

Sx2

USER'S MANUAL

Software Release 1.0



Preface

About this Manual

This User Manual is a guide to the functions provided by your Sx2 instrument.

For further information on Leader Electronics of Europe products, please refer to the Leader Electronics of Europe web page:

<https://leaderphabrix.com/products/>

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Revision Sx2

This manual is a revision-controlled document. Any changes to any page content will be reflected in the overall revision status of the whole manual.

Release	Date	Software Version	Updates Include:
1a	September 2026	1.0	First release of Sx2 User's Manual

General Safety Information

General Safety

Read this Section Before Using the Sx2

This unit should be used only by persons with sufficient knowledge of electronics who thoroughly understand the contents of this manual.

This unit is not designed or manufactured for households or ordinary consumers.

If unqualified personnel are to use the unit, be sure that the unit is handled under the supervision of qualified personnel (those who have electrical knowledge). This is to prevent the possibility of personal injury or damage to the unit.

Warning

Warnings Concerning the Power Source

Do not use a power source with a voltage other than the rated power source voltage for the unit. Doing so could lead to fire. Confirm the voltage of the power source before you connect the power cord to it. Only use a power source whose frequency is 50/60 Hz.

Use a power cord that is appropriate for the voltage of the power source. Also, use a power cord that meets the safety standards of the country that you are using it in. Using a power cord that does not meet the standards could lead to fire. If the power cord is damaged, stop using it, and contact your local LeaderPhabrix agent. Using a damaged power cord could lead to electrical shock or fire.

When removing the power cord from the power outlet, do not pull on the cord. Pull from the plug.

Warnings Concerning Grounding

The unit has a ground terminal to protect the user and the unit from electric shock. Ensure that the product is properly grounded for safe operation.

Warnings Concerning the Panel

Sections of the panel are made of glass. If the glass breaks, the broken glass may lead to injury. Do not apply a strong shock to the panel, cut it with sharp metal, or damage it in any similar manner.

Avoiding Personal Injury



The Sx2 is designed for use by qualified personnel only.

No internal user-serviceable parts are provided. Units should be returned to your local LeaderPhabrix agent for servicing.

The operator must NOT remove the casing from the unit as this will invalidate the warranty.

Do not spill any liquid onto the unit or its power adapter.

Warning: Do not look directly into the fiber optic connections of cable as this may cause permanent damage to the eyes.

Power Supply

Make sure that the unit is connected to the correct power supply voltage. Only the supplied AC cable should be used with the unit. Do not use a damaged AC cable with the unit as it may cause a shock or fire hazard. Replacement AC cables are available from your local LeaderPhabrix agent.

This unit might have both an AC and a DC power supply cord connected. Make sure to disconnect **all** power supply cords before servicing to avoid electric shock.

Mains AC powered devices are shipped with a three wire electrical cord with a grounding-type plug designed to fit only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical standards.

Internal Battery

The unit includes a 10.8 V Lithium-ion rechargeable battery to maintain the system clock and ensure memory persistence in the event of mains power loss, as well as allowing for portable operation.

Sécurité générale

A lire avant d'utiliser le Sx2

Cet appareil ne doit être utilisé que par des personnes possédant des connaissances suffisantes en électronique et comprenant parfaitement le contenu de ce manuel.

Cet appareil n'est pas conçu ni fabriqué pour un usage domestique ou par des usagers non-qualifiés.

Si du personnel non qualifié est amené à utiliser l'appareil, veillez à ce qu'il soit manipulé sous la supervision d'un personnel qualifié (possédant des connaissances en électronique), ceci afin de prévenir tout risque de blessure ou de dommage à l'appareil.

Avertissement

Avertissements concernant la source de courant

N'utilisez pas une source de courant dont la tension est différente de la tension nominale de l'appareil. Cela pourrait provoquer un incendie. Vérifiez la tension de la source de courant avant de brancher le cordon d'alimentation. Utilisez uniquement une source de courant dont la fréquence est de 50/60 Hz.

Utilisez un cordon d'alimentation adapté à la tension de la source de courant. Utilisez également un cordon d'alimentation conforme aux normes de sécurité en vigueur dans le pays où vous utilisez le produit. L'utilisation d'un cordon non conforme pourrait provoquer un incendie. Si le cordon d'alimentation est endommagé, cessez de l'utiliser et contactez votre agent LeaderPhabrix. L'utilisation d'un cordon endommagé pourrait provoquer une électrocution ou un incendie.

Lors du débranchement du cordon d'alimentation de la prise secteur, ne tirez pas sur le cordon. Tirez sur la fiche.

Avertissements concernant la mise à la terre

L'appareil est équipé d'une broche de terre pour protéger l'utilisateur et l'appareil contre les chocs électriques. Assurez-vous que le produit est correctement mis à la terre pour un fonctionnement sûr.

Avertissements concernant la face avant

Certaines parties de la face avant sont en verre. En cas de bris, les éclats de verre peuvent provoquer des blessures. N'appliquez pas de coup violent à la face avant, ne la découpez pas avec un objet métallique tranchant et ne l'endommagez pas de quelque manière que ce soit.

Prévention des blessures



Le Sx2 est conçu pour être utilisé uniquement par du personnel qualifié.

Aucune pièce interne n'est réparable par l'utilisateur. Les appareils doivent être retournés à votre agent LeaderPhabrix pour toute réparation.

L'opérateur NE DOIT PAS retirer le boîtier de l'appareil car cela annulerait la garantie.

Ne renversez aucun liquide sur l'appareil ou son adaptateur secteur.

Attention: Ne regardez pas directement dans les connecteurs des fibres optiques, car cela pourrait causer des dommages permanents aux yeux.

Alimentation électrique

Assurez-vous que l'appareil est connecté à la tension de courant correcte. Seul le câble secteur fourni doit être utilisé avec l'appareil. N'utilisez pas un câble secteur endommagé avec l'appareil, car cela pourrait provoquer un choc électrique ou un incendie. Des câbles secteur de remplacement sont disponibles auprès de votre agent LeaderPhabrix.

Cet appareil peut être équipé à la fois d'un cordon d'alimentation courant alternatif (CA) et d'un cordon d'alimentation courant continu (CC). Veillez à déconnecter tous les cordons d'alimentation avant toute intervention pour éviter tout choc électrique.

Les appareils alimentés par le secteur CA sont livrés avec un cordon électrique à trois fils muni d'une broche de mise à la terre conçue pour s'insérer uniquement dans une prise de courant avec mise à la terre. Ne contournez pas ce dispositif de sécurité. La mise à la terre des équipements doit être conforme aux normes électriques locale et nationale.

Batterie interne

L'appareil est équipé d'une batterie rechargeable lithium-ion de 10,8 V pour maintenir l'horloge système et assurer la persistance de la mémoire en cas de coupure de courant, ainsi que pour permettre un fonctionnement portable.

Disposal of Equipment



This product is subject to the European WEEE (Waste Electrical and Electronic Equipment) directive and should be disposed of according to the regulations of each country.

Mise au rebut de l'équipement



Ce produit est soumis à la directive européenne relative aux Déchets d'Équipements Électriques et Électroniques (DEEE) et doit être mis au rebut conformément à la réglementation de chaque pays.

RoHS Compliance

LeaderPhabrix products are designed and manufactured to be RoHS compliant, adhering to the RoHS directive for components and materials. Based on information provided by our suppliers, LeaderPhabrix certifies that all its products comply with the provisions of the European Parliament and Council Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (2011/65/EC) and associated regulations collectively known as the RoHS Regulations.

Conformité LdSD

Les produits LeaderPhabrix sont conçus et fabriqués en conformité avec la directive LdSD, en respectant ses exigences pour les composants et les matériaux. Sur la base des informations fournies par nos fournisseurs, LeaderPhabrix certifie que tous ses produits sont conformes aux dispositions de la directive du Parlement européen et du Conseil relative à la limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques (2011/65/CE) et aux réglementations associées, communément désignées sous le nom de réglementation LdSD.

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1. Quick Start Guide

This chapter describes how to connect your unit to get it up and running, and includes the following sections:

- [What's in the Box?](#)
- [Powering the Sx2](#)
- [Connecting Cables to the Sx2](#)
- [Using the Sx2 Front Panel](#)
- [Using the Sx2 UI](#)

What's in the Box?

On receipt of your shipment, proceed as follows:

1. Check the external packaging for any visible signs of damage.
Should you find any damage, contact the courier immediately.
2. Carefully open the packaging and check that it contains the following standard items:
 - One Sx2 model; either:
 - Model **Sx2** (supporting single-link signals from SD to 12G YCbCr-422 10-bit) or
 - Model **Sx2E** as above plus added SDI Loop, Eye and Jitter functionality
 - Sx2 carry case with shoulder strap
 - Hand strap (attached to unit)
 - USB stick containing this User's Manual in PDF format
 - Printed Welcome and Getting Started cards (recyclables).
3. Check all optional items against your order form or invoice. The unit's box will contain the following items, if ordered:
 - SDI cable (1 m length)
 - One power supply with IEC Power cord
 - Battery Charger
 - Spare battery
 - Spare IEC Power cord
 - VESA mount.

Note: Optional items are shipped in a separate carton.

4. If you suspect optional items are missing, contact your distributor or LeaderPhabrix support at:
<https://leaderphabrix.com/contact-support/>
5. Complete the Product Registration form available at:
<https://leaderphabrix.com/contact-support/product-registration>

Packaging Material

We recommended that you retain the original packaging material (carton and foam inserts) for future use, however the cardboard items can be recycled, while the packing material is biodegradable after shredding.

Powering the Sx2

Connect the power supply/battery charger cable to a suitable mains power source, and connect its output cable to one of the USB ports on the Sx2.

Note: Wait 10 seconds after reconnecting the power supply/battery charger cable.

Press the Power button on the front panel of the unit. You should see the power button change color in the following sequence:

1. **Yellow (blinking):** initialization
2. **Blue:** initial start-up
3. **White (blinking):** configuring
4. **White:** running.

Note: You may need to wait a few minutes for the unit to complete its boot cycle.

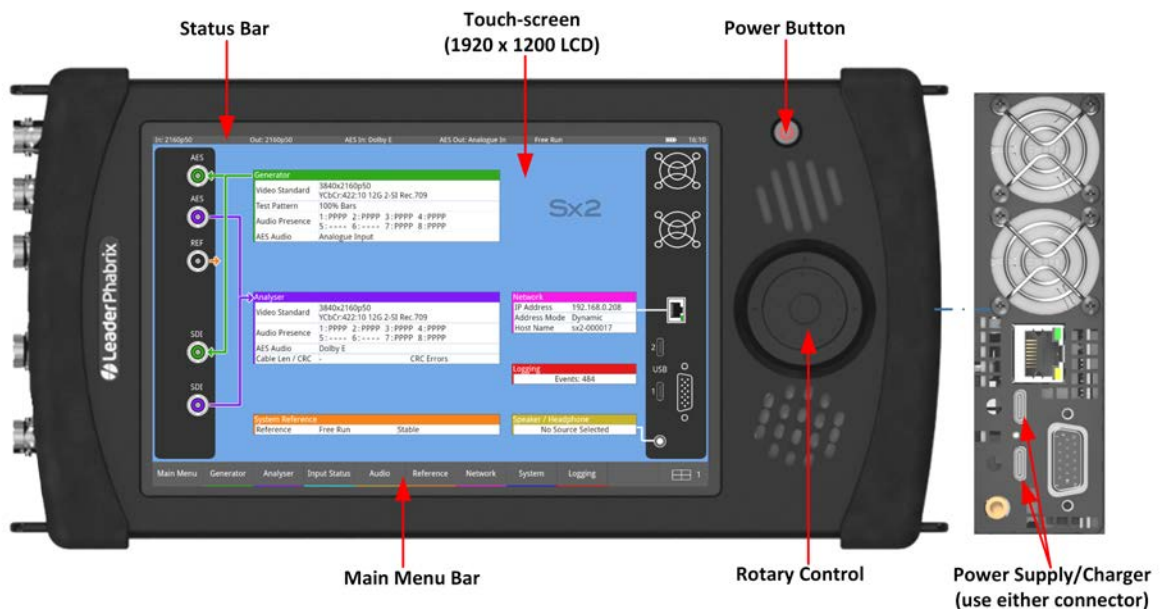


Figure 1-1: Sx2 Front Panel and Power Connector

Powering Down the Sx2

To power down the unit, press and hold the Power button on the front panel for two seconds. The unit will display a shutdown dialog and will power down after 10 seconds. To power down immediately, use the **SHUT DOWN NOW** button, or press the power button again to shutdown now.

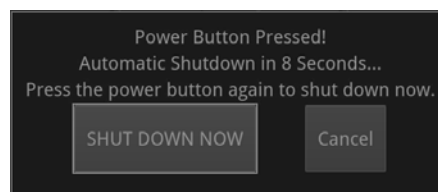


Figure 1-2: Shutdown Dialog

Charging the Sx2

The color of the battery icon in the Status Bar shows the charge status of the internal battery:

1. **Green:** battery is charging
2. **White:** battery is charged
3. **Yellow:** battery charge is less than 20 %
4. **Red:** battery charge is less than 10%.

The battery status is detailed on the System Status page. At 10% and below, system alert messages will be generated. Refer to [System Status](#) for further information.

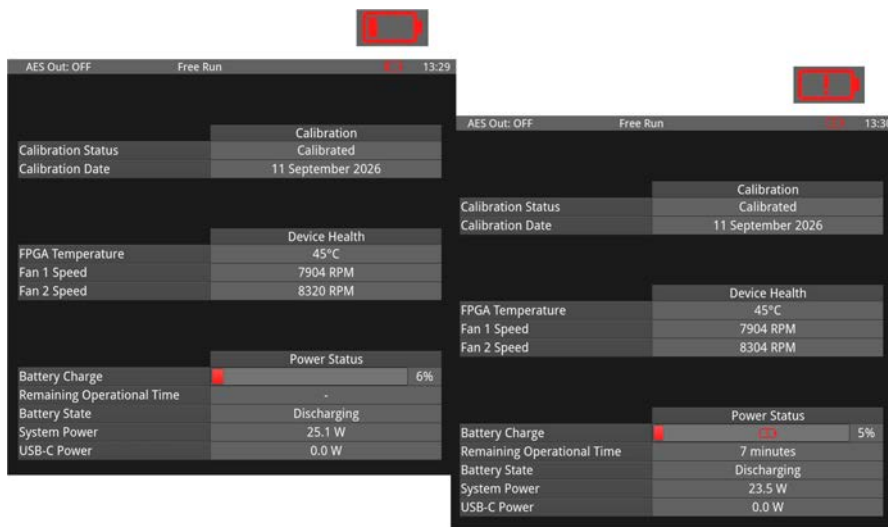


Figure 1-3: System Status showing Very Low Battery States

Connecting Media Cables to the Sx2

Two base models of Sx2 are available with the following options:

- Standard model **Sx2** provides an SDI interface comprising one SDI In and one SDI Out using 75Ω BNC connectors.
- **Sx2E**, as the standard model but also offers Eye Input and SDI In Loop.

All models allow you to analyze and generate SDI content up to 12G.

75 Ω BNC connectors must be used for media connections.

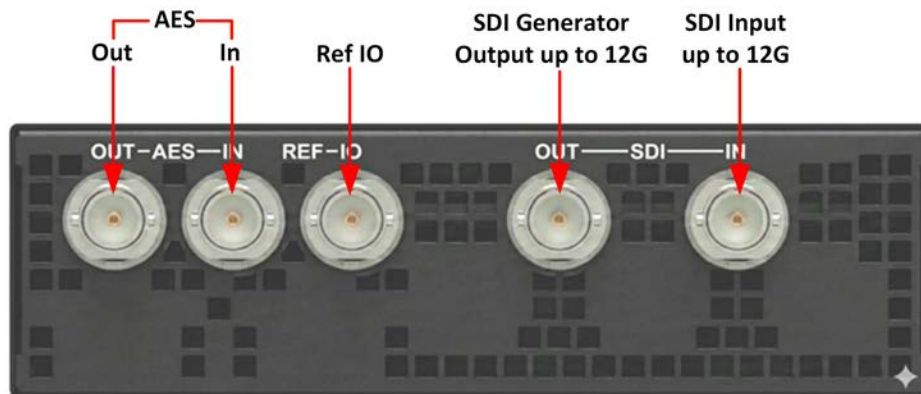


Figure 1-4: Sx2 Left-side Interface

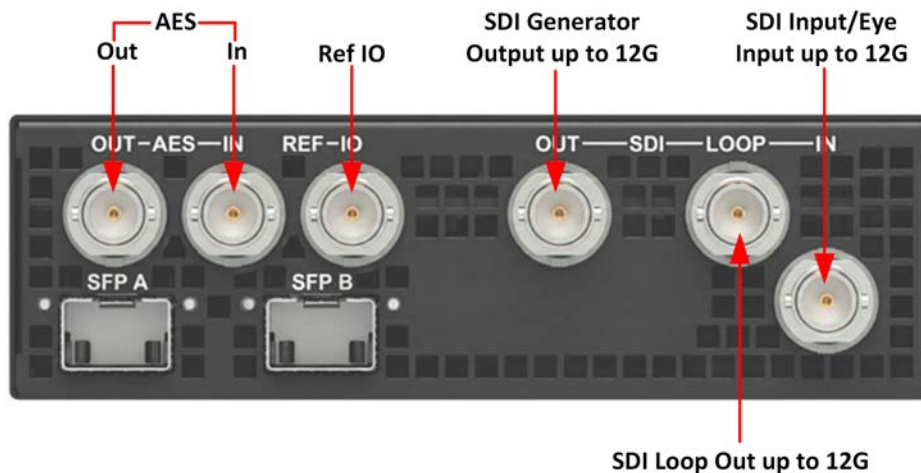


Figure 1-5: Sx2E Left-side Interface

Note: The SFP A and B cages are for future use and are currently not supported.

SDI Loop (Sx2E only)

The looped signal can be any SDI signal up to 12 G SDI, including signals that the instrument cannot analyze. Before being output, this looped signal is buffered and re-clocked.

Note: This is an active controlled output, so the Sx2 must be running in order for the loop output to operate.

Connection Diagram

The figure below shows the typical connections required for first use.

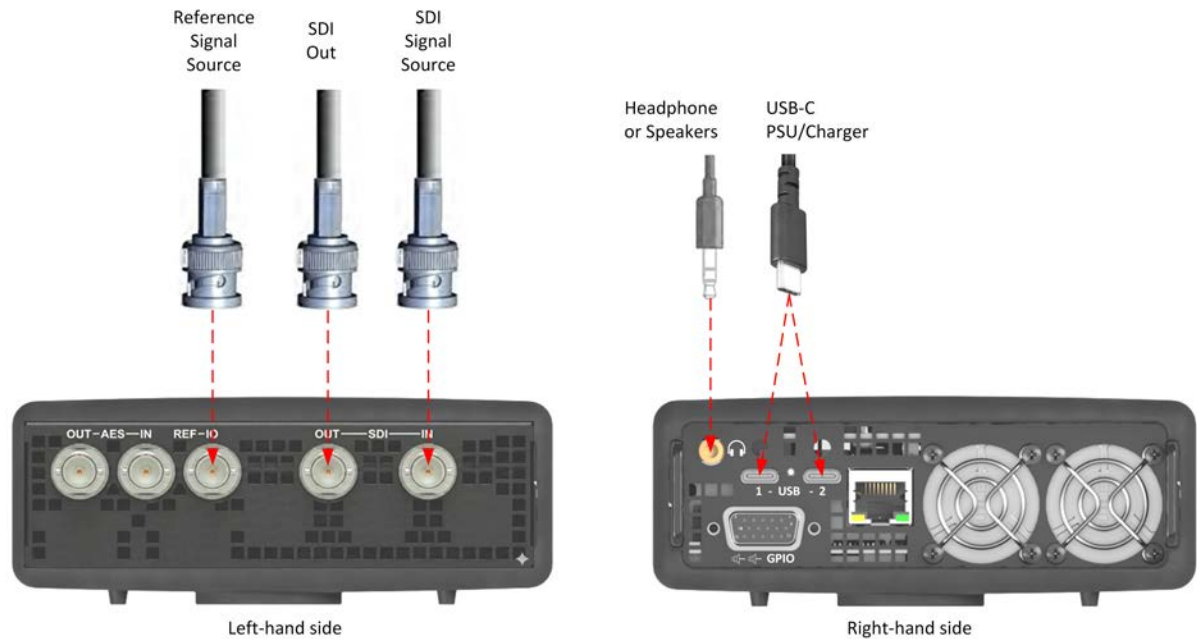


Figure 1-6 Sx2 Simple Connection Diagram

Note: The PSU/Charger cable can be connected to either USB-C port.

USB-C DisplayPort Alt Mode

One USB-C port can be used to drive an external DisplayPort video monitor, with a fixed output resolution of 1920 x 1200, when used with a suitable USB-C to DisplayPort cable and monitor. Check the Output Rate in the Sx2 Display Settings corresponds to the capabilities of your monitor. Refer to [Display Settings](#) for further information.

Understanding the Front Panel

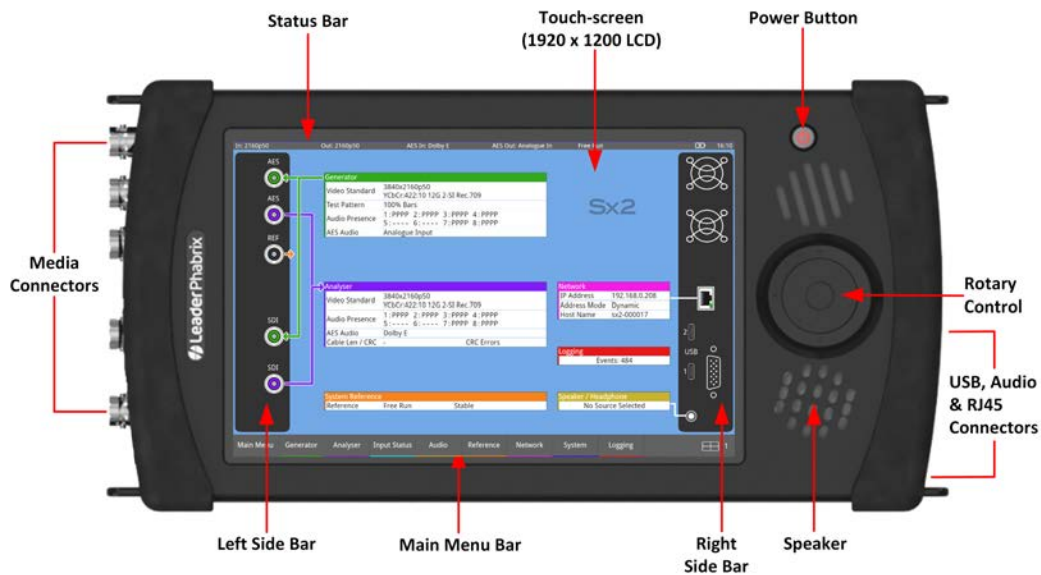


Figure 1-7: System Overview Page

The **System Overview** page is the first screen displayed at power-up, after a firmware update or when Main Menu has been selected in the menu bar. It shows the status of the Sx2 and connected signals. The main menu bar gives access to instruments and tools. These can be selected using the menu bar softkeys.

The status bar at the top of the screen shows a summary of the input, output and reference signals, battery condition, and the time.

The left side bar shows a representation of the media connectors. While unused, the connectors remain black but, when in use, their centers are colored to match the lines connecting them to their respective status boxes on the system overview. These boxes display a summary of the condition of the Analyser (for inputs) and the Generator (for outputs).

Note: Cable Length, Eye and Jitter information is only displayed with model Sx2E.

Additional boxes show the status of the Network, Logging and Speaker/Headphone jacks, all of which colors correspond to the colors of the respective softkey on the main menu bar.

Note: The Network box displays the device hostname and, if applicable, IP address.

The right side bar shows a representation of the location of the cooling fans, USB, network and audio connectors. In the event of low fan speed, the fan icons will turn red. Refer to the section ["Checking the System Health" on page 9-2](#) for further information.

The Sx2 is controlled via the menu bar at the bottom of the display. The main menu bar contains softkeys that are used to select different instruments and tools. When a softkey is selected, a new menu bar is presented to reflect the new options available. Selecting Main Menu at any time will directly return you to the System Overview page.

At the right-hand side of the main menu bar, the quad-split icon  is displayed. Selection of this opens up to four instruments at the same time. See ["Customizing and Using Quad-split Mode" on page 9-10](#) for further information.

Navigation of the menu system can be performed using the touchscreen, the rotary control, or a combination of the two.

Using the Sx2 User Interface

Overview

The main UI features are summarized in the following table and include:

- the Status Bar, at the top of the screen, displays status information including the video and audio inputs and outputs
- the Touchscreen is used for navigating and selecting instruments and settings
- the Rotary Control is used as an alternative to the Touchscreen
- the menu bar at the bottom of the screen contains softkeys which allow you to start instruments or set instrument options.

Table 1-1 : Symbols for Sx2 Controls in this User's Manual

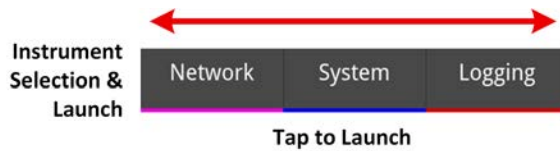
Sx2 Control	Symbol	Description	Action Term Used for selection
Touch		Touch control using the touchscreen display.	Tap
Softkeys		Always displayed in the menu bar at the bottom of the touchscreen. Tap, or use the rotary control to select and return to the System Overview page.	Tap or rotary control
		In the main menu bar, select to open the quad-split display.	Tap or rotary control
		Select to open context sensitive menu.	Tap or rotary control
Rotary Control		Rotate to move the focus indicator and press to select the item in focus. It can also be used to increase/decrease an option value, move a slider or work as a volume control.	Turn or Press

Using the Touchscreen Controls

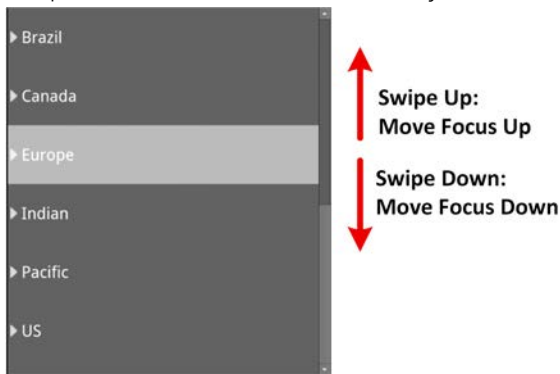
The touchscreen features a menu bar with softkeys, which allow the user to access instrument and tool pages.

Touchscreen actions include:

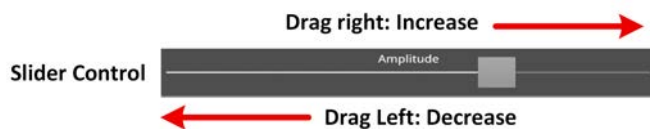
- Tapping to trigger an action, such as displaying an instrument output or opening a context menu



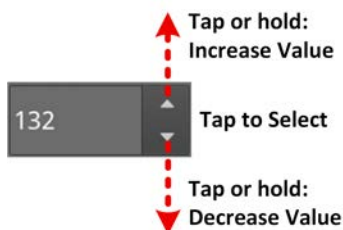
- Swipe the touchscreen to vertically scroll through a list, e.g. on the Time and Date page



- Touch and drag to move the cursor of a slider control, or the selection in a dropdown list



- Press on a spinbox arrow to increase or decrease a value



Using the Rotary Control

The Rotary Control (RC) provides an alternative method for navigating the UI. It can be used to move the position of the focus indicator within the UI. Once in position, the center button can be used to make a selection.

Pressing the Up and Down keys may move the focus indicator onto the display of an instrument or tool, or back to the menu bar. For example, in the Audio Meters instrument, the rotary control can be used to select an audio pair or single channel to monitor.

If you select a numeric field with a spinbox control, you can increase the displayed value by rotating the control clockwise, or decrease the value by rotating counter-clockwise. In the case of a slider control, rotating the ring will increase/decrease the numeric value.

When used with a menu or list, using the Up, Down keys or rotating the ring allows navigation of the menu or list.

The following figure shows examples of these operations.

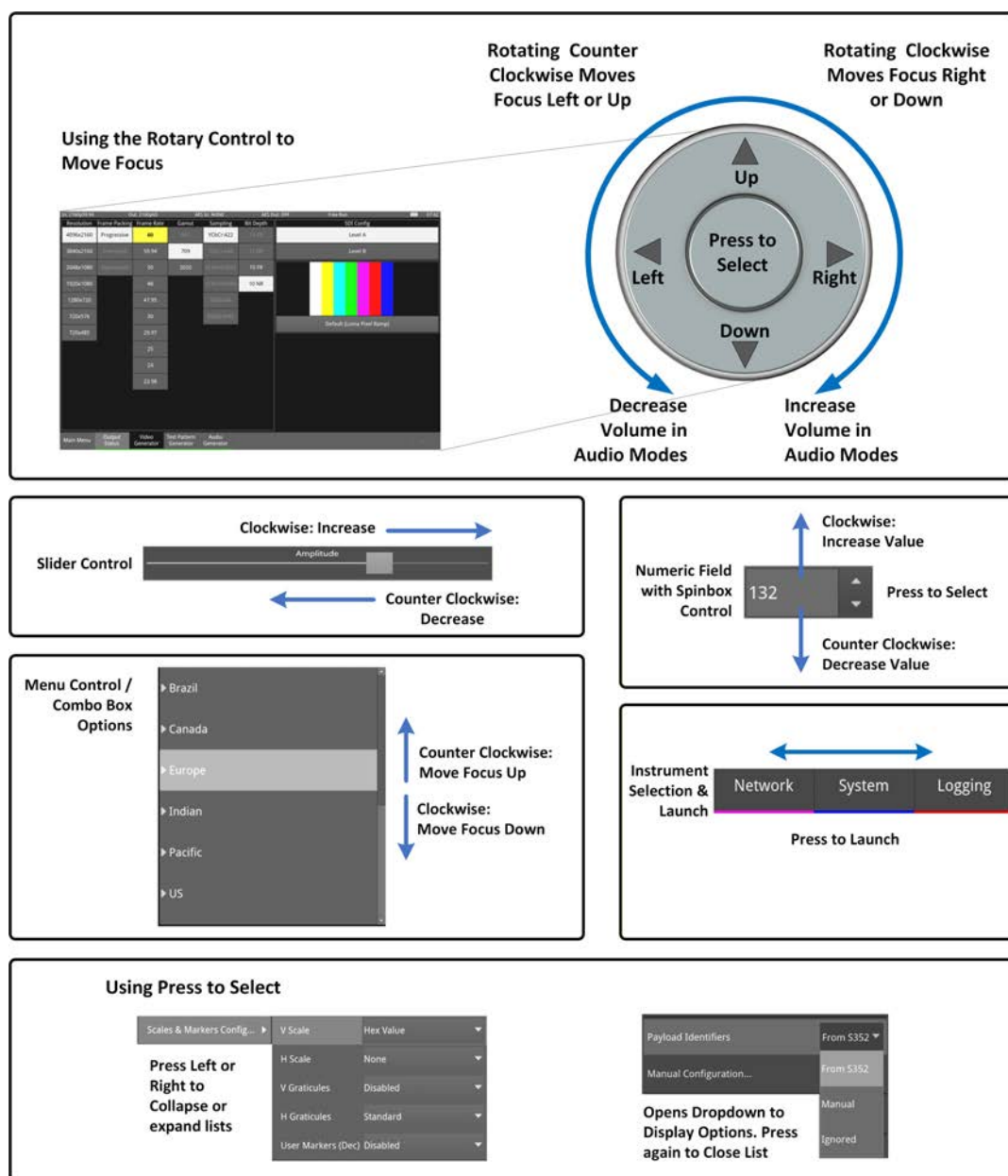


Figure 1-8: Using the Rotary Control with Software Controls

Editing Settings using the On-screen Tools

Some settings expect numeric or alphanumeric entries, and offer the use of the on-screen numpad or keyboard.

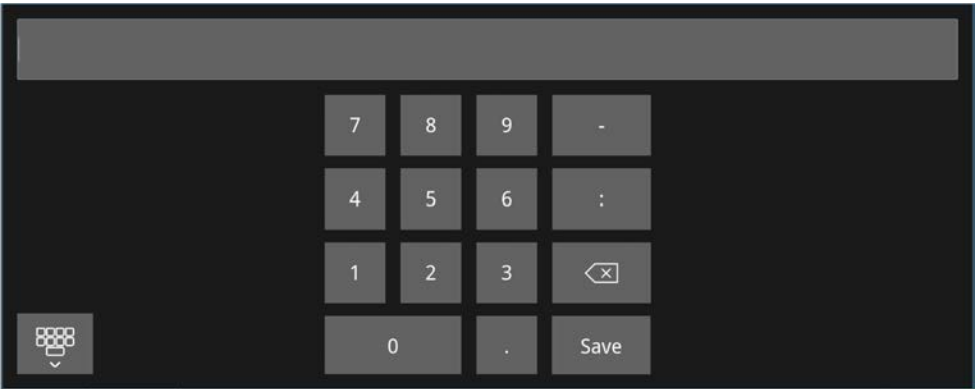


Figure 1-9: On-screen Numpad

Note: An alternative numpad features Hex options.



Figure 1-10: On-screen Keyboard

Enter the information required and select **Save** to accept the entry and dismiss the keyboard.

Using an Increment Bar

A few menus requiring numerical input offer a toolbar with softkeys that allow you to select predefined increments, min and max values, and a link to open the on-screen numpad to enter user-defined values.

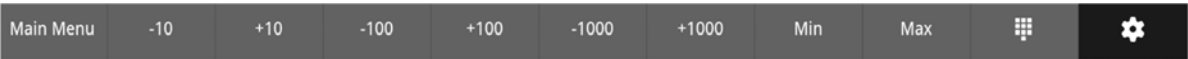


Figure 1-11: Example of an Increment Bar

Common Operations

Configuring the Network Interface

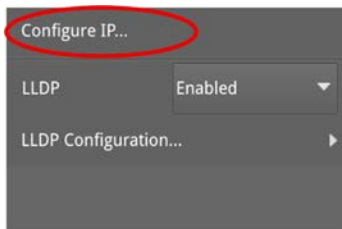
In the main menu bar, select Network:



In the network menu bar, select the **cog** softkey to open the context menu.



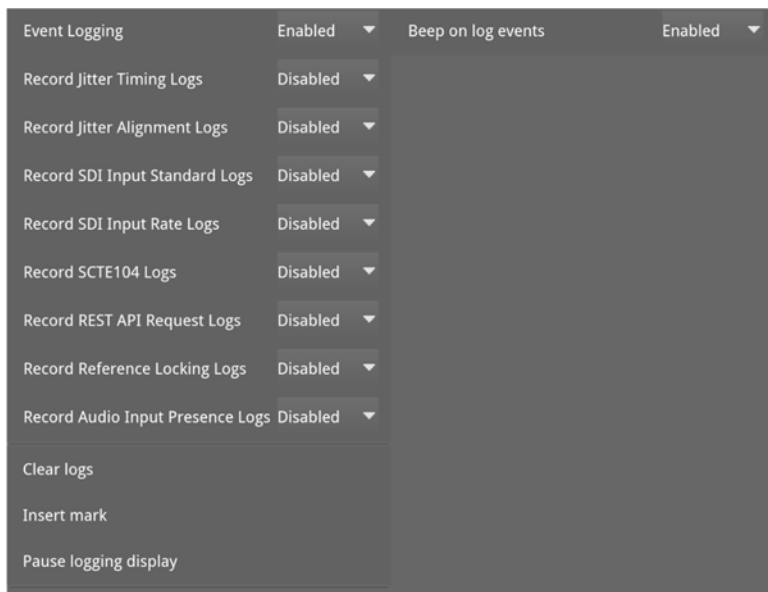
In the context menu, select **Configure IP...** to customize the network settings.



Refer to ["Network Status" on page 8-1](#) for further information.

Configuring which events to Log

In the main menu bar, select Logging:



In the logging menu bar, select the **cog** softkey to open the context menu.

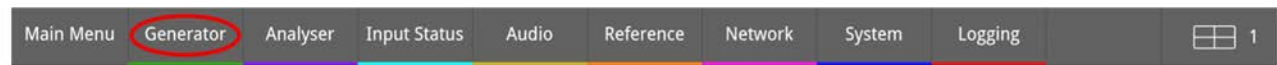


In the context menu, use the dropdown menus to enable the items required to be logged. Refer to ["Logging" on page 10-1](#) for further information.

Generating Content

Generating a Video Standard

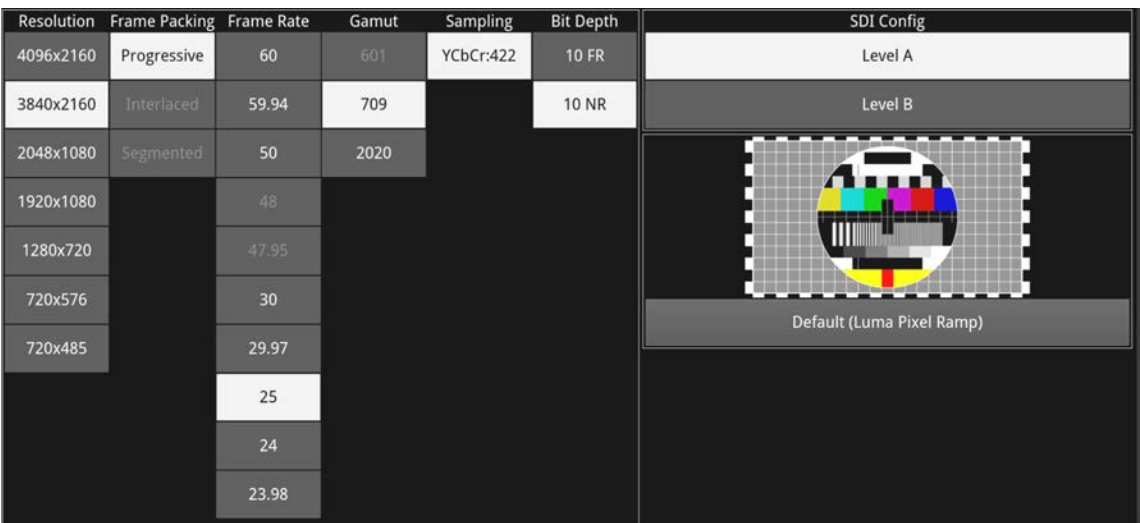
In the main menu bar, select Generator:



In the generator menu bar, select Video Generator:



This new page allows you to select the resolution, frame packing, frame rate, gamut, sampling structure, bit-depth and mapping of the source image to Level A/B.

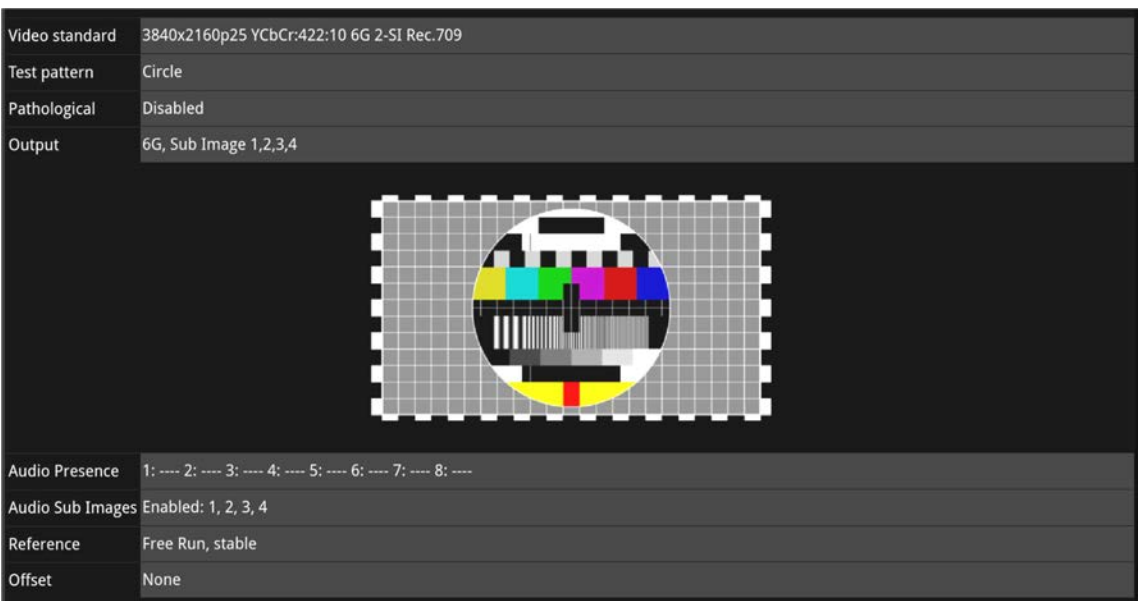


Refer to ["Video Generator" on page 3-5](#) for further information. As soon as a valid configuration is selected, the video standard is generated, with no confirmation dialog displayed.

To view the characteristics of the output, select Output Status:



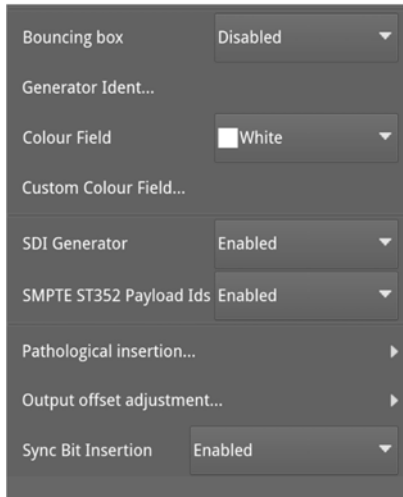
This shows a summary of the current SDI video and audio output.



Select the **cog** softkey to open the context menu:



The context menu allows you to select a bouncing box overlay and ident text which may contain the name of the device and other useful information. ["Generator Ident" on page 3-10](#) provides further information.



The Color Field pattern can be selected in the Test Pattern Generator, but customized via the Output Status context menu. Refer to ["Output Status" on page 3-2](#) for further information.

To select the test pattern to use, select Test Pattern Generator:



The patterns applicable to the currently specified video standard are displayed. Refer to ["Test Pattern Generator" on page 3-13](#) for further information.

Generating Audio

In the Generator menu bar, select Audio Generator:

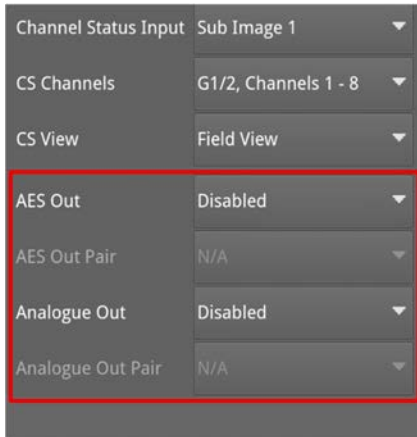


The Audio Generator page allows up to 8 audio groups to be enabled/disabled, muted/unmuted, with customizable frequencies and amplitudes of the audio output. For further information, see ["Audio Generator" on page 3-17](#).

The audio groups enabled are embedded in the SDI video standard generated. To copy the generated audio to the AES and/or Analog audio interfaces:

1. Select Main Menu in the menu bar
2. Select Audio in the Main Menu bar
3. Select Audio Status

4. Open the context menu to set AES Out and/or Analog Out from Disabled to Generator



5. Set the AES Out and/or Analog Out Pair to the generated pair you want to output.

Refer to ["Audio Status" on page 6-2](#) for further information.

Validating the Content of the SDI Input

In the Main Menu bar, select Input Status:



- To check the Payload ID (ST 352), select Video Standard in the menu bar.
This page also allows to override the Payload ID content, which might be useful when the SDI signal does not look as expected. Refer to ["Video Standard" on page 5-2](#) for further information.
- To check whether the signal is corrupted, select SDI Status in the menu bar.
This page displays counters of CRC errors as well as the image sampling structure.
Refer to ["SDI Status" on page 5-5](#) for further information.
- To check the content of ancillary packets, select Ancillary Status in the menu bar to see which ancillary packets are present in the signal.
Select Ancillary Inspector to verify the content of the selected ancillary packets. To see how Ancillary Status and Ancillary Inspector cooperate, refer to ["Ancillary Inspector" on page 5-11](#).
- To check the presence of the AES and Analog Out pair, see ["Audio Status" on page 6-2](#) for further information.

Analyzing the Media Input

Analyzing the Physical Quality of the SDI signal (Eye and Jitter) - model Sx2E required.

Select Analyzer in the main menu bar:



Then select either Eye or Jitter:



Analyzing the Image Content

Select Analyser in the main menu bar. The instruments for image content analysis include Picture, Waveform, Vectorscope and Dataview. Dataview allows to inspect the raw data in the frame, including the data in the ancillary space. See ["Dataview" on page 4-43](#) for further information.



These four analyzer instruments can work in a coordinated way and allow the same line, and where applicable, the same pixel to be analysed at the same time. For further information, refer to ["Using Picture and Dataview with the Waveform Instrument" on page 4-28](#).

Analyzing the Audio Content

In the main menu bar, select Audio:



This opens the Audio menu bar:



Audio Meters allows metering and monitoring of SDI audio, AES audio and Analog audio. For further information, see ["Audio Meters" on page 6-5](#) for further information.

Audio Status shows the presence and AES channel information of the SDI and AES inputs, as well as configuring the AES and Analog outputs. See ["Audio Status" on page 6-2](#) for further information.

The speaker softkey allows control of the volume when monitoring audio.

System Reference and Video Timing

In the main menu bar, select Reference:



The context menu of the Reference Status page allows to set the system reference.

When an external reference is connected to the device, measurements of SDI vs External Reference timings are provided, numerically and graphically. The context menu of Reference Status also allows to set input offsets. Refer to ["System Reference and Timing Measurements" on page 7-2](#).

Checking the Unit Health and Setting Time and Date

In the main menu bar, select System:



The System Status page displays the health of the device as well other useful information.

From the context menu, you can set the Time & Date for the device and adjust the display settings (brightness, etc). See ["Time and Date" on page 9-5](#) for further information. You can also take a screenshot of an instrument. Refer to ["Take a Screenshot" on page 9-4](#).

Configuring the Quad-Split Templates

In the main menu bar, select System, then in the System menu bar select Quad Split:



This page allows you to select which instruments to display in the 4 quadrants of the Quad-Split display. The page also allows you to enable or disable templates, as well as rename them. Only enabled templates can be displayed in the Quad-Split display on the System Overview page.

See ["Customizing and Using Quad-split Mode" on page 9-10](#) for more information.

Uploading and Downloading Files

There are two ways to perform this action: use either the File Manager or remote access (web browser or SFTP/SCP).

To use File Manager, select System in the main menu bar, then File Manager:



The context menu of the File Manager allows you to upload and download files from a USB stick. These files include preset files, screenshots, user test patterns and log files. For further information, see ["File Manager" on page 9-12](#).

User test patterns are provided by the user of the device. For information on their definition, refer to ["User Patterns and Images" on page 3-15](#).

To download files and/or, where applicable, visualise their content, you can also use a web browser. See ["Web Browser" on page 2-6](#) for more information.

To use SFTP/SCP, see ["Upgrading the System Software Remotely" on page 2-3](#) for more information.

Taking a Screenshot

In the main menu bar, select System, then System Status, then open the context menu.



Select "Take Screenshot..." from the context menu to open the screenshot dialog. The dialog remains on screen while you choose the page that you wish to capture. To take a screenshot of that page, press the screenshot button. You can also select a delay time of 5, 10 or 30 seconds before the screenshot is taken automatically. See ["Take a Screenshot" on page 9-4](#) for further information.

Adding a License

When you receive a new license file, copy it to a USB stick and insert it into the unit. The Sx2 will recognise the license and prompt you to install it. See ["Loading a License File" on page 2-4](#) for further information.

Advanced Toolsets

Advanced HDR Visualization and Analysis Toolset

Note: This Toolset requires the software option **Sx2-HDR**. This license is required as a prerequisite to generating HDR content.

The Advanced High Dynamic Range (HDR) Toolset provides the following Instruments and tools:

- [False Color Highlighting](#) (additional submenu item in [Picture](#) instrument)
- [HDR Toolset Overview](#) (additional HDR submenu items in the Generator and Waveform Instruments).

