



SxE

USER MANUAL

Software Release 14.01



About this Manual

Notice

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Revision

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.

Revision	Date	Software Version	Comment
1	08/08/2012	0.10.0109	First release of manual
2	14/06/2013	0.11.0003	2K Formats Option
3	21/10/2013	0.12.0013	Dolby Digital & Digital Plus support
4	24/01/2018	14.00.13938	AV Delay
5	15/03/2019	14.01	AV Delay Generation and Analysis

Getting Started

Package Contents

The shipping box should contain the following:

- 1 black carrying bag containing:
 - PHABRIX SxE unit
 - Power Supply Unit
 - Mains lead
 - USB Manual

The shipping box will also contain this Manual on a USB key, note that the website always contains the latest version of the manual. The version of software that this manual supports is on the front page.

General Safety

Avoiding Personal Injury



This instrument is designed for use by qualified personnel only.

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

The Operator should NOT remove the case from the unit.

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

Power Supply

Make sure that the unit is connected to the correct power supply voltage. A power supply adaptor is supplied with the unit which may be connected to any AC power supply between 100 and 240VAC at 50-60Hz. Only the supplied power adaptor 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 PHABRIX agent.

Installation Environment

Operating Temperature



The unit should only be operated between 0 and 40 °Centigrade. If the unit is operated at a higher temperature, there is a possibility of a fire hazard. If the temperature is changed rapidly from a cold environment to a hot environment, moisture can be created internally which can cause malfunction or damage the unit. Allow the unit to sit for 30 minutes without power applied to reduce any possibility of condensation. If the temperature rises above 60° Centigrade a warning dialog will be given. If the temperature rises above 65° Centigrade the unit will be turned OFF. Under both conditions, an event will be added to the event log to show what happened.

Input/Output Terminals

Do not connect the input or output BNC connectors to external power as this can damage the internal circuitry and cause the unit to work incorrectly.

The BNC connectors fitted on this unit are 75Ω type which are not compatible with 50Ω plugs.



The use of 50Ω plugs will permanently damage the connectors on the unit. The use of 50Ω plugs is considered to be misuse of the equipment and will therefore invalidate the unit's warranty.

When Not In Use

Disconnect the unit from the power supply and AC power source when not in use.

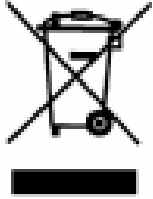
Maintenance

Wipe the case, and knobs gently with a soft cloth, lightly dampened with a neutral cleaning agent. A screen cleaning cloth may be used to clean the LCD. Do not apply force to the LCD when cleaning or it may be damaged.



Remove the power supply from the unit and turn OFF before cleaning. Do not allow any water or other liquid to enter the unit while cleaning.

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.

Contains hazardous substance information

Part number: PHSXAES

Description: PHABRIX SxA



China RoHS is a two-step process that identifies concentration limits of certain hazardous substances in electronic information products that are sold into China. Per the deadline set by the Chinese government, March 1, 2007, PHABRIX Limited has implemented step one of China RoHS, self declaration of hazardous materials and marking of the product.

PHABRIX products that are sold into the China market have the required marking as indicated by the symbol shown left applied to the product designating that the product meets the China RoHS requirements.

Toxic or Hazardous Substances or Elements

Parts	Hazardous Substances in each Part					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chrome (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Assembled board	○	○	○	○	○	○
Mainframe	○	○	○	○	○	○
LCD	○	○	○	○	○	○
Fan	○	○	○	○	○	○
Wire assembly	○	○	○	○	○	○
Enclosure	○	○	○	○	○	○
Accessory	○	○	○	○	○	○
Packaging	○	○	○	○	○	○
Battery	○	○	○	○	○	○
<p>O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006. X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.</p>						

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PHABRIX®

1 Description

Description

SxE Instrument

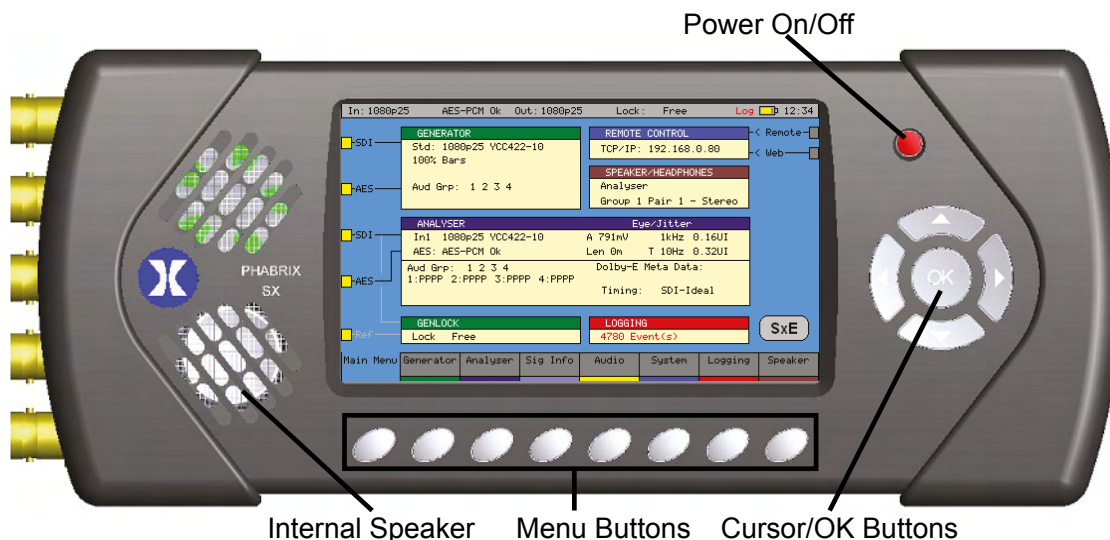
Overview

The PHABRIX SxE represents the most comprehensive handheld instrument available in the world today.

The PHABRIX SxE is a handheld multi-standard video (3G-SDI, HD-SDI and SD-SDI supported as standard) test signal generator, analyzer and monitor including AES audio testing, monitoring plus physical layer analysis on its large 4.3 inch best of class 16:9 colour TFT screen, it is unique in offering laboratory level testing.

The PHABRIX SxE eye and jitter diagrams allow optional filter selection for timing and alignment measurements with cursors and histogram functions to allow detailed measurements to be made.

The ability of the SxE to produce eye patterns from a 3G signal is particularly significant for those users requiring a solution to testing high end products in the 3G arena. Jitter too is one of the most important issues in the design and operation of high-speed serial links and the SxE jitter tools can be applied from SD-SDI, HD-SDI to 3G-SDI. These comprehensive features propel the SxE into the domain of much more expensive bench bound products and has resulted in it achieving many technological awards.



Turning on and off the instrument

To turn on your PHABRIX SxE Instrument press the red button at the top right hand corner of the front panel.

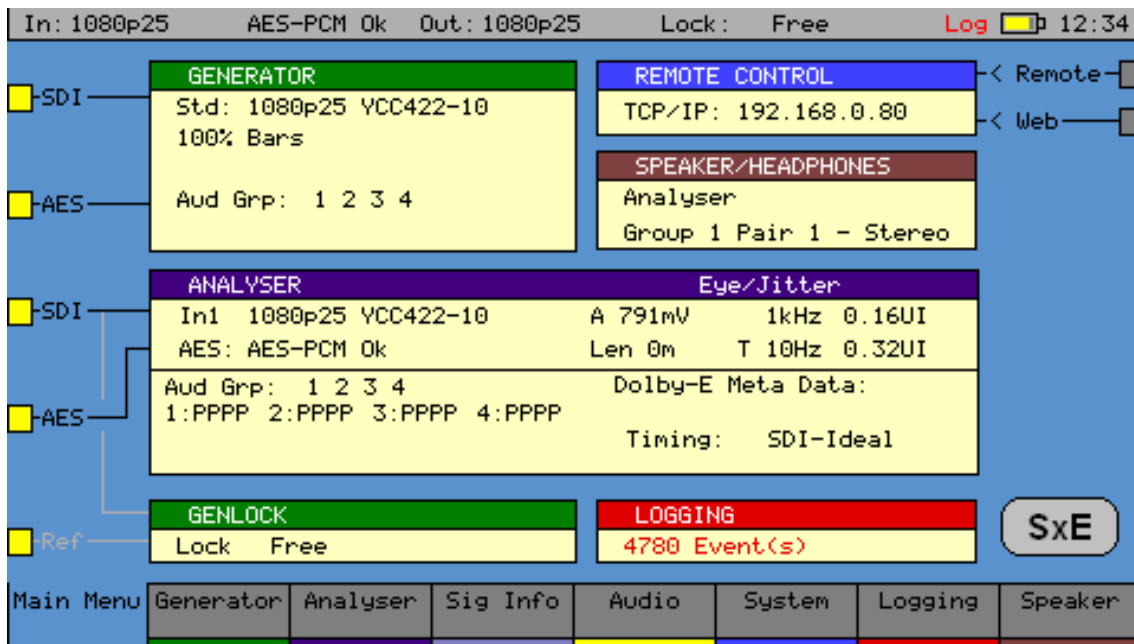
Once the system has started, pressing the button again will turn it off. If for some reason the instrument stops responding, pressing and holding the button for a few seconds will turn it off.

The unit is battery operated and the battery should last for between 3 and 6 hours dependent on which video standard is being used and whether the input and outputs are active. If the unit is turned ON and the battery is almost discharged, it will turn itself OFF. If the battery level starts to get too low for operation a dialogue will be displayed prompting the user to turn off the unit. The current settings will also be saved. The unit should then be connected to the power supply unit as soon as possible to recharge the battery. The battery should be fully charged in about 4 hours. The battery will charge faster if the unit is turned off while charging.

Menu Operation

Main Menu

The Main menu, displayed on the right-hand OLED screen gives access to the software modules available on the SxE instrument. The buttons beneath the screen correspond to the menu areas. Pressing on any of these buttons will display the corresponding menu.



This page displays an overview for the system. It shows the video input and output standards and frame rate. The audio status for the generator shows which audio groups are being generated whilst the audio status for the input shows which groups are present and an overview of the channel status for each audio channel.

Audio channel status is displayed as:

- 'P' if PCM audio is present,
- 'N' if NON-PCM audio is present,
- 'E' if Dolby-E packets are present
- 'D' if Dolby-Digital packets are present
- '+' if Dolby-Plus packets are present
- V if the validity bit is set

Dolby-E program configuration and Timing status is also displayed if the Dolby-E analysis option has been purchased and a Dolby-E signal has been detected on the selected input. If the generator is generating errors then the video standard is displayed in red. If the input detects errors, then the input standard will be displayed in red if the analyser is monitoring the input.

If the unit is connected to the network, the current TCP/IP address of the unit is displayed in the Remote Control box. If the unit is NOT connected to a network and is set to DHCP mode, it will show 'acquiring' to show that the connection hasn't been made yet. The model type is displayed at the bottom right corner of the screen.

Instrument Status

The top line of the menus shows the unit status and includes the Input Video status, Genlock status, battery status and current time. If the unit is being powered by the AC adaptor, the battery status will not be shown. If a command script is being run, this is shown on the top line to the left of the time as "Script". A red "Log" is shown on the status line if there are any events in the event log.

A red “Log” is shown on the status line if there are any events in the event log.

If a 3G video standard is selected the video standard display will be shown as 3GA if it is a 3G-Level A standard, 3GB if it is a 3G-Level B dual link standard, 3G2 if it is a 3G-level B dual stream (two patterns) standard or DL if it is a dual link output.

The input video standard will be shown in red if the input signal has errors, but only if the analyzer is connected to the input. If the analyzer is set to monitor the output, the input standard will be shown in brown.

The output standard will be shown in red if the instrument is generating errors. The output standard will show OFF if the generator output is Off.

The Jitter values will be shown in red if the jitter values are greater than the values specified on the Log Setup page for the relevant jitter meter.

Using the Menus

The Menu buttons select which instrument is in use as well as selecting the options for the instrument. The bottom of the display shows the function of each Menu button.

When in a specific function e.g. Generator, Analyzer etc, the cursor controls (←→↑↓) on the right hand of the instrument select a field to edit. The current field has a red box around it. Pressing the OK button starts or ends editing of that field. Check boxes are always in edit mode and pressing the OK button inverts the current state.

When editing some types of fields, the menu buttons at the bottom take on different functionality to allow cancelling edit mode or setting the value for the field. When lists of options are displayed the menu buttons allow selection of the first/last item in the list as well as paging through the available options. If the list of items is small, the available items may be displayed on the menu buttons for instant access.

The buttons along the bottom of the display change the currently displayed page when not editing a data field. The left hand button always selects the top level menu and system overview page. So for example pressing the first button will select the “Main Menu”, selecting the second button will select the “Generator” menu, etc.

The Main menu is the top level menu from which all other menus are selected on the SxE instrument. The main menus are:

Generator	(only present if a Generator module is fitted) allows video test pattern selection to be made and audio test tones to be selected.
Analyzer	allows the selected input signal to be analysed in the form of a Picture, Waveform monitor, Vectorscope and Eye Pattern display (option).
Sig Info	allows detailed signal information about the video and audio status for the analyzer source to be displayed.
Audio	gives access to the Audio Meters and Audio Status displays.
System	allows the setup of system wide settings including memories, date/time and software.
Logging	selects the logging page to view and setup the error logging system.
Speaker	selects the speaker/headphone setup page.

See chapter 2 : “Menu Reference” for full details of these menus.

SxE Software Options

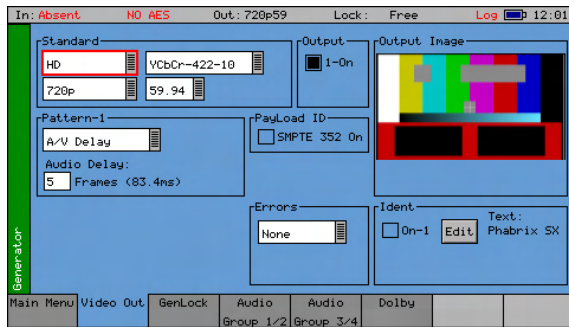
Overview

The SxE instrument has a range of software options that can enhance its functionality for specific applications.

AV Delay Generation and Analysis (NEW!)

The AV Delay Generation and Analysis option (PHSXO-AVD) offers an end-to-end solution for the measurement of the Audio to Video differential delay through a broadcast system. The tool provides a real-time update of the differential delay between the video and the selected audio channel pair. When using the SxA and SxE, this new tool can also be used to measure the propagation or pipeline delay of either video or audio.

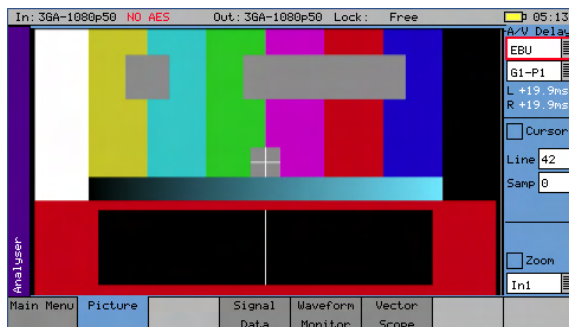
The combined license provides both an AV Delay signal generator and an analyzer. These can be used with all Sx supported video formats and frame rates on SDI and AES interfaces.



The AV Delay Generator produces an adapted EBU Tech 3305 AV Sync 'clapperboard' Test Pattern. This is compatible with third party AV delay analysers such as the LAWO V_pro8.

An audio delay offset with respect to video of up to +/-40 frames can be applied in increments of 1 frame.

The AV Delay audio pulse can be inserted on up to 16 embedded SDI audio channels, plus the AES out.



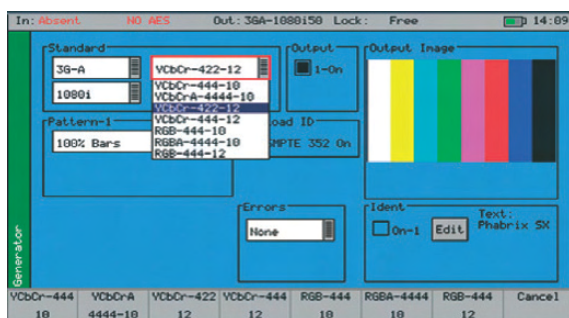
AV Delay measurement is available in the Picture instrument. Measurement of two AV Delay test patterns is supported:

- EBU Tech 3305
- LAWO V_line AV Sync test pattern

The tool provides a real-time update of the differential delay between the video and the selected audio channel pair.

The source of the audio can be either an embedded SDI audio or AES channel pair. The differential delay between the video and the selected audio is measured in 0.1ms steps (to an accuracy of 1ms) with a measurement range of +/-400ms.

Advanced video formats & 2K



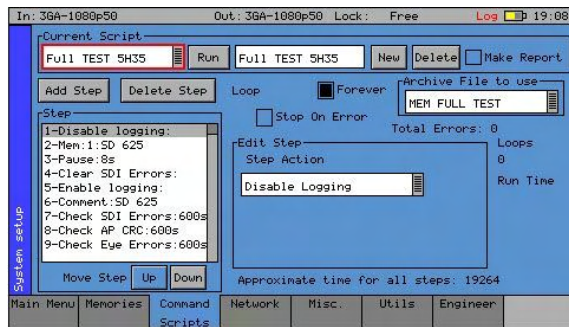
This option (PHSXOF) provides advanced formats including: 4:2:2 YUV, 4:4:4 RGB and 4:4:4 YUV at 10/12 bit, and 2K formats including: 4:2:2 YCbCr, 4:4:4 RGB' and 4:4:4 YCbCr at 10/12 bit as well as 4:4:4 XYZ at 12-bit. For broadcast manufacturers this option allows rigorous testing of many more formats beyond the standard signals used in traditional broadcasting.

The 2K-SDI support provides analysis of, and test pattern generation for, 2K Digital Cinema as defined in the SMPTE ST 2048-2:2011 standard (“2048 x 1080 Digital Cinematography Production Image FS/709 Formatting for Serial Digital Interface”) and SMPTE 428-9 (D-Cinema Distribution Master - Image Pixel Structure Level 3 - Serial Digital Interface Signal Formatting).

Among the support for 3G Level B on the SxA and SxE is the ability to generate and analyze signals such as SMPTE 425-B carrying 1 x 372M dual link payload.

Uniquely the PHABRIX units create three pathological signals in all formats which will be of great interest to broadcast manufacturers. The first is as defined in SMPTE RP198 and is the split field signal with the equalizer test in the first half and the PLL test in the second half. The second and third are separate full-frame EQ test and PLL tests signals. To maintain a regular parity distribution and mitigate any DC offset, the EQ part of the pattern inverts a bit at the start of the first line in each alternate frame. This is the form of 3G Level B Pathological signal that many video manufacturers are adopting as their test signal of choice as it stresses electronic circuits more thoroughly.

Command scripts with print report



The Command Script & Reports option (PHSXOS) allows a series of predefined actions to be run through within the PHABRIX Sx using a script stored in internal memory.

The command scripts option can be used to automatically step through a sequence of instrument states, controlling the generator, analyser and logging functions. If required the instrument will prompt the user before going onto a subsequent state.

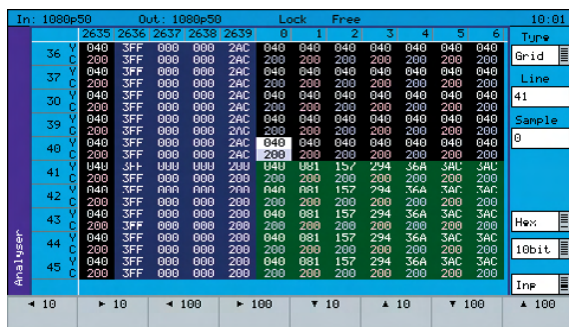
Applications include repeated test sequences as required by manufacturer Test Departments, R&D Departments, Systems Integrators and Commissioning/Support Engineers.

A script requires a set of memories to configure the unit and then a script file which recalls those memories and specifies times and actions for each step. The process of creating a command script requires these two files to activate the sequence.

Additionally a script can be created as a simple text file on a PC and then transferred to the unit via Ethernet and recalled at any time. A large number of named scripts and memories may coexist within the instruments store to be recalled as required.

Access to the Command Scripts functionality is the “System” - “Command Scripts” menu. See chapter 2 for details.

SDI Data Display & VANC/ANC Inspector



The SDI Data Display & VANC/ANC Inspector option (PHSXOSD) provides the engineer with a detailed view of the data words contained within the SDI stream. This allows the analysis of complex faults and is particularly useful when determining compatibility issues between equipment and when debugging new product developments particularly in a R&D environment. Detail within the active SDI stream can be viewed with continuous update.

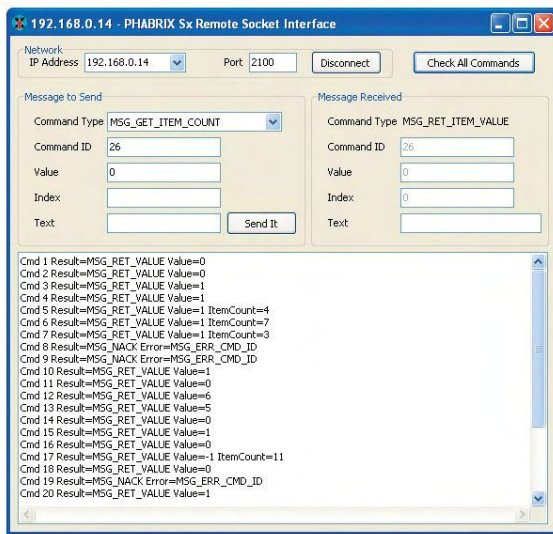
The SDI Analysis option provides the following functional areas:

Grid	displays the SDI data in the form of an array.
Stream	allows the SDI continuous data stream to be viewed.
Component	allows the video components to be displayed in separate columns.
Split	allows the video components to be display individually.
Ancillary Data	allows the user to capture whole Ancillary data packets identified by their data id (DID).
Ancillary Status	allows additional 'user defined' selections with the appropriate DID or SDID code.

Access to the SDI analysis functionality is via the Analyzer - Signal Data menu. See the "Analyzer - Signal Data" section in chapter 2 for full details.

This option also provides a VANC/ANC Inspector - allowing Ancillary data packets to be detected and checked for errors.

Enhanced remote control



The Enhanced Remote Control Integration option (PHSXOR) gives users full remote control of the unit via TCP/IP Sockets to allow any aspect of the unit to be modified or queried.

This allows complex applications to be created to perform test and measurement functions such as automated testing of routers or other broadcast equipment.

PHABRIX products act as a server and listen on a port waiting for incoming requests from clients such as a PC. Using this method of communication the Sx range can provide a variety of information to the control device it is connected to and be controlled in specified areas of the product using the command details included. All visual controls on the product have an associated command.

Messages may be sent to 'set' or 'get' data from a command i.e. if you 'set' a value the unit will be configured accordingly and a reply returned and if you 'get' a value from the PHABRIX unit it will reply with that value. All messages are acknowledged to increase the security of the interface i.e. closed loop communication.

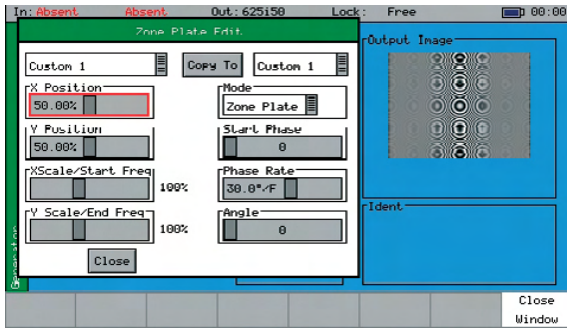
The control structure can be selected as Passive or Active. Passive control allows simple remote control where the host PC is in control and sends commands when it wants to change data or get information. It is this method which is the most popular use for remote control.

Active control is when the PHABRIX unit synchronizes with the host PC. Any changes on the PHABRIX unit will result in a message being sent to the host PC. This method is useful for controlling a PHABRIX unit from another unit or via the PC simulator software. It requires more complex software on the host to respond to the returned messages.

The option provides a programming guide with command information and examples, and can be downloaded from the PHABRIX website. A Windows™ application for testing the interface is also provided as part of this option.

See the Remote Control Guide for details.

Programmable zone plate



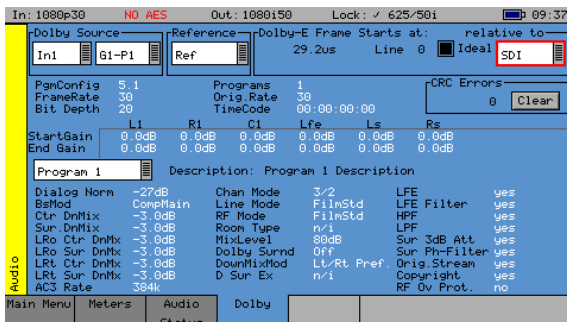
The Advanced Zone Plate Generator option (PHSXOZ) adds a range of preprogrammed zone plate patterns along with user-defined controls over several parameters which can be saved to custom buffers.

Using the System - Memories menu window, multiple saves of zone plates can be saved to the system by checking the video box and saving by name. In use the zone plate can be used to test a range of video processing requirements using horizontal, vertical and temporal (time) controls. Temporal control is particularly useful for testing up/down converters and applications which compress signals.

Aspect ratios can be tested using the horizontal and vertical controls. Frequency sweep is particularly useful and also available using this option. By feeding in the signal generated, the output of the device can be sent back into the Sx instrument's waveform monitor to determine the usable bandwidth of the system. Once purchased, the zone plate editor is reached by selecting the button next to the standard zone plate.

