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A **BELDEN** BRAND

KUDOSPRO UHD 1100 & 1200

SD/HD/3G/UHDTV1 CONVERTERS

User Manual

Issue 2 Revision 2

2020-11-02

www.grassvalley.com

Patent Information

This product may be protected by one or more patents.

For further information, please visit: www.grassvalley.com/patents/

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Title	KudosPro UHD 1100 & 1200 User Manual
Part Number	Issue 2 Revision 2
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Important Safety Information

This section provides important safety guidelines for operators and service personnel. Specific warnings and cautions appear throughout the manual where they apply. Please read and follow this important information, especially those instructions related to the risk of electric shock or injury to persons.

Symbols and Their Meanings



Indicates that dangerous high voltage is present within the equipment enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



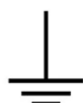
Indicates that the user, operator or service technician should refer to the product manuals for important operating, maintenance, or service instructions.



This is a prompt to note the fuse rating when replacing fuses. The fuse referenced in the text must be replaced with one having the ratings indicated.



Identifies a protective grounding terminal which must be connected to earth ground prior to making any other equipment connections.



Identifies an external protective grounding terminal which may be connected to earth ground as a supplement to an internal grounding terminal.



Indicates that static sensitive components are present, which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.



Indicates that the equipment has more than one power supply cord, and that all power supply cords must be disconnected before servicing to avoid electric shock.



The presence of this symbol in or on Grass Valley equipment means that it has been tested and certified as complying with applicable Underwriters Laboratory (UL) regulations and recommendations for USA.



The presence of this symbol in or on Grass Valley equipment means that it has been tested and certified as complying with applicable Canadian Standard Association (CSA) regulations and recommendations for USA/Canada.



The presence of this symbol in or on Grass Valley equipment means that it has been tested and certified as complying with applicable Underwriters Laboratory (UL) regulations and recommendations for USA/Canada.



The presence of this symbol in or on Grass Valley equipment means that it has been tested and certified as complying with applicable Intertek Testing Services regulations and recommendations for USA/Canada.



The presence of this symbol in or on Grass Valley product means that it complies with all applicable European Union (CE) directives.



The presence of this symbol in or on Grass Valley product means that it complies with safety of laser product applicable standards.

Warnings



A warning indicates a possible hazard to personnel, which may cause injury or death. Observe the following general warnings when using or working on this equipment:

- Appropriately listed/certified mains supply power cords must be used for the connection of the equipment to the rated mains voltage.
- This product relies on the building's installation for short-circuit (over-current) protection. Ensure that a fuse or circuit breaker for the rated mains voltage is used on the phase conductors.
- Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only.
- Do not operate the equipment in wet or damp conditions.
- This equipment is grounded through the grounding conductor of the power cords. To avoid electrical shock, plug the power cords into a properly wired receptacle before connecting the equipment inputs or outputs.
- Route power cords and other cables so they are not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages may exist at several points in this equipment. To avoid injury, do not touch exposed connections and components while power is on.
- High leakage current may be present. Earth connection of product is essential before connecting power.
- Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.
- To avoid fire hazard, use only the fuse type and rating specified in the service instructions for this product, or on the equipment.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- Use proper lift points. Do not use door latches to lift or move equipment.
- Avoid mechanical hazards. Allow all rotating devices to come to a stop before servicing.
- Have qualified service personnel perform safety checks after any service.

Cautions



A caution indicates a possible hazard to equipment that could result in equipment damage. Observe the following cautions when operating or working on this equipment:

- This equipment is meant to be installed in a restricted access location.
- When installing this equipment, do not attach the power cord to building surfaces.
- Products that have no on/off switch, and use an external power supply must be installed in proximity to a main power outlet that is easily accessible.
- Use the correct voltage setting. If this product lacks auto-ranging power supplies, before applying power ensure that each power supply is set to match the power source.
- Provide proper ventilation. To prevent product overheating, provide equipment ventilation in accordance with the installation instructions.

- Do not operate with suspected equipment failure. If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.
- To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.
- This unit may have more than one power supply cord. Disconnect all power supply cords before servicing to avoid electric shock.
- Follow static precautions at all times when handling this equipment. Servicing should be done in a static-free environment.
- To reduce the risk of electric shock, plug each power supply cord into separate branch circuits employing separate service grounds.

