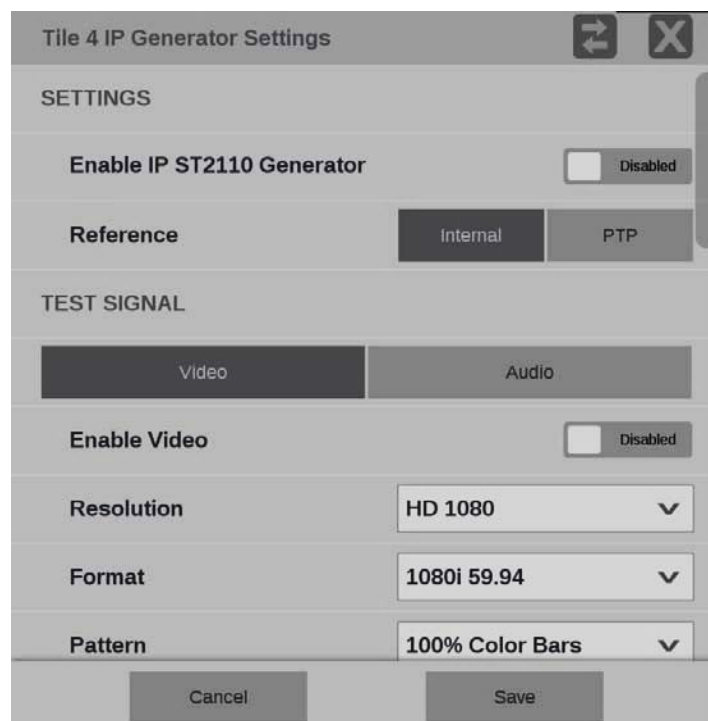


Figure 179: IP Generator application settings menu

- **Enable IP ST2110 Generator:** Select to set the IP ST2110 Generator to either Enabled or Disabled.
- **Reference:** Select to set the IP Generator reference to either Internal or PTP.

Video test signal options

Under TEST SIGNAL select **Video**.

TEST SIGNAL: These options are available under TEST SIGNAL.

- **Enable Video:** This slider enables and disables the video test signal.
- **Resolution:** Open this drop-down list to choose a resolution: **SD**, **HD 720**, **HD 1080**, or **3G Level A**.
- **Format:** Open this drop-down list to choose a format:
 - **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 patterns: Black or 100% Color Bars.
- **Motion:** Select this to enable or disable horizontal motion of the color bars.

NOTE. *The Motion option is unavailable when Pattern is set to Black.*

VIDEO TRANSPORT: These options are available under VIDEO TRANSPORT.

- **Packing Mode:** Select this option to choose one of these 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):** Select this option to choose one of these 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: Video port SFP 1 and SFP 2 can be Enabled or Disabled.

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 are automatically configured based on the Destination Address and Destination Port.*

VIDEO PORT SFP+ 1		Enabled ☐
Source IP Address	172.21.54.17	
Source Port	50020	
Source MAC Address	08:00:11:22:5c:32	
Destination Addr.	239.20.54.17	
Destination Port	50020	
Destination MAC Address	01:00:5e:14:36:11	

Figure 180: Video Port SFP configuration

Audio test signal options

Under TEST SIGNAL select **Audio**.

TEST SIGNAL: These options are available under TEST SIGNAL.

- **Enable Audio:** Select to enable or disable the audio test signal.
- **Channels:** Select either 2 or 8 channels.
- **Frequency:** Select 1 kHz frequency or Multiple frequencies.
- **Amplitude:** Select from these options:
 - **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.

Table 14 shows the audio test signal values in each channel when both Frequency and Amplitude, in the settings menu, are set to Multiple.

Table 14: 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

VIDEO TRANSPORT: These options are available under VIDEO TRANSPORT.

- **Packet Time:** Select 125 μ s or 1 ms packet times.
- **RTP Payload Type:** Enter an RTP Payload Type number for the generated IP stream.

NOTE. Each generated IP stream must have a unique RTP Payload Type number.

AUDIO PORT SFP 1 and SFP 2: Audio port SFP 1 and SFP 2 can be Enabled or Disabled.

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.

AUDIO PORT SFP+ 1		☐ Disabled
Source IP Address	172.21.54.17	
Source Port	50030	
Source MAC Address	08:00:11:22:5c:32	
Destination Addr.	239.30.54.17	
Destination Port	50030	
Destination MAC Address	01:00:5e:1e:36:11	

Figure 181: Audio port configuration

Elements of the IP Generator application display

Three display tabs provide information regarding the generated IP streams. Select one of the tabs to view the associated display.

TRANSPORT tab display: Select TRANSPORT to view the status of the generated IP streams (See Figure 182.)

IP Generator						
TRANSPORT		VIDEO	AUDIO			
	STREAM	PORT	PAYLD	DEST IP	SOURCE IP	D
☐	S2110.20 P1	SFP1	96	239.20.54.17:50020	172.21.54.17:50020	0
☐	S2110.20 P2	SFP2	96	239.20.54.17:50020	172.22.54.17:50020	0
☐	S2110.30 P1	SFP1	97	239.30.54.17:50030	172.21.54.17:50030	0
☐	S2110.30 P2	SFP2	97	239.30.54.17:50030	172.22.54.17:50030	0

Figure 182: IP Generator application – TRANSPORT tab display

VIDEO tab display: Select VIDEO to view the settings of the generated video stream. (See Figure 183.)

IP Generator											
TRANSPORT	VIDEO										
<table> <tr> <th colspan="2">VIDEO SIGNAL</th></tr> <tr> <td>Res:</td><td>HD 1080</td></tr> <tr> <td>Format:</td><td>1080i 59.94</td></tr> <tr> <td>Pattern:</td><td>100% color bar</td></tr> <tr> <td>Motion:</td><td>Enabled</td></tr> </table>		VIDEO SIGNAL		Res:	HD 1080	Format:	1080i 59.94	Pattern:	100% color bar	Motion:	Enabled
VIDEO SIGNAL											
Res:	HD 1080										
Format:	1080i 59.94										
Pattern:	100% color bar										
Motion:	Enabled										
<table> <tr> <th colspan="2">SETTINGS</th></tr> <tr> <td>Ref:</td><td>INTERNAL</td></tr> </table>		SETTINGS		Ref:	INTERNAL						
SETTINGS											
Ref:	INTERNAL										

Figure 183: IP Generator application – VIDEO tab display

AUDIO tab display: Select AUDIO to view the settings of the generated audio stream. (See Figure 184.)

IP Generator				
TRANSPORT	VIDEO	AUDIO		
AUDIO SIGNAL		Chan	Amp (dBFS)	Freq (Hz)
Channels:	8	1	-20	1000
Freq:	1 kHz	2	-20	1000
Amp:	-20 dBFS	3	-20	1000
Depth:	24 bits	4	-20	1000
		5	-20	1000
		6	-20	1000
		7	-20	1000
		8	-20	1000
SETTINGS				
✓ Ref:	INTERNAL			

Figure 184: 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.

NOTE. The SDI Generator application requires Option MP2-GEN.

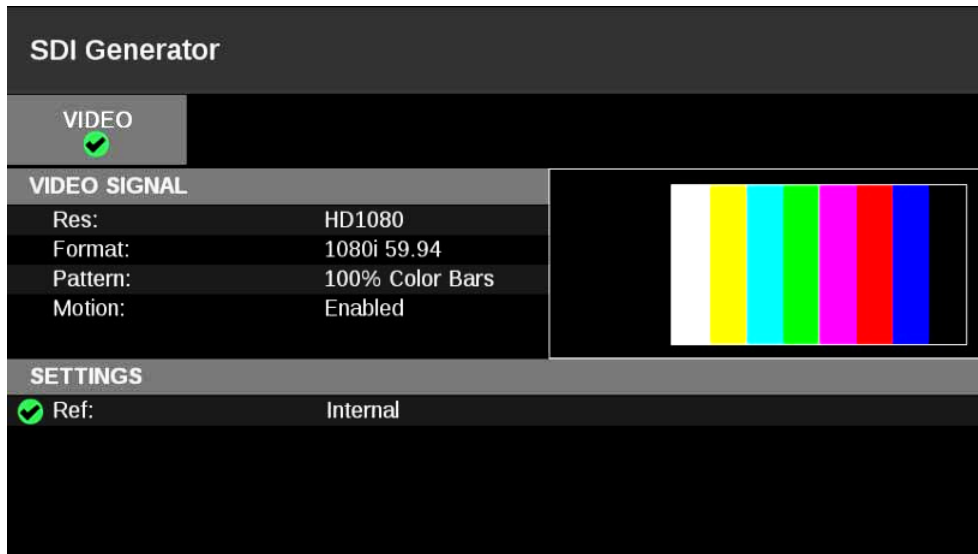


Figure 185: SDI Generator application display

NOTE. After the application settings menu is opened, the Move icon (↔) appears. Select this icon to move the settings menu left or right.

SDI Generator application settings menu

These options configure the SDI Generator settings.



Figure 186: SDI Generator application settings menu

Enable SDI Generator: Select this to set the SDI Generator to Enabled or Disabled.

Reference: The SDI Generator uses an internal reference.

Test signal options These options are available to configure the test signal.

- **Resolution:** Use this drop-down list to select from these resolutions: SD, HD 720, HD 1080, 3G LevelA, 3G LevelB, 6G UHD, or 12G UHD.
- **Format:** Use this drop-down list to select from these 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 23.98:** available for format 6G UHD only
 - **3840p 24:** available for format 6G UHD only
 - **3840p 25:** available for format 6G UHD only
 - **3840p 29.97:** available for format 6G UHD only
 - **3840p 30:** available for format 6G UHD 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:** Select to enable or disable horizontal motion of the color bars.

**Elements of the SDI
Generator application
display**

Select the **VIDEO** tab to view the settings of the generated SDI stream.

NOTE. SDI audio and data generation is not yet available.

Datalist application

Datalist allows you to see the digital data contained in SDI frames for HD, 3G Level A, and single link 12G formats so you can perform in-depth monitoring and analysis of incoming SDI data. 4K Quad Link signals can be monitored by looking at the individual links as separate inputs.

NOTE. Datalist requires software option MP2-ENG or MP2-QC.

NOTE. Deep color is not supported in the Datalist application. All other SDI applications support deep color.

Elements of the Datalist display

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

The Expand icon (🔍) expands the tile vertically. If the tile expands, it covers the tile above or below, depending on whether you are expanding the top or bottom tile. The Collapse icon (🔍) brings the tile back to its original size.

The Datalist display shows the digital data from the selected SDI input. (See Figure 187.) It is updated approximately once per second and updating can be controlled by the Run/Pause button in the application banner.

While the application is running or paused, you can scroll through the SDI data using a touchscreen or mouse. Scroll vertically by touch-swipe or use the mouse scroll wheel. Scroll horizontally by touch-swipe or click and drag with the mouse. Alternately, the navigation controls described in Figure 187 can be used.

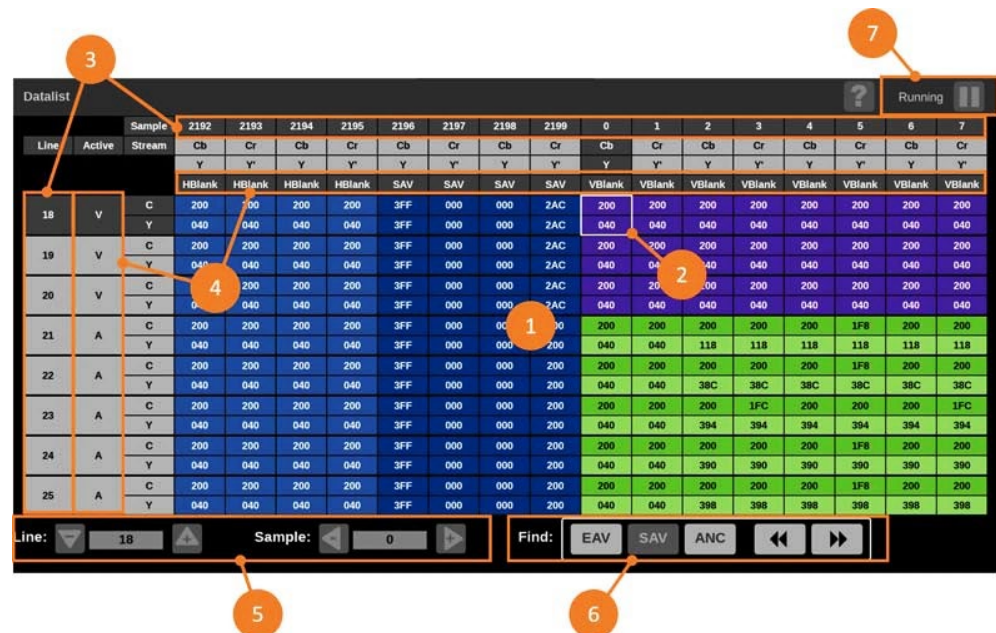


Figure 187: Datalist display

Table 15: Descriptions of elements in the Datalist display

Item (See Figure 187)	Description
1	SDI frame data: The SDI frame data is color coded for easier identification. Select the ? key in the application banner for help in decoding the SDI data types.
2	Selected SDI sample: The SDI sample that is selected by the Line and Sample controls at the bottom of the application.
3	Line and Sample numbers
4	Line and Sample data types
5	Line and Sample selection: Use these controls to go to a specific sample and line. The number can be entered directly by selecting the current number; this opens a keyboard. Enter the line or sample number and select Enter to go to that location.
6	SDI frame shortcuts: Use these controls to go to the next EAV, SAV, and ANC location after the selected SDI sample. For example, to go to the next SAV location, select the SAV button and then select the fast forward button.
7	Run/Pause control: Select this button to run and pause the SDI frame updates. Pausing will allow you to examine a single SDI frame in more detail.