Dolby bit-stream Analyzer & Generator

The Dolby bit-stream analysis & generation option (PHSXO-DAG) displays Dolby E, Dolby Digital and Dolby Digital Plus metadata present in a selected audio stream and determines whether the Dolby E packet is timed correctly on the SDI video stream. It also uniquely adds significant Dolby E, Dolby Digital, and Dolby Digital Plus metadata generation features to the Sx range.



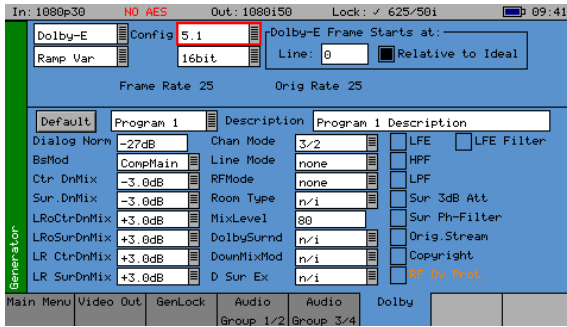
The Dolby audio may be monitored from any of the SDI input embedded audio channel pairs or the AES input. Peak audio levels are also displayed for Dolby E.

The start menu window displays both the V Bit information and PCM values along with a snapshot of the Dolby audio metadata if a Dolby is present. Using the Signal Information - Dolby menu will present the full analysis display which forms the major analytical tool for this option.

The Dolby metadata screen carries primary information including signal source, Dolby-E 'guard band' timing, CRC errors, program channel and metadata detail. The characters shown in white will only be presented when a Dolby signal is introduced into the unit.

Peak audio levels included in the Dolby E metadata packet are displayed, allowing the user to select the appropriate set of meters to display Dolby levels which will follow the selected Dolby source. Logging for Dolby errors, Dolby E Timing, Common metadata, and Program metadata can be also be controlled.

Note: This option does NOT decode Dolby audio



The Dolby generation capability provides broadcast engineers with a highly functional set of tools for Dolby E, Dolby Digital and Dolby Digital Plus streaming. It is unique in being the world's first metadata Dolby generator with editable profiles.

With a selection of Dolby streams to choose from, engineers can quickly enter and adjust parameters to check broadcast infrastructure.

This option allows the display of Dolby metadata present in a selected audio stream and determines whether the Dolby E packet is timed correctly on the SDI video stream.

Dolby streams are provided for all program configurations with fixed audio data. Among the tools included in the Dolby E streaming option is the ability to adjust the 'start of frame' for Dolby E packets.

The generated Dolby audio follows the video generator reference source. There is also the ability to edit the program configuration and bit depth with fixed audio signal. The PCM stream can be carried on any embedded or AES pair. The option can set the video line number where the internally generated Dolby audio test stream begins. Metadata can be edited by the user, and stored in memories.

The option allows a closed loop test scenario with both generation and analysis toolsets.

Note: This option does NOT generate Dolby audio.

Ancillary Data status (Now included as standard)



The Ancillary Status option (PHSXOVNC) provides broadcasters, studios, OB and broadcast manufacturers with a detailed analysis of the ancillary data present in an SDI signal.

A simple grid layout provides a quick view check for an engineer of the available VANC/ANC ancillary data. The packet type is then displayed as present, absent or red if in fault. Simple icons next to the packet indicate the fault. Each ancillary packet available from the grid view can be set to enable logging and then presented together with other information in the events window of the logging menu.

This option further allows additional 'user-defined' selections with the appropriate DID or SDID code. Any ancillary packet code can be saved down for future recall. Please note, this option does not fully decode the ancillary data. It is used to identify if the packet is present in the signal.



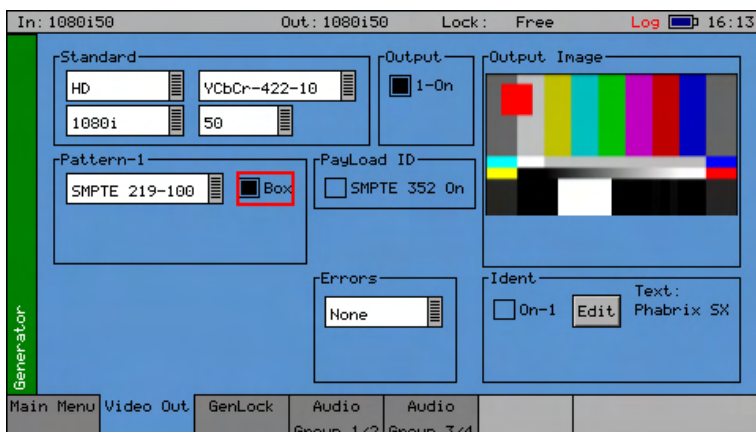
PHABRIX®

2 Menu Reference

Menu Reference

Generator Menu

Video Out



The Sx instrument can create video test signals for all supported SD-SDI, HD-SDI, 3G-SDI and 2K-SDI output standards including the 3GHz standards at 1080p/50/59/60. It will support Y,Cr,Cb, RGB and XYZ formats as well as RGB formats.

Output On

The Output On function turns ON the output circuitry.

Standard

The menus in the Standard section are used to select the desired video output format. The top-left box selects the basic mode of the Sx instrument and determines whether it is generating normal SD/HD video or 3G level A or level B video.

Only valid frame rates for the output standard may be selected.

Color Format

The SxA and SxE support the YCbCr 4:2:2 10 bit color format as standard.

An Advanced Video Formats option may be purchased to enable the following color formats. Note that the available color formats are dependent on the selected picture format and frame rate:

- YCbCr 444 12bit
- YCbCr 444 10bit
- YCbCrA 4444 10bit
- YCbCr 422 12bit
- RGB 444 10bit
- RGBA 4444 10bit
- RGB 444 12bit
- XYZ 444 12bit

All of the above Color Formats including the Advanced Video Formats are supported in the SxD as standard and are available on the dual link SDI interfaces provided by the SxD.

2K-SDI (part of Adv. Video Formats Option)

The Sx Advanced Video Formats option includes the generation and analysis of 2K video formats for YCbCr, RGB and XYZ colour spaces.

XYZ colour space is a non-linear format that requires additional treatment by the Sx generator and analyser circuitry to convert between linear and non-linear data formats. Only a limited number of non-linear test patterns are provided for XYZ as the traditional linear test patterns that are normally available in SD, HD and 3G are not applicable and will produce misleading results when analysed.

100% Colour Bars is generated in RGB colour space and needs to be analysed using the RGB colour space selection in the Waveform monitor. This test pattern is provided to check the accuracy of the colour paths through the equipment under test.

Legal Ramp is generated in XYZ non-linear format and needs to be analysed using the X'Y'Z' colour space selection in the Waveform monitor. This test pattern is provided to check the accuracy of the data path through the equipment under test.

Multiburst is generated in XYZ non-linear format and needs to be analysed using the X'Y'Z' colour space selection in the Waveform monitor. This test pattern is provided to check the frequency response and sample rate of the data passed through the equipment under test.

Colour Field produces fixed level colours in RGB colour space that are converted to equivalent XYZ colour space values and needs to be analysed using the RGB colour space selection in the Waveform monitor.

User File allows user-defined test patterns that have been created in XYX non-linear colour space to be selected.

The XYZ, X, Y and Z settings in the Waveform monitor display the XYZ colour space in its native non-linear form. So test patterns such as Legal Ramp will be displayed as curves instead of straight lines.

The X'Y'Z', X', Y, and Z' settings in the waveform monitor display the XYZ colour space with a reverse transform to convert it to linear form. So test patterns such as Legal Ramp will be displayed as straight lines.

The Picture monitor and Vectorscope instruments will automatically apply the appropriate transforms to display the images in YCbCr, RGB and XYZ colour spaces correctly. The colour space transform to be applied is defined by the SMPTE 352 payload.

Pattern


This selects the video pattern that is output by the generator. Many standard patterns are provided by the Sx instrument. You may also upload your own test patterns to the Sx instrument into the 'Patterns' directory and then select them using the 'User File' option in this field. See the 'File Structure - Patterns' section for file formats supported. If a 'User File' has been selected, the 'i' button beside the file can be selected to get information on the file properties. Unsupported file types will be displayed as a black image. If the video standard is changed while a user file is loaded and there is no file for the new standard present, a black image will be loaded and the User File blanked.



If Checkfield/Pathological is selected when a dual stream format has been selected, BOTH outputs will be forced to check field due to internal hardware limitations. If another pattern is selected, the Check field pattern will be de-selected. The exceptions to this are when Colour Field or Zone Plate are selected as test patterns.

The Checkfield/Pathological/PLL Check/EQ Check patterns will only look like the picture above when a YCbCr 422 10 bit colour mode is selected. Other colour modes will have different pictures but still create the SDI data stream required by SMPTE.

A bouncing Box may be overlaid on the current test pattern by selecting the Box checkbox field.

 100% Bars	 75% Bars	 75% Bars + Red	 SMPTE Bars
 Checkfield Pathological	 EQ Test	 PLL Test	 Luma Ramp
 Legal Ramp	 Valid Ramps	 Multiburst	 Pluge
 Bowtie	 Tartan Bars	 Grey Bars - 5	 Grey Bars - 5 -vertical
 Grey Bars - 11	 Grey Bars - 11 -vertical	 SMPTE 219/ARIB-28 Bars - 3 variants	 A/V Delay
 Zone plate	Black, Red, Green, Blue, Yellow, Cyan, Magenta, White, Custom Colour Field	Downloadable files in bitmap(.bmp), 10bit DPX/YUV (.dpx, .yuv), Targa (.tga) and Phabrix .pat/.rgb/.yc4 compressed files User File	

- AV Delay The AV Delay Test pattern and associated audio pulse provided by the Generator module can be used to check the differential delay between video and audio. This animated test pattern provides a constantly moving clapperboard and the corresponding AV Delay Audio pulse and video white line flash when the clapperboard reaches the center of the test pattern.
- Colour Field If colour field is the selected test pattern, another control selects which colour to generate. Three user definable custom colours may be defined using the “->” button. Custom colours are edited using the Red-Green-Blue sliders. When setting the colour using the RGB sliders, the YCbCr values will show the values for the current colour space. When setting the colour using the YCbCr sliders, the RGB values will show the values for the current colour space.
- Zone Plate A basic zone plate generator is supplied with all Sx instruments. The zone plate selector will contain 3 user customizable zone plates as well as several predetermined zone plates. The ‘->’ button displays a dialogue which allow the parameters of the zone plate to be adjusted for the custom zone plates. Any of the preset zone plates may be copied to the custom zone plates to act as a starting point for a new zone plate. As the zone plate settings are stored in user memories a large number of custom zone plates are available for use.

Moving Zone-2H - A moving zone plate centred on the screen.

Static Zone-2H - A static zone plate centred on the screen from DC to the Nyquist frequency at left/right edges.

Static Zone-2V - A static zone plate centred on the screen from DC to the Nyquist frequency at top/bottom edges.

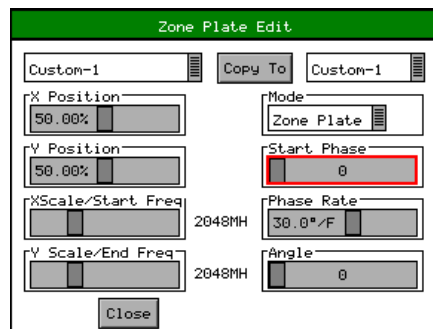
Sweep-Horiz - A horizontal sweep from DC to Nyquist frequency horizontally.

Sweep-Vert - A vertical sweep from DC vertically.

Grating-50kHz - A 50kHz frequency sine wave when using an HD output.

Grating-1MHz@HD - A 1MHz frequency sine wave when using an HD output.

Grating-5MHz@HD - A 5MHz frequency sine wave when using an HD output
- Custom This allows editing of Custom zone plate settings. Three custom zone plates can be set up and can be copied from an existing presets using the ‘Copy To’ button.



Mode - sets which type of Zone Plate is being produced. It may be Zone Plate (circular pattern) Grating (Linear horizontal or vertical grid) Sweep (Frequency sweeps from start to end Frequency)

Start Phase - sets the start phase of the sine wave generated by the zone plate generator and is set in degrees from 0-360

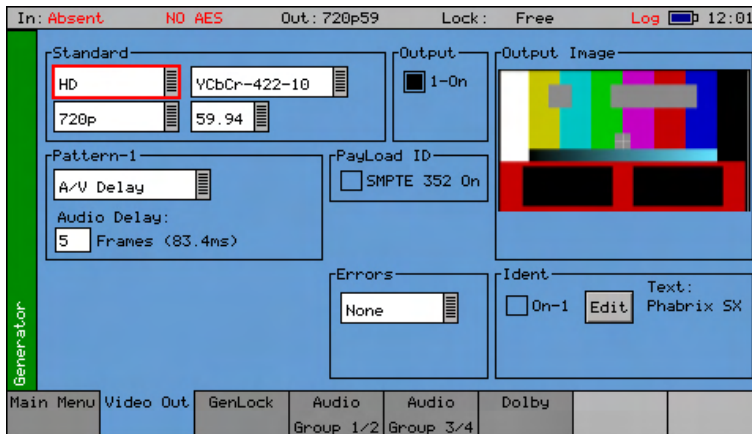
Phase Rate - is used to set the rate of change of phase of the sine wave and thus changes the speed that the zone plate moves at. It is specified in degrees per frame.

Angle - changes the angle of the zone plate and thus can change a horizontal sweep into a vertical sweep or rotate an elliptical zone plate pattern.

XScale/Start Freq - sets the horizontal scale of grating patterns or the start value of the zone plate sweep frequency.

YScale/End Freq - sets the vertical scale of grating patterns or the end value of the zone plate sweep frequency.

AV Delay Generator (AV Delay Option)



The AV Delay Generator produces an adapted EBU Tech 3305 AV Sync 'clapperboard' Test Pattern.

An audio delay offset with respect to video of up to +/-40 frames can be applied in increments of 1 frame.

The AV Delay test pattern and audio pulse provided by the Generator module can be used to measure the differential delay between the video and audio paths in a piece of equipment or an SDI or AES based system.

In the 'Video Out' menu page, the AV Delay test pattern and 'Audio Delay' offset can be selected.

In the 'Audio Group' menu pages, the AV delay audio tone can be inserted on up to 16 embedded SDI audio channels, plus AES out.

When using the SxA and SxE, this new tool can also be used to measure the propagation or pipeline delay of either video or audio.



Note: The AV Delay signal is compatible with third party AV delay analyzers such as the LAWO V_pro8

The AV Delay Generator creates an adapted EBU Tech 3305 AV Sync pattern. This provides a constantly moving 'clapperboard' that when it closes shows a vertical white 'flash' line for 1 frame with a corresponding audio pulse.

To access the AV Delay Generator option:

- Select 'AV Delay' in the 'Pattern' drop-down menu

AV Delay can be used with all Sx supported video formats and frame rates on SDI and AES interfaces.



Note: The SxD is restricted to SDI as it has no dedicated AES interfaces

An 'Audio Delay' field will then appear.

Here you can offset the timing of the generated audio pulse relative to the central 'white flash' frame of the test pattern. An audio delay offset of up to +/-40 frames can be applied in increments of 1 frame. The delay value in milliseconds is displayed alongside the frame delay value.

- When 'Audio Delay' is set to a positive (+) value, the audio pulse will lag behind the video
- When 'Audio Delay' is set to a negative (-) value, the audio pulse will be ahead of the video

The 'Audio Delay' offset has several applications:

1. The differential delay of a system or device under test can be quickly measured in TV frames by adjusting the Audio Delay offset until the measurement reads less than a TV Frame
2. This can quickly confirm that the differential AV delay is an integer number of TV frames
3. The analyzer can measure AV differential delay up to +/-400ms. If the system under test has a propagation delay longer than this, setting an offset of up to -40 frames extends the overall measurement window

(On the AV Delay analyzer, a measured delay amount that is not accounted for by the generated Audio Delay offset, will indicate delay introduced by the system under test.)

To choose the AV Delay pulse audio channels, go to the 'Generator – Audio Group...' menu pages, and select 'AV Delay' in the drop-down menu for each audio channel as required.

EDH

If the output signal is SD (PAL-625 or NTSC-525) the insertion of EDH information may be turned on or off.

Errors

This field enables the insertion of CRC or EDH errors into the video signal. This allows checking of third party error detection circuitry. In SD there is one EDH ancillary packet per field. When errors are being inserted every EDH value gets deliberately corrupted. This creates one error count per field. (Actually one AP error and one FF error). In HD there is a CRC value calculated for each line. When errors are being inserted the CRC value on line number 1 gets deliberately corrupted. This creates one CRC error count per frame. There is also the option to generate CRC errors (not SD EDH errors) on only the switching line in field 1 which can be used to check that any downstream equipment ignores errors on switching lines.

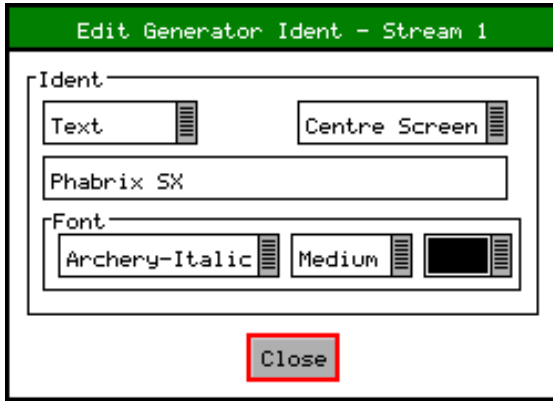
SMPTE 352

This checkbox allows the SMPTE 352 Payload ID field to be inserted into the video output stream. The state of this check box is stored separately for SD, HD and HD-3G line standards. Note that for HD-3G line standards the Payload ID should be turned ON.

Ident

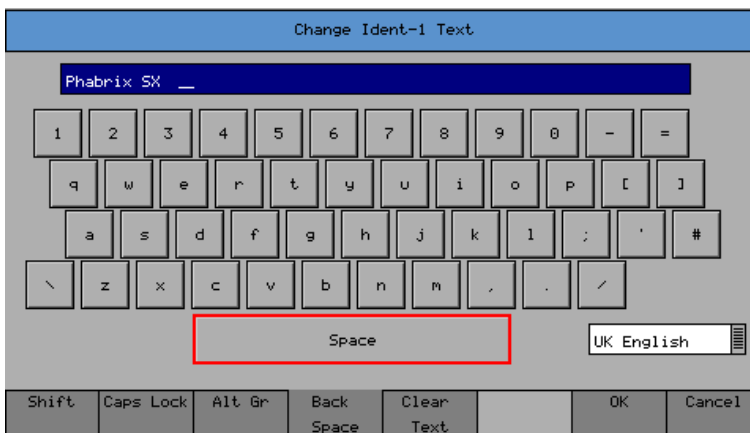
An picture or text 'Ident' may be set to identify an SDI source. This Ident can be turned on/off from this page but changing the text/font/bitmap is performed by selecting the Edit button to bring up the Ident Dialogue. An overview of what the Ident is can be seen beside the Edit button. Note: If zone plate or colour field are selected, text cannot be overlaid over them.

A smaller version of the video output signal is displayed on this page with any overlaid ident.



This dialogue allows selection of either a user defined bit map picture which has been downloaded into the 'Idents' directory of the Sx instrument or user defined text.

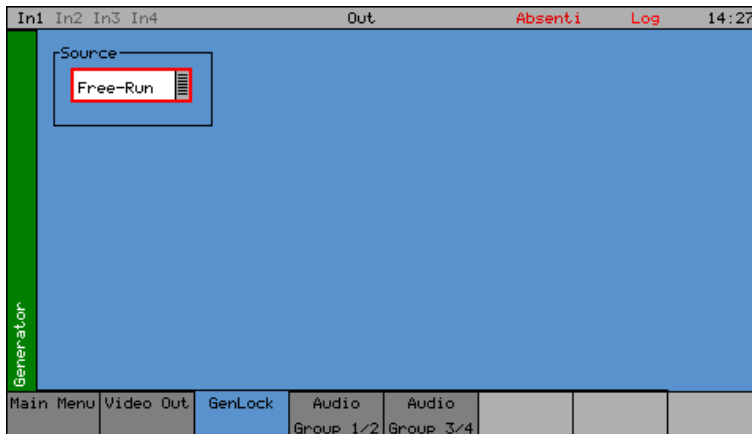
For both types, the position of the ident can be set to one of Top-Left, Top-Centre, Top-Right, Left-Centre, Centre-Screen, Right Centre, Bottom-Left, Bottom-Centre, Bottom-Right. When text ident is used, the font, font size and color can be specified. Several fonts are built in to the Sx instrument, other true-type (.ttf) fonts may be downloaded as required.



When editing text, the keyboard above is displayed to allow easy editing. Move the cursor to select the key to 'press' and then press 'Ok' to 'press' it. The Shift menu key causes the next keyboard to change to shift mode for the next key press.

The Caps Lock menu key locks the keyboard in all capitals mode. The Alt Gr. key shows any language dependent alternate keys that may be pressed. Several country keyboard styles are provided. Note that not all fonts support all non-English characters.

Genlock Menu



The Sx instrument can create video test signals that are either free-running or locked to a studio reference signal.

The Genlock menu is used to select an external locking reference or set the instrument to free run.

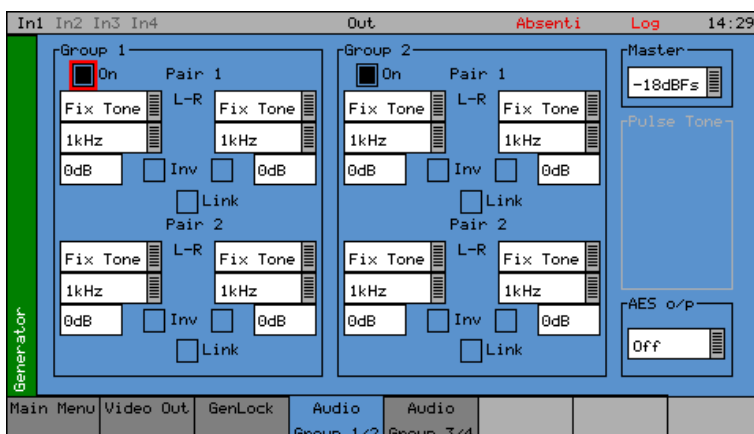
Source

The generator may be locked to an input reference which may be either the reference input which is a Bi-Level/Tri-Level sync or may be locked to the video input. Alternatively, the generator may free run.

Delay

The SDI and AES outputs generated by the unit can be advanced/delayed with respect to the currently selected locking reference. Controls are provided for line and pixel advance/delay for SDI and AES output.

Audio Group Menu



The Sx instrument can embed an audio signal on all 16 embedded audio outputs.

The Audio Group menu controls which audio channels, pairs or groups have test tones applied and the type of tone.

Group *n*

Each of the four groups may be separately enabled. When enabled, the source and level of each channel in a pair can be selected.

Source

The source for each channel may be Silence, Fixed tone (a range of fixed frequencies), variable tone (where the frequency can be set on 1Hz steps from 1Hz to 23.99kHz), white noise, or AV Delay. The AES input may also be selected if present. If the Dolby Generation option has been purchased, the source may be set to 'Dolby' at which time the other channel in the audio pair is also set to 'Dolby' and gain control disabled.

AV Delay Audio Pulse (AV Delay Option)

For AV Delay audio pulse generation, choose which audio channel should carry the AV Delay pulse, and then set the source to 'AV Delay' in the drop-down menu. (Make sure that the 'Group' checkbox for this channel is also enabled.)

The AV delay audio pulse can be inserted on up to 16 embedded SDI audio channels and an audio pair can also be routed to the AES Out.

To route an AV delay audio group pair to AES Out, select the pair in the 'AES o/p' drop-down menu.

If an 'Audio Delay' offset is required for the generated AV Delay pulse, this can be set on the 'Generator – Video Out' page after selecting the 'A/V Delay' test pattern. An offset of up to +/- 40 frames can be applied in increments of 1 frame.

Inv

This checkbox phase-inverts the audio signal to allow checking of third-party audio mixing.

Link

This links the left and right channels of a pair so that changing the level on the left hand channel changes the level on the right hand channel.

Master

The master level sets the 0dB level for all the embedded audio channels. Thus if the Master level is set to -18dB and group 1 pair 1 output is set to -2dB, the actual level output on that pair is -20dB. This feature allows all embedded outputs to be adjusted together as well as giving a simple method to change from -18dB to -20dB based standard levels. The Master level will not adjust the level of an AES input signal selected for embedding on SDI output.

AES O/P

The AES o/p control selects the source for the AES output of the Sx instrument and can be:

The AES input (via the built-in sample rate converter) to allow easy conversion to 48kHz sample rate AES signals.

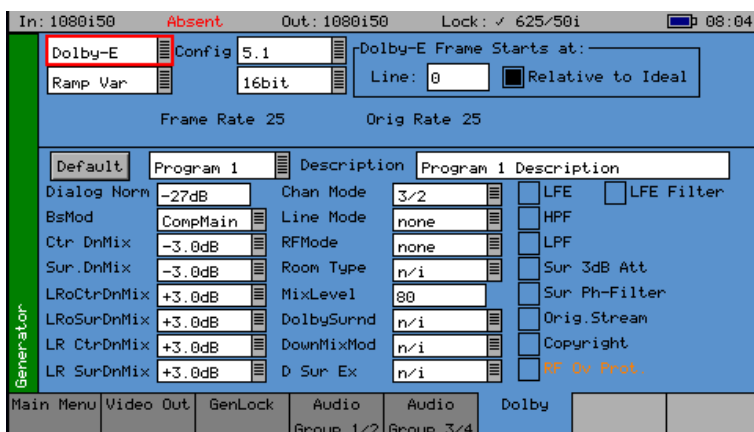
A mirrored output of the specified embedded AES stream contained within the SDI output to allow easy generation of audio tones or white noise.