Electrostatic Discharge (ESD) Protection



Electrostatic discharge occurs when electronic components are improperly handled and can result in intermittent failure or complete damage adversely affecting an electrical circuit. When you remove and replace any card from a frame always follow ESD-prevention procedures:

- Ensure that the frame is electrically connected to earth ground through the power cord or any other means if available.
- Wear an ESD wrist strap ensuring that it makes good skin contact. Connect the grounding clip to an *unpainted surface* of the chassis frame to safely ground unwanted ESD voltages. If no wrist strap is available, ground yourself by touching the *unpainted* metal part of the chassis.
- For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms.
- When temporarily storing a card make sure it is placed in an ESD bag.
- Cards in an earth grounded metal frame or casing do not require any special ESD protection.

Battery Handling



This product may include a backup battery. There is a danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions. Before disposing of your Grass Valley equipment, please review the *Disposal and Recycling Information* at:

http://www.grassvalley.com/assets/media/5692/Take-Back_Instructions.pdf

Cautions for LCD and TFT Displays



Excessive usage may harm your vision. Rest for 10 minutes for every 30 minutes of usage.

If the LCD or TFT glass is broken, handle glass fragments with care when disposing of them. If any fluid leaks out of a damaged glass cell, be careful not to get the liquid crystal fluid in your mouth or skin. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all times.

Mesures de sécurité et avis importants

La présente section fournit des consignes de sécurité importantes pour les opérateurs et le personnel de service. Des avertissements ou mises en garde spécifiques figurent dans le manuel, dans les sections où ils s'appliquent. Prenez le temps de bien lire les consignes et assurez-vous de les respecter, en particulier celles qui sont destinées à prévenir les décharges électriques ou les blessures.

Signification des symboles utilisés



Signale la présence d'une tension élevée et dangereuse dans le boîtier de l'équipement ; cette tension peut être suffisante pour constituer un risque de décharge électrique.



Avertit l'utilisateur, l'opérateur ou le technicien de maintenance que des instructions importantes relatives à l'utilisation et à l'entretien se trouvent dans la documentation accompagnant l'équipement.



Invite l'utilisateur, l'opérateur ou le technicien de maintenance à prendre note du calibre du fusible lors du remplacement de ce dernier. Le fusible auquel il est fait référence dans le texte doit être remplacé par un fusible du même calibre.



Identifie une borne de mise à la terre de protection. Il faut relier cette borne à la terre avant d'effectuer toute autre connexion à l'équipement.



Identifie une borne de mise à la terre externe qui peut être connectée en tant que borne de mise à la terre supplémentaire.



Signale la présence de composants sensibles à l'électricité statique et qui sont susceptibles d'être endommagés par une décharge électrostatique. Utilisez des procédures, des équipements et des surfaces antistatiques durant les interventions d'entretien.



Le symbole ci-contre signifie que l'appareil comporte plus d'un cordon d'alimentation et qu'il faut débrancher tous les cordons d'alimentation avant toute opération d'entretien, afin de prévenir les chocs électriques.



La marque UL certifie que l'appareil visé a été testé par Underwriters Laboratory (UL) et reconnu conforme aux exigences applicables en matière de sécurité électrique en vigueur au Canada et aux États-Unis.



La marque C-CSA-US certifie que l'appareil visé a été testé par l'Association canadienne de normalisation (CSA) et reconnu conforme aux exigences applicables en matière de sécurité électrique en vigueur au Canada et aux États-Unis.



La marque C-UL-US certifie que l'appareil visé a été testé par Underwriters Laboratory (UL) et reconnu conforme aux exigences applicables en matière de sécurité électrique en vigueur au Canada et aux États-Unis.



La marque ETL Listed d'Intertek pour le marché Nord-Américain certifie que l'appareil visé a été testé par Intertek et reconnu conforme aux exigences applicables en matière de sécurité électrique en vigueur au Canada et aux États-Unis.



Le marquage CE indique que l'appareil visé est conforme aux exigences essentielles des directives applicables de l'Union européenne en matière de sécurité électrique, de compatibilité électromagnétique et de conformité environnementale.



Le symbole ci-contre sur un appareil Grass Valley ou à l'intérieur de l'appareil indique qu'il est conforme aux normes applicables en matière de sécurité laser.