ANC (Ancillary Data) Session application

The ANC Data Session application allows you to examine all the ancillary data present in a signal. The instrument continually monitors the signal and tells you when changes in the presence of data occur.

Select the Clear icon  to reset the monitoring session for both the WATCH LIST and the SCTE104 pages.

NOTE. PRISM monitors the first 4 links of the 8 logical SDI links in Quad Link 3G LB and Quad Link 12G.

ANC Session							Run Time: 0d, 00:08:55 
WATCH LIST		SCTE104					
NAME	DID	SDID ▲	LINK	LOCATION(S)	OCCURRENCE	NOTE	
 S352M VPID	41	1	C	Line 10 Sample 1939	Field	89 ca 00 01	
 Type 2	42	1	C	Line 10 Sample 1928	Field		
 S352M VPID	41	1	Y	Line 10 Sample 1939	Field	89 ca 00 01	
 Type 2	42	1	Y	Line 10 Sample 1928	Field		
 S299-1 Ctrl Grp 1	E3	--	Y	Line 9 Sample 1928	Field	48kHz PP-- Frn	

Figure 188: ANC Session WATCH LIST (only OCCURRENCE and NOTE columns are shown)

NOTE. A green checkmark in the WATCH LIST name column means data is being continuously received. A yellow exclamation mark means data has been received but it has stopped.

WATCHLIST tab

Watchlist tab provides a list of the detected ANC data. It also reports the last detected time, so an infrequent ANC data, such as SCTE-104, can be monitored in the Occurrence column. The Line/Sample information, in conjunction with Datalist display, helps you diagnose the ANC data at the bit level.

DID: Data identifier of the packet; permissible values range from 1 to 0xFF (255) inclusive.

SDID: Secondary data identifier of the packet; permissible values range from 0 through 0xFF (255) inclusive.

LINK: Virtual link or stream the ANC data is present on.

LOCATION(S): Transport line number the ANC data is present on.

OCCURRENCE: Shows the last time a packet occurred.

NOTE: Shows the basic information about the Anc data, like timecode or summary of SCTE104.

SCTE104 tab

The SCTE104 tab displays the Multiple Operations messages, and RTC / TC displays the reception time of the ANC packets with SCTE104 data. The user can review up to the last 10 messages to check the message sequence is correct.

Select the run  button to start the data stream. (See Figure 189)

Select the pause  button to pause the data stream.

NOTE. When the run  button is visible, it means data monitoring-collecting is paused. When the pause  button is visible, it means data collecting-monitoring is running.

Table 16: Op codes and titles

Op code	Op title
0x0101	splice_request_data()
0x0102	splice_null_request_data()
0x0104	time_signal_request_data()
0x0109	insert_DTMF_descriptor_request_data()
0x010A	insert_avail_descriptor_request_data()
0x010B	insert_segmentation_descriptor_request_data()
0x010C	proprietary_command_request_data()

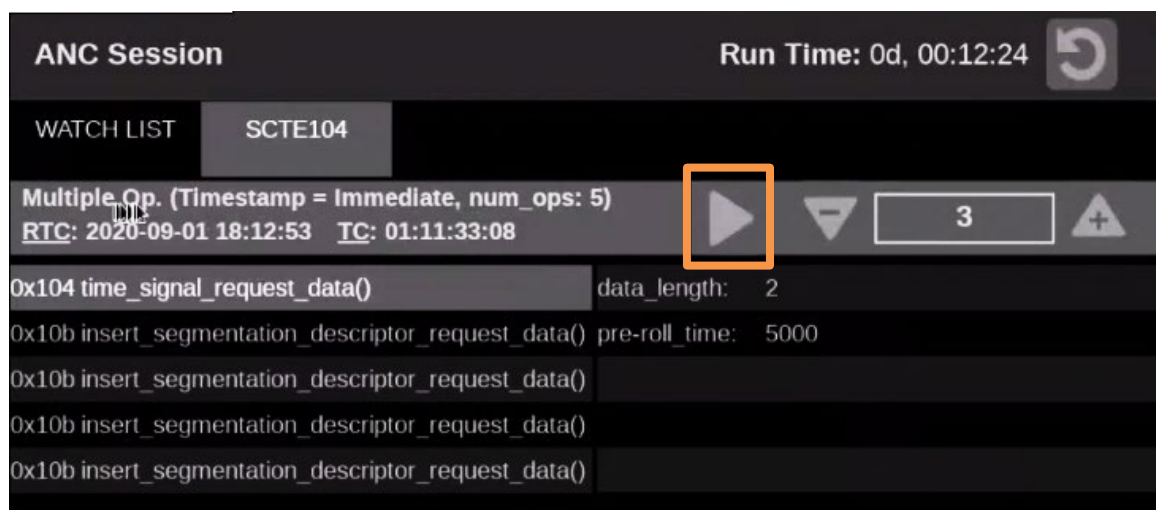


Figure 189: ANC Session SCTE104 page with a time_signal_request_data() message open and the play icon marked

NOTE. The RTC (real-time clock) and TC (time code) numbers in the SCTE104 page match the RTC and TC in the PRISM status menu.

The number in the left column of the SCTE104 page is the number of operations received. Select the Plus icon  or Minus icon  to scroll through the list of up to the last 10 received messages.

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. (See Figure 190.)

NOTE. This application requires hardware option PHY and software Option MP2-FMT-4K to enable 12G-SDI. This application is only valid on SDI 1.

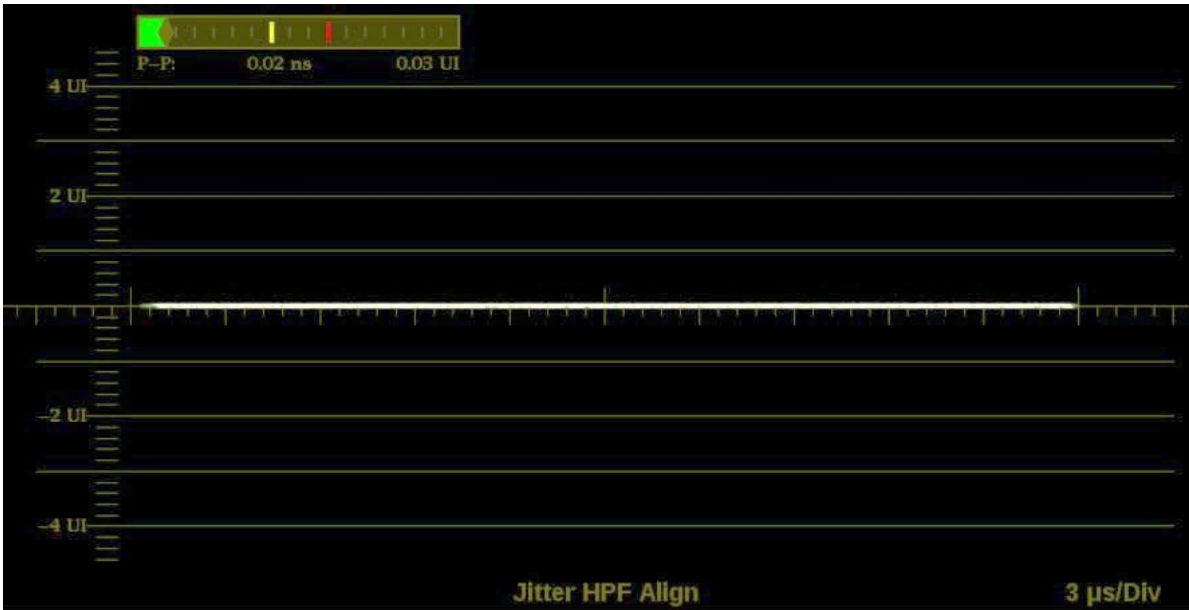


Figure 190: Jitter Display application display

To adjust the tile settings, select the **Tile** icon (⚙️) to open the Jitter Display application settings menu.

NOTE. After the Jitter Display application settings menu is opened, the Move icon (📏) appears. Select this icon to move the settings menu left or right.

Jitter Display application settings menu

The Jitter Display application settings menu figure shows the available options. (See Figure 191.)

Tile 4 Jitter Display Settings		↔️	✕
Jitter High Pass Filter	Align	▼	
Sweep Mode	1 Line	▼	
Jitter Meter	Show ☐		

Figure 191: 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: Select this 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.*

Eye Display application

The Eye Display presents an eye pattern diagram of the SDI signal to verify electrical characteristics of the SDI transport layer. (See Figure 192.) Use this application to make automated eye measurements on SD, HD, and 4K SDI signals.

NOTE. This application requires hardware Option PHY and software option MP2-FMT-4K to enable 12G-SDI. This application is only valid on SDI 1.

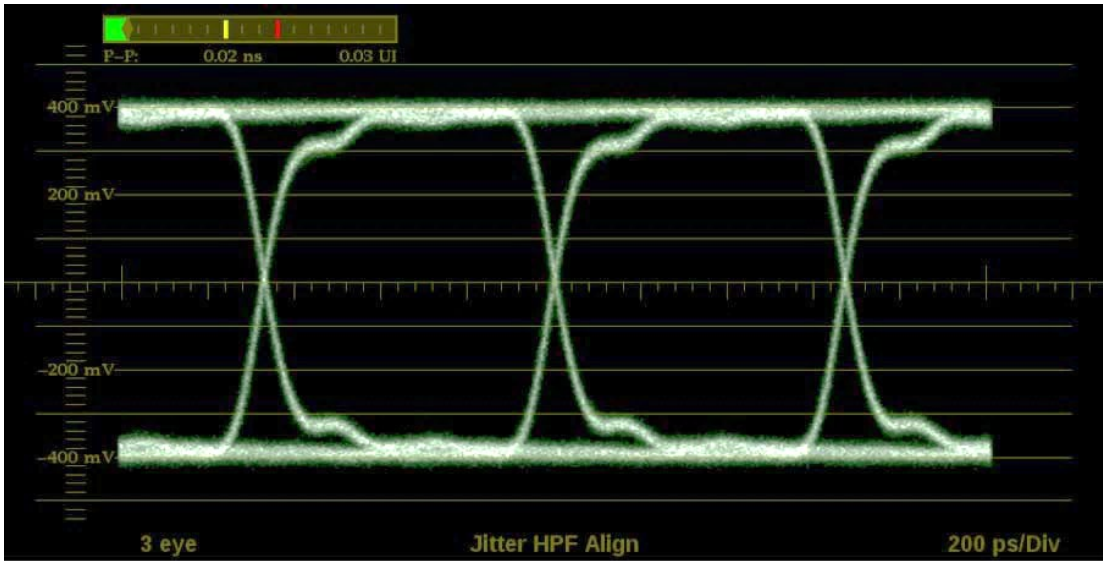


Figure 192: Eye Display application display

To adjust the tile settings, select the **Tile** icon (⚙️) to open the Eye Display application settings menu.

NOTE. After the Eye Display application settings menu opens, the Move icon (↔️) displays. Select this icon to move the settings menu left or right.

Eye Display application settings menu

The Eye Display application settings menu figure shows the available options. (See Figure 193.)