One of the embedded input pairs on the SDI input to allow use as a de-embedder.

Off, if the output is not required.

Note that the AES output is always at a 48kHz sample rate. The AES input may be at any sample rate from 32kHz to 192kHz.

Dolby (Dolby Generator Option)



The Sx instrument Dolby Generator software option allows generation of Dolby-E, Dolby Digital and Dolby Digital Plus pre-encoded test signals to check that they are transferred transparently through the broadcast chain unaffected by routers/switchers, satellite links, etc.

The Audio - Dolby menu controls the generation of Dolby test data.



Note that with this software version Non-Keyed signals are generated which may be incompatible with certain VTRs.

Overview

There are a number of Dolby broadcast digital audio standards that transport audio data over an SMPTE 337M AES carrier with a 48kHz sample rate. The type of Dolby to be generated can be selected from the drop down list in the top left corner of the menu:

- Dolby E
- Dolby Digital
- Dolby Digital Plus

These standards can be used to transport mono, stereo, 5.1 and 7.1 audio programmes:

Dolby 5.1 - involves five channels for normal-range speakers (20 Hz – 20,000 Hz) (right front, centre, left front, rear right, rear left) and one channel (20 Hz – 120 Hz allotted audio) for the subwoofer driven low-frequency effects.

Dolby 7.1 uses six channels in the primary program (Independent Substream) for a standard 5.1 surround sound mix and then the 2 remaining 2 channels in an ancillary programme (Dependent Substream) to provide the additional down-mix.

Dolby E

Dolby E is an audio encoding and decoding technology developed by Dolby Laboratories that allows up to 8 channels of audio (mono, stereo, 5.1 or 7.1) that for a primary programme (Programme 1) and optional ancillary programs. These 8 channels are compressed (lossless) into a digital stream that can be transferred between compatible devices and stored on a standard stereo pair of audio tracks. The most elaborate mode in common use is Dolby 7.1 which uses all eight channels to provide surround sound.

Dolby Digital

Dolby Digital (AC-3) is a 'perceptual audio' system for digital audio that allows the reduction of data needs to deliver high-quality sound. This system was developed primarily for DTV, DVD and HDTV. This format allow up to six channels of sound (mono, stereo or 5.1) in the form of a single 'program' that can be delivered at different bit rates. These 6 channels are compressed (lossy) into a digital stream that can be broadcast. The most elaborate mode in common use is Dolby 5.1 with uses all six channels to provide surround sound.

Dolby Digital Plus

Dolby Digital Plus (E-AC-3) is a more advanced version of Dolby Digital that provides a more efficient encoding algorithm that provide enough bandwidth that allows up to 20 channels of audio (mono, stereo, 5.1, 7.1 up to 13.1) that for a primary programme (Programme 1) and optional ancillary programs that can be delivered at much lower bit rates than Dolby Digital. These 20 channels are compressed (lossy) into an independent digital data stream plus up to 8 dependent sub stream that can be transferred between compatible devices and stored on a standard stereo pair of audio tracks. The most elaborate mode in common use is Dolby 7.1 with uses eight channels to provide surround sound.

Dolby E Synchronization - Generator Reference

The Dolby audio test signal produced by the Sx instrument is affected by the use of a reference signal connected to the Sx instrument and by the following settings:

Free Run - If the generator is not locked to reference, the Dolby signal will be generated synchronous to the generator. If the generator is running at a fast progressive rate (50-60 fps) it will generate packets on every other frame.

External Reference/Ext SDI reference - If the generator is locked to an external signal, the reference signal MUST be of an appropriate standard. See the table below for examples.

Video Output Format	Valid Reference Formats
1080i50	1080i50, 625i50(PAL)
1080i59	1080i59, 525i59(NTSC)
1080p25	1080p25, 1080i50, 625i50(PAL)
1080p29	1080p29, 1080i59, 525i59(NTSC)
720p50	1080p25, 720p25, 1080i50, 625i50(PAL) – due to length of packet being over 1 frame long
720p59	1080p29, 720p29, 1080i59, 525i59(NTSC) – due to length of packet being over 1 frame long
1080p50	1080p25, 720p25, 1080i50, 625i50(PAL) – due to length of packetbeing over 1 frame long
1080p59	1080p29, 720p29, 1080i59, 525i59(NTSC) – due to length of packet being over 1 frame long

Editing Program Information

Stream type: Only Dolby-E streams can be generated with this software version.

Config, Bit Depth: The program configuration and Bit Depth can be changed to load the pre-encoded file.

Stream contents: The tones generated are of a fixed predefined frequency. Four sets of pre-encoded streams are provided:

Ramp Var - Each channel has a different frequency to allow checking of channels. The levels are ramped so that different channels have different levels.

-3dB Fixed - All the tones are at -3dB co-phased/timed and are at the same frequency.

-18dB Fixed - All the tones are at -3dB co-phased/timed and are at the same frequency.

-20dB Fixed - All the tones are at -3dB co-phased/timed and are at the same frequency.

Fixed Frequency values for “Fixed level“streams above:

Frame Rate	Normal Frequency	LFE Frequency
23.98	4.8kHz	211Hz
24	6kHz	240Hz
25/50	6kHz	240Hz
29.97/59.84	6kHz	133Hz
30/60	6kHz	240Hz

Dolby-E start line: The start line can be used to set valid or invalid ranges to allow checking of the Dolby-E guard band on downstream equipment. If the start line is set outside the valid range specified by Dolby, the line number will be displayed in RED.

Relative to Ideal If this check box is checked, the line number displayed is relative to the Dolby specified ideal line. A value of '0' therefore starts the Dolby-E packet on the 'Ideal Line' for that video format.

Frame Rate This is set by default to the currently generated frame rate but may be modified by the user to test downstream equipment.

Original rate This is set by default to the currently generated frame rate but may be modified by the user to test downstream equipment.



Note that if generating a progressive fast rate video standard such as 720p50, 720p59 or 720p60 etc. the Dolby-E signal will always be generated at the related slower rate. This is a Dolby restriction as the packets are over 1 frame in length for these video formats.

Program Metadata Editing

Many of the metadata fields may be edited to test downstream equipment. The Channel Mode field may be edited to invalid settings but they will be shown in RED to show that they are invalid. The settings currently being edited are for the selected program but multiple program metadata values can be modified and the settings for all programs are stored in memories.

Metadata changes and line changes will happen cleanly so that no corruption to the Dolby signal will occur.

A maximum of 30 characters may be used for program description text. If the text is longer than this, extra characters will be ignored.

The “Generator” – “Dolby” menu allows the metadata for a Dolby E data stream to be setup for testing purposes. The main purpose of setting these metadata fields is to check that they are transferred transparently through the broadcast chain unaffected by routers/switchers, satellite links, etc. For any programme this metadata would be created as part of Dolby E authoring process. Using the Dolby generator, the following metadata can be setup for Program 1:

Dialogue Norm is the normal audio level for dialogue. Ideally all transmitted programs would have the same value.

BsMod (Bitstream Mode) indicates the type of audio service that the bitstream contains. Complete Main (CM) is the normal mode of operation and contains a complete audio program including dialog, music, and effects.

Ctr DnMix (centre down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

Sur DnMix (surround down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.

LROCtrDnMix	(left/right/stereo/centre down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 7.1 Dependent Substream.
LROSurDnMix	(left/right/stereo/surround down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 7.1 Dependent Substream.
LR CtrDnMix	(left/right/centre down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.
LR SurDnMix	(left/right/surround down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.
Chan Mode	defines the channel configuration for Program 1 (i.e. mono, stereo, 5.1 channels).
Line Mode	this is an Operational Mode / Dynamic Compression Mode that is used by consumer and professional decoder products that simplifies the implementation of Dialogue Normalization, Dynamic Range Control, and down mixing functions, all of which are necessary in Dolby Digital products.
RFMode	this is an Operational Mode / Dynamic Compression Mode that is used by consumer and professional decoder products that simplifies the implementation of Dialogue Normalization, Dynamic Range Control, and down mixing functions, all of which are necessary in Dolby Digital products.
Room Type	this informational parameter indicates the type and calibration of the mixing room used for the final audio mixing session.
MixLevel	the Surround Down mix Level parameter indicates the nominal Lo/Ro down mix level of the Surround channel(s) with respect to the Left and Right channels
DolbySurnd	the Dolby Surround Mode parameter indicates whether or not a two-channel Dolby Digital bitstream is conveying a Dolby Surround encoded program.
DownMixMod	this controls the Down Mix Mode which is used by the content creator to optimize Center and Surround channel levels for use in stereo down mix mode for any two-channel programmes.
D Sur Ex	this controls the Dolby Surround Ex channel that provides an extra audio channel for Dolby 5.1. The extra surround channel of the Dolby Surround Ex system is matrix-encoded onto the discrete left-surround and right-surround channels of the 5.1 mix.

The following control bits can also be set:

LFE	the LFE Channel parameter enables or disables the Low-Frequency Effects (LFE) channel.
HPF	this parameter can be used to activate the DC High pass filter for all input channels.
LPF	the LFE Low pass Filter parameter can be used to activate a 120 Hz low-pass filter applied to the LFE input channel.
Sur 3dB Alt	the Surround Channel 3 dB Attenuation function is use to apply a 3 dB attenuation to the Surround channels of a multichannel soundtrack created in a room with film style calibration, when encoding it for consumer home theater playback.
Sur Ph + Filter	the Surround Channel 90-Degree Phase-Shift feature is used for generating multichannel Dolby Digital bitstreams that can be down-mixed in an

	external two channel decoder to create a true Dolby Surround compatible output.
Orig. Stream	the Original Bitstream informational parameter sets the value of a single bit within the Dolby Digital bitstream. This bit has a value of 1 (box checked) if the bitstream is an original. If it is a copy of an original bitstream, it has a value of 0.
Copyright	the Copyright Bit informational parameter sets the value of a single bit within the Dolby Digital bitstream. If this bit has a value of 1 (box checked), the information in the bitstream is indicated as protected by copyright. If it has a value of 0, it is not copyright protected.
RF Ov Prot.	the RF Over-modulation Protection parameter determines whether or not an RF pre-emphasis filter is used in the overload protection algorithm to prevent RF over-modulation in set-top box decoders.

Default Program Metadata

Pressing the “Default” button will return program meta-data settings to their default values.

Embedding Dolby on SDI Stream

To embed Dolby signals on an SDI stream, the Audio source for that channel should be set to ‘Dolby’. These source selections are found on the Generator – Audio Group 1,2,3,4 pages. Selecting one channel of an audio pair to ‘Dolby’ will force the other channel in the pair to select ‘Dolby’ also. As the Dolby streams are data, the volume and phase controls are disabled. Changing a channel from Dolby to another source will cause the other channel in the pair to select silence.

Embedding Dolby Signals on AES Stream

To embed Dolby signals on the AES output, the Audio source for the AES output should be set to ‘Dolby’. This selection is found on the right hand side of the Generator – Audio Group 1,2,3,4 pages.

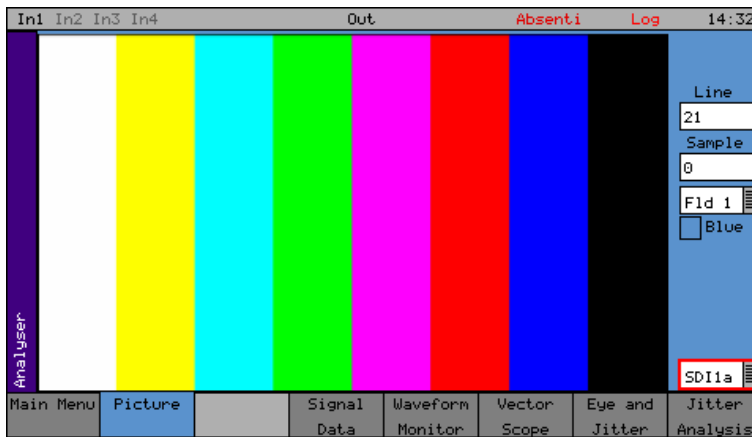
Menu Reference

Analyzer Menu

Overview

The Sx instrument signal analyzer displays the selected video input or output signal. The source for the analyzer is set by the field at the bottom right of the page. The current line and sample are the same for all pages of the analyzer and therefore when selecting a sample on the Signal Data page, the cursor will show where that is on the 'Full Picture' page.

Picture



With Picture selected, the video picture is displayed in a window as a down-converted display. The picture will automatically view the horizontal or vertical blanking areas if the line or sample values are in the blanking area.

If the focus cursor is moved to the picture window and OK pressed, the cursor may be used to scroll around the window. Press OK again to cancel this mode. When in zoom mode, the cursor is always in the centre of the window and the picture scrolls behind it. If the cursor is moved to an area of interest on the picture, the same area will be visible on the SDI data option (if purchased).

If the picture window is focussed and current tab button is pressed again to enter full-screen mode, the cursors may be moved by pressing the OK button again.



Note that the normal cursor menu keys may be used but are not visible. Press OK again to cancel cursor adjustment mode.

- Line: Specify the current line for analysis.
- Sample: Specify the current sample for analysis.
- Field: (Only for interlaced formats) This control selects the field for analysis. If the current line is in Field 1, changing the field will change to the same line in field 2. The field number will change to show the correct field for the current line number.
- Aspect Ratio: The aspect ratio of PAL (625 lines) may be set to be either 4:3 or 16:9 as required for the source signal. NTSC (525) signals are always 4:3 aspect ratio and HD signals are always 16:9.
- Zoom: If not checked, the picture displayed is a down-converted picture to fill the window or the full screen as requested. If checked, then a pixel on the LCD display will reflect a pixel in the video signal. In zoom mode, no filtering is used.
- Cursor: A cursor may be turned ON over the area of the picture specified by the specified line and sample.
- Source: The analyzer can view either the video SDI input or the SDI output so that comparisons can be made between input and output.

The Picture monitor will automatically apply the appropriate transforms to display the images in YCbCr, RGB and XYZ colour spaces correctly. The colour space transform to be applied is defined by the SMPTE 352 payload.

AV Delay Analyzer (AV Delay Option)



AV Delay measurement is available in the Picture instrument.

Measurement of two AV Delay test patterns is supported:

- EBU Tech 3305
- LAWO V_line AV Sync test pattern

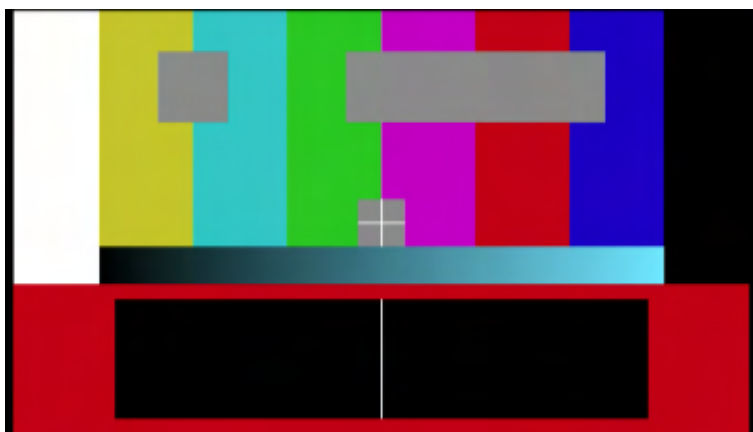
The tool provides a real-time update of the differential delay between the video and the selected audio channel pair.

When analyzing an AV delay video test pattern and audio pulse, the differential delay between the video and the selected audio channel pair will be measured and displayed – with the display updated in real-time.

- A positive (+) measurement indicates that the audio pulse is lagging behind the video
- A negative (-) measurement indicates that the audio pulse is ahead of the video
- When video and audio are completely in sync, zero delay will be measured

The differential delay between the video and the selected audio is measured in 0.1 ms steps (to an accuracy of 1ms) with an operating range of +/-400ms.

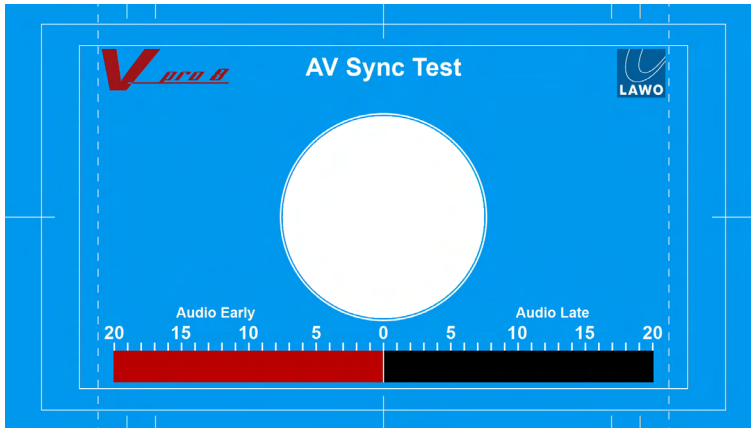
(An 'Audio Delay' offset can be applied to an Sx generated AV delay test pattern in 'Generator – Video Out'. In the AV Delay analyzer, any delay amount that is not accounted for by the generated 'Audio Delay' offset, will indicate delay introduced by the system under test.)



The Sx modified EBU Tech 3305 AV Sync test pattern provides a constantly moving 'clapperboard' that when it closes shows a vertical white 'flash' line for 1 frame.

When video and audio are in sync, the audio pulse will sound at the exact moment the 'white flash' appears.

If video and audio are out of sync, there will be a differential delay between the timing of these two events.



The LAWO V_line AV Sync test pattern provides a constantly moving progress bar. When the progress bar reaches the center frame of the test pattern a vertical white bar appears and a white flash appears in the center circle.

When video and audio are in sync, the audio pulse should sound at the exact moment the 'white flash' appears.

When video and audio are out of sync, there will be a differential delay between the timing of these two events.

To measure AV Delay in the 'Picture' instrument:

The Picture source should be set to the SDI input to analyze the incoming video signal.



Note: The Picture source can also be set to view the generator output

The 'AV Delay' selection menus and measurements display are located in the top right hand corner of the Picture instrument.

To measure the differential AV Delay, first ensure that a suitable test source is being used.

For the AV Delay measurement to be valid, the measuring Sx unit must be genlocked to a suitable reference.

A suitable reference is defined as either of the following:

- the SDI input being analyzed
- the external reference to which the AV Delay test signal source device is locked

If however, the measuring Sx is also the source device generating the AV Delay test signal in a loop, then a suitable reference is defined as either of the following:

- external reference
- free-run

Trying to lock the Sx unit to its own input signal is not valid.

The Sx unit reference input can be set in the 'Generator – GenLock' menu.

Switch on AV Delay measurement in the Sx by selecting the appropriate test pattern type from the first 'A/V Delay' drop-down menu:

- OFF, EBU, LAWO

Next, in the second drop-down menu, select the required audio group and pair carrying the AV delay audio pulse – the timing of which will be measured relative to the video test pattern.

The AV Delay pulse can be carried on either an embedded SDI audio or AES channel:

- AES In, G1-P1, G1-P2, G2-P1, G2-P2, G3-P1, G3-P2, G4-P1, G4-P2

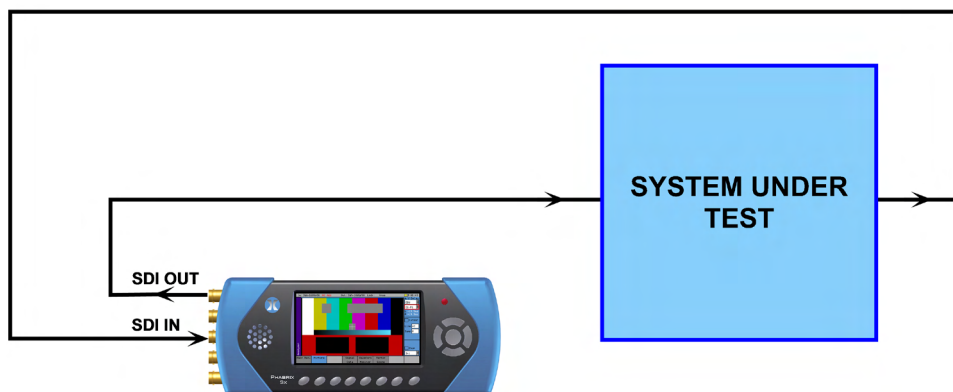
The Left (L) and Right (R) channel fields will display any measured differential delay between the video and that audio channel in milliseconds (ms).

The status of the AV delay measurement tool (when switched on) is shown by the color of the measurement display fields:

Red	The correct AV delay pattern has not been detected and/or no AV delay pulse has been detected
Yellow	Stabilization period: Each time the AV delay analyzer detects a new video standard, a 10 second stabilization period occurs before the measurement display is refreshed
White	Measured differential delay. No errors detected.

Audio-to-Video Differential Delay Testing:



Objective: Measure the imposed differential delay of the audio and video paths in the system under test



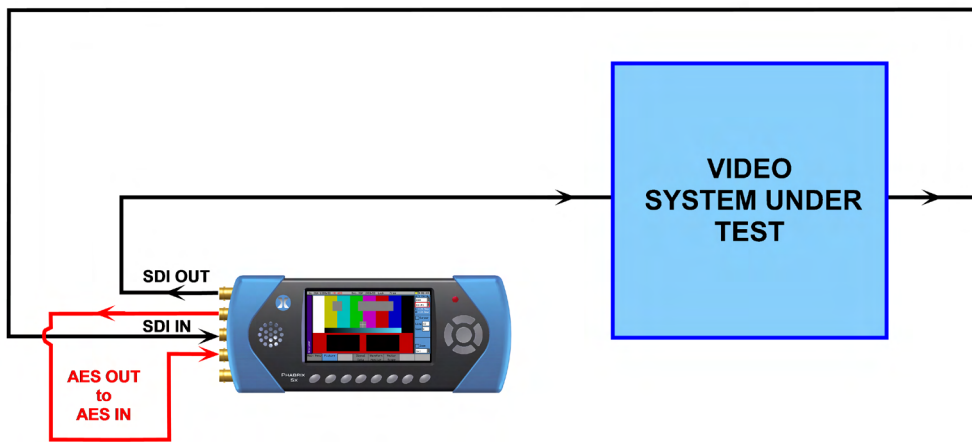
- Audio pulse carried on embedded SDI channel pair
- Genlock to external reference or free-run

Propagation Delay Testing (of either video or audio):

Objective: Measure the propagation delay imposed on the video or audio by the system under test

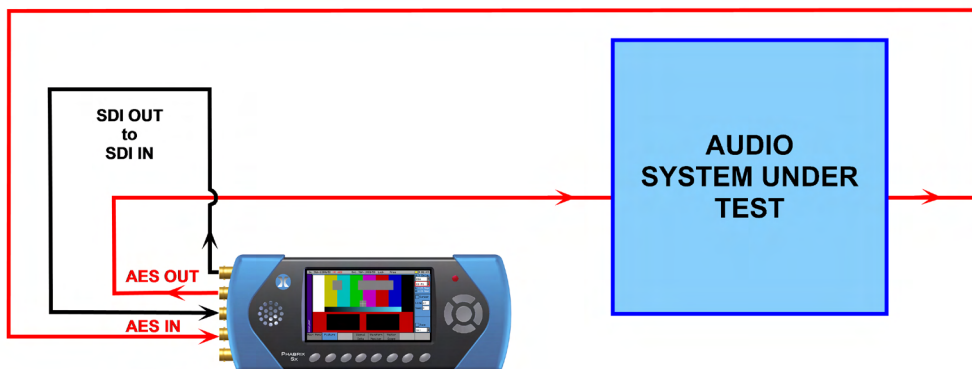
-  Note: Propagation delay testing is not available on the SxD as it has no dedicated AES interfaces
-  Note: The analyzer can measure delay up to +/-400ms. If the system under test has a delay longer than this, setting an 'Audio Delay' offset of up to -40 frames will extend the analysis window.

Video Propagation Delay Testing



- Audio pulse carried on AES channel pair
- Genlock to external reference or free-run

Audio Propagation Delay Testing



- Audio pulse carried on AES channel pair
- Genlock to external reference or free-run

Signal Data



The Signal Data menu shows the video signal as a data stream in several formats as described below. In each mode, the data may be displayed in hexadecimal, decimal or binary formats. The binary format is not available in grid mode. The data may also be displayed as 10-bit or 8-bit format.

To simplify scrolling around the SDI signal view, use the cursor keys to move the red focus rectangle to the data display and press OK. The focus rectangle should change to a blue colour and the cursor keys allow the display to be scrolled in any direction. The menu keys at the bottom allow the Line/Sample to be adjusted by 10 or 100 in any direction.



Note that the line number of a line of video changes at the end of active video. This gives the strange side effect that the line number for pixels in horizontal blanking is the same as the line number for the active picture after that line.

Type

- Grid:** In this mode the data is shown in an X-Y format with lines and samples at the same time. Thus this is a representation of the picture but in data format. If the cursor keys are used to select the grid window and 'OK' pressed, the cursor keys will scroll around the window. The luma (Y) channel is shown in white whilst the Cr and Cb channels are shown in with a red or blue tint respectively.
- Strm:** This is one of 3 modes for displaying the samples on the current line only. The cursor keys may be used to scroll the sample number when 'OK' has been pressed. The 'info' column shows the type of data being displayed.
- AP - Active picture
 - VBL - Vertical blanking
 - HBL - Horizontal blanking
- Comp:** This is a similar to the Strm mode above but in a component mode with Cr and Cb in different columns. See Strm mode above for the info column description.
- Split:** This mode shows the 2 streams split into 4 parts to show Y, Y', Cr and Cb in separate columns. See Strm mode above for the info column description.