Avertissements



Les avertissements signalent des conditions ou des pratiques susceptibles d'occasionner des blessures graves, voire fatales. Veuillez vous familiariser avec les avertissements d'ordre général ci-dessous :

- Un cordon d'alimentation dûment homologué doit être utilisé pour connecter l'appareil à une tension de secteur de 120 V CA ou 240 V CA.
- La protection de ce produit contre les courts-circuits (surintensités) dépend de l'installation électrique du bâtiment. Assurez-vous qu'un fusible ou un disjoncteur pour 120 V CA ou 240 V CA est utilisé sur les conducteurs de phase.
- Dans le présent manuel, toutes les instructions qui nécessitent d'ouvrir le couvercle de l'équipement sont destinées exclusivement au personnel technique qualifié.
- N'utilisez pas cet appareil dans un environnement humide.
- Cet équipement est mis à la terre par le conducteur de mise à la terre des cordons d'alimentation. Pour éviter les chocs électriques, branchez les cordons d'alimentation sur une prise correctement câblée avant de brancher les entrées et sorties de l'équipement.
- Acheminez les cordons d'alimentation et autres câbles de façon à ce qu'ils ne risquent pas d'être endommagés. Supportez correctement les enroulements de câbles afin de ne pas endommager les connecteurs.
- Coupez l'alimentation avant de nettoyer l'équipement. Ne pas utiliser de nettoyeurs liquides ou en aérosol. Utilisez uniquement un chiffon humide.
- Des tensions dangereuses peuvent exister en plusieurs points dans cet équipement. Pour éviter toute blessure, ne touchez pas aux connexions ou aux composants exposés lorsque l'appareil est sous tension.
- Avant de procéder à toute opération d'entretien ou de dépannage, enlevez tous vos bijoux (notamment vos bagues, votre montre et autres objets métalliques).
- Pour éviter tout risque d'incendie, utilisez uniquement les fusibles du type et du calibre indiqués sur l'équipement ou dans la documentation qui l'accompagne.
- Ne pas utiliser cet appareil dans une atmosphère explosive.
- Présence possible de courants de fuite. Un raccordement à la masse est indispensable avant la mise sous tension.
- Après tout travail d'entretien ou de réparation, faites effectuer des contrôles de sécurité par le personnel technique qualifié.

Mises en garde



Les mises en garde signalent des conditions ou des pratiques susceptibles d'endommager l'équipement. Veuillez vous familiariser avec les mises en garde ci-dessous :

- L'appareil est conçu pour être installé dans un endroit à accès restreint.
- Au moment d'installer l'équipement, ne fixez pas les cordons d'alimentation aux surfaces intérieures de l'édifice.

- Les produits qui n'ont pas d'interrupteur marche-arrêt et qui disposent d'une source d'alimentation externe doivent être installés à proximité d'une prise de courant facile d'accès.
- Si l'équipement n'est pas pourvu d'un modules d'alimentation auto-adaptables, vérifiez la configuration de chacun des modules d'alimentation avant de les mettre sous tension.
- Assurez une ventilation adéquate. Pour éviter toute surchauffe du produit, assurez une ventilation de l'équipement conformément aux instructions d'installation.
- N'utilisez pas l'équipement si vous suspectez un dysfonctionnement du produit. Faites-le inspecter par un technicien qualifié.
- Pour réduire le risque de choc électrique, n'effectuez pas de réparations autres que celles qui sont décrites dans le présent manuel, sauf si vous êtes qualifié pour le faire. Confiez les réparations à un technicien qualifié. La maintenance doit se réaliser dans un milieu libre d'électricité statique.
- L'appareil peut comporter plus d'un cordon d'alimentation. Afin de prévenir les chocs électriques, débrancher tous les cordons d'alimentation avant toute opération d'entretien.
- Veillez à toujours prendre les mesures de protection antistatique appropriées quand vous manipulez l'équipement.
- Pour réduire le risque de choc électrique, branchez chaque cordon d'alimentation dans des circuits de dérivation distincts utilisant des zones de service distinctes.

Protection contre les décharges électrostatiques (DES)



Une décharge électrostatique peut se produire lorsque des composants électroniques ne sont pas manipulés de manière adéquate, ce qui peut entraîner des défaillances intermittentes ou endommager irrémédiablement un circuit électrique. Au moment de remplacer une carte dans un châssis, prenez toujours les mesures de protection antistatique appropriées :

- Assurez-vous que le châssis est relié électriquement à la terre par le cordon d'alimentation ou tout autre moyen disponible.
- Portez un bracelet antistatique et assurez-vous qu'il est bien en contact avec la peau. Connectez la pince de masse à une *surface non peinte* du châssis pour détourner à la terre toute tension électrostatique indésirable. En l'absence de bracelet antistatique, déchargez l'électricité statique de votre corps en touchant une surface métallique *non peinte* du châssis.
- Pour plus de sécurité, vérifiez périodiquement la valeur de résistance du bracelet antistatique. Elle doit se situer entre 1 et 10 mégohms.
- Si vous devez mettre une carte de côté, assurez-vous de la ranger dans un sac protecteur antistatique.
- Les cartes qui sont reliées à un châssis ou boîtier métallique mis à la terre ne nécessitent pas de protection antistatique spéciale.