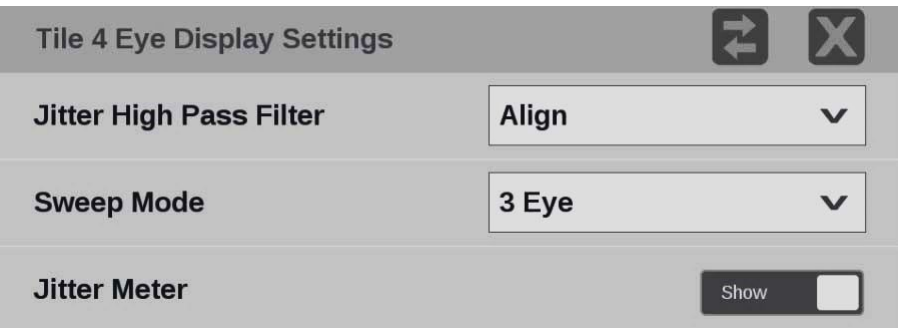


Figure 193: Eye Display application settings menu

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.*

Stop Display application

The Stop Display provides a tool to monitor video signals with a variety of transfer functions in a consistent manner. It helps the Director of Photography (DP), Cinematographer, and Lighting Engineer to communicate to create a scene.

NOTE. Stop Display is enabled with Option MP2-PROD and is affected by the Gamma and Color Gamut settings. For additional information regarding these settings, refer to the [How to configure signal inputs](#) section.

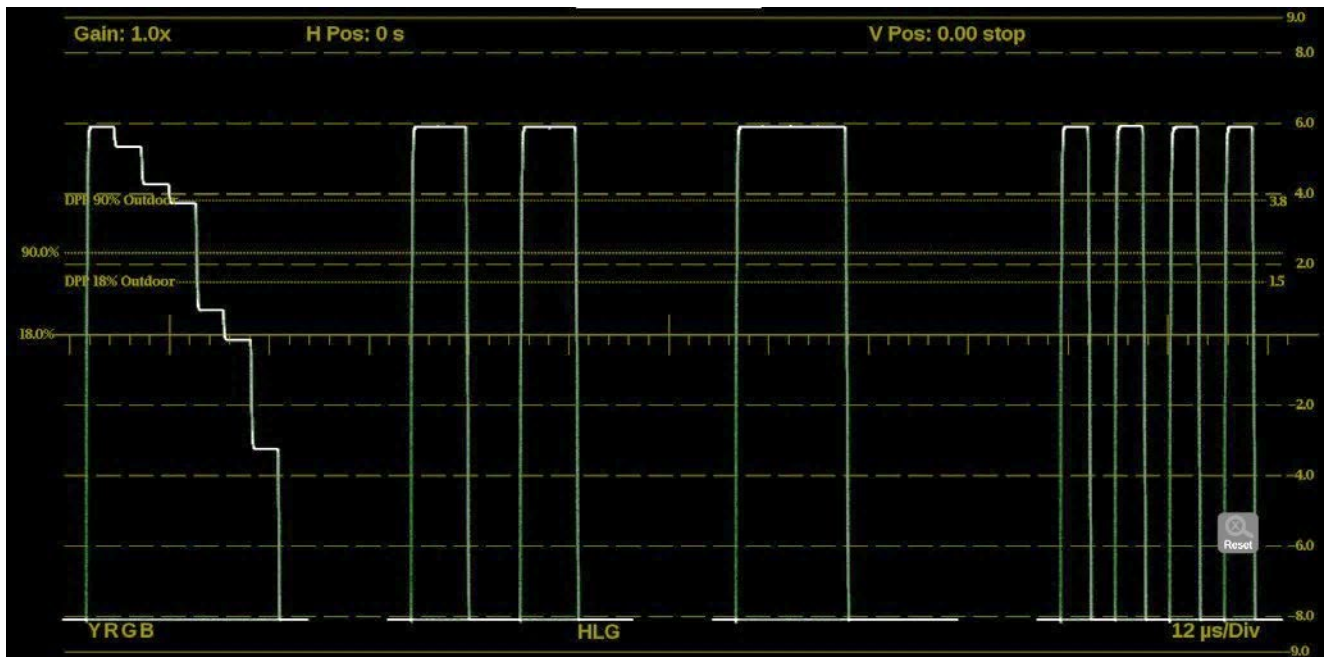


Figure 194: Stop Display application

To adjust the tile settings, select the **Tile** icon (⚙️) to open the Stop Display application settings menu.

NOTE. After the Stop Display application settings menu is opened, Move icon (↔️) displays. Select this icon to move the settings menu left or right.

Stop Display application settings men

The Stop Display application settings menu figure shows the available options. (See Figure 195.)

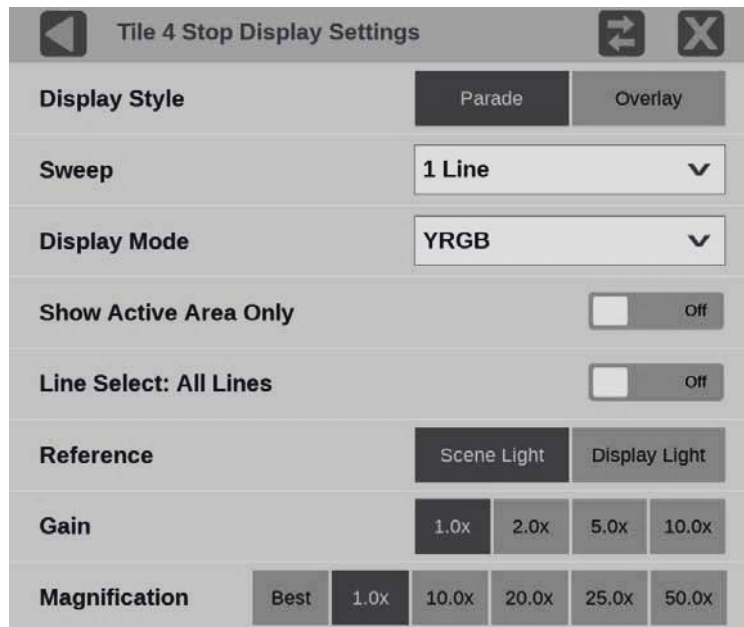


Figure 195: Stop Display application settings menu

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

- **Parade:** All the components are shown one beside the other.
- **Overlay:** All the components are drawn at the same location so 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 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 these 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: Select to turn Show Active Area Only On or Off. When the option is On it removes the trace of vertical / horizontal blanking data.

Line Select: Choose the picture lines to monitor in the display. Either All Lines or 1 Line can be selected.

If 1 Line is selected, the display only shows results for the selected line in the picture. The line can be selected using the on-screen tools. ([See Line Select function](#).) Or the line can be selected directly on the Picture.

Reference: Choose between Scene Light (Stops) and Display Light (Nits).

Gain: Select to change the gain to x1, x2, x5, or x10.

Magnification: Change the magnification to Best View, x1, x10, x20, x25, or x50.

Stop Display application on-screen tools

You can change the gain, display mode, and sweep without opening the Stop Display settings menu through on-screen tools. Select the tool/button for the setting you want to adjust. (See Figure 196.) All the available tools are located on the top and bottom of the display and are highlighted for a few seconds when the application is first opened or if you select anywhere in the middle of the application tile.

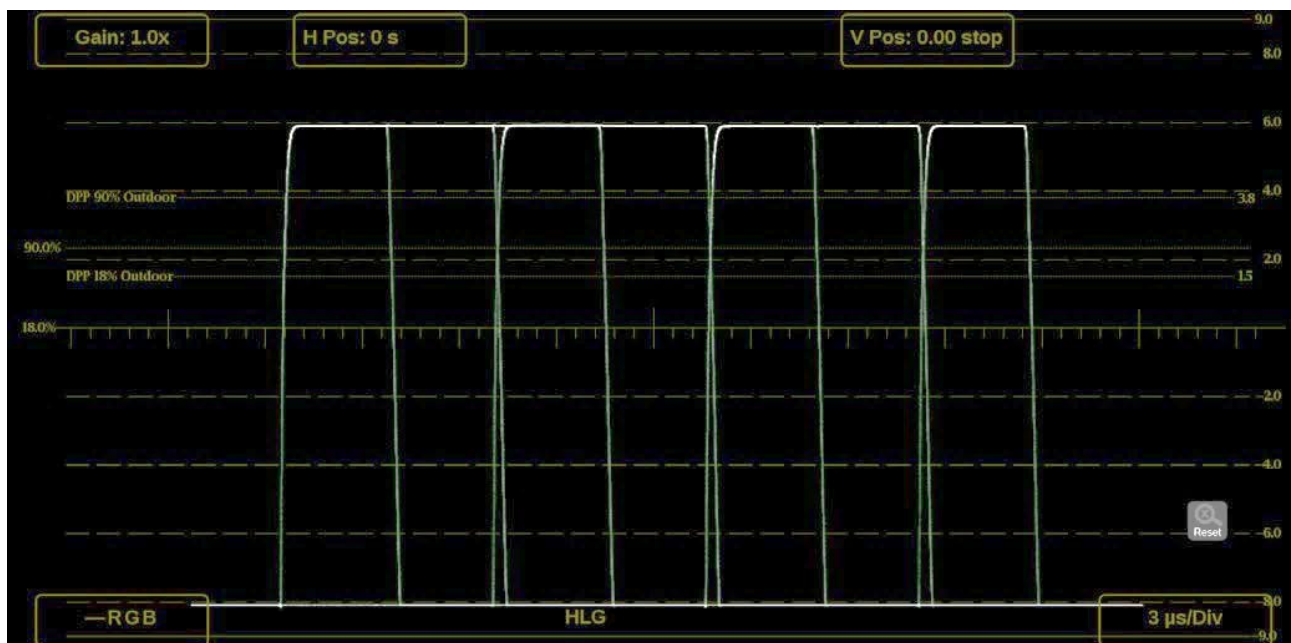


Figure 196: Available on-screen tools for the Stop Display application

Gain: Increase or decrease the magnification of the trace display.

1. Select **Gain** to expand the available magnification options drop-down list. (See Figure 197.)
2. Select one of the preset fixed-gain values from the drop-down list. Choose from 1.0x, 2.0x, 5.0x, or 10.0x.
3. Select the **Reset** icon () to reset the gain to 1.0x.



Figure 197: Stop Display on-screen tools–Gain

Horizontal and vertical position: Adjust the position of the trace display.

1. Select **H Pos** to allow adjustment of the horizontal trace. (See Figure 198.)
 - Select and drag to move the trace on the touchscreen. This method can be performed without using the button.
 - Use a mouse scroll wheel to move the trace.
 - For incremental adjustments, select the plus or minus button to adjust the horizontal position.
 - Select the **Reset** icon () to reset the horizontal position adjustment to default.

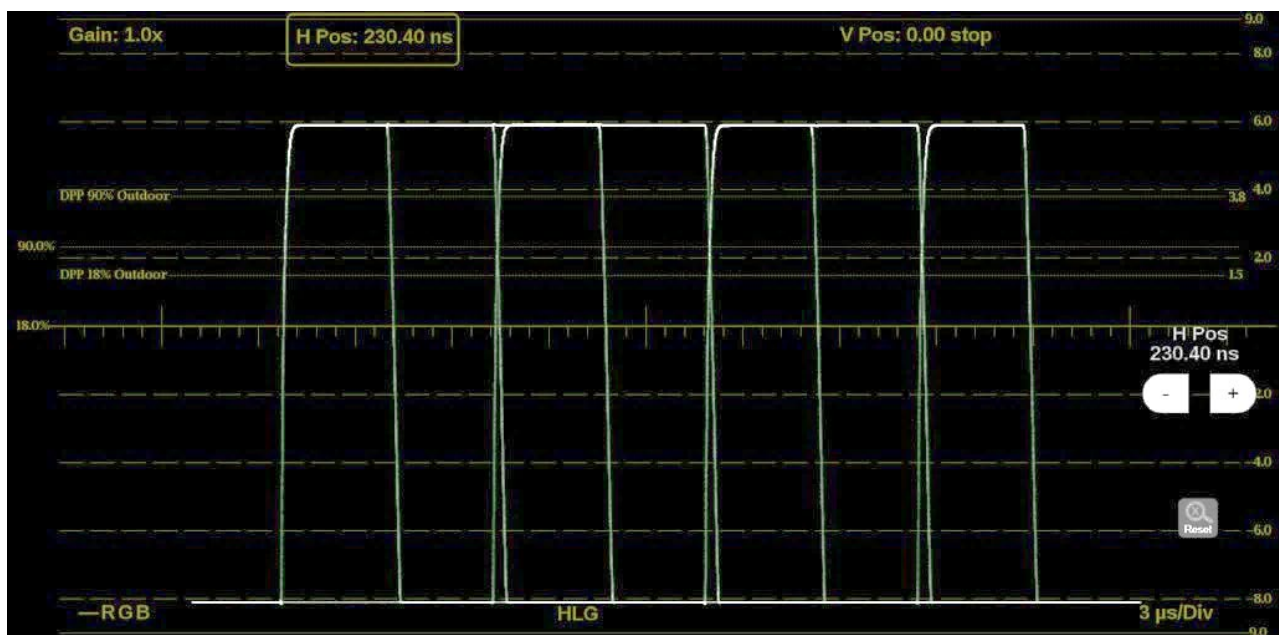


Figure 198: Stop Display on-screen tools – horizontal position

2. Select **V Pos** to allow adjustment of the vertical trace. (See Figure 199.)

- Select and drag to move the trace on the touchscreen. This method can be performed without using the button.
- Use a mouse scroll wheel to move the trace.
- For incremental adjustments, select the plus or minus button to adjust the vertical position.
- Select the **Reset** icon () to reset the vertical position adjustment to default.