2. Upgrading & Remote Connection

This chapter describes how to upgrade the unit's software and how to remotely use it, and includes the following sections:

- [Upgrading the Unit](#)
- [Remote Access](#)

Upgrading the Unit

Upgrading the System Software and Firmware

Software downloads can be found in the Support area of the LeaderPhabrix website currently located at: <https://leaderphabrix.com/contact-support/leaderphabrix-product-software/>

1. Complete and submit the access request form
2. Open the generated link to download the latest software
3. Download the **.pug** file for the selected software release

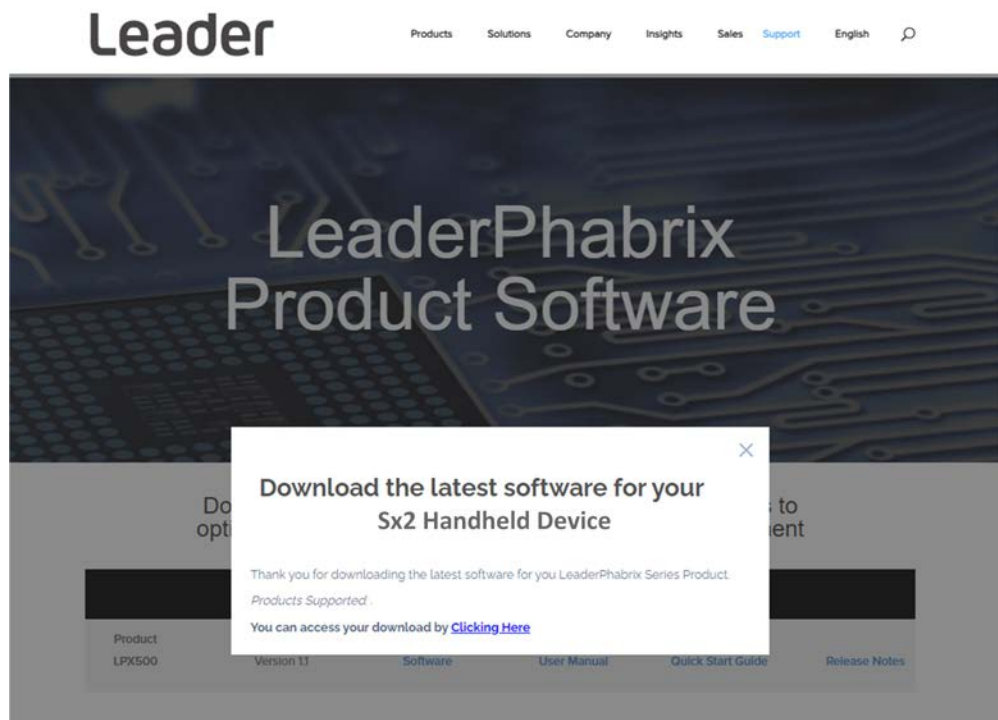


Figure 2-1: Downloading the Software Bundle from the Software Downloads Page

4. Upgrade the software on the unit using one of the methods described below.

Upgrading the System Software from a USB Stick

Note: Connect the Sx2 to mains power for the system software update if the battery level is less than 50 %.

Upgrade the software using a USB memory stick as follows:

1. Copy the downloaded **.pug** file to the root directory of a FAT32 or exFAT formatted USB stick
2. Insert the USB stick into one of the USB-C ports on the side of the unit
3. Reboot or power-on the Sx2
4. When the yellow LED flashes, press and hold the Left button of the rotary control until the LED changes to magenta

5. Release the button and wait a few seconds for the unit to boot into the Rescue Menu



6. Press the Down button of the rotary control so that **Upgrade Software** is highlighted, then press the center button to select and initiate the software upgrade
7. During installation the screen will display progress messages while the LED flashes blue
8. When complete, the Sx2 will automatically reboot with the new software
9. After the Sx2 has restarted, go to System Status to confirm that the update has been applied
10. Use the File Manager to eject the USB stick after completion.

Note: Downgrade can only be performed by connecting via SFTP/SCP.

Upgrading the System Software Remotely

Note: The unit's name is displayed in the Network summary on the System Overview page.

Upgrading the System Software Using SCP

You can upgrade the software on your unit from a remote location using SCP. In this example, we are using a command line SCP client.

1. To remotely connect to a unit to be upgraded using SCP, enter on the command line:
scp <pug file> user@<sx2_hostname>:transfer/upgrade
2. As soon as the Sx2 has validated the pug file, the upgrade will start.

Upgrading the System Software Using SFTP

You can upgrade the software on your unit from a remote location using a standard SFTP client, e.g., FileZilla. In this example, we are using a command line SFTP client.

1. Log on remotely to a unit to be upgraded using SFTP, enter:
sftp user@<sx2_Hostname>
2. Enter the password: **leader**
You should see the message **Connected to user@<sx2_Hostname>**
3. Use the SFTP **put** command to upload the upgrade **.pug** file to the directory of the unit:
transfer/upgrade.
4. Log out of the SFTP session.

5. On completion of the transfer, the unit automatically detects the presence of the upgrade file and starts its upgrade cycle, indicated by the LED in the power button flashing.

Loading a License File

You can order and install licenses for optional software toolsets at any time after purchasing your unit. You will receive an email from LeaderPhabrix with an encrypted license file attached.

The status of your licenses is displayed on the System Status page.

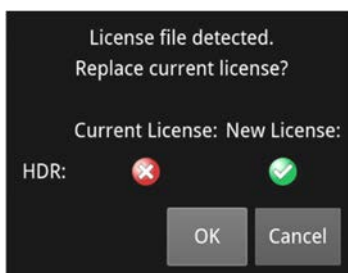


Types of License Files

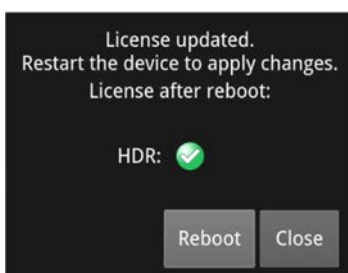
Two types of licenses are available: permanent and trial. Both types are updated via the USB stick method. Prior to installing a license, make sure that the unit's date and time are set correctly.

Install the license as follows:

1. Make sure that the unit is powered on.
2. Download the email attachment and copy it to a FAT32 or exFAT formatted USB stick
3. Insert the USB stick into either of the USB ports on the side of the unit. The unit detects the license file and displays a dialog box showing the license and its status.



4. Select OK to replace the license. After updating, a dialog box requesting you to reboot the unit opens. Selecting Reboot activates the new license.



5. After reboot, check that the updated license appears on the System Status page.



Remote Access

Overview

Various methods are provided to enable you to remotely access your unit. A link can be established using one of the following methods:

- [SCP/SFTP](#)
- [Web browser](#)
- [REST API](#)

SCP

You can use SCP to perform the following tasks on the unit:

- Upgrade the software, see [Upgrading the System Software Using SCP](#).

SFTP

You can use an SFTP client to perform the following tasks on the unit:

- Upgrade the software, see [Upgrading the System Software Using SFTP](#)
- Retrieve event logs, presets, screenshots and user-defined test patterns
- Delete presets, screenshots and user-defined test patterns
- Upload presets from another unit and user-defined test patterns.

Connecting to the Unit Using SFTP

Enter the unit hostname (displayed on the System Overview page) of your unit in the following format:

- **sftp://sx2-000014.local**

In addition, enter the following details:

- Username: **user**
- Password: **leader**

Once connected, open the transfer directory to access the following folders:

- **common licenses**
- **log** - contains Event Log files
- **presets**
- **screenshots**
- **testPatterns**
- **upgrade**
- **userTestPatterns**

You can download files from any of these folders or delete files from the *screenshots*, *userTestPatterns*, *upgrade*, and *presets* folders. In addition, you can upload files to the *presets*, *upgrade* and *userTestPatterns* folders.

Web Browser

You can use a web browser to view and retrieve Event Log, Screenshot, Preset, and User Test Pattern files.

Note: The webpage must be refreshed in order for the changes to be viewed.

Connecting to the Unit Using a Web Browser

In the web browser of your choice, enter the hostname or IP address of your unit in the following format:

- **http://sx2-*<hostname>***, e.g., **http://sx2-000003**

When connected, you should see a display similar to this, showing the file folders on your Sx2:

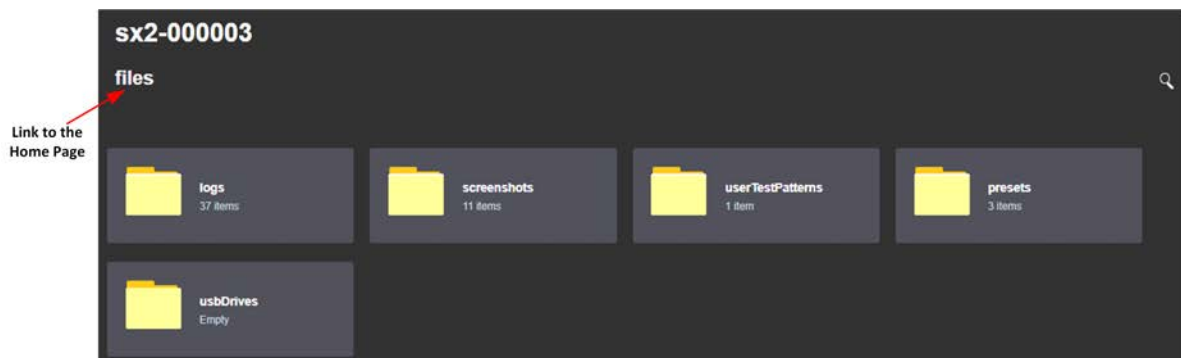


Figure 2-2: Web Browser Access to the Unit's Folders

Note: Files cannot be deleted using the web browser.

Rest API

The Sx2 features a fully functional REST API. Check that the REST API is enabled in the System Status page. Refer to [REST API](#).

For further information, contact LeaderPhabrix support at: <https://leaderphabrix.com/contact-support/>

The following examples shows how to use the API client to get system information, or load presets.

Note: The hostname of the Sx2 is displayed on the System Overview page.

Examples of REST API Requests

Using the REST API to View the System Information

The system information is retrieved by sending a GET request to:

http://sx2-#####:8080/api/v1/system/about

where **sx2-#####** is the name or the IP address of the Sx2 unit.

Using the REST API to Manage and Load Presets

To list the existing presets, send the following GET request:

http://sx2-#####:8080/api/v1/presets/userPresets

To rename the preset "renamed-1" into "renamed-222", send the following PUT request:

http://sx2-#####:8080/api/v1/presets/userPresets/renamed-1

with a payload of {"action": "rename", "newPresetName": "renamed-222"}

To load the preset named "renamed-222", send the following PUT request:

http://sx2-#####:8080/api/v1/presets/userPresets/renamed-222

with a payload of {"action": "load"}

3. Generator

This chapter describes the unit's Generator instruments. These instruments are accessed by selecting the Generator option on the Main menu bar.

The method of generating an SDI output is to set up the video signal parameters in the **Video Generator**, select a suitable test pattern in the **Test Pattern Generator** and enable (if necessary) an audio signal in the **Audio Generator**. The **Output Status** page displays a summary of the current settings and offers some configuration options.

To generate an audio output only via the AES or Analog Audio interface, you only need to use the **Audio Generator**, however you must enable these outputs in the **Audio Status** menu. Refer to [Audio Status](#).

This chapter includes the following sections:

- [Output Status](#)
- [Video Generator](#)
- [Test Pattern Generator](#)
- [Audio Generator](#)

Output Status

Select **Output Status** from the menu bar. This page displays an overview of the SDI signal being generated. It includes:

- Details of the current video standard being generated (these are displayed in yellow when ST 352 packets are not included in the generated video)
- Description of the selected test pattern, displaying the test pattern name, and showing a thumbnail illustrating the pattern
- Presence of a bouncing box, if enabled
- Use of pathological pattern insertion
- SDI audio signal presence and location in sub-images
- System reference status
- Output offset adjustment.

At the top of the page, the status bar displays a summary of the generated video characteristics. In the figure below **Out: 2160p60** indicates 2160 lines, progressive scan at 60 frames per second, whereas **Out: 1080i60** would indicate 1080 lines, interlaced scan at 60 fields per second.

In the menu bar, the cog icon opens the context menu.

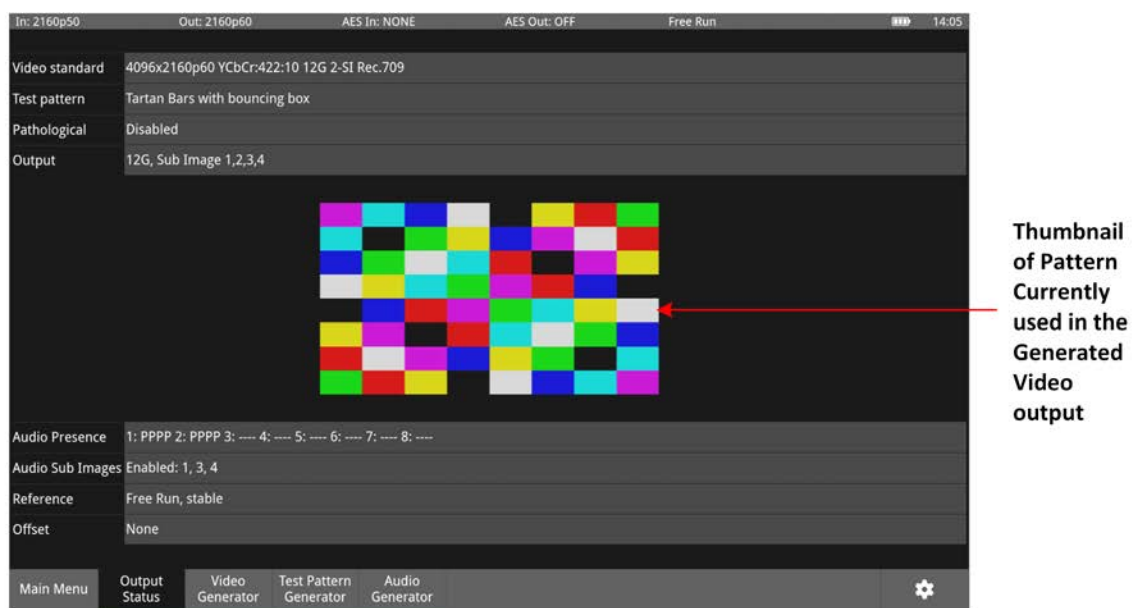


Figure 3-1: Output Status

Context Menu

Select the **cog** button to open the context menu.

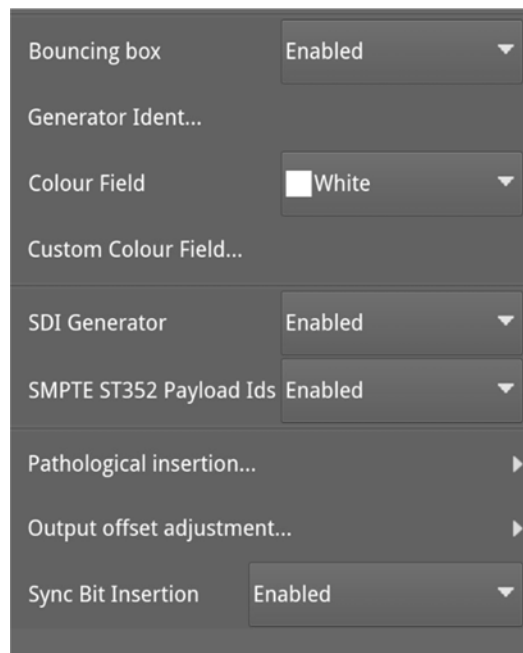


Figure 3-2: Output Status Context Menu

The following table lists the configurable parameters in the Output Status context menu:

Table 3-1 : Output Status Context Menu

Item	Options	Description
Bouncing Box	Disabled (Default) Enabled	Enable the animated red box overlay. Refer to Bouncing Box .
Generator Ident...		Select to start Generator Ident configuration. Refer to Generator Ident .
Color Field	Black 75% Gray 50% Gray 25% Gray White (Default) Red Green Blue Cyan Magenta Yellow Custom (see below)	Set the color of the Color Field test pattern.
Custom Color Field...		Specify a user-defined color for the Color Field pattern. Refer to Custom Color Field .
SDI Generator	Enabled (Default) Disabled	Control of SDI Generator output. Note: Selecting Disabled does not affect AES or Analog Audio output.
SMPTE ST352 Payload IDs	Enabled (Default) Disabled	When enabled, the SMPTE ST352 Payload IDs are included in the video signal. When disabled, the status is displayed in yellow text in the menu and

Item	Options	Description
		on the Output Status page.
Pathological insertion...	Disabled (Default) Enabled	When Enabled, select Pattern to overlay: Eq, PLL, CLK, CheckField+CLK or CheckField (Default) and number of pairs to insert.
Output offset adjustment...	Offset Type Output Line/Pixel/Time Offset Clear Offsets	Choose Offset Type to be Time or Lines and Pixels. For Offset Type Time: Time Offset For Offset Type Lines & Pixels: Line Offset plus Pixel Offset Clear Offsets resets offsets and closes the submenu.
Sync Bit Insertion	Disabled (Default) Enabled	Control of Sync Bit insertion. This applies to 1.5G, 3G, 6G and 12 G (see ST 2081-1 and ST 2082-1 standards).

Custom Color Field

Select color mode RGB or YCbCr and 10-Bit or 12-bit video generation, then either enter the color values in the spinboxes or use the color picker and brightness slider. Select OK to accept and close the dialog.

Note: The color format selected in this dialog is unrelated to the generator output.

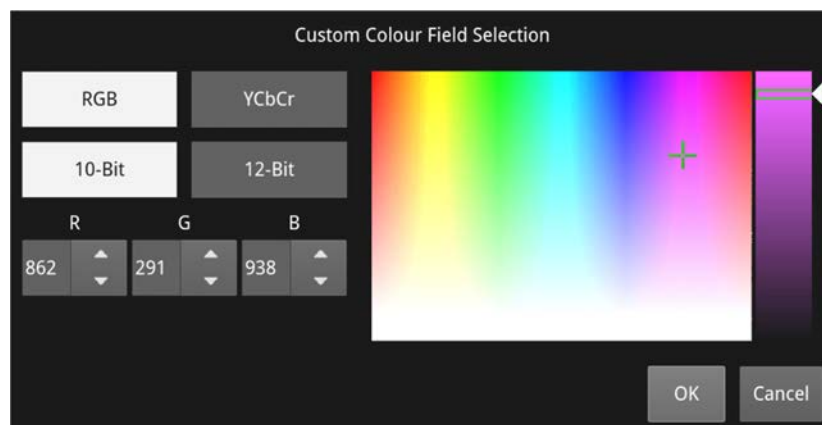


Figure 3-3: Custom Color Field Selection

Video Generator

Using the Video Generator

Select **Video Generator** from the Menu Bar:

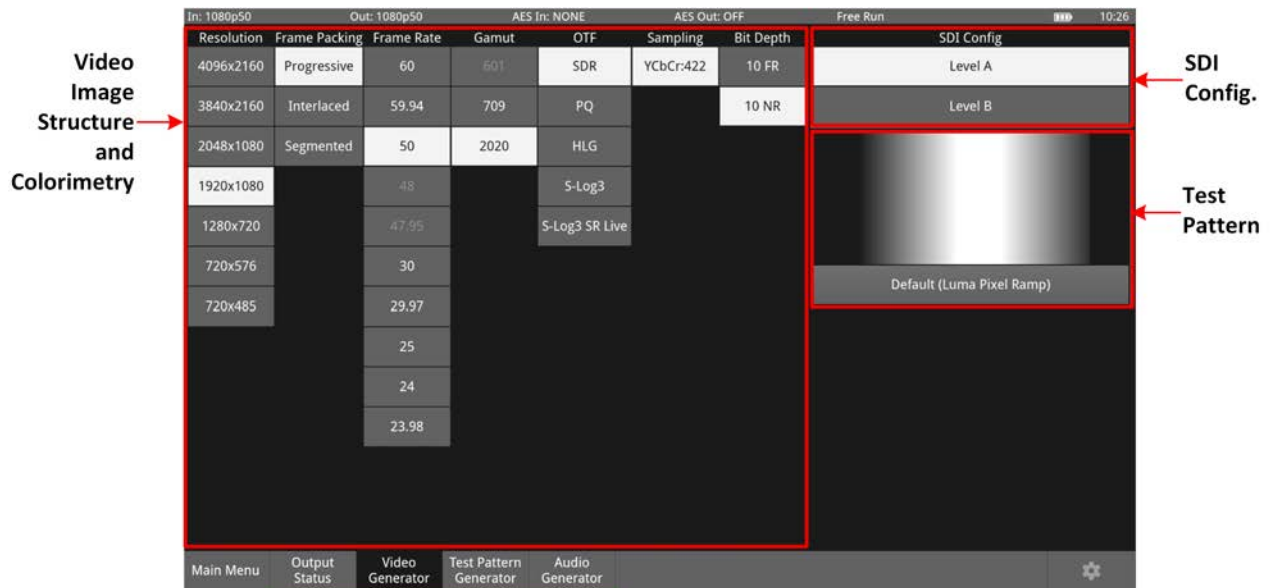


Figure 3-4: Video Generator with HDR License Installed

The **Video Generator** instrument can generate the following standards:

- SDI (SD, 1.5G, 3G, 6G and 12G).

Configuring the Video Standard

This configuration page allows you to select the desired parameters for the standard from the following characteristics:

- Resolution
- Frame Packing
- Frame Rate
- Gamut
- OTF
- Sampling
- Bit Depth and Range.

In addition, the **SDI Config** box in the top-right of the page enables you to set the SDI output to Level A or Level B.

Settings that are not applicable for a given standard are grayed-out. A yellow header indicates that a value in that column has yet to be selected. Select the desired parameter value in each of the columns to define the standard, which will be output as soon as valid settings are entered.

Note: The test pattern may take a few seconds to generate when first selected.

You can choose to use the default test pattern or open the Test Pattern Generator page to select a different test pattern as described in the section [Test Pattern Generator](#).

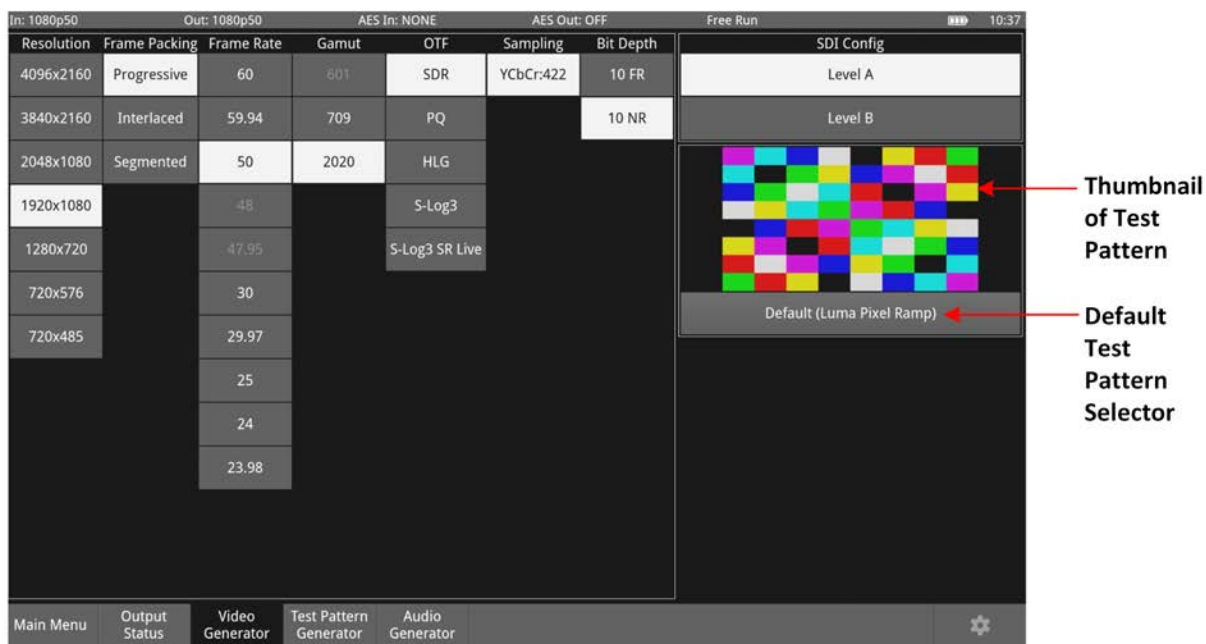


Figure 3-5: Generator - SDI Video Configuration with HDR License Installed

If a pattern is not available for the current combination of settings, a message is displayed over the thumbnail.

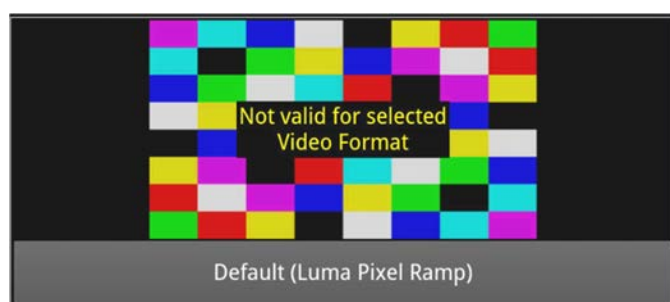


Figure 3-6: Generator - Incompatible Test Pattern

To resolve this conflict without opening the Test Pattern Generator, select the Default (Luma Pixel Ramp) test pattern which is always available.

Using the Rotary Control with the Video Generator

Navigation of the Video Generator can be performed using the Rotary Control but its functions are limited to using the ring control or Left/Right keys to step through the dialog.

Bouncing Box

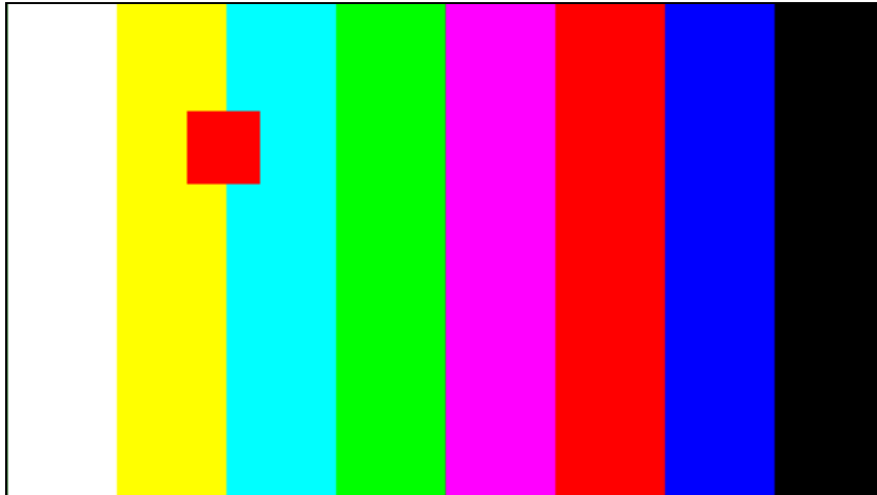


Figure 3-7: Bouncing Box Test Pattern Enabled

To display a dynamic test pattern, you can overlay a bouncing box on top of any test pattern. To do so, select **Output Status** in the menu bar, then the **cog** softkey. Enable the **Bouncing box** in the context menu.

Video Configuration Parameters

The following configuration parameters are available:

Table 3-2 : Generator Video Configuration Parameters with Sx2-HDR option

Standard Configuration	Available Parameters			
Resolution	720x485 720x576	1280x720 1920x1080	2048x1080 3840x2160	4096x2160
Frame Packing	Progressive	Interlaced	Segmented	
Frame Rate	23.98 24 25	29.97 30 47.95	48 50 59.94	60
Gamut	601	709	2020	
OTF	SDR PQ	HLG S-Log3	S-Log3 SR Live	
Sampling	YCbCr:422			
Bit Depth and Range	10 NR	10 FR		
SDI Output Level	Level A	Level B		

Range and Bit Depth Support

The unit can generate video standards with either a full range (**FR**) or narrow range (**NR**) code values for SDI output. The unit uses the definitions for Narrow and Full Range defined in EBU R 103 *Video Signal Tolerance in Digital Television Systems* and SMPTE RP 2077 *Full-Range Image Mapping*.

For a full range video standard, **FR** is displayed alongside the bit depth indication in the description of the video standard. If FR is not displayed, then the generated standard is narrow range.



Figure 3-8: Video Standard Displayed in Output Status

Colorimetry Range Definitions for the Sx2 Series

The 10 NR and 10 FR refer to 10 bit Narrow Range and Full Range respectively. The Sx2 only supports the generation and analysis of 10 bit video signals. For each RGB or YCbCr color channel in a 10 bit video signal there are 1024 possible color values, from **0 to 1023**. The following figure is adapted from EBU R 103, for a schematic overview.

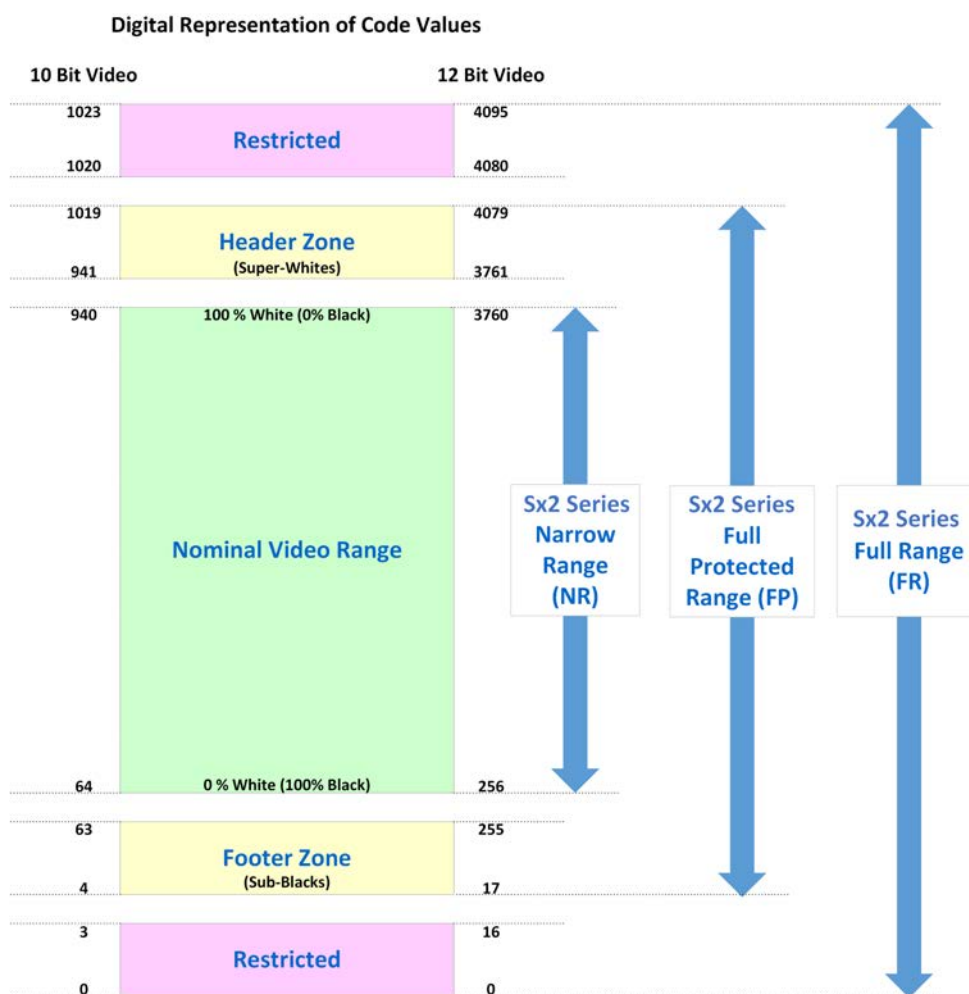


Figure 3-9: Typical Video Code Values and Equivalent Range Definitions

SMPTE defines the first 4 bits (**0 to 3**) and last 4 bits (**1020 to 1023**) of a 10 bit video signal as reserved for signal processing. This leaves the range of available code values for color display as **4 to 1019**. In this range, **4** represents the darkest black of the sub-blacks and **1019** the brightest white, respectively.

The nominal video range for a 10 bit video signal is the code range extending from 100% Black to 100% white, excluding the sub-blacks and super whites. This is **Narrow Range (NR)**. In 10 bit color encoding, NR ranges from **64** and **940**.

A 10 bit Full Range (**FR**) video signal has a range from **0** to **1023**.

To summarize, the following table shows the Full, Full Protected and Narrow ranges as implemented:

Range Terminology	10 Bit Code Values
Full Range (FR)	0 - 1023
Full Protected Range (FP)	4 - 1019
Narrow Range (NR)	64 - 940

Generator Ident

You can define an **ident** to overlay on the active picture of the video standard.

Note: An Ident is useful to identify the source of the video.

Up to four lines of text with a maximum of 42 characters in each line can be inserted into the text field of the Generator Ident dialog. The ident can be set in one of nine locations on the video image.

The **Generator Ident...** is accessible in the **Output Status** options menu.

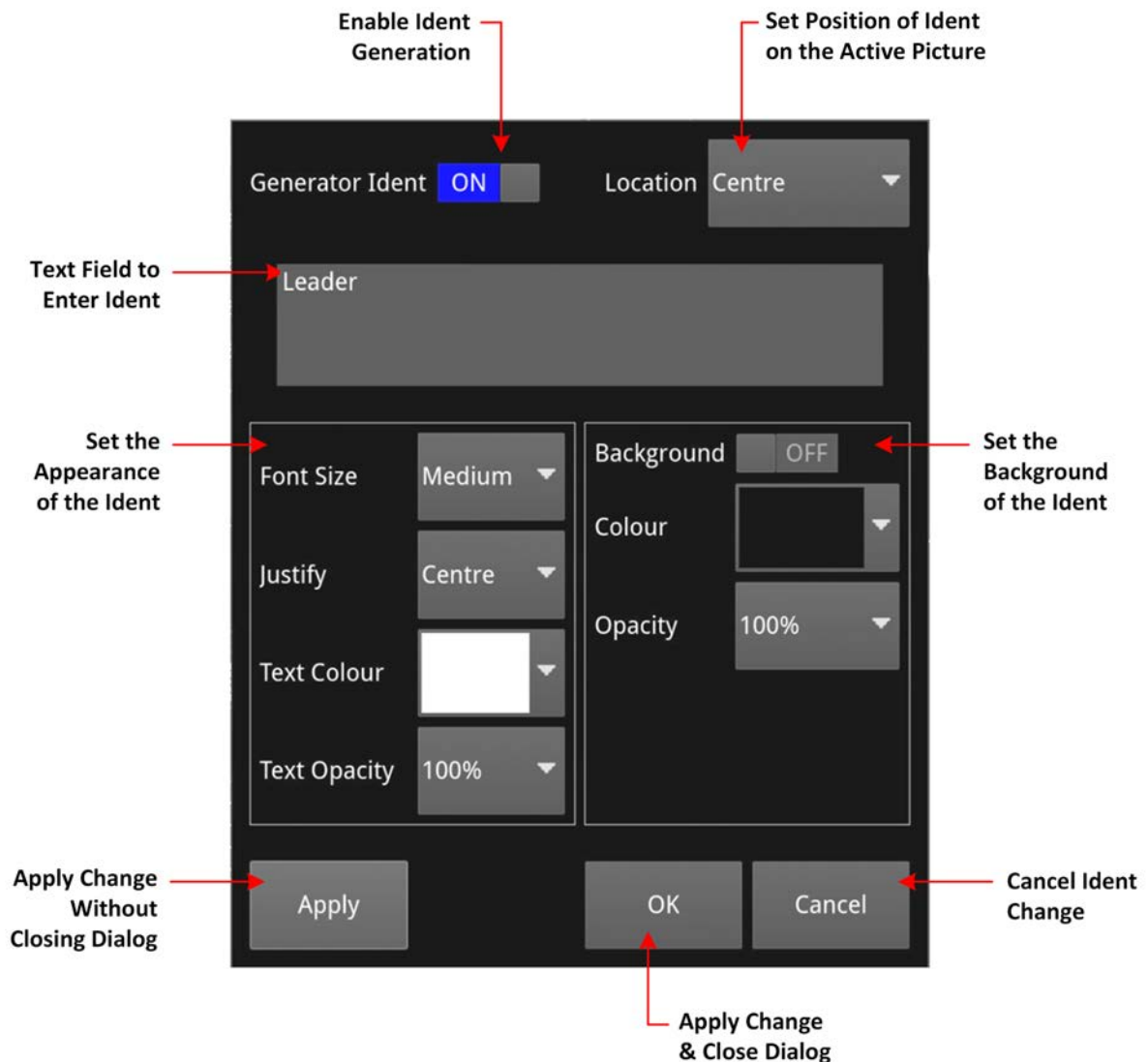


Figure 3-10: Generator - Generator Ident Dialog

Define an ident as follows:

1. Set the **Generator Ident** toggle switch to **ON** to enable the ident.
2. Select the location for the ident from the **Location** dropdown. Options are:
 - Top Left
 - Top
 - Top Right
 - Left
 - Center

- Right
- Bottom Left
- Bottom
- Bottom Right

3. Select the ident text entry field.

4. Define how you want the ident text to appear in the video image. Options are:

- **Font Size**
- **Justify**
- **Text Color:** Use the color picker to select a color. See the section [Using the Ident Color Picker](#).

Note: The selected text (and background) color is affected by the gamut and transfer function (OTF) selected for the generated video standard.

- **Text Opacity**

5. Set the background attributes of the ident. Options are:

- **Background:** On, Off
- **Background Color:** Use the color picker to select a color.

Note: The color lightness value (V) component of the background color is set to zero (black) by default when you select a color in the hue/saturation panel. To change the color of the background from black, select a lightness value in the Value sidebar at the right-hand side of the color picker. You will see the number change from zero in the **Value (V)** field to show the changed background color. For more information, see the section [Using the Ident Color Picker](#).

- **Background Opacity:** 25%, 50%, 75%, 100%.

6. Select **Apply** to review your changes while keeping the Generator Ident dialog open, or **OK** to save your changes and close the dialog.



Figure 3-11: Generator Ident Displayed in Picture Display

Test Pattern Generator

To select a test pattern, select the **Generator** from the main menu bar, followed by **Test Pattern Generator**.

The Test Pattern page displays all test patterns available for the selected video standard and provides two tabs as follows:

- **System Patterns:** Lists standard test patterns supplied by LeaderPhabrix
- **User Patterns:** Lists any user-defined test patterns loaded into the folder **userTestPatterns**. For further information, see [User Patterns and Images](#).

Note: The available range of test patterns depend on the video standard generated.

To select a test pattern using the rotary control:

- Press the Up key. The selected tab label will be displayed in yellow
- Use the Left/Right keys or the Rotary Control ring to change tab then press OK to enter that tab
- Use the Left/Right keys or the RC ring to navigate to the required pattern thumbnail.

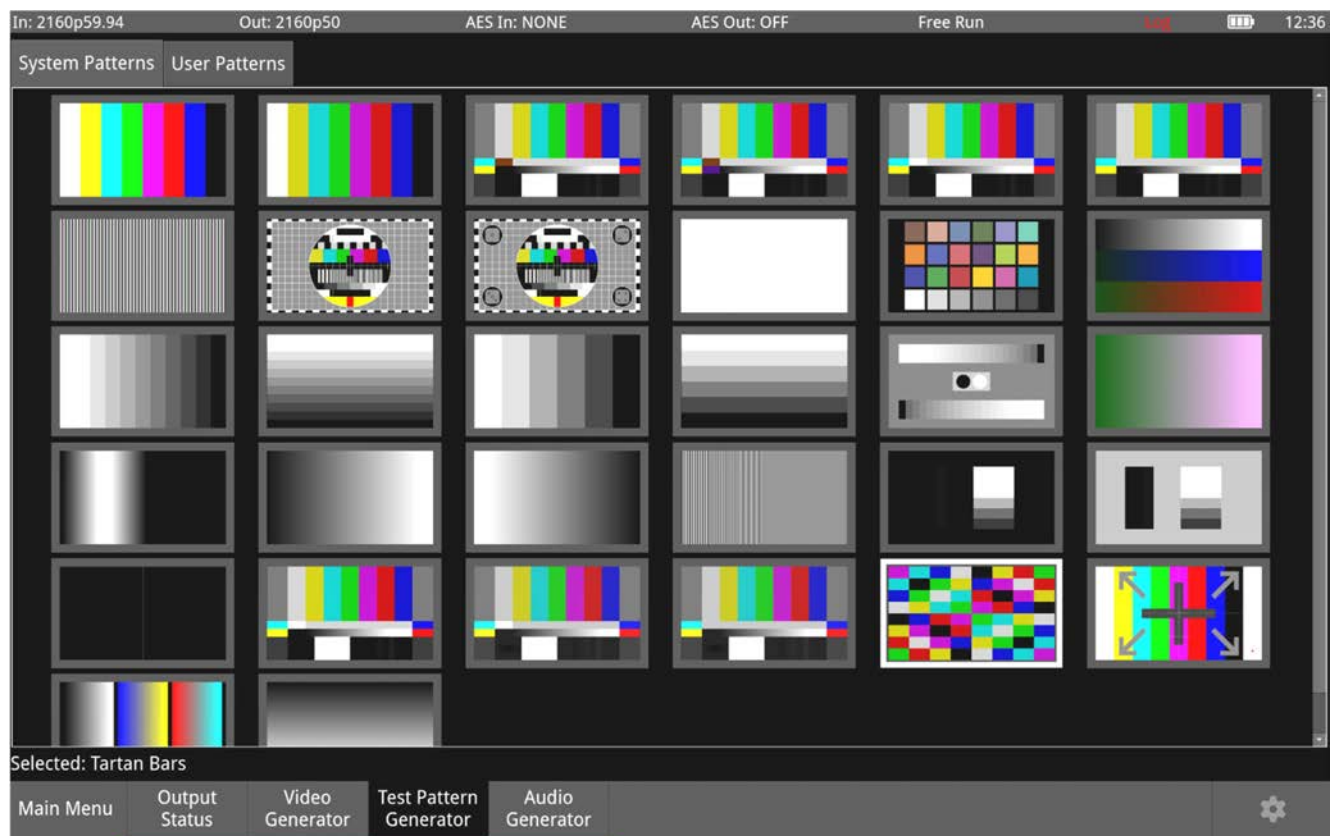


Figure 3-12: Test Pattern Generator - System Pattern Selection Tab

Note: The test pattern may take a few seconds to generate when first selected. You may notice a delay with the larger test patterns: Gray Steps, Vertical Luma Ramp, UHD Quad Align, Circle and Circle 2si Numbers. Subsequently, the test pattern will be loaded with no observable delay.

Test patterns include:

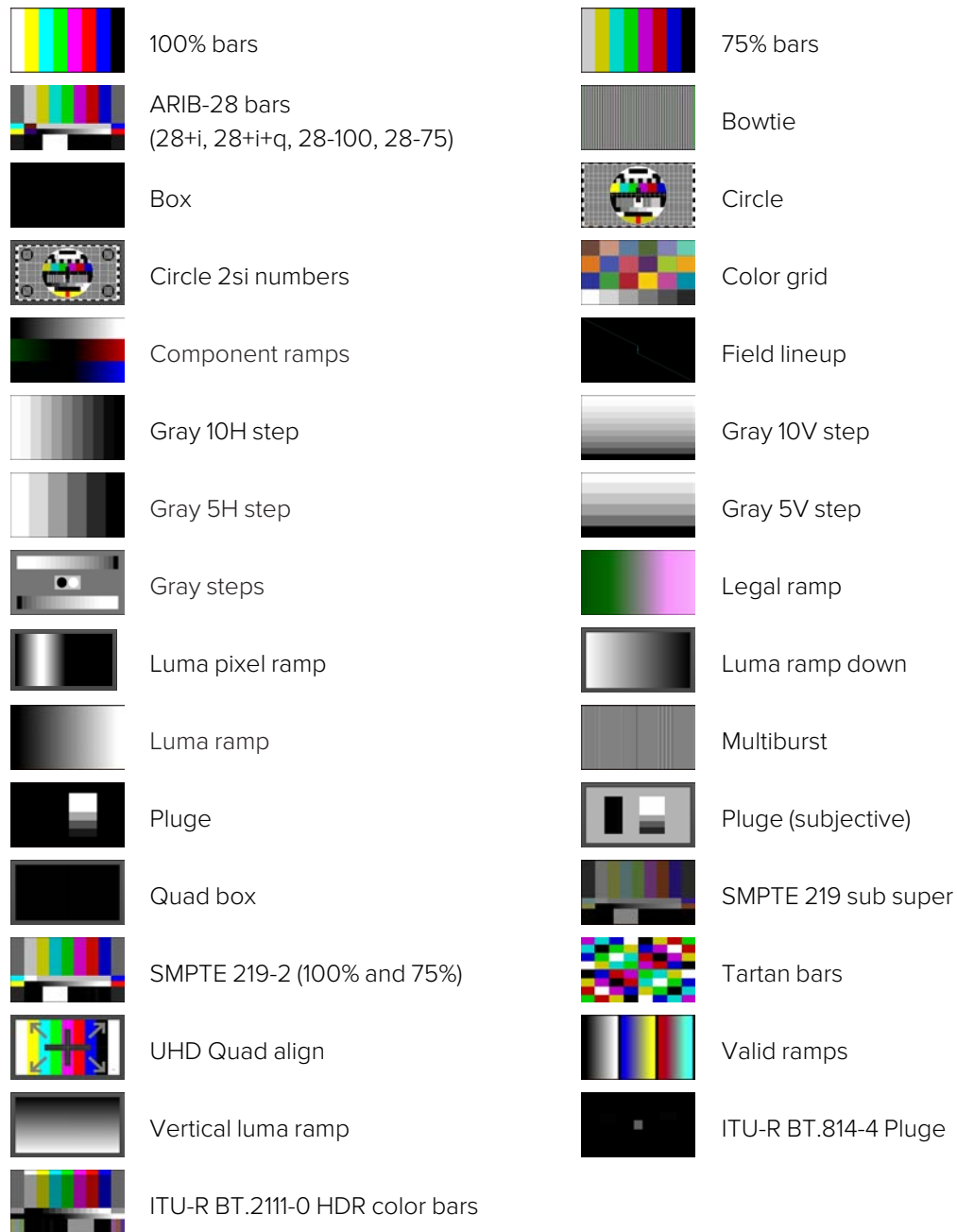


Figure 3-13: System Test Patterns

HLG, PQ and both S-Log3 and S-Log3 SR Live (HDR Live) test pattern variants are available as part of the **Sx2-HDR** license.

Note: A customizable Color Field pattern is also available, which is defined in the Output Status context menu.

User Patterns and Images

You can upload your own test images to the unit.

Note: User test files must be in the TIFF (Tagged Image File Format) and match the exact parameters (pixel resolution, frame packing, field/frame rate, gamut, sampling, and bit depth) of the video standard you intend to use. If these conditions are not satisfied, the user test pattern will not be displayed in the **User Patterns** tab of the test pattern selector.

The specifications for user pattern files are detailed below:

Table 3-3 : Required Format of User Test Pattern Images

Format	Type	Extension	Pixel Resolutions	Bit Depth	Pixel Order
TIFF	Native (Files converted to TIFF from other formats are not supported)	.tif	720 x 485 720 x 486 720 x 576 1280 x 720 1920 x 1080 2048 x 1080 3840 x 2160 4096 x 2160	16 per RGB Component, 48 per Pixel	Interleaved

Note: If a test pattern with a resolution of 720 x 485 is used, the bottom line of the pattern will be duplicated on the SDI output.

Note: Full range TIFF image files are clipped to full protect range; no scaling is applied.

If you have direct access to the unit, you can upload user test files using the [File Manager](#). If you have only remote access to the unit, use SFTP to upload test files as described in the section [Connecting to the unit using SFTP](#).

Upload user test files to the **transfer/userTestPatterns** directory and then restart the unit.

Using the Ident Color Picker

Select a color as follows:

1. Select the dropdown color selector to open the color picker tool (Hue, Saturation, Value or HSV tool) shown below.

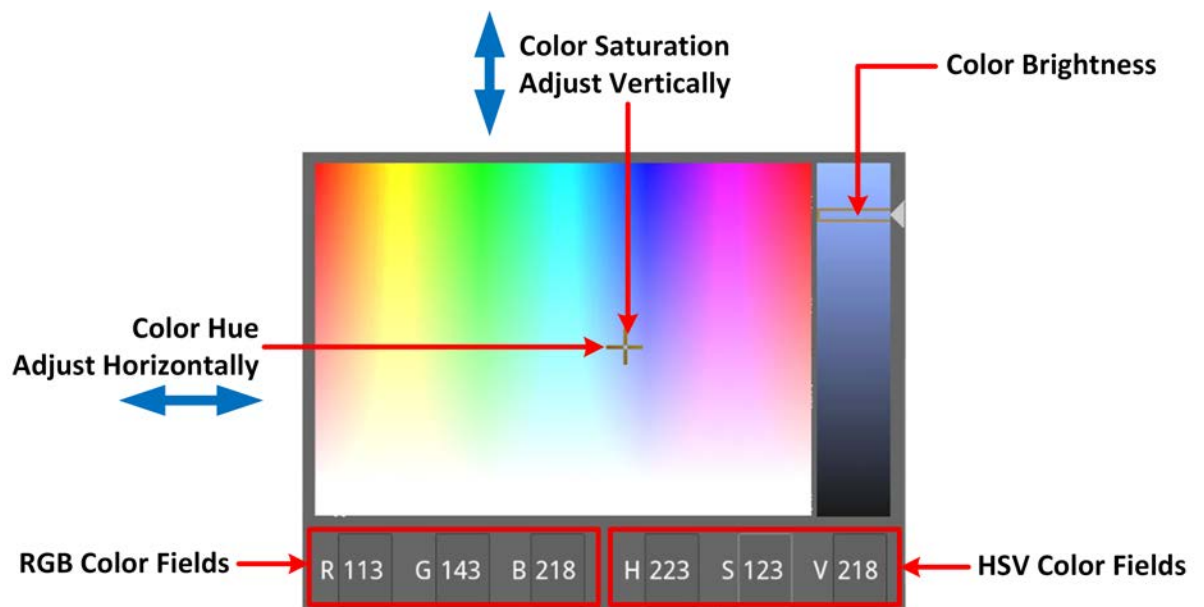


Figure 3-14: Selecting Colors in the Color Picker

2. Touch a point in the color map that corresponds to the color you require. Alternatively:
 - a. Enter the RGB or HSV values in the numerical fields using the increment bar and numpad
 - b. Touch and drag the brightness slider
 - c. Fine tune the numerical values if required.
3. Tap anywhere outside the dialog to close the color picker.

Audio Generator

Overview

Note: Audio is always generated but is only embedded in the SDI signal when enabled by the user. It is always available to copy onto the AES and Analog Audio out interfaces.

To configure the generation of an audio signal, select the **Audio Generator** softkey.

Using the audio generator configuration dialog you can:

- Generate a fixed audio frequency (using a Hertz or musical pitch scale)
- Generate a ramped audio frequency (Hertz or musical pitch), in decreasing steps of 50 Hz
- Generate a fixed audio amplitude (in dBFS)
- Generate a ramped audio amplitude (in dBFS), in decreasing steps of 1 dBFS
- Generate a custom frequency (in Hertz or musical pitch) for either left, right or both channels
- Generate a custom amplitude for either left, right or both channels.