Manipulation de la pile



Ce produit peut inclure une pile de sauvegarde. Il y a un risque d'explosion si la pile est remplacée de manière incorrecte. Remplacez la pile uniquement par un modèle identique ou équivalent recommandé par le fabricant. Disposez des piles usagées conformément aux instructions du fabricant. Avant de vous séparer de votre équipement Grass Valley, veuillez consulter les *informations de mise au rebut et de recyclage* à :

http://www.grassvalley.com/assets/media/5692/Take-Back_Instructions.pdf

Précautions pour les écrans LCD et TFT



Regarder l'écran pendant une trop longue période de temps peut nuire à votre vision. Prenez une pause de 10 minutes, après 30 minutes d'utilisation.

Si l'écran LCD ou TFT est brisé, manipulez les fragments de verre avec précaution au moment de vous en débarrasser. veillez à ce que le cristal liquide n'entre pas en contact avec la peau ou la bouche. En cas de contact avec la peau ou les vêtements, laver immédiatement à l'eau savonneuse. Ne jamais ingérer le liquide. La toxicité est extrêmement faible, mais la prudence demeure de mise en tout temps.

Environmental Information

European (CE) WEEE directive.



This symbol on the product(s) means that at the end of life disposal it should not be mixed with general waste.

Visit www.grassvalley.com for recycling information.

Grass Valley believes this environmental information to be correct but cannot guarantee its completeness or accuracy since it is based on data received from sources outside our company. All specifications are subject to change without notice.

If you have questions about Grass Valley environmental and social involvement (WEEE, RoHS, REACH, etc.), please contact us at environment@grassvalley.com.

Lithium Batteries

Battery Warning

CAUTION

This equipment contains a lithium battery
There is a danger of explosion if this is replaced incorrectly
Replace only with the same or equivalent type.
Dispose of used batteries according to the manufacturer
instructions.
Batteries **shall only** be replaced by trained service technicians.

Your Grass Valley equipment usually comes with at least one button battery located on the main printed circuit board. The batteries are used for backup and should not need to be replaced during the lifetime of the equipment.

Battery Disposal

Before disposing of your Grass Valley equipment, please remove the battery as follows:

- 1 Make sure the AC adapter/power Cord is unplugged from the power outlet.
- 2 Remove the protective cover from your equipment.
- 3 Gently remove the battery from its holder using a blunt instrument for leverage such as a screwdriver if necessary. In some cases the battery will need to be desoldered from the PCB.
- 4 Dispose of the battery and equipment according to your local environmental laws and guidelines.

WARNING

- Be careful not to short-circuit the battery by adhering to the appropriate safe handling practices.
- Do not dispose of batteries in a fire as they may explode.
- Batteries may explode if damaged or overheated.
- Do not dismantle, open or shred batteries.
- In the event of a battery leak, do not allow battery liquid to come in contact with skin or eyes.
- Seek medical help immediately in case of ingestion, inhalation, skin or eye contact, or suspected exposure to the contents of an opened battery.

Laser Safety - Fiber Output SFP and QSFP Modules Warning

LASER SAFETY



The average optical output power does not exceed 0 dBm (1mW) under normal operating conditions. Unused optical outputs should be covered to prevent direct exposure to the laser beam.

Even though the power of these lasers is low, the beam should be treated with caution and common sense because it is intense and concentrated. Laser radiation can cause irreversible and permanent damage of eyesight. Please read the following guidelines carefully:

- Make sure that a fiber is connected to the board's fiber outputs before power is applied. If a fiber cable (e.g. patchcord) is already connected to an output, make sure that the cable's other end is connected, too, before powering up the board.
- **Do not** look in the end of a fiber to see if light is coming out. The laser wavelengths being used are totally invisible to the human eye and can cause permanent damage. Always use optical instrumentation, such as an optical power meter, to verify light output.

Safety and EMC Standards

This equipment complies with the following standards:

Safety Standards



Information Technology Equipment - Safety Part 1

EN60950-1: 2006

Safety of Information Technology Equipment Including Electrical Business Equipment.