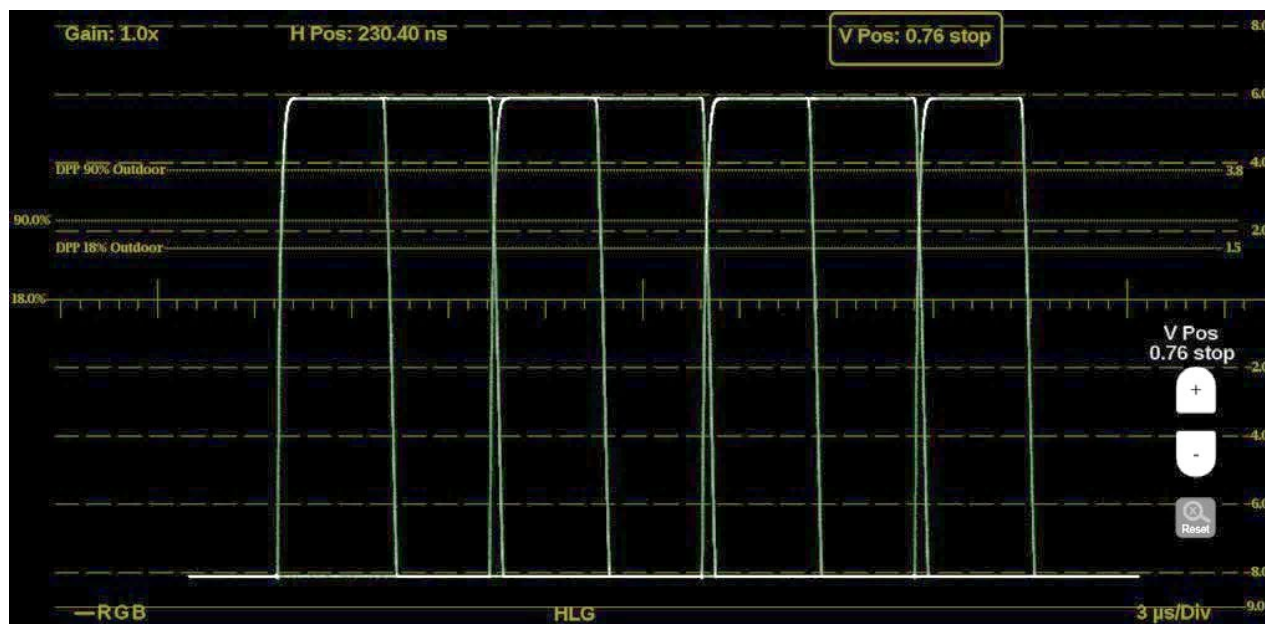


Figure 199: Stop Display on-screen tools – vertical position

Display Mode: Change how the signal components are displayed.

1. Select the button in the bottom left corner of the application to expand the available display options. (See Figure 200.)
2. Select the display style of the signal components. Use YRGB to display any combination of the Y, R, G, and B waveforms.

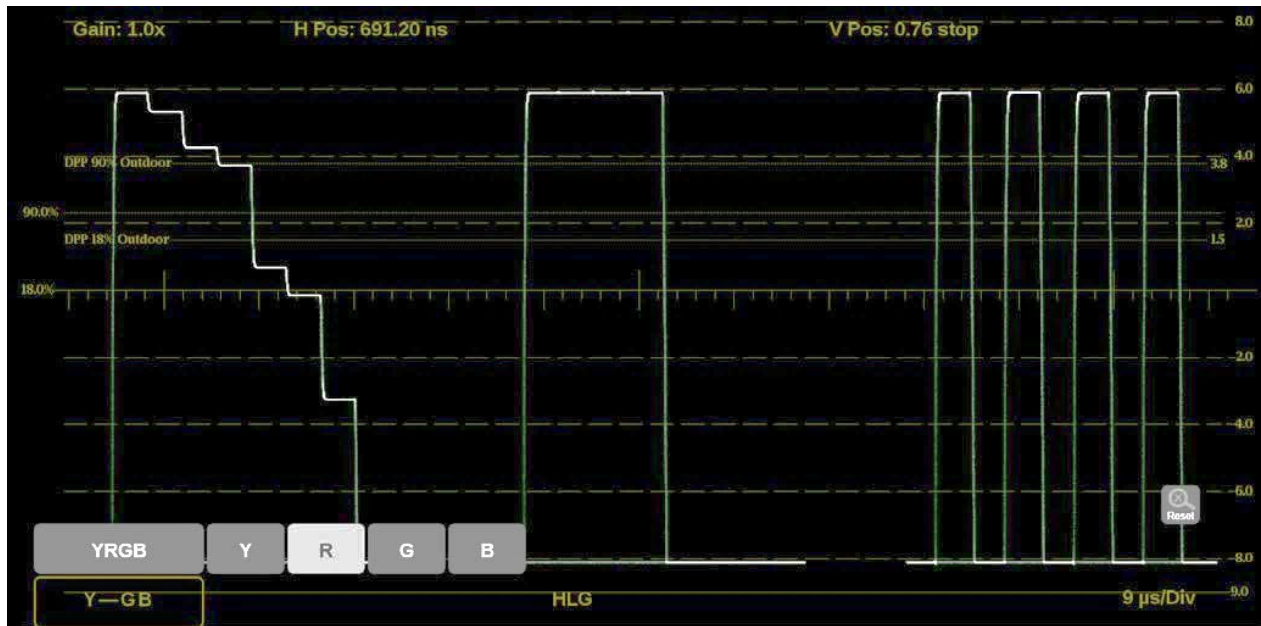


Figure 200: Stop Display on-screen tools – Display Mode

Display format: Change the Display Style, Sweep, and Magnification of the Stop Display.

1. Select the button in the bottom right corner of the application to expand the available display format options. (See Figure 201.)
2. Select the **Mag** option to adjust the magnification to Best View, x1, x10, x20, x25, or x50.
3. Select **Parade** or **Overlay** to switch between the Display Style options. The 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.

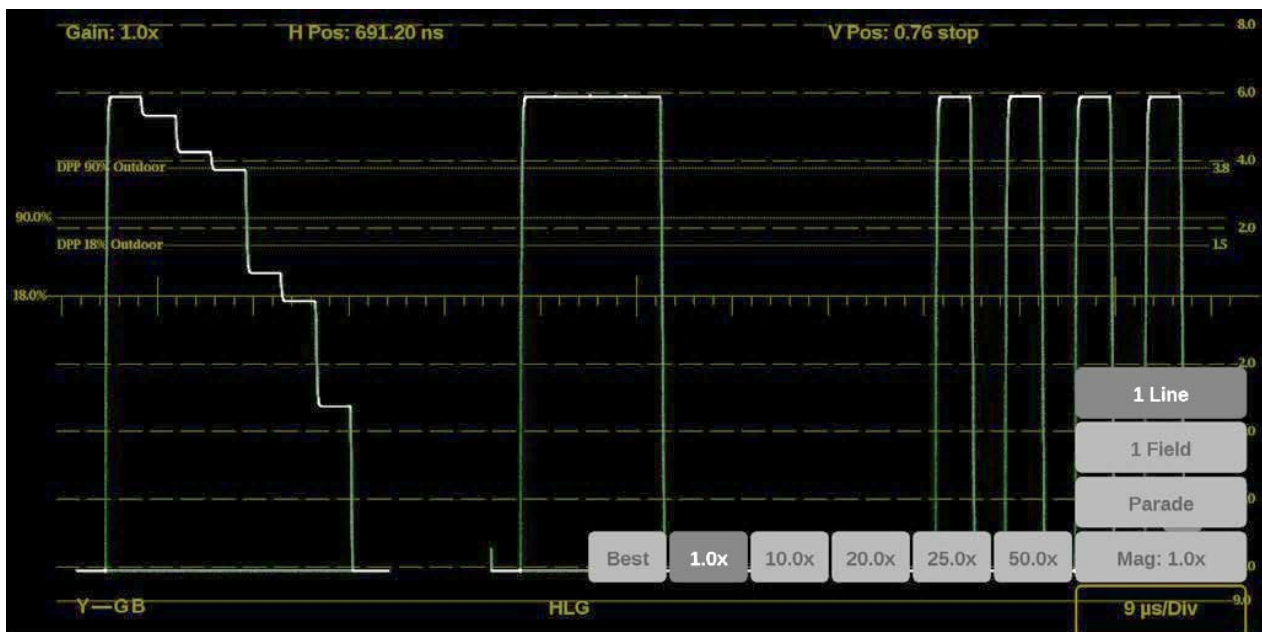


Figure 201: Stop Display on-screen tools – display format

Line Select function: Line Select allows you to select a single picture line to monitor in the display. By default All Lines is selected and all lines are monitored.

NOTE. *The same line is selected in any trace display if line select is enabled.*

To turn on Line Select (and choose the line to monitor):

1. Select the **Lines** button at the bottom of the tile. (see Figure 202).
2. Select **1 Line**.
 - To scroll through lines, select the + and – buttons.
 - To enter a specific line to monitor:
 - select **Line Sel.** and enter the line on the keypad,
 - or in the Picture application, use the line-select cursor (for

active lines).

Depending on the resolution in the signal, the Line Select provides different information.

- If a signal is SD, HD, 3G (see Figure 202):
 - the *Line* number is the selected line, including vertical blanking,
 - if the signal is interlaced format, the *Fields* readout is below the Line number,
 - the *Pic Line* number is next to Line; the Pic Line is the active line number, or numbers, selected.
- If a signal is UHD, 4K (see Figure 203):
 - the *Line* number is the selected raster line,
 - the *SDI Line* is the selected line including vertical blanking,
 - the *link* number appears below the SDI Line.

NOTE. In link, the letters (A-D) refers to the physical links.

The numbers (1-4) refers to the virtual links.

For example, A3/62 indicates it is physical link 1 and virtual link 3 (in a 2-sample interleave, 12G transport).



Figure 202: Stop Display on-screen tools – Pic Line number



Figure 203: Stop Display on-screen tools – SDI Line number

Diamond Display application

The Diamond Display 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.

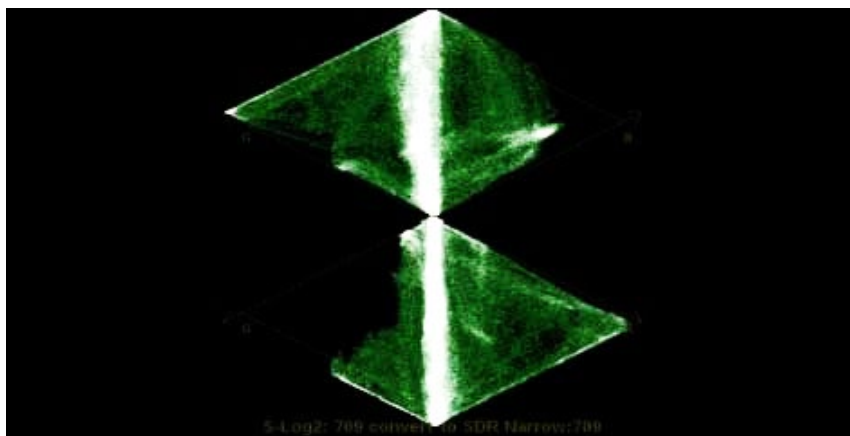


Figure 204: Diamond Display application

To adjust the tile settings, select the **Tile** icon () to open the Diamond Display application settings menu.