Source

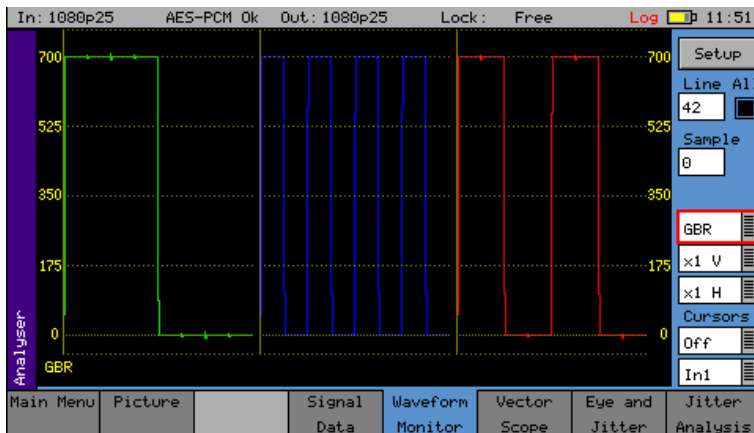
The analyzer can view either the video SDI input or the Generator output so that comparisons can be made between input and output.

- In1 SDI Input
- Out1 SDI Output



Note that when in Colour modes other than YCbCr 422 10 bit, the pixel RGB or YCbCr values are packed into 10 bit values across the different streams and thus will give unfamiliar values. When the 'UnPack' checkbox is checked the values in the active picture are unpacked to RGB or YCbCr values.

Waveform Monitor



The Waveform menu displays the selected input in the form of a waveform monitor.

The display may be restricted to a single line or all lines may be displayed at the same time. The display can be formatted as all streams (Luma and Chroma) or just a single stream.

The streams may be in YCbCr or GBR formats. The line, sample and field controls all track the related controls on other pages.

The 'All' checkbox forces the waveform monitor to display all lines, overlaid on each other. Otherwise the specified line is displayed.

The waveform display format is set using the 'Setup' button. The waveform monitor displays the selected signal in one of 5 formats as set by the Mode control:

YCbCr	The Y, Cr and Cb waveforms are shown as three separate waveforms in a Parade format
Y	Only the luminance channel is shown
Cb	Only the blue chroma channel is shown
Cr	Only the red chroma channel is shown
GBR	The Green, Blue and Red waveforms are shown as three separate waveforms in a Parade format
Red	Only the red channel is shown
Green	Only the green chroma channel is shown
Blue	Only the blue chroma channel is shown
XYZ, X, Y, Z	settings in the Waveform monitor display the 2K-SDI XYZ colour space in its native nonlinear form. So test patterns such as 2K, XYZ Legal Ramp will be displayed as curves instead of straight lines.
X'Y'Z', X', Y, Z'	settings in the waveform monitor display the 2K-SDI XYZ colour space with a reverse transform to convert it to linear form. So test patterns such as 2K, XYZ Legal Ramp will be displayed as straight lines.

The next 2 controls show the vertical and horizontal magnifications. If either value is set to a value other than x1, a vertical or horizontal offset will be shown on the bottom right edge of the waveform display. The offsets are set by moving the focus cursor to the waveform window and pressing OK. The menu keys can then be used to scroll around the window. The offset will be the same for all magnifications values so switching between x1 and x5 will not lose the offset used in x5 mode.

The vertical offset values are in signal level bits but displayed in the current scale units so switching between scales will keep the same offsets.

Cursors

Cursors may be displayed over the waveform to allow measurement of time or amplitude values. The cursor may be set to several modes:

- Off: Cursors are hidden
- Pict.: The cursor is displayed at the current pixel point. If in YCbCr or RGB mode, three cursors are displayed. Otherwise a single cursor is displayed. The cursor position tracks across the picture monitor and Signal Data tabs.
- Ampl.: Two cursors are displayed to allow measurement of signal amplitudes.
- Time: Two cursors are displayed to allow measurement of signal timing.
- Both: Amplitude and time cursors are displayed.

To use the cursors, use the navigation keys to move the focus to the waveform display and press OK. You should then get a display similar to that below. Note that the menu keys shown depend on the display mode and cursor mode.



The navigation keys now move the selected cursor around the waveform display which will scroll if moved out of the visible area. The x10 and x100 buttons magnify the action of the navigation keys if held down.

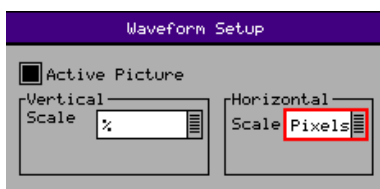
The Select Window button is only available in YCbCr or RGB modes and selects the window that the cursor is displayed in.

The Amplitude Cursor and/or the Timing Cursor buttons switch the currently active cursor. In each direction two cursors are displayed. The currently active cursor is the one displayed as a full line (rather than the dotted cursor). The bottom of the waveform screen shows the cursor measurements in the current format which may be Decimal, Percentage or Hexadecimal for amplitude measurements or Pixels/uS for timing measurements. The difference between the two cursors is also displayed in absolute form.

The Cursor Mode button changes the current mode without having to leave the navigation window.

Source: The analyzer can view either the video SDI input or the Generator output so that comparisons can be made between input and output.

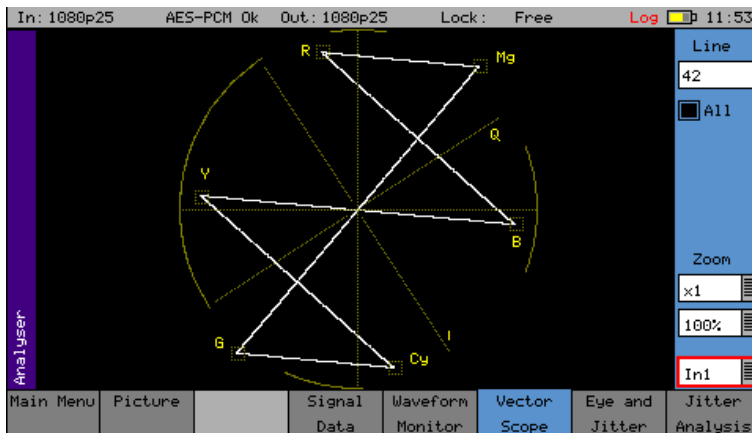
Setup Button Dialogue



The Waveform Setup menu allows the vertical and horizontal scale of the waveform display to be setup.

- Active Picture: If checked, only active picture is displayed for picture view and waveform monitor, all other VBI data such as TRS words ANC data and audio is blanked. This control tracks the state of the ActPix control on the Picture.
- Vertical Scale: The axes and measurements for the waveform monitor can be displayed either in percentages or in hex or decimal values as required.
- Horizontal Scale: The timing measurements may be set in either pixels or micro-seconds (us)

Vectorscope

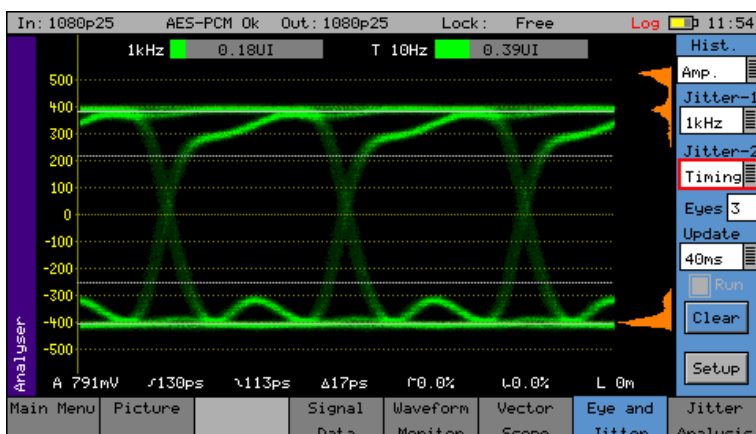


The Vectorscope menu displays the selected input in the form of a vectorscope. This may be set to show either the 100% bar positions or 75% positions. The colour bar position boxes will change according to the colour space for the current input video standard.

- Line allows a specific video line to be displayed. This is useful when test patterns are transmitted as part of a programme on specific video lines.
- All the All check box forces the waveform monitor to display all lines, overlaid on each other. Otherwise the specified line is displayed.
- Field the Fld 1 and Fld 2 modes allow specific video fields to be displayed.
- Zoom allows the vector scope display to be zoomed-in to the Centre, Cyan, Yellow, Green, Magenta, Red or Blue positions at x1, x2, x5 or x10 magnifications.
- 100%/75% selects the graticule scale to match the colour bars being analyzed.
- In1 / Out 1 selects either the input to the Sx analyser or the output of the Sx generator as the display.

The Vectorscope will automatically apply the appropriate transforms to display the images in YCbCr, RGB and XYZ colour spaces correctly. The colour space transform to be applied is defined by the SMPTE 352 payload.

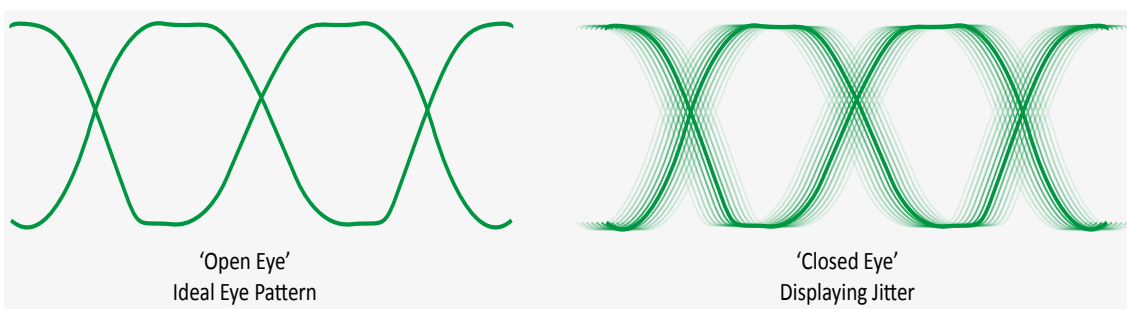
Eye and Jitter



The Eye and Jitter menu displays the selected input in the form of an Eye Pattern Display.

The name Eye Pattern is given to the measurement of SDI clock jitter display that forms the shape of an eye due to the 2 superimposed clock cycles.

The 'open eye' is displayed when monitoring a jitter free SDI signal and the eye closes increasingly as the severity of the jitter on the SDI signal increases.



The Eye Pattern is formed by displaying the clock signal from the SDI data stream then superimposing a delayed version of the clock signal at exactly half way through the duty cycle (or unit interval) of the clock signal. This forms the recognisable eye shape.

When the SDI data stream is actually generated by a piece of equipment, ideally the leading edge of the SDI clock is aligned exactly half way through the data sample. Distribution of the SDI data stream via cabling, infrastructure, repeaters and distribution amplifiers can cause distortions to the waveform and cause the data stream to be sampled earlier or later in the duty cycle (or unit interval) which in turn will cause the wrong data samples to be taken.

The result of the incorrect data samples being taken is displayed as faint lines before and after the ideal waveform. The greater the number of incorrect data samples that are taken the more the eye closes.

The eye pattern can be used to display a range of different artefacts that can be isolated using filters. Jitter occurs when a signal varies in time or amplitude outside of the ideal waveform shape. The integrated circuits used within equipment contain tens of thousands of individual transistors that can all cause errors. Problems occur when these errors cause a level of jitter outside the specified acceptable parameters.

Timing Jitter refers to a short-term time interval error above a low frequency threshold of 10 Hz (as defined in the SMPTE standards for SDI signals).

Alignment Jitter refer to artefacts above the specified threshold frequencies of (1 kHz for SD-SDI signals and 100 kHz for HD-SDI signals). Typically video equipment cannot tolerate Alignment Jitter which cause decoding errors due to incorrect sampling of the data stream because the SDI Clock transition occurs on the edge of the data sample instead of in the centre of the data sample.

Wander	refers to a long-term time interval error, ie artefacts below 10 Hz. Typically all video equipment has the tendency to cause wander over a long period, the display of these artefacts are not easily displayed in a meaningful way but are better logged as errors that exceed tolerances over a long period.
Random Jitter	refers to artefacts caused by random events or processes such as thermal or shot noise that cause small amplitude variations in the clock edge position or could cause large signal amplitude variations, though these typically would be infrequent.

Eye Display

The “Eye and Jitter” display shows the Eye Pattern against a vertical graticule of +500mV to -500mV. Four horizontal cursor lines show the 100%, 80%, 20% and 0% measurement positions on the waveform. Along the bottom of the display are continuous automatic measurements for:

Amplitude – measured in mV

Rise time – measured in Pico seconds. The rise time measurement is specified as the time between the 20% and 80% points on the eye waveform.

Fall time - measured in Pico seconds. The fall time measurement is specified as the time between the 20% and 80% points on the eye waveform.

Rise/fall difference - measured in Pico seconds

Rising edge overshoot – measured as a percentage of the overall signal amplitude.

Falling edge overshoot – measured as a percentage of the overall signal amplitude.

Cable length – measured in Metres. The cable length display is only an approximate value with 10m resolution thus a 5m cable will be shown as 0m long. The cable type affects the length displayed which has been calibrated for Belden 1694A cables.

Any measurements which exceed the specification of the SDI signal are indicated in RED whilst valid parameters are displayed in WHITE.



Note that if jitter values are too large, the automated measurements cannot be made accurately and should NOT be relied on.

The eye display is only accurate when connected via a 1m cable, if a longer cable is used the eye will begin to ‘close up’ and measurements will become harder to perform. Note that the eye display is of the signal pre-equaliser, the equalizer in a system being used to compensate for long cable lengths. There is no method for the Sx instrument to view the signal post-equaliser.

Histogram

Amp/Timing/Both. Histograms enable the operator to observe the distribution of samples in both amplitude (Amp) and time (Time).

Amp The amplitude histogram shows the distribution of samples over the complete visible eye picture.

Timing The time histogram shows the distribution of samples at the zero point of the eye waveform for two thirds of the visible time period.

Note that the time histogram overlays some of the automatic measurement display. The measurements may still be read by Remote Control if purchased.

Jitter Filters

The “Jitter 1” and “Jitter 2” filter options allow the specific type of jitter to be applied to the waveform and the thermometers displays.

- Jitter-1: Timing/Align/10Hz/100 Hz/1 KHz/10KHz/100KHz. This filter operates on both the left hand jitter thermometer and the eye waveform. The different filters enable the operator to understand more fully the nature of any jitter present. When in Timing or Alignment modes, the meter range is set to show appropriate ranges for the SMPTE specification at the current video input standard. .
- Jitter-2: This is a second jitter measurement thermometer and may be set to Timing/Align/10Hz/100Hz/1 KHz/10KHz/100KHz. This filter operates on just the right hand jitter thermometer. When in Timing or Alignment modes, the meter range is set to show appropriate ranges for the SMPTE specification at the current video input standard. When in other filter modes, the meter ranges are expanded so that larger ranges may be viewed.
- Timing as determined by the SMPTE standard for the specific video standard (ie jitter above the 10 Hz threshold)
- Align as determined by the SMPTE standard for the specific video standard (ie jitter above 1 kHz threshold for SD-SDI signals and 100 kHz for HD-SDI signals)
- 10Hz jitter above a 10Hz threshold
- 100 Hz jitter above a 100Hz threshold
- 1 KHz jitter above a 1 KHz threshold
- 10KHz jitter above a 10KHz threshold
- 100KHz jitter above a 100KHz threshold

Jitter filter selection affects both the jitter thermometer and eye pattern displays. Timing and Alignment jitter filters are defined in the relevant SMPTE publication. The thermometer automatically calibrates to the specification of the video standard and chosen filter. When reading is in specification the thermometer bar is GREEN, when close to specification it is YELLOW, and when out of specification it's RED.

	3G-SDI (2.97Gbps)	HD-SDI (1.485Gbps)	SD-SDI (270Mbps)
Alignment Jitter	SD-SDI (270Mbps)	100 KHz high pass	1 KHz high pass
Alignment Jitter	10 Hz high pass	10 Hz high pass	10 Hz high pass
Upper limit	-3 dB at 9.5 MHz low pass	-3 dB at 4.75 MHz low pass	-3 dB at 0.86 MHz low pass

On screen horizontal cursors indicate where on the eye the rise time measurements are being made.

Please note that the Sx instrument takes a little time to stabilise when the SDI input standard changes.

Jitter Meter Ranges

	3G-SDI (2.97Gbps)	HD-SDI (1.485Gbps)	SD-SDI (270Mbps)
Alignment Full-Scale	0.52UI	0.34UI	0.34UI
Alignment (Red Threshold)	0.3UI	0.2UI	0.2UI
Alignment (Yellow Threshold)	0.2UI	0.14UI	0.14UI
Timing Full Scale	3.4 UI	1.7UI	0.34UI
Timing (Red Threshold)	2UI	1 UI	0.2UI
Timing (Yellow Threshold)	1.4UI	0.7UI	0.14UI

Update

This allows selection of the update rate to allow longer display persistence. This may be set to 40ms (normal use) or infinite. When set to infinite, the Run and Clear buttons are enabled.

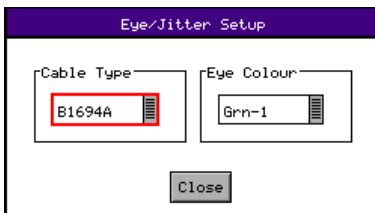
Run This check box stops the display from updating so that a waveform may be investigated in more detail. It is only enabled when the update mode is set to infinite update mode.

Clear This button clears the eye display. It is only enabled when the update mode is set to infinite update mode.

Eyes

Adjusts the number of eyes visible on the eye display. The 10 and 20 modes are useful for observing serial-parallel conversion jitter, the H, 2H, V, and 2V are useful for observing the effects of power supply born video synchronous noise in SDI signals. (H/2H/V/2V not yet implemented)

Setup



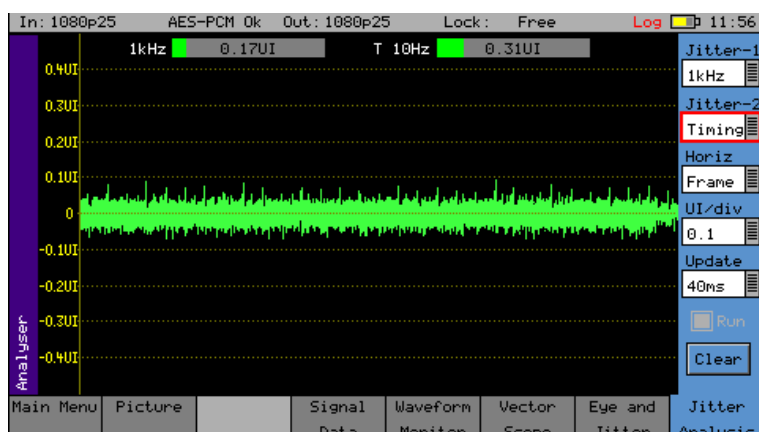
The Setup button shows a dialogue box that allows the eye colour and cable type to be specified.

Cable Type Selects the cable type used which affects the cable measurements.

B8281	Belden 8281	B1505	Belden 1505
B1694A	Belden 1694A	B1855A	Belden 1855A
CL5CSB	Canare L-5CFB	I-1000	Image 1000

Eye Colour The eye colour may be set to green or blue and may also be adjusted in gain to allow the eye display to show 'hot spots' where the majority of the signal data is found.

Jitter Analysis



The jitter analysis display shows a trace of jitter amplitude versus time along with two jitter thermometers and has the following controls:

Jiter Filters

The “Jitter 1” and “Jitter 2” filter options allow the specific type of jitter to be applied to the waveform and the thermometers displays.

- Jitter-1: Timing/Align/10Hz/100 Hz/1KHz/10KHz/100KHz. This filter operates on both the left hand jitter thermometer and the eye waveform. The different filters enable the operator to understand more fully the nature of any jitter present. When in Timing or Alignment modes, the meter range is set to show appropriate ranges for the SMPTE specification at the current video input standard. .
- Jitter-2: This is a second jitter measurement thermometer and may be set to Timing/Align/10Hz/100Hz/1KHz/10KHz/100KHz. This filter operates on just the right hand jitter thermometer. When in Timing or Alignment modes, the meter range is set to show appropriate ranges for the SMPTE specification at the current video input standard. When in other filter modes, the meter ranges are expanded so that larger ranges may be viewed.

Display Controls

The resolution and timebase of the display can be controlled by the following:

- Horiz: H/2H/V/Frame – horizontal sweep control for jitter trace.
- UI/div: 0.1/0.2/0.5/1.0 – vertical gain control for the sweep trace.

Update

This allows selection of the update rate to allow longer display persistence. This may be set to 40ms (normal use) or infinite. When set to infinite, the Run and Clear buttons are enabled.

- Run This check box stops the display from updating so that a waveform may be investigated in more detail. It is only enabled when the update mode is set to infinite update mode.
- Clear This button clears the eye display. It is only enabled when the update mode is set to infinite update mode.

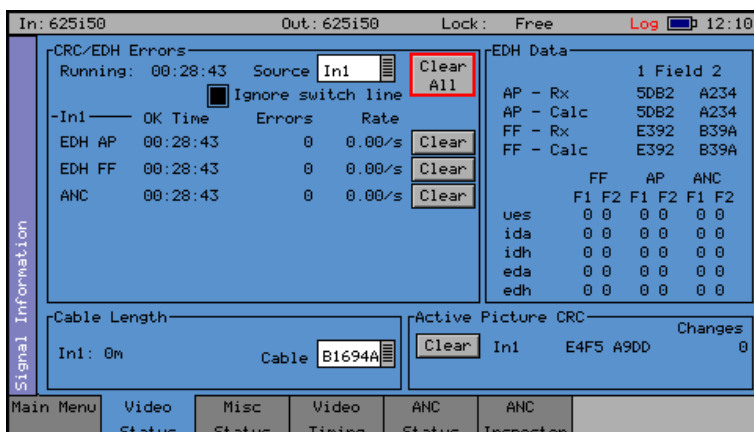
Menu Reference

Signal Information Menu

Overview

These pages give a detailed view of the status of the input (or generator output) signal. They are sub-divided into Video, Misc, and Ancillary (ANC) Status.

Video Status



The Video Status menu displays the status of the selected video input and displays any errors that have been found in the data stream.

EDH/CRC ERRORS

This displays the EDH or CRC status of the analyzer input as appropriate for the video standard being monitored. The status of each EDH/ CRC count is displayed as the number of seconds since an error occurred. The individual CRC fields may be reset individually or together. The 'running time' field shows the time since the last error reset occurred. The error rate field shows the number of errors per second. The running time will also be affected by the input being lost or being intermittent. CRC errors are ignored on the switching line if the 'Ignore switch line' check box is checked.

ANC checksum errors are also detected and counted and may be logged.

When analysing a 3G-Level B signal, the CRC status is displayed for each link or stream present according to the input video format. On an Sx instrument with a Dual-Link with 2 video inputs, only one 3G-Level B may be analysed for CRC status at a time.

EDH DATA

If the signal is SD (PAL-625 or NTSC-525) the EDH values for both active picture (AP) and full-field (FF) are displayed for each field. To enable engineers checking EDH integrity, the EDH values calculated for active picture and full-field are also displayed.

Under normal conditions, the EDH-AP values should be constant, the full-field values may change if audio or other ancillary data is embedded in the SDI signal.

The EDH flags for active picture, full-field and ancillary data are also displayed for diagnostic purposes.

edh: Error Detected Here - This is set to 1 if a SDI error was detected. In the case of ancillary data, this means that one or more ANC data packets had an incorrect checksum.

eda: Error Detected Already - This is set to 1 if a SDI error was detected in the signal received by the previous device.

idh: Internal error Detected Here - This is set to 1 if a hardware error was detected in the previous device.

ida: Internal error Detected Already - This is set to 1 if an idh flag was received by the previous device.

ues: unknown error status: This is set to 1 if the previous device received an SDI signal from a device not supporting EDH.

Note that there is only one EDH detector which is connected to the input currently being analysed. On an Sx instrument with multiple video inputs, only the current input being analysed can check for EDH errors.

Cable Length

The Sx instrument measures the cable length connected to the SDI input BNC and the measurement is only an approximate value.

The cable type may be set to one of the following:

Belden 8282, 1694A, 1505, 1855A.

Canare L-5CFB

Image 1000

The selected cable type will affect the cable length measurement.

Active Picture CRC

16-bit CCITT CRCs are calculated for the active picture data of the received signal. This can be used to give a known value for known static picture content and allows the user to determine if the active picture content is as expected.

CRCs are calculated independently upon each 10-bit stream (luminance and chrominance) of the interface.

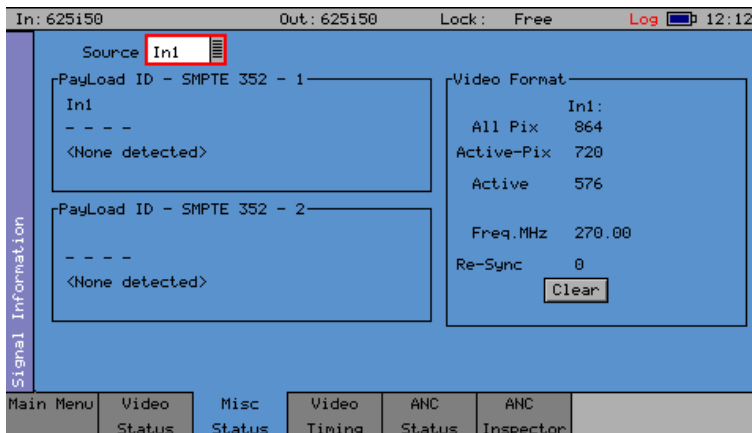
For example the generated 1920x1080, 100% bars in YCC422-10 should always produce a luminance CRC of 0x0AB4 and a chrominance CRC of 0xB88E, no matter what scanning mode (interlaced, segmented frame or progressive) or frame rate is used.