UL1419 (4th Edition)

Standard for Safety – Professional Video and Audio equipment (UL file number E193966)

EMC Standards

This unit conforms to the following standards:

EN55032:2015 (Class A)

Electromagnetic Compatibility of multimedia equipment - Emission requirements

EN61000-3-2:2014 (Class A)

Electromagnetic Compatibility - Limits for harmonic current emissions

EN61000-3-3:2013

Electromagnetic Compatibility - Limits of voltage changes, voltage fluctuations and flicker

EN55103-2:2009 (Environment E2)

Electromagnetic Compatibility, Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 2. Immunity

WARNING

This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.

FCC / CFR 47:Part 15 (Class A)

Federal Communications Commission Rules Part 15, Subpart B

Caution to the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EMC Performance of Cables and Connectors

Grass Valley products are designed to meet or exceed the requirements of the appropriate European EMC standards. In order to achieve this performance in real installations it is essential to use cables and connectors with good EMC characteristics.

All signal connections (including remote control connections) shall be made with screened cables terminated in connectors having a metal shell. The cable screen shall have a large-area contact with the metal shell.

SIGNAL/DATA PORTS

For unconnected signal/data ports on the unit, fit shielding covers. For example, fit EMI blanking covers to SFP+ type ports; and fit 75 Ω RF terminators to BNC type ports

COAXIAL CABLES

Coaxial cables connections (particularly serial digital video connections) shall be made with high-quality double-screened coaxial cables such as Belden 8281 or BBC type PSF1/2M and Belden 1694A (for 3Gbps).

D-TYPE CONNECTORS

D-type connectors shall have metal shells making good RF contact with the cable screen. Connectors having indents which improve the contact between the plug and socket shells are recommended.

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1 Introduction

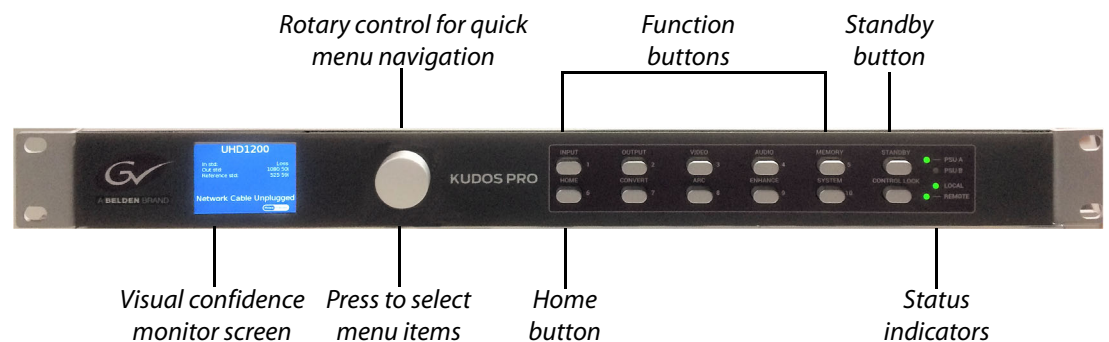
Description

Kudos Pro UHD units are linear motion-adaptive up/down format and frame rate converters for a range of applications, including:

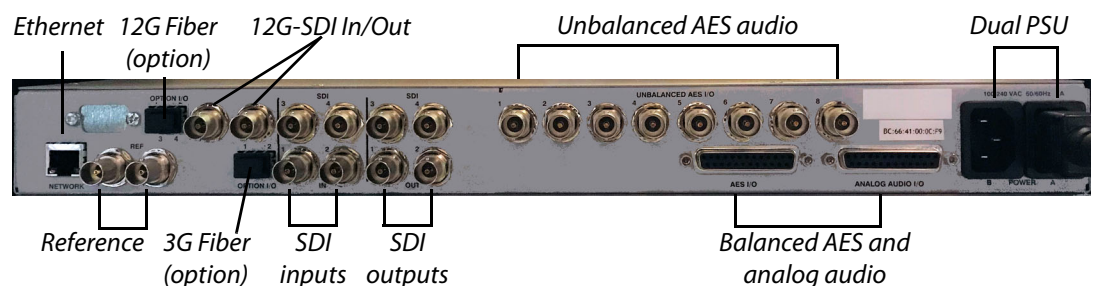
- Integration of HD programming into UHDTV productions.
- Provision of HD simultaneous transmissions alongside UHDTV services.
- Mixed usage of four quadrant square-division and pixel-interleaved UHDTV content.