NOTE. After the Diamond Display application settings menu is opened, the Move icon () displays. Select this icon to move the settings menu left or right.

Diamond application settings menu

The Diamond application settings menu shows the available options. (See Figure 205.)

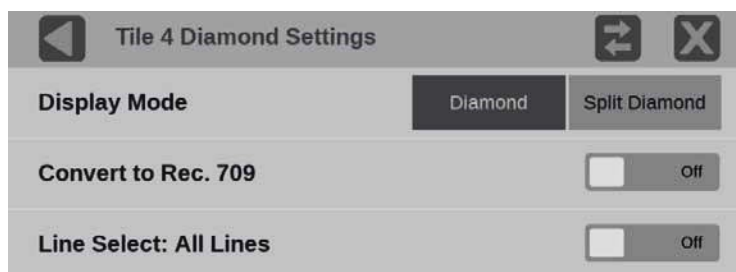


Figure 205: Diamond application settings menu Display

Mode: Select one of the options:

- **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 MP2-PROD).

NOTE. Convert to Rec. 709 auto converts to BT.709, otherwise the graticule selection must be manually changed ([See Configure the instrument for HDR/WCG monitoring.](#))

Convert to Rec. 709 mode is not supported for SD signals.

Line Select: Line Select allows you to choose the picture lines to monitor in the display. Either All Lines or 1 Line can be selected.

If **1 Line** is selected then the display will only show results for the selected line in the picture. The line can be selected using the on-screen tools. ([See Line Select function.](#)) Or the line can be selected directly on the Picture.

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 206.)

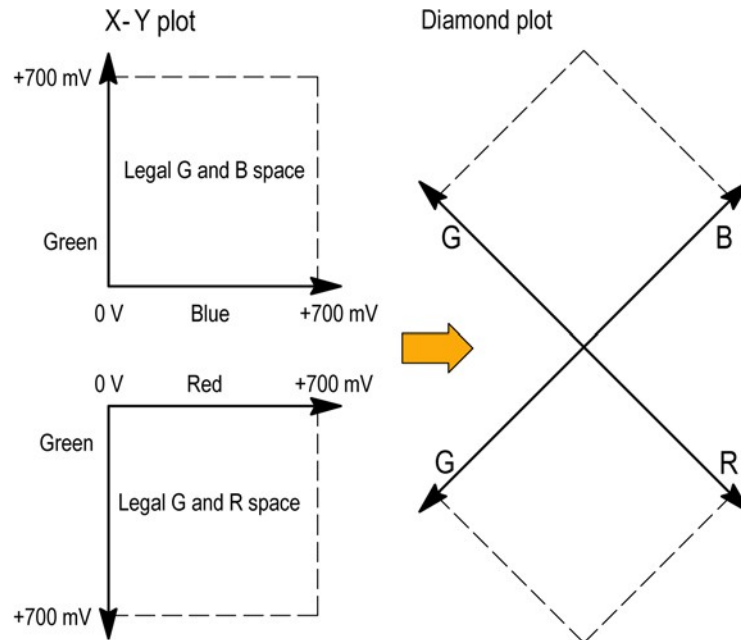


Figure 206: Diamond Display plot

Compare the signal to the display to determine out-of-gamut components. Be aware of these details:

- 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 these examples. (See Figure 207.)

- Example A:
R - Ok
 $G > 700 \text{ mV}$ B - Ok
- Example B:
R - Ok G - Ok
 $B > 700 \text{ mV}$
- Example C:
R - Ok
G - Ok, 350
 mV B < 0 mV

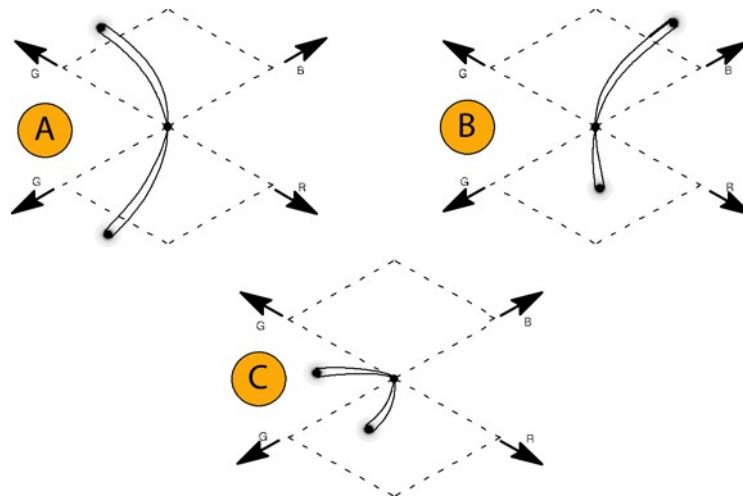


Figure 207: Out-of-gamut examples

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.

Diamond application on-screen tools

Line Select function: Line Select allows you to select a single picture line to monitor in the display. By default All Lines is selected and all lines are monitored.

NOTE. *The same line is selected in any trace display if line select is enabled.*

To turn on Line Select (and choose the line to monitor):

1. Select the **Lines** button at the bottom of the tile. (see Figure 208).
2. Select **1 Line**.
 - To scroll through lines, select the + and – buttons.
 - To enter a specific line to monitor:
 - select **Line Sel.** and enter the line on the keypad,
 - or in the Picture application, use the line-select cursor (for active lines).

Depending on the resolution in the signal, the Line Select provides different information.

- If a signal is SD, HD, 3G (see Figure 208):
 - the *Line* number is the selected line, including vertical blanking,
 - if the signal is interlaced format, the *Fields* readout is below the Line number,
 - the *Pic Line* number is next to Line; the Pic Line is the active line number, or numbers, selected.
- If a signal is UHD, 4K (see Figure 209):
 - the *Line* number is the selected raster line,
 - the *SDI Line* is the selected line including vertical blanking,
 - the *link* number appears below the SDI Line.

NOTE. *In link, the letters (A-D) refers to the physical links.*

The numbers (1-4) refers to the virtual links.

For example, A3/62 indicates it is physical link 1 and virtual link 3 (in a 2-sample interleave, 12G transport).



Figure 208: Diamond on-screen tools – Pic Line number

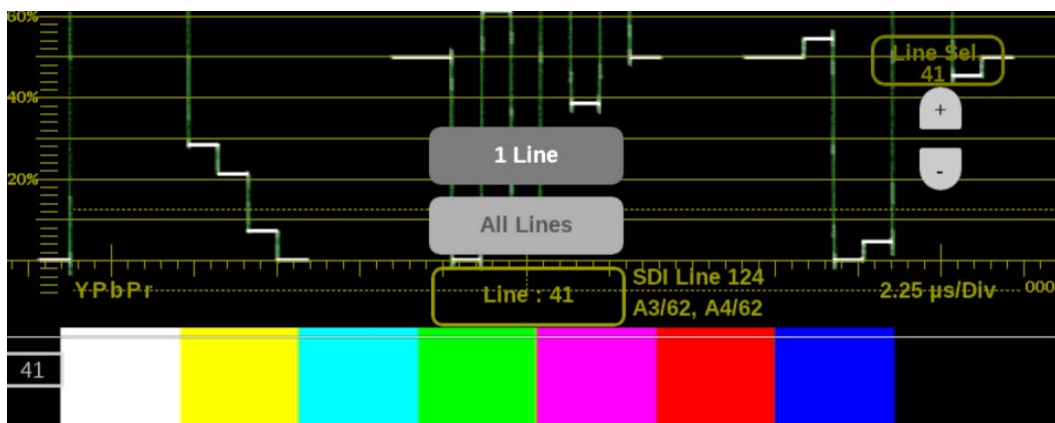


Figure 209: Diamond on-screen tools – SDI Line number

Lightning Display application

The Lightning Display application shows luma and chroma amplitudes and helps verify component timing using a color-bar signal. (See Figure 210.) Using a test signal in component format, this display helps make precise, accurate measurements of interchannel amplitude and timing.

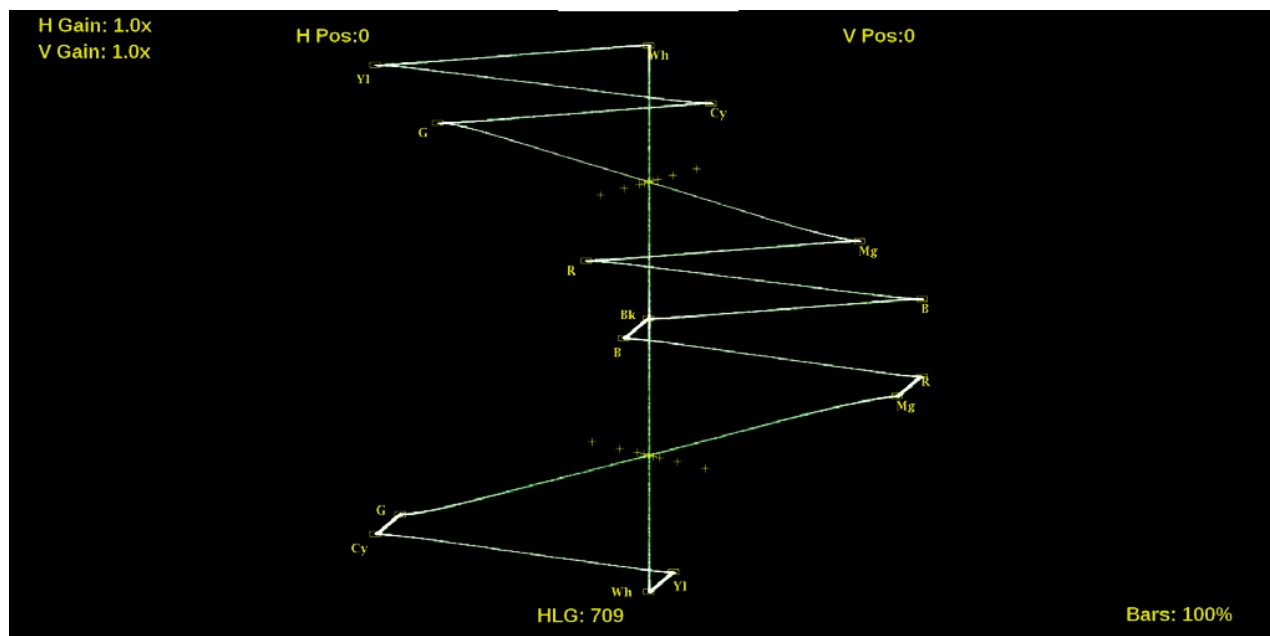


Figure 210: Lightning Display application

To adjust the tile settings, select the **Tile** icon (⚙️) to open the Lightning Display application settings menu.

NOTE. After the Lightning application settings menu is opened, the Move icon (↔️) displays. Select this icon to move the settings menu left or right.

Lightning
application settings
menu

The Lightning application settings menu shows the lighting choices.
(See Figure 211.)



Figure 211: Lightning application settings menu

Bar Targets: Change the bar targets to either 75% or 100%.

V Gain: Change the vertical gain by x1, x2, x5, or x10 magnification.

H Gain: Change the horizontal gain by x1, x2, x5, or x10 magnification.

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 MP2-PROD).

NOTE. Convert to Rec. 709 auto converts to BT.709, otherwise the graticule selection must be manually changed. ([See Configure the instrument for HDR/WCG monitoring.](#))

Convert to Rec. 709 mode is not supported for SD signals.

Line Select: Line Select allows you to choose the picture lines to monitor in the display. Either All Lines or 1 Line can be selected.

If 1 Line is selected, the display only shows results for the selected line in the picture. The line can be selected using the on-screen tools. ([See Line Select function.](#)) Or the line can be selected directly on the Picture.

Lightning application
on-screen tools

You can change the horizontal gain, vertical gain, horizontal position, vertical position, and bar targets without opening up the Vector settings menu through on-screen tools. Select the tool/button for the setting you want to adjust. All the available tools are located on the top and bottom of the display and are highlighted for a few seconds when the application is first opened or if you select anywhere in the middle of the application tile. (See Figure 212.)