The audio generator configuration dialog is subdivided into four functional areas as shown in [Figure 3-15](#).

To configure an audio output signal:

- Select the required audio options in the left-side options panel
- Select the target groups, channel pairs or single channel using the toggle switch or target channel selector
- Set the audio output signal, using the frequency and/or amplitude sliders or increment bar.

Note: Fixed and Ramp settings are applied to all groups. Custom settings are applied only to the selected pair.

Note: Any adjustments made to the audio generator settings are instantly reflected in the audio output, with no confirmation step.

Configuring the Audio Generator

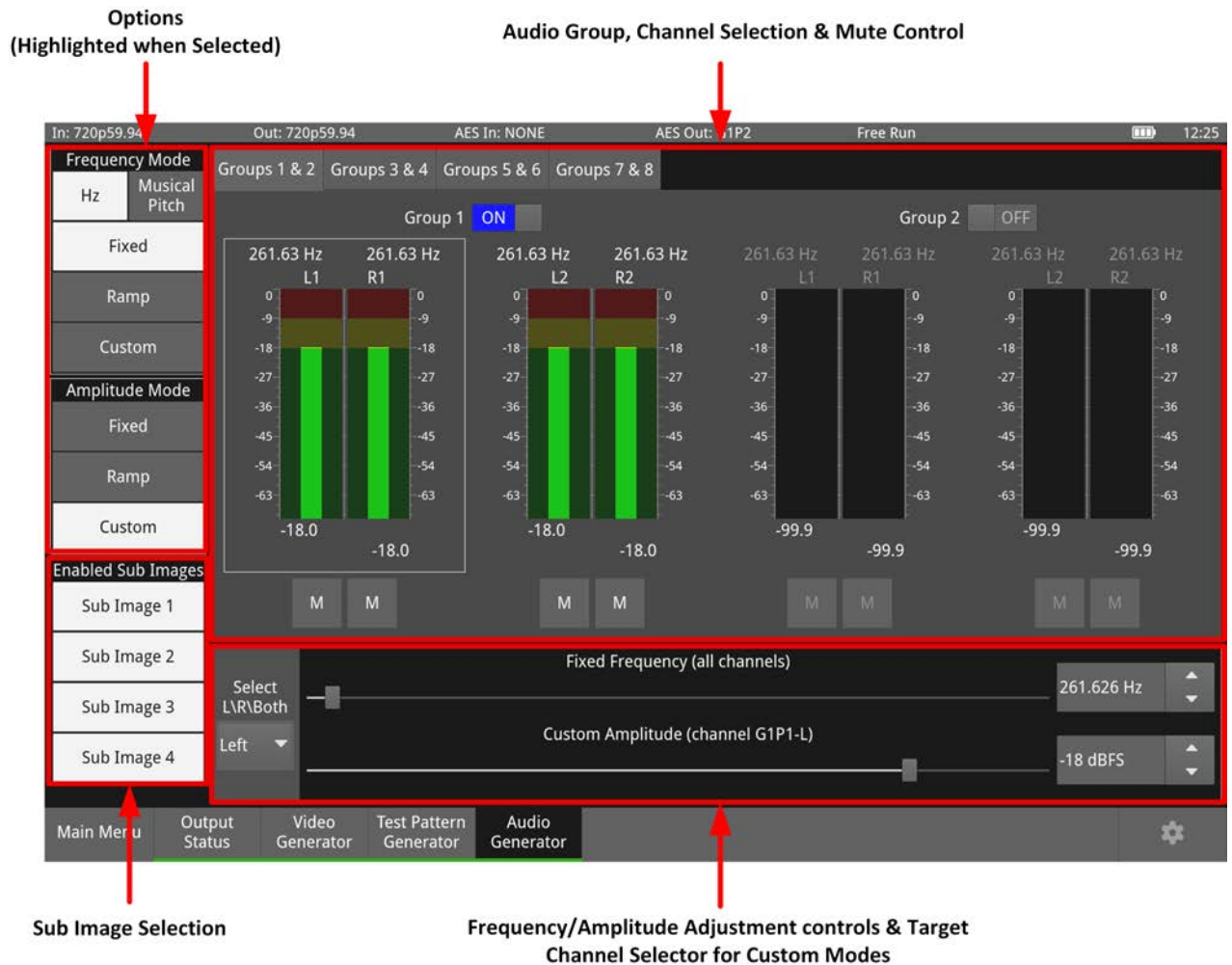


Figure 3-15: Audio Generator Configuration Dialog

Depending on the generated video standard, up to eight audio groups (32 channels) can be included in the SDI output in each sub image, making a total of 128 audio channels. A pair of channels can be chosen to send to the AES or Analog Audio outputs.

In the Audio Generator Configuration dialog, you can enable/disable audio groups in the SDI output using the ON/OFF switches. Use the Audio Group tabs to display additional groups.

After selecting the desired audio options in the side panel, use the audio group and channel selection controls ([Figure 3-18](#)) to enable or disable the target audio groups in the SDI channel, or to mute channels in the output. You can select a pair of channels within an audio group as the target for a custom frequency or amplitude. A selected pair is shown with a white border.

The options side panel ([Figure 3-16](#)) enables you to select the desired frequency and/or amplitude and, in addition, enable or disable the video sub-image to include the audio signal in.

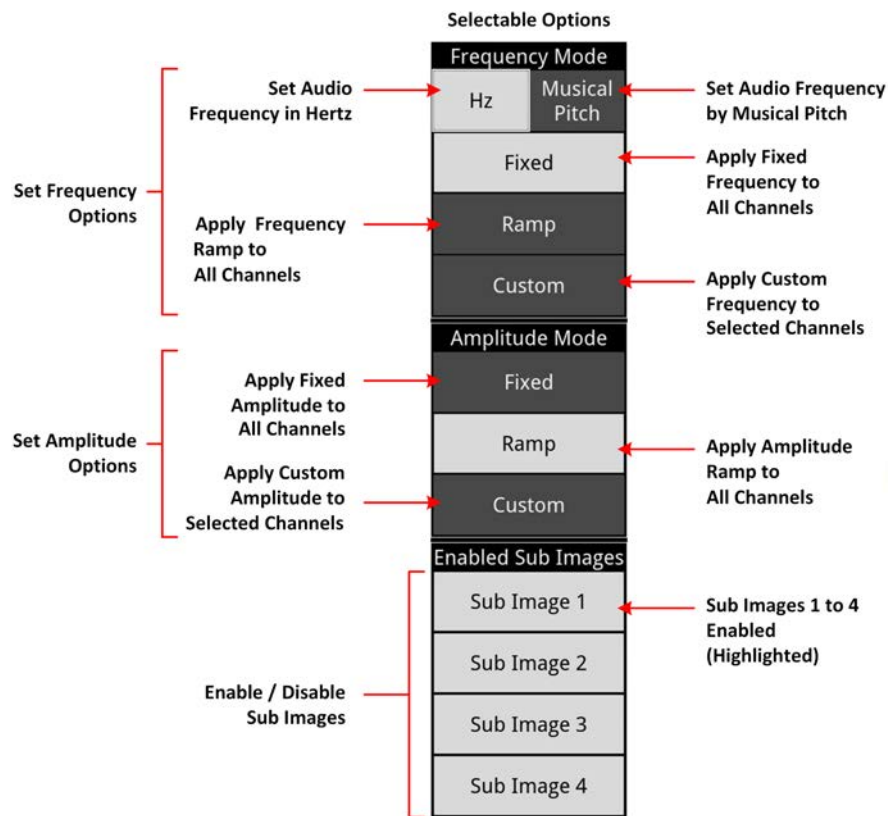


Figure 3-16: Audio Generator Configuration Dialog - Options Panel

The custom mode only applies to the currently selected channel pair. When configuring a custom setting for either frequency and/or amplitude, use the *target channel selector* to define the channels to which the custom setting applies. This could be either the selected pair's left channel, right channel, or both channels. Instead of "all channels", you will see the target channel(s) displayed in the label above the associated slider, as in the figure below.

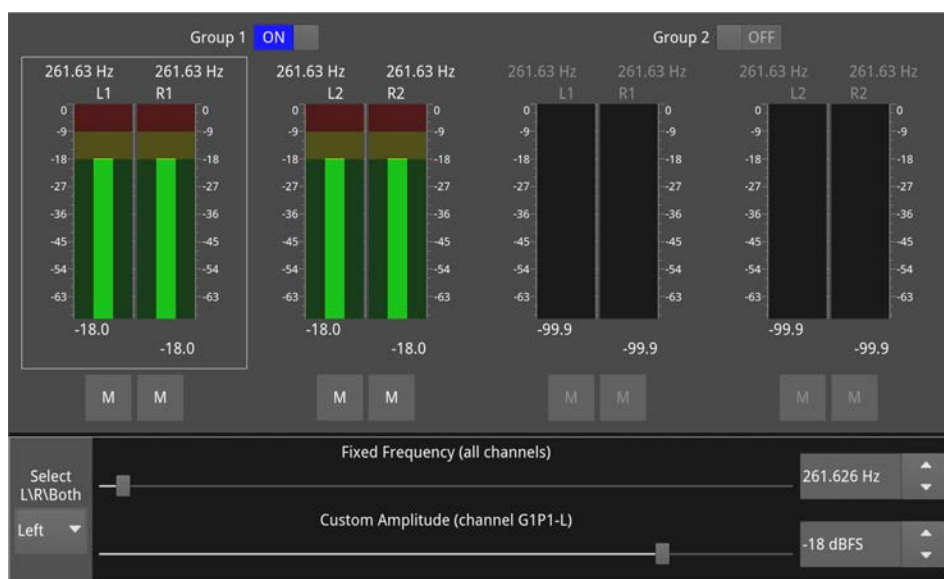


Figure 3-17: Audio Generator Configuration Custom Mode

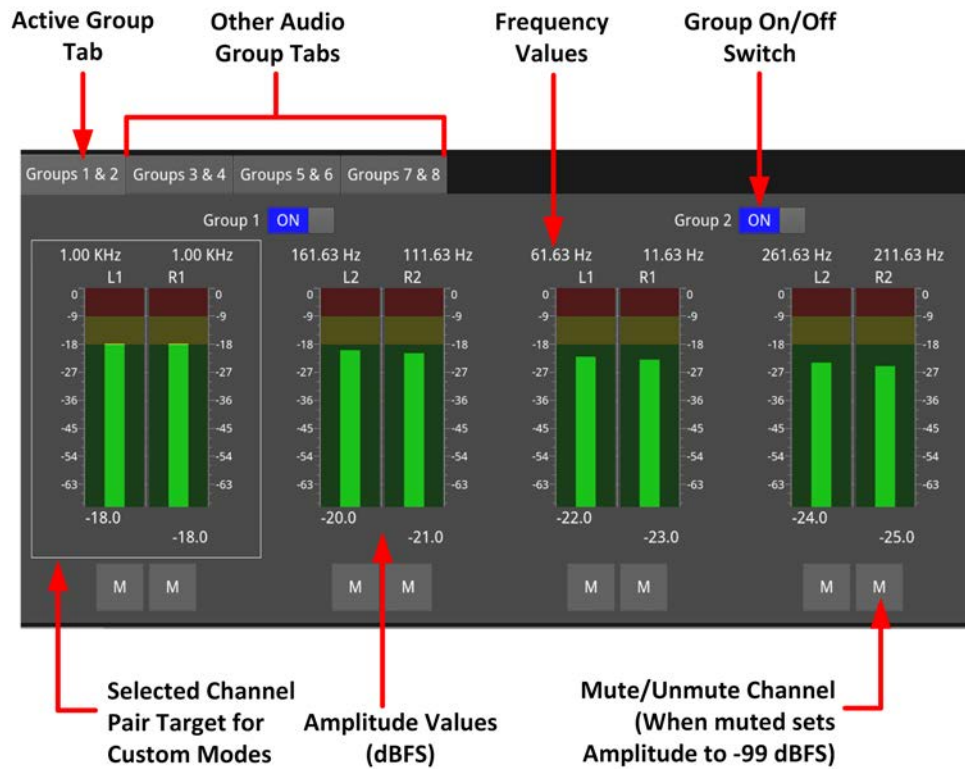


Figure 3-18: Audio Generator Configuration Dialog - Audio Group Selection Panel

When setting either a fixed frequency or frequency ramp and/or amplitude for all channels, set the levels by sliding the appropriate control.

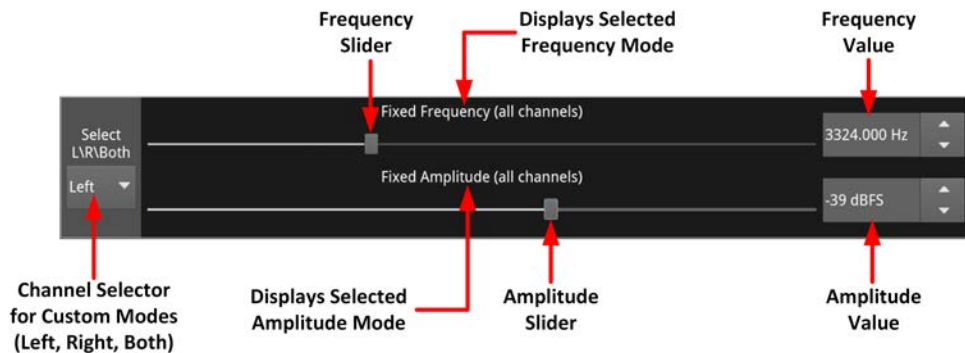


Figure 3-19: Audio Generator Configuration Dialog - Adjustment Controls

Alternatively, touching the slide control opens the appropriate increment bar. This provides quick entry of frequency and amplitude values using either the preset keys or the numpad.

Main Menu	-10	+10	-100	+100	-1000	+1000	Min	Max			Frequency Increment Bar
Main Menu	-1	+1	-10	+10	Min	Max					Amplitude Increment Bar

Figure 3-20: Increment Bars

4. Analyzer

This chapter describes the unit's Analyzer instruments. These instruments are accessed by selecting the Analyzer option on the Main menu bar.

This chapter includes the following sections:

- [Picture](#)
- [Waveform](#)
- [Vectorscope](#)
- [Dataview](#)
- [Eye \(Sx2E only\)](#)
- [Jitter \(Sx2E only\)](#)

Picture

Overview

The **Picture** window shows the video input currently being analyzed by the unit.

Some features of the Picture instrument are dynamically linked to the Dataview, Vectorscope, and Waveform instruments to enable more precise, synchronized analysis of the picture.

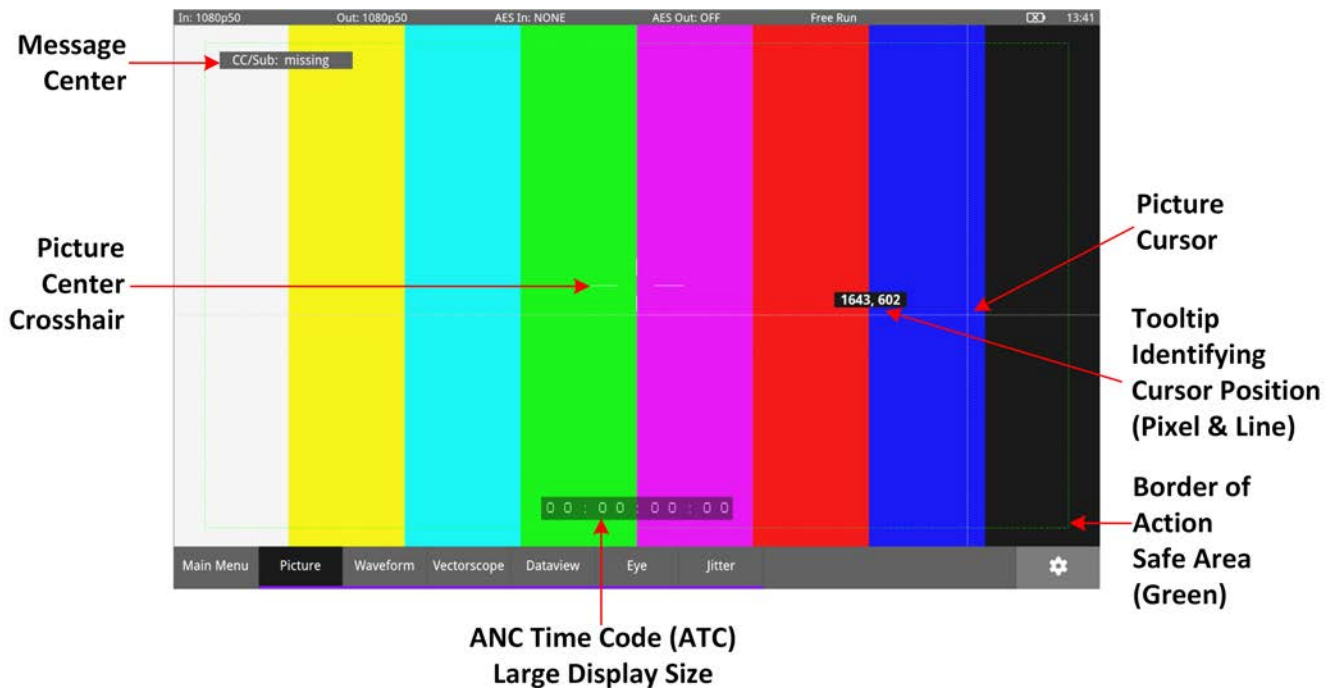


Figure 4-1: Components of the Picture Instrument

In addition to displaying the video picture, you can configure the Picture instrument to overlay various data elements, for example extracted from the ancillary data in the signal, including:

- Closed Captions
- Ancillary Time Code (ATC)
- Picture Cursor and Position
- Picture Safe Areas
- Picture Center Crosshair
- Message Center displaying V-chip, AFD, Input Name, Closed Caption/Subtitle CDP detection, ST309 Date, and SCTE 104 data.
- HDR False Color Overlay and Grayscale Mode (HDR mode only). For more information, refer to [Heat Map \(False Color Overlay\)](#).

Picture Aspect Ratios

The Picture instrument features a set scaling functionality so that you can view the signal's full picture. These scaling functions enable the source video input to fill the standard 1920 x 1080 (16:9) Picture window with the maximum possible image size.

To scale an image to fit the window correctly, the unit will automatically insert borders either at the top and bottom sides of the window, referred to as Letter-boxing; or at the left and right sides of the window, referred to as Pillar-boxing, see [Figure 4-2](#).

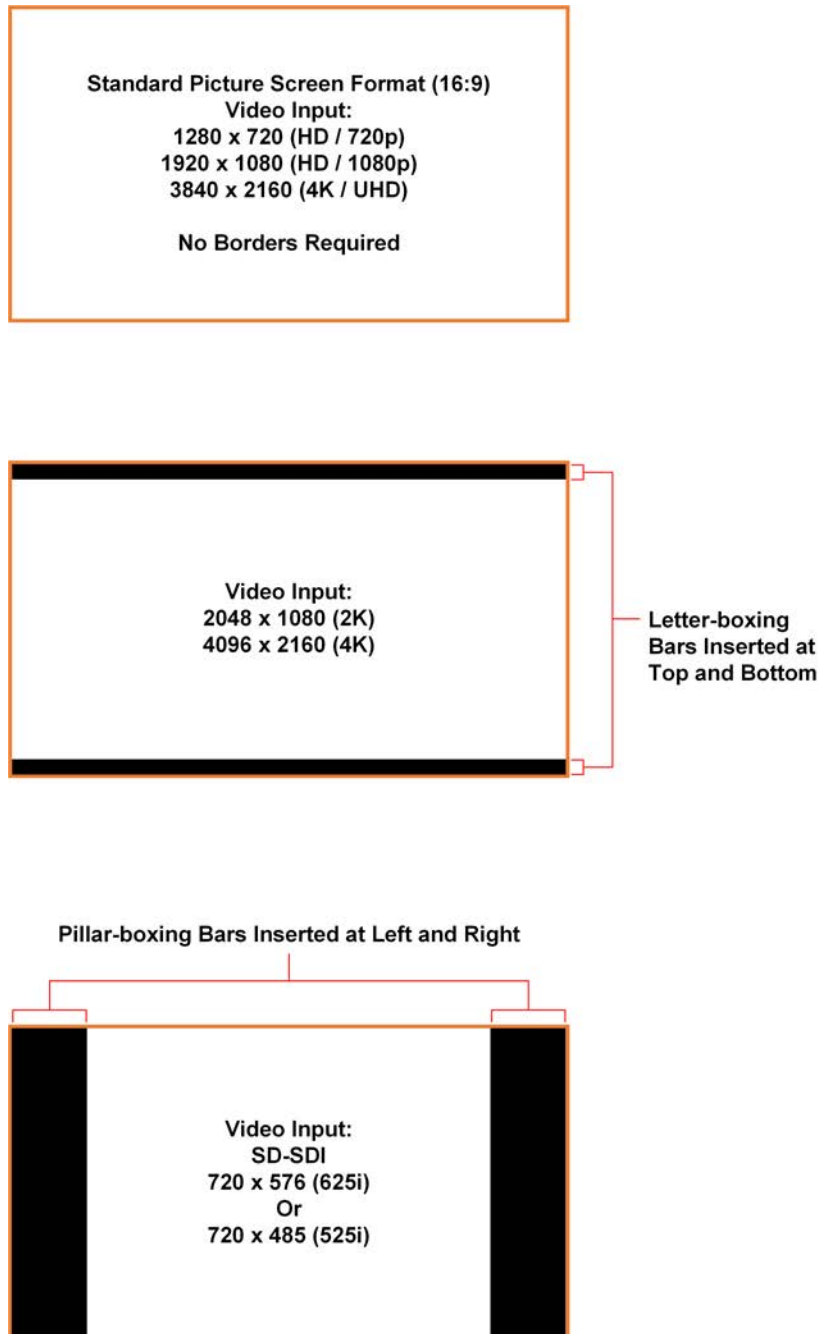


Figure 4-2: Standard, Letter-boxing and Pillar-boxing Formats in Picture Instrument

The following table shows where pillar-boxing and letter-boxing borders are displayed:

Table 4-1 : Image Framing by Screen Resolution

Screen Resolution	Type of Picture Framing Required
720 x 485	525i standard image scaled to a 4:3 aspect ratio. Pillar-box borders added to left and right sides.
720 x 576	625i standard image scaled to a 4:3 aspect ratio. Pillar-box borders added to left and right sides.
1280 x 720	Scales to fit 16:9 aspect ratio of Picture window. No additional borders required.
1920 x 1080	Scales to fit 16:9 aspect ratio of Picture window. No additional borders required.
2048 x 1080	Scaled to a 16:9 aspect ratio. Letter-box borders added to top and bottom sides.
3840 x 2160	Scales to fit 16:9 aspect ratio of Picture window. No additional borders required.
4096 x 2160	Scaled to a 16:9 aspect ratio. Letter-box borders added to top and bottom sides.

Context Menu

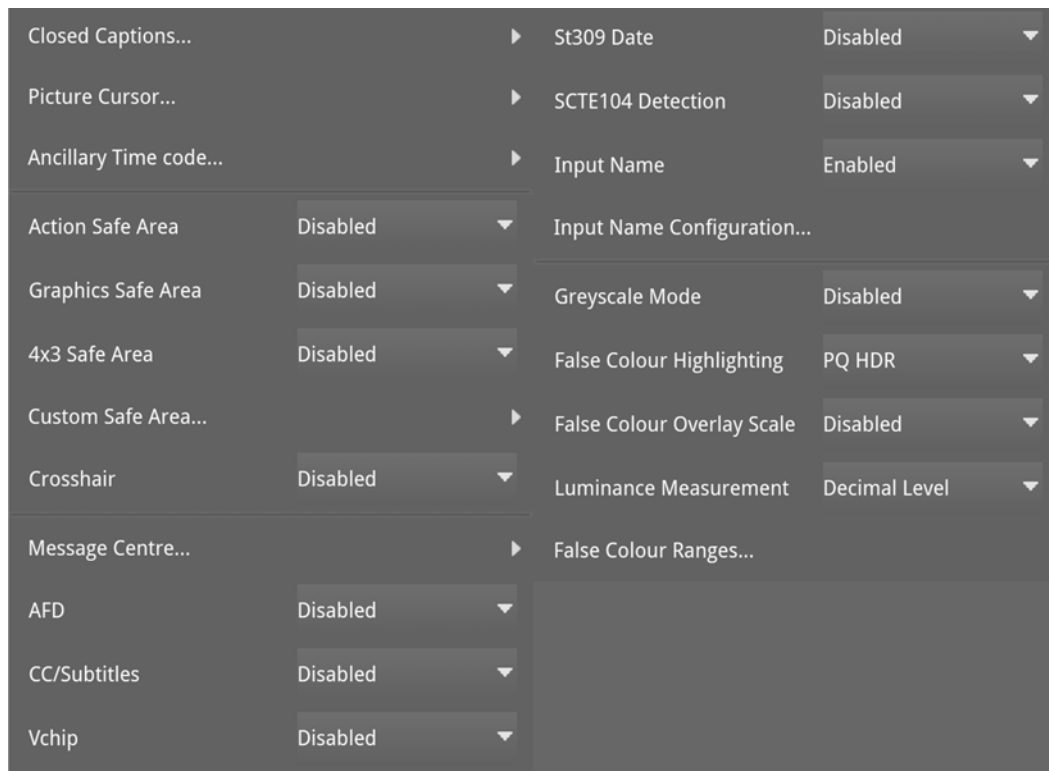


Figure 4-3: Analyzer - Picture Instrument Context Menu with HDR License Installed

The following table lists the *standard* options available in the Analyzer - Picture Instrument submenu.

Table 4-2 : Menu Options for the Analyzer - Picture Instrument

Item	Options	Description
Closed Captions	Disabled (Default)	Disables the detection of closed captions in the ancillary data. When enabled, by selecting one of the following closed caption options, the unit detects closed captions carried in the ancillary data.
	OP47	Enables the detection of OP47 closed captions in the ancillary data. This displays additional menu entries: OP47 Page and OP47 Show Unboxed .
	OP47 Page	Select the desired OP47 page containing the relevant closed captions, using the slider or scrolling through page numbers in the range 100 to 8FF.
	OP47 Show Unboxed Disabled (Default) Enabled	Select to display outside-of-box subtitles (closed captions) outside the permitted area for closed captions. When enabled, subtitles are being displayed outside the usual display area. OP47 unboxed captions are being shown, these characters should not be displayed by decoders when bit C6 (subtitle) is set.
	608	Enables the detection of CEA 608 standard closed captions in the ancillary data. This displays an additional menu entry enabling you to select the desired 608 service in which to look for the CEA 608 format closed captions. See 608 in 708/608 services below for more info on services to display. Note: CEA-608 Line 21 closed captions are not supported. This option refers to CEA-608 (raw) ancillary packets carried in the VANC.
	608 in 708	Select to display 608 in 708 standard closed captions in the picture window for high definition (HD) video. This displays an additional menu entry enabling you to select the 608 service from which to read the closed captions.
	608 in 708/608 Services	Select the desired service from either: CC1, CC2, CC3, CC4, T1, T2, T3, T4 or XDS . Note: CC1 is the primary caption service found in field 1 carrying the primary language and in-sync with video. CC2 is a non-synchronous channel in field 1 intended to supplement information carried in the program. CC3 is the secondary caption service found in field 2 carrying the secondary language and in-sync with video. CC4 is a non-synchronous channel in field 2 carrying supplementary information carried in the program. T1, T2, T3 and T4 are text services that carry program related information. T1 and T2 are found in field 1 whilst T3 and T4 are carried in field 2. XDS (Extended Data Services) defines a number of packet types to identify the program, its running time and content rating (for use with V-Chip). XDS is only carried in field 2.

Item	Options	Description
	708	Enable the detection of CEA 708 closed captions.
	Text Encoding	The Text Encoding setting determines how character data within the captions stream is displayed. Select either Default which uses the text encoding that is signaled within the CEA-708 captions CDP itself. If no encoding information is signaled and the incoming characters are 16-bit values, the system will assume Unicode (UTF-16). Alternatively, select EUC-KR (Korean) to manually set the text to EUC_KR (KS X 1001) encoding, a widely used multibyte character set for the Korean language.
	Service #	Select service number, from 1 to 63
Picture Cursor	Disabled (Default) Enabled	When enabled, this feature allows you to select a specific line and pixel in the picture, which is dynamically linked to the Waveform, Dataview and Vectorscope analysis instruments. The unit positions a visible cursor. The location of the cursor can be changed by tapping a different position in the Picture window. Line: Line 1 to maximum number of lines in the active picture. Pixel: Pixel 0 (zero) to maximum number of pixels in the active picture, minus 1 (one).
Ancillary Time Code (ATC) Display		
Ancillary Time Code	Disabled (Default) Enabled	When enabled, displays the ATC panel in the picture window.
Ancillary Time Code Type	VITC (Default) LTC	When ATC is enabled, choose whether to display the vertical interval time code (VITC) or the linear time code (LTC).
Ancillary Time Code Size	Small Medium Large Auto	Increases or decreases the displayed size of the ATC panel in the window. The Auto option adjusts the size of the time code panel automatically, depending on the displayed size of the instrument window.
Ancillary Time Code Position	Bottom Middle Top	Adjusts the position of the displayed ATC panel on the vertical center-line of the window.
Ancillary Time Code Field	Disabled (Default) Enabled	Activates/deactivates the display of the field identification flag, for either 25 Hz or 24/30 Hz.
Safe Area Generation		
Action Safe Area	Disabled (Default) Enabled	When enabled, displays a 16:9 safe area border for actions as a green, dashed border.
Graphics Safe Area	Disabled (Default) Enabled	When enabled, displays a 16:9 safe area for graphics as a red, dashed border.
4x3 Safe Area	Disabled (Default) Enabled	When enabled, displays a 4:3 safe area as a cyan, dotted border.

Item	Options	Description
Custom Safe Area	Disabled (Default) Enabled	When enabled, displays a user-defined, safe area as a white, dashed border.
Crosshair	Disabled (Default) Enabled	When enabled, displays crosshair to indicate the center (origin) of the displayed image in the picture window.
Message Center Display		
Message Center	Top Left Top Right Bottom Left Bottom Right	Defines the position of the Message Center panel in the picture window. The message center displays messages decapsulated from the ancillary data packets and includes ST309 Date, SCTE 104, AFD and V-Chip, etc.
Transparency	Disabled (Default) Enabled	When enabled, applies a transparent background to the message center in the picture window.
Message Timeout (secs)	1 to 10 seconds	Defines the length of time in seconds dynamic SCTE 104 messages are displayed in the message center. SCTE 104 messages are removed from the message center after the timeout period.
AFD	Disabled (Default) Enabled	Activates the display of AFD markers in the message center of the picture window.
CC/Subtitles	Disabled (Default) Enabled	When enabled, indicates the presence of Closed Captions/ Subtitles CDP/SDP packets.
Vchip	Disabled (Default) Enabled	Activates the display of V-chip markers in the message center of the picture window.
ST309 Date	Disabled (Default) Enabled	Activates the display of the ST 309 date information in the message center using ST 309 date format: dd mmm yyyy.
SCTE 104 Detection	Disabled (Default) Enabled	Activates the detection of SCTE 104 packets in the ancillary data and displays the message OpID, indicating the message type, in the selected hex or decimal format.
SCTE 104 OpID Format	Dec (Default) Hex	Defines whether to display the OpID of the SCTE 104 message type in decimal or hex format.
Input Name	Disabled (Default) Enabled	Displays the configured source input name of the video, for example, the ID of the originating camera.

Closed Captions

Closed captions (or subtitles in Europe) are the text-based, encoded information included in the ancillary data of the video signal, which can optionally be displayed by the viewer. The unit can detect closed captions carried in the ancillary data and display them, when enabled, in the Analyzer - Picture Instrument for monitoring purposes.

The following closed caption formats are supported:

- **OP-47** (or SMPTE RDD-08): European and Australian standard for closed captions/subtitles on HD TV. Supports the following languages: Czech, English, Finnish, French, German, Hungarian, Italian, Portuguese, Slovakian, Spanish and Swedish
- **608** and **608 in 708**: CEA-608 (or EIA-608) is a legacy US standard for closed captions. CEA-708 is the current US standard for closed captions on HD TV and is backward compatible with CEA-608. CEA-708 acts as a wrapper for embedded CEA-608 closed captions, enabling the

unit to extract 608-standard closed captions from 708-standard ancillary data. Supports the following languages: Danish, English, Finnish, French, German, Italian, Portuguese, Spanish and Swedish.

Note: Legacy 608 (Line 21) closed captions are not supported for SD-SDI.

- **708** (CEA-708 / EIA-708) refers to the U.S. digital television closed captioning standard established by the Consumer Electronics Association (CEA). It is designed for digital broadcasts and provides advanced captioning capabilities. South Korean closed captioning uses a system similar to CEA-708 but relies on a different character encoding, EUC-KR (KSX1001). When enabled through menu settings, the 708 standard supports the following languages: Danish, English, Finnish, French, German, Italian, Portuguese, Spanish, and Swedish, along with an additional character set for South Korea.

Enable the CC/Subtitles option in the **Message Center** to identify the presence of Closed Caption and Subtitle CDP/SDP packets in the video signal. It will indicate if 608, 708, 608 in 708 and OP47 captions are present at that moment in time. Configure the Closed Caption options and services in the **Analyzer - Picture** instrument menu to decode the captions identified in the CC/ Subs field of the Message Center. The Ancillary Status and/or Ancillary Inspector instruments can also show the presence of the CEA-608, CEA-708 or OP-47 ANC packet in the ancillary area of the SDI signal.

Note: "missing" will be indicated if there are currently no CDP/SDP packets identified for more than 4 seconds. If null characters or an empty service exist in the CDP/SDP packet, it will still report detection even though there may not be any characters to decode.

When enabled, closed caption text is displayed in the Picture area as defined by the format of the selected closed caption standard.

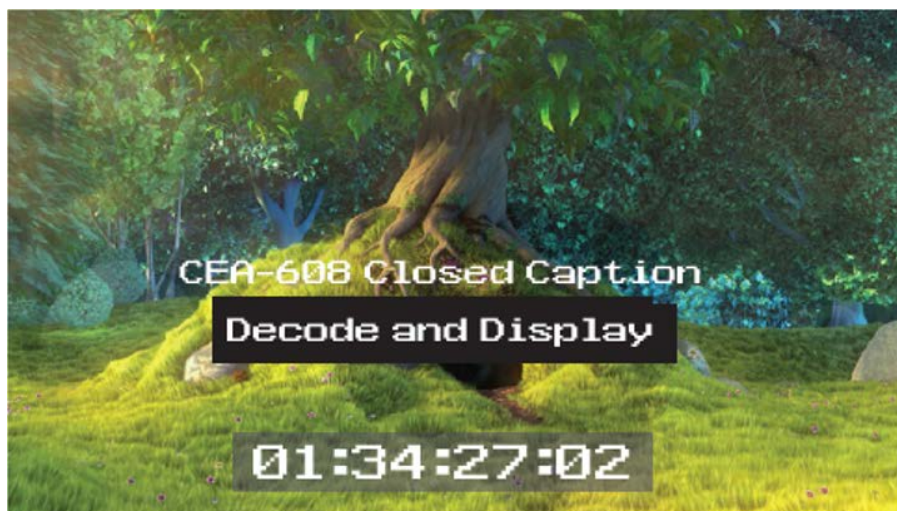


Figure 4-4: Closed Captions in the Picture Instrument

The CEA-708 closed captioning system, employed in the USA and Canada for HD video, embeds data within the VANC area of the HD-SDI video frame and uses data identifier (DID) 0x61 for the Caption Distribution Packet (CDP). Generally, it accommodates up to six different closed caption streams (or services). It may also incorporate 608 CDP packets containing 608 closed captions, along with CEA-708: "extended services 7 to 63". Furthermore, CEA-708 can be used to transport Korean captions. The OP-47 closed caption system (used in Europe and Australia for HD SDI) embeds closed caption text in the VANC area of the HD-SDI video frame using DID 0x43. This system supports closed caption pages in the range 0x100 to 0x8FF.

Picture Cursor

The Picture Cursor consists of two intersecting horizontal and vertical dashed lines. With the option **Picture Cursor** enabled, tap anywhere inside the window boundary to position the intersection of the cursor. You can precisely adjust the position using the Line and Pixel options in the menu. When using the touchscreen to place the cursor, a tool-tip appears displaying the coordinates of the picture cursor.

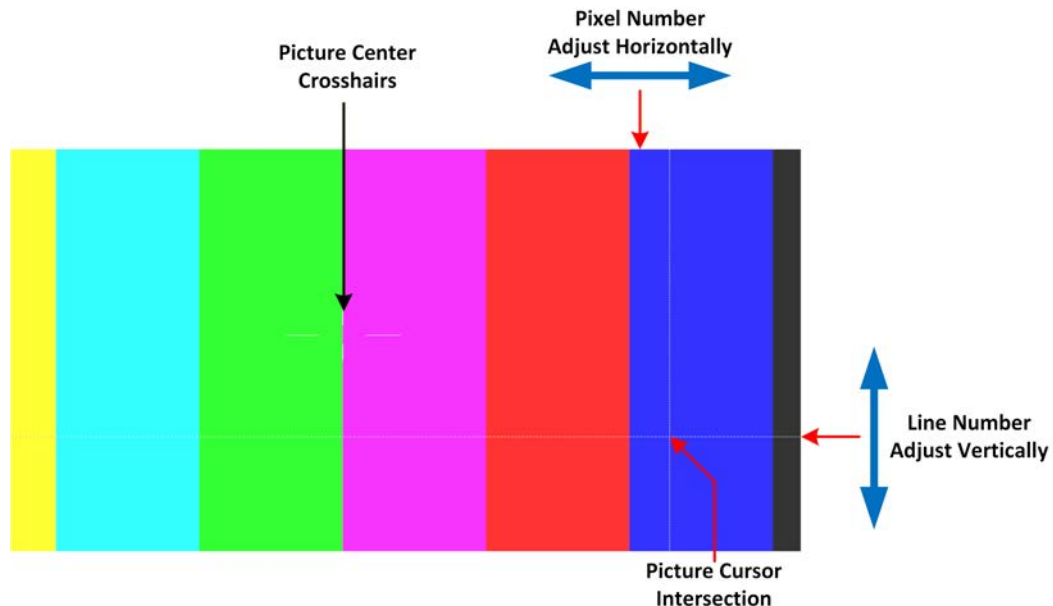


Figure 4-5: Using the Picture Cursor

The line and pixel positions are displayed in the option menu when you select Picture Cursor. This measurement is dynamically linked to a few instruments, such as Waveform and Dataview, so that the selected picture position can be used by these instruments at the same time.

Picture Safe Areas

The **Analyzer - Picture** instrument features picture safe areas designed according to the EBU Recommendation R95 *Safe Areas for 16:9 Television Production*. Picture safe areas define the part of the picture that can be viewed without compromise on a TV or movie screen.

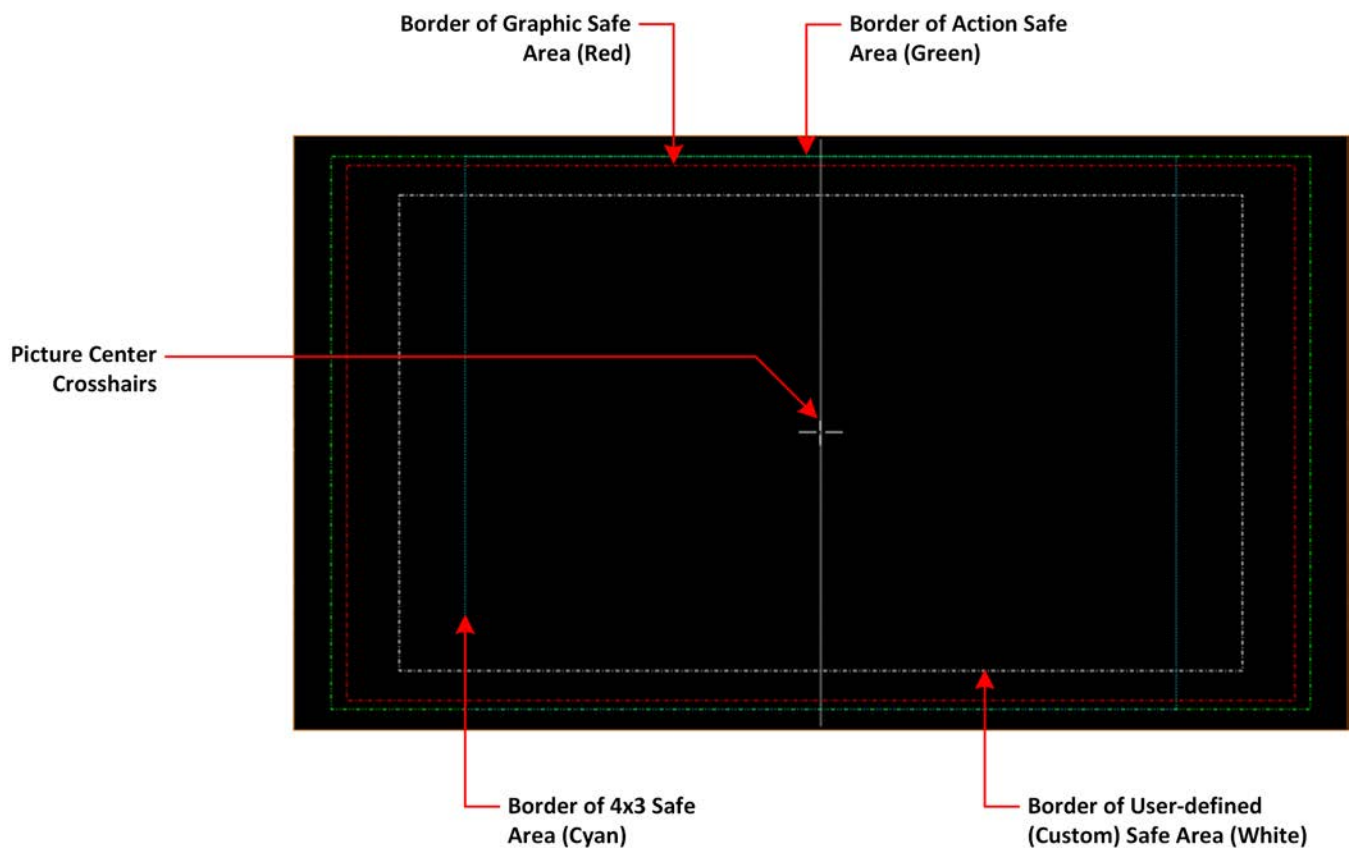


Figure 4-6: Picture Safe Areas Showing Border Colors

The Analyzer - Picture instrument can generate three predefined, independent safe areas for the following:

- **Graphics (16:9):** Allows to check that all essential graphics are inside this area. The border of the Graphics safe area is 5% in from all edges of the picture.
- **Action (16:9):** Larger than the Graphics safe area; allows to check that all essential program content is inside this area. The border of the Action safe area is 3.5% in from all edges of the picture.
- **4x3:** Shows the safe area for HD video to be viewed on domestic TVs still using a 4:3 aspect ratio.

The Picture instrument also includes a facility to generate a user-defined, custom safe area, which enables you to set the height and width of the safe area as a percentage of the picture height and width. In addition, you can also define vertical or horizontal offsets for the custom safe area as a percentage relative to the distance between the side margins (left or right, and top or bottom) and the picture center so that a 100% vertical offset is the distance between the top or bottom of the window and the center of the window.

When enabled, you can display a crosshair to mark the center-point of the picture.

The unit currently supports HD 16:9 formats, providing safe areas for 16:9 HD, 3G and UHD picture formats.

For more information, see the EBU Recommendation R95 *Safe Areas for 16:9 Television Production*.

Displaying the Picture Safe Areas

Activate a safe picture area in the Picture window as follows:

1. Select the **cog** softkey to open the context menu.
2. To display one of the standard safe areas, select **Enabled** from the corresponding dropdown list. You can differentiate the safe areas by the color of their border:
 - Action Safe Area - Green dashed-line border
 - Graphics Safe Area - Red dashed-line border
 - 4x3 Safe Area - Cyan dotted-line border
 - Custom Safe Area - White dashed-line border.
3. To display a custom safe area, set the **Custom Safe Area** to **Enabled**. This displays additional fields in which to define the custom safe area:
 - A percentage of the full picture window height or width relative to the top/bottom or left/right borders
 - A percentage offset of the custom safe area center from the center of the picture window.

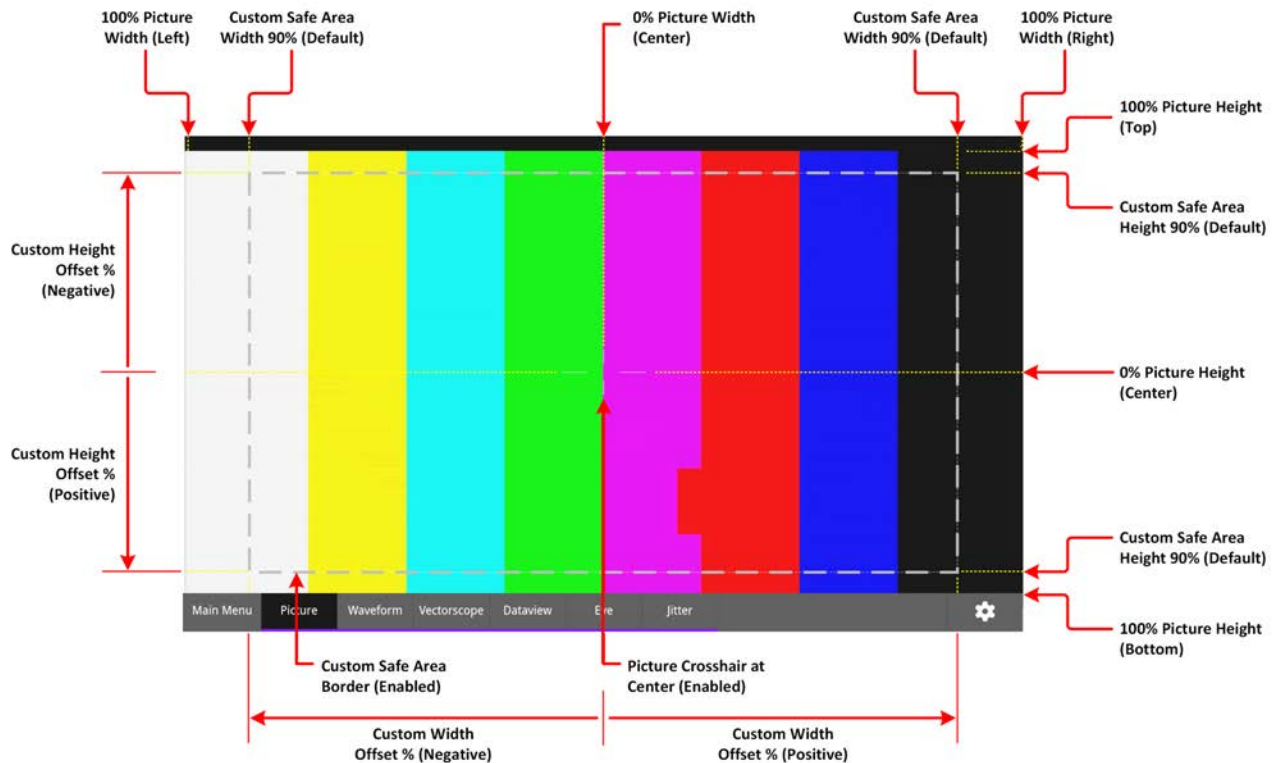


Figure 4-7: Picture - Defining the Custom Safe Area

Using the Picture Message Center

Note: For SD-SDI video input, the unit supports ancillary data as long as it is provided in ANC data packets according to SMPTE ST 291.

The **Message Center** is a designated area of the Analyzer - Picture window intended to alert you to the receipt of certain messages transported as packets in the ancillary data stream. The Message Center enables quality control of the source video material, both before and during transmission. On identifying one of the target message types, the Message Center decapsulates the message and

displays an appropriate marker, text or ID to reference the message. You can configure the Message Center to display the following:

- **AFD Marker:** The Active Format Description is a set of codes used to identify the aspect ratio of the video signal and the protected area of the picture.
- **CC/ Subtitles:** Closed Caption/ Subtitle CDP/ SDP packet detection.
- **V-chip Marker:** Identifies a parental guidance rating, used primarily in the US and Canada, to categorize age-sensitive material in a TV program. The V-chip hardware in the receiving television can be configured by the viewer to block certain categories of V-chip ratings as desired.
- **ST309 Date:** The date as conveyed ST 309 and displayed using the format: **dd mmm yyyy**.
- **SCTE 104 OpID:** The industry standard for including specific program signals and markers in the video signal at various time points, for example, program parts, commercial breaks, etc.
- **Input Name:** The defined source input name of the video stream.

V-chip data is included with closed caption data of type CEA-608 or CEA-608-in-708. V-chip data is not currently available with closed captions of type OP-47. If 608 or 608-in-708 closed captions are enabled but unavailable and you then enable the V-chip marker, you will see that the V-chip label in the Picture submenu is displayed in yellow as a warning. Furthermore, if OP-47 closed captions are enabled, together with the V-chip marker, the V-chip label in the Picture submenu is displayed in yellow.

Note: For SD-SDI source video, V-chip data included with legacy 608 (Line 21) closed captions is not supported.

The Message Center separates messages into either *static* or *dynamic* message types. When enabled, static messages are always displayed in the Message Center and indicate the Analyzer source input and the presence of a V-chip or Active Format Description (AFD) code in the ancillary data.

Note: For SD-SDI source video, the unit supports AFD data as long as it is provided in ANC data packets according to SMPTE ST 2016-1 and ST 2016-3. Wide Screen signaling (WSS) and Video Index (VI) signaling (SMPTE RP 186) are not supported for SD-SDI.