These converters are ideal for customers who need to manage both HD and UHD content within their production or transmission workflow.

Front Panel View



Rear Panel View

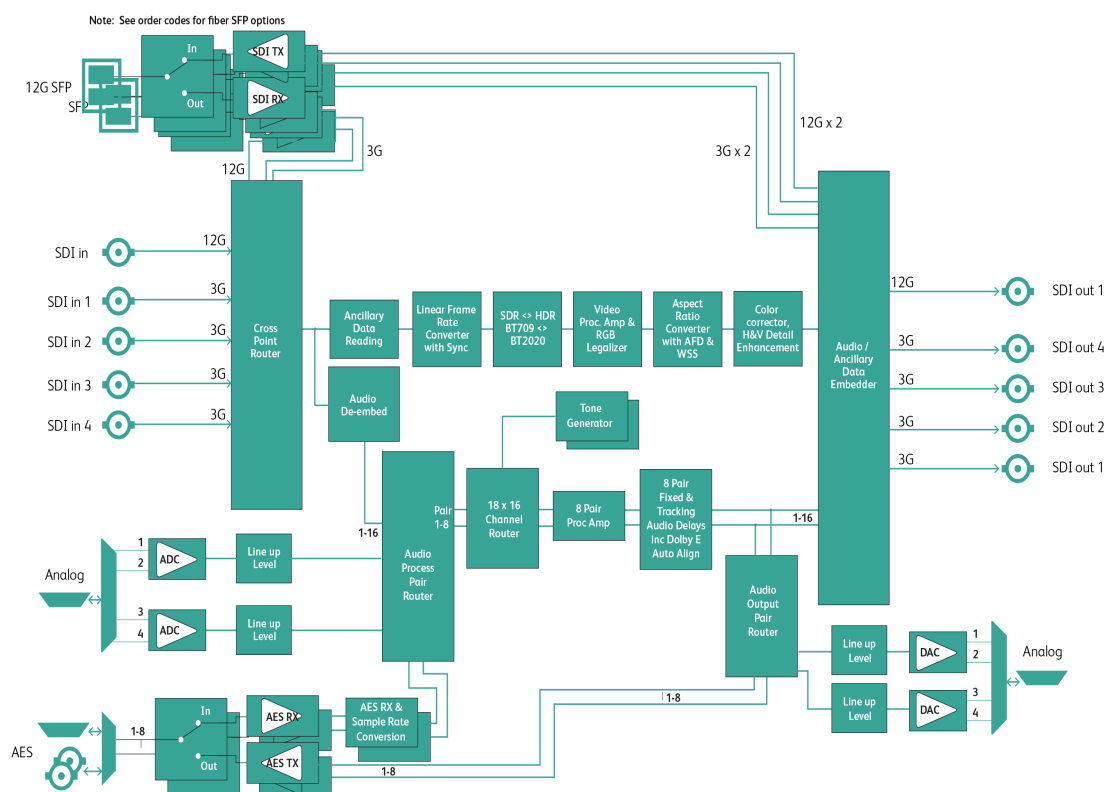


Feature Summary

- SD/HD/3G/4K UHD up/down/cross conversion with clean cut feature.
- Frame synchronization including continuous output on input standard changes.
- HDR (PQ, HLG, S-Log3) scene-referred and display-referred conversions with BT2020 wide color gamut support.
- 3D user LUT loading with full support for BBC type I, II & III 1.4 version LUTs.

- Linear motion adaptive frame rate conversion for all supported standards, including UHD-UHD along with video processing and powerful picture enhancement tools, edge enhance and noise reduction.
- 16-channel embedded audio processing and PCM/Dolby channel-based audio delay compensation.
- Metadata support including closed caption, WST, timecode, SMPTE ST 2020 handling and an ancillary data bridge to allow transfer of up to seven different ANC packet types around the converter.
- Easy to use control options including front panel with control lock, and remote via web interface and RollCall.
- Automatic aspect ratio conversion with signaling support (SMPTE ST 2016, L23 ETSI, L23 AFD, VI SMPTE, VI AFD).
- 4 x SD/HD/3G SDI inputs, 4 x SD/HD/3G SDI outputs with support for Quad link (2SI and QSD). Rec709/2020 color space.
- 1 x 12G SDI input, 1 x 12G SDI output.
- Analog and AES audio inputs and outputs.
- 2 x SFP+ .
- Dual PSU as standard.