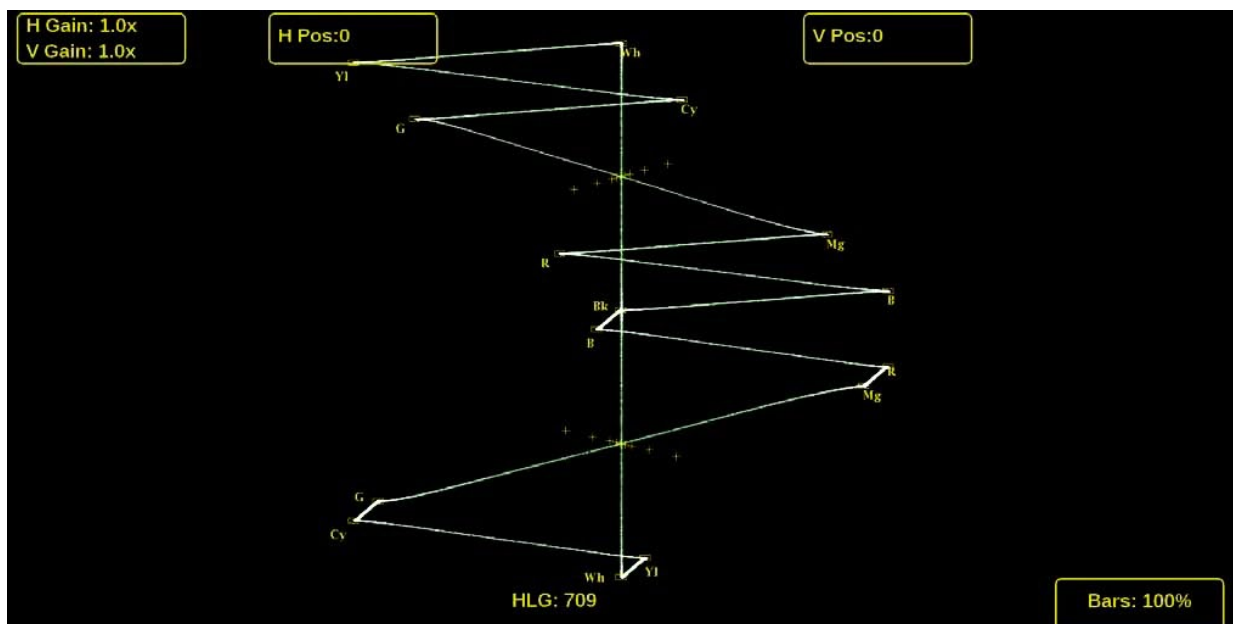


Figure 212: Available on-screen tools for the Lightning application

Horizontal and vertical gain: Increase or decrease the magnification of the horizontal and vertical trace displays.

1. Select the button in the top left corner to expand the available options drop down list. (See Figure 213.)
2. Select one of the preset magnifications for fixed horizontal and vertical gain using the H Gain and V Gain options.
3. Select Variable Gain; select VAR: Off to VAR: H or VAR: V.
 - Select **VAR: H** to change the horizontal gain in increments.
 - Select **VAR: V** to change the vertical gain. Variable gain allows you flexibility in changing the gain factor between 0.5x to 20.0x. (See Figure 214.)

The limits of the variable gain change depending on the gain factor you select.

- 1.0x has a range of 0.25x to 2.00x gain.
- 2.0x has a range of 0.50x to 4.00x gain.
- 5.0x has a range of 1.25x to 10.00x gain.
- 10.0x has a range of 2.50x to 20.00x gain.

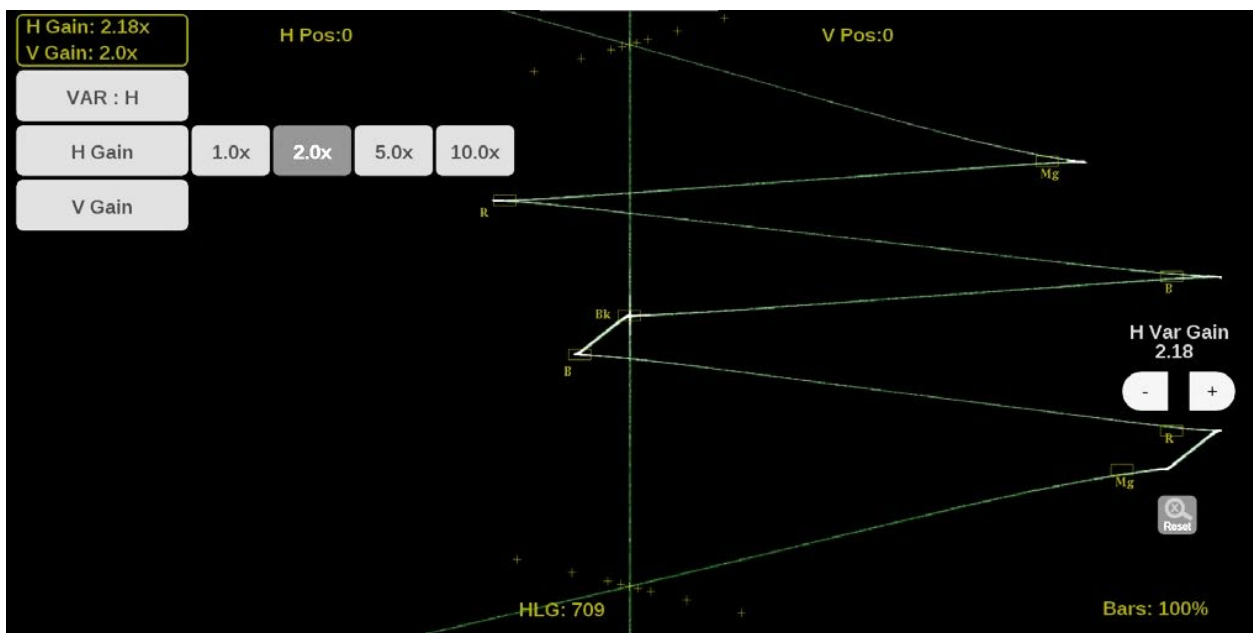


Figure 213: Lightning on-screen tools – horizontal gain

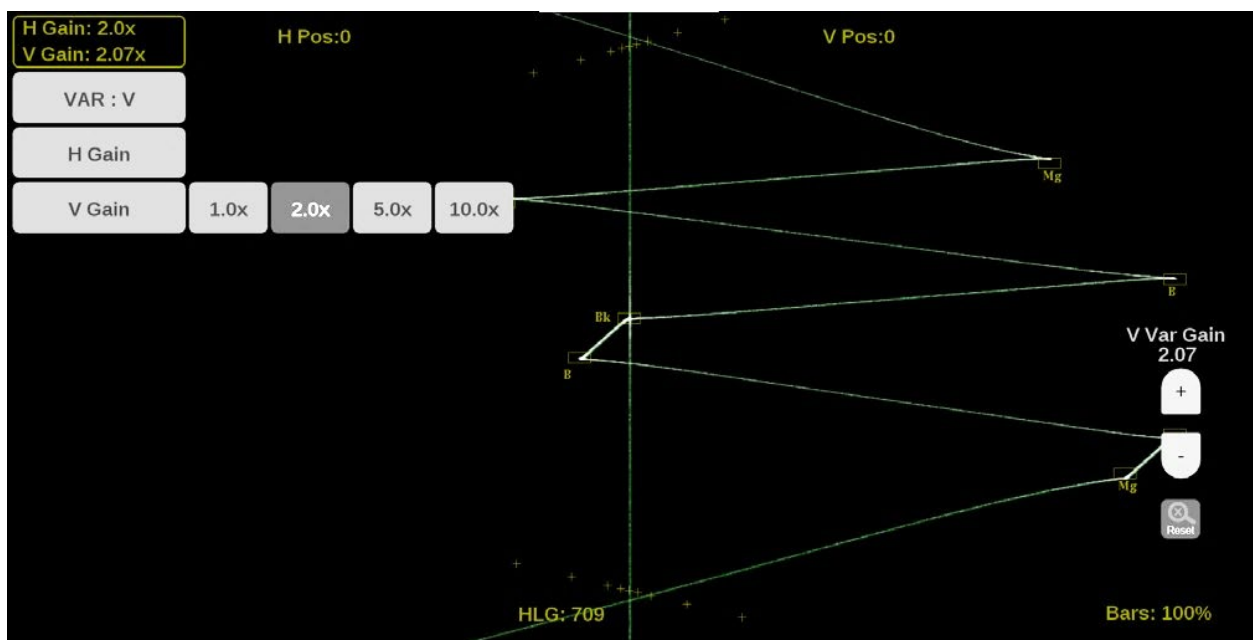


Figure 214: Lightning on-screen tools – vertical gain

To adjust the gain:

- With a touchscreen, use a pinch gesture to change the scale of the trace for large incremental changes.
- For incremental adjustments, select the plus or minus button.
- The scroll wheel on a mouse can adjust the variable gain.
- Select the **Reset** icon () to remove variable gain adjustments.

Horizontal and vertical position: Adjust the position of the trace display.

1. Select the **H Pos** button to allow adjustment of the horizontal trace. (See Figure 215.)
 - Select and drag to move the trace on the touchscreen. This method can be performed without using the button.
 - Use a mouse scroll wheel to move the trace.
 - For incremental adjustments, use the plus or minus button to adjust the horizontal position.
 - Select the **Reset** icon (Reset) to reset the horizontal position adjustment to default.

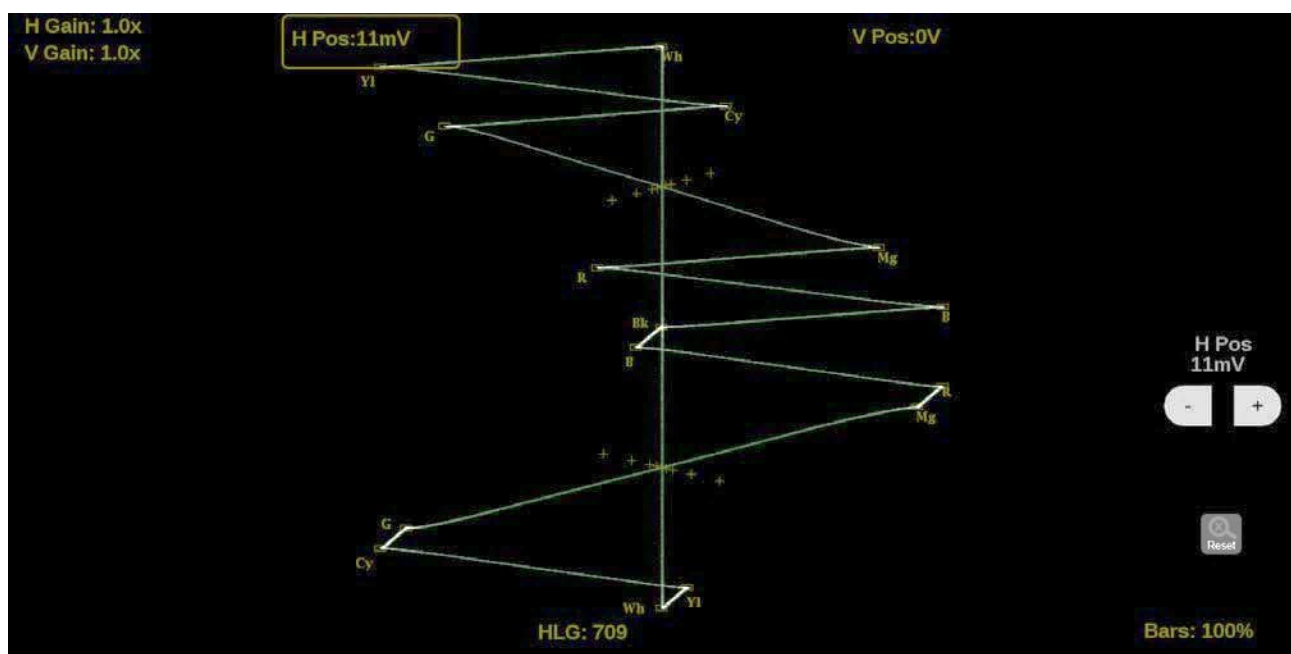


Figure 215: Lightning on-screen tools – horizontal position

2. Select the **V Pos** button to allow adjustment of the vertical trace. (See Figure 216.)
 - Select and drag to move the trace on the touchscreen. This method can be performed without using the button.
 - Use a mouse scroll wheel to move the trace.
 - For incremental adjustments, use the plus or minus button to adjust the vertical position.
 - Select the **Reset** icon (Reset) to reset the vertical position adjustment to default.