Dynamic messages, however, are displayed for a configurable time period (in seconds) after which they are removed from the Message Center. The unit manages the OpIDs of SCTE 104 packages, detected in the ancillary data, as dynamic messages. Each consecutive SCTE 104 packet received by the unit replaces the previous displayed OpID.

For ease of viewing, you can choose the specific quadrant of the Analyzer - Picture window in which to display the Message Center from:

- Top-left quadrant
- Top-right quadrant
- Bottom-left quadrant
- Bottom-right quadrant.

Note: The Message Center is displayed only when you enable at least one of the message types (AFD, V-chip, ST309 Date, Analyzer Source, SCTE 104 or Input Name).

The layout of the Message Center adapts so that it always displays the static messages closest to the picture edge, depending on the selected screen quadrant in which it is located. This ensures that the V-chip, Analyzer Source, and AFD codes are always displayed in the same position in the window.

Dynamic SCTE 104 OpID codes are appended either above or below the static messages, again depending on the quadrant in which the Message Center is located.

Note: When present, V-chip, AFD ST309 Date, Analyzer Source, and SCTE 104 OpID data packets will also appear in the [Ancillary Status](#) instrument and you can view the corresponding packet contents in the [Ancillary Inspector](#) instrument.

Displaying the Ancillary Time Code

Time and control code information, used to identify video frames, is carried as the payload of packets located in the ancillary data space of the video signal. When you enable the ATC option in the Analyzer - Picture options menu, the ancillary time code is displayed in a panel overlaid across the Picture window.

The ATC is a 13 character time code with the following format:

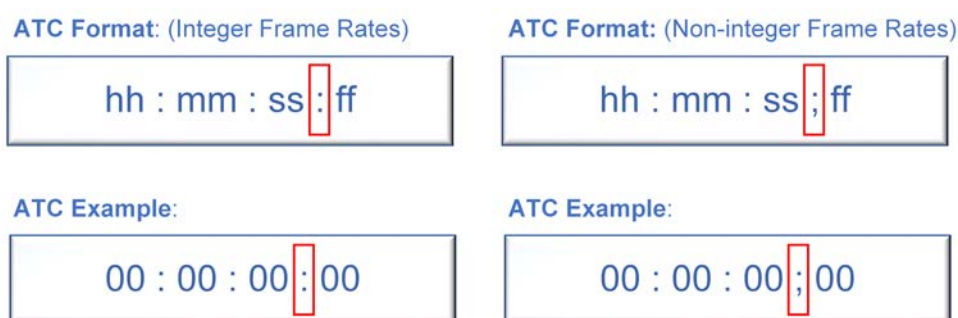


Figure 4-8: Format and Example of the Ancillary Time Code

Where:

- Colon (:) Separator between seconds and frames indicates Integer frame rates
- Semi-colon (;) Separator between seconds and frames indicates drop-frame, non-integer frame rates
- hh = hours (24 hour clock)
- mm = minutes
- ss = seconds
- ff = frame number

When enabled, the ATC panel is displayed in the top-center of the window by default and you can adjust both its position down the center line (top, middle or bottom) and the panel size (small, medium, large or automatic size adjustment) for ease of viewing.

The option **Anc Time Code Field** allows you to activate the display of the field number, after the two digits of the frame number.

When you enable the display of ancillary time code information, the option **Anc Time Code Type** allows you to choose whether to display the default ancillary time code - vertical interval time code (ATC-VITC) or an ancillary time code - linear time code (ATC-LTC).

SCTE 104 Packet Detection

SCTE 104 is the broadcast industry standard for including specific program signals and markers in the video signal, for example, program parts, commercial breaks, etc.

When this option is enabled, the Analyzer - Picture window displays a list of SCTE 104 messages in the Message Center, with the most recent displayed at the top of the list. On receipt, the OpID code of each SCTE 104 message is displayed for at least one second, depending on the configured message timeout period.

The unit displays the following information for each SCTE 104 message received:

- SCTE 104 operation ID (OpID) - identifies the SCTE 104 message type.

You can choose to display the message OpID in either hexadecimal or decimal format.

If you are interested in SCTE 104 messages, it is recommended to enable SCTE 104 messages in the Event Logging instrument so that the full message type is saved to the logfile.

Source Name Dialog

The unit provides a facility to enter identification strings for input sources, for example, cameras, etc. to identify the source of the input stream. The Input Name is displayed in the Message Center.

You can choose either to enter the input name manually, or configure the Data Identifier (DID) and Secondary Data Identifier (SDID) value of the input name in the ancillary data of the input stream.

The Input Name is an ancillary data packet with the following message structure:

Ancillary Data Flag			DID	SDID	DC	Data	CS
0x000	0x3ff	0x3ff	0x53	0x49	nn	up to 12 ASCII chars	

Figure 4-9: Input Name Message Structure

In addition, you can define a prefix to be applied to the source input name, for example: **Input ID:**.

Enter a source Input Name as follows:

1. Select the **cog** softkey to open the menu.
2. Select **Enabled** from the **Input Name** dropdown.
This displays the **Input Name Configuration...** control.
3. Use **Input Name Configuration...** to open the Input Name Configuration dialog.
4. Use the onscreen keyboard to configure an input name as follows:
 - a. If you require a standard prefix for your input names, enter the prefix text string into the **Prefix** field.
 - b. To enter an input name, either select **User Entered** and enter the name using up to a maximum of 12 characters.
Alternatively, to extract an input name automatically from the ancillary data in the input

feed, select Mode then **Ancillary Data** and enter the target DID and SDID. You can specify the DID/SDID using either decimal (default) or hex notation.

5. Select **OK** to save the input name.

A dark-themed dialog box titled "Input Name Configuration:". It contains three input fields: "Mode" with a dropdown menu showing "User Entered", "Prefix" with a text input field, and "Name" with a text input field. At the bottom right, there are two buttons: "OK" and "Cancel".

Input Name Configuration:

Mode User Entered ▼

Prefix

Name

OK Cancel

Figure 4-10: Input Name Configuration Dialog

Advanced HDR Toolset

Requires Option(s):	Sx2-HDR
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Overview

The comprehensive advanced HDR toolset includes a signal generator for HDR test patterns, luma false color highlighting (or heat map), a waveform monitor and vectorscope. The HDR toolset supports all the main live production formats for both SDR and HDR.

For Standard Dynamic Range (SDR), the toolset supports:

- BT.709
- BT.2020

For High Dynamic Range (HDR), the toolset supports:

- BT.2100 HLG
- PQ
- Sony S-Log3
- Sony SR Live

The Analyzer - Waveform instrument provides a Nits (Cd/m^2) graticule along with BT.2048 diffuse white markers. The flexible user-controlled HDR heatmap highlights signals beyond SDR with seven simultaneous programmable color overlay bands with presets for HDR and SDR ranges, plus a user-definable preset.

An extensive set of test patterns includes BT.2111 HDR color bars for HLG, PQ and SR Live as well as a full set of SDR 709 patterns mapped to each of the four HDR formats using *display light* for line checks, comparative monitor set-up and evaluation of HDR to SDR converters.

HDR Test Patterns

In addition to the standard SDR test patterns which are converted to HDR, the Advanced HDR toolset provides an additional two native HDR test patterns. These test patterns are available when you select one of the following HDR WCG (Wide Color Gamut) options from the **Gamut** and **OTF** lists in the dialog of the **Video Generator** Instrument:

- 2020 HLG
- 2020 PQ
- 2020 S-Log3
- 2020 S-Log3 SR Live

The available test patterns for a selected video standard are displayed in the **Test Pattern Generator**. The native HDR test patterns are as follows:

- ITU-R BT.2111-0 HDR Color Bars
- ITU-R BT.814-4 PLUGE

In addition, all other test patterns are converted to HDR when generating an HDR signal, see the section [Test Pattern Generator](#) for a detailed list. Both S-Log3 and SR Live [S-Log3 (HDR Live)] test pattern variants are available.

Transfer Curve and Colorimetry Overrides

HDR content may still contain the SMPTE payload ID for SDR and Rec.709 color space (as standard).

When analyzing HDR and WCG content, therefore, you may want to use Manual Configuration... which can be found in the context menu of the Video Standard page, see [Video Standard Context Menu](#) to apply a manual override configured as follows:

- Transfer Curve Override OTF is set to HLG or PQ
- Colorimetry Override Gamut is set to 2020.

HDR Heat-map (False Color Overlay)

A false color overlay can be applied to the image displayed in the **Picture** instrument to highlight luminance ranges that are of particular interest.

The active picture can also be displayed in monochrome using grayscale shades. When enabled at the same time as false color highlighting, all highlighted image elements are displayed in color while the rest of the image is displayed in monochrome.

Different types of pre-defined false color overlay may be applied to highlight different values of pixels in the active picture, and the custom mode is provided to create a bespoke overlay.

The range and colors of a selected false color overlay can be modified by adjusting the seven overlay bands. Up to seven distinct ranges can be simultaneously enabled in a single overlay. Modifying any of these updates the Custom overlay.

Note: You can use the color picker to make a coarse selection by tapping on the color selectors, then made fine adjustments by editing the numerical values. Alternatively, select the upper or lower boundary values displayed above the color selectors. This opens a dialog where you can adjust the values. Altering any preset in False Color Highlighting mode (e.g., PQ HDR), will update the Custom overlay.

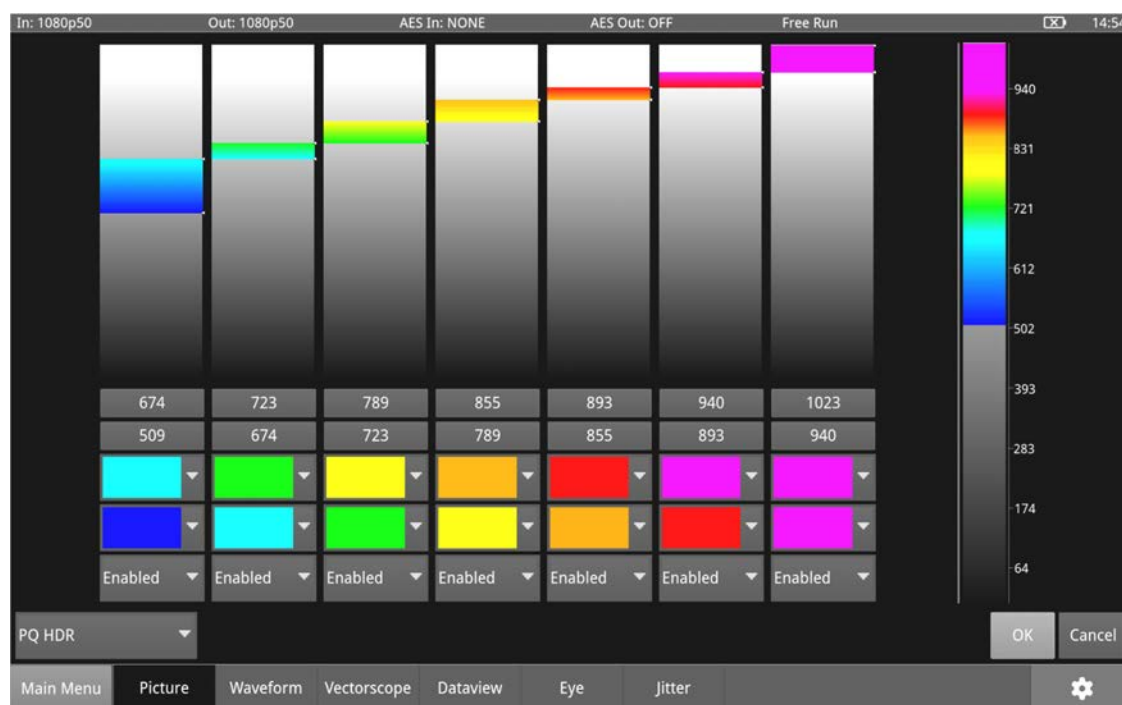


Figure 4-11: Configuring the False Color Overlay Ranges (PQ HDR Definition)

When False Color Overlay Scale is enabled, a scale is displayed on the right of the Picture window, overlaid on the active picture (see the following figure). The scale is set to Decimal Level, Percent, PQ Nits or HLG Nits in the Luminance Measurement dropdown menu.



Figure 4-12: False Color Overlay Scale Applied (Decimal Luminance Scale)

HDR Options in Analyzer - Picture Instrument Menu

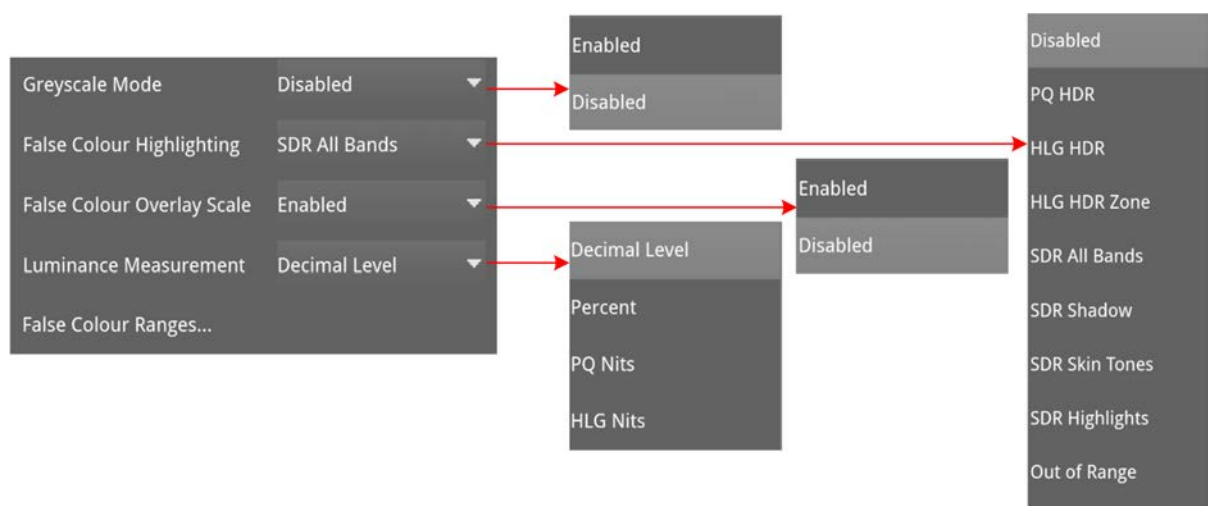


Figure 4-13: HDR Options in Analyzer - Picture Context Menu

The following table lists the options for the Advanced HDR Toolset available in the **Picture** instrument context menu:

Table 4-3 : HDR Menu Options for the Picture Instrument

Item	Options	Description
Grayscale Mode	Disabled (Default) Enabled	When enabled, displays the active picture using a grayscale.
False Color Highlighting	Disabled (Default) PQ HDR HLG HDR HLG HDR Zone SDR All Brands SDR Shadow SDR Skin Tones SDR Highlights Out of Range S-Log3 Out of Range Custom	Selects the type of false color overlay required. Note: The Out of Range overlay is defined to highlight pixels out of the EBU R103 narrow range, i.e., super-whites and sub-blacks are highlighted.

Item	Options	Description
False Color Overlay Scale	Disabled (Default) Enabled	When enabled, displays a scale, showing both numeric and color representation of the range(s) for the selected overlay, at the right-hand side of the window.
Luminance Measurement	Decimal Level (Default) Percent PQ Nits HLG Nits	Selects the measurement units used in the false color overlay scale and in the configuration of the false color ranges.
False Color Ranges	Disabled (Default), PQ HDR, HLG HDR, HLG HDR Zone, SDR All Bands, SDR Shadow, SDR Skin Tones, SDR Highlights, Out of Range, S-Log3 Out of Range, Custom	Opens the false color highlighting dialog. Refer to Figure 4-11 . Adjust any of the overlay bands to modify the range(s) of colors highlighted by the overlay when applied to the active picture. You can enable up to seven distinct ranges simultaneously in a single overlay. If adjusted, the modified overlay is saved as the Custom overlay.

Waveform

Overview

Note: Some of the features described in this section require the Sx2-HDR software license to process high dynamic range (HDR) signals. These are marked in the text as **HDR Only** where appropriate.

The **Waveform** instrument displays the selected input video signal as a waveform in a number of selectable waveform and display modes.

In addition, the Waveform instrument provides numerous analytical tools including:

- Various filters
- Single-line mode link with Vectorscope instrument for Cb/Cr analysis
- Picture cursor control linked to Dataview and single line modes of the Waveform and Vectorscope instruments
- Pixel cursor (picture cursor) which can be set via the touchscreen
- Full-width display (allows Waveform and Picture displays to be stacked for visual comparison)
- Highlight markers (including user-defined markers)
- Configurable horizontal (Y-axis) or vertical (X-axis) measurement cursors
- Zoom and panning functions for waveform inspection.

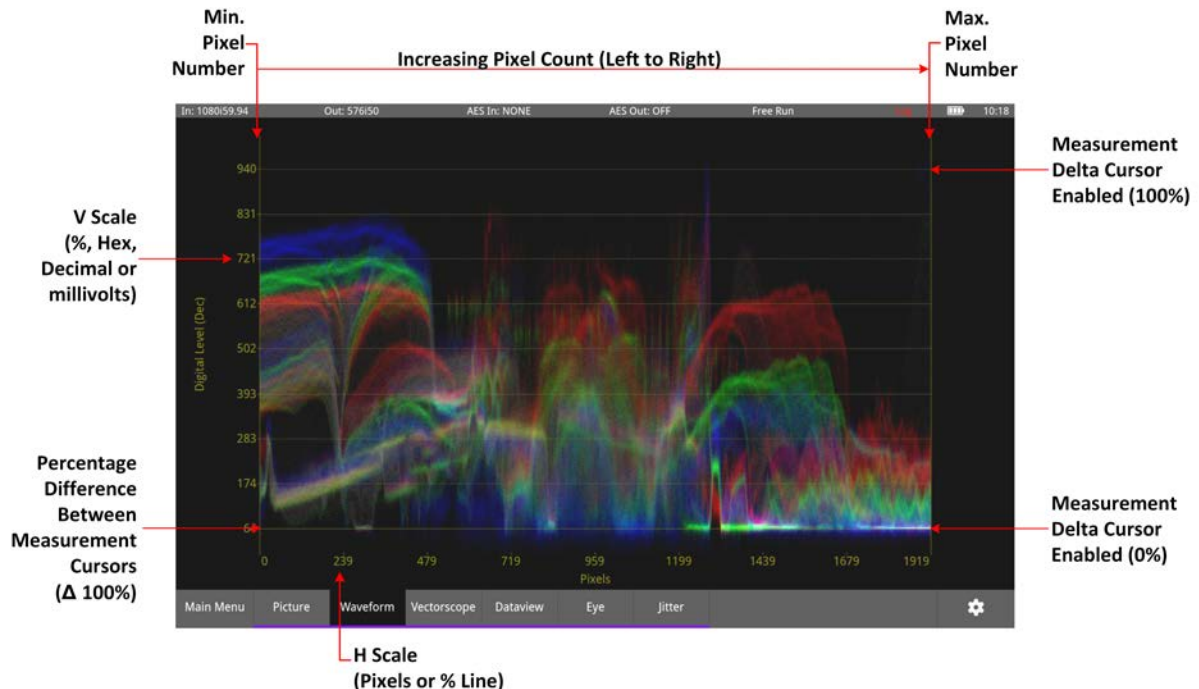


Figure 4-14: Waveform Instrument (Overlay Waveform Mode)

You can use the Waveform instrument in combination with the Picture and Dataview instruments. When the option **Picture Cursor** is enabled in both instruments, the cursors become dynamically linked. Tap a position in the Picture window to update the pixel and line positions selected in the Waveform instrument, and to update the active picture line and pixel positions selected in Dataview.

Analyzer - Waveform Display Modes

The waveform instrument can display up to four channels for analysis of the video signal color-space components in one of the following display modes:

- **YCbCr**: Luma (Y), Cb, and Cr components
- **YCbCrA**: Luma, Cb, Cr and Alpha (A) components
- **Y**: Individual Luma component
- **Cb**: Individual Cb component
- **Cr**: Individual Cr component
- **RGB**: Red, Green, Blue components
- **GBR**: Green, Blue, Red components
- **YRGB**: Luma, Red, Green, and Blue components
- **YGBR**: Luma, Green Blue, Red components
- **RGBA**: Red, Green Blue, Alpha components
- **GBRA**: Green, Blue, Red, Alpha components
- **Red**: Individual Red component
- **Green**: Individual Green component
- **Blue**: Individual Blue component
- **Alpha**: Individual Alpha component
- **Custom**: Customize the display (see below).

When selected, the Waveform instrument displays the Alpha component of a waveform in white, that is, the same color as the Luma (Y) component and monochrome color mode.

Setting the Vertical and Horizontal Scales

You can choose to display various vertical scales at either the left- or right-hand side of the component display and to set the horizontal scale to pixels, percentage of the video line, or even to hide it.

[Figure 4-15](#) is a schematic representation of the horizontal and vertical scales available for use with the Waveform instrument in Overlay waveform mode with an SDR standard (2048 x 1080 p50 BT.709 SDR YCbCr:422 10bit NR) and at full screen size. The following figure shows the equivalent vertical scales available when analyzing the same standard but at a full range bit depth.

For the Digital Level V scale (Y-axis), you can choose to measure in the following units:

- Percentage of the color code range
- Hexadecimal color code values
- Decimal color code values
- mV.

Similarly you can set the H scale (X-axis) to number of pixels or to percentage of the picture line.

When the HDR license is available (**Sx2-HDR**) the Luma (Y) channel can be configured to be displayed with either a Nits or Percent scale. By default, this appears on the right-hand side of the Luma (Y) waveform, but you can choose to switch this to the left-hand side or hide it completely. If you switch to display on the left-hand side, the Digital Level scale switches to the right-hand side of the Luma (Y) waveform.

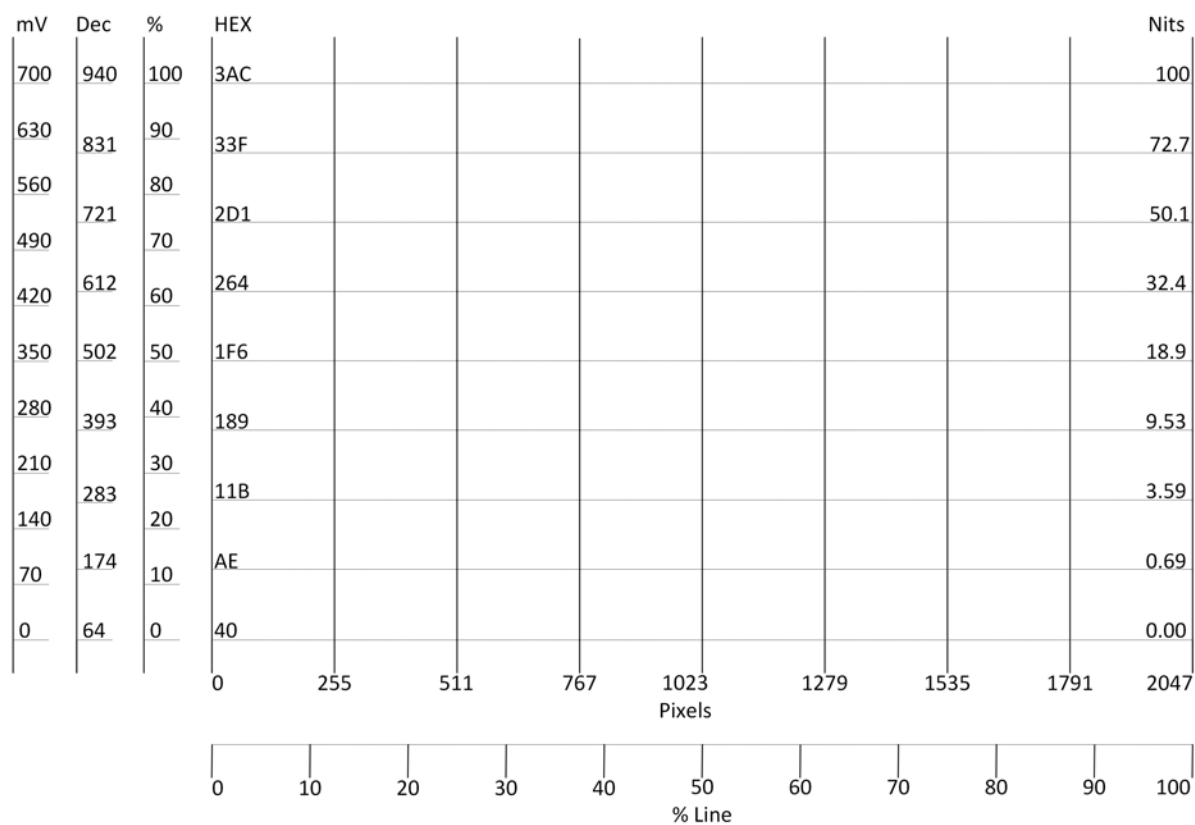


Figure 4-15: Waveform Scales (Overlay Mode; SDR 2048 x 1080; NR, Full Screen Size)

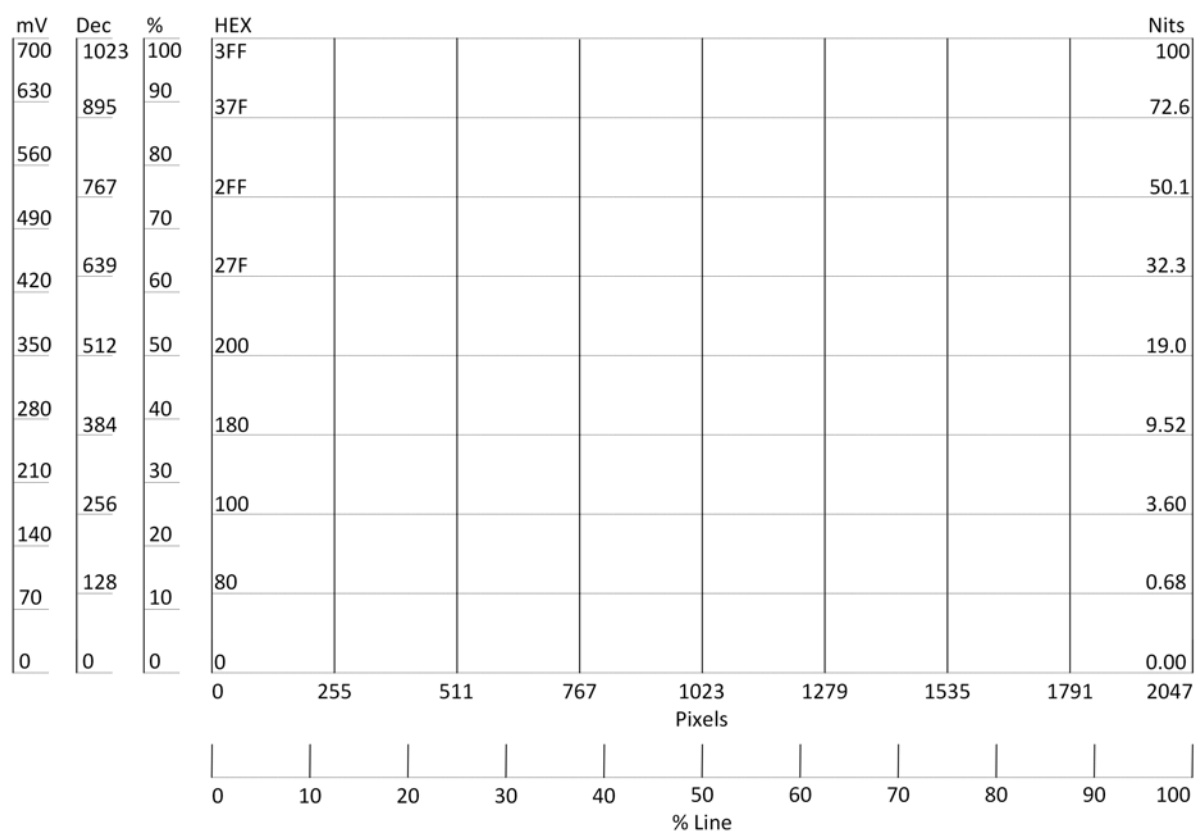


Figure 4-16: Waveform Scales (Overlay Mode; SDR 2048 x 1080; FR; Full Screen Size)

Note: The Nits scale is not displayed for either of the Cb or Cr components.

The Nits scale is displayed from 0 to 100 cd/m^2 for the SDR transfer curve. For source inputs using the HDR transfer curves, the Nits scale is extended beyond 100 cd/m^2 .

Using Full-width Screen Mode

The mode allows Waveform and Picture displays to be stacked for visual comparison. A full-width mode is available to display all waveforms in Stacked, Overlay or single-channel Parade waveform modes. The unit displays the selected waveforms across the full width of the Waveform window. The vertical and horizontal scales are superimposed over the waveforms.

To benefit from the use of the Full-width mode, the user must use a Quad-split view where the Picture display is stacked above the Waveform display, as shown in the figure below.

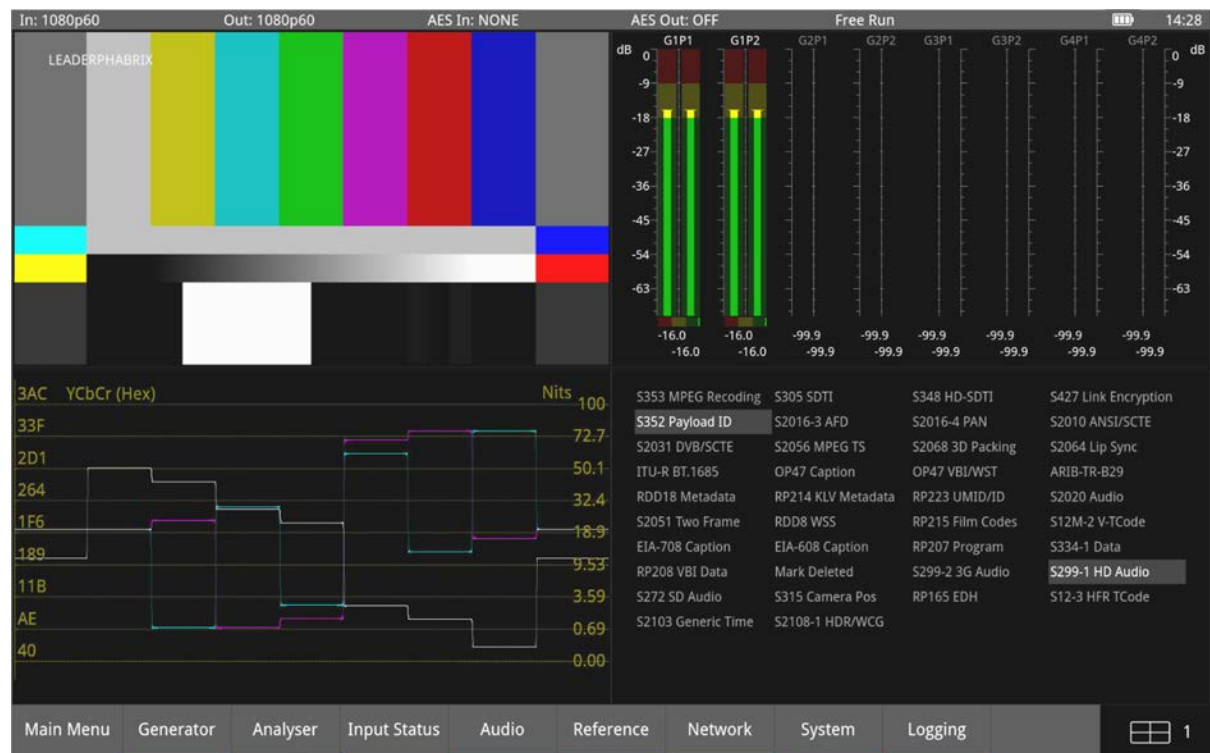


Figure 4-17: Quad-split Mode showing Full-width Mode Aligned with Waveform Display

Using the Custom Display Mode

In addition to using the standard display modes, you can use the Custom Display Mode Configuration option to define your own selection of channels chosen from Y, Cb, Cr, Red, Green, Blue and Alpha.

To do so, open the **Custom Display Mode Config...** sub menu from the context menu. You can define a display mode of up to four channels by selecting a desired luma/chroma component from the dropdown menus. Channels 2, 3 and 4 dropdown menus become active only after you select a Display Mode for the previous channel.

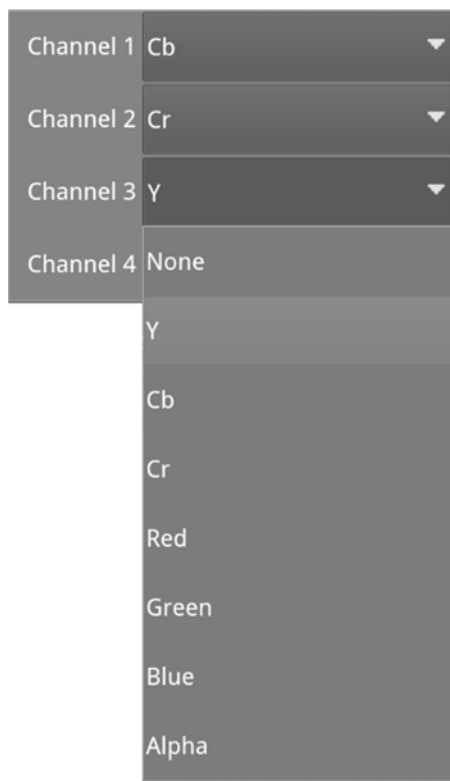


Figure 4-18: Waveform Instrument Custom Display Mode Configuration Menu

To activate your defined custom display mode, select the **Custom** option from **Display Mode** dropdown.

Analyzer - Waveform Modes

The following figure shows the source Picture and waveform analysis for each waveform mode in the display modes YCbCr and RGB.

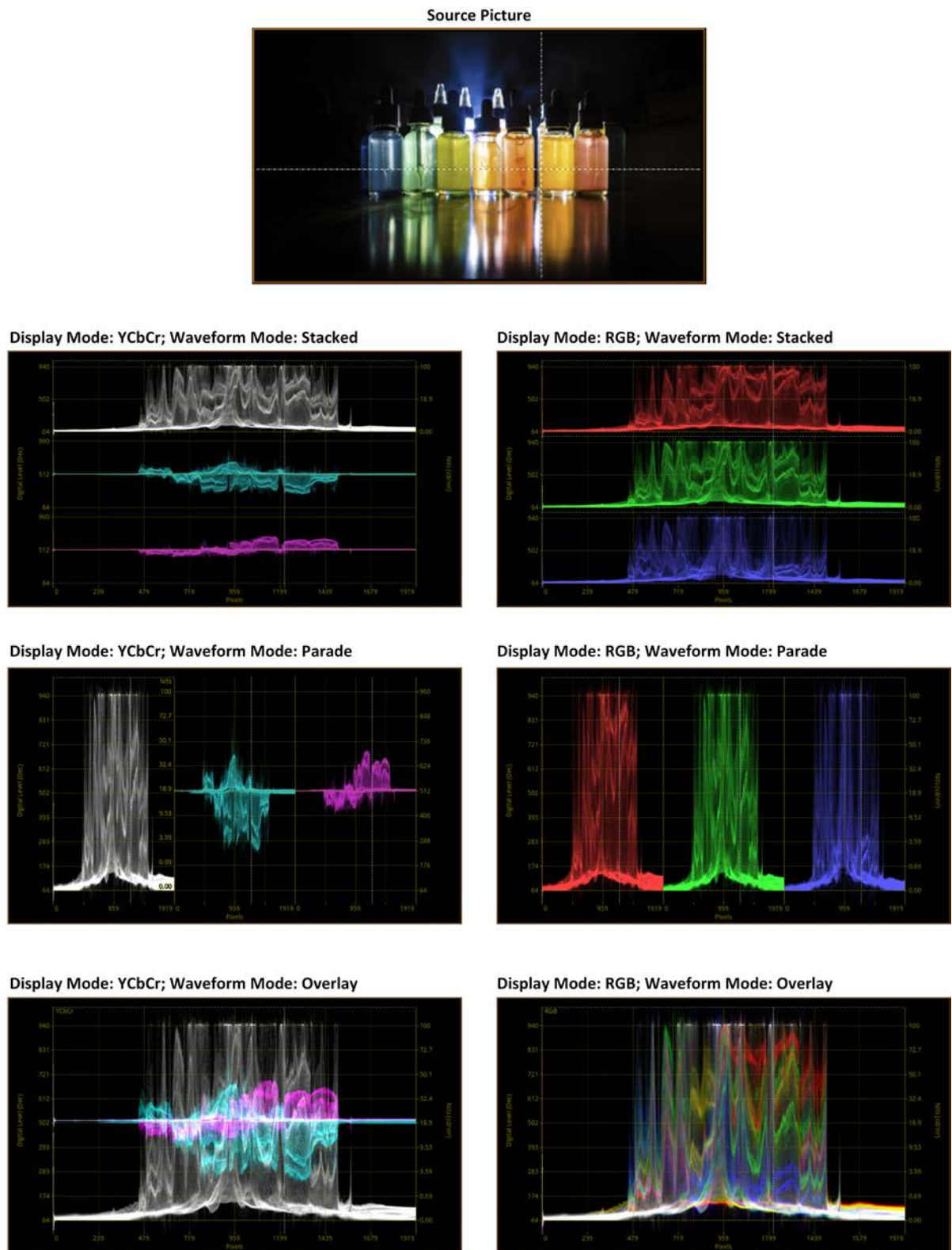


Figure 4-19: Waveform Modes for YCbCr and RGB Display Modes

For the **Parade** mode waveform, you can choose from the following display modes:

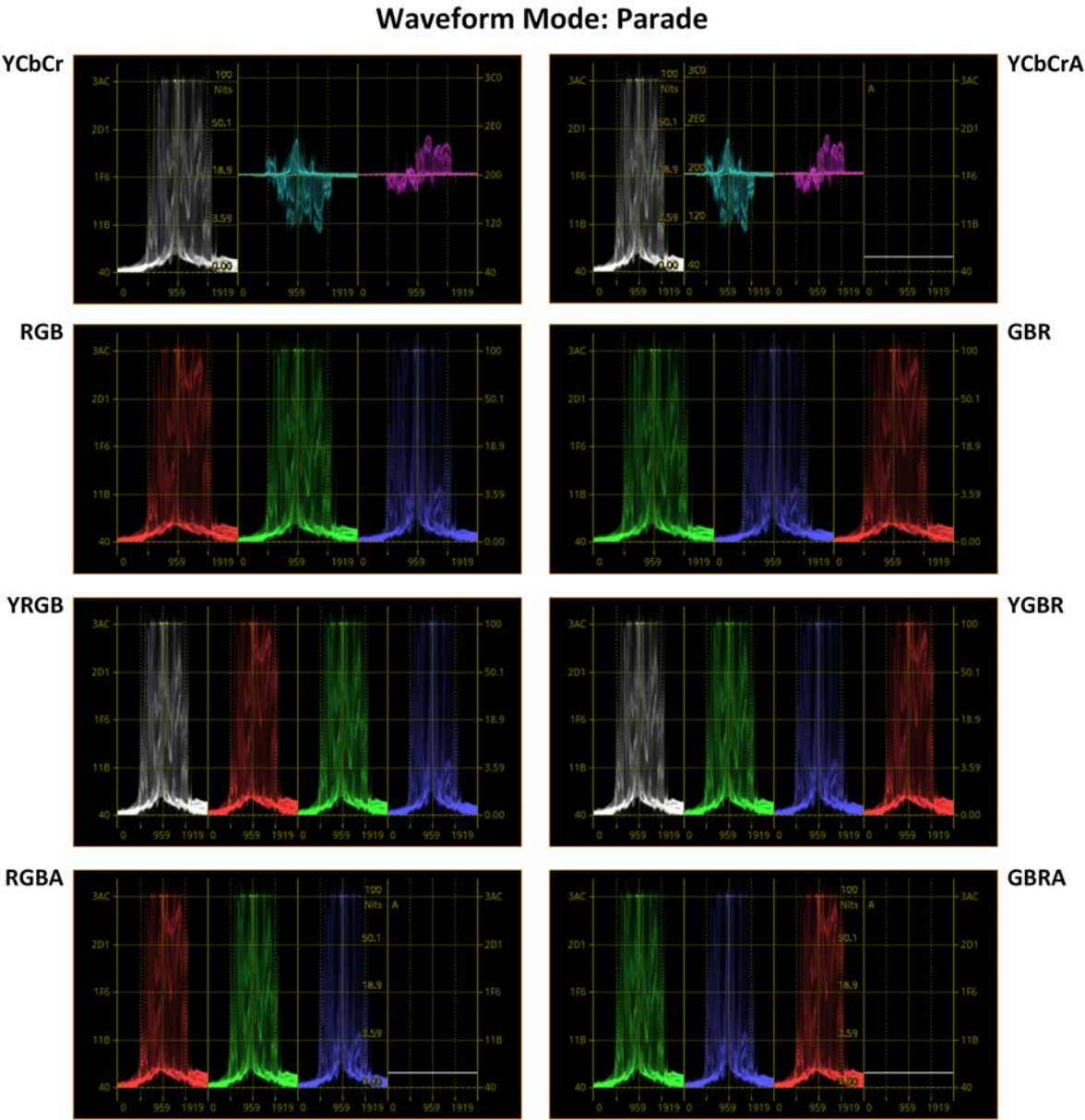


Figure 4-20: Parade Waveform Display Modes (Excludes Single Waveforms)

For the **Stacked** mode waveform, you can choose from the following display modes:

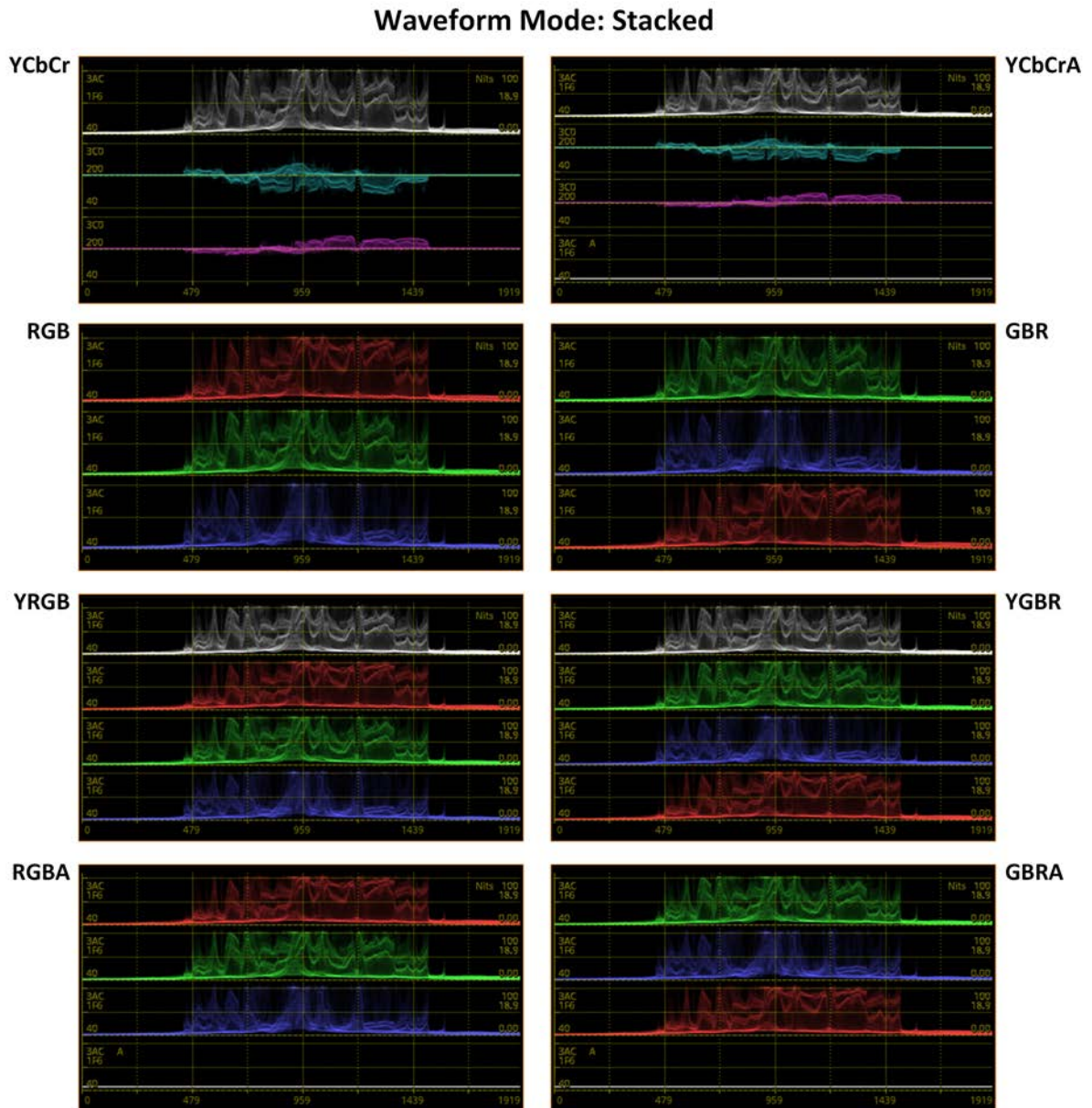


Figure 4-21: Stacked Waveform Display Modes (Excludes Single Waveforms)

The Overlay mode superimposes each waveform on top of the other, the layout of the screen does not change in Overlay mode.

Using the Zoom and Panning Controls

Note: Vertical magnification is not possible when using the stacked waveform mode.

The Waveform instrument provides controls in the options menu that enable you to zoom in/out of the displayed waveform. With the options menu open:

- Adjust the **H Magnification** slider control to zoom in/out along the horizontal axis of the waveform.
- Adjust the **V Magnification** slider control to zoom in/out along the vertical axis of the waveform
- Adjust the **H position** slider control to pan horizontally to keep the point of interest in the Waveform display. (This control becomes available when you increase the H Magnification setting above 1.)

- Adjust the **V Position** slider control to pan vertically to keep the point of interest in the Waveform display. (This control becomes available when you increase the V Magnification setting above 1.)

Using Picture and Dataview with the Waveform Instrument

The Picture Cursor position sets the position of the Dataview Cursor and Waveform Cursor. The Picture Cursor must be enabled to be visible. The cursor can then be moved using any of these three instruments. If single line mode is selected in the Vectorscope or Waveform instruments, that mode is set for both, using the line selected by the Picture Cursor.

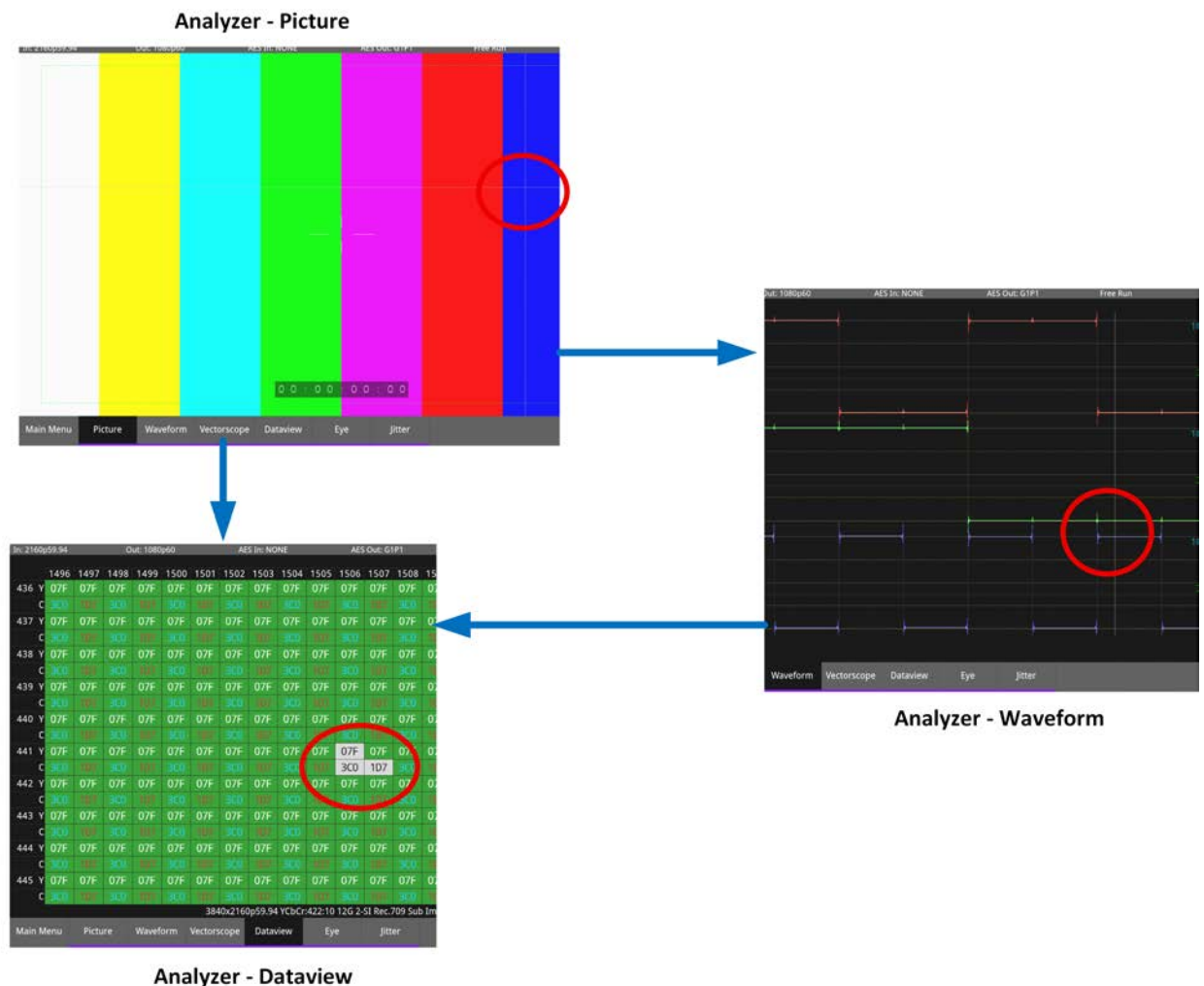


Figure 4-22: Automatic Linking of Picture Cursor in Picture, Waveforms, and Dataview

Adjusting the User Markers in Vectorscope only alters their display in the Cb/Cr waveforms in waveform. Adjusting the User Markers in **Waveform** only affects the markers displayed on the Y waveform (YCbCr parades, stacked or overlay) or the user markers across R, G and B waveforms (RGB parades). The adjustment is not applied to the Vectorscope.