Block Diagram



Order Codes

The following product order codes are covered by this manual:

FGAFA 611121X - UHD1200 Single-channel 4K UHD-1 video & audio processing unit with 12G SDI (BNC or fiber), remote or front panel control and Dual PSUs.

FGAFA 611131Y - UHD1200 Single-channel 4K UHD-1 video & audio processing unit with 12G SDI (BNC or fiber), Balanced & Unbalanced AES and analog audio I/O, remote or front panel control and Dual PSUs.

FGAFA 6111141X - UHD1100 Single-channel 4K UHD-1 video & audio processing unit with SDI (BNC or Fiber), remote or front panel control and Dual PSUs.

FGAFA 6111151Y - UHD1100 Single channel 4K UHD-1 video & audio processing unit with SDI (BNC or Fiber), Balanced & Unbalanced AES and analog audio I/O, remote or front panel control and Dual PSUs.

Technical Specifications



Inputs and Outputs	
Signal Inputs	
Serial Digital Inputs	4 x 75 Ohm SD/HD/3Gb/s serial digital with embedded audio 1 x 75 Ohm UHD 6G/UHD12G/HD/3Gb/s serial digital with embedded audio
Input Standards	UHDTV1 video interfaces: <ul style="list-style-type: none"> • Square division (4 x 1.5Gbps links) for <= 30fps • Square division (4 x 3Gbps links) for > 30fps • Sample interleaved SMPTE ST425-3 (2 x 3Gbps links) for <=30fps • Sample interleaved SMPTE ST425-5 (4 x 3Gbps links) for > 30fps 12Gb/s UHD-4K SDI, SMPTE ST-2082-10 3Gb/s HD-SDI, SMPTE425 level A, dual-link level B 1.5 Gb/s HD-SDI SMPTE292M/SMPTE299M 270 Mbit/s SD-SDI SMPTE259M
Reference	1 x loop-through HDTV Tri-/SD Bi- (black and burst) SMPTE 240M/274M, with auto selection dependent on output standard
Audio AES (option)	Up to 8 ¹ balanced AES inputs/outputs via 25-way D-type Up to 8 ¹ unbalanced AES inputs/outputs via BNC ¹ AES audio connectors may be configured as input or output.
Audio Analog (option)	2 x stereo analog inputs via 25-way D-type
Signal Outputs	
Serial Digital Outputs	4 x 75 Ohm SD/HD/3Gb/s serial digital with embedded audio
Output Standards	UHDTV1 video interfaces: <ul style="list-style-type: none"> • Square division (4 x 1.5Gbps links) for <= 30fps • Square division (4 x 3Gbps links) for > 30fps • Sample interleaved SMPTE ST425-3 (2 x 3Gbps links) for <=30fps • Sample interleaved SMPTE ST425-5 (4 x 3Gbps links) for > 30fps 3Gb/s HD-SDI, SMPTE425 level A, dual-link level B 1.5 Gb/s HD-SDI SMPTE292M/SMPTE299M 270 Mbit/s SD-SDI SMPTE259M
Audio AES (option)	Up to 8 ¹ balanced AES inputs/outputs via 25-way D-type Up to 8 ¹ unbalanced AES inputs/outputs via BNC ¹ AES audio connectors may be configured as input or output.
Audio Analog (option)	2 x stereo analog outputs via 25-way D-type

Standards		
Input/Output Standards Supported	525 59i	1080 25psf
	625 50i	1080 29psf
	720 23p	1080 30psf
	720 24p	1080 50p-A
	720 25p	1080 59p-A
	720 29p	1080 60p-A
	720 30p	1080 50p-B
	720 50p	1080 59p-B
	720 59p	1080 60p-B
	720 60p	2160 23p
	1080 23p	2160 24p
	1080 24p	2160 25p
	1080 25p	2160 29p
	1080 29p	2160 30p
	1080 30p	2160 50p-A
	1080 50i	2160 59p-A
	1080 59i	2160 60p-A
1080 60i	2160 50p-B	
1080 23psf	2160 59p-B	
1080 24psf	2160 60p-B	

Interface Formats		
SD	625i, 525i	
HD	720p, 1080i, 1080p	
3G Level A	1080p	
3G Level B	1080p	
6G	2160p	2-sample interleaved ST.2081
12G	2160p	2-sample interleaved ST.2082-10
Dual Link 2SI	2160p	2-sample interleaved ST.425-3
Quad Link 2SI	2160p	2-sample interleaved ST.425-5
Quad Link SQD	2160p	Square Division 1.5G, 3G