Note: When using 4:4:4, 4:4:4:4 or 12-bit video formats (in dual-link or 3Gbps) the CRCs are calculated for each of the packed 10-bit virtual interfaces and will therefore generate different values from those for YCC422-10.

See the “Active Picture CRC Technical Information” section at the end of the manual for details of CRC calculation.

MISC Status



The Misc Status menu display the status the SMPTE 352 packets embedded in the selected video input and displays any errors that have been found.

Payload ID – SMPTE 352

If the Sx instrument has detected a SMPTE 352 ancillary packet, it will be displayed here in hex and decoded format.

The display shows the transport media, frame rate and interlaced/progressive/segmented frame mode, as well as colour format, bit depth, dynamic range and channel number. See the SMPTE 352 specification for further details.

When analysing a 3G-Level B signal, the SMPTE 352 status is displayed for each link or stream present according to the input video format. On an Sx instrument with Dual-Link with 2 video inputs, only one 3G-Level B may be analysed for 352 status at a time.

Video Format

This displays the currently detected line length for both active video and full line including blanking as well as the number of active lines for the inputs present.

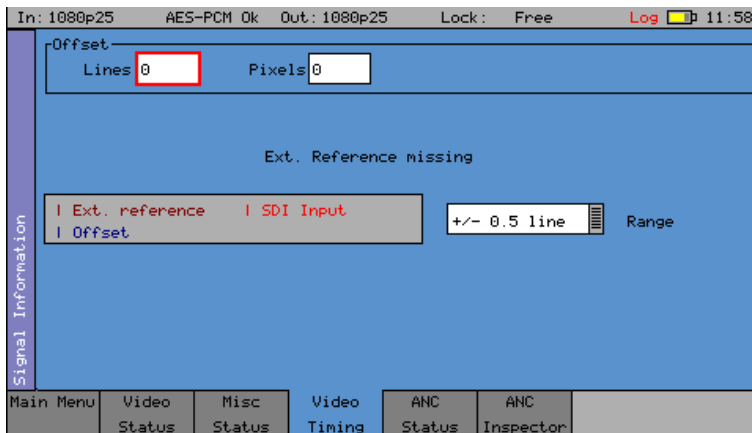


Note that the video frequency displayed is only correct if the Sx instrument has been calibrated and free running or has been connected to an accurate reference input.

If the input signal is not a known signal (i.e. the line count or pixel count is not recognised) The input status on the top line will show “Invalid” but the values in this section will be updated every few seconds.

The Re-sync counter displays the number of times the SDI data has been re-synchronised and can help detect intermittent SDI signal problems.

Video Timing



The Video Timing menu displays the relationship between the selected video input with respect to the locking reference input.

The timing of SDI input signals is displayed relative to the external reference. If no reference is present then an error message is displayed. If the signal is timed to within ± 2 samples the values are displayed in black in lines and samples (spl) If mistimed, then they will be displayed in red. A bar graph also displays the timing value which may either be line timing (± 0.1 lines or ± 0.5 lines) or frame timing (± 0.5 frame). The total timing value is also displayed in micro seconds.

The RED arrow on the bar shows the SDI input timing and the BLUE arrow shows the current target timing point. The BROWN line shows the timing of the reference signal.

To compare timings of different signals, connect the signal to be compared to the SDI input and select the "Offset" button to make this the current offset. All future timings will be relative to this offset value.

To clear the current offset, move the focus to the 2 offset fields, press OK to edit them and then press default.



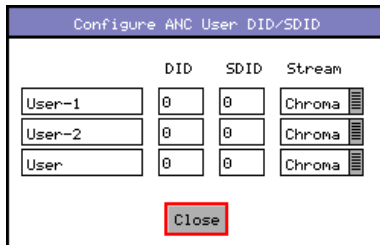
Note that all timing measurements are relative to line 1 on the SDI signal and line 1 on the reference signal. This can lead to different values to other test and measurement instruments that include an SD (PAL/NTSC) offset in their calculations. By comparing line 1 timings, the Sx instrument can be used to accurately measure time delays through up/down/cross converters.

ANC Status



The ANC status menu shows which ANC packets are present on the SDI input and whether they have any errors. Each field is colour coded according to whether the ANC packet is present (White), missing (Grey), has errors (Red), or has previously had errors (yellow).

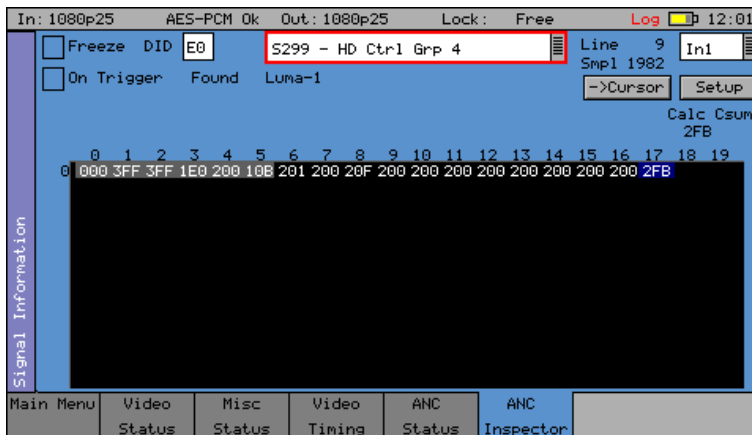
If the field has errors then a symbol beside the field shows which error type it is. The bottom of the page shows the symbol for each type of error. The Reset button resets the “Previous Errors” state.



The Setup button and dialog allows user defined ANC packets to be configured.

The packet name, data ID (DID) and SDID may be specified for up to 3 user-defined ancillary packets. The stream field specifies whether the packet should be on the chroma stream, the luminance stream or both.

ANC Inspector (SDI Data Option)



The SDI Data Option allows Ancillary data packets to be detected and checked for errors.

The ANC Inspector menu displays details of the ANC packets.

The packet type can be selected using either the drop down list of known packets or the DID/SDID number fields. If the DID/SDID values match a known type, then that type will be selected in the drop down list. This may be further filtered using the Check Boxes on the Setup dialogue.

The Line and sample number of the detected packet is displayed to facilitate debugging of generation equipment. The complete data packet is displayed as a hexadecimal grid at the bottom of the page and may also be decoded into text above the grid.

If an error occurs in the packet, the header and checksum are displayed in red.

The display of data may be frozen by pressing the Freeze check box.

The 'Found' description shows in which stream the ANC packet was detected, Chroma or Luma and what kind of trigger was detected. This may be:

- C Checksum Error
- D DBN (Data block number) Error
- P Parity Error
- G ANC Gap error

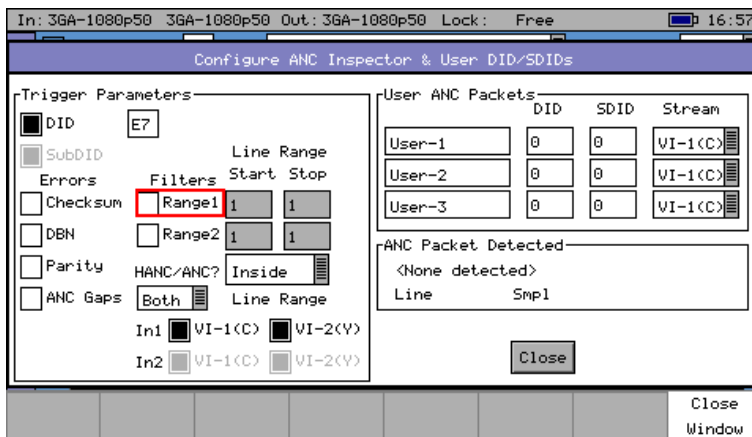
Several of the above flags may be displayed at the same time.

The ANC packets detected may be filtered using the Setup dialogue. This allows a great deal of freedom in setting when the display will be triggered.

If the On Trigger checkbox is checked the data packet will cause the display to be frozen and the Freeze check box will turn red when a trigger condition is met. See the section on the ANC Inspector setup dialogue below. Unchecking the freeze button will restore normal operation.

The "->Cursor" button will copy the Line and Sample numbers to the SDI data view cursors to simplify navigation to the ANC packet under investigation.

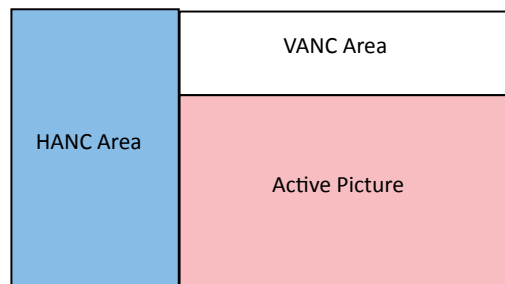
ANC Inspector Setup



If the Setup button is pressed a dialogue box is shown to allow the ANC packet trigger parameters to be set. The trigger parameters allow only selected lines to be checked or excluded when checking for the presence of packets.

Line Range Filter If either of the Line Range Filter check boxes are checked then the range of lines that the ANC inspector will check is limited to that range. If the Selection below the range is set to “Inside” then it will only check ANC packets inside the range (including the start and end lines). If it is set to “Outside” then it will only check ANC packets outside the specified range.

HANC/VANC Filter This is another filter for simpler selection of where to search for packets. It may be selected to search the HANC area, the VANC area or both areas.



Error Triggers

If any of the “Errors” check boxes are checked, then the ANC packet data will only be displayed if an error occurs. The error states detected are:

- Checksum:** A checksum error in a packet was detected. (Sum of data between DID and final UDW)
- DBN:** A Data Block number error was detected in an audio packet. The DBN field (in the same place as the SDID) of an audio packet should either be 0 and never change OR increment from 1...255 and then start at 1 again.
- Parity:** A parity error was detected for the DID, SDID and DataCount words in a packet. (Even Parity used and bit 9 is inverse of bit 8)
- ANC Gaps** The ANC packets were separated by a gap containing video blanking data. EDH (DID = 0xf4) packets are ignored. Note that if an EDH packet is marked for deletion, this will result in an ANC GAP error.

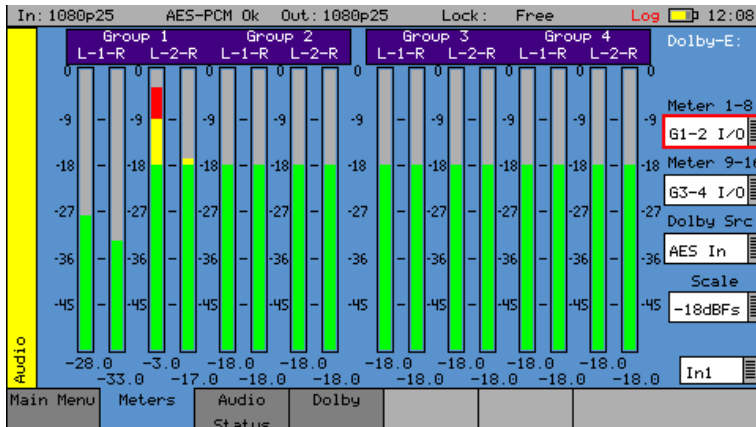
The Setup dialogue also shows when an ANC packet has been detected and where it was found. This makes changing a filter simpler as the effect of the filter can be determined without closing the dialogue.

This dialogue also allows the user defined ANC packets to be configured.

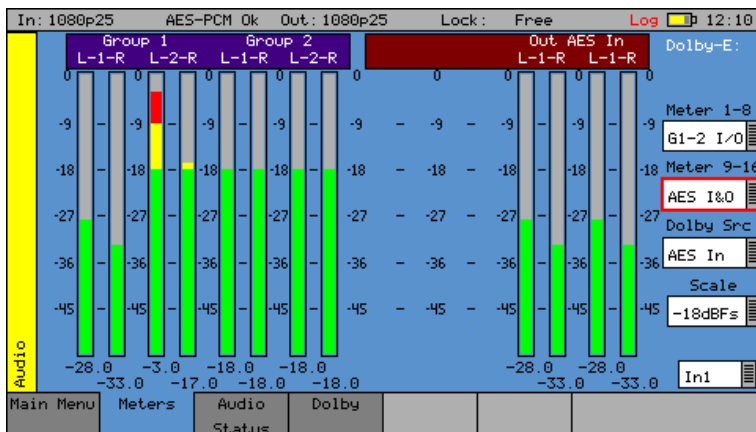
Menu Reference

Audio Menu

Meters



The Audio Meters menu displays up to 16 audio channels. The source for each block of 8 meters may be independently set to allow simultaneous metering of 8 inputs and 8 outputs or all 16 channels in an embedded SDI stream.



If AES inputs or outputs are present then these may also be metered. At the bottom of each meter is the current audio level for that channel in dBFS (decibels relative to 0dB full-scale).

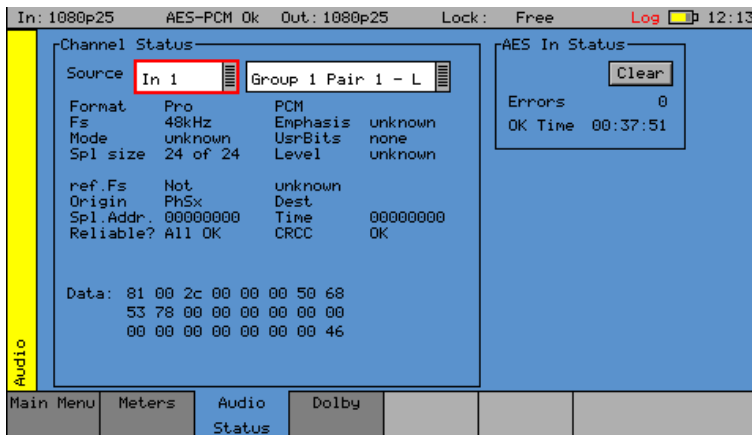
The scale used by the meters may be set to -18dB or -20dB according to the standard operating level used.

If the Dolby option has been purchased, the meters may be set to display the encoded Dolby levels for the specified audio pair or AES input.



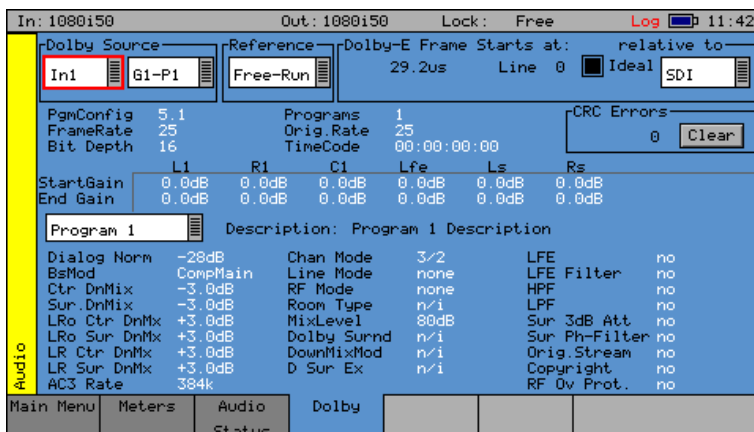
Note that Dolby audio cannot be heard on the speaker as a Dolby decoder is not present.

Audio Status



The Audio Status menu shows the Channel Status for the selected audio channel is displayed in decoded form as well as a hexadecimal dump of the bytes. The source may either come from the input signal or from the generator for comparison purposes.

Dolby Status (Dolby Analyzer Option)



The Dolby Analysis option allows display of the Dolby-E, Dolby Digital and Dolby Digital Plus metadata present in the selected audio stream and determines whether the Dolby-E packet is timed correctly on the SDI video stream.

This option therefore allows the Dolby-E audio timed to be checked at all stages in a broadcast chain. Checks can be made to see that the Dolby E has been created correctly and transferred transparently through the broadcast chain unaffected by routers/switchers, satellite links, etc.

Overview

There are a number of Dolby broadcast digital audio standards that transport audio data over an SMPTE 337M AES carrier with a 48kHz sample rate:

- Dolby E

- Dolby Digital

- Dolby Digital Plus

These standards can be used to transport mono, stereo, 5.1 and 7.1 audio programmes:

Dolby 5.1 - involves five channels for normal-range speakers (20 Hz – 20,000 Hz) (right front, centre, left front, rear right, rear left) and one channel (20 Hz – 120 Hz allotted audio) for the subwoofer driven low-frequency effects.

Dolby 7.1 uses six channels in the primary program (Independent Substream) for a standard 5.1 surround sound mix and then the 2 remaining 2 channels in an ancillary programme (Dependent Substream) to provide the additional down-mix.

Dolby E

Dolby E is an audio encoding and decoding technology developed by Dolby Laboratories that allows up to 8 channels of audio (mono, stereo, 5.1 or 7.1) that for a primary programme (Programme 1) and optional ancillary programs. These 8 channels are compressed (lossless) into a digital stream that can be transferred between compatible devices and stored on a standard stereo pair of audio tracks. The most elaborate mode in common use is Dolby 7.1 which uses all eight channels to provide surround sound.

Dolby Digital

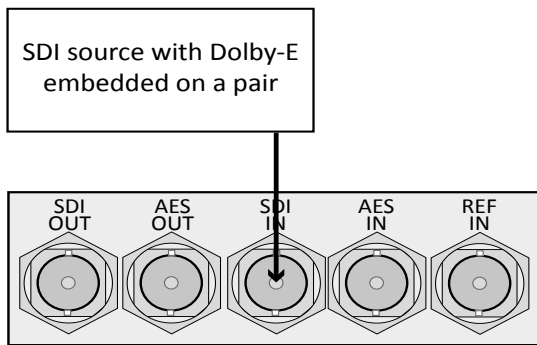
Dolby Digital (AC-3) is a 'perceptual audio' system for digital audio that allows the reduction of data needs to deliver high-quality sound. This system was developed primarily for DTV, DVD and HDTV. This format allow up to six channels of sound (mono, stereo or 5.1) in the form of a single 'program' that can be delivered at different bit rates. These 6 channels are compressed (lossy) into a digital stream that can be broadcast. The most elaborate mode in common use is Dolby 5.1 with uses all six channels to provide surround sound.

Dolby Digital Plus

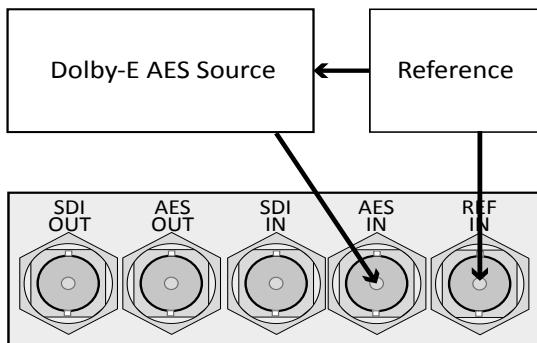
Dolby Digital Plus (E-AC-3) is a more advanced version of Dolby Digital that provides a more efficient encoding algorithm, offering enough bandwidth to allow up to 20 channels of audio (mono, stereo, 5.1, 7.1 up to 13.1) for a primary program (Program 1) and optional ancillary programs to be delivered at much lower bit rates than Dolby Digital. These 20 channels are compressed (lossy) into an independent digital data stream plus up to 8 dependent sub stream that can be transferred between compatible devices and stored on a standard stereo pair of audio tracks. The most elaborate mode in common use is Dolby 7.1 with uses eight channels to provide surround sound.

Analyzer Reference

In order for the Dolby-E data to be decoded correctly, the internal audio circuitry requires a reference that is synchronized to the input signal. The Generator Reference **MUST** therefore NOT be set to Free-Run or Dolby E errors may be detected. The description field will display "Invalid Reference" if an incorrect reference is selected.



In this example, the SDI signal contains embedded audio with Dolby-E present on one or more audio pairs. The Sx instrument needs to lock its internal audio clock to the SDI signal (Generator – Genlock – Source = Input 1) and the Dolby Timing source should be set to SDI.



In the example above, the AES signal contains a Dolby-E stream. The Sx instrument needs to lock its internal audio clock to the external reference signal (Generator – Genlock – Source = 1 Ref) and the Dolby Timing source should be set to Ext.Ref. The AES source **MUST** be locked to the same reference as the Sx.

Source selection

The Dolby-E may be monitored from any of the SDI input embedded audio channel pairs or the AES input.

Dolby E Framing Values

It is important for the Dolby E packet to be positioned well away from the video switching line so that Dolby E packets are not corrupted by downstream switchers. At all places in the signal chain where audio can be delayed by a different value to the video, the Dolby-E packet needs to be re-timed to make sure that this timing specification is met. The position of the Dolby-E packet in the video frame is displayed in lines and micro-seconds (us).

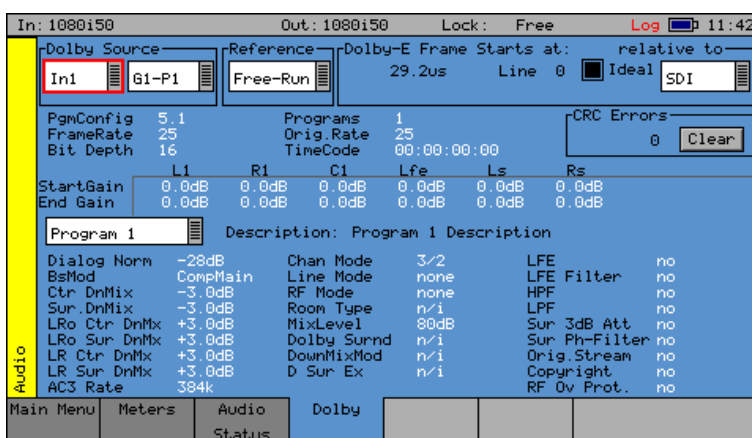
Dolby E Timing source

Dolby E timing may be measured relative to the SDI input or the External reference. If the 'Ideal' checkbox is checked, the Dolby-E Frame timing is relative to the normal position that it should be, i.e. it should be as close to 0 as possible. Each video standard has a specified 'Ideal' line number that the Dolby E packet should start on. If the Dolby-E timing line is outside the valid range of lines it will be displayed in red. If it is outside the ideal range it will be displayed in dark green – this is still a valid Dolby-E position but not recommended by Dolby. The timing measurement is always displayed in terms of the SDI input lines and thus if an AES input is used as the Dolby E source, the line position will NOT be displayed.

If you do not have the same reference as the SDI source, you will have to set the Reference Source and Dolby Timing Source to be the SDI input.

IMPORTANT: If Dolby E is present on a fast frame rate signal (50p, 59p or 60p) then it should always be referenced to a interlaced reference at the same field rate as the packet length is longer than a single frame and must start at the beginning of an even numbered frame.

Dolby E Program configuration



This displays the Program configuration (5.1 + 2 etc), the number of programs in the metadata, the frame rates and bit depths and timecode if any present.

Errors: This displays the number of CRC errors detected in the Dolby-E meta-data.

Start Gain: These fields indicate the gain to be applied to the specified channel at the beginning of the audio frame when decoding.

End Gain: These fields indicate the gain to be applied to the specified channel at the end of the audio frame when decoding.

Program selection:

Selects which set of program metadata is shown. Up to 8 programs can be encoded in the Dolby-E packet dependent on the Program Configuration.

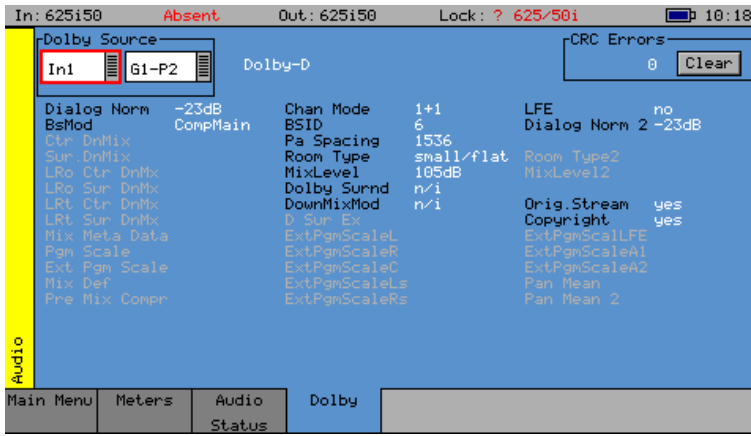
Program description:

User defined description for the selected program.

Program Metadata:

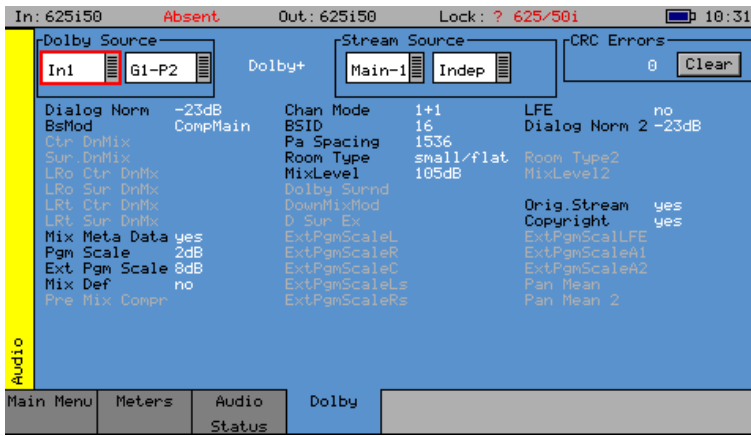
The metadata is displayed in a Dolby specified order. Any data not required for the Program Configuration specified is grayed out and the data hidden.