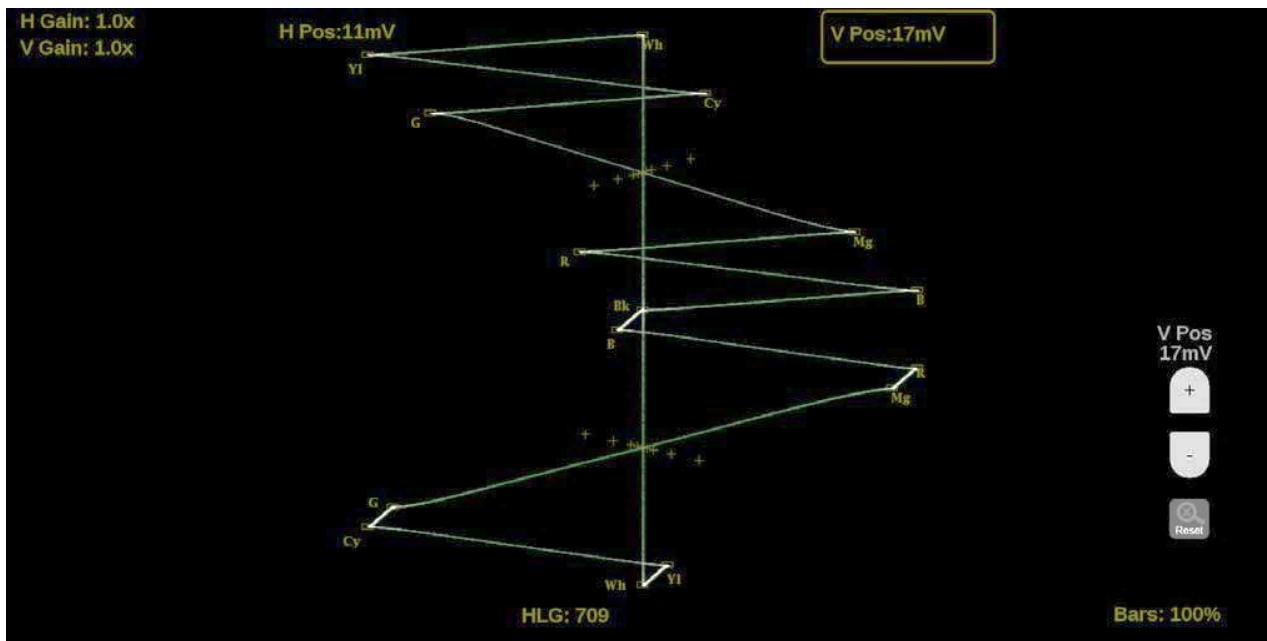


Figure 216: Lightning on-screen tools – vertical position

Bar Targets: Change the scaling of the Lightning Display.

1. Select **Bars** in the bottom right corner of the application to expand the available options. (See Figure 217.)
2. Select 75% or 100% scaling.

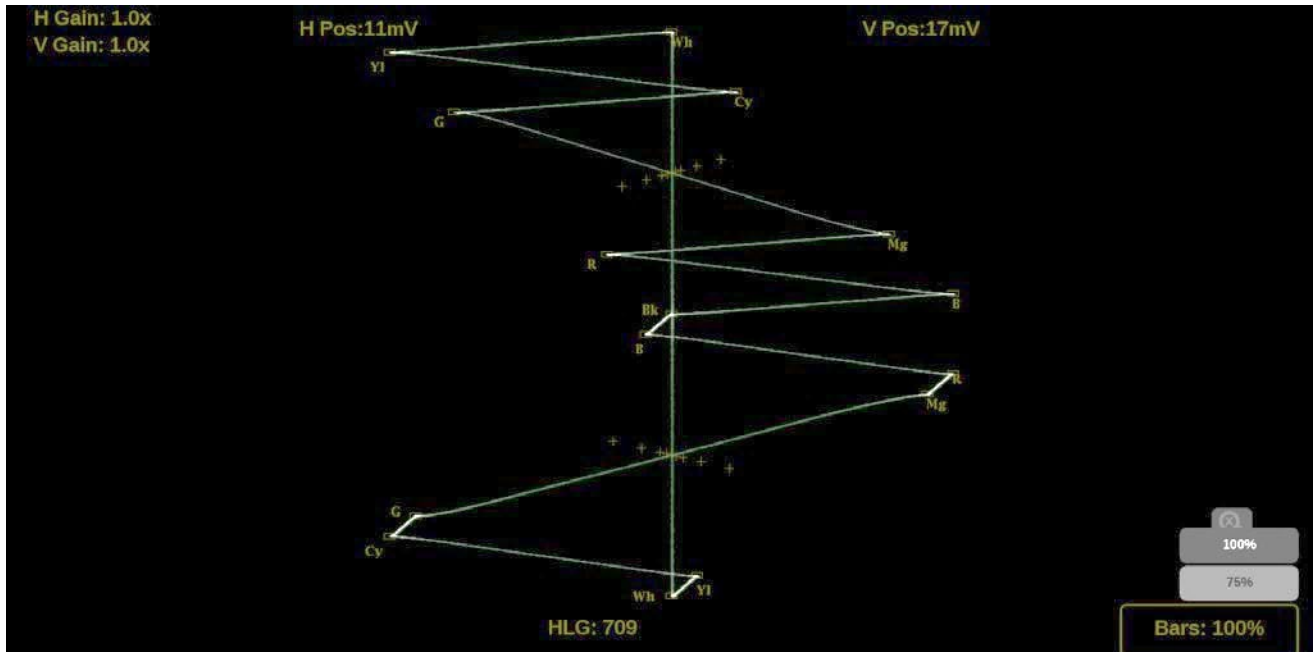


Figure 217: Lightning on-screen tools – Bar Targets

Line Select function: Line Select allows you to select a single picture line to monitor in the display. By default All Lines is selected and all lines are monitored.

NOTE. *The same line is selected in any trace display if line select is enabled.*

To turn on Line Select (and choose the line to monitor):

1. Select the **Lines** button at the bottom of the tile. (see Figure 218).
2. Select **1 Line**.
 - To scroll through lines, select the + and – buttons.
 - To enter a specific line to monitor:
 - select **Line Sel.** and enter the line on the keypad,
 - or in the Picture application, use the line-select cursor (for active lines).

Depending on the resolution in the signal, the Line Select provides different information.

- If a signal is SD, HD, 3G (see Figure 218):
 - the *Line* number is the selected line, including vertical blanking,

- if the signal is interlaced format, the *Fields* readout is below the Line number,
 - the *Pic Line* number is next to Line; the Pic Line is the active line number, or numbers, selected.
- If a signal is UHD, 4K (see Figure 219):
 - the *Line* number is the selected raster line,
 - the *SDI Line* is the selected line including vertical blanking,
 - the *link* number appears below the SDI Line.

NOTE. In link, the letters (A-D) refers to the physical links.

The numbers (1-4) refers to the virtual links.

For example, A3/62 indicates it is physical link 1 and virtual link 3 (in a 2-sample interleave, 12G transport).



Figure 218: Lightning on-screen tools – Pic Line number

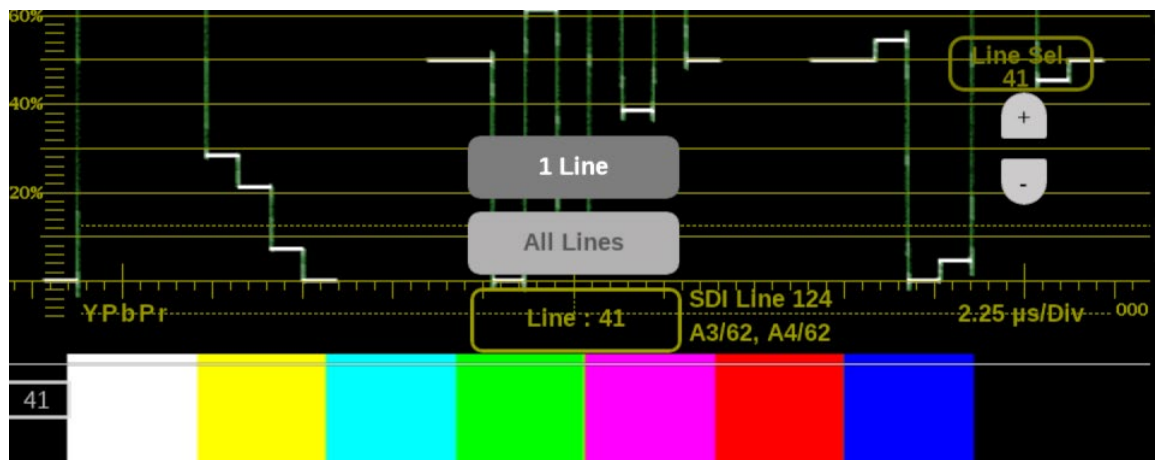


Figure 219: Lightning on-screen tools – SDI Line number

CIE application

The CIE display application shows video data as it is plotted in a 1931 or 1976 CIE diagram. (See Figure 220.) CIE diagrams are used to check the chromaticity of the video signal and determine compliance to the standard color Gamut limits shown on the CIE diagram. In addition to the BT.2020, P3, and Rec. 709 limits shown, the D65 white point is also indicated.

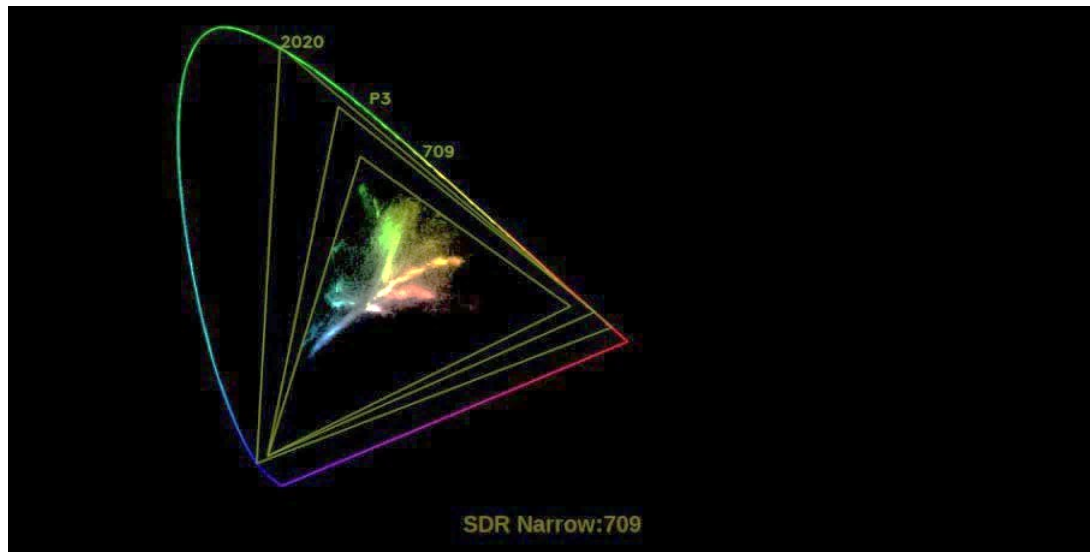


Figure 220: CIE application display

To adjust the tile settings, select the **Tile** icon (⚙️) to open the CIE application display settings menu.

NOTE. After the CIE application settings menu is opened, the Move icon (📏) displays. Select this icon to move the settings menu left or right.

CIE application settings menu

The CIE application settings menu shows the different choices. (See Figure 221.)

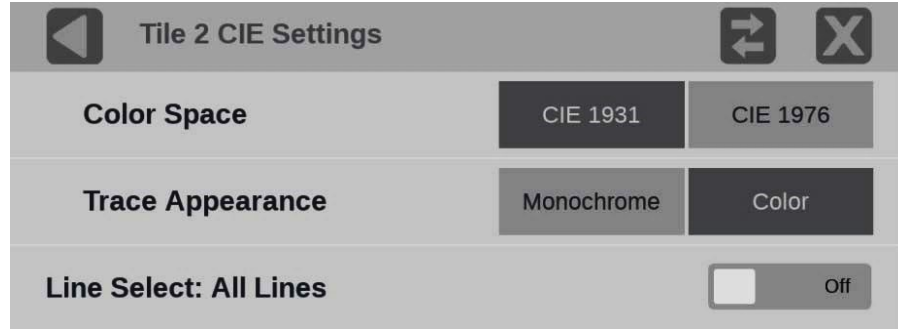


Figure 221: CIE application settings menu

Color Space: Select either **CIE 1931** or **CIE 1976** diagrams.