In addition, you can also use single-line mode without filtering (Raw mode selected) to perform detailed technical analyzes of a waveform without artifacts generated by filtering. For information about the available filters, see the section [Context Menu](#).

Using the Vectorscope with the Waveform Instrument

You can use the Vectorscope and Waveform instruments in combination to analyze the Cb/Cr channels. If you enable single line mode in the Vectorscope, it is also automatically enabled in the Waveform instrument. Similarly, when the Cb and/or Cr channels (stacked and parade waveform modes only) are active, any adjustment of the user markers in the Vectorscope is also reflected in the markers of the Waveform instrument.

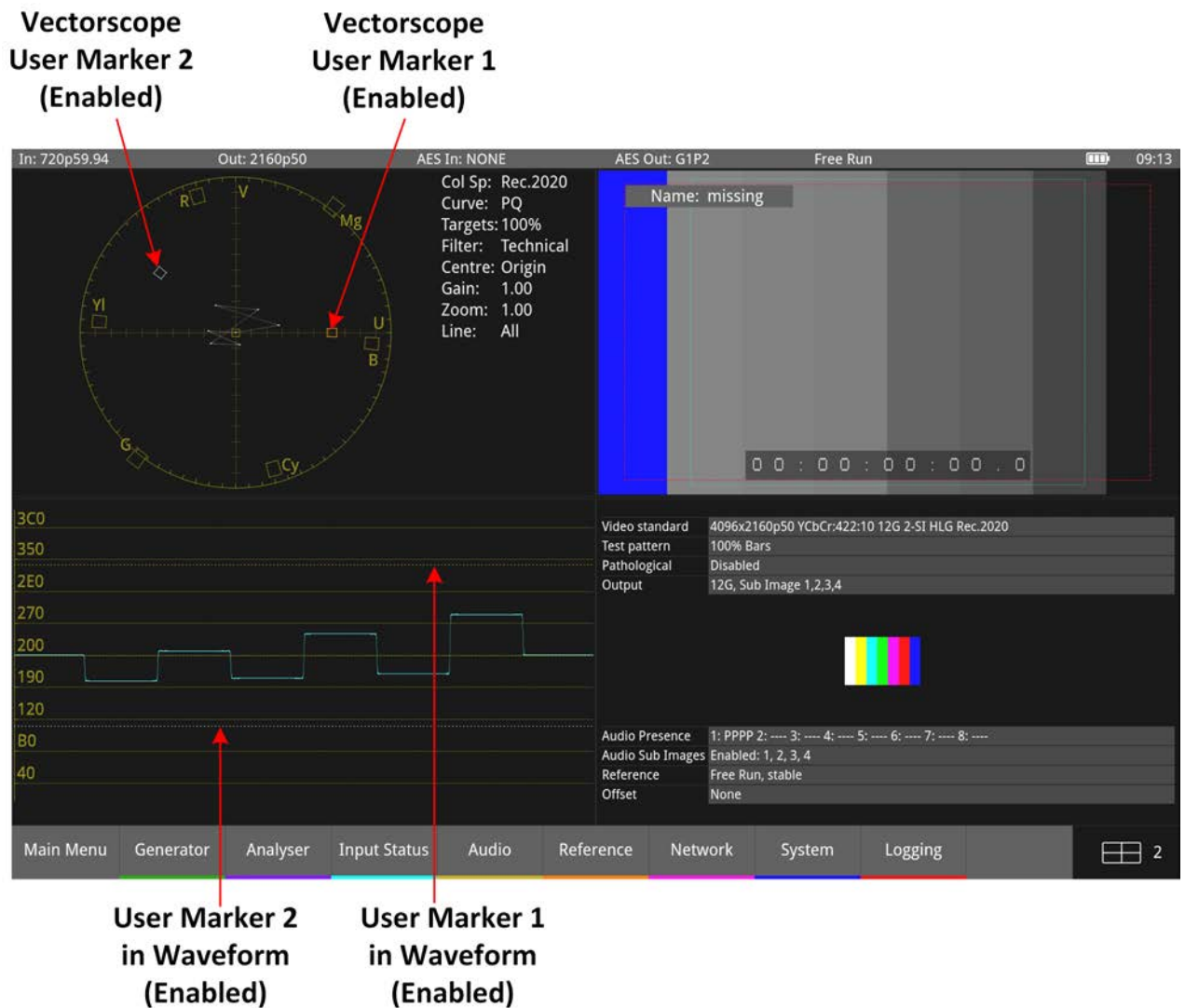


Figure 4-23: Displaying Vectorscope User Markers in the Waveform Instrument

Note: Vectorscope user markers must be controlled from the Vectorscope. User marker changes made in the Waveform instrument are not reflected in the Vectorscope.

Context Menu

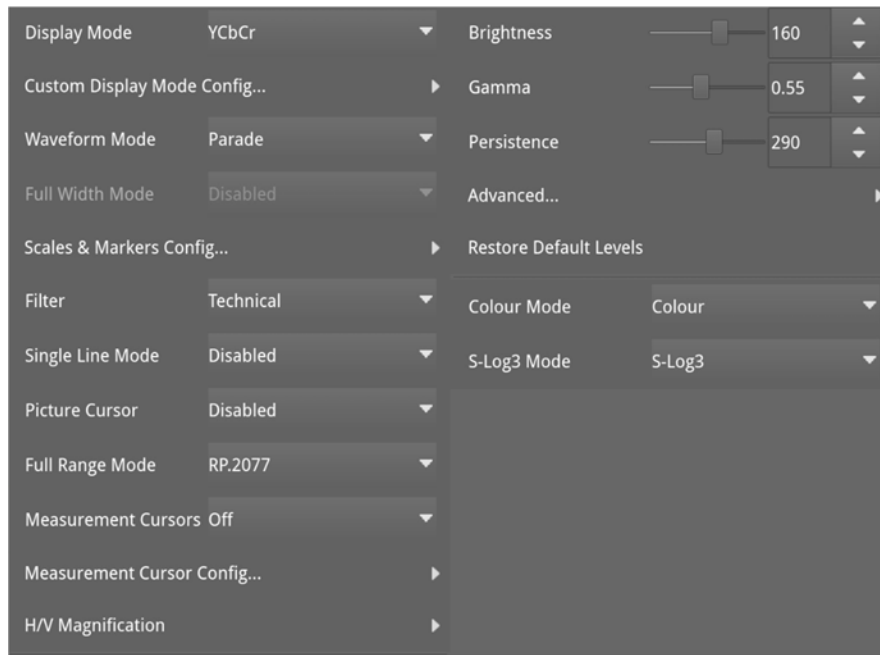


Figure 4-24: Components of the Picture Instrument with HDR option

The following table lists the configurable parameters in the Analyzer - Waveform instrument:

Table 4-4 : Analyzer - Waveform Options

Item	Options	Description
Display Mode	YCbCr (Default) YCbCrA Y Cb Cr RGB GBR YRGB YGBR RGBA GBRA Red Green Blue Alpha Custom	Selects the desired display mode in which to display the waveforms. For more information, see Analyzer - Waveform Display Modes .
Custom Display Mode Config...	System Control	Opens the Custom Display Mode Channel configurations submenu. See Custom Display Mode Configuration below for submenu parameters. For more information, see Using the Custom Display Mode .
Waveform Mode	Parade (Default) Stacked Overlay	Parade - displays each individual waveform separately, in horizontal, side-by-side graphs. Stacked - displays each individual waveform in vertical stacked graphs. Note: vertical magnification is not supported in this waveform mode. Overlay - displays each individual waveform on the same graph, superimposed on top of each other.

Item	Options	Description
Full Width Mode	Enabled Disabled (Default)	In Parade mode, you can only enable full-width mode for a single channel. When you select waveform modes Stacked, Overlay, or any single channel Parade (Red, Cb, Cr, etc), you can enable in full-width mode.
Scales & Markers Config...	System Control Opens the Scale & Marker config submenu	See Scales & Markers Configuration below for submenu parameters.
Filter	Technical (Default) Production Low Pass Raw	Selects the type of filtering applied to the waveform. When you select the Raw option, no filtering is applied and no waveform drawn, thus eliminating filtering artifacts. Instead, the values of the pixels in the image are represented as individual points on the graph.
Single Line Mode	Enabled (Default) Disabled	When enabled, allows single line mode analysis of the active picture. When disabled, all lines in the active picture are represented as waveforms, one per line. This setting is automatically reflected in the Vectorscope instrument.
Line Number	System Control One to the total number of active lines in the selected standard	In single line mode, selects the line in the active picture for analysis.
Picture Cursor	Disabled (Default) Enabled	When enabled, dynamically links the picture cursor to the Dataview, Waveform and Vectorscope analysis instruments so that measurements from the selected picture position can be taken from these tools at the same time.
Pixel Number	System Control 1 to Maximum Pixel Number	When Picture Cursor enabled, selects a specific pixel number. Tapping the touchscreen can be used to position the cursor approximately on the waveform, then the menu controls can be used to adjust the position. Note: If you tap and hold the position on the touchscreen, a tool-tip displays the pixel number at the touched position.
Full Range Mode	RP.2077 (Default) SDI Protected	Uses full range, by default, as defined in SMPTE RP 2077 <i>Full-Range Image Mapping</i> but can be set to use full protected range, as required. For more information see Colorimetry Range Definition for the Sx2 .
Measurement Cursors	Off (Default) Single Both	Enables either one (Single) or two (Both) measurement cursors. When initially displayed, the Reference cursor is displayed as a green dotted line located at the bottom of the waveform display (0%). If you choose to display both cursors, the Delta cursor is displayed as a blue dotted line at the top of the waveform display (100%). When not Off, horizontal cursors are displayed, measuring against the Y axis. You can change the orientation of the measurement cursors in the Measurement Cursor Config... submenu.
Measurement Cursor Config...	System Control	Opens the Measurement Cursor configuration submenu. See Measurement Cursor Configuration below for submenu parameters. For more information see Using the Waveform Measurement Cursors .
Ref Cursor Position	Slider Control	Available when one or both measurement cursors are enabled. Moves the Reference cursor (green) to adjust the reference level.
Delta Cursor Position	Slider Control	Available when both measurement cursors are enabled and independent. Moves the Delta cursor (blue) to adjust the difference (delta) between the two cursors.

Item	Options	Description
Cursor Differential	Slider Control	Available when both measurement cursors are enabled and linked. Moves the Delta cursor (blue) relative to the Reference cursor (green) while keeping the Reference cursor static.
H/V Magnification	Slider control: 1.00 (Default) to 10.00	Opens sliders to adjust the horizontal and vertical magnification of the waveform. Use the slider to zoom in to the waveform, providing a better view of a waveform section. When you increase the horizontal or vertical magnification above 1.00, the position control becomes available to pan along the waveform. Use this control together with the H and V Position sliders to adjust the point of interest in the waveform. Note: The Waveform and Vectorscope instruments are all linked so that when you adjust the Horizontal Magnification in the Waveform instrument, it also adjusts the Horizontal Magnification in the other linked instruments.
H Position	Slider control Horizontal Axis	Displayed when the horizontal magnification is greater than 1. Pans along the horizontal axis of the waveform. Enables you to shift horizontally the displayed portion of the waveform, when the position of interest moves out of view when zooming.
V Position	Slider control Vertical Axis	Displayed when the vertical magnification is greater than 1. Pans along the vertical axis of the waveform. Enables you to shift vertically the displayed portion of the waveform, when the position of interest moves out of view when zooming.
Brightness	Slider control: 1 to 255 (Default: 160)	Adjusts the brightness of the waveform display.
Gamma	Slider control: 0.2 to 1.00 (Default: 0.55)	Adjusts the gamma component of the waveform display.
Persistence	Slider control: 0 to 511 (Default: 290)	Adjusts the persistence of the waveform display.
Advanced...	System Control	Enables you to adjust the gain on any of the four channels independently. See Advanced Waveform Controls below.
Restore Default Levels	System Control	Resets the Waveform instrument to its default gain levels.
Color Mode	Color (Default) Highlight Green Monochrome	Selects the desired palette for the waveforms from four different color modes. The Highlight option adds a white highlight to the input component logarithmically proportional to the amount of the displayed color.
S-Log3 Mode (HDR only)	S-Log3 (Default) SR Live	Use when analyzing an S-Log3 or S-Log3 SR Live signal. Set the SR Live to extend the range of the Nits scale.
Custom Display Mode Configuration		
Channel 1	Y Cb (Default) Cr Red Blue Green Alpha	Selects any of the available single Display Modes to display in the Channel 1 position.

Item	Options	Description
Channel 2	None Y Cb Cr (Default) Red Blue Green Alpha	Selects any of the available single Display Modes to display in the Channel 2 position.
Channel 3	None (Default) Y Cb Cr Red Blue Green Alpha	Selects any of the available single Display Modes to display in the Channel 3 position.
Channel 4	Disabled (Default) None Y Cb Cr Red Blue Green Alpha	Enabled only when you select a parameter for Channel 3. Selects any of the available single Display Modes to display in the Channel 4 position.
Scales & Markers Configuration		
V Scale	Percent (Default) Hex Value Decimal Value Millivolts	Selects the units for the vertical (Y-axis) scale in the instrument window.
HDR Scale (HDR Only)	Percent (Default) Nits	Selects the units for the second vertical (Y-axis) scale in the instrument window displayed at the left-hand side by default.
V Scale HDR (HDR Only)	Hidden Right Side (Default) Left Side	Selects the position of the second vertical (Y-axis) luma scale. By default the scale is positioned on the right-hand side of the Y waveform. If the right-most channel is Cr or Cb, the scale is displayed (by default) to the right of the Y channel, if present.
H Scale	Pixels % Line None (Default)	Selects the units for the horizontal (X-axis) scale in the instrument window. To switch off the display of the H Scale, select None.
V Graticules	Disabled (Default) Enabled	When enabled, displays vertical graticules on the waveform graph. These are disabled by default for enhanced observation of the waveform details.
H Graticules	Disabled (Default) Standard Nits Preferred (HDR only)	When enabled, displays horizontal graticules on the waveform display. These are enabled by default.
Reference Level Marker (HDR Only)	Disabled Enabled (Default)	When enabled, displays a reference level marker across all waveforms at a fixed value of 203 cd/m ² (nits), when analyzing an HDR signal. When enabled, the marker is set at 58% for Perceptual Quantizer (PQ) and 75% for Hybrid Log-Gamma (HLG) color ranges.

Item	Options	Description
Peak White Marker (HDR Only)	Disabled (Default) 1000 Nits 2000 Nits 4000 Nits 10000 Nits	When enabled, displays a peak white marker across all waveforms in HDR standards at a selectable level in Nits.
User Markers (Dec)	Disabled (Default) Enabled	When enabled, this feature allows you to position user markers anywhere in the waveform display (Y channel). Provides two sliders for Marker 1 and Marker 2, which you can adjust along the V Scale (Y-axis).
Marker 1 and Marker 2	Slider Controls	When User Markers are enabled, adjust from the minimum to maximum value of the selected V Scale. These values are expressed in the unit set by the V Scale option.
Measurement Cursor Configuration (Refer to Using the Waveform Measurement Cursors).		
Cursor X/Y Select	Y (Default) X	Selects either horizontal Y-axis cursor(s) or vertical X-axis cursor(s) to display along the Y-axis or X-axis, respectively.
Cursor Scale (if Y cursor(s) selected)	Percent (Default)	Selects the required scale for the Y-axis cursor measurements. Displays measurement values as a percentage of the range of luma/chroma values.
	Percent Ref	Displays measurement values as a percentage of the reference value at the point you selected Set % Reference , or the default reference (0%) if no user-defined reference is set.
	Millivolts	Displays measurement values in millivolt units.
	Hex Value	Displays measurements as hexadecimal values.
	Decimal Value	Displays measurements as decimal values.
	Nits	Displays measurement values in Nits. (HDR Only).
Cursor Scale (if X cursor(s) selected)	Percent (Default)	Selects the required scale for the X-axis cursor measurements. Displays measurement values as a percentage of the waveform width.
	Pixel	Displays measurement values in a number of pixels.
	Time	Displays measurement values in microseconds.
	Frequency (kHz)	Displays measurements in units of kHz.
Cursor Values	Displayed (Default) Hidden	Choose whether to display the values measured at the current cursor position and the difference between the values when both cursors are active.
Cursor Adjustment	Independent (Default) Linked	When both cursors are active, you can choose whether you want to move each cursor independently of the other or to link both cursors. When linked, both cursors move together as a unit, maintaining a fixed separation between them.
Set % Reference	System control	The Reference cursor sets the 0% mark, the Delta cursor sets the 100% mark, in between is a 100% range.
Reset % Reference	System control	Reverts the change introduced using Set % Reference. Both cursors also return to their original default positions at top or right (100%) and bottom or left (0%) of the waveform display.

Item	Options	Description
Advanced Waveform Controls		
Channel 1 Gain	Slider control: 0 to 1.9 1.50 (Default)	Adjusts the gain setting for the Channel 1 waveform. The gain setting enables you to adjust the brightness of the trace displayed in Channel 1, changing its brightness independently of the components in the other channels. This functionality is useful when using the Overlay waveform mode, especially in combination with single-line analysis.
Channel 2 Gain	Slider control; 0 to 1.9 1.50 (Default)	Adjusts the gain setting for the Channel 2 waveform. The gain setting enables you to adjust the brightness of the trace displayed in Channel 2, changing its apparent brightness independently of the components in the other channels.
Channel 3 Gain	Slider control; 0 to 1.9 1.50 (Default)	Adjusts the gain setting for the Channel 3 waveform. The gain setting enables you to adjust the brightness of the trace displayed in Channel 3, changing its apparent brightness independently of the components in the other channels.
Channel 4 Gain	Slider control; 0 to 1.9 1.50 (Default)	Adjusts the gain setting for the Channel 4 waveform. The gain setting enables you to adjust the brightness of the trace displayed in Channel 4, changing its apparent brightness independently of the components in the other channels.

Using the Waveform Measurement Cursors

The unit provides a pair of measurement cursors which you can configure to indicate waveform values against either vertical or horizontal axes. When first enabled, the waveform measurement cursor(s) are displayed as one or two, horizontal dashed lines.

You can choose to display either a single measurement cursor or a pair of cursors. By default, the cursor(s) are aligned horizontally against the current Y axis (referred to as the **Y-axis Cursors**). You can, however, change the orientation of the cursor(s) so that they are aligned vertically to measure against the X axis (referred to as the **X-axis cursors**).

If you choose to display a single cursor, the cursor displays the value at that point; there is no delta value. The single cursor is always referred to as the **Reference** (or REF) cursor and is displayed as a green dashed line.

If you choose to display both measurement cursors, the **Reference** cursor is located at **0%** by default and the **Delta** cursor is displayed as a blue dashed line at **100%** by default.

The measurements made by the cursor(s) are displayed as follows:

- **For Y-axis cursors:** On the cursor, at the right-hand side of the display
- **For X-axis cursors:** Next to the cursor, at the top of the display.

When you enable both cursors, the difference between the values measured by the Delta and Reference cursors (Delta cursor value minus Reference cursor value) is displayed as follows:

- **For Y-axis cursors:** At the bottom, left-hand side of the display, above the Reference (green) cursor
- **For X-axis cursors:** At the bottom, left-hand side of the display, next to the Reference (green) cursor.

Cursors in a pair can be independent or linked together so that they move as a single unit, with a fixed separation between them.

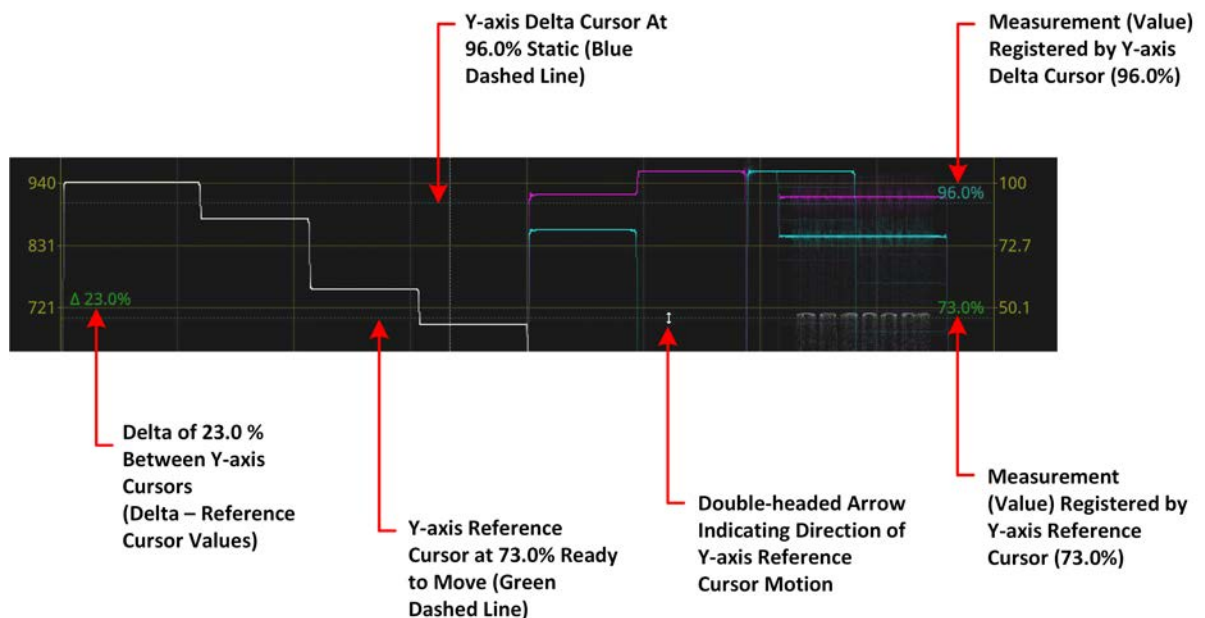


Figure 4-25: Waveform Measurement Y-axis Cursors (Independent Configuration)

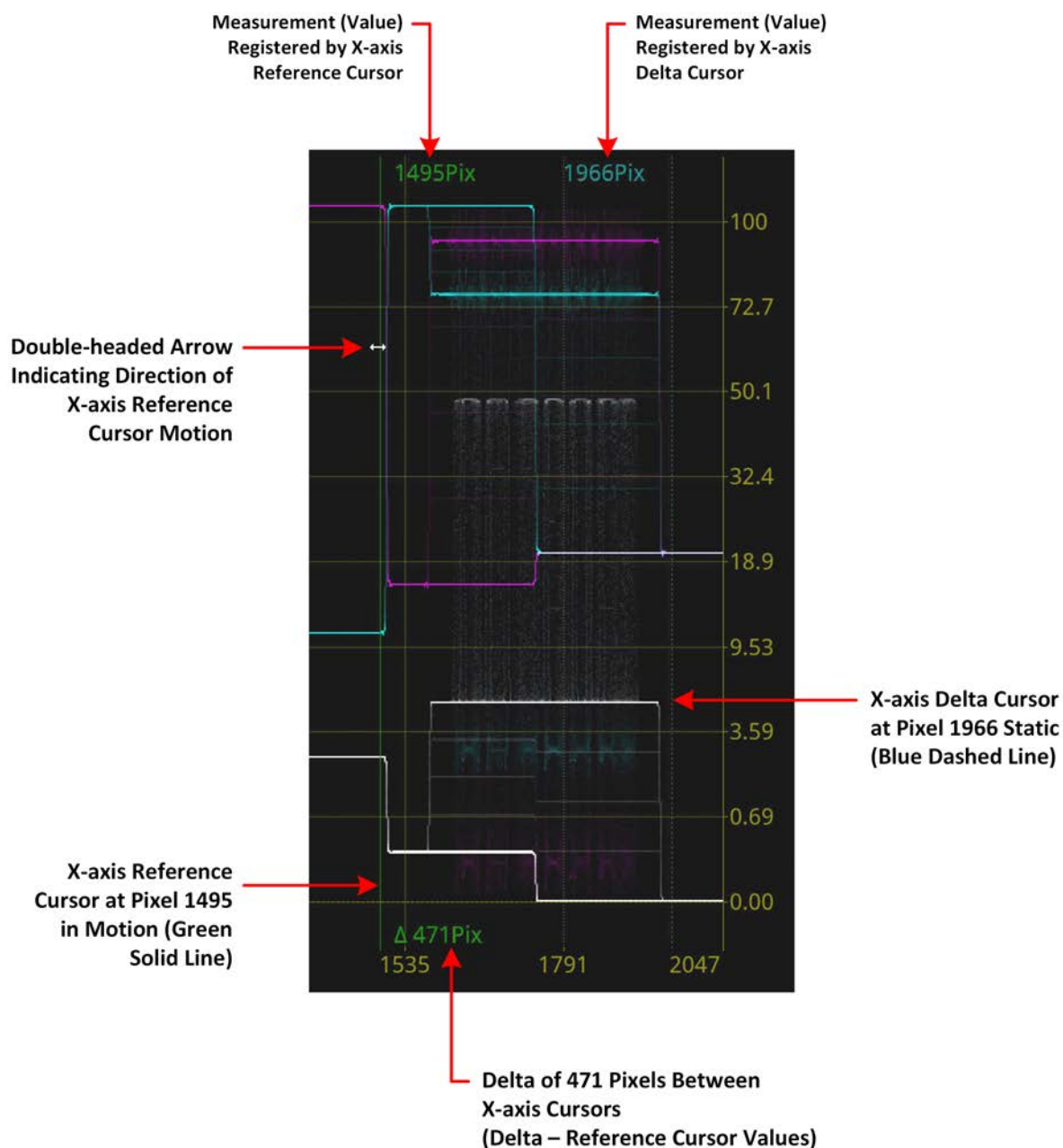


Figure 4-26: Waveform Measurement X-axis Cursors (Independent Configuration)

To position a measurement cursor, use one of the following methods:

- Open the options menu, then adjust the **Ref Cursor Position** slider to move the Reference cursor (recommended).
- Open the options menu, then adjust the **Delta Cursor Position** slider to move the Delta cursor (recommended).
- Select a measurement cursor then turn the rotary control left or right to move the selected cursor(s) down/up (Y-cursors) or left/right (X-cursors), respectively.
- Select a measurement cursor and slide to a new position.

Note: If the cursors are linked, then both will move together. To move a cursor independently, adjust the **Cursor Differential** slider in the options menu. This action moves the Delta cursor while keeping the Reference cursor fixed in position.

When in motion, the dashed line of the cursor changes to a solid blue or green line for improved visibility. You will see the measured values on the cursors change in real-time as you adjust the cursor positions.

You can configure the measurement cursor(s) to measure in different units, as follows:

- **For Y-cursors:** Select units of percent (default), percentage of reference, millivolts, hex value decimal value, or Nits (HDR Only).
- **For X-cursors:** Select units of percent (default), number of pixels, time (μ s) or frequency (kHz).

For information about the configurable parameters of the waveform measurement cursors, see the [Measurement Cursor Configuration](#) section of the options table.

Setting a % Reference

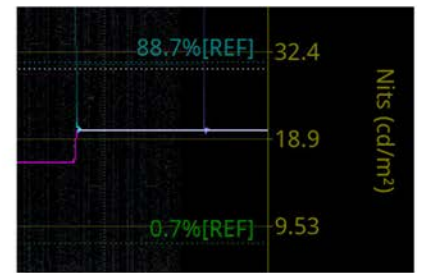
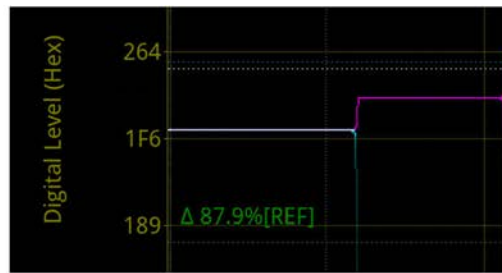
Use the **% Reference** cursor scale to measure a position relative to a reference baseline that you set; otherwise, the measurement is relative to the 0 value of the waveform scale. This is useful only when using the Percent Ref measurement unit i.e., the vertical cursors.

Setting the % Reference changes the reference value to the current Reference cursor position and the 100% delta cursor value to the current position of the Delta cursor.

In the **Measurement Cursor Config...** submenu, first set the Cursor Scale to **Percent Ref**, adjust the position of the Reference cursor to the new baseline, then select **Set % Ref**. The Reference cursor value is displayed as **0.0%[REF]**. You can now adjust the measurement cursors to measure values within the new range.

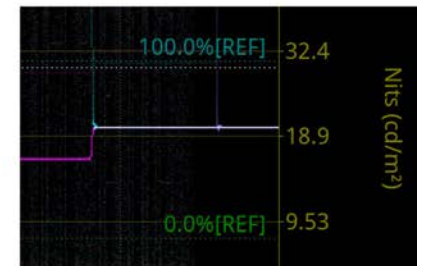
On completion, select **Reset % Reference** to set the measurement cursors back to their default positions of 0% and 100%.

Starting Position with Delta Cursor (Blue) at 88.7% and Reference Cursor (Green) at 0.7%. Delta Between Cursors is 87.9%



In Measurement Cursor Config... Submenu, select: Set % Reference

New Baseline (0.0%) Set at Reference Cursor Position and 100% at Delta Cursor Position



Change the Position of the Reference Cursor

New Delta of 100% Retained

On Completion, In Measurement Cursor Config... Submenu, select: Reset % Reference

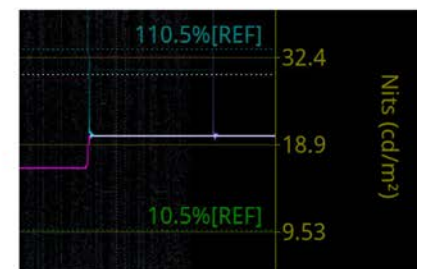
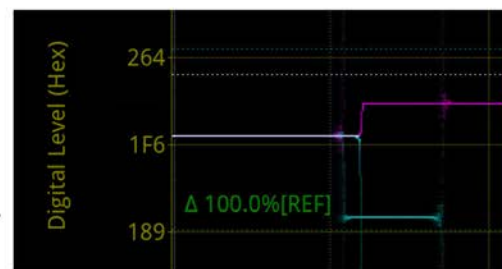


Figure 4-27: Waveform Linked Measurement Vertical Cursors - Using Set % Reference

Vectorscope

Overview

The Vectorscope is part of the video core toolset that provides a polar (X-Y) display of the Cb and Cr Color Difference representations of the image, where the hue of the color is the angular component of the polar display. The Y component of the YCbCr video input to the vectorscope is ignored. The vectorscope presents the amplitude of the color difference as the distance from the origin.

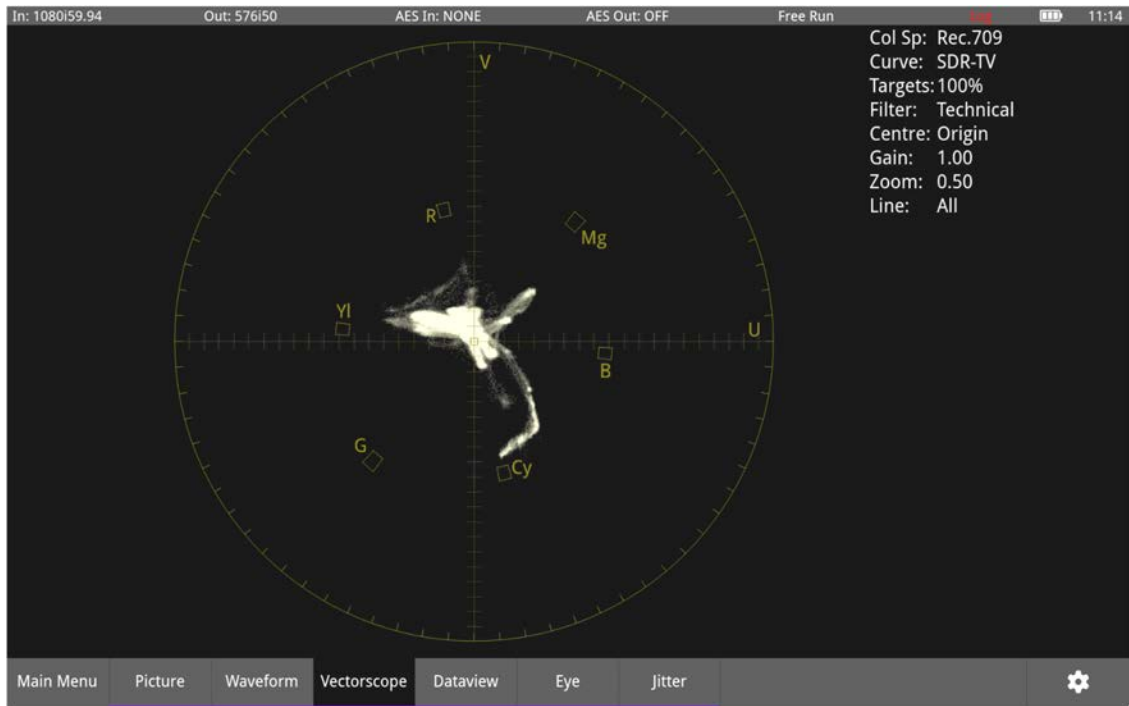


Figure 4-28: Vectorscope Instrument

Context Menu

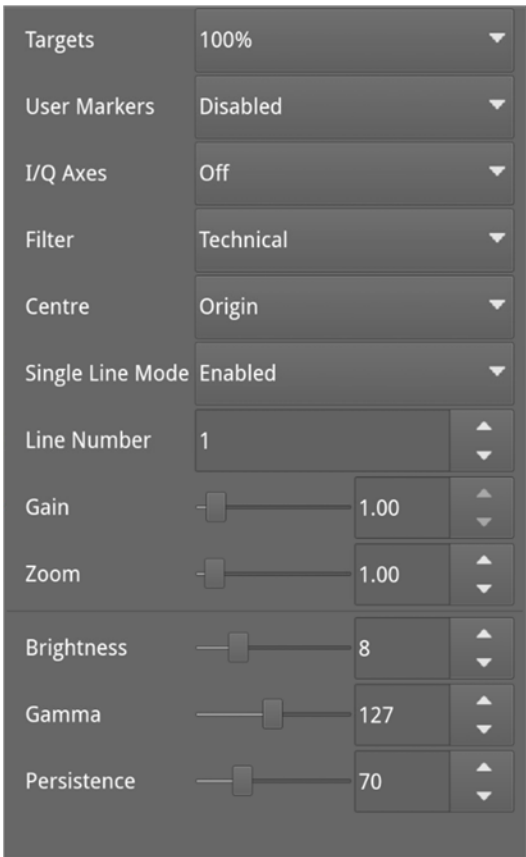


Figure 4-29: Analyzer - Vectorscope Context Menu

The following table lists the configurable parameters in the Analyzer - Vectorscope context menu:

Table 4-5 : Analyzer - Vectorscope Options

Item	Options	Description
Targets	Off 75% 100% (Default)	If selected, sets the display graticule scale to match either the 75% or 100% color bar positions. It also leads to the display of markers indicating the positions of pure R, G, B, C, Y and M. When set at 75%, the target represents 75% saturation. At 100%, the target represents 100% saturation.
User Markers (Dec)	Disabled (Default) Enabled	When enabled, places two markers in the Vectorscope display. In addition, opens two new sliders for Marker Angle (adjustable in the range 0 and 359.99) and Marker Gain, (adjustable in the range 0 and 100.00).
Marker Selected	Marker 1 (Default) Marker 2	When User Markers are enabled, sets the focus for Marker Angle and Marker Gain adjustments to either Marker 1 or Marker 2. By default, Marker 1 is orange and Marker 2 is cyan. Note: Marker 1 and Marker 2 are linked to the special markers in the Cb/Cr channels of the Waveform instrument.

Item	Options	Description
Marker Angle	Marker 1: 0.00 to 359.99 (Default: 0.00) Marker 2: 0.00 to 359.99 (Default: 90.00)	Adjusts the angle of the cursor from its default starting position around the center of the vectorscope.
Marker Gain	Marker 1: 0.00 to 100.00 (Default: 50.00) Marker 2: 0.00 to 100.00 (Default: 75.00)	Adjusts the Gain on the signal from 0 at the origin to 100 at the outer limit of the vectorscope.
I/Q Axes	Off (Default) I Only Q Only Both	When enabled, displays either the I axis only, the Q axis only, or both IQ axes together.
Filter	Technical (Default) Production Low Pass Raw	Sets the type of filtering applied. When you select the Raw option, the dots displayed correspond to the pixel values recorded in the stream. There is no filtering applied to these pixels.
Center	Origin (Default) Red Green Blue Magenta Cyan Yellow Marker 1 Marker 2	Selects the origin for the vectorscope display; used as the zoom focus.
Single Line Mode	Disabled (Default) Enabled	When enabled, allows single line mode analysis of the active picture. When disabled, all points in the image are represented in the graph.
Line Number	System Control, One to Total number of active lines in the input signal.	When Single Line Mode is enabled, selects the line in the active picture.
Gain	System Control 1.00 (Default) to 5.00	Used in combination with the zoom control to enhance the detail or color saturation levels of the signal at the zoom location.
Zoom	System Control 0.5 to 10.00 (Default: 1.00)	Zooms into, or out of, the selected Center, which can be either the origin, a color target, or either of the user markers. Use the slider control to adjust the zoom.
Brightness	Slider control: 1 to 31 (Default: 8)	Adjusts the brightness of the vectorscope display.
Gamma	Slider control: 1 to 255 (Default: 127)	Adjusts the gamma component of the vectorscope display.
Persistence	Slider control: 1 to 255 (Default: 70)	Adjusts the persistence of the vectorscope display.

Dataview

Overview

The **Dataview** instrument displays the raw data present in the SDI input signal. You can read the data in hexadecimal, decimal, or binary format, and each data word has a sample and line coordinate. The instrument displays the entire video frame complete with active video, TRS words, and blanking data.



Figure 4-30: SDI Signal Dataview

Data is presented with a color-coding for both text and background:

- Foreground text color indicates the data type as follows:
 - White - Y or blanking space sample
 - Blue - Cb
 - Red - Cr
- Background color indicates the data type, as follows:
 - Blue - Timing reference signal (TRS) words
 - Black - Blanking space
 - Green - Active Picture.

You can quickly navigate the dataview window using the **Line** and **Sample** controls in the context menu or using the Increment Bar. Also see the [Alternative Navigation Toolbar](#).



Figure 4-31: Dataview Increment Bar

When a pixel is specified in Picture, Waveform or Vectorscope, Dataview highlights it and displays it and its area of the frame. These values are displayed in the upper right corner of the page. Additionally, the line and sample slider controls allow you to navigate around the dataview grid, with the corresponding picture coordinates (line and pixel numbers) displayed.

Dataview allows positioning of the cursor in the blanking and TRS areas, which is not possible using the Waveform, Vectorscope or Picture instruments.

Alternative Navigation Toolbar

An alternative method of navigating the data is provided by either tapping the data area of the touchscreen, or pressing the Up key of the rotary control. This changes the menu bar to the alternative navigation bar which allows quick navigation of the dataview, with each softkey toggling between two views (these being the left/right and/or top/bottom of the frame).



Figure 4-32: Dataview with Alternative Navigation Toolbar

The views available via the softkeys are:

- First Line/Last Line toggles between the first line and last line in the frame
- First Sample/Last Sample toggles between the first sample in the frame and the last
- AP Top/Bottom toggles between the top active picture data and the bottom
- AP Left/Right toggles between the left active picture data and the right
- SAV TRS/EAV TRS toggles between the start of active video TRS and the end of active video TRS.

For example, if you select First Sample, data is displayed from the start of the frame line, while the softkey function changes to Last Sample. Selecting Last Sample displays data for the end of the frame, while the softkey function changes back to First Sample.

To leave this view, either tap the touchscreen, press the Down key of the rotary control, or return to the System Overview page.

Note: To navigate to field 2 of an interlaced signal, use Line Select in the context menu to jump to the second half of the picture, then use the Alternative Navigation bar to select the area of interest. Field 2 active picture data is highlighted in dark green, with Field 2 indicated at the bottom of the Dataview page. To navigate back to field 1, use Line Select to jump to a line in the first half of the picture, then use the Alternative Navigation bar.

Context Menu

Select the **cog** softkey to open the context menu:

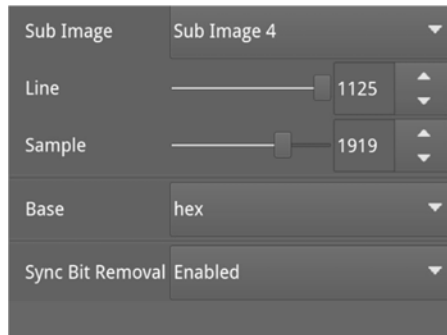


Figure 4-33: Dataview Context Menu

The following table lists the configurable parameters in the Dataview instrument:

Table 4-6 : Analyzer - Dataview Options

Item	Options	Description
Sub Image	Sub Image 1, 2, 3 or 4	Selects the sub image for analysis (UHD signals only).
Line	System Control: 1 to the Total number of lines in the frame	Selects the line in the signal for analysis. Allows for selection of active picture samples and samples in the vertical and horizontal blanking spaces.
Sample	System Control: 0 to the Total number of samples in the frame, minus 1	Selects the sample in the current line. Allows for selection of active picture samples and samples in the vertical and horizontal blanking spaces.
Base	Hex (Default) Decimal Binary	Changes the base in which to display the data.
Sync Bit Removal	Enabled (Default) Disabled	Removes the sync bit when enabled. This applies to 6 G and 12 G (see ST 2081-1 and ST 2082-1 standards).

Eye

(Physical Layer Analysis)

Requires Model:	Sx2E
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Overview

The **Eye** instrument enables you to analyze physical layer compliance measurements from 270 Mbps to 12 Gbps for SDI source input. An analog front-end provides a bandwidth of more than 30 GHz (5th harmonic of the 6 GHz fundamental for 12G-SDI). The GUI uses LeaderPhabrix RealTime Eye (RTE™) to generate a reliable, AC coupled, instantaneous physical layer display with automatic measurements to SMPTE standards.

You can receive accurate measurements within seconds of connecting an SDI input. The unit enables you to measure both rise and fall overshoot at the top and bottom of the waveform. In addition, the unit displays amplitude, rise and fall overshoot delta and DC offset - all compulsory measurements when testing against SMPTE standards. The unit highlights any measurements exceeding the specification in red (for example, an eye amplitude greater than 10 %).

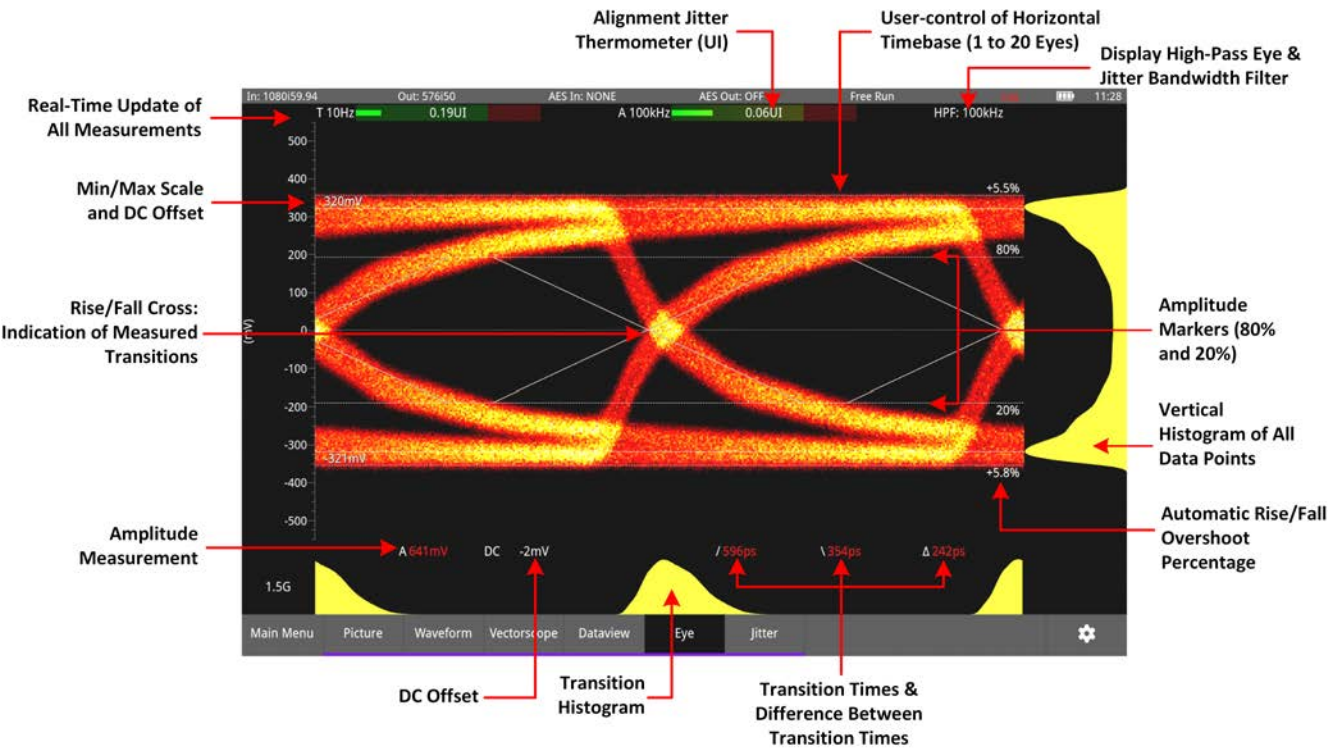


Figure 4-34: Standard SDI Eye Pattern Display with 100 kHz Jitter Filter

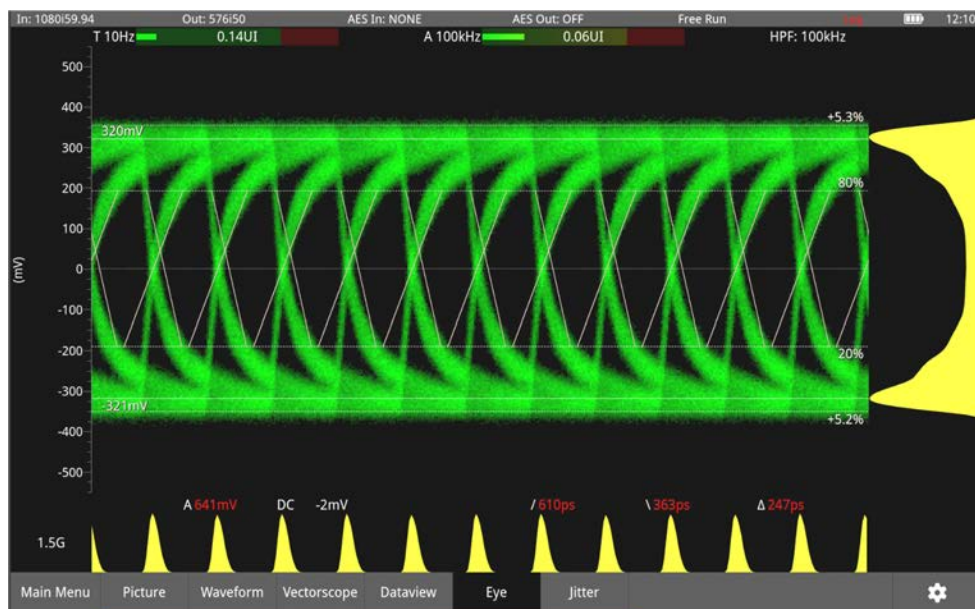


Figure 4-35: 3G-SDI Eye Pattern Set to Display 12 Eyes (Using Green Display Color)

The **Eye** instrument display also provides:

- Timing jitter thermometer color-coded to indicate whether the measured jitter is within the specification of the standard
- Alignment jitter thermometer color-coded according to the analyzed SDI standard
- Positive and negative Eye amplitude values
- On screen indication of 20 % and 80 % levels (dashed lines) for rise and fall time measurements
- Horizontal time histogram of eye crossing point (0 mV threshold)
- Vertical amplitude histogram indicating energy distribution across all samples
- Eye coupled to AC with display of DC offset measurement.

Context Menu

The following table lists the configurable parameters in the context menu of the **Eye** instrument.

Eyes	2	▲ ▼
Colour	Red	▼
Eye and Jitter Filter	100kHz	▼
Infinite Mode	Disabled	▼
Show Rise/Fall Cross	Enabled	▼
Show eye for unsupported rates	Disabled	▼
Power Save Mode	Enabled	▼

Figure 4-36: Eye - Context Menu

Table 4-7 : Context Menu Options for the Eye Instrument

Item	Options	Description
Eyes	1 to 20 (Default = 2)	Sets the number of eyes displayed in the instrument window.
Color	Green Heat Red (Default) Ferrara Green-red Blacklight	Sets the color scheme for the eye display.
Eye and Jitter Filter	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz (Default)	Sets the frequency of the high-pass jitter filter. Note: This setting controls the filter applied both to the Eye instrument and the Jitter instrument.
Infinite Mode	Disabled (Default) Enabled	When disabled, each Eye data point is displayed only for a fixed period of time. When enabled, infinite mode ensures that no data points are removed from the eye. This can be useful when attempting to identify anomalies in the signal which appear sporadically over time and might be missed in the standard mode.
Show Rise/Fall Cross	Disabled Enabled (Default)	Toggle the display of the rise/fall crossing points, which gives a visual indication of the rise and fall time measurements.
Show eye for unsupported rates	Disabled (Default) Enabled	Toggle the display of eyes for rates currently unsupported by the unit. Note: This setting is transient, enabling support of officially unsupported rates. The setting reverts to default following a reboot.
Power Save Mode	Disabled (Default) Enabled	Enable to turn off Eye and Jitter circuitry and updates when not actively being displayed.