Dolby Digital Programme configuration



When Dolby Digital metadata is analysed this displays channel configuration and limited metadata that is sent with Dolby Digital.

Dolby Digital Plus Programme configuration



When Dolby Digital Plus metadata is analysed this displays the Main, Dependent and Independent program stream configuration and limited metadata that is sent with Dolby Digital Plus.

Program Metadata

The “Audio” – “Dolby” menu allows the metadata for a Dolby data stream to be viewed. For any program this metadata would be created as part of the Dolby authoring process. The following metadata can be viewed for a Dolby E Program 1:

Dialog Norm	is the normal audio level for dialog. Ideally all transmitted programs would have the same value.
BsMod	(Bitstream Mode) indicates the type of audio service that the bitstream contains. Complete Main (CM) is the normal mode of operation and contains a complete audio program including dialogue, music, and effects.
Ctr DnMix	(centre down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.
Sur DnMix	(surround down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.
LROctrDnMix	(left/right/stereo/centre down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 7.1 Dependent Substream.
LROsurDnMix	(left/right/stereo/surround down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 7.1 Dependent Substream.
LR CtrDnMix	(left/right/centre down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.
LR SurDnMix	(left/right/surround down-mix) is a weighting value used in the encoding and decoding of surround sound mixes for a Dolby 5.1 Independent Substream.
Chan Mode	defines the channel configuration for Program 1 (i.e. mono, stereo, 5.1 channels).
Line Mode	this is an Operational Mode / Dynamic Compression Mode that is used by consumer and professional decoder products that simplifies the implementation of Dialogue Normalization, Dynamic Range Control, and down mixing functions, all of which are necessary in Dolby Digital products.
RFMode	this is an Operational Mode / Dynamic Compression Mode that is used by consumer and professional decoder products that simplifies the implementation of Dialogue Normalization, Dynamic Range Control, and down mixing functions, all of which are necessary in Dolby Digital products.
Room Type	this informational parameter indicates the type and calibration of the mixing room used for the final audio mixing session.
MixLevel	the Surround Down mix Level parameter indicates the nominal Lo/Ro down mix level of the Surround channel(s) with respect to the Left and Right channels
DolbySurnd	the Dolby Surround Mode parameter indicates whether or not a two-channel Dolby Digital bitstream is conveying a Dolby Surround encoded program.
DownMixMod	this controls the Down Mix Mode which is used by the content creator to optimise Center and Surround channel levels for use in stereo down mix mode for any two-channel programmes.
D Sur Ex	this controls the Dolby Surround Ex channel that provides an extra audio channel for Dolby 5.1. The extra surround channel of the Dolby Surround Ex system is matrix-encoded onto the discrete left-surround and right-surround channels of the 5.1 mix.

The following control bits can also be viewed:

LFE	the LFE Channel parameter enables or disables the Low-Frequency Effects (LFE) channel.
HPF	this parameter can be used to activate the DC High pass filter for all input channels.
LPF	the LFE Low pass Filter parameter can be used to activate a 120 Hz low-pass filter applied to the LFE input channel.
Sur 3dB Alt	the Surround Channel 3 dB Attenuation function is use to apply a 3 dB attenuation to the Surround channels of a multichannel soundtrack created in a room with film style calibration, when encoding it for consumer home theatre playback.
Sur Ph + Filter	the Surround Channel 90-Degree Phase-Shift feature is used for generating multichannel Dolby Digital bitstreams that can be down-mixed in an external two channel decoder to create a true Dolby Surround compatible output.
Orig. Stream	the Original Bitstream informational parameter sets the value of a single bit within the Dolby Digital bitstream. This bit has a value of 1 (box checked) if the bitstream is an original. If it is a copy of an original bitstream, it has a value of 0.
Copyright	the Copyright Bit informational parameter sets the value of a single bit within the Dolby Digital bitstream. If this bit has a value of 1 (box checked), the information in the bitstream is indicated as protected by copyright. If it has a value of 0, it is not copyright protected.
RF Ov Prot.	the RF Over-modulation Protection parameter determines whether or not an RF pre-emphasis filter is used in the overload protection algorithm to prevent RF over-modulation in set-top box decoders.

Peak Metering

The peak audio levels are included in the Dolby-E meta-data packet and may be displayed on the Analyzer-Audio-Meters page. Select the appropriate set of meters to display Dolby levels and then they will follow the selected Dolby-E source.

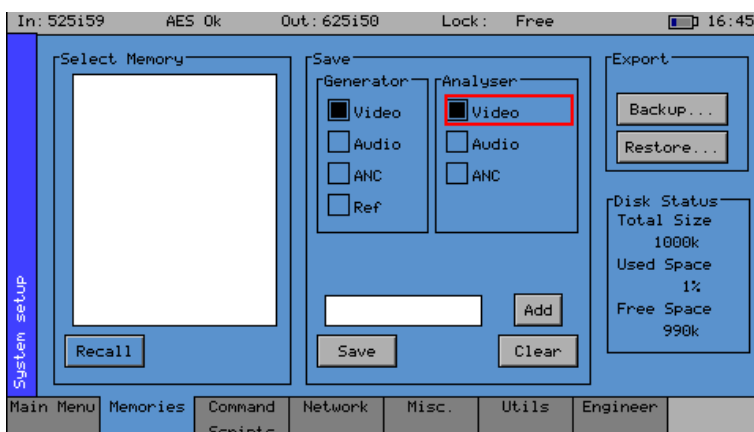


Note that audio cannot be decoded by the Sx range of products and so you will NOT be able to listen to the Dolby-E signal.

See the logging section for details on which changes of Dolby-E status may be logged.

System Menu

Memories



The Memories menu displays the current settings in the Sx instrument may be saved for future recall.

The check boxes on the right-hand side determine what is saved in the memory. Non overlapping memories may then be combined together.



Note that if log-in has been enabled for an Sx instrument, memories may only be added, edited, renamed or cleared and archives backed up by a user with “Modify Memories” permissions.

Saving Memories

Select the memory to save settings to by moving the cursor to the ‘Select Memory’ list and pressing ‘OK’. Use the up/down cursor keys to select the memory and then press ‘OK’. The name edit field next to the memory list will be updated with the name of the selected memory.

Specify which aspects of the Sx instrument are to be saved in the memory using the check boxes on the right hand side. If you want to change the name of the memory see the section ‘Renaming Memories’ below before saving.

Move the cursor to the ‘Save’ button and press ‘OK’. The text field under the Memory list will change to show the last Saved or Recalled memory.

Recalling Memories

Select the memory to be recalled by moving the cursor to the ‘Select Memory’ list and pressing ‘OK’. Use the up/down cursor keys to select the memory and then press ‘OK’. The name edit field next to the memory list will be updated with the name of the selected memory.

Move the cursor to the ‘Recall’ button and press ‘OK’. The text field under the Memory list will change to show the last Saved or Recalled memory.

Renaming Memories

Select the memory to be renamed by moving the cursor to the ‘Select Memory’ list and pressing ‘OK’. Use the up/down cursor keys to select the memory and then press ‘OK’. The name edit field next to the memory list will be updated with the name of the selected memory.

Move the cursor to the edit field and press ‘OK’. The menu keys at the bottom of the screen will change to show text keys similar to a mobile phone. Pressing a key repeatedly will cycle through the characters for that key. Pressing a different key will move the cursor to the next position and insert the first key value for that key. The cursor left and right keys can be used to move the position of the text cursor which is where the next character will be inserted. The ‘Back Space’ key will delete the key to the left of the cursor. The ‘Cancel’ key will cancel edit mode and restore the original text. Once you have finished editing the name, press ‘OK’ to rename the memory.

Adding Additional Memories

To add a new memory, press the ADD button. This will use the current memory name and settings.

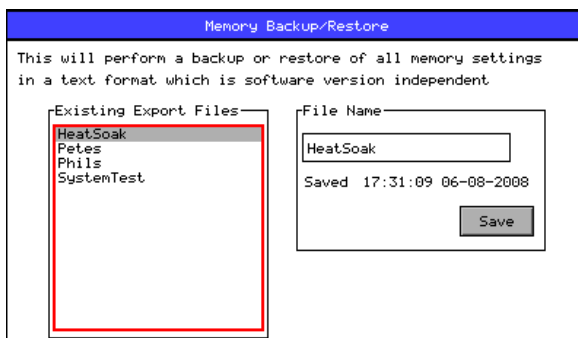
Clearing Memories

Select the memory to be cleared by moving the cursor to the 'Select Memory' list and pressing 'OK'. Use the up/down cursor keys to select the memory and then press 'OK'. The name edit field next to the memory list will be updated with the name of the selected memory.

Move the cursor to the 'Clear' button and press 'OK'. The memory list will show the default name for that memory. A cleared memory cannot be recalled.

Exporting Memories

Memories can be exported to a single file for backup purposes and re-imported into the internal format. This allows different sets of memories to be used for different tasks, such as command scripts. Exported memories are in a text format and so may be edited on a PC and downloaded to/from the backups directory on the Sx instrument via FTP or USB.



To export memories, select the Backup... button which will open a window to select the file to create. Existing files are shown and a new filename may be selected using the File Name edit box. Select the Save button to create the backup file. The filename created will have a .mem file extension.

To import memories, select the Restore... button which will open a window to select the file to import. Existing files are shown and one should be selected before the Load button is pressed. Select the Load button to import the backup file.

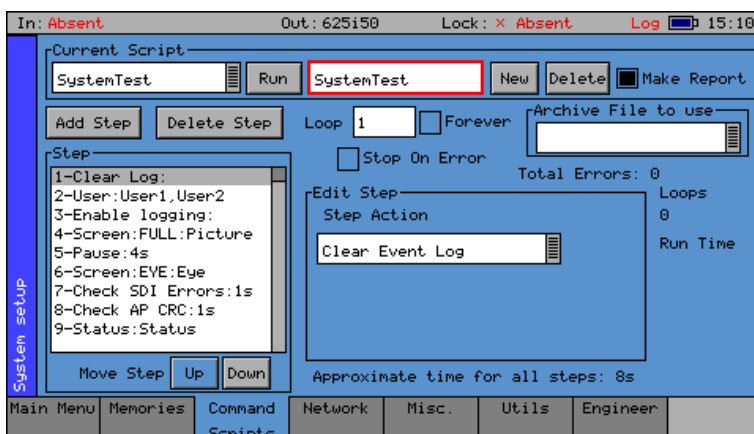


Note that when importing a backup file, all existing memories are deleted before the backup file is loaded so make sure that they are backed up first.

Disk Space

The disk space section shows total size of the internal flash disk and how much is used as a percentage and how much is free.

Command Scripts



The Command Scripts menu allows the Sx instrument to run predefined scripts.

This can be used automate testing of signals.

Steps, Actions and Parameters

Command scripts are text files with an file extension of .cmd. They are formatted with one step per line. The line is formatted as StepTime, StepAction, StepParameters

StepTime is a numeric value in seconds 0...n

StepAction is one of:

ARCHIVE	This is used to specify the archive file to be loaded when the script is run. This makes sure that all the memories required for the test have been loaded. This archive file is loaded EVERY time the script is run so if you make changes to any memories you MUST use the Export/Archive section on the System-Memories tab to backup the current memories.
LOADMEM,	Loads the memory specified in the StepParameters field – must be a numeric value 1...num memories.
CHECKERRS,	Check for CRC/EDH/ANC checksum errors in StepTime seconds. If there are any errors an event is added to the event log and the sequence pauses with a message to continue or abort. If the SDI input signal is missing, this is treated as an error.
CHECK_AP_CRC	Check for changes to the active picture CRC value in StepTime seconds. An event is added to the event log.
PROMPT	This will put a short prompt on screen in a dialogue asking the operator a question and waiting for OK to be pressed to continue. The time field is ignored and the parameter following is the text displayed.
CLEARLOG	This clears the Event Log
DISABLEEVT	This disables Event logging
ENABLEEVT	This enables Event logging
CLEARERRORS	This clears all error counts (EDH/CRC etc.)
LOGCOMMENT	Add the specified comment to the log file – useful to document the stage in the test process
PAUSE	Pause for the specified number of seconds to allow another process such as loading test patterns to complete.
SAVESTATUS	Save the current system status as an XML file.
SAVEIMAGE	Save the selected image as a bitmap file in the current scripts directory. Filename must be specified.

SELECTTAB	Show the selected tab to allow the user to view something.
SEL_USER	Select user – users are comma separated
CHECK_EYE	Checks that the eye amplitude, overshoot, undershoot and rise/fall and difference between rise and fall times are within the SMPTE specifications for the time period specified.
CHECK_JITTER	Checks that the jitter levels are under those set in the logging jitter threshold fields for the time period specified. See logging setup section for further details.
CHECK_METER_OFF_LEVEL	This action checks that the level for any visible meters is at the level set by the meter scale. This level may be -18dB or -20dB. If the level is over 1 dB greater or less than that value an error will be inserted in the log and report files. If any groups are missing, these will be ignored by the test. Testing may be limited to specified audio pairs as set up on the Log Setup page.
CHECK_METERS_OFF	This action checks that the level for any visible meters is below -70dB. If the level is above that value an error will be inserted in the log and report files. If any groups are missing, these will be ignored by the test. Testing may be limited to specified audio pairs as set up on the Log Setup page.
CHECK_AES_INP	This action checks that the AES input signal is present and has no errors for the specified time period.

Creating Command Scripts

To create a new script:

1. Select the New button. This will create a blank script with the title “NewScript1_”. Select this title and a keyboard will be displayed. Enter the title you require and then select OK to save this title.
2. The first step in the script will be displayed Step Editor window. Use the Edit Step section to select the required Step Action.
3. Select the Add Step function to add a new step to the Script. This will add a new step directly below currently highlighted Step in the Step Editor window.

Editing Command Scripts

To edit the title, select it, enter the title you require and then select OK to save this title.

To change the order of the steps within the script, highlight the step to be reordered and then use the Move Step Up/Down functions.

Unwanted steps can be removed by highlighting them and then selecting the Delete Step function.

An unwanted Command Script can be deleted by selecting the script (to make it the current script) and then selecting the Delete function.

Running a Script

To run an existing Command Script, select it so that it is the Current Script, and then select the Run function.

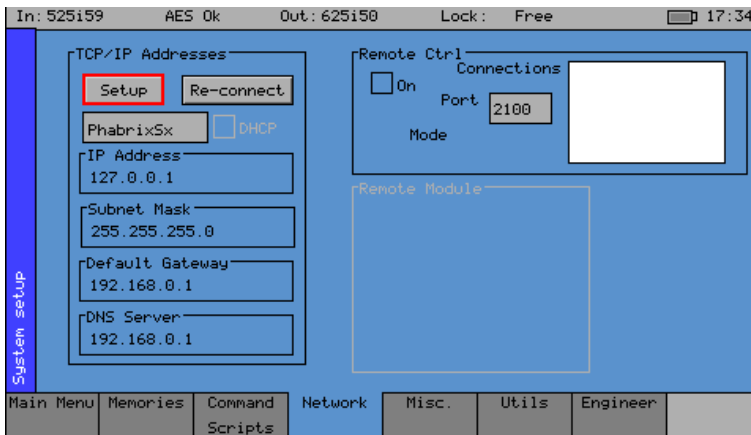
- Loop if the Forever check box is selected, the Command Script will run repeatedly until it is stopped. If the check box is not set, the number of repeats can be set.
- Stop on Error If the Stop on Error check box is selected, the script will stop if an error is encountered.
- Make a Report If the Make a Report check box is selected, a report will be generated with the results of the Command Script when it is run.

When the report is created its title can be edited by selecting the title and using the keypad.

The report can also be numbered automatically using the auto-increment value to the right of the report title. Subsequent reports will have the same but will have an incremental number.

The Res (reset) button can be used to reset the number to 1.

Network



PHABRIX Sx is fully network compatible and has a complete network interface to allow control of any Sx instrument from any other unit.

The Network menu allows the Sx instrument to be configured as part of a network.



Note that if the Sx instrument is turned on without the network connected, you will have to select the “Re-connect” button to set networking up correctly. This is because the Ethernet connection auto senses whether it has to swap the cable over, which means that you can use any Ethernet cable with the Sx instrument, but it also requires the Ethernet connection to be present when starting up.

If the DHCP checkbox is enabled, then the Sx instrument will attempt to automatically request an IP Address from any network it is connected to. This will only work if there is a DHCP server on network.

If your network has ‘static’ (nonchanging) addresses, you will need to see your network administrator to get an address assigned to your instrument, and to get the Subnet mask and default gateway address. Select the ‘Setup’ button to edit the settings. These details can then be entered in the corresponding boxes in the menu. Note that if the DHCP checkbox is enabled, these values will not be editable. Select each numeric box in turn and use the up and down cursors to pick the required value.

When the IP Address, Subnet Mask, Default Gateway and DNS Server values have been setup, use the ‘Re-connect’ button to attach the Sx instrument to the network.

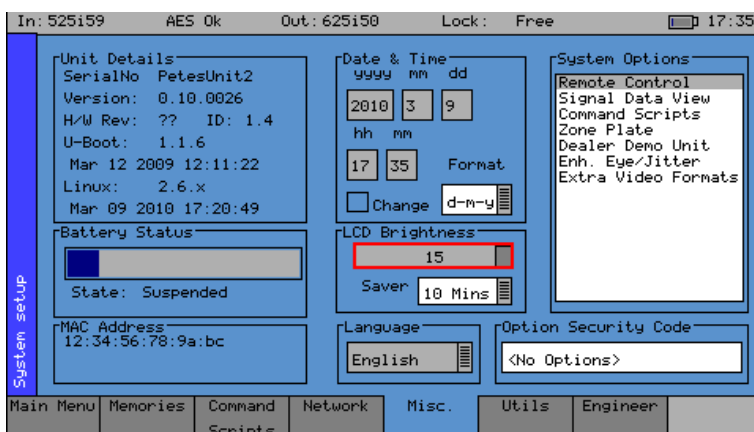
Remote Control of Sx Instrument (Cost Option)

To allow remote control of an Sx instrument, you must have the TCP/IP address of the instrument set and the Remote Control ‘On’ check box must be checked.

The list box shows a list of current connections made to the instrument. This includes the web browser connection (127.0.0.1) which may be seen intermittently as the web browser connects every few seconds and then disconnects again. See the remote control documentation available for download for more information on the protocol and method of control.

The Sx instrument uses a default Port Number of 2100 for remote control access (See Remote Control SDK documentation on Download section of Web Site) This port number may now be changed if it conflicts with other applications in your system.

Misc



The Misc menu shows serial numbers, Sx instrument MAC address, version information and battery state. It also allows the date and time to be set and factory default settings to be recalled. The options security code is entered on this page if options are purchased.

Changing the Date/Time

Check the 'Enable Change' check box under the date and time fields and then use the cursor to move around the date and time. Press 'OK' to edit a field and again to complete the change. When all fields have been edited, uncheck the 'Enable Change' check box and the new date and time will be set.

Note that the date may not be changed while a 30 day trial option is active.

Changing the Date Format:

The date format used on logging screens etc. may be set using the Format selection control. Three formats are available: Date-Month-Year, Month-Date-Year and Year-Month-Date.

Setting LCD Brightness

Use the LCD brightness slider to set the LCD brightness, using a lower brightness will reduce the current drawn from the battery and thus lengthen battery life.

Setting Screen Saver Mode

When the unit is battery powered the screen saver will operate after a user defined time period and reduce the LCD brightness down to its lowest level. This will lengthen battery life. Pressing any key will restore the previously set LCD brightness.

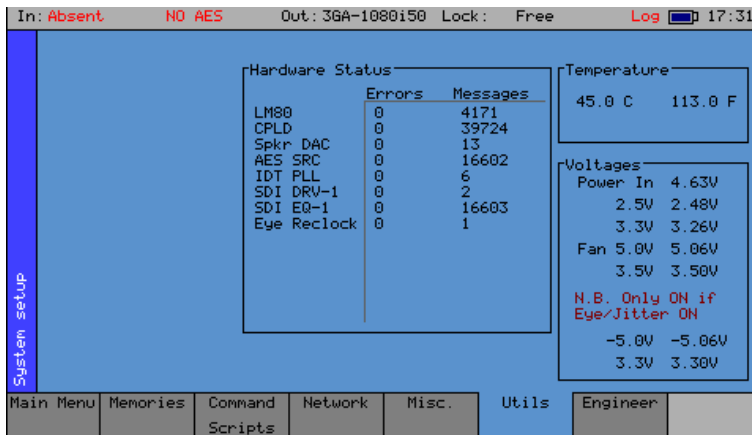
Setting User Language

The language used to display the menus in may be changed to one of the supported languages. (Currently only English is supported)

Changing Options Security Code

When new options are purchased for the Sx instrument a new Security Code will be supplied. This is specific to this instrument and cannot be used on other units. The security code is entered using the Edit field below the System Option list and is edited by pressing OK and using the menu function keys. If an incorrect Security code is entered a dialogue will be displayed. The new Security code will only be saved if it is valid, the old code will be used until a valid code is entered. Once a valid new code has been entered, the list of options provided by that code will be displayed. The options code is stored independently to memories and system settings.

Utils



The Utils menu displays details of the Sx instrument's operating status and details the temperature and individual voltages. This menu also allows you to disable selected options.

Dealer Features

This section of the menu details the features that can be used by suppliers of the Sx instrument.

- Show Options this check box, if selected, will enable the features throughout the menu system.
- Enable this check box, if selected, allows options to be cleared from the Sx instrument.
- Clear Option this function, when pressed, will remove the selected options from the Sx instrument.

Hardware Status

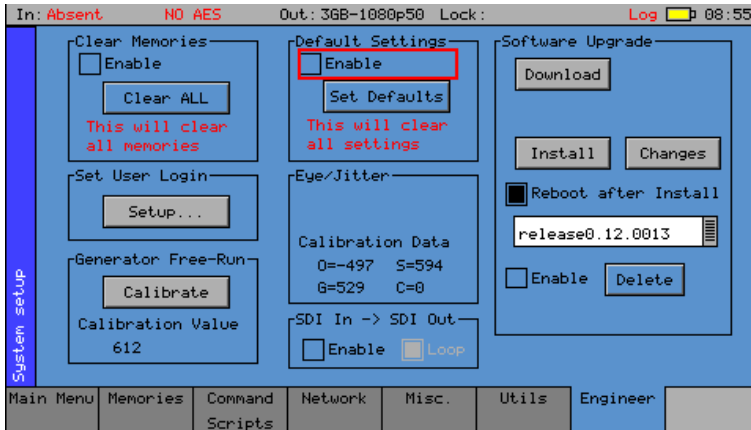
This section of the menu shows any hardware errors that have been recorded by the Sx instrument. If the error count is greater than 0, contact your local dealer for advice.

System Temperature

This section of the menu displays the current Sx instrument temperature. This information is provided for diagnostics purposes only.

Voltages

This section of the menu displays the current voltages for the currently selected board in the "Board" section of the menu. This information is provided for diagnostics purposes only.



The Engineer menu is used to manage the Sx instrument and allows user access to be setup and the installation of new versions of software.

Clear Memories

This section of the menu allows the defined users who can access the Sx instrument to be cleared. To use this function, select the 'Enable' check box and press the 'Clear ALL' button. This will clear all of the user memories will be deleted.

Default Settings

This section of the menu allows you to reset the Sx instrument back to its default settings. To do this, select the 'Enable' check box and press the 'Set Defaults' button and the factory defaults will be recalled. This will not affect the system Security Code or Free Run frequency.

SDI In - SDI Out

The Loop check box in the SDI In - SDI Out section of the Engineer menu allows the video signal on the SDI Input to be looped through to the SDI Out connector. In this mode the Generator menu will be disabled.

Set User Login

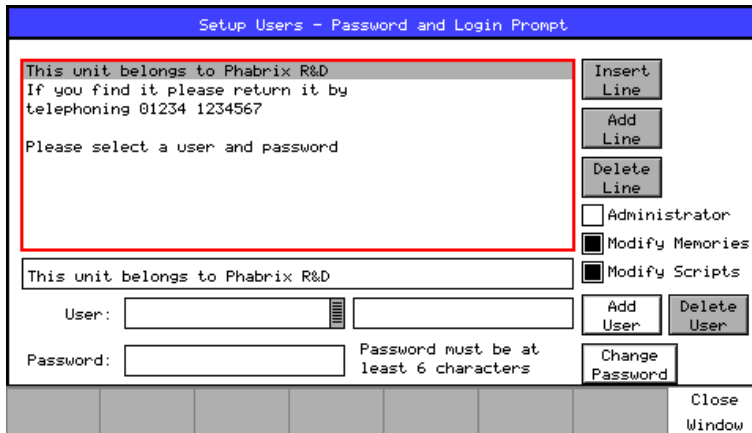
User access can be setup for the Sx instrument by adding users to the system. With User log-in enabled, a log-in screen will be displayed when the Sx instrument is turned ON. This will then require a valid user and password to be entered. Each user has an encrypted password and permissions which may be set.



Using the User Login feature allows the Sx to be protected from unauthorized operation of the Front Panel controls. The prompt feature can allow a message to be displayed so that if the Sx instrument gets lost or stolen, someone finding it knows where to return it.

Adding/Deleting Users

Add a user by editing a new name in the User Edit box next to the “Add User” button and then editing a new password. Once the password is 6 characters or longer, the “Add User” button will become enabled and may be pressed. Make sure that your password is memorable. If all passwords to an Sx instrument are forgotten, you can contact Phabrix for an over-ride password. Users with administrator permission may add/delete users.