Trace Appearance: You can plot the video data on the CIE display in either Monochrome or Color. If Color is selected, the plotted video data is colored with the corresponding CIE diagram colors. If Color is not selected, the plotted video data is gray.

Line Select: Line Select allows you to choose the picture lines to monitor in the display. Either All Lines or 1 Line can be selected.

If **1 Line** is selected, the display only shows results for the selected line in the picture. The line can be selected using the on-screen tools. ([See Line Select function.](#)) Or the line can be selected directly on the Picture.

CIE application on-screen tools

Line Select function: Line Select allows you to select a single picture line to monitor in the display. By default All Lines is selected and all lines are monitored.

NOTE. *The same line is selected in any trace display if line select is enabled.*

To turn on Line Select (and choose the line to monitor):

1. Select the **Lines** button at the bottom of the tile. (see Figure 222).
2. Select **1 Line**.
 - To scroll through lines, select the + and – buttons.
 - To enter a specific line to monitor:
 - select **Line Sel.** and enter the line on the keypad,
 - or in the Picture application, use the line-select cursor (for active lines).

Depending on the resolution in the signal, the Line Select provides different information.

- If a signal is SD, HD, 3G (see Figure 222):

- the *Line* number is the selected line, including vertical blanking,
 - if the signal is interlaced format, the *Fields* readout is below the Line number,
 - the *Pic Line* number is next to Line; the Pic Line is the active line number, or numbers, selected.
- If a signal is UHD, 4K (see Figure 223):
 - the *Line* number is the selected raster line,
 - the *SDI Line* is the selected line including vertical blanking,
 - the *link* number appears below the SDI Line.

NOTE. In link, the letters (A-D) refers to the physical links.

The numbers (1-4) refers to the virtual links.

For example, A3/62 indicates it is physical link 1 and virtual link 3 (in a 2-sample interleave, 12G transport).



Figure 222: CIE on-screen tools – Pic Line number

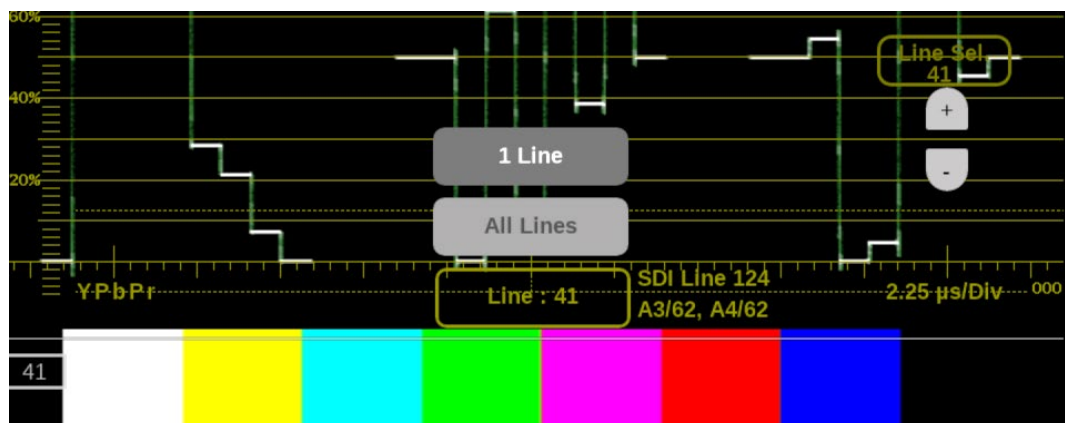


Figure 223: CIE on-screen tools – SDI Line number

Dolby Status application

Dolby audio metadata for the currently monitored SDI input can be viewed in the Dolby Status application. (See Figure 224.) The application tile indicates if Dolby audio is not available in the currently monitored SDI input.

NOTE. The Dolby Status application requires software options MP2-AUD or MP2-DLBY.

Dolby Status		Program 1		
Program Desc Text				
Dolby Format	Dolby E 16	Dolby Surround Mode	Yes	
Channel Mode	3/2 L	Copyright Bit	Yes	
Program Config	5.1	Original Bitstream	Yes	
Metadata Source	VANC 45/01	DC Filter	Yes	
Dolby Data Rate	Not specified	Lowpass Filter	Yes	
Bitstream Mode	Complete Main	LFE Lowpass Filter	Yes	
Dolby E Frame Rate	29.97 fps	Surround 3 dB Atten	No	
Dolby E Frame Loc	L21 F1 s1937	Surround Phase Shift	Yes	
DYNAMIC RANGE PARAMETERS		EXTENDED BSI		
Dialogue Level	-31 dB	Preferred Stereo Dmix	Lt/Rt	
Program Loudness		Lt/Rt Center Mix Lvl	-3 dB	
Average Loudness		Lt/Rt Surrnd Mix Lvl	-3 dB	
Line Mode Cmpr	Disabled	Lo/Ro Center Mix Lvl	-3 dB	
RF Mode Cmpr	Disabled	Lo/Ro Surrnd Mix Lvl	-3 dB	
		Surround EX Mode	No	
RF Overmod Prot	Disabled	Headphone Mode	Not Indicated	
Center Mix Lvl	-3 dB	A/D Converter Type	STD	
Surround Mix Lvl	-3 dB			
Mixing Level	Not Indicated	SMPTE Timecode	00:00:00:00	
Room Type	Not Indicated			

Figure 224: Dolby Status application

NOTE. After the Dolby Status application settings menu opens, the Move icon (📏) appears. Select this icon to move the settings menu left or right.

Dolby Status application settings menu

To adjust the application settings, select the **Tile** icon (🔧) to open the Dolby Status application settings menu.

The Dolby Status application settings menu figure shows the available options. (See Figure 225.)

Figure 225: Dolby Status application settings menu

Metadata Source lets you select the source of the Dolby E metadata, either from the incoming Dolby E audio, if your instrument is decoding Dolby E audio, or VANC metadata if the Dolby E is externally decoded.

- **Auto** selects the Dolby E audio by default as the metadata source, if it is available. If Dolby E audio is not available, it uses VANC audio.
- **AES** selects the Dolby E audio as the metadata source. The Dolby Status app is blank if Dolby E is not being decoded.
- **VANC** selects the decodes and displays the VANC metadata source. The SDID must be properly selected.

DID: Data Identifier of the requested packet; is set to 0x45 (69 decimal) and is not changeable.

SDID: Secondary Data Identifier of the requested packet.

An SDID value of 01h is used when there is only one audio program associated with a video signal, and there is no intended association between VANC packets with an SDID value of 01h and a specific audio channel pair.

See Annex E for further information on how to assign SDID values.

Table 17: Association between SDID values and the first audio channel pair of an audio program

Audio Channel Pair	SDID
No association	01h
Channel pair 1/2	02h
Channel pair 3/4	03h
Channel pair 5/6	04h
Channel pair 7/8	05h
Channel pair 9/10	06h
Channel pair 11/12	07h
Channel pair 13/14	08h
Channel pair 15/16	09h

Annex E: Assigning SDID Values (Normative)

When multiple audio programs are carried by, or associated with, a single video signal, the SDID value is used to identify the VANC data packets carrying the audio metadata for each of the audio programs.

The audio channels making up an audio program are assigned to consecutively numbered or consecutively arranged audio channel pairs. The VANC packets carrying the audio metadata for a specific audio program are identified by setting the SDID values of these packets to the value associated with the lowest numbered audio channel pair of the group of audio channel pairs carrying the complete audio program, as shown in Table 17.

For example, if there is a six-channel program carried in the first three audio channel pairs and a stereo program carried by the fourth audio channel pair, then the VANC packets carrying the metadata for the six-channel program would have their SDID value set to 02h because the program starts in audio channel pair 1/2. The VANC packets carrying the metadata for the stereo program would have their SDID value set to 05h because the stereo program starts in audio channel pair 7/8.

Dolby Program: Use the drop-down menu to select the Dolby program number to monitor.

The Program number in the top right of the Dolby Status app border is the same as the Dolby Program number in the Dolby Status Settings. Select the arrow and select the number of the program to monitor.

Elements of the Dolby Status display

This is a list of some of the elements in the Dolby Status application. For a complete list of the elements that might appear, see the Dolby Metadata Guide available at www.dolby.com.

Program Description Text: A 32-character ASCII text field used by the program

author to describe the audio program; for example, the name of the program (Movie Channel Promo), the program source (Football Main Feed), or the program language (Danish).

Dolby Format: Indicates the Dolby Format. This indicator is also tied to the Dolby Format Error/Alarm: if the Alarm is asserted, the Dolby Format is displayed in red.

Channel Mode (or Audio Coding mode): Indicates the active channels within the encoded bit stream, representing it in a ratio, X/Y, where X is the number of front channels (Left, Center, Right) and Y is the number of rear (Surround) channels. If the LFE Channel is present, an L is appended at the end of the channel mode.

Program Configuration: Determines how the audio channels are grouped within a Dolby E bitstream. Up to eight channels can be grouped together in individual programs, where each program contains its own metadata.

Metadata Source: Indicates the input from which the Dolby Content is sourced.

Dolby Data Rate: For Dolby E it indicates the data rate that would be used to encode a Dolby Digital bitstream.

Bitstream Mode: Describes the audio service contained within the Dolby Digital bitstream. A complete audio program may consist of a main audio service (a complete mix of all the program audio), an associated audio service comprising a complete mix, or a main service combined with an associated service. For more information about possible values, see the instrument online help; when the Dolby Status display is active in a tile, select the HELP button.

Dolby E Frame Rate: Indicates the Dolby E frame rate. If Dolby Frame Rate is not the same as the video Frame Rate, the rate value is displayed in red.

Dolby E Frame Loc: Displays the location (line number and sample number) of the SMPTE337 preamble.

Dialogue Level: Represents the long-term, A-weighted average level of dialog within a presentation, $Leq(A)$.

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 capable 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

This section describes the five basic timing messages in a PTP system. 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 time stamps 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 One-step and two-step operation.](#))

Delay request message The Delay request is sent by the slave. The time 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 time stamps 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. After the slave receives the delay response, it has the second pair of time stamps needed to calculate the second delay measurement of the slave to master delay.

Message timing Figure 226 shows the relationships between the five PTP timing messages.

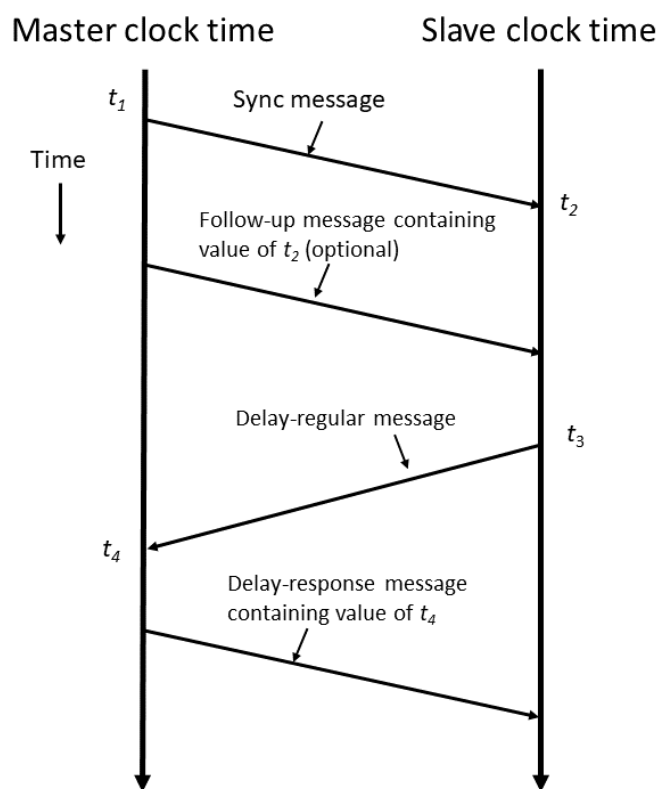


Figure 226: Five PTP timing messages relative to the master and slave clocks

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 because 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 because there are two messages.

It is interesting to note that in End-to-End mode, only the Sync message is affected 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 an SPG8000A master clock generator, set the master and slave to any of the modes: Multicast, Mixed, or Mixed without negotiation. The masters 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 $\frac{1}{2}$ 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. This section contains suggestions 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 performs a “store and forward” action 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 but 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 time stamps. 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.