A table showing the SMPTE tolerances for each standard is provided in the section [SMPTE UHD TV: SDI Physical Layer Tolerances](#).

Jitter

(Physical Layer Analysis)

Requires Model:

Sx2E

Overview

The **Jitter** instrument is available for the SDI source input. If the measured Timing Jitter and/or Alignment Jitter exceeds the limits specified in the SMPTE standards, it is automatically logged in the Event Log. See [Event Logging](#) for further information.

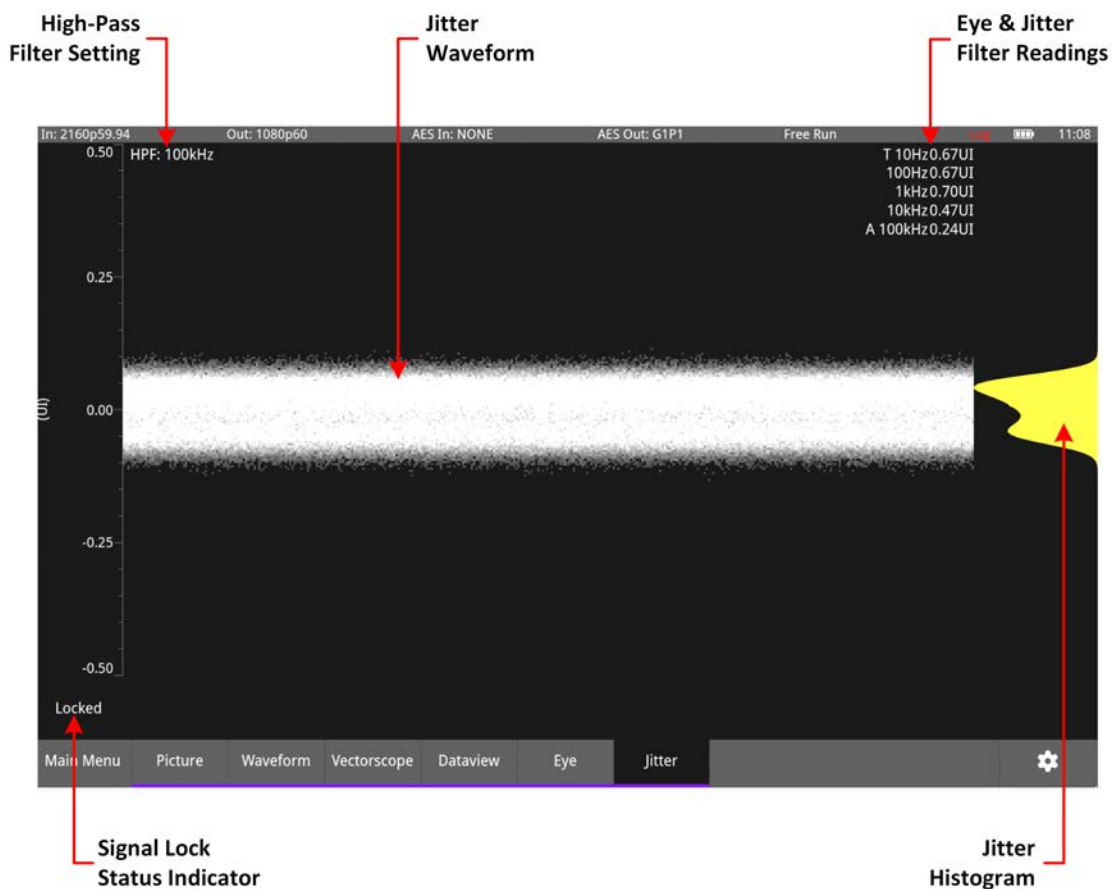


Figure 4-37: Jitter Instrument

The **Jitter** instrument displays automated measurements to SMPTE standards. A Jitter histogram, displayed at the right of the window in yellow, provides additional information about the distribution of points in the jitter waveform.

Readings for each of the filters are displayed in the top-right corner of the instrument window. Any value displayed in red indicate a reading outside the standard specification for the signal analyzed.

A signal lock status indicator (**Locked/Unlocked**) in the bottom-left corner of the window indicates whether the signal is:

- **Unlocked:** No signal available
- **Unlocked (red font):** The firmware fails to lock to the signal
- **Locked (white font):** Eye pattern is locked.

Context Menu

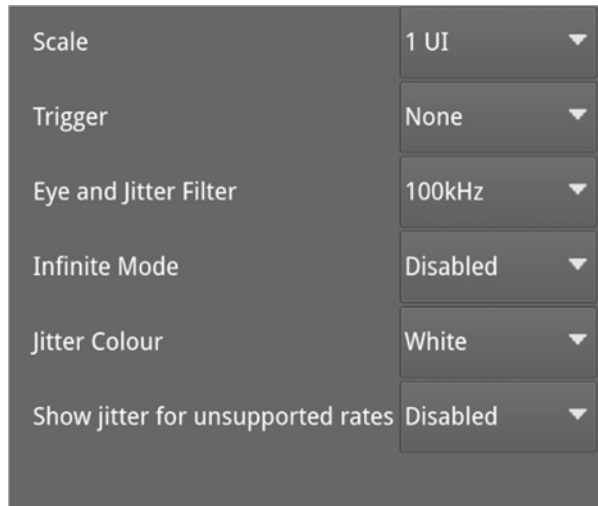


Figure 4-38: Jitter - Context Menu

The following table lists the configurable parameters in the Jitter - instrument context menu:

Table 4-8 : Jitter - Context Menu Options

Item	Options	Description
Scale	1 UI (Default) to 128 UI	Adjust the scale of the Y-axis from 1 UI to 128 UI
Trigger	None (Default) Single Line Two Lines Single Field Frame	Select a trigger for jitter measurement. Trigger modes are useful to correlate jitter content to line and frame-rate frequencies.
Eye and Jitter Filter	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz (Default)	This setting controls the high-pass filter applied to both the Jitter and Eye instruments.
Infinite Mode	Enabled Disabled (Default)	When disabled, jitter data points are displayed only for a fixed period of time and then removed from the display. When enabled, infinite mode ensures that no data points are removed from the display.
Jitter Color	White (Default) Red Green Blue Cyan Magenta Yellow	Select the color for the display of the jitter waveform.
Show Jitter for Unsupported Rates	Enabled Disabled (Default)	Toggle the display of jitter for rates currently unsupported by the unit. Note: This setting is transient, enabling support of officially unsupported rates. The setting reverts to default following a reboot.

5. Input Status

This chapter describes the unit's Input Status instruments. These instruments are accessed by selecting the Input Status option on the Main menu bar.

This chapter describes how to view the input signal characteristics and check its status, and includes the following sections:

- [Video Standard](#)
- [SDI Status](#)
- [Ancillary Status](#)
- [Ancillary Inspector](#)

Video Standard

This screen displays detailed information about the SDI signal being received. When the signal contains ST352 packets, the ST 352 Payload ID can be used to identify the signal characteristics.

The instrument allows for manual overrides of the ST 352 content by selecting **Manual Configuration...** from the context menu. The instrument then applies the manual configuration to the signal.

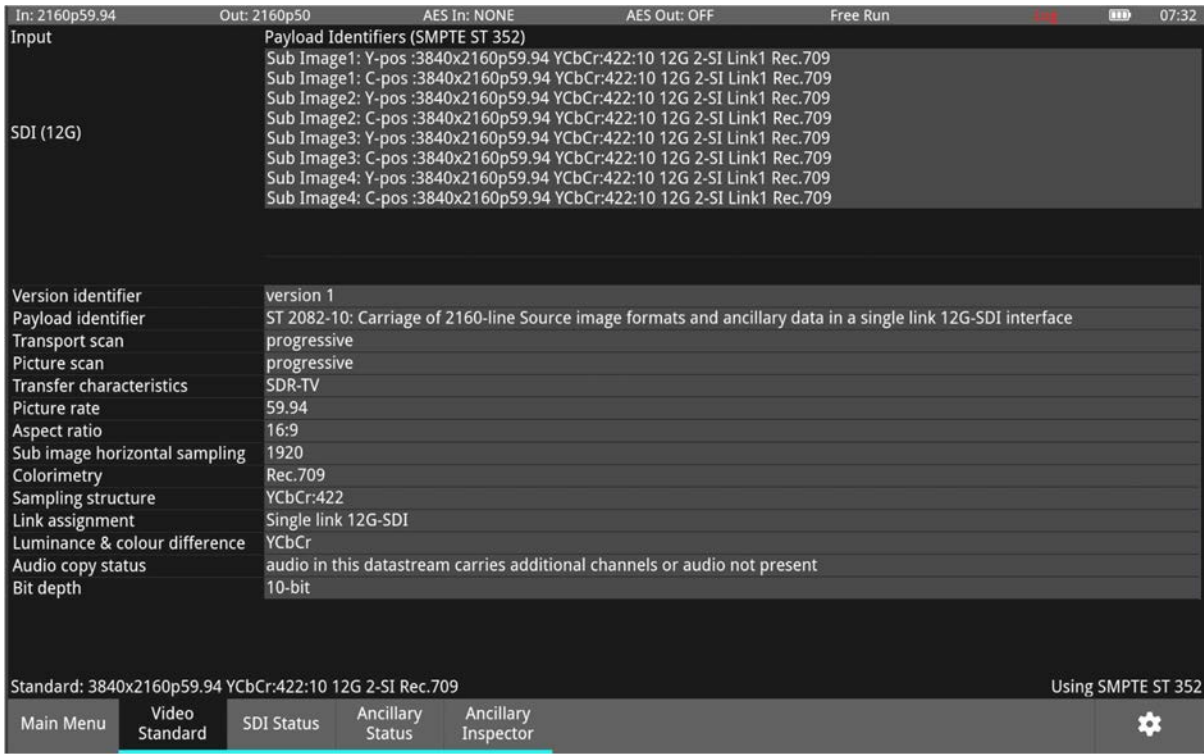


Figure 5-1: Input Status - Video Standard

Context Menu

Select the **cog** softkey to open the context menu.

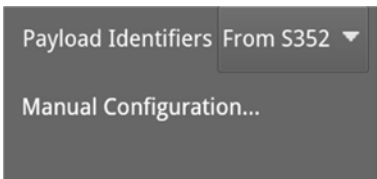


Figure 5-2: Input Status - Video Standard

Changing the Payload Identification Source

It is recommended to keep the default setting for the **Payload Identifiers** parameter (**From S352**). When the accuracy of incoming ST 352 packets cannot be relied upon, you can either force the instrument to use your override configuration by selecting the **Manual** option or to ignore both the ST 352 payload and manual override by selecting **Ignored**.

The text color of the standard displayed at the bottom of the screen indicates, as follows:

- White: Payload Identifiers are valid, or no override configuration is being applied
- Yellow: Manual configuration applied and matches or is compatible with the SDI signal

- Red: Manual configuration applied and is incompatible with the SDI signal, or the signal cannot be estimated (when either the **Payload Identifiers** is set to **Ignored** or the ST 352 content is incorrect).

Table 5-1 : Video Standard Options

Item	Options	Description
Payload Identifiers	From S352 (Default) Manual Ignored	By default, set to From S352, the instrument uses the SMPTE ST 352 payload ID (if present) in the incoming video signal to identify the video standard. Ignore ST 352 data when parameter set to Ignored. Instead, the unit attempts to identify the standard. Some parameters cannot be identified in this way. The gamut is an example. You can define a manual override configuration using the Manual Configuration... dialog. The instrument displays the applied manual configuration in yellow if it matches the input signal. Note: If the override config to be applied is incompatible with the estimated characteristics, the applied configuration is displayed in red.
Manual Configuration...	Instrument Control	Opens a manual override dialog enabling you to override the various parameters defining the video standard. If you leave a parameter unspecified, the header of the column containing no selected value changes color to yellow.

Manual Override Configuration

This dialog is used to configure a standard to override the standard automatically detected from the ST 352 payload. Incompatible standards are displayed at the bottom of the configuration dialog in red. When they are made compatible, they are displayed in yellow.

Note: Applying an override configuration affects how other instruments analyze the data in the signal, but as the data is unchanged, **Dataview** continues to display the raw data.

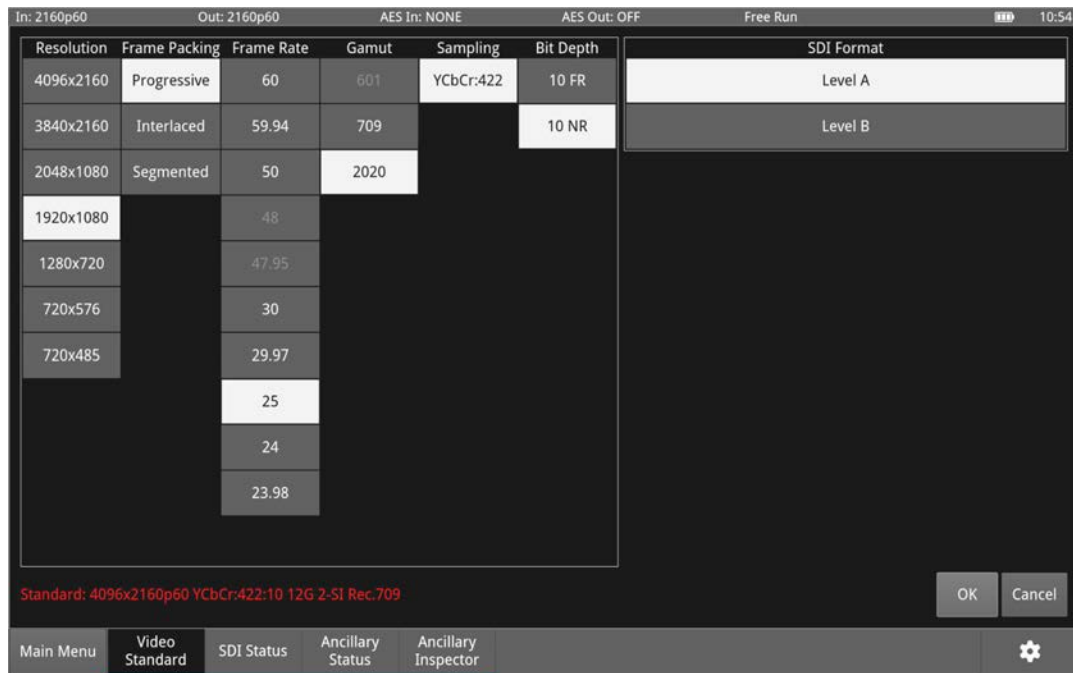


Figure 5-3: Video Standard Instrument - Manual Override

For the override configuration to be a compatible standard, the following criteria must be satisfied:

- The data rate implied by the override configuration matches the data rate of the input
- The number of physical links are the same or less
- The number of sub-images are the same or less
- The incoming signal (as defined in the **SDI Status** instrument) and the override standard have the same values for following items:
 - Active Samples per Line
 - Active Lines per Field
 - Total Samples per Line
 - Total lines per Frame/Field.

Note: When the Sx2-HDR option is enabled, HDR OTFs (HLG, PQ, Unspecified) will be available.

SDI Status

Select the **Input Status** softkey in the main menu bar then **SDI Status** in the menu bar.

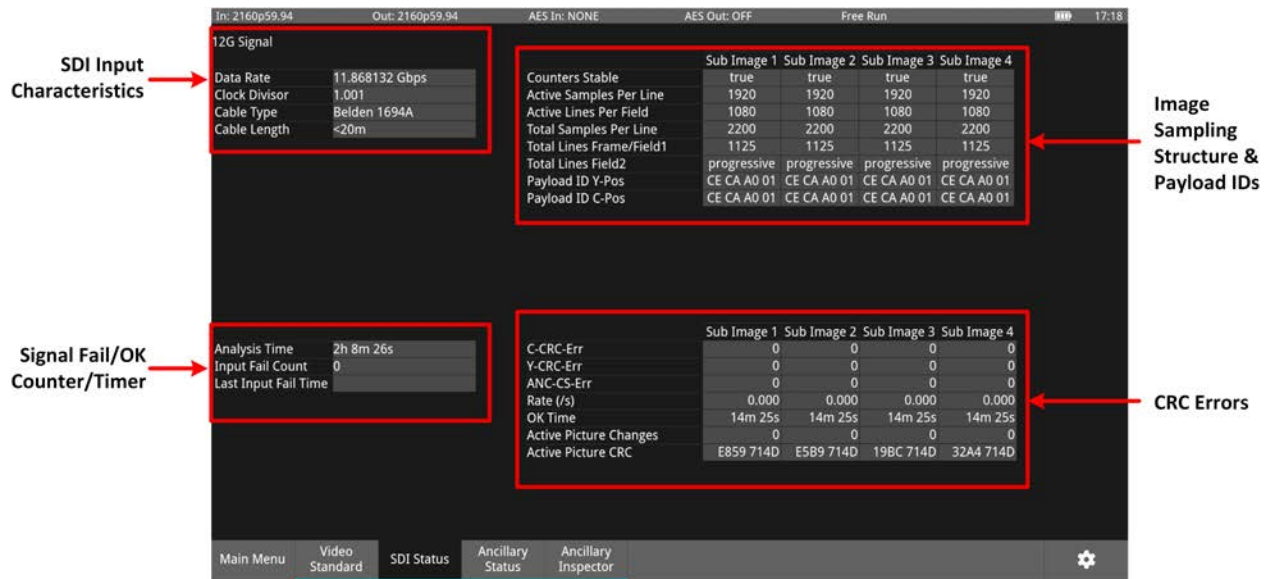


Figure 5-4: SDI Status Screen

The SDI Status screen provides data to verify the format of the signal being analyzed, and includes:

- Data Rate - displays the data rate of the SDI input
- Analysis Time - shows the time since the device was started
- Input Fail Count - number of SDI input failures: this could be caused by stopping the SDI source, disconnecting the cable, or changing the SDI signal
- Last Input Fail Time - time elapsed since last failure (including changes of the SDI input)
- OK Time - time elapsed without encountering a CRC error in the picture-line
- Active Picture Changes - number of SDI signal changes, e.g., a static SDI test pattern will give a count of 0, but if a bouncing box is added to the signal, the count will start to increase from the first frame
- Cable Type - shows the cable type selected in the settings menu. This is used to estimate the cable length (Sx2E only)
- Estimated Cable Length - cable length from signal source (Sx2E only)
- Image sampling structure and payload IDs - provides information to verify the format of the signal being analyzed
- CRC errors - this displays the number of picture-line CRC errors since reset of the counters or start of the analysis.

Context Menu

Use the **cog** softkey to open the context menu.

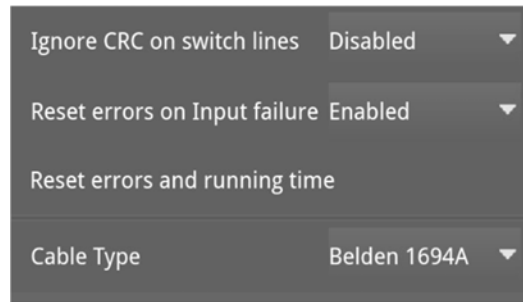


Figure 5-5: SDI Status Context Menu (Sx2E)

The following table lists the configurable parameters of the SDI Status instrument.

Item	Options	Description
Ignore CRC on switch lines	Disabled (Default) Enabled	Enable to ignore CRC errors on switch lines.
Reset errors on Input failure	Disabled Enabled (Default)	Automatically reset errors when the input signal is lost or changed.
Reset errors and running time		Reset the timers and counters.
Cable Type (Sx2E only)	Belden 1694A Belden 8281 Belden 1505 Belden 1694A Belden 1855A Canare L5CFB Image 1000	Select cable type.

Ancillary Status

Overview

The **Ancillary Status** page provides a real-time display of the ancillary data present in the source input.

Health status information is indicated by the text color as follows:

- White - ANC packets present and correct
- Red - ANC packets present but in error
- Yellow - ANC packets present and correct but there has been an error.

The screenshot shows the 'Ancillary Status' interface. At the top, it displays system information: In: 1080i59.94, Out: 576i50, AES In: NONE, AES Out: OFF, Free Run, and a time of 10:55. Below this is a grid of packet IDs. A table below the grid shows details for selected packets.

Packet ID	Presence	Checksum	Parity	DBN
EIA-708 Caption (61h 01h)	Y	OK	OK	--
Mark Deleted (80h)	Y	OK	OK	OK
No Pair Associated (45h 01h)	Y	OK	OK	--
S12M-2 V-TCODE (60h 60h)	Y	OK	OK	--
S2016-3 AFD (41h 05h)	Y	OK	OK	--
S299-1 HD Audio	C,Y	OK	OK	OK

Figure 5-6: Ancillary Status

Two views provide the following data. The top view shows a summary view, which includes the packet IDs known to the Sx2, and highlights those that are detected in the SDI stream. The lower view, or tree view, shows the status info for these detected data packets. Where a small triangle appears to the left of an entry, it indicates that a tap will expand the information to show the data packets, from where you can select the packet of interest.

It is possible to select only a single packet ID in the top view to show expanded information in the lower view, allowing a granular drill-down of present ancillary packets – providing information on presence, checksum, parity, and data block number (DBN). To do so, select the **cog** softkey and then **Inspect....** This primes the **Ancillary Inspector** to extract such data packets for subsequent analysis.

Context Menu

Select the **cog** softkey to open the context menu.

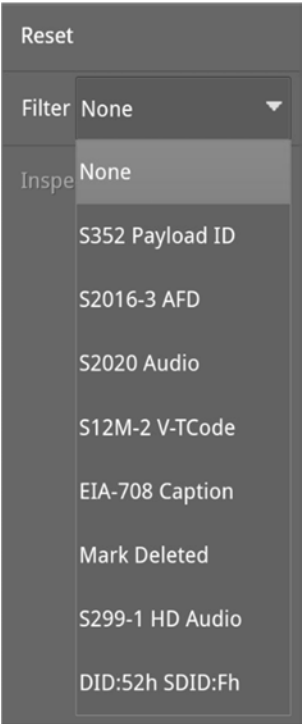


Figure 5-7: Packet Types Found in Signal

The lower view of the **Ancillary Status** page displays all detected packet types when the filter is set to **None**. Selecting a specific filter simplifies the tree view by only listing the packets of that type.

The menu options are as follows:

Table 5-2 : Ancillary Status Context Menu

Item	Options	Description
Reset	System Control	The lower view of the ancillary status page will only display the selected type of ANC packet unless the filter is set to None , whereby all packet types in the signal are displayed.
Filter	None (Default) Ancillary Packet Identifiers	Select the packet type to be displayed in the lower view. See Table 5-3 for the list of ancillary data identifiers.
Inspect	Selected packet identifier in Ancillary Status List View.	The Inspect... option is available after a packet identifier is selected in the lower view, which primes the Ancillary Inspector to load the packet. This operates on one single packet ID at a time and allows the Ancillary Inspector to provide a more detailed analysis, see Ancillary Inspector .

Table 5-3 : List of Ancillary Status Identifiers

Ancillary Status Identifier	Description
S353 MPEG Recoding	MPEG-2 Recoding Information
S305 SDTI	SDTI transport in active frame space
S348 HD SDTI	HD-SDTI Transport in active frame space
S427 Link Encryption	Link encryption for 1.5 Gb/s Serial Digital Interface
S352 Payload ID	Payload identification
S4S2016-3 AFD	AFD and Bar data
S2016-4 PAN	Pan-scan data
S2010 ANSI/SCTE	ANSI/SCTE 104 messages
S2031 DVB/SCTE	DVB/SCTE VBI data
S2056 MPEG TS	MPEG TS packets in VANC
S2068 3D Packing	Stereoscopic 3D frame compatible packing and signaling
S2064 Lip Sync	Lip sync data as specified by ST 2064-1 or ST 2064-2
ITU-RBT.1685	Structure of inter-station control data conveyed by ancillary data packets
OP47 Caption	OP47/RDD8 Subtitling distribution packet (SDP)
OP47 VBI/WST	OP47/RDD8 Transport of VBI and/or WST data in a VANC Multipacket
ARIB-TR-B29	Metadata to monitor errors of audio and video signals on a broadcasting chain
RDD18 Metadata	Acquisition metadata sets for video camera parameters
RP214 KLV Metadata	KLV encoded metadata transport
RP223 UMID/ID	Packing UMID and Program Identification Label data into SMPTE 291M Ancillary Data Packets
S2020 Audio	Compressed audio metadata
S2051 Two Frame	Two frame marker in HANC
RDD8 WSS	Wide-screen signaling data
RP215 Film Codes	Film codes in VANC space
S12M-2 V-TCODE	Ancillary time code
EIA-708 Caption	S334-1 EIA 708B Data mapping into VANC space
EIA-608 Caption	S334-1 EIA 608 Data mapping into VANC space
RP207 Program	Program description in VANC space
S334-1 Data	Data broadcast (DTV) in VANC space
RP208 VBI Data	VBI data in VANC space
Mark Deleted	S291 - Packet marked for deletion
S299-2 3G Audio	Audio data in HANC space (3G)
S299-1 HD Audio	Audio data in HANC space (HDTV)
S272 SD Audio	Audio data in HANC space (SDTV)
S315 Camera Pos	Camera position (HANC or VANC space)

Ancillary Status Identifier	Description
RP165 EDH	Error detection and handling (HANC space)
S12-3 HFR TCode	Time code for high frame rate signals
S2103 Generic Time	Generic time label
S2108-1 HDR/WCG	Extended HDR/WCG

Ancillary Inspector

Overview

The **Ancillary Inspector** monitors the analyzed signal and displays the contents of selected Ancillary packets in the signal. This instrument can be used in combination with the [Ancillary Status](#) instrument.

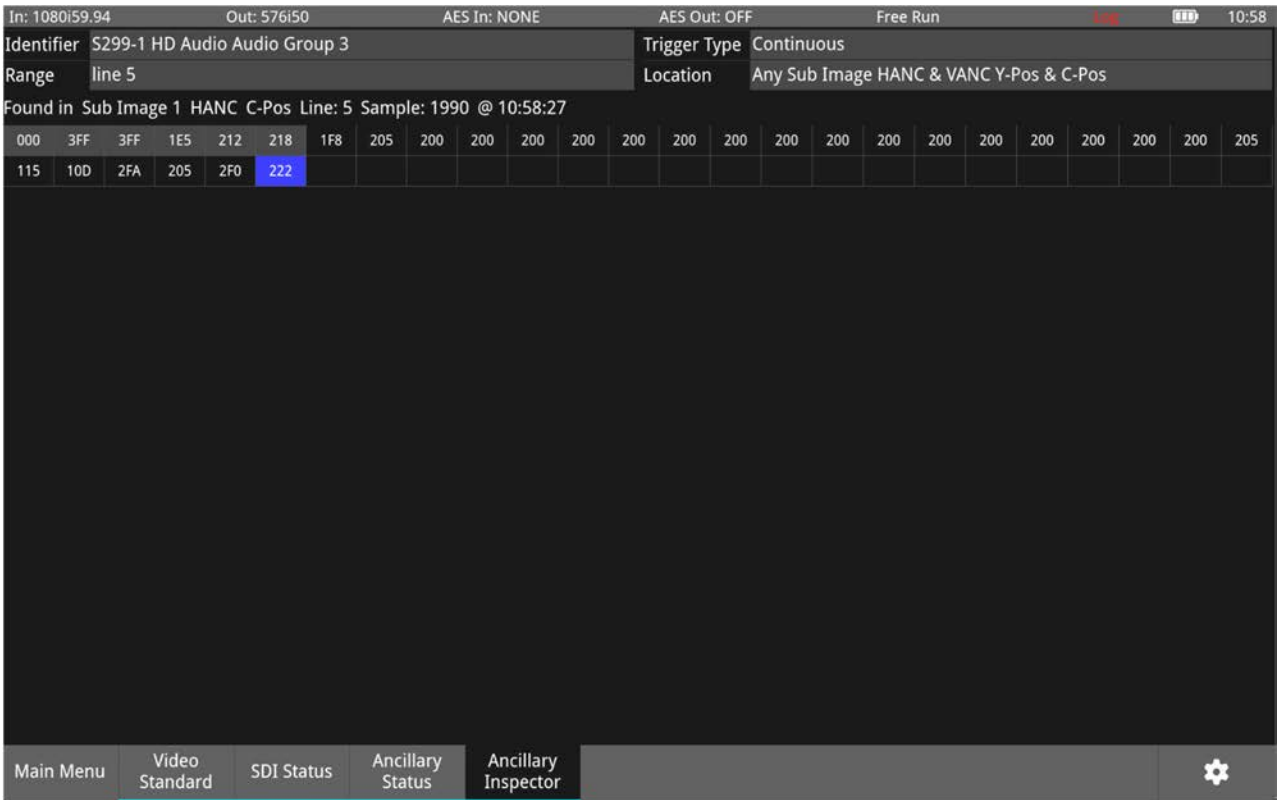


Figure 5-8: Ancillary Inspector Instrument

Note: The Sx2 decapsulates only the ST 352 Payload ID packets. For other data packets, only the raw data is displayed.

The window displays both the location of the found packet and the time at which it was found.

Note: If the time appears frozen, the signal is no longer being received or recognized by the Sx2. The display keeps the last valid extracted information. If a checksum error is detected from an invalid packet, this will also be displayed.

When a packet is not in ST352, the lower part of the window displays the packet in hexadecimal form including individual header words (gray background), data words (black background), and checksum (blue background).

Context Menu

Select the **cog** softkey to open the context menu.

When setting any parameters in Ancillary Inspector, AND logic applies: so **all** active search parameters must be met before Ancillary Inspector can successfully locate the desired packets.

When searching for data packets it is recommended to keep the search domain as wide as possible to establish that ANC packets can actually be located. Only when the Ancillary Inspector displays streaming data, should you introduce more specific search parameters. If the user tests for standards conformance, the expected location should be specified.

The Ancillary Inspector can also be used to report packets containing errors with **Trigger only on Errors** set to **Enabled** and **Identifier** set to **Any**. When an error is present in a packet, the individual data word will be displayed in red, indicating the exact position of an error within a packet.

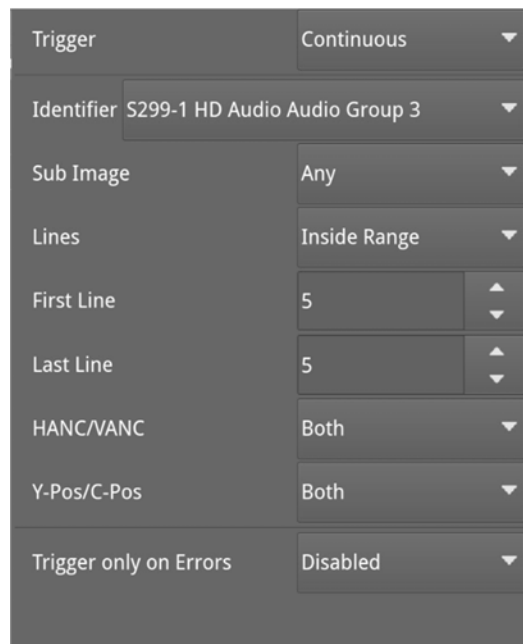


Figure 5-9: Ancillary Inspector Context Menu

The following menu options are available for configuring the **Ancillary Inspector** Instrument:

Table 5-4 : Ancillary Inspector Context Menu

Item	Options	Description
Trigger	None (Default) Single Shot Continuous	None sets no trigger. Single Shot sets a single packet inspection. The content is displayed and the trigger state reverts to None . To refresh the display, set the Trigger back to Single Shot . Continuous sets uninterrupted inspection of all packets matching the search criteria with the display refreshed in real-time. The details of the last detected error remain displayed for inspection. To refresh the display, set the Trigger back to Continuous . Note: Trigger events occur when the packet data conditions match the selected criteria, or when the Trigger only on Errors option is enabled and an error is detected.

Item	Options	Description
Identifier	None (Default) Any Custom Ancillary Packet Type (see Table 5-5 for a possible selection)	When None is selected, no packet is searched, irrespective of the Trigger setting. When Any is selected, the first ancillary packet found on any line in the search range is displayed. Select the Ancillary Packet Type that you want to find. For a list of ancillary data identifiers, see Table 5-5 . Custom enables you to specify a packet type not listed in the Table 5-5 . When Custom is selected, you can specify the DID and SDID of the packets to find.
Sub Image	Any (Default) Sub Image 1 Sub Image 2 Sub Image 3 Sub Image 4 Sub Image 1 Link B Sub Image 2 Link B Sub Image 3 Link B Sub Image 4 Link B	Select a Sub Image for analysis.
Lines	Any (Default) Inside Range Outside Range	Ancillary inspection parameters specifying where to look in the ANC space for the data desired. Any allows any line to be searched for the specified packets. Inside / Outside specify lines delimited, the range is required. Note: Any means Inside OR Outside i.e., all lines can be searched.
HANC/VANC	Both (Default) HANC VANC	Ancillary inspection parameter specifying where to look in the ANC space for the data desired.
Y-Pos/C-Pos	Both (Default) Y-Pos C-Pos	Ancillary inspection parameter specifying where to look in the ANC space for the data desired.
Trigger only on Errors	Enabled Disabled (Default)	When enabled, opens additional dropdown menus to enable any of the following error types.
	Checksum Errors	When enabled, triggers on checksum errors.
	DBN Errors	When enabled, triggers on ancillary DBN (data block number) errors.
	Parity Errors	When enabled, triggers on parity errors.
	ANC Gap Errors	When enabled, triggers on gap errors.

The possible identifiers or packet types are as follows:

Table 5-5 : List of Available Ancillary Data Identifiers

Any	Custom	S353 MPEG Recoding VANC Space	S353 MPEG Recoding HANC Space	S305 SDTI
S348 HD-SDTI	S427 Link Encryption Message 1	S427 Link Encryption Message 2	S427 Link Encryption Metadata	S352 Payload ID
S2016-3 AFD	S2016-4 PAN	S2010 ANSI/SCTE	S2031 DVB/SCTE	S2056 MPEG TS
S2068 3D Packing	S2064 Lip Sync	S2108-1 HDR/WCG	ITU-R BT.1685	OP47 Caption
OP47 VBI/WST	ARIB-TR-B29	RDD18 Metadata	RP214 KLV Metadata VANC Space	RP214 KLV Metadata HANC Space
RP223 UMID/ID	S2020 No Pair Associated	S2020 Audio Channel Pair 1/2	S2020 Audio Channel Pair 3/4	S2020 Audio Channel Pair 5/6
S2020 Audio Channel Pair 7/8	S2020 Audio Channel Pair 9/10	S2020 Audio Channel Pair 11/12	S2020 Audio Channel Pair 13/14	S2020 Audio Channel Pair 15/16
S2051 Two Frame	RDD8 WSS	S12M-2 V-TCODE	S2103 Generic Time	EIA-708 Caption
EIA-608 Caption	S12-3 HFR TCODE	RP207 Program	S334-1 Data	RP208 VBI Data
Mark Deleted	S299-2 3G Audio Control Group 8	S299-2 3G Audio Control Group 7	S299-2 3G Audio Control Group 6	S299-2 3G Audio Control Group 5
S299-2 3G Audio Audio Group 8	S299-2 3G Audio Audio Group 7	S299-2 3G Audio Audio Group 6	S299-2 3G Audio Audio Group 5	S299-1 HD Audio Control Group 4
S299-1 HD Audio Control Group 3	S299-1 HD Audio Control Group 2	S299-1 HD Audio Control Group 1	S299-1 HD Audio Audio Group 4	S299-1 HD Audio Audio Group 3
S299-1 HD Audio Audio Group 2	S299-1 HD Audio Audio Group 1	S272 SD Audio Control Group 4	S272 SD Audio Control Group 3	S272 SD Audio Control Group 2
S272 SD Audio Control Group 1	S315 Camera Pos	RP165 EDH	S272 SD Audio Group 4 Ext	S272 SD Audio Audio Group 4
S272 SD Audio Group 3 Ext	S272 SD Audio Audio Group 3	S272 SD Audio Group 2 Ext	S272 SD Audio Audio Group 2	S272 SD Audio Group 1 Ext
S272 SD Audio Audio Group 1				

6. Audio Instruments

This chapter describes the unit's Audio instruments. These instruments are accessed by selecting the Audio option on the Main menu bar.

This chapter includes the following sections:

- [Audio Status](#)
- [Audio Meters](#)

Audio Status

Overview

The **Audio Status** Instrument displays detailed information about the available audio channels which, depending on the SDI input, can be up to 128 channels. For AES inputs, the information for the two audio channels is displayed.

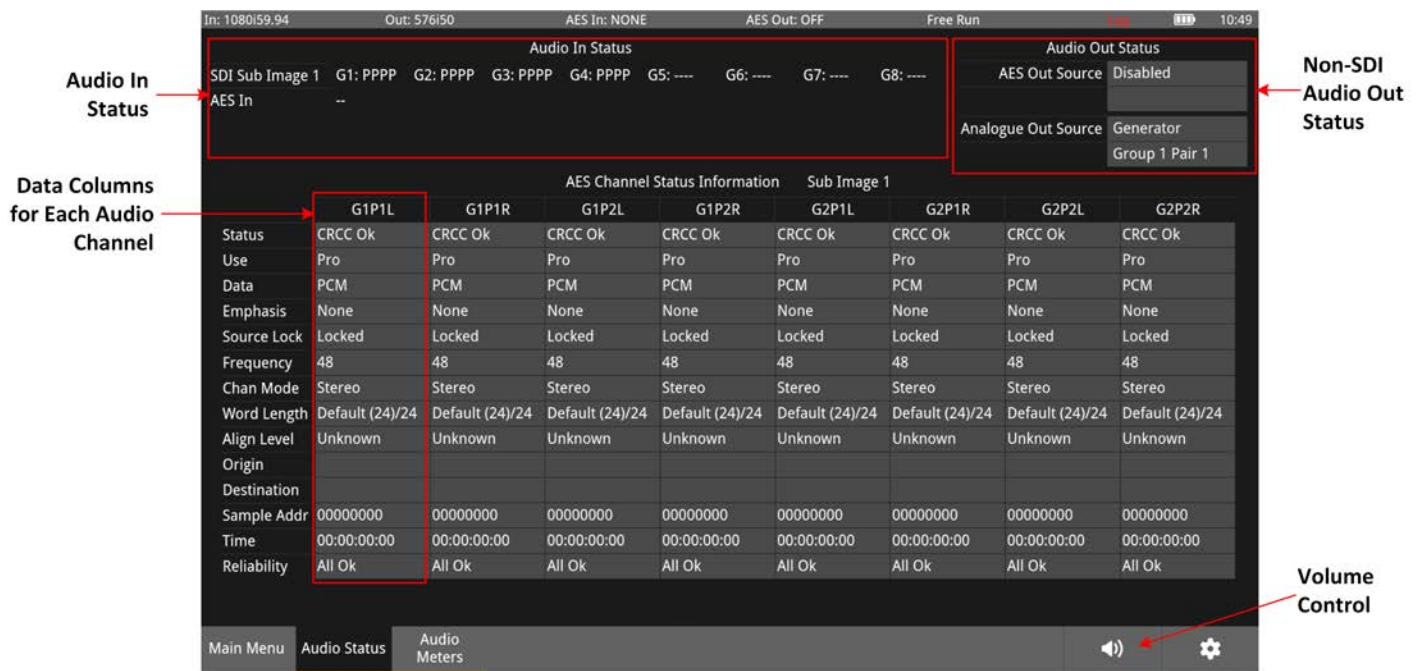


Figure 6-1: Audio Channel Status

Audio In Status

Presence is defined in the upper row of the window. For each channel, one of the following channel presence indicators is displayed:

- -: No audio
- **P**: PCM audio present
- **D**: Dolby Digital® packets present
- **+**: Dolby Digital Plus™ packets present
- **E**: Dolby E™ packets present
- **2**: Dolby ED2™ packets present
- **?**: Unspecified data present.

Audio Out Status

Shows the configuration of AES and Analogue Audio Out signals.

AES3 Channel Status Information

In addition, the following AES3 channel information is displayed in the main data table for each audio channel:

- **Channel Status:** Result of the cyclical redundancy check checksum (CRCC).
The status table uses the following color-coding to indicate CRCC errors:
 - If the channel status is in error, the text is displayed in a red font
 - If errors have occurred but are no longer present the text is displayed in a yellow font
 - If no errors are present, the text is displayed in a white font
- **Use:** Intended purpose of the audio signal
- **Data:** Digital sampling method employed
- **Emphasis:** Type of signal pre-emphasis applied to the audio signal
- **Source lock:** Indicates whether the source is locked
- **Frequency:** Audio sampling frequency in kHz
- **Channel Mode:** Represents the relationship within each audio channel pair
- **Word Length:** Represents the audio word length
- **Align Level:** Alignment Level element in the audio channel status data
- **Origin:** Four ASCII characters indicating the channel origin
- **Destination:** Four ASCII characters indicating channel destination
- **Sample Address:** A rolling counter that increments with each audio sample
- **Time:** Local time of the encoded audio
- **Reliability:** Contains information about the reliability of the channel status word.

Raw Data Display

You can select an audio channel column and display the raw data for that channel, when **CS View** is set to Hex View.

In: 2160p50

Out: 1080p50

AES In: NONE

AES Out: OFF

Free Run

15:16

Audio In Status

SDI Sub Image 1

G1: PPPP

G2: PPPP

G3: PPPP

G4: PPPP

G5: PPPP

G6: PPPP

G7: PPPP

G8: PPPP

SDI Sub Image 2

G1: PPPP

G2: PPPP

G3: PPPP

G4: PPPP

G5: PPPP

G6: PPPP

G7: PPPP

G8: PPPP

SDI Sub Image 3

G1: PPPP

G2: PPPP

G3: PPPP

G4: PPPP

G5: PPPP

G6: PPPP

G7: PPPP

G8: PPPP

SDI Sub Image 4

G1: PPPP

G2: PPPP

G3: PPPP

G4: PPPP

G5: PPPP

G6: PPPP

G7: PPPP

G8: PPPP

AES In

--

Audio Out Status

AES Out Source

Disabled

Analogue Out Source

Disabled

AES Channel Status Information

Sub Image 1

	G1P1L	G1P1R	G1P2L	G1P2R	G2P1L	G2P1R	G2P2L	G2P2R
Status	CRCC Ok	CRCC Ok	CRCC Ok	CRCC Ok	CRCC Ok	CRCC Ok	CRCC Ok	CRCC Ok
CS [00-03]	81 00 2C 00	81 00 2C 00	81 00 2C 00	81 00 2C 00	81 00 2C 00	81 00 2C 00	81 00 2C 00	81 00 2C 00
CS [04-07]	00 00 50 68	00 00 50 68	00 00 50 68	00 00 50 68	00 00 50 68	00 00 50 68	00 00 50 68	00 00 50 68
CS [08-11]	51 78 44 65	51 78 44 65	51 78 44 65	51 78 44 65	51 78 44 65	51 78 44 65	51 78 44 65	51 78 44 65
CS [12-15]	73 74 BB 19	73 74 BB 19	73 74 BB 19	73 74 BB 19	73 74 BB 19	73 74 BB 19	73 74 BB 19	73 74 BB 19
CS [16-19]	EB 0D 14 16	EB 0D 14 16	EB 0D 14 16	EB 0D 14 16	EB 0D 14 16	EB 0D 14 16	EB 0D 14 16	EB 0D 14 16
CS [20-23]	13 21 00 12	13 21 00 12	13 21 00 12	13 21 00 12	13 21 00 12	13 21 00 12	13 21 00 12	13 21 00 12

Main Menu

Audio Status

Audio Meters

Figure 6-2: Audio Channel Status - Raw Data View

Context Menu

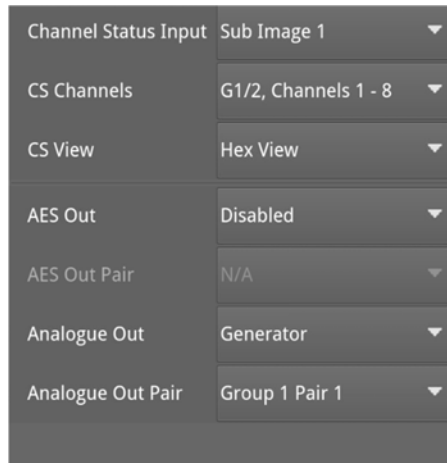


Figure 6-3: Audio Channel Status Context Menu

The following table lists the options for the Audio Channel Status option menu:

Table 6-1 : Audio Channel Status Context Menu

Item	Options	Description
Channel Status Input	Sub Image 1 (Default) Sub Image 2 Sub Image 3 Sub Image 4 AES In	Source of the audio channel.
CS Channels	G1/2, Channels 1 - 8 (Default) G3/4, Channels 9 - 16 G5/6, Channels 17 - 24 G7/8, Channels 25 - 32	Select the channel groups (8 channels per group).
CS View	Field View (Default) Hex View	Select Hex View to see raw data for the selected channels.
AES Out	Disabled (Default) Analyser Generator AES In Analog In	Select the source of the AES audio out.
AES Out Pair	N/A Group 1 Pair 1 to Group 8 Pair 2	When AES Out is set to either Generator or Analyzer, select a channel pair.
Analog Out	Disabled (Default) Analyser Generator AES In Analog In	Source of Analog audio out.
Analog Out Pair	N/A Group 1 Pair 1 to Group 8 Pair 2	When Analog Out is set to either Generator or Analyzer, select a channel pair.

Audio Meters

Overview

The **Audio Meters** instrument displays 16 audio meters together with peak level indicators and indication of audio pair correlation. Up to 128 audio channels can be metered/monitored. The colored bands indicate when the signal is in the warning zone (yellow) or error zone (red). In addition, the measurement values are displayed in dBFS below each meter. Use the volume control to adjust the audio level of the selected stereo or single channel when monitoring via headphones or the internal speaker. The **cog** softkey opens the context menu.

The **Correlation Meters** are used to measure the "phase relationship" between two audio channels. When the indicator is at the right hand side of the meter (green), the two channels are **fully correlated** (+1); for equal-level channels this means they contain the same signal (i.e. mono). When the indicator is in the centre of the meter (yellow), the two channels are **uncorrelated** (0), as may occur with independent stereo content. When the indicator is at the left hand side of the meter (red), the channels are **fully negatively correlated** (-1); for equal-level channels this corresponds to opposite polarity.

When AES/Analog inputs are selected, both sources can be monitored and metered simultaneously.



Figure 6-4: Audio Meters Instrument SDI Input

Dolby E™, Dolby ED2™, Dolby Digital® and Dolby Digital Plus™ streams are automatically detected by the unit, with Dolby® stream presence indicated by blue graph bars. For an SDI input carrying embedded Dolby E audio, the Dolby E Reference Line number is also displayed below the meter, either as an absolute value or relative to the Ideal line number specified by Dolby for that video standard. If the Line number is outside the Dolby specifications, it will appear in red.

Up to 16 audio channels can be analyzed at one time. To monitor a stereo pair, select the speaker icon above the target audio meter. To select a channel, select the corresponding **solo** bus icon (see [Figure 6-4](#) above). Both the rotary control and slider control can be used as volume controls.

[Figure 6-5](#) provides a comparison of the available audio metering scales (PPM Scale Types) and illustrates the relative scope and alignment levels.

Note: Sx2 does not support audio in data packets in data stream #2 of 3G Level B-DL signals.

dBFS Configuration

dBFS Configuration allows customization of the audio warning and error levels used in the Audio Meters instrument.

Meters are colored as follows:

- Green when the audio level is in the range between Minimum Level (default: -70dB) and Warning Level
- Yellow when the audio level exceeds the Warning Level but remains below or equal to the Error Level
- Red when the audio level exceeds the Error Level.

These settings can be customized in the configuration menu. To return to one of the default settings, select either **Reset to -18 dBFS Defaults**, or **Reset to -20 dBFS Defaults**.