Once user log-in has been set up on your Sx a “Log out” button is added to the main menu which causes the log-in screen to be displayed. This may be used to protect a systems settings from being modified by other users. The system is still fully running while the log-in screen is visible.

The permissions are:

Administrator: This user may add/delete users and may also edit the Log-in prompt text.

Modify Memories: This user may create, save and delete memories and Archives.

Modify Scripts: This user may create, save and delete script files (if the command scripting option has been purchased)

Each user may modify their own password by entering a new password (6 or more characters) and pressing Change Password.

If all users are deleted, the Sx instrument reverts to starting up without a login screen.

Editing the Prompt Text

The simplest way to edit the prompt text is to FTP a prompt text file onto the Sx instrument. This file should be called “loginprompt.txt” (it MUST be all lower case). The instrument should then be re-started for the new file to be used.

Users with administrator permissions may also edit the prompt text by selecting a line in the prompt text list and editing it by pressing the OK button when in the line edit field using the text keyboard.

Add a new blank line after the selected line by pressing the “Add Line” button.

Insert a new blank line before the selected line by pressing the “Insert Line” button.

Generator Free-Run

Press this button to calibrate the free running frequency using the External reference or Video Input as selected by the Generator – Genlock page. If no input is present or the Generator is free running, an error dialogue will be shown. The calibration will take a few seconds to take place and once completed, the calibration value will be shown. This calibration value is not lost when memories are cleared or factory defaults recalled above.

Software Upgrade

This section of the menu allows new software versions to be installed. The Sx instrument may download and install new versions of software when available. This process is a two stage process: Download the software and then install it.

1. To download the latest software version, make sure that the network settings are correct and that the Sx instrument is connected to the internet via the Ethernet connection.

Pressing the Download button will cause the current release of software to be downloaded from the Phabrix Web Site. This will take a short time dependent on the connection to the Internet. Once the download has completed, the software will be checked for errors before being stored on the Sx instrument for future installation. If the latest software is already present on the Sx instrument, no software will be downloaded and a message will be shown.



Note that the unit should be connected to the AC adaptor so that the battery state does not affect the installation process.

Note that multiple releases of software may be stored on the Sx instrument so a previous release can be re-installed if required.

2. To install the downloaded software on the Sx instrument, select the release using the field with releases listed. The largest number is the latest release. Select the 'Install' button and a confirmation dialogue will be shown. Press "Yes" and the installation will start. This process takes several minutes to decompress the software, extract the files and then reprogram the hardware. If an error is given during the installation, retry the installation and or download. Do NOT turn the Sx instrument off until an installation has completed correctly.

Once the installation has completed, if "Reboot after Install" is checked the Sx instrument will re-start with the new software installed. If not checked then the instrument should be turned off and on again manually.



Note that as part of the installation procedure, all memories are archived to a backup file and then deleted. They can be restored from the System-Memories page using the Restore button and selecting the '_Before_Upgrade' archive.

The software release notes can be viewed by selecting the Changes button.

Menu Reference

Logging Menu

Overview

Logging allows events to be detected and recorded for future examination. The events to be logged can be specified so that unwanted events do not appear in the event log. If a system has a problem with intermittent signals, the Sx instrument can be connected to that source and can be left for several days to log any errors. At the end of that period the log can be examined and the time and date of each error noted.

Event Log

In: Invalid AES-PCM Ok Out: 1080p25 Lock: x Inp-1 Log 12:17		
Time	Date	Event
4453 of 4453 Event(s)		
C 12:17:49	29-08-2012	Signal OK state changed: 0■
E 12:17:49	29-08-2012	Input 1 Std: Absent
E 12:17:51	29-08-2012	Ref. Unlocked Absent
C 12:17:53	29-08-2012	RemCtrl: Client Connection
E 12:17:55	29-08-2012	Ref. Unlocked Inp-1
E 12:17:55	29-08-2012	Input 1 Std: 1080p25 YCC422-10
C 12:17:55	29-08-2012	Signal OK state changed: 0■
C 12:17:55	29-08-2012	Signal OK state changed: 0■
C 12:17:55	29-08-2012	Signal OK state changed: 0■
E 12:17:56	29-08-2012	Input 1 Std: Absent
E 12:17:58	29-08-2012	Ref. Unlocked Absent
E 12:18:01	29-08-2012	Ref. Unlocked Inp-1
E 12:18:01	29-08-2012	Input 1 Std: 1080p25 YCC422-10
C 12:18:01	29-08-2012	Signal OK state changed: 0■
C 12:18:01	29-08-2012	Signal OK state changed: 0■
C 12:18:01	29-08-2012	Signal OK state changed: 0■
E 12:18:02	29-08-2012	Input 1 Std: Absent

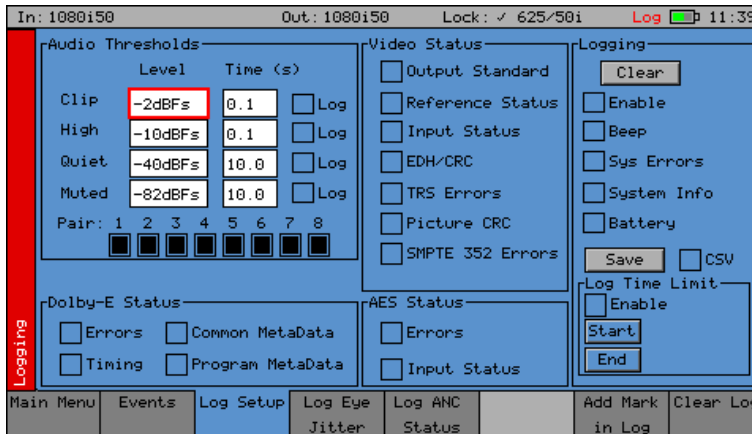
The Event Log menu displays a list of events with a time stamp showing when they occurred.

Pressing the OK button on the front panel when the highlight is on the event log page allows the event log to be scrolled through to view all events in the list. The currently selected event is shown on the event log header. The date format may be changed using the Date 'Format' control on the "System" - "Misc" page. The event log may be cleared by pressing 'Clear Log' button; a dialogue will be shown asking the user to confirm the action. A date stamped 'mark' may be inserted into the event log to allow users to see when a test started or when a significant event happened using the 'Add Mark in log' button.



Note that the event log only shows changes in status, so if the input is always in error and never good, an event will not be shown. To get the full state of the instrument will require looking at the current status as well as the event log.

Log Setup



The Log Setup menu allows specific events to be tracked by the Sx instrument.

The events to be logged are set up on this page by checking the appropriate 'Log' check boxes.

Audio Thresholds

This section allows the thresholds for audio events to be set. If the audio level for a channel is higher than that specified for the Clip or High fields for the number seconds specified then an event will be added to the event log. If the audio level for a channel is lower than that specified for the Quiet or Muted fields, then an event will be added to the event log. Logging may be limited to specified audio pairs.

Video Status

This section allows specific video status events to be logged:

- Output Standard A log event will be added whenever the generator video standard changes.
- Reference Status A log event will be added whenever the external reference standard changes or the external reference input is lost or re-appears.
- Input Status A log event will be added whenever the input video standard changes or if the input is lost or re-appears.
- EDH/CRC A log event will be added whenever a EDH/CRC error state changes. If the EDH/CRC state is correct, the event will show OK, else it will show FAIL. Separate Luma and Chroma CRC events may be shown. Note that EDH/CRC events may occur when an SDI signal is connected or removed.
- TRS Errors If the number of lines changes or line length changes during a frame, the input video will be detected as the TRS changing and an event logged. If the signal stays changing only a single event will be logged. If the SDI signal has a static line count and line length for 5 seconds, a TRS OK event will be added to the log. This reduces the number of log events for a bad SDI signal.
- Picture CRC This should only be used for static single frame test patterns (do not use for Zone Plate, dynamic broadcast signals or Checkfield/Pathological test patterns which are two frames long at HD). This can be used to log changes in the CRC for the active picture (a value which is unique for each test pattern). If the CRC changes and was previously OK an error is added to the event log. If the CRC is the same as the last frame for 5 seconds an OK event will be added to the event log. Thus, if the active picture CRC is continuously changing there will only be one event in the log until the picture remains static when an OK event will be added.

AES Status

This section allows AES audio errors to be logged:

Errors	A log event will be added whenever the embedded audio error status changes. This may be due to a Data Block Number error, ECC error or phase error status change. The event entry will detail which state has changed.
Input Status	A log event will be added if the AES signal disappears or appears.

Dolby Status (Requires Dolby Analysis Option)

This section allows Dolby errors to be logged.

Errors	will add an event to the event log when a Dolby input stream is detected or lost. An event will also be added if a CRC error is detected in the Dolby metadata stream. If an error is detected in the Dolby-E stream, it may mean that the Dolby-E stream has not been synchronized with the embedded audio clocks.
Timing	will log if the Dolby-E frame timing is outside the Dolby specified 'Ideal' range. A Warning event will be given if the signal is OK but slightly outside the range and an Error event if it is on an invalid line.
Common Metadata	will log any changes of the common metadata (Program Configuration, Bit Depth, Frame Rates)
Program Metadata	will log any changed program metadata. This can be useful for following changes to a program stream over a long period of transmission.

Logging

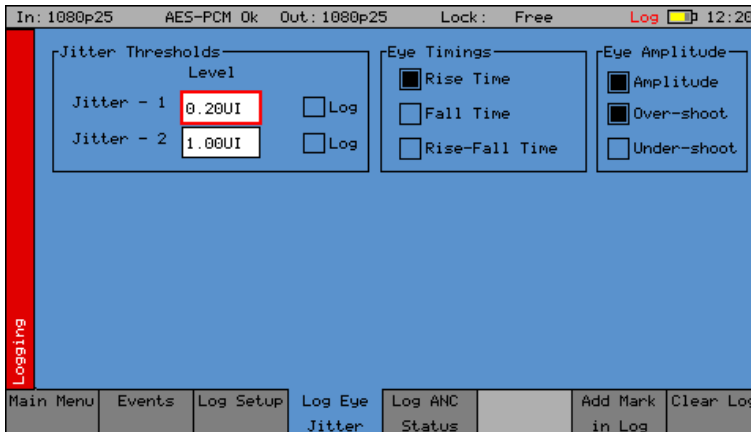
This section controls ALL logging events

Clear	clears all entries in the event log.
Enable	enables the logging process. If this is not checked, no events will be added to the log. This is a simple method of turning off ALL logging temporarily.
Beep	causes the Sx will emit a short tone when an Event is added to the log. Note that the beep will happen even if the Speaker is set to Mute.
SYS Errors	allows system errors to be displayed in the Event Log if they happen. If you are having problems with your Sx, checking this box can add events that can help PHABRIX determine the nature of the problem.
System Info	allows system to report additional internal messages in the Event Log if they happen. If you are having problems with your Sx instrument, checking this box can add events that can help PHABRIX determine the nature of the problem.
Save	saves the current event log to a text file in the currently specified language. The log file created, logfile.txt may be downloaded using a FTP connection. If the CSV box is checked then a comma separated value file will be created.

Log Time Limit

The time when logging is enabled may be limited by time of day. Logging will start at the specified start time and end at the specified end time. The specified times must be after the current time. Uncheck the box to log at all times. Logging must be enabled using the checkbox above for this to work.

Log Eye Jitter



This menu allows Eye Jitter events to be logged.

The events to be logged are set up on this page by checking the appropriate 'Log' checkboxes.

Jitter Thresholds

The jitter level at which an event is added may be set independently for each meter. (Only one meter provided as standard) This allows you to set the maximum allowed jitter level and then test for invalid values over a period of time.

A different jitter threshold may be set for each of the 3 SDI data rates (SD/HD/3G) for both Jitter1 and Jitter2. The defaults are the maximum values specified by the SMPTE standard.

Jitter errors are detected within 200ns and so intermittent peak errors can be detected.

Eye Timings

If checked, these controls will enable logging of invalid timing values. An event will be logged if the value exceeds the valid SMPTE range and an event will be logged when the signal becomes valid again.

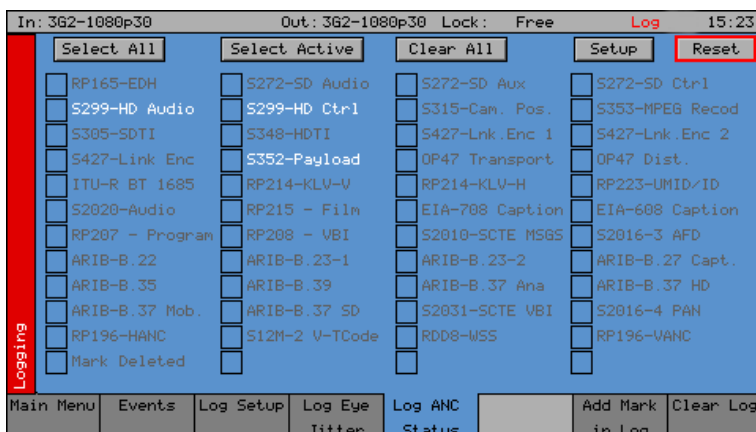
Eye measurements are performed using statistical calculations on the waveforms and are thus performed at a slower rate than jitter measurements. Measurements can take a few seconds to stabilise and this should be taken into account.

Eye Amplitude

If checked, these controls will enable logging of invalid amplitude or over-shoot/undershoot values. An event will be logged if the value exceeds the valid SMPTE range and an event will be logged when the signal becomes valid again.

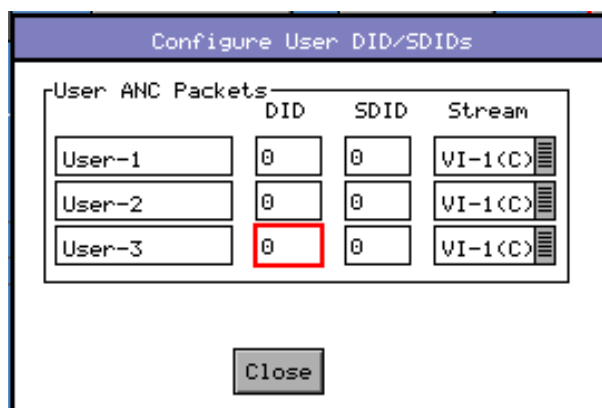
Eye measurements are performed using statistical calculations on the waveforms and are thus performed at a slower rate than jitter measurements. Measurements can take a few seconds to stabilise and this should be taken into account.

Log ANC Status



The Log ANC Status menu allows customization of which ANC packets to log for changes in status (e.g. Present, Checksum Error, Missing, Parity Error). Individual checkboxes are provided to determine which packet DID/SDID combinations are logged.

- Select All Pressing this causes the checkboxes for all packets to be checked.
- Select Active Pressing this causes the checkboxes for all packets currently present to be checked.
- Select All Pressing this causes the checkboxes for all packets to be un-checked.
- Setup This allows the user to define and name their own DID/SDID values for an ANC packet type.

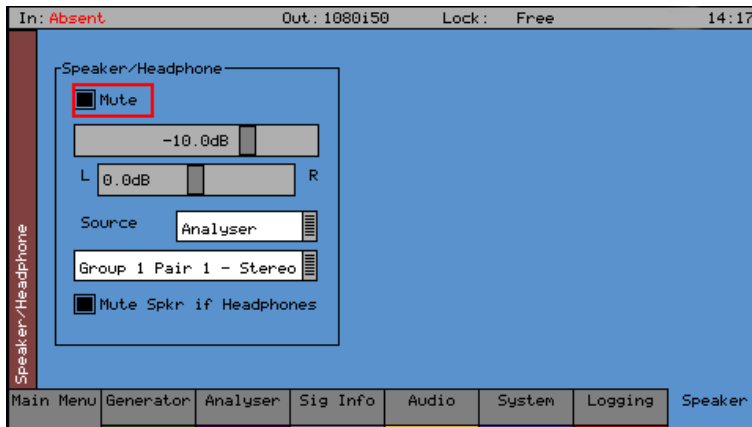


- Reset Clears the state for all packet types and thus a packet that was displayed as previously in error is shown as OK.

Menu Reference

Speaker Menu

Overview



The Speaker menu controls which audio pair that can be heard on the loud speakers and headphone output of the Sx instrument.

The Sx instrument contains a stereo loud speakers and associated stereo headphone socket which can be connected to any of the audio input or output channels or pairs.

The “Mute” checkbox allows both signals to be muted.

A volume control is provided to adjust the level to headphones and speaker together. The balance control can be used to adjust the Left-Right balance for the source being monitored.

The monitored source can be set to the input or output of the Sx instrument and the input and output sources can be set independently to either a stereo pair or single audio channel.

The “Analyzer Source” is used to select the specific input that is to be heard.

The speaker can be muted when headphones are plugged in by checking the “Mute Spkr if Headphones” control.

Note that when listening to an audio source, the Sx instrument needs the audio to be synchronous with that of the Sx Generator. If this is NOT the case, ‘clicks’ will be heard on the speaker. Either connect the Sx instrument reference to the same reference as the SDI input source and set the Generator - GenLock source to Ref or set the genlock source to Input-1.

Menu Reference



PHABRIX[®] A Glossary

Glossary

Glossary of Terms

2K-SDI	2K digital cinema can be transmitted via SDI as defined in the SMPTE ST 2048-2:2011 standard (“2048 x 1080 Digital Cinematography Production Image FS/709 Formatting for Serial Digital Interface”) and SMPTE 428-9 (D-Cinema Distribution Master - Image Pixel Structure Level 3 - Serial Digital Interface Signal Formatting).
3G-SDI	is a single 2.970 Gbit/s serial link (standardized in SMPTE 424M) that will replace the dual link HD-SDI (is standardized in SMPTE 372M).
AES	Audio Engineering Society
AES3-2003	standard for digital audio — Digital input-output interfacing —Serial transmission format for two channel linearly represented digital audio data
Alignment Jitter	refer to artefacts above the specified threshold frequencies of (1 kHz for SD-SDI signals and 100 kHz for HD-SDI signals). Typically video equipment cannot tolerate Alignment Jitter which cause decoding errors due to incorrect sampling of the data stream because the SDI Clock transition occurs on the edge of the data sample instead of in the centre of the data sample.
CPU	Central Processor Unit
CRC	(cyclic redundancy check) is an error-detecting code commonly used in digital networks and storage devices to detect accidental changes to raw data. Blocks of data entering these systems get a short check value attached, based on the remainder of a polynomial division of their contents; on retrieval the calculation is repeated, and corrective action can be taken against presumed data corruption if the check values do not match.
DID	(Data ID) is part of the Ancillary Data that is transmitted with the SDI data.
Dolby Digital	(AC-3) is a ‘perceptual audio’ system for digital audio that allows the reduction of data needs to deliver high-quality sound. This system was developed primarily for DTV, DVD and HDTV.
Dolby Digital Plus	(E-AC-3) is a more advanced version of Dolby Digital that provides a more efficient encoding algorithm that provides enough bandwidth that allows up to 20 channels of audio (for a primary programme (Programme 1) and optional ancillary programs that can be delivered at much lower bit rates than Dolby Digital.
Dolby E	is an audio encoding and decoding technology developed by Dolby Laboratories that allows up to 8 channels of audio to be compressed into a digital stream that can be transferred between compatible devices and stored on a standard stereo pair of audio tracks.
EDH	(Error Detection and Handling) protocol is an optional but commonly used addition to the Standard Definition-Serial Digital Interface (SDI) standard. This protocol allows an SD-SDI receiver to verify that each field of video is received correctly.
FPGA	a field-programmable gate array (FPGA) is an integrated circuit designed to be configured by the customer or designer after manufacturing.

Function Buttons	these are the set of 8 buttons below the Instrument Display on the Sx and Rx Ranges that are used to select the Instrument Display menu options.
GPI	General Purpose Input
Graticule	this is the scale displayed on an oscilloscope, vectorscope or waveform monitor that provides a visual indication of the signal amplitude, time base and phase relationship.
Input Status Bar	is the bottom part of the Monitor Output display that shows the format and status of the input signals currently connected to the Rx chassis.
Instrument Display	is the TFT monitor available on the Sx Range of products and on the Rx 2000.
Navigation Buttons	These are the up, down, left, right arrow buttons available on the Sx and Rx Ranges.
OLED	Organic Light-Emitting Diode
PHABRIX Rx 500	is a 1U height half rack mount Rasterizer which is small and light enough to fit a variety of applications from camera shading in OB environments or studio editing suites as well as manufacturing R&D departments. The Rx 500 has two input slots with 4 simultaneous inputs. All inputs are switchable and each can be independently controlled as picture or analysis instruments on an HDMI Monitor Output.
PHABRIX Rx 1000	is a 1U height 19" (482cm) rack mount Rasterizer with the ability to monitor up to 8 simultaneous inputs with loop through and is powerful enough to support simultaneous display of instruments across each module on HDMI Monitor Output. All inputs are switchable and each can be independently controlled as picture or analysis instruments with central control and report logging.
PHABRIX Rx 2000	is a 2U height 19" (482cm) rack mount Rasterizer with 2 on-board displays and the ability to monitor up to 8 simultaneous inputs with loop through and is powerful enough to support simultaneous display of instruments across each module on HDMI Monitor Output. All inputs are switchable and each can be independently controlled as picture or analysis instruments with central control and report logging.
PHABRIX SxA	is a 3G-SDI , HD-SDI and SD-SDI handheld SDI test signal generator, analyser and monitor supporting AES audio.
PHABRIX SxD	is a 3G-SDI , HD-SDI and SD-SDI handheld SDI test signal generator, analyser and monitor supporting dual link.
PHABRIX SxE	is a 3G-SDI , HD-SDI and SD-SDI handheld SDI test signal generator, analyser and monitor supporting eye and jitter measurement.
Pre-set Buttons	These are the set of 8 buttons below the Video Confidence display on the Rx 2000 that are used to select predefined inputs for display.
PSU	Power Supply Unit
Random Jitter	refers to artefacts caused by random events or processes such as thermal or shot noise that cause small amplitude variations in the clock edge position or could cause large signal amplitude variations, though these typically would be infrequent.

Rasteriser	is an electronic device used to display (either as picture or waveform) the video/audio data in a 3G-SDI, HD-SDI and SD-SDI stream. Typically a Rasterizer will display multiple output forms of the same input data stream.
SDI	(Serial Digital Interface) capable of transferring SD or HD broadcast video and broadcast audio between compatible devices.
SMPTE	(Society of Motion Picture & Television Engineers)
SMPTE RP211	Implementation of 24P, 25P and 30P Segmented Frames for 1920 x 1080 Production Format
SMPTE 259M	Implement a SMPTE 259M Serial Digital Interface Using SMPTE HOTLink™ and CY7C9235/9335
SMPTE 260M	Television - 1125/60 High-Definition Production System - Digital Representation and Bit-Parallel Interface
SMPTE 274M	High Definition (HD) Image Formats for Television Production
SMPTE-276M	Television - Transmission of AES-EBU Digital Audio Signals Over Coaxial Cable
SMPTE 292M	Bit-Serial Digital Interface for High-Definition Television Systems
SMPTE 296M	1280 × 720 Scanning, Analogue and Digital Representation and Analogue Interface
SMPTE 297-2006	Serial Digital Fiber Transmission System for SMPTE 259M, SMPTE 344M, SMPTE 292 and SMPTE 424M Signals
SMPTE 352	Payload Identification Codes for Serial Digital Interfaces — Amendment 1
SMPTE 424M	3 Gb/s Signal/Data Serial Interface
SMPTE 425-B	Mapping of 2 x SMPTE 292M HD SDI interfaces. Level-B can carry a Dual Link 1.485 Gb/s payload or two HD 1.485 Gb/s payloads..
SMPTE 425M-A	Direct mapping of source image formats
SMPTE 428-9	D-Cinema Distribution Master – Image Characteristics
TFT	(Thin Film Transistor) is a type of LCD (Liquid Crystal Display) monitor.
Timing Jitter	refers to a short-term time interval error above a low frequency threshold of 10 Hz (as defined in the SMPTE standards for SDI signals).
UI	(Unit Interval) is time between consecutive clock cycles used to sample the SDI data stream. The UI measurement is used for Eye Pattern measurement.
Wander	refers to a long-term time interval error, ie artefacts below 10 Hz. Typically all video equipment has the tendency to cause wander over a long period, the display of these artefacts are not easily displayed in a meaningful way but are better logged as errors that exceed tolerances over a long period.

Glossary



PHABRIX[®]

B Specification

Specification

SxE Instrument

Operating Environment

Operating Temperature 0-40 °C

Operating Humidity <85% RH (no condensation)

If the unit is operated at a higher temperature there is a possibility of a fire hazard.

If the temperature is changed rapidly from a cold environment to a hot environment, moisture can be created internally which can cause malfunction or damage the unit. Allow the unit to sit for 30 minutes without power applied to reduce any possibility of condensation.

If the temperature rises above 60°Centigrade a warning dialogue will be given. If the temperature rises above 65°Centigrade the unit will be turned OFF.

Under both conditions, an event will be added to the event log to show what happened.

Expected Behavior

LCD Monitor

The LCD may have some pixels that are always turned ON or always turned OFF. This is normal and should not affect normal operation.

LCD Flicker

The unit supports many video standards. The input SDI signal is displayed asynchronously and may flicker on the waveform display or picture display. The unit stores the input SDI signal internally, and then reads the internal frame using the LCD sync signal, which is asynchronous to the input SDI signal. LCD flickering may occur if a frame is skipped or repeated.