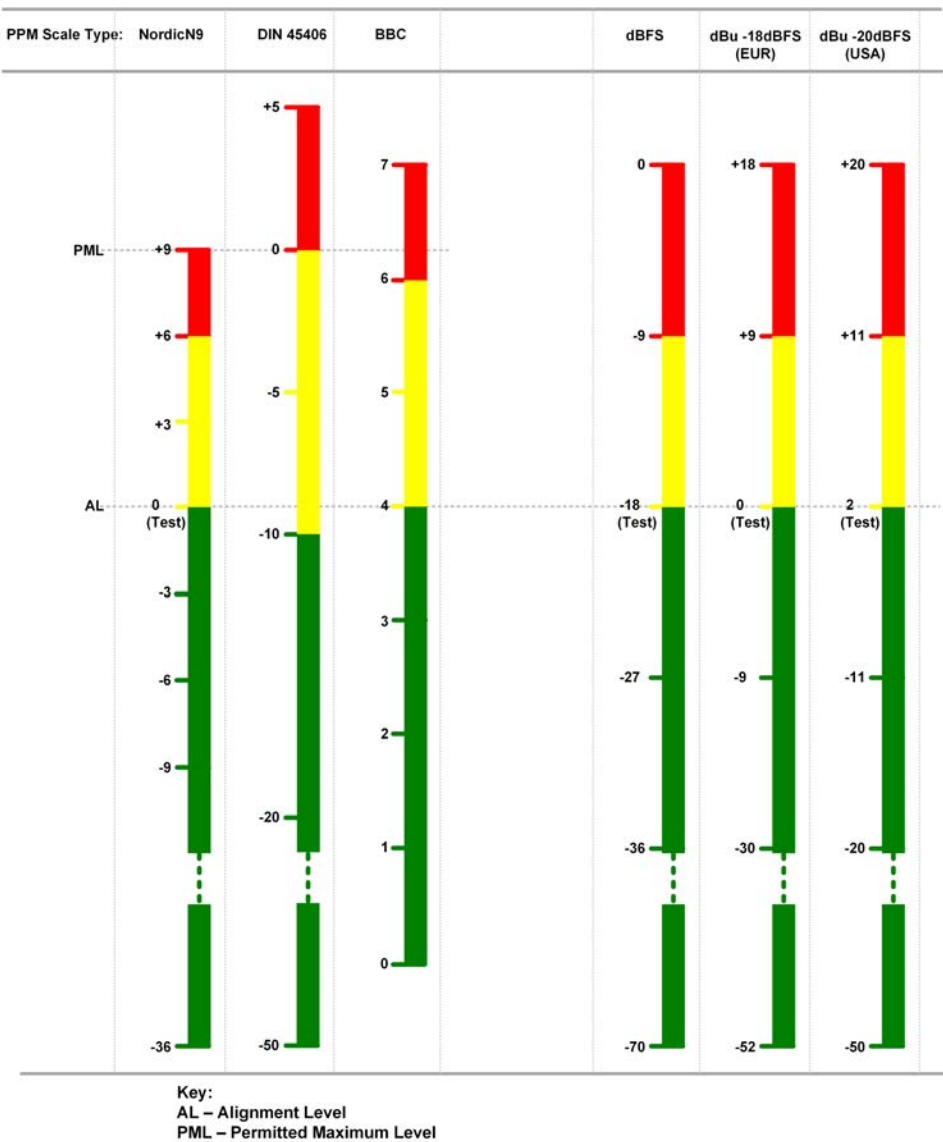


Figure 6-5: Comparison of Audio Metering Scales

Instrument Context Menu

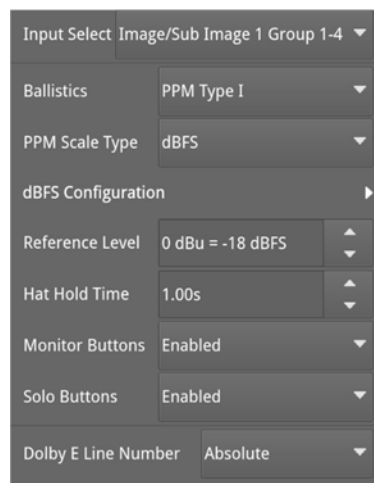


Figure 6-6: Audio Meters Context Menu

The following configurable parameters are available to configure the **Audio Meters** Instrument:

Table 6-2 : Audio Meters Context Menu

Item	Options	Description
Input Select	Image/Sub Image 1 Group 1-4 (Default) Image/Sub Image 1 Group 5-8 Sub Image 2 Group 1-4 Sub Image 2 Group 5-8 Sub Image 3 Group 1-4 Sub Image 3 Group 5-8 Sub Image 4 Group 1-4 Sub Image 4 Group 5-8 AES/Analog In	Select the sub image audio groups to monitor and meter in 16 channel audio blocks. Select the AES and/or Analog input.
Ballistics	PPM Type I (Default) PPM Type II Vu VuFr Fast	Set the required peak program meter (PPM) ballistic responsiveness for the audio meters. • PPM Type I emulates the performance of IEC 60268-10 Type I PPM style audio meters typically used by German broadcasters. • PPM Type II emulates the performance of IEC 60268-10 Type II PPM style audio meters typically used by UK broadcasters. • Vu emulates the performance of IEC 60268-17 Type I PPM style audio meters typically used by US and Australian broadcasters. • VuFr emulates the performance of ITU-R Rec BS.645 style audio meters typically used by French broadcasters. • Fast provides instantaneous attack ballistics.
PPM Scale Type	dBFS (Default) dBu BBC DIN45406 NordicN9	Set up the desired scale for the audio meters according to your standard operating model.

Item	Options	Description
dBFS Configuration	Maximum Level	-30 to +5 dB, set in 1 dB steps
	Error Level	-70 to 0 dB, set in 1 dB steps
	Warning Level	-70 to 0 dB, set in 1 dB steps
	Minimum Level	-70 to 0 dB, set in 1 dB steps
	Scale Step	5 to 20 dB, set in 1 dB steps
	Reset to -18 dBFS Defaults	Resets all above to -18 dBFS defaults
	Reset to -20 dBFS Defaults	Resets all above to -20 dBFS defaults
Reference Level	0 dBu = -18 dBFS (Default)	This maps the 0 dBu analog audio level on a dBFS scale. The default setting is 0 dBu (analog) or -18 dBFS. Reference Level can be adjusted from -21 to -14 dBFS in 1 dBFS steps. This setting is relevant when metering analog audio.
Hat hold time	0 to 10 seconds, in 0.1 s increments (0.01 s Default), or Infinite	Used to set the minimum time that the signal gate is held open. When set to Infinite (and Ballistics is set to Fast), the Hat in the meters indicates the true peak of the metered audio.
Monitor Buttons	Enabled (Default) Disabled	Toggle the display of Monitor icons for the audio meters.
Solo Buttons	Enabled (Default) Disabled	Toggle the display of Solo icons for each channel of a pair.
Dolby E Line Number	Absolute (Default) Relative to Ideal	Select Dolby E timing reference type, either the absolute line number or relative to the nominal line indicated in the Dolby specification.

7. Reference Status

This chapter describes the unit's Reference instrument. This instrument is accessed by selecting the **Reference** option on the Main menu bar.

This instrument is used to set the system reference. The same instrument is used for measuring video timing against the external reference. The Reference Status instrument provides SDI timing measurements that allow you to assess the timing quality of the input relative to an external reference. You can then set timing offsets to compensate.

System Reference and Timing Measurements

The Status Bar at the top of the screen indicates the Reference status of the Sx2. If the user has not changed the default value, or Free Run has been selected, the status displays "Free Run". This message is duplicated in the top right corner of the page as "System Reference: Free Run".

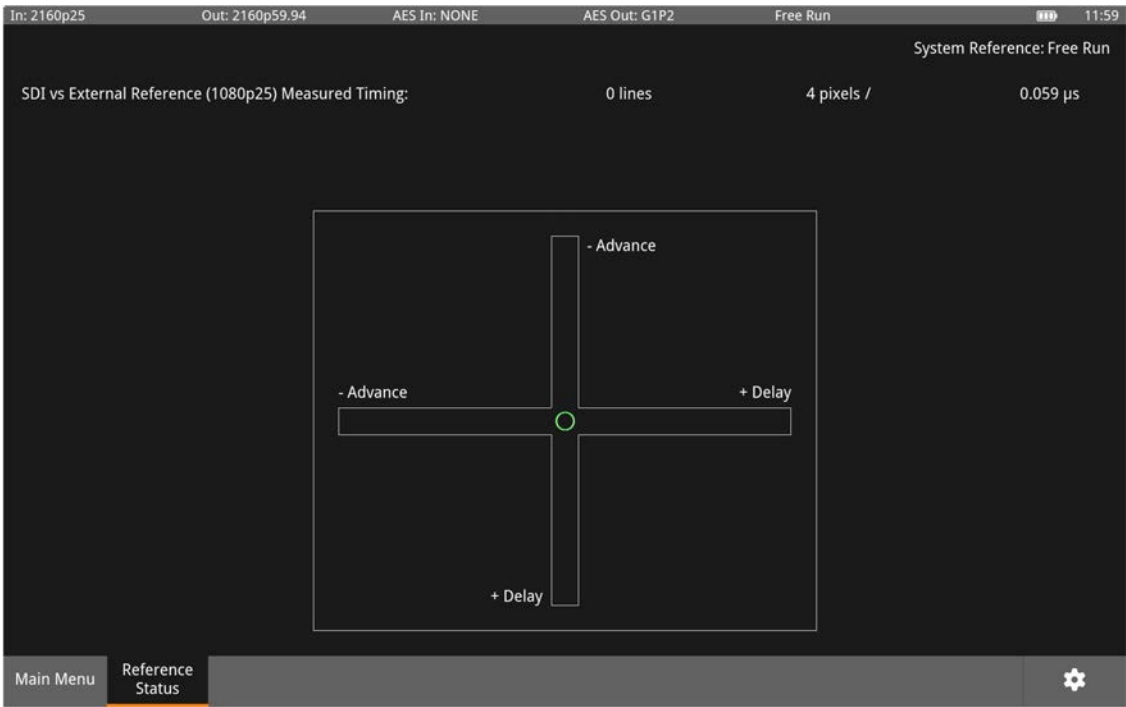


Figure 7-1: Reference Status - Free Run

When the System Reference is set to either External Reference or SDI, and is locked to the source, the status message "SDI" or "External" is displayed, followed by the parameters of the source.

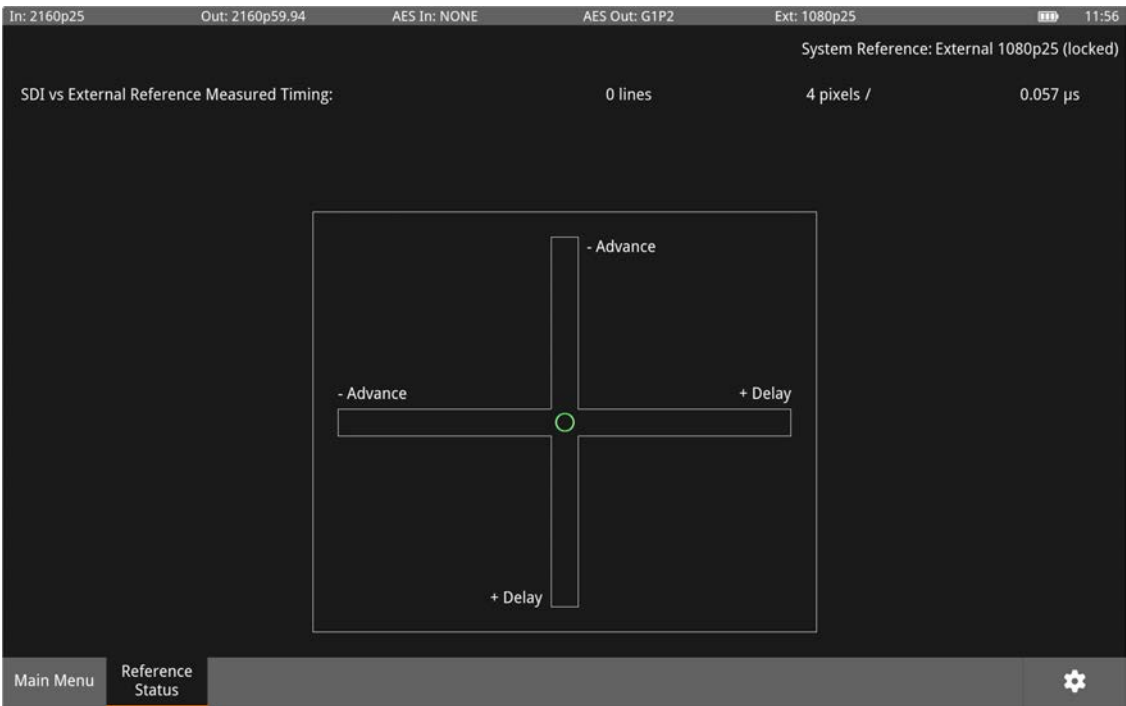


Figure 7-2: Reference Status - No Offset

The cross represents timing advance or delay of the signal with respect to the external reference. The vertical arm represents the vertical timing (in lines) while the horizontal arm represents the horizontal timing (in pixels). The center of the cross represents the origin, where the difference between the SDI signal and the external reference is zero, meaning no deviation between the values. When there is no external reference connected to the unit, no circles appear on the cross, however when an external reference is provided, two circles will appear which represent the vertical and horizontal deviations. The circles appear in white unless they are within ± 3 lines or ± 3 pixels of the origin, whereby they appear in green.

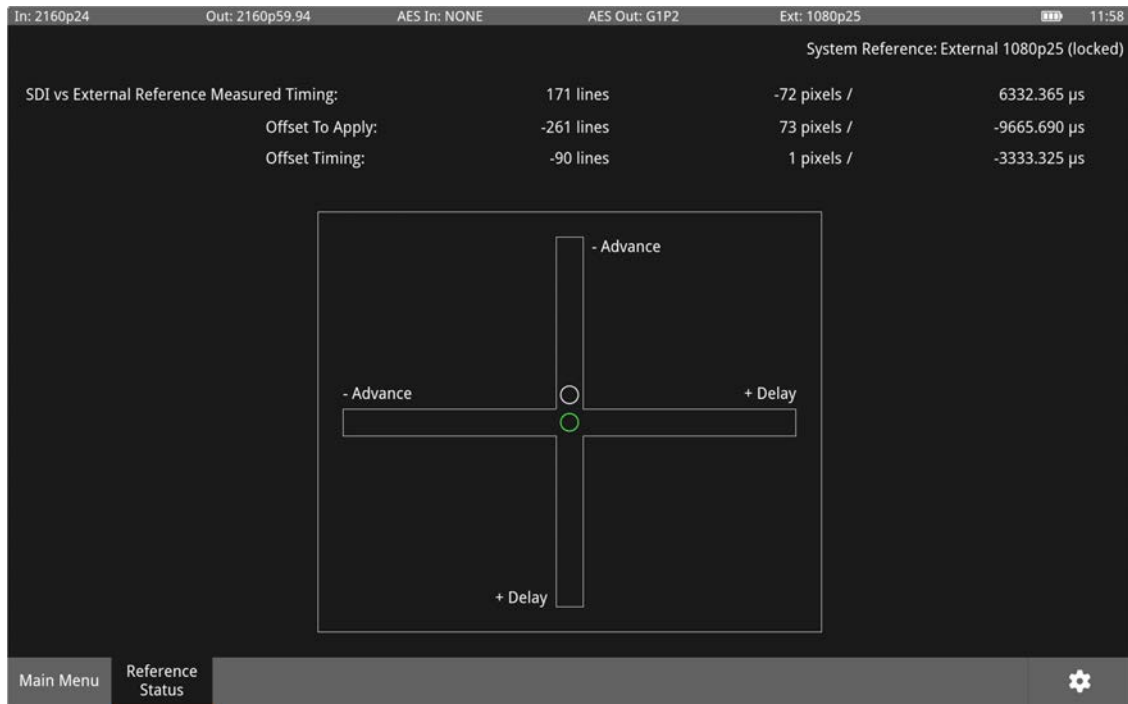


Figure 7-3: Reference - Offset

To adjust the timing and therefore move the circles nearer the origin, select the **cog** softkey to open the context menu. Use the **Input Line Offset** to move the circle in the vertical arm up and down, and use the **Input Pixel Offset** to move the circle in the horizontal arm left and right.

In the above example, the vertical deviation circle is white, which indicates that it is more than ± 3 lines from the origin, so can be adjusted. The horizontal deviation circle is green however, so is within ± 3 pixels of the origin, so may require only small or no adjustment. The timing differences, applied offsets and resulting Offset Timing are displayed above the cross, in terms of lines, pixels and time.

Note: There will always be two circles but if they overlap perfectly, they will appear as one.

For more detailed information about video signal ranges, see the recommendation EBU R 103 *Video Signal Tolerance in Digital Television Systems*.

Context Menu

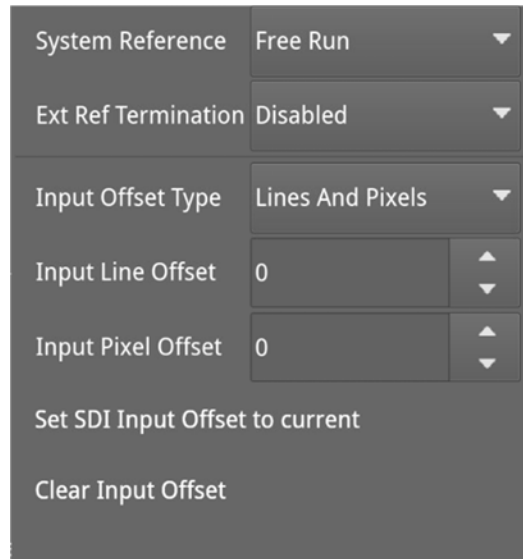


Figure 7-4: Reference Context Menu

The following table lists the options available in the Reference Status instrument menu.

Table 7-1 : Reference Context Menu

Item	Options	Description
System Reference	Free Run (Default) External Reference SDI	This option is used to set the system reference. Lock status is displayed in the upper-right corner of the Reference screen, when the system reference is set to SDI or External Reference. The text is displayed in yellow until the signal is locked.
Ext Ref Termination	Enabled (Enabled) Disabled	When enabled, adds an internal 75 Ω termination to the reference input. Note: This parameter should be enabled.
Input Offset Type	Time (Default) Lines and Pixels	Time is adjustable in 0.01 μ s steps. Lines and Pixels are adjustable in single steps.
Set SDI Input Offset to current		Select to apply the current measured offsets to the signal.
Clear Input Offset		Resets all input offsets to zero.

8. Network Status

This chapter describes the unit's Network Status instrument. This instrument is accessed by selecting the **Network Status** option on the Main menu bar.

Overview

The **Network Status** instrument lets you connect the unit to a network, via an Ethernet cable connected to the RJ45 management port.

You can choose either dynamic or static IP addressing for the management interface, and enable LLDP if required. Once the unit is powered on and connected, you can access the unit remotely and set its time and date from an NTP server.

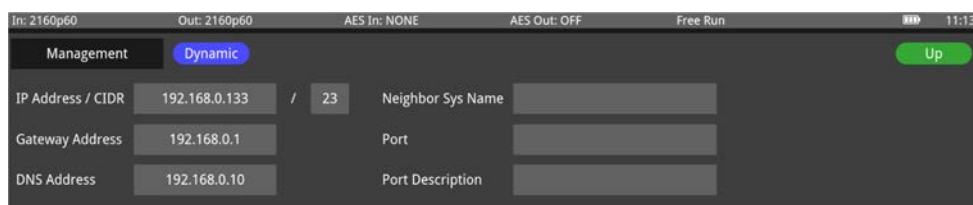


Figure 8-1: Network Status Instrument - DHCP

To switch between Static and Dynamic IP addressing, use the **cog** softkey in the menu bar to open the Context Menu then select Configure IP... options.

Use the Dynamic/Static dropdown list to make a selection. When Static is selected, you can enter or change the IP Address/CIDR, Gateway Address and DNS Address by selecting the relevant entry, which launches the numeric numpad. See [Numeric Keypad \(Numpad\)](#) for details. If CIDR is selected, a dropdown list is expanded from which you can choose a value.

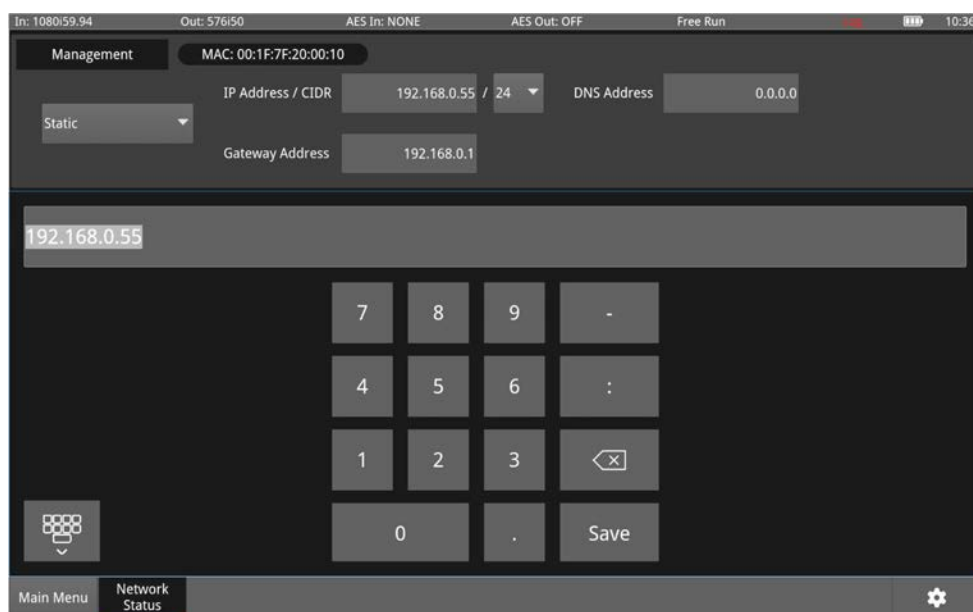


Figure 8-2: Network Status Instrument - Static IP

Configure IP... Parameters

The following table lists the configurable parameters in the Configure IP...:

Table 8-1 : Configure IP... Parameters

Item	Options	Description
Configure IP		
Management	Dynamic (Default) Static	Dynamic uses DHCP to automatically assign IP settings. Static requires you to enter your own settings.
IP Address/CIDR	Enter static IP address and mask (range: 8 to 31) as required.	Only available when static IP addressing is selected. The dropdown list selects the Mask, using CIDR notation with a default value of 24 .
Gateway Address	Enter the IP address of the Gateway as required.	Only available when static IP addressing is selected. Note: A gateway address is required, even on a network without a default gateway. If this is the case, enter a dummy gateway address.
DNS Address	Enter the IP address of the DNS Server.	Only available when static IP addressing is selected.

Select OK to confirm Network settings or Cancel to exit without applying settings.

Network Status Context Menu

This menu contains the Configure IP... item described above and the LLDP settings.

By default LLDP is Enabled. The option allows LLDP to **Send Version Info** and **Send Management Port** info. After making a selection, use the **cog** softkey again to close this menu.

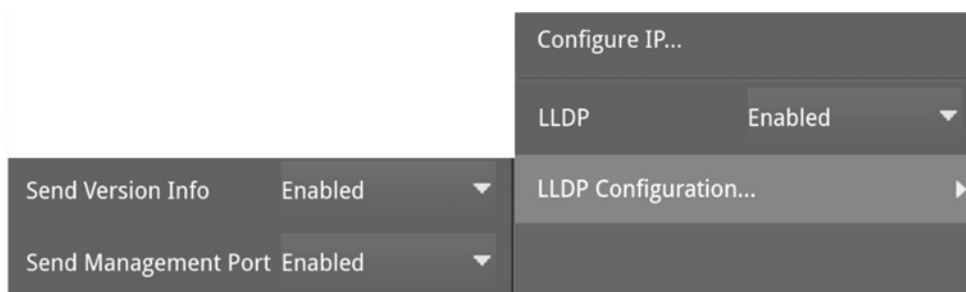


Figure 8-3: Network Status Context Menu

The following table lists the configurable network parameters:

Table 8-2 : Network Menu Options

Item	Options	Description
Configure IP...		Refer to Configure IP... above.
LLDP	Enabled (Default) Disabled	When disabled, no LLDP information is sent over the network, or read from the network.
Send Version Info	Enabled (Default) Disabled	Displayed only when LLDP is enabled. When enabled, the system will advertise the software version number.
Send Management Port	Enabled (Default) Disabled	Displayed only when LLDP is enabled. When enabled, the unit will advertise its management IP address.

Numeric Keypad (Numpad)

If you select the static IP addressing mode in the Configure IP... dialog, select any of the IP address fields to display the on-screen numpad as shown in [Figure 8-4](#).

Note: The on-screen numpad is available only if the on-screen keyboard is enabled in the Systems Status page.

Enter an address using the numpad as follows:

1. Use the backspace to remove digits or highlighted text. Note that an incomplete value will be displayed in yellow text.
2. Enter the new address using the numpad as required. Valid addresses are displayed in white text.
3. Select **Save** to save the new address and close the numpad.

To quit the numpad without saving, select



4. If all IP address parameters are complete, select **OK** to save and exit the dialog.

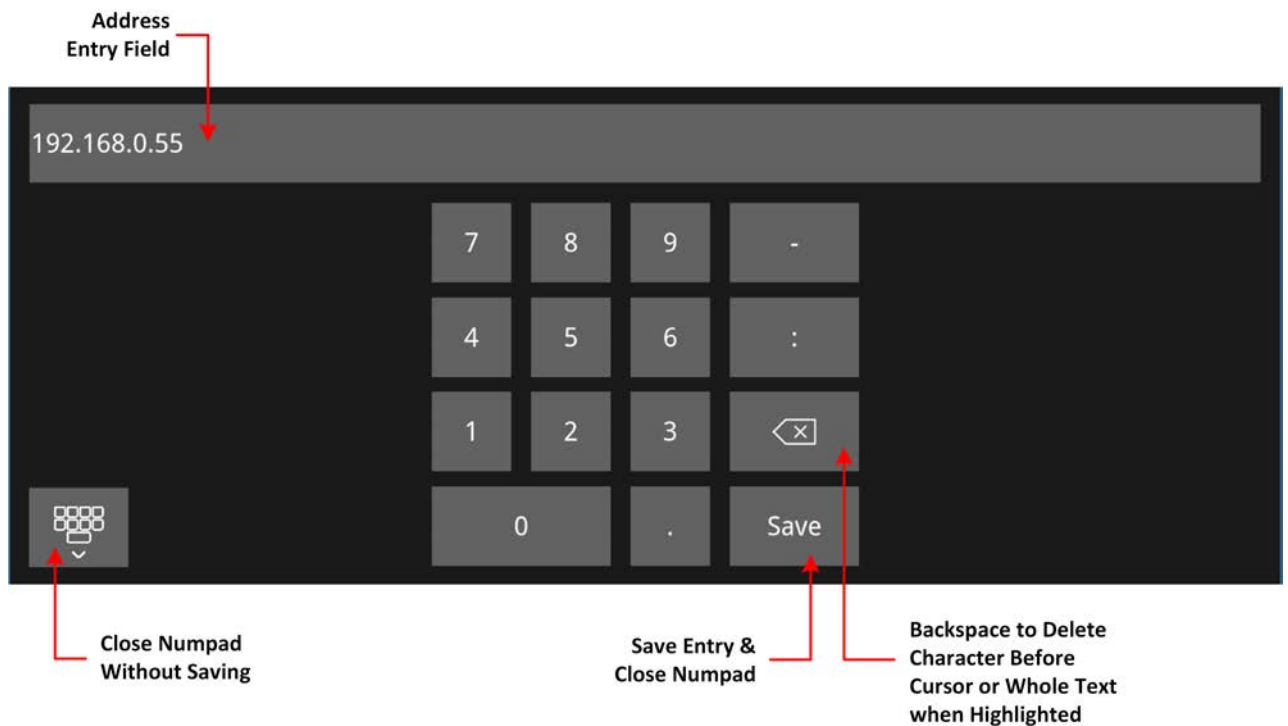


Figure 8-4: Numpad to Enter Static IP Addresses

9. System

This chapter describes the unit's System instruments. These instruments are accessed by selecting the **System** option on the Main menu bar. This chapter consists of the following sections:

- [System Status](#)
- [Presets](#)
- [Quad Split Config](#)
- [File Manager](#)

System Status

Overview

The **System Status** page displays an overview of the Sx2 status.

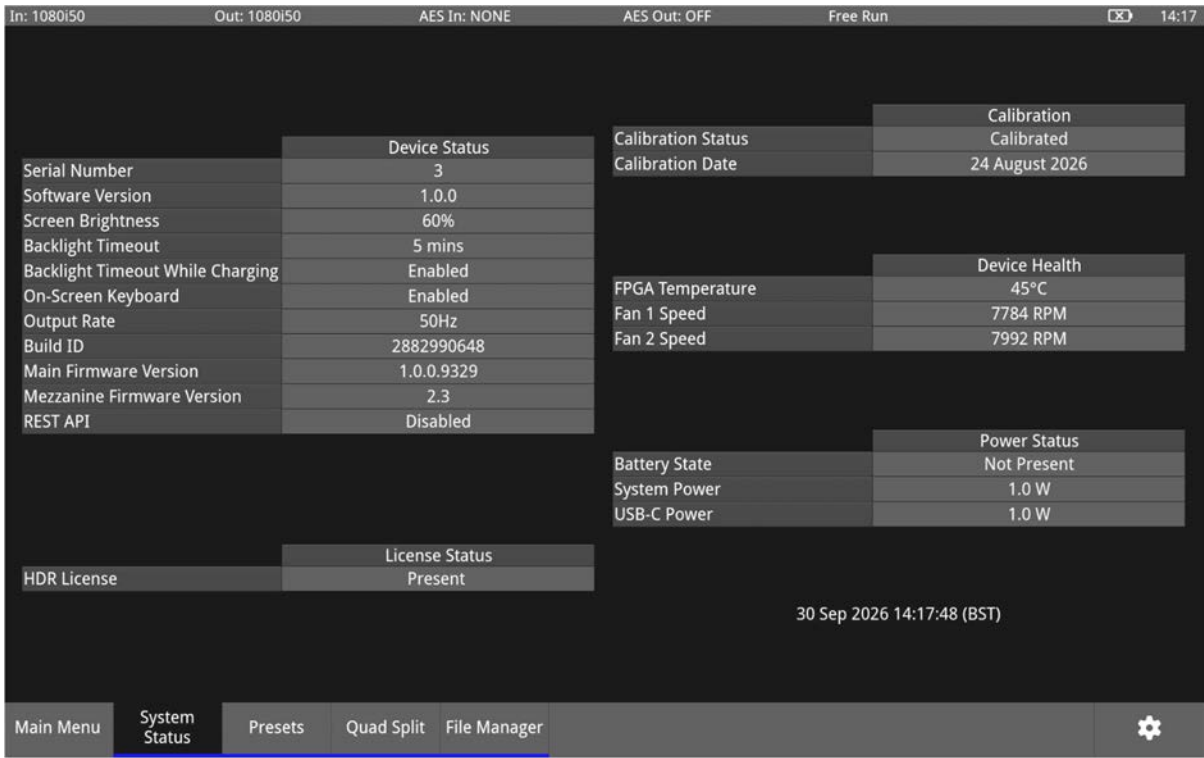


Figure 9-1: System Status Page

Checking the System Health

The System Status page displays the current health: FPGA temperature, rotational speed of the cooling fans and the Power Status.

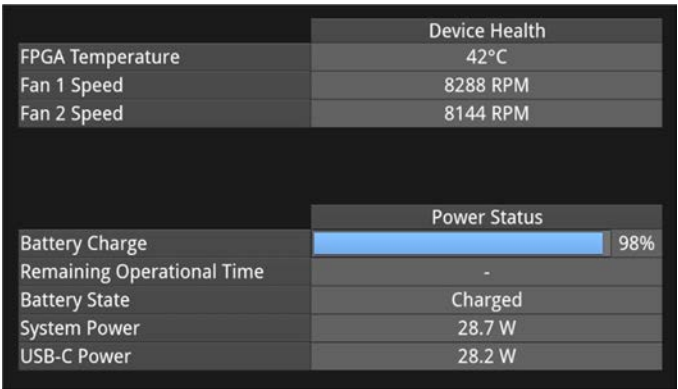
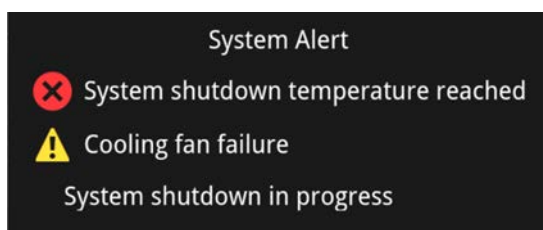


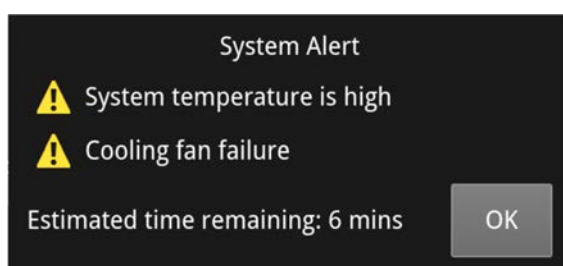
Figure 9-2: System Health Information

Alert thresholds are set for each of the factors which, when passed, trigger alert messages. The System Alert indicates the source of the alert and **must** be acknowledged. In the case of a critical alert, the alert may shut down the Sx2 before the user has acknowledged it. The alerts are:

- Temperature: High and Critical, the latter shuts down the Sx2 immediately.



- Fan speed: less than 100 RPM or missing. The alert is only displayed once and is not repeated until the Sx2 is restarted. The fan icons on the System Overview page will also turn red, indicating an alert condition.



- Battery: Low (10 %), Very Low (5 %) and Critical, all of which are cleared by connecting the battery charger.

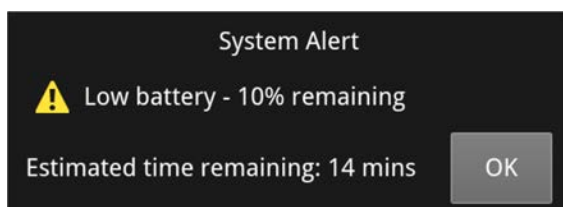


Table 9-1 : Recommended Operating Conditions

	Safe Range	Description
FPGA Temperature	From 0° to 60°C (32° to 140°F)	Unit issues a high temperature warning at 60°C (140°F) and switches off at 85°C (185°F)
Cooling Fans	1500 to 8000 rpm	Speed of fans varies with the temperature of the FPGA. Two cooling fans are located in the side of the unit and operate at 75% of the maximum capability of the fans.

Take a Screenshot

In the **System Status** menu, select the **cog** softkey to open the context menu, then select **Take Screenshot**. This opens the Screenshot capture dialog.

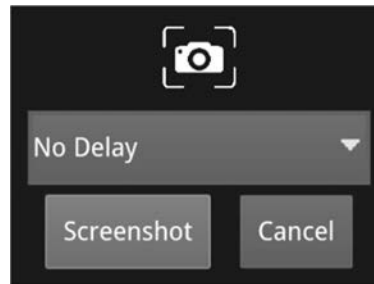


Figure 9-3: Screenshot Capture Dialog

This dialog remains in the foreground while you go to the page you wish to capture. When there, tap the **Screenshot** button. If a delay has been selected in the dropdown list (3, 10 or 30 seconds), the screenshot will be taken after that delay, otherwise it will be taken immediately. The image file is saved to the device's screenshots folder and the message "Screenshot Saved" is displayed.

Calibration

The System Status page indicates the status and date of the **SDI Driver** calibration. For model Sx2E only, the calibration information is indicated for the **Eye** instrument and **SDI driver**.

To display further information, select the **cog** softkey then **Calibration Data...**

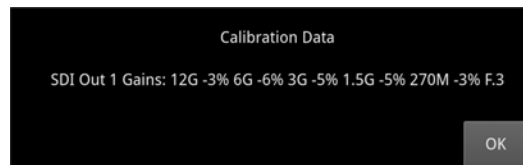


Figure 9-4: Sx2 Calibration Data

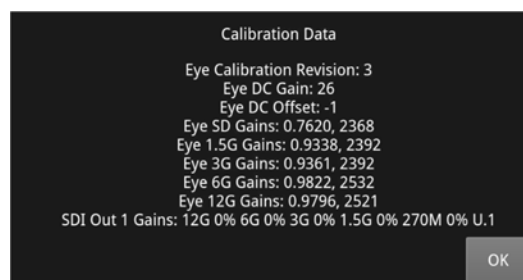


Figure 9-5: Sx2E Calibration Data

Additional Information

To display information about the unit's hardware and firmware, select the **cog** softkey then **Additional Information...**

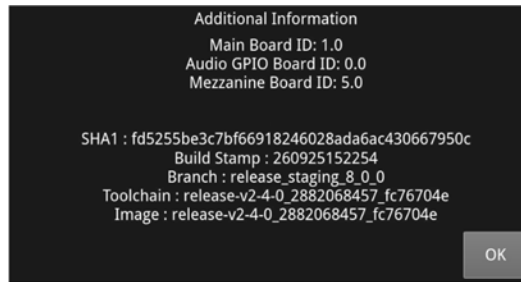


Figure 9-6: Sx2E Additional Information

Restore Defaults

To restore the factory defaults:

1. Go to the System page and select the **cog** softkey.
2. Select: **Restore Defaults**.

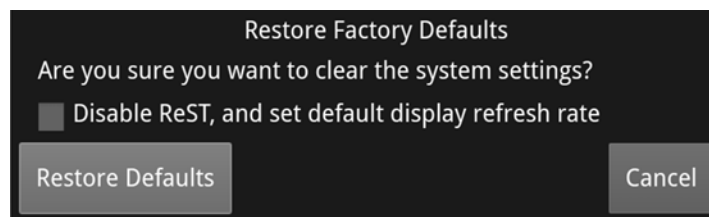


Figure 9-7: Confirmation Dialog to Restore Factory Default Settings

3. Select **Restore Defaults** to confirm or **Cancel** to quit.

Note: If the **Disable ReST** tickbox has been checked, access to REST API will be disabled and the display refresh rate returned to its default value. All Quad-Split templates will also be reset.

Time and Date

The unit displays the system time at the top right of the status bar, and the time and date in the lower right corner of the **System Status** page. Time and date can be set automatically using NTP (Network Time Protocol).

Open the **System Status** menu, select the **cog** softkey and select **Time and Date....**

This opens the following dialog:

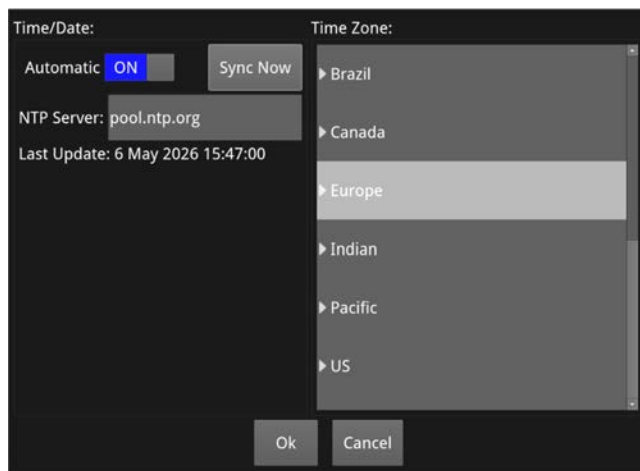


Figure 9-8: Time and Date Dialog

1. To use the time and date delivered by NTP:
 - a. Switch the **Automatic** toggle switch to **ON**.
 - b. Check the address of the NTP server. In most cases, the pre-selected address **pool.ntp.org** will normally suffice.
 - c. Select your local time zone from the **Time Zone** list box.
 - d. Select **OK** to save your changes and quit the dialog, or **Cancel** to discard.
2. To set a time and date manually:
 - a. Set the **Automatic** toggle switch to **OFF**.

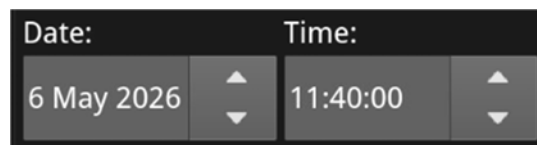


Figure 9-9: Date and Time Fields for Manual Time Setting

- b. Select the Date field and adjust using either the up/down spinbox arrows or the rotary control
- c. Select the Time field and adjust using either the up/down spinbox arrow or the rotary control
- d. Select **OK** to save your changes and quit the dialog, or **Cancel** to discard.

LGPL v3 License

To view the LGPL v3 License, select the **cog** softkey then **LGPL v3 License...**

Drag the screen contents up to view the complete copyright notice, then select **OK** to close it.

Temperature

To change temperature units from Celcius (°C) to Fahrenheit (°F), select the **cog** softkey then **Temperature Units**.

Select the required units from the dropdown list. Any change will result in the new units being used throughout the Sx2 user interface.

On-Screen Keyboard

The on-screen keyboard (and numpad) are enabled by default. To change the setting, select the **cog** softkey then **On-Screen keyboard**.

Restart Device

To restart the unit, select the **cog** softkey then **Restart Device...**

Select **OK** to continue or **Cancel** to exit.

REST API

By default, REST API is disabled. To change the setting, select the **cog** softkey then change the setting to **Enabled**.

Display Settings

To adjust the Display Settings, select the **cog** softkey to open the context menu, then select **Display Settings...** to expand the options.

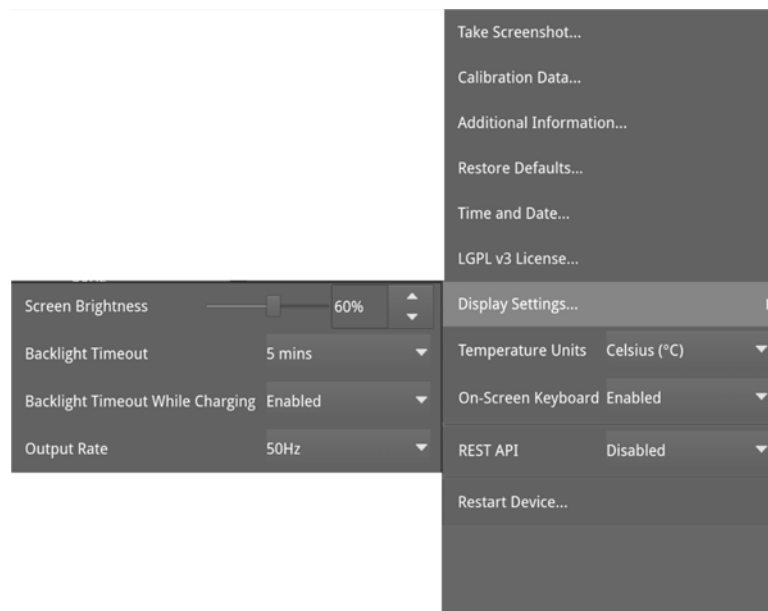


Figure 9-10: Display Settings Configuration Dialog

Screen Brightness can be adjusted by either dragging the slider left or right, using the adjacent up/down arrows, or the rotary control

Backlight Timeout can be enabled to reduce battery usage. By default it is set to On.

Backlight Timeout While Charging is set to Disabled by default.

Select the desired frame rate from the **Output Rate** dropdown list:

- 47.95 Hz
- 48 Hz
- 50 Hz
- 59.94 Hz
- 60 Hz

Presets

Overview

A **preset** is a personalized configuration that includes instruments and their settings. The preset is used to open multiple instruments which have been configured.

All presets are saved to the device and are accessed from the **Presets** page in the System menu.

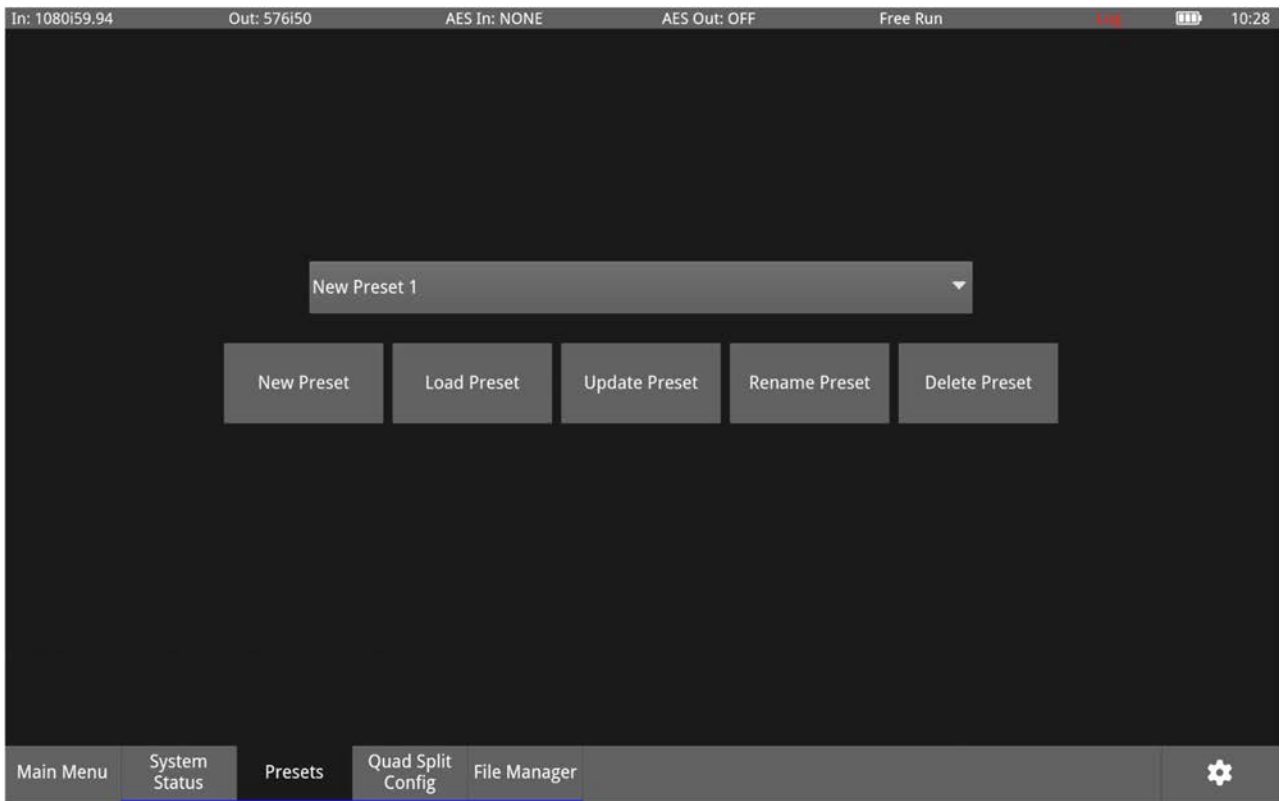


Figure 9-11: Presets menu

Create Presets

To create a preset, select the **New Preset** button.

Rename Preset

To rename the preset, select it in the dropdown list then select the **Rename Preset** button.

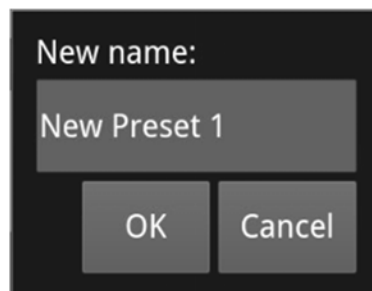


Figure 9-12: Rename Preset Dialog

In the **New Name** dialog, select the existing name, which opens the on-screen keyboard. Enter the New Preset name and select **Save** to add the new value to the New Name field. This also closes the on-screen keyboard.

Load Preset

To load a different preset, select the preset in the dropdown list then select the **Load Preset** button. The new preset will be loaded and you will be returned to the System Overview page.

Update Preset

If you have updated your settings and want to update the preset, select **Update Preset**.

Delete Preset

To delete a preset, select it in the dropdown list then select **Delete Preset**.

Customizing and Using Quad-split Mode

Overview

Quad-split mode allows 3 or 4 instruments to be displayed concurrently. Note that the settings of the instruments cannot be changed when viewed in Quad-split mode.

Quad-split mode is accessed by selecting the quad-split softkey  on the System Overview page.



Figure 9-13: Main Menu bar displayed in the System Overview page

This switches to quad-split display, for example:



Figure 9-14: Example of a Quad-split Display

Selecting the quad-split display button again will select the next enabled template.

To exit Quad-split mode, select one of the menu bar options.

Customizing Templates

On the menu bar, select **System** then **Quad Split Config**. This opens the quad-split template configuration page. Eight templates are provided and at least two are always enabled.

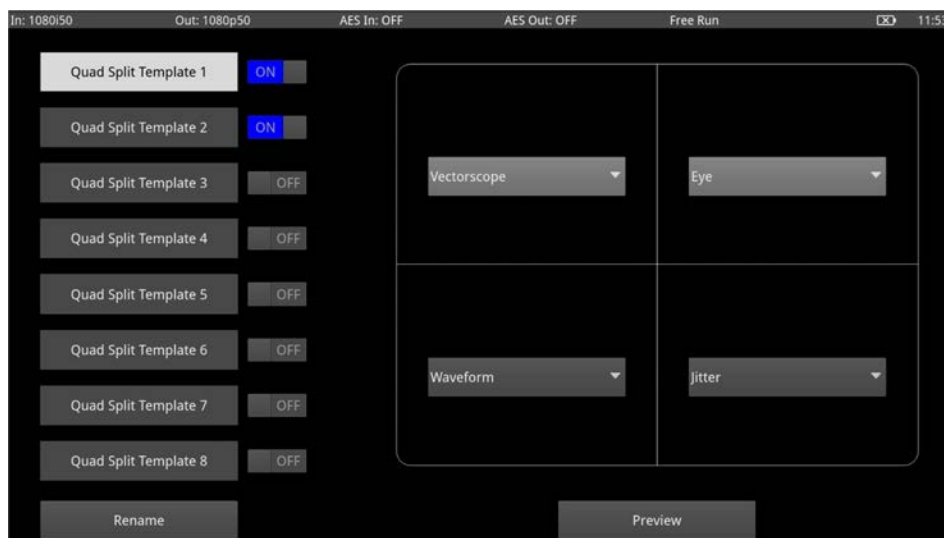


Figure 9-15: Quad-split Template Configuration Page

To enable a template, select a Quad Split Template then set the adjacent switch to **ON**.

Use the dropdown list in each of the quadrants to assign the required instrument. You can select from **Ancillary Status**, **Audio Meters**, **Eye**, **Jitter**, **Output Status**, **Picture** and **Vectorscope**. Additionally, in one of the upper quadrants, you can select **Waveform (quarter size)** or **Waveform (full height)**. The use of a full height instrument will fill two of the four quadrants and use one side of the quad-split display.

Note: **Eye** and **Jitter** are only available on Sx2E.

To view the newly configured template, select **Preview**. The saved quad-split screen will be displayed.

To rename a template, select it then select **Rename**.

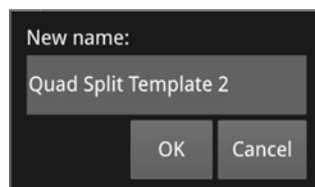


Figure 9-16: Rename Template Dialog

In the Rename Template dialog, select the existing name and use the on-screen keyboard to enter the new name, then Select **Save**.



Figure 9-17: Rename Template Dialog

File Manager

Introduction

With the File Manager you can:

- Select files on either the unit or the USB stick
- Copy selected files in two directions (from unit to USB or USB to unit)
- Drag and drop selected files between the unit and USB device
- Rename files on the USB stick
- Create folders on the USB stick
- Delete files from the unit or USB stick.

You can upload or download the following file types to or from the unit:

- Screenshots
- Presets
- Logfiles
- Test pattern image files (TIFF file format).

Available space on both the unit and USB stick is displayed at the bottom of the corresponding File Manager panels.

In most cases, the easiest way to operate the File Manager is using the touchscreen, however use of the rotary control (RC) can be useful for some operations. Examples are described in the section [Using the Rotary Control](#). In many cases, both methods can be used together.

Some RC use cases specific to the File Manager are:

- When in the System page, the RC ring (or Left/Right) buttons can be used to move the focus indicator to the File Manager softkey, then the center (OK button) pressed for selection
- When in the File Manager page, the Up key can be used to select File Manager folders, which display a white border when selected
- To select the left side (Device) tree, press OK, to select the right side (USB) tree, press the Right key, then OK
- To navigate within the directories, press the Up and Down keys
- Press the Right key to enter a directory, or the Left key to leave a directory and return to the parent
- When you have navigated to a file of interest, press the **Right** key to select it. This highlights the file
- After selection, press OK, then the Down key to exit the tree pane and return to the File Manager menu.

Note: The white border highlighting a tree or file will timeout. To bring it back, press the Left or Right keys to reactivate it, then press OK.

Opening the File Manager

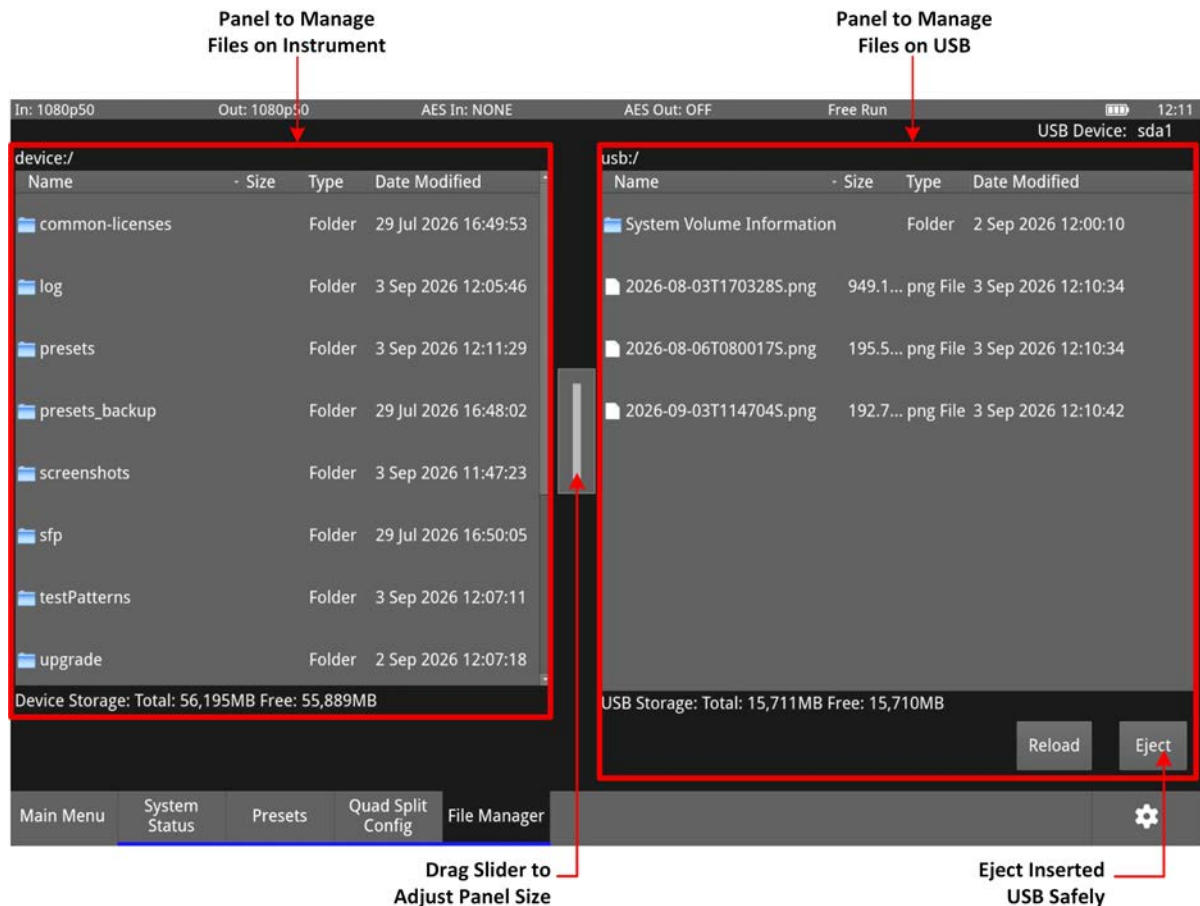


Figure 9-18: File Manager Page

To launch the File Manager from the **System** menu, select **File Manager**.

Copying Files from the Unit to USB

Note: USB-A memory sticks require use of a USB-A to USB-C adaptor.

Copy files from the unit as follows:

1. Insert an ex-FAT or FAT32 formatted USB stick into one of the USB-C ports and open the File Manager.
2. Double-tap the folder icon containing the files to copy.
3. Tap to select the files to copy in the left-hand panel.
You can also tap and hold then choose **Select All Device Files** from the File Manager menu.
4. To deselect a file, simply tap it again. You can also choose **Clear Selected Device Files** from the File Manager menu to deselect multiple files.
5. Use the **cog** button to display the context menu and select **Copy from Device to USB....** This opens the Copy Source Files dialog.

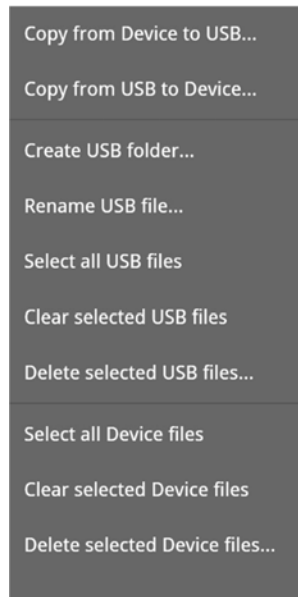


Figure 9-19: File Manager Context Menu

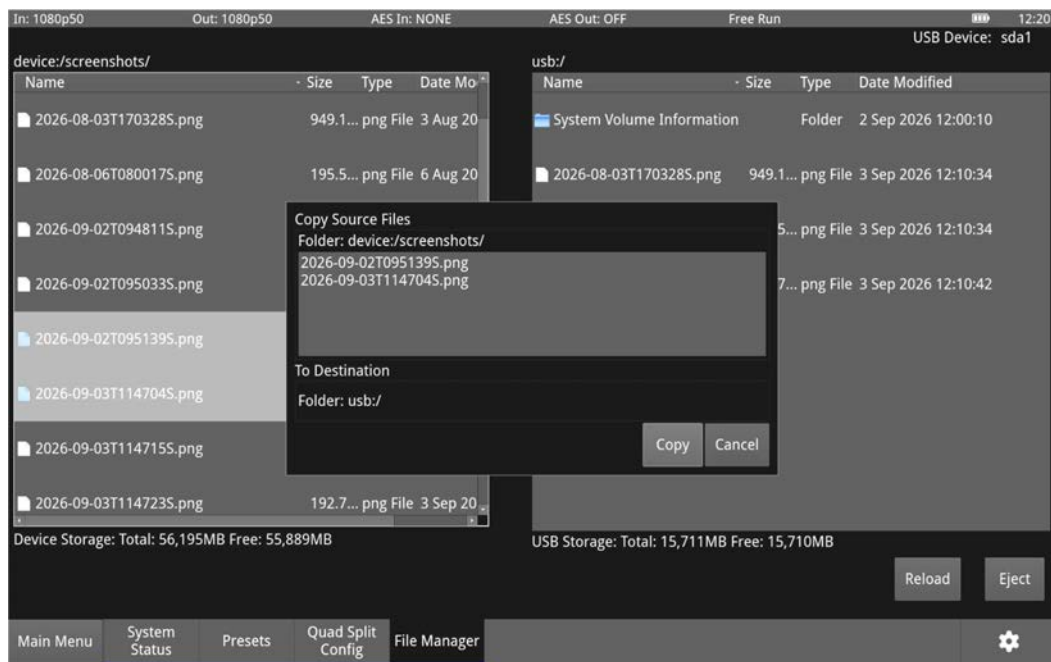


Figure 9-20: Selection of Source Files to Copy

6. Check that the selected files and destination are correct, then select **Copy**.
7. After adding or deleting files from the USB stick, select **Reload** to reload the view.

Note: **Reload** does not remount the USB drive. If you have selected **Eject**, you must remove the USB drive and reinsert it.

Uploading Files from USB to the Unit

Upload files to the unit as follows:

1. Select the files you want to upload in the right-hand panel, or choose **Select all USB files** from the menu.
2. Select the target folder on the unit, in the left-hand panel.
3. Use the **cog** button to display the context menu and select **Copy from USB to Device....** This opens the Copy Source Files dialog.
4. Check that the selected files and destination folder are correct then select **Copy** to confirm.

Deleting Files from the Unit

Delete files on the unit as follows:

1. Select the files you want to remove in the left-hand panel, or choose **Select all Device files** from the menu.
2. Tap and hold anywhere in the File Manager window to display the menu and select **Delete selected Device files....** This opens the Delete Files dialog.
3. Check that you have selected the correct files then select **Delete** to confirm.

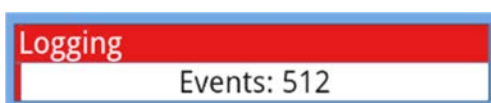
Note: When you delete a file using the File Manger, the action cannot be undone.

10. Logging

This chapter describes the unit's Logging instrument. The instrument is accessed by selecting the Logging option on the Main menu bar.

Overview

A count of logged events appears on the System Overview page.



To view the complete list of logged events, select the **Logging** softkey on the main menu bar. This opens the **Event Log** page, which displays up to 33 lines of the most recent logs, with more available by scrolling. Logs are automatically saved to log files on the unit.

Note: When a log event is recorded, the word Log appears in red in the status bar until the event log is viewed.

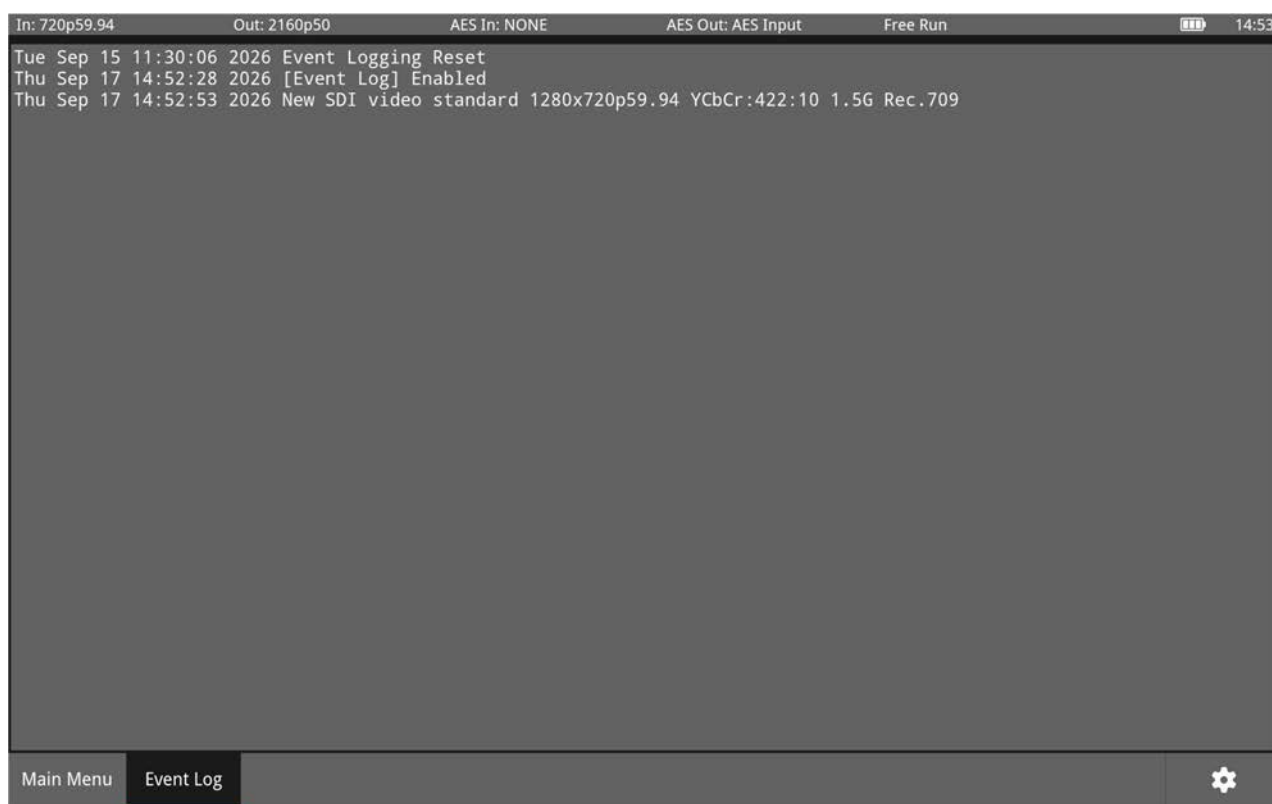


Figure 10-1: Event Log Page

Event Log Context Menu

To manage the logging options, use the **cog** softkey in the menu bar to open the context menu.

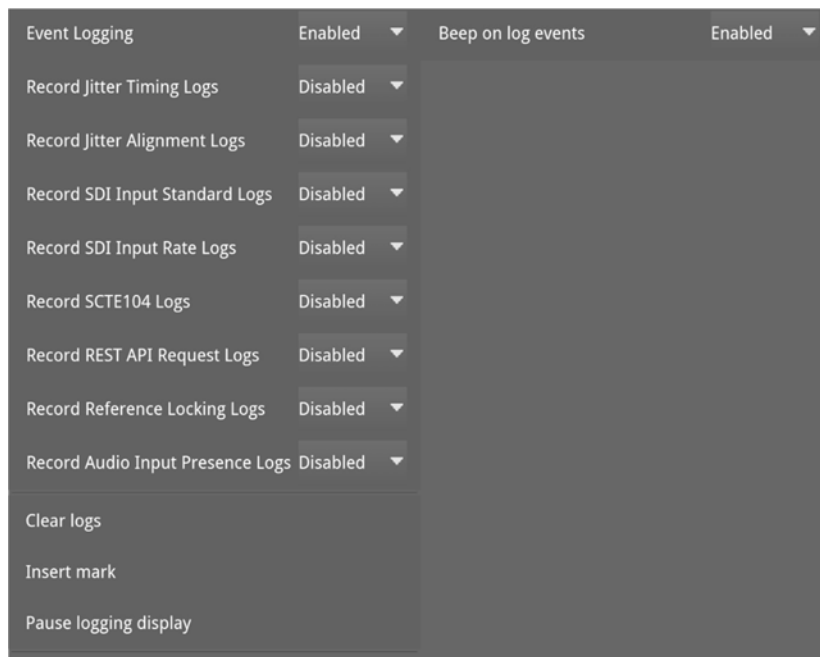


Figure 10-2: Event Log Context Menu

The following recording options are available:

- Event Logging (enable/disable all logging)
- Record Jitter Timing Logs (model Sx2E only)
- Record Jitter Alignment Logs (model Sx2E only)
- Record SDI Input Standard Logs
- Record SDI Input Rate Logs
- Record SCTE 104 Logs
- Record REST API Request Logs
- Record Reference Locking Logs
- Record Audio Input Presence Logs.

To clear the page, use the **Clear logs** option. Note that this does not delete the saved log files.

Insert Mark places the note "---MARK---" into the log.

Pause logging display temporarily pauses the log display

Beep on log events can be enabled to provide an audio notification.

Event Log File Types

Two types of files are created to save the recorded log events to internal storage. One file type is JSON and the other type is a tab-separated values (TSV) file. These are saved to the log folder on the unit and can be managed with the **File Manager**. Only the most recent log files are retained.

A Technical Specifications

This Appendix defines the technical specifications of your unit and includes the following sections:

- [AC Power \(External PSU/Charger\)](#)
- [DC Power](#)
- [SDI Analyzer \(Input\)](#)
- [SDI Analyzer \(Output\)](#)
- [External Locking Reference](#)
- [SDI Generator Output](#)
- [USB 3.1 Type C Connectors](#)
- [Networking](#)
- [Physical Data](#)
- [Audio I/O GPIO](#)

Technical Specifications

AC Power (External PSU/Charger)

Connector	USB-C Male
Operating Voltage	90 - 264 (100 - 240 VAC $\pm$ 10%)
Frequency	50 - 60 Hz
Current	1.6 A (maximum)
Power Consumption	77 W (typical), 110 W (maximum)
Dimensions	108 x 56 x 27 mm
Weight	0.3 kg

Note: Wait 10 seconds after reconnecting the power supply/battery charger cable, before powering the unit back on.

DC Power (Internal Li-ion Battery)

Part No.	RRC2040-2
Connector	Proprietary
Operating Voltage	10.8 V
Current	> 6.8 A
Power Capacity	> 74 Wh

SDI Analyzer Input(s)

Label	SDI IN
Connector	12G BNC
Input Return Loss	-15 dB (5 MHz to 1.485 GHz), -10 dB (1.485 to 3 GHz), -7 dB (3 to 6 GHz), -4 dB (6 to 12 GHz)
Purpose	SDI inputs supporting SD, HD, 3G, 6G and 12G-SDI standards.

SDI Generator Output

Label	SDI OUT
Connector	12G BNC
Output Return Loss	-15 dB (5 MHz to 1.485 GHz), -10 dB (1.485 to 3 GHz), -7 dB (3 to 6 GHz), -4 dB (6 to 12 GHz)
Purpose	SDI Output supporting SD (looped out), HD, 3G, 6G and 12G-SDI standards.

SDI Loop Output (Sx2E only)

Label	LOOP
Connector	12G BNC
Output Return Loss	-15 dB (5 MHz to 1.485 GHz), -10 dB (1.485 to 3 GHz), -7 dB (3 to 6 GHz), -4 dB (6 to 12 GHz)
Purpose	SDI Output supporting SD, HD, 3G, 6G and 12G-SDI standards.

External Locking Reference

Label	REF IO
Input Signal	Tri-level or Bi-Level (black burst) syncs 23.98, 24, 50, 59.94, 60 Hz
Connector	BNC
Input Impedance	> 10 k Ω , software selectable internal 75 Ω termination
Input Return Loss	> 40 dB to 6 MHz (typical)
Maximum Input voltage	± 2 V AC coupled
Specification	600 mV pk-pk Tri-level syncs (SMPTE 274M and SMPTE 296M) 1 V pk-pk PAL Black Burst (ITU 624-4/SMPTE 318) 1 V pk-pk Composite NTSC (SMPTE 170M).

USB 3.1 Type C Connectors

Label	1, 2
USB Version	USB 3.1
USB Connector	Type-C connector
Quantity	Two on right-hand panel
Purpose	Ports used to connect data and power DisplayPort Alt Mode, supporting 2x 2.7Gb/s lanes carrying 1920x1200 8 bit RGB video at 48 – 60Hz at full speed and high speed rates only.

Speaker/Headphone Jack

Label	Headphones
Type	3.5 mm stereo jack socket
Impedance	16 Ω
Location	Right-hand panel.

Networking

Ethernet	IEEE 802.3 10/100/1000 BASE-T
Connector	RJ-45
Purpose	SCP and SFTP access for software upgrade and upload/download of data files REST API Web server for file access NTP for automatic clock control.

Physical Data

Sx2 Dimensions	261 x 135 x 57 mm
Sx2 Weight	1.7 kg

Audio In/Out/GPIO Connector

Label	Analog Audio Input/Output/GPIO
Connector	15-way high-density D-type socket
Location	On right-hand panel
Format	DB-15
Pinout	

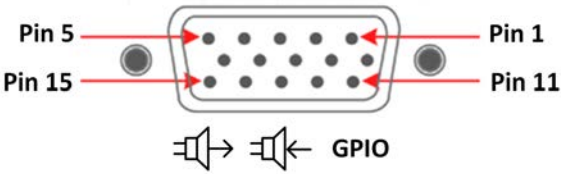


Table A-1 : Analog Audio input Connector Pinouts

Pin Number	Description
1	Analog balanced audio input Left +
2	Analog balanced audio input Right +
3	Analog balanced audio Output Left +
4	Analog balanced audio Output Right +
5	Reserved
6	GND
7	GND
8	GND
9	GND
10	GND
11	Analog balanced audio input Left -
12	Analog balanced audio input Right -
13	Analog balanced audio Output Left -
14	Analog balanced audio Output Right -
15	Reserved

B SMPTE SDTV, HDTV & UHDTV

LeaderPhabrix is committed to developing the toolsets available on the unit, including upgrades to existing instruments and the introduction of new instruments. Please do not hesitate to contact LeaderPhabrix at any time to discuss your requirements for the product or current product timelines.

SDI Physical Layer Tolerances

The unit will automatically measure the SMPTE SDTV, HDTV and UHDTV tolerances listed in the following table:

Table B-1 : SMPTE SDTV, HDTV and UHDTV Tolerances

Data Rate	0.270 Gbps	1.485 Gbps	2.97 Gbps	5.94 Gbps	11.88 Gbps
Standard	SMPTE ST259	SMPTE ST292-1	SMPTE ST424	SMPTE ST2081-1, 10	SMPTE ST2082-1, 10
Coding	Scrambled NRZI	Scrambled NRZI	Scrambled NRZI	Scrambled NRZI	Scrambled NRZI
Amplitude	800 mV $\pm$ 10 %	800 mV $\pm$ 10 %	800 mV $\pm$ 10 %	800 mV $\pm$ 10 %	800 mV $\pm$ 10 %
DC Offset	0.0 V $\pm$ 0.5 V	0.0 V $\pm$ 0.5 V	0.0 V $\pm$ 0.5 V	0.0 V $\pm$ 0.5 V	0.0 V $\pm$ 0.5 V
Rise/Fall Time	< 1500 ps	< 270 ps	< 135 ps	< 80 ps	< 45 ps
Rise/Fall Time Difference	< 500 ps	< 100 ps	< 50 ps	< 35 ps	< 18 ps
Rise/Fall Overshoot	< 10 % of Amplitude	< 10 % of Amplitude	< 10 % of Amplitude	< 10 % of Amplitude	< 10 % of Amplitude
Timing Jitter	< 0.2 UI (10 Hz to 27 MHz)	< 1 UI (10 Hz to 148.5 MHz)	< 2 UI (10 Hz to 297 MHz)	< 4 UI (10 Hz to 594 MHz)	< 8 UI (10 Hz to 1188 MHz)
Alignment Jitter	< 0.2 UI (100 kHz to 27 MHz)	< 0.2 UI (100 kHz to 148.5 MHz)	< 0.3 UI (100 kHz to 297 MHz)	< 0.3 UI (100 kHz to 594 MHz)	< 0.3 UI (100 kHz to 1188 MHz)
75 Ω Coaxial Cable Length (Belden 1694A)	400 m	200 m	200 m	100 m	70 m

The complexity of both analyzing and generating signals for SDTV, HDTV and UHDTV is shown in the above table. SMPTE standards require that the unit's instruments measure critical values within the tolerances set by SMPTE and summarized in the table.

C Supported Video Standards

Please contact [LeaderPhabrix](#) if you require support for any standards not listed here. The current software version only supports YCbCr:10 4:2:2 standards.

HD/2K Supported Formats

The following SDI formats are supported:

Table C-1 : Supported SD/HD/2K Video Standards (SDI Input)

SMPTE Stnds. Link (Content)	Interface	Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	SDI- SDR
ST 259 (ST 125)	SD (525i)	720 x 485	4:2:2 (YCbCr)	10	59.94i	●
ST 259 (ST 125)	SD (625i)	720 x 576	4:2:2 (YCbCr)	10	50i	●
ST 292 (ST 296)	HD	1280 x 720	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p	●
ST 292 (ST 274)	HD	1920 x 1080	4:2:2 (YCbCr)	10	60i, 59.94i, 50i, 30p, 29.97p, 25p, 24p, 23.98p	●
ST 292 (RP 211)	HD	1920 x 1080	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF	●
ST 292 (ST 2048-2)	HD	2048 x 1080	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	●
ST 425-1 (ST 274)	3G Level A (I)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	●
ST 425-1 (ST 2048-2)	3G Level A (I)	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	●
ST 425-1 (ST 274)	3G Level B-DL (I)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	●
ST 425-1 (ST 2048-2)	3G Level B-DL (I)	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	●

4K/UHD Supported Formats

Table C-2 : Supported 4K/UHD SDI Video Standards

SMPTE Stnds. Link (Content)	Interface	Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	SDI-SDR
ST 2081-10 M1 (ST 2036-1)	6G-2SI	3840 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	●
ST 2081-10 M1 (ST 2048-1)	6G-2SI	4096 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	●
ST 2082-10 M1, ST 425-5 (ST 2036-1)	12G-2SI (I)	3840 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	●
ST 2082-10 M1, ST 425-5 (ST 2048-1)	12G-2SI (I)	4096 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	●

Key to tables:

- - Generator with Analyzer
- - Optional
- A** - Analyzer Only
- Not supported

D Accessories

Removing the Hand-strap



Place the Sx2 face down on a soft, clean surface:

- Remove the two M3 x 14 mm Pozi Pan head screws that retain the hand-strap
- Lift off the hand-strap from the strap mounting points.

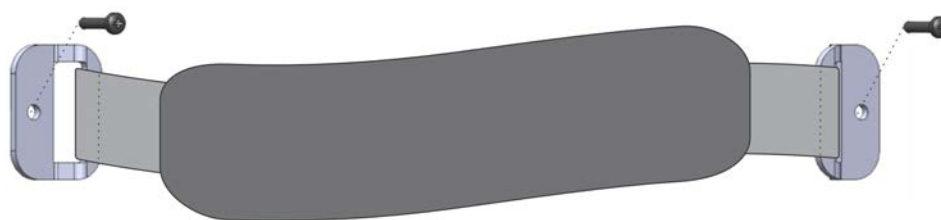


Figure D-1: Removing the Hand-strap

Note: When removing the hand-strap, retain the fixing screws as they are required to attach the VESA mount to the unit, or to refit the hand-strap.

Attaching the VESA Mount

To attach the optional VESA mount, the hand strap must first be removed:

- Refer to the figure below, and locate the VESA mount over the four T-shaped lugs on the rear of the Sx2 (note that the VESA screw bosses must face outwards)
- Insert the two M3 x 14 Pozi Pan head screws through the holes in the VESA mount and into the same mounting points where the hand-strap was previously installed.

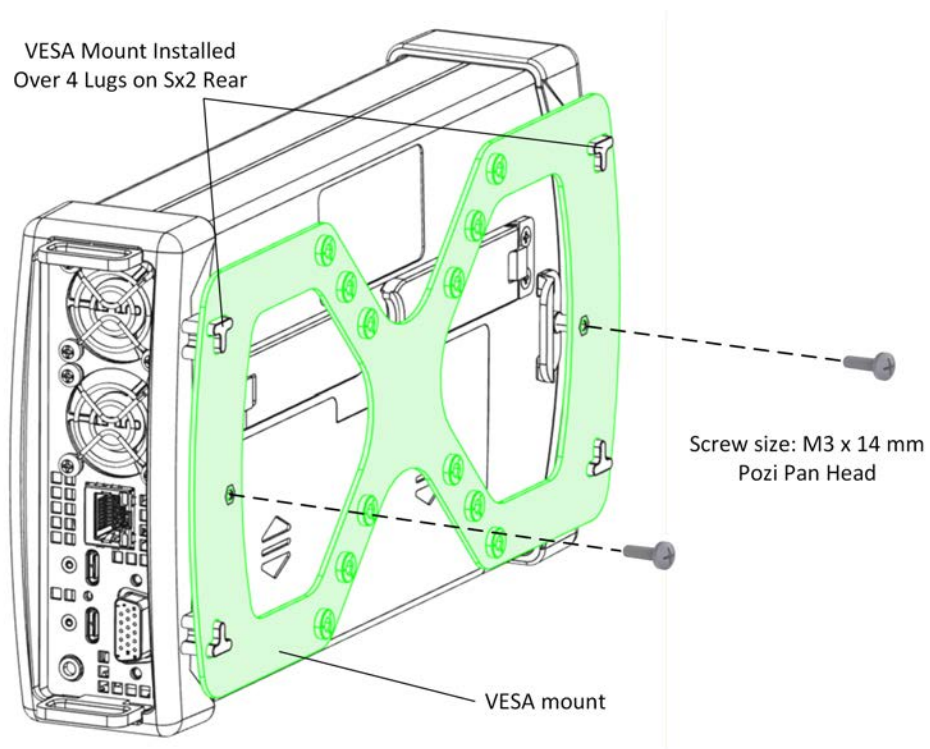


Figure D-2: Attaching the VESA Mount

Attaching the Shoulder-Strap

The shoulder-strap has a latching side release buckle at each end which clip onto two of the four protection barriers at the sides of the Sx2.

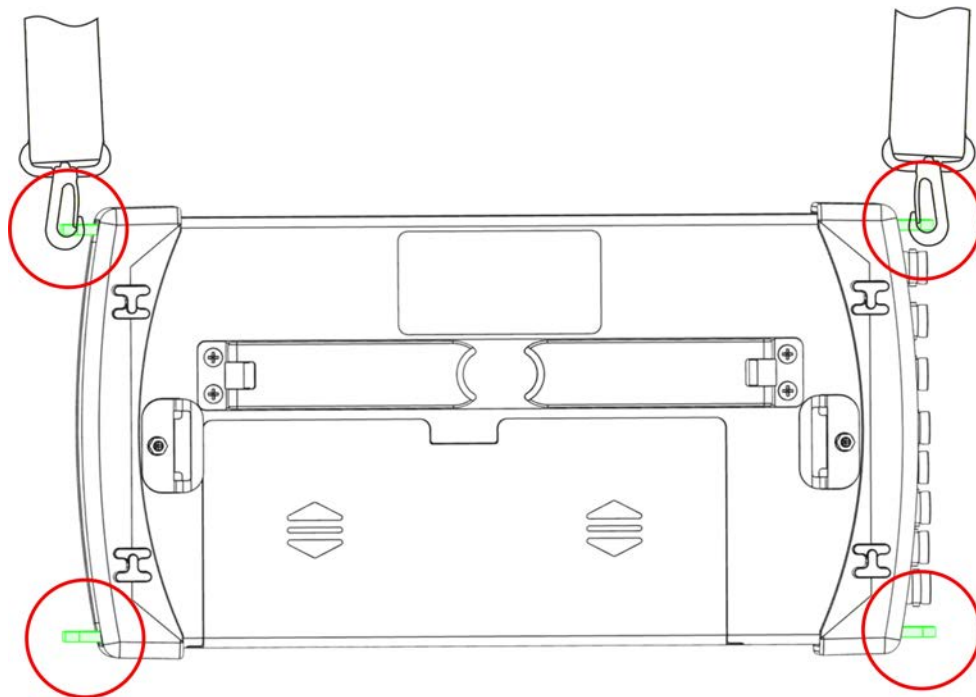


Figure D-3: Shoulder-strap Fixing Points

Replacing the Battery

To replace the battery, power off the Sx2 and place it face down on a soft, clean surface. Follow these steps:

1. Remove the battery cover by sliding it down and away from the unit

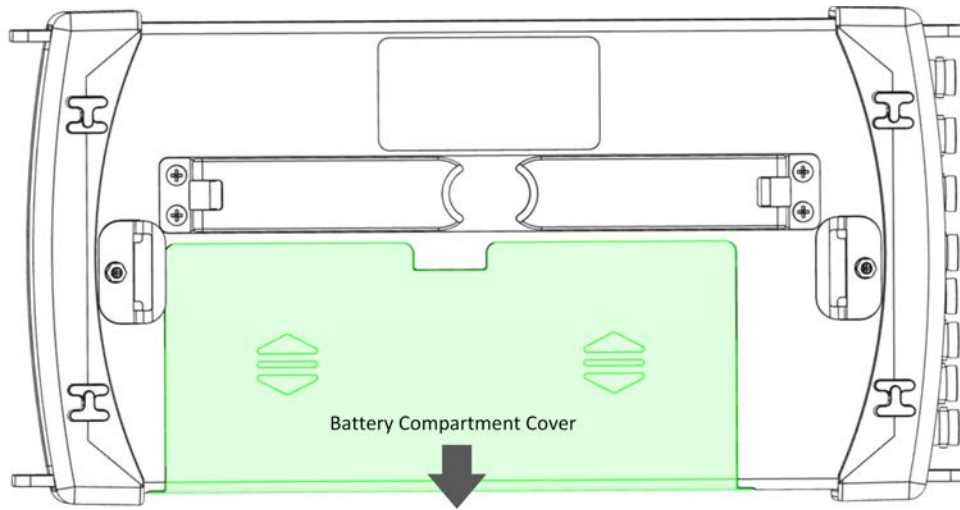


Figure D-4: Removing the Battery Compartment Cover

2. Lift out the existing battery
3. Check the orientation of the replacement battery and insert it so that it fully connects with the Sx2's internal battery connector

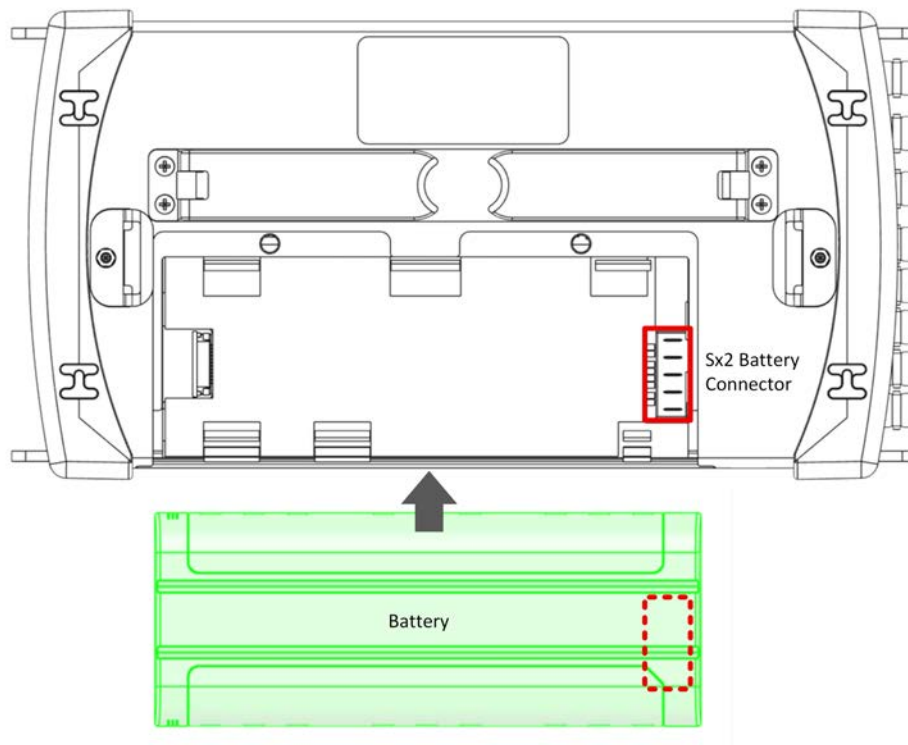


Figure D-5: Installing the Battery

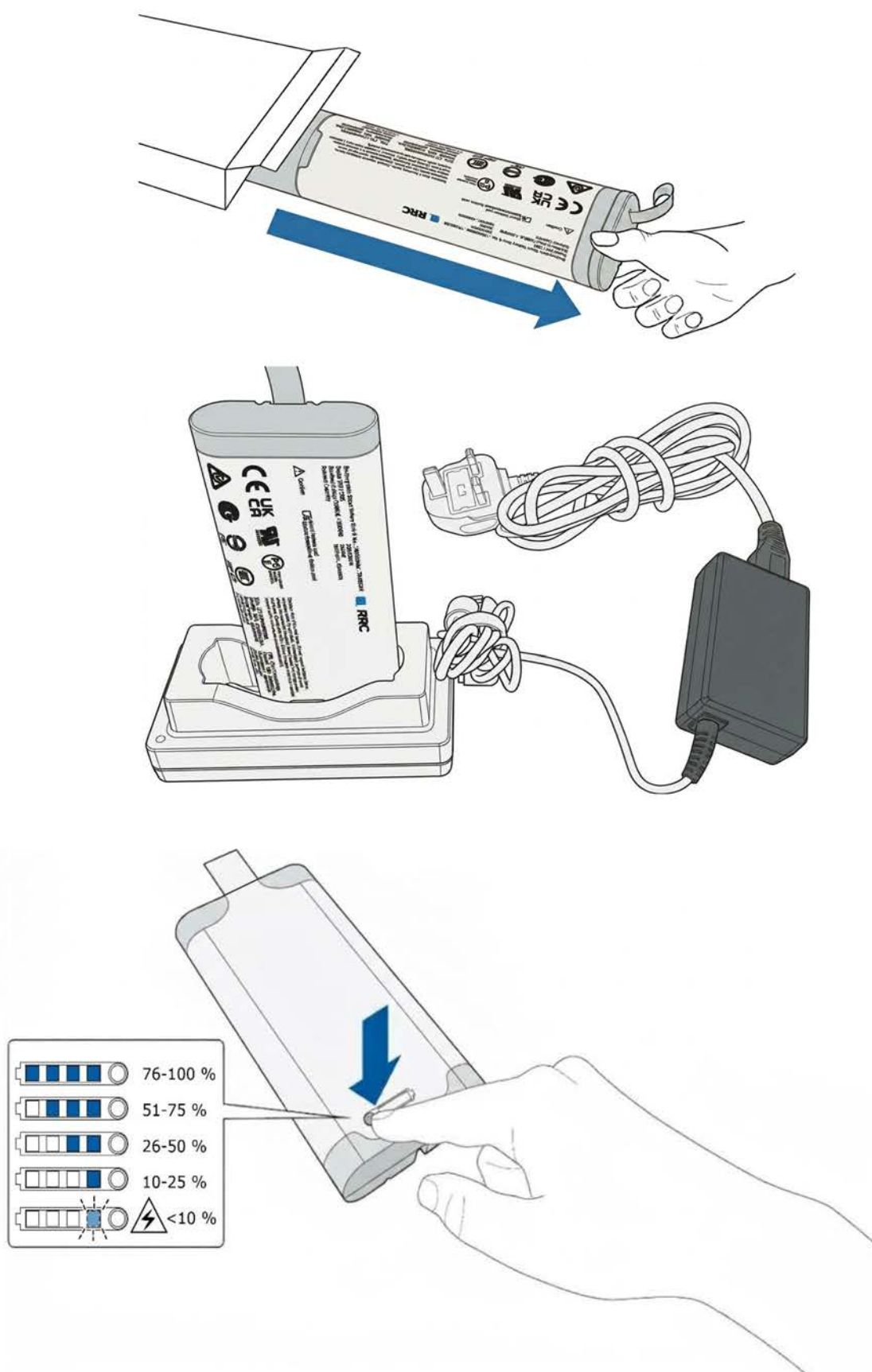
4. Replace the battery cover
5. Turn the unit over so that you can see the screen and connect the power/charging cable
6. Power-on the unit and check the battery status.

E Battery Pack

The Sx2 uses an RRC2040-2 Smart Battery Pack. For complete manufacturer safety disclosures in additional languages, visit rrc-ps.com.

RRC2040-2 Battery Pack Instruction Manual





English Instruction Manual

 This manual contains instructions for use and important safety information. Read the instructions carefully before using the product.																					
Safety: • Do not open or dismantle a battery. • Do not expose the battery to heat or fire. Avoid storage in direct sunlight. • Do not short-circuit a battery. • Do not store the battery haphazardly in a box or drawer where they may short-circuit each other or be short-circuited by other metal objects. • Do not remove a battery from its original packaging until required for use. • Do not subject the battery to mechanical shock. • In the event of a battery leaking, do not allow the liquid to come in contact with the skin or eyes. If contact has been made, wash the affected area with copious amounts of water and seek medical advice. • Do not use any charger other than that specifically provided for use with the equipment. See also chapter "Charging". • Observe the plus (+) and minus (–) marks on battery and equipment and ensure correct use. • Do not mix batteries of different manufacture, capacity, size or type within a device. • Keep the battery out of the reach of children. • Keep the battery clean and dry. • The battery needs to be charged before use. • Use only the battery in the application for which it was intended. • When possible, remove the battery from the equipment when not in use. • Do not store a battery longer than 1 month in a discharged state. • Do not storage a battery longer than 1 year without recharge. • The battery must be recycled or disposed of properly.																					
Operating Temperature: For charge: 0°C to +45°C , For discharge: -20°C to +60°C	Storage Temperature: < 1 year: -20°C to +20°C , < 3 months: -20°C to +45°C, < 1 month: -20°C to +50°C																				
Recommendation:Store the battery at below 20°C, low humidity, no dust and no corrosive gas atmosphere. Store the battery with a state of charge between 40-60 %.																					
Charging: Charge only with a SMBUS compliant charger, e.g. RRC-SMB-MBC. Refer also to the manufacturer's instructions or equipment manual for proper charging instructions.																					
Specifications: <table> <tr> <td>Type</td><td>RRC2040-2</td></tr> <tr> <td>Voltage</td><td>10.80 V</td></tr> <tr> <td>Capacity</td><td>≥ 6.80 Ah</td></tr> <tr> <td>Max. charge current</td><td>≥ 4.00 A</td></tr> <tr> <td>Max. charge voltage</td><td>12.60 V</td></tr> <tr> <td>Max. discharge current</td><td>10.00 A</td></tr> <tr> <td>Dimensions (L x W x H)</td><td>150.5 mm x 59.0 mm x 22.4 mm (max.)</td></tr> <tr> <td>Weight</td><td>336 g</td></tr> </table>		Type	RRC2040-2	Voltage	10.80 V	Capacity	≥ 6.80 Ah	Max. charge current	≥ 4.00 A	Max. charge voltage	12.60 V	Max. discharge current	10.00 A	Dimensions (L x W x H)	150.5 mm x 59.0 mm x 22.4 mm (max.)	Weight	336 g				
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Weight	336 g																				
Recycling: Recycle batteries according to national and local regulations. Contact your local representative for assistance. The batterie s must be disposed only in a discharged state at the collection center. In case the battery is not fully discharged, provide for a risk against short circuits. Short circuits can be prevented by isolating the terminals with tape.																					
Declaration of Conformity: CE:The battery complies with the current regulations of the EU guidelines. FCC: 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.																					
Symbols: Explanation of symbols that are on the battery and/or in this manual. <table> <tr> <td> Caution, consult accompanying documents</td><td> Operator's manual; operating instructions</td></tr> <tr> <td> Mark of conformity to applicable European Directives</td><td> Japan, PSE</td></tr> <tr> <td> United Kingdom, UKCA</td><td> Thailand, TISI</td></tr> <tr> <td> Russia, GOST-R</td><td> Morocco, CMIM</td></tr> <tr> <td> Canada and USA, UL</td><td> UN Transportation Test</td></tr> <tr> <td> Australia and New Zealand, RCM</td><td> Dispose of this product according to local regulations.</td></tr> <tr> <td> China, CCC</td><td> Recycling Symbol</td></tr> <tr> <td> India, BIS</td><td> Taiwan, Recycling Symbol</td></tr> <tr> <td> Korea, KC</td><td> China, RoHS</td></tr> <tr> <td> Taiwan, BSMI</td><td> For Canada & USA: Please call 1-800-822-8837 for information on how to recycle this battery</td></tr> </table>		 Caution, consult accompanying documents	 Operator's manual; operating instructions	 Mark of conformity to applicable European Directives	 Japan, PSE	 United Kingdom, UKCA	 Thailand, TISI	 Russia, GOST-R	 Morocco, CMIM	 Canada and USA, UL	 UN Transportation Test	 Australia and New Zealand, RCM	 Dispose of this product according to local regulations.	 China, CCC	 Recycling Symbol	 India, BIS	 Taiwan, Recycling Symbol	 Korea, KC	 China, RoHS	 Taiwan, BSMI	 For Canada & USA: Please call 1-800-822-8837 for information on how to recycle this battery
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Manual d'utilisation en Français

 Ce manuel contient des instructions d'utilisation et d'importantes informations de sécurité. Avant toute utilisation de ce produit, lisez attentivement ce manuel.																	
Sécurité: • Ne pas ouvrir ou désassembler la batterie. • Ne pas exposer la batterie à une source de chaleur ou au feu. Eviter toute exposition directe aux rayons du soleil. • Ne pas court-circuiter la batterie. • Ne pas stocker la batterie sans emballage dans une boîte où un quelconque objet métallique pourrait les court-circuiter. • Conserver la batterie dans son emballage d'origine jusqu'à son utilisation. • Eviter les chocs mécaniques. • Si la batterie coule, veiller à ce que le liquide n'entre pas en contact avec la peau ou les yeux. Si tel est la cas, rincer abondamment la zone concernée à l'eau et consulter un médecin. • N'utiliser qu'un chargeur approprié. Voir aussi le chapitre "Recharge" • Respecter le marque plus (+) et le marque moins (–) sur la batterie et sur votre équipement afin de garantir une utilisation correcte. • Ne pas mélanger dans un même appareil des batteries de différents types, fournisseurs, capacités ou tailles. • Ne pas laisser à la portée d'enfants. • Maintenir la batterie propre et sèche. • La batterie doit être chargée avant utilisation. • N'utiliser la batterie que dans une application pour laquelle elle a été définie. • Si possible, retirer la batterie de l'équipement lorsqu'il n'est pas utilisé. • Ne pas stocker la batterie déchargée plus d'un mois. • Ne pas stocker la batterie plus d'un an sans la recharger. • Une batterie doit être correctement triée ou recyclée.																	
Temperature d'utilisation: En recharge: de 0°C à +45°C, en décharge: de -20°C à +60 °C	Temperature de stockage: < 1 an: de -20°C à +20°C, < 3 mois: de -20°C à +45 °C, < 1 mois: de -20°C à +50°C																
Recommandation: Stocker la batterie en dessous de 20°C et dans un environnement à faible taux d'humidité. Eviter la poussière et les gaz atmosphériques corrosifs. Stocker la batterie avec un état de charge entre 40-60 %.																	
Recharge: Utiliser uniquement un chargeur de batteries compatible SMBUS, par exemple RRC-SMB-MBC. Respecter les instructions du fabricant ou du manuel d'utilisation du chargeur pour une recharge correcte.																	
Spécifications: <table><tr><td>Type</td><td>RRC2040-2</td></tr><tr><td>Tension</td><td>10.80 V</td></tr><tr><td>Capacité</td><td>≥6.80 Ah</td></tr><tr><td>Courant de charge max.</td><td>≥4.00 A</td></tr><tr><td>Tension de charge max.</td><td>12.60 V</td></tr><tr><td>Courant de décharge max.</td><td>10.00 A</td></tr><tr><td>Dimensions (longueur x largeur x hauteur)</td><td>150.5 mm x 59.0 mm x 22.4 mm (max.)</td></tr><tr><td>Poids</td><td>336 g</td></tr></table>		Type	RRC2040-2	Tension	10.80 V	Capacité	≥6.80 Ah	Courant de charge max.	≥4.00 A	Tension de charge max.	12.60 V	Courant de décharge max.	10.00 A	Dimensions (longueur x largeur x hauteur)	150.5 mm x 59.0 mm x 22.4 mm (max.)	Poids	336 g
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Courant de décharge max.	10.00 A																
Dimensions (longueur x largeur x hauteur)	150.5 mm x 59.0 mm x 22.4 mm (max.)																
Poids	336 g																
Recyclage: La batterie doit être recyclée selon les directives locales et nationales. Veuillez contacter votre revendeur local pour plus de renseignements. La batterie doit être déchargée avant son dépôt dans un centre de collecte. Une batterie qui n'est pas entièrement déchargée peut engendrer un risque de court-circuit. Un court-circuit peut être évité en isolant les contacts avec du ruban adhésif.																	
Déclaration de conformité: CE: Cette batterie est conforme aux directives actuelles de la communauté européenne. FCC: Ce produit est conforme à la partie 15 des règles FCC. L'utilisation du produit est soumise aux deux conditions suivantes: (1) ce produit ne peut causer d'interférences nuisibles, et (2) ce produit doit accepter toute interférence reçue, y compris les interférences qui peuvent provoquer un fonctionnement indésirable.																	
Symboles: Explication des symboles se trouvant sur la batterie et/ou dans ce manuel.																	
 Attention / Avertissement	 Respecter le manuel et les instructions d'utilisation																
 Symbole de conformité aux directives applicables de la CE	 Japon, PSE																
 Royaume-Uni, UKCA	 Thaïlande, TISI																
 Russie, GOST-R	 Maroc, CMIM																
 Canada et États-Unis, UL	 Test de transport UN																
 Australie et Nouvelle-Zélande, RCM	 Ce produit doit être trié et recyclé selon les normes locales en vigueur.																
 Chine, CCC	 Symbole de recyclage																
 Indie, BIS	 Taiwan, Symbole de recyclage																
 Corée, KC	 Chine, RoHS																
 Taiwan, BSMI	 Pour le Canada et les Etats-Unis: Appelez le 1-800-822-8837 pour toute information concernant le recyclage de cette batterie.																



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Please visit <https://leaderphabrix.com/> for the latest product information