Remote Network Operation

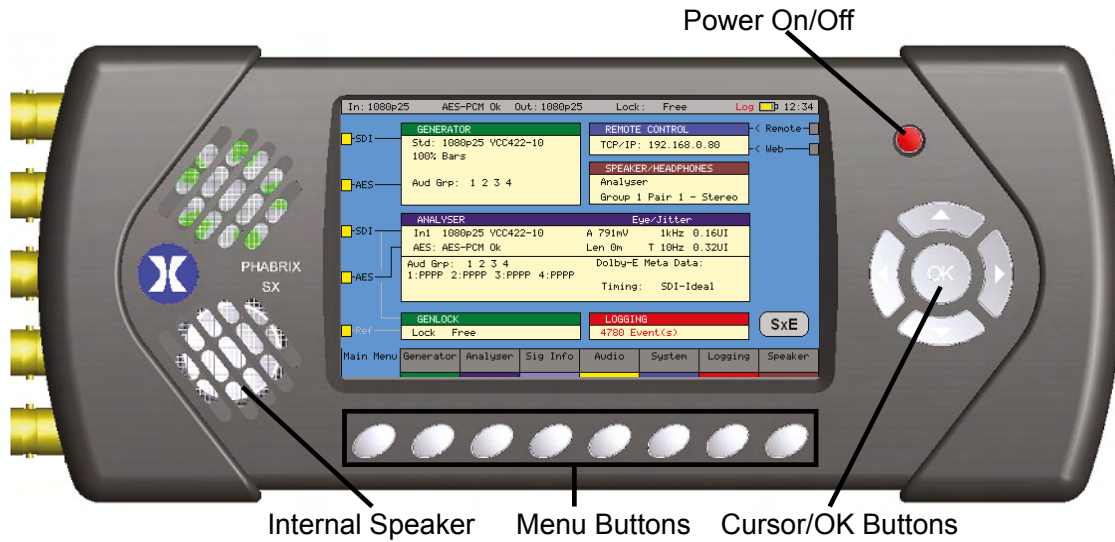
Remote network operation is only guaranteed when connected to a local machine.

Dimensions

Dimensions 230 (L) x 93(H) x 45(D) mm

Weight 2kg

Front Panel



The front panel provides access to the TFT Display and menu system.

Display Type	4.3 inch TFT colour
Display Format	480 x 272 24 bits
Backlight	Variable brightness
Screen Saver	Reduces brightness after user adjustable time.

BNC Panel



The Sx instrument BNC panel provide the following connections.

External Locking Reference

Label	REF IN
Input Signal	Tri-level or Bi-Level (black burst) syncs 50/59.94/60Hz
Connector	BNC 75Ω type
Input Impedance	75 ohm terminated
Input Return Loss	> 40dB to 6MHz (typical)
Maximum Input voltage	+/- 2V
Specification	Tri-level syncs (SMPTE274M and SMPTE296M) 600 mV pk-pk PAL Black Burst (ITU624-4/SMPTE318) 1V pk-pk, Composite NTSC (SMPTE 170M) 1V pk-pk

Analyzer SDI Input

Label	SDI IN
Supported standards	SD-SDI or HD-SDI. See Supported formats
Connector	BNC 75Ω type
Input Impedance	75 ohm terminated
Input Return Loss	> = 15dB (5MHz to serial clock frequency)
Maximum Input Voltage	+/- 2V
Purpose	Analyzer Input

Analyzer AES Input

Label	AES IN
Connector	BNC 75Ω type
Input Impedance	75 ohm terminated
Maximum Input Voltage	+/- 2V
Sample Rates	The input has a sample rate converter and so will accept any sample rate from 32kHz to 192kHz.
Specification	Conforming to AES3-2003 and SMPTE-276M

Generator SDI Output

Label	SDI OUT
Supported standards	SD-SDI or HD-SDI. See Supported formats
Connector	BNC 75Ω type
Output Impedance	75 ohm terminated
Output Level	+/- 400mV
Purpose	Generator Output

Generator AES Output

Label	AES OUT
Connector	BNC 75Ω type
Input Impedance	75 ohm terminated
Maximum Input Voltage	1V
Sample Rates	48kHz
Specification	Conforming to AES3-2003 and SMPTE-276M

Control Panel



The Sx instrument Control panel provide the following connections.

Power Connection

Voltage	5V +/- 5%. (DC Power adapter provided)
Power Requirements	AC 90-250V 50/60Hz 10W max

Local Control

USB	USB 1
USB Connector	Mini A/B
Purpose	Software installation.

Networking

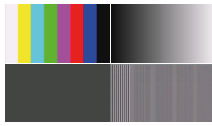
Ethernet	IEEE802.3 10/100Mb/s (10/100-base-T connection)
Ethernet Connector	RJ-45
Purpose	Browser control of instrument and FTP access to system files and allowing the Sx instrument to be connected into a network and accessed via TCP/IP so that it can be controlled remotely.

Headphone Output

Connector	Miniature 3.5mm Stereo Jack
Level	Adjustable
Purpose	Local monitoring of audio

Generator Functionality

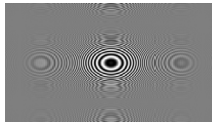
The SxE instrument provides a single video/audio signal generator functionality. The Generator menu (see chapter 2 for full details) allows the following test signals to be generated. The Generator provides:



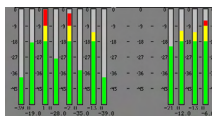
32, 10-bit Line-based video test patterns such as colour bars, ramp, colour plate, multiburst and user defined (DPX, YUV, TGA, BMP) that can be used to check video levels, linearity, saturation, hue, colour phase and frequency response.



Pathogenic video test patterns such as Bars + Red, SMPTE Bars, Check Field that can be used to check that decoding, encoding and transmission processes are correct.



Zone Plate generator test patterns are provided and allow the selection of several predetermined zone plates as well as optionally 3 user customizable zone plates.



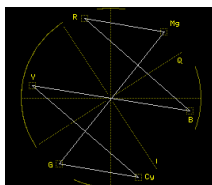
17 fixed Audio test tones (fixed 100Hz to 20kHz), variable tones (1 Hz- 24Khz in 1Hz steps), intermittent tone, white noise or silence on audio pairs and audio groups. Audio level variable (0 to -100dB in 1dB steps).

Analyzer Functionality

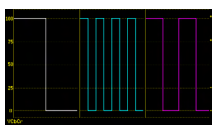
The SxE instrument provides analyzer functionality for two concurrently connected SD-SDI, HD-SDI or Optical inputs. With the module installed the Analyzer menu (see chapter 2 for details) allows the follow monitoring to be displayed:



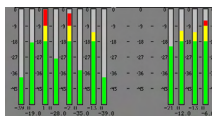
The Picture viewer is provided to allow you to monitor the selected input to give confidence that the signal is present, is the correct subject (or feed), it is moving and looks OK.



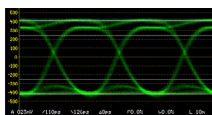
The Vectorscope allows you to check the hue, saturation and phase of the selected input. Controls are provided to allow you to select the line (s) to be monitored (ideal for checking any embedded test pattern in the selected feed), the field to be checked and the graticule scale.



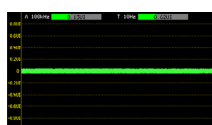
The Waveform Monitor allows you to check the levels of the video content are correct. Controls are provided to allow you to select the waveform (YCbCr, Y, Cb, Cr, GBR, Red, Green or Blue), the horizontal and vertical scale and the line(s) to be monitored.



The Audio monitor (16 embedded audio channels, 48 kHz, 20-bit (SD-SDI) 24-bit (HD-SDI)) allows you to check the audio levels of the selected input. In addition to the visual display, the selected audio channel can be monitored via the front panel loud speakers or head phone jack.



The Eye Pattern monitor allows you to check the level of jitter present in the selected source. Controls are provided to allow you to isolate specific frequencies of jitter to ensure that they are within acceptable tolerances.



The Jitter monitor allows you to measure the amplitude of jitter present in the selected source against time. Controls are provided for scaling and filtering to isolate specific jitter types.

Specification

Supported Video Formats

SD 270 Mb/s

Standard	Resolution	Colour Space	Rate
EBU Tech. 3267-E	720 x 576	4:2:2 (Y'C'BC'R')/10-bit	I 50.00
SMPTE 259M	720 x 483	4:2:2 (Y'C'BC'R')/10-bit	I 59.94

HD 1.485 Gb/s (SMPTE 292M)

Standard	Resolution	Colour Space	Rate
SMPTE 296M	1280 x 720	4:2:2 (Y'C'BC'R')/10 bit	P 23.98
			P 24.00
			P 25.00
			P 29.97
			P 30.00
			P 50.00
			P 59.94
			P 60.00
SMPTE 260M	1920 x 1035	4:2:2 (Y'C'BC'R')/10 bit	I 59.94
			I 60.00
SMPTE 274M	1920 x 1080	4:2:2 (Y'C'BC'R')/10 bit	I 50.00
			I 59.94
			I 60.00
SMPTE 274M	1920 x 1080	4:2:2 (Y'C'BC'R')/10 bit	P 23.98
			P 24.00
			P 25.00
			P 29.97
			P 30.00
SMPTE RP211	1920 x 1080	4:2:2 (Y'C'BC'R')/10 bit	sF 23.98
			sF 24.00
			sF 25.00
			sF 29.97
			sF 30.00

Dual Link 1.485 Gb/s (SMPTE 327M)

Standard	Resolution	Colour Space	Rate
SMPTE 274M	1920 x 1080	4:2:2 (Y'C'BC'R')/10 bit	P 50.00
			P 59.94
			P 60.00
	1920 x 1080	4:4:4 (R'G'B'), 4:4:4:4 (R'G'B'+A)/10-bit	P or sF 23.00
			P or sF 24.00
			P or sF 25.00
			P or sF 29.97
			P or sF 30.00
			I 50.00
			I 59.94
			I 60.00
SMPTE 274M	1920 x 1080	4:4:4 (R'G'B')/12-bit	P or sF 23.00
			P or sF 24.00
			P or sF 25.00
			P or sF 29.97
			P or sF 30.00
			I 50.00
			I 59.94
			I 60.00
SMPTE 274M	1920 x 1080	4:4:4 (Y'C'BC'R'), 4:4:4:4 (Y'C'BC'R'+A)/10-bit	P or sF 23.00
			P or sF 24.00
			P or sF 25.00
			P or sF 29.97
			P or sF 30.00
			I 50.00
			I 59.94
			I 60.00
SMPTE 274M	1920 x 1080	4:4:4 (Y'C'BC'R')/12 bit	P or sF 23.00
			P or sF 24.00

			P or sF 25.00
			P or sF 29.97
			P or sF 30.00
			I 50.00
			I 59.94
			I 60.00
SMPTE 274M	1920 x 1080	4:2:2 (Y'CbCr)/12 bit	P or sF 23.00
			P or sF 24.00
			P or sF 25.00
			P or sF 29.97
			P or sF 30.00
			I 50.00
			I 59.94
			I 60.00
SMPTE 428-9	2048 x 1080	4:4:4 (XYZ)/12 bit	P or sF 23.98
			P or sF 24.00

3G Level-A 2.97 Gb/s (SMPTE 425M-A)

Standard	Resolution	Colour Space	Rate
SMPTE 274M	1920 x 1080	4:2:2 (Y'CB'R')/10 bit	P 50.00
			P 59.94
			P 60.00
SMPTE 296M	1280 x 720	4:4:4 (R'G'B'), 4:4:4:4 (R'G'B' + A)/10-bit	P 23.00
			P 24.00
			P 25.00
			P 29.97
			P 30.00
			P 50.00
			P 59.94
SMPTE 296M	1280 x 720	4:4:4 (Y'CB'R'), 4:4:4:4 (Y'CB'R' + A)/10-bit	P 23.00 *
			P 24.00 *
			P 25.00 *
			P 29.97 *
			P 30.00 *
			P 50.00 *
			P 59.94 *
SMPTE 274M	1920 x 1080	4:4:4 (R'G'B'), 4:4:4:4 (R'G'B' + A)/10-bit	P or sF 23.00 *
			P or sF 24.00 *
			P or sF 25.00 *
			P or sF 29.97 *
			P or sF 30.00 *
			I 50.00 *
			I 59.94 *
SMPTE 274M	1920 x 1080	4:4:4 (Y'CB'R'), 4:4:4:4 (Y'CB'R' + A)/10-bit	P or sF 23.00 *
			P or sF 24.00 *
			P or sF 25.00 *
			P or sF 29.97 *
			P or sF 30.00 *
			I 50.00 *
			I 59.94 *

			I 60.00
SMPTE 274M	1920 x 1080	4:4:4 (R'G'B')/12-bit	P 23.00 *
			P 24.00 *
			P 25.00 *
			P 29.97 *
			P 30.00 *
			I 50.00 *
			I 59.94 *
			I 60.00 *
SMPTE 274M	1920 x 1080	4:4:4 (Y'C'BC'R')/12 bit	P 23.00 *
			P 24.00 *
			P 25.00 *
			P 29.97 *
			P 30.00 *
			I 50.00 *
			I 59.94 *
			I 60.00 *
SMPTE 428-9	2048 x 1080	4:4:4 (X'Y'Z')/12 bit	P or sF 23.98 *
			P or sF 24.00 *
SMPTE 274M	1920 x 1080	4:2:2 (Y'C'BC'R')/12 bit	P or sF 23.98 *
			P or sF 24.00 *
			P or sF 25.00 *
			P or sF 29.97 *
			P or sF 30.00 *
			I 50.00 *
			I 59.94 *
			I 60.00 *

* Advance Format Option required

3G Level-B 2.97 Gb/s (SMPTE 425-B)

Payload type
1 x SMPTE 372M dual-link payload
2 x SMPTE 292M HD 720 payloads
2 x SMPTE 292M HD 1080 payloads

2K-SDI Formats (part of Adv. Video Formats Option)

Standard	Resolution	Colour Space	Rate
SMPTE ST 2048-2	2048 x 1080	4:2:2 (Y'C'B'C'R) 10 bit	60.00, 60/1.001, 50, 48 and 48/1.001 P
SMPTE ST 2048-2	2048 x 1080	4:4:4 (Y'C'B'C'R) 10 bit	30, 30/1.001, 25, 24 and 24/1.001 PsF
SMPTE ST 2048-2	2048 x 1080	4:4:4 (Y'C'B'C'R+A) 10 bit	30, 30/1.001, 25, 24 and 24/1.001 PsF
SMPTE ST 2048-2	2048 x 1080	4:4:4 (R'G'B') 12-bit	30, 30/1.001, 25, 24 and 24/1.001 P
SMPTE ST 2048-2	2048 x 1080	4:4:4 (Y'C'B'C'R+A) 12 bit	30, 30/1.001, 25, 24 and 24/1.001 P
SMPTE ST 2048-2	2048 x 1080	4:4:4 (R'G'B') 12-bit	30, 30/1.001, 25, 24 and 24/1.001 PsF
SMPTE ST 2048-2	2048 x 1080	4:4:4 (Y'C'B'C'R+A) 12 bit	30, 30/1.001, 25, 24 and 24/1.001 PsF
SMPTE ST 2048-2	2048 x 1080	4:2:2 (Y'C'B'C'R) 12 bit	30, 30/1.001, 25, 24 and 24/1.001 P
SMPTE ST 2048-2	2048 x 1080	4:2:2 (Y'C'B'C'R+A) 12 bit	30, 30/1.001, 25, 24 and 24/1.001 P
SMPTE ST 2048-2	2048 x 1080	4:2:2 (Y'C'B'C'R) 12 bit	30, 30/1.001, 25, 24 and 24/1.001 PsF
SMPTE ST 2048-2	2048 x 1080	4:2:2 (Y'C'B'C'R+A) 12 bit	30, 30/1.001, 25, 24 and 24/1.001 PsF
SMPTE ST 428-9	2048 x 1080	4:4:4 (X'Y'Z') 12-bit	24 and 24/1.001P
SMPTE ST 428-9	2048 x 1080	4:4:4 (X'Y'Z') 12-bit	24 and 24/1.001Psf
SMPTE ST 428-19	2048 x 1080	4:4:4 (X'Y'Z') 12-bit	25, 30 and 30/1.001 P
SMPTE ST 428-19	2048 x 1080	4:4:4 (X'Y'Z') 12-bit	25, 30 and 30/1.001 Psf



PHABRIX[®]

C Maintenance

Maintenance

Warranty

Overview

The Sx range benefits from a 2 year warranty including telephone and email support. Each Sx leaves our UK factory with its own unique list of quality controlled settings which are recorded by our manufacturing department. Should the Sx require calibration, these settings are compared with its pre- calibration state to ensure consistency and traceability.

The product has been designed and manufactured to be of the highest quality. However, should the instrument develop a fault during the warranty period, please return to your local PHABRIX agent for repair.

Calibration services are available throughout the PHABRIX network of distributors.

Warranty Exceptions

PHABRIX are not responsible for free service during the warranty period under the following conditions:

- Incorrect voltage applied to instrument.
- Incorrect power adaptor used.
- Fire, natural disaster.
- Repair of instrument by non PHABRIX approved agent
- Repair of damage caused by third party products.
- Repair of damage caused by improper use.
- Repair without proof of purchase.

Product Registration

Registration of your product ensures a further year of support.

Maintenance

Maintenance

General Maintenance

The Sx instruments have been designed to need minimum maintenance. The use of low power components means that there is not need for large amounts of cooling and therefore there are is not need to clean fan filters.

The case can be cleaned by wiping gently with a soft cloth, lightly dampened with a neutral cleaning agent. A screen cleaning cloth may be used to clean the LCD. Do not apply force to the LCD when cleaning or it may be damaged.



Warning always remove the power supply from the instrument and turn OFF before cleaning. Do not allow any water or other liquid to enter the instrument while cleaning.

Preventative Maintenance

For long reliable use of the Sx instrument please take the following precautions:

Install the Sx instrument in a position which has adequate air flow and is not in direct sun light.

Ensure that connecting cables are tied back so that they do not put strain on the rack mounts and that the do not obstruct air flow.

Ensure that the fan grills are not obstructed.

Avoid installations where there are dramatic changes in temperature, high humidity and areas contaminated by dust, smoke or construction debris.

Avoid installations that may be affected by vibration.

Do not exceed the rated operation of the Sx instrument, ie temperature and signal levels.



The instrument should only be operated between 0 and 40 °Centigrade. If the instrument is operated at a higher temperature there is a possibility of a fire hazard. If the temperature is changed rapidly from a cold environment to a hot environment, moisture can be created internally which can cause malfunction or damage the instrument. Allow the instrument to sit for 30 minutes without power applied to reduce any possibility of condensation. If the temperature rises above 60 °Centigrade a warning dialog will be given. If the temperature rises above 65 °Centigrade the instrument will be turned OFF. Under both conditions, an event will be added to the event log to show what happened.

Maintenance

Software Maintenance

Installing New Software

New software can be installed on the Sx instrument using 2 different techniques that take into account the location of the Sx instrument, the type of network access that the Sx instrument has and you company's IT policy.

Note that during the installation process the instrument will not be available for use.



Note also that any existing Presets stored will be archived and will need to be restored if they are required. See the "System"- "Memories" section in chapter 2 for details about how to restore presets archived by the installation of an new version of software.

Software Download from Internet

Using the Sx instrument's LCD screen (access via a web browser - see chapter 1 for details), and the Sx instrument has Internet network access, you can download and install directly into the Sx instrument from the browser:

This process is a two stage process, first the new software needs to be Downloaded then the new software needs to be installed.

1. In the System - Network menu (Network window on Monitor Output) check that the network settings are correct and that the instrument is connected to the internet via the Ethernet connection.
2. From the System menu, select Engineer (Engineer Setup window on Monitor Output) to download the latest software version. Pressing the Download button will cause the current release of software to be downloaded from the PHABRIX website.

This will take a short time dependent on the connection to the Internet. Once the download has completed, the software will be checked for errors before being stored on the instrument for future installation. If the latest software is already present on the Rx instrument, no software will be downloaded and a message will be shown.



Note that multiple releases of software may be stored on the Sx instrument so a previous release can be re-installed if required.

3. To install the downloaded software on the Sx instrument, select the release using the field with releases listed. The largest number is the latest release. Select the 'Install' button and a confirmation dialogue will be shown. Press "Yes" and the installation will start. This process takes several minutes to decompress the software, extract the files and then reprogram the hardware. If an error is given during the installation, retry the installation and or download. Do NOT turn the instrument off until an installation has completed correctly.

Once the installation has completed, if "Reboot after Install" is checked the instrument will re-start with the new software installed. If not checked then the instrument should be turned off and on again manually.



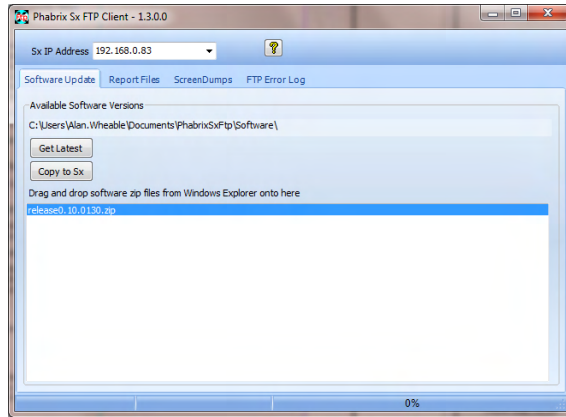
Note that as part of the installation procedure, all memories are archived to a backup file and then deleted. They can be restored from the System-Memories page using the Restore button and selecting the '_Before_Upgrade' archive.

The software release notes can be viewed by selecting the Changes button.

FTP Transfer from a connected PC

If the software cannot be installed, for example because the Sx instrument does not have Internet access, you can transfer the software files directly to the Sx instrument's Setup folder using the PHABRIX FTP client:

1. Download the latest Sx software version from the PHABRIX website then drag the zip file to the PHABRIX FTP client (also available from the PHABRIX website).



To connect to the instrument you will need to use the PHABRIX FTP client available from the PHABRIX website. This connects to the Sx unit using unit's IP address (as host name) with:

Username "sxuser"

Password: "phabrixsx"

2. In the PHABRIX FTP client enter the IP address of the Sx unit to be updated.



Note: If a static IP address has been assigned to your Sx unit, be sure also to set a valid default gateway address. Contact your network administrator for these. If connecting directly between the Sx and your PC, you must set the default gateway to the IP address of your PC. See 'System – Network' section in chapter 2 for details on how to configure network settings on the Sx.

3. In the PHABRIX FTP client select the zip file for the new software and press the 'Copy to Sx' button.

This will copy the new software files to the Sx instrument's 'Setup' folder, updating the existing files as necessary. This can take up to 20 minutes depending on the connection speed.

4. Once the PHABRIX FTP client has finished copying the files to the Sx unit, use the 'System' - 'Engineer' menu find the new software version in the 'Software Upgrade' section of the menu then select 'Install'.

Wait for the new software to be installed. The progress will be indicated on screen.

During this time the software will be decompressed, files will be extracted and the hardware (FPGA) will be reprogrammed. If an error is given during the installation, retry the installation and or download. Do NOT turn the unit off until an installation has completed correctly.

Reverting to an Earlier Version of Software

If you need to revert to an earlier version of software:

Use the "System" - "Engineer" menu find the version of software you require in the "Software Upgrade" section of the menu then select "Install".

Wait for the new software to be installed. The progress will be indicated on the front panel screen and on the Monitor output.

During this time the software will be decompressed, files will be extracted and the hardware (FPGAs) will be reprogrammed. If an error is given during the installation, retry the installation and or download. Do NOT turn the instrument off until an installation has completed correctly.

Sx File Structure

The Sx instrument uses Linux as its operating system and a number of directories within the file system are provided for user-specific files.

Patterns

The Patterns directory contains several sub-directories for the related video standards. Test pattern files should be placed in the correct directory for the video standard in use. i.e. if a 720p video standard is being used, only the test patterns in the 720yuv directory will be available. You may have a test pattern with the same name in different pattern directories but they should have the correct size and colour type (rgb/yuv) for the directory that they are in or they will be converted and may lose colour accuracy.

Patterns that are too large for the current standard will be clipped to fit; patterns that are too small will gain a black border and will be centred on the output image.

Test patterns are .pat files for the standard line based pattern files or user files. Supported user file formats are:

- Windows bitmap files (.bmp). We support 24bit uncompressed bitmap formats only.

- 10 bit video files (.dpx) We support 10bit RGB/YUV formats only in Left to Right orientation.

- Yuv and qnt files (8/10 bit packed yuv only)

- targa (.tg) files which are compressed or uncompressed 8bit RGB files. We support Left to Right orientation only.

- Phabrix specific .pat, .rgb, .yc4 files generated by the Phabrix pattern editor/convertor.

Note that bitmap files which are RGB will be converted to YUV internally as appropriate to the output standard. This will mean that not all valid YUV values can be output. If dpx YUV files are used then all valid values may be output.

Scripts

Command scripts may be downloaded into this directory. See File Formats-Command Scripts for more details.

Setup

The Setup directory contains the installer files for different releases of the software. Each release is comprised of a .tar.gz file and is self contained. If a release of software is copied onto the instrument, the list of available releases will be updated within a minute.

Idents

The Idents directory contains bitmap idents as used by the generator. Supported user file formats are:

- .bmp (Windows bitmap files: 24bit only)

- .dpx files (10 bit video files)

- .yuv files (8/10 bit packed yuv)

- .tga (targa files)

Note that bitmap files are RGB and will be converted to YUV internally as appropriate to the output standard. This will mean that not all valid YUV values can be output. If YUV files are used(.dpx), then all valid values may be output.

Fonts

The fonts available for use by the generator to add text idents may be enhanced by downloading new True Type fonts (.ttf) into this directory.



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Please visit www.phabrix.com for latest product information