Input Capabilities							
Input	SD	HD 720p (23-60) 1080i (50-60) 1080p (<=30)	3G 1080p-A 1080p-B	6G 2160p (<=30)	12G 2160 (>30)	Dual Link 2160p 2SI (<=30)	Quad Link 2160p 2SI (>30) SQD (23-60)
SDI 1	✓	✓	✓			✓ Ch1	✓ Ch1
SDI 2	✓	✓	✓			✓ Ch2	✓ Ch2
SDI 3	✓	✓	✓				✓ Ch3
SDI 4		✓	✓				✓ Ch4
12G SDI		✓	✓	✓	✓		
SFP 1 (Rx)	✓	✓	✓				

Input	SD	HD 720p (23-60) 1080i (50-60) 1080p (<=30)	3G 1080p-A 1080p-B	6G 2160p (<=30)	12G 2160 (>30)	Dual Link 2160p 2SI (<=30)	Quad Link 2160p 2SI (>30) SQD (23-60)
SFP 2 (Rx)	✓	✓	✓				
SFP 3 (Rx)		✓	✓				
SFP 4 (Rx)		✓	✓	✓	✓		

Output	SD	HD 720p (23-60) 1080i (50-60) 1080p (<=30)	3G 1080p-A 1080p-B	6G 2160p (<=30)	12G 2160 (>30)	Dual Link 2160p 2SI (<=30)	Quad Link 2160p 2SI (>30)	Quad Link 2160p SQD (23-60)
SDI 1	✓	✓	✓			✓ Ch1	✓ Ch1	✓ Ch1
SDI 2	✓	✓	✓			✓ Ch2	✓ Ch2	✓ Ch2
SDI 3		✓	✓			✓ Ch1	✓ Ch3	✓ Ch3
SDI 4		✓	✓			✓ Ch2	✓ Ch4	✓ Ch4
12G SDI		✓	✓	✓	✓	✓ 6G	✓ 12G/Ch4	✓ 3G Ch4
SFP 1 (Tx)	✓	✓	✓			✓ Ch1	✓ Ch1	✓ Ch1
SFP 2 (Tx)	✓	✓	✓			✓ Ch2	✓ Ch2	✓ Ch2
SFP 3 (Tx)		✓	✓	✓	✓	✓ 6G	✓ 12G/Ch3	✓ Ch3
SFP 4 (Tx)		✓	✓	✓	✓	✓ 6G	✓ 12G/Ch4	✓ Ch4

Note: Simultaneous outputs of dual/quad link and 6/12G via BNC are available only when the UHD output interface is set to 12G via the 2SI mode control. See [2SI Mode](#) on page 35 for more information.

SFP inputs will show as available if any module is fitted, although will only report the detection of video if an Rx module is fitted.

Conversion Functions

Modes	SD/HD/3G/UHDTV Up, Down, and Cross Conversion
Conversion	Linear/Motion Adaptive
Aspect Ratio Conversion (Manual or Auto)	AFD (SMPTE 2016), VI (RP186), WSS (L23)

Audio

Embedded Audio	Each processing channel includes 16-channel embedded audio processing. PCM audio processing includes channel level gain and delay compensation, as well as pair level routing with L/R swap and phase invert feature.
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Throughput Delay			
Input	Output	Min Delay	Max Delay
UHD SQD	UHD SQD	0.1ms	Min plus 1 field
UHD SQD	UHD 2SI	<10ms	Min plus 1 field
UHD 2SI	UHD 2SI	0.1ms	Min plus 1 field
UHD 2SI	UHD SQD	<10ms	Min plus 1 field
UHD SQD	3G/HD	<18ms	Min plus 1 field
UHD 2SI	3G/HD	<8ms	Min plus 1 field
UHD SQD	SD	<20ms	Min plus 1 field
UHD 2SI	SD	<10ms	Min plus 1 field
3G/HD	UHD SQD	<15ms	Min plus 1 field
3G/HD	UHD 2SI	<7ms	Min plus 1 field
SD	UHD SQD	<16ms	Min plus 1 field
SD	UHD 2SI	<8ms	Min plus 1 field

With frame rate conversion, the average delay is <130ms.

Note: Sync Mode (see [page 50](#)) applies only when the input and output are the same format, e.g. 1080 50i to 1080 50i.

Note: The **ARC** feature (see [page 50](#)) is not available in UHD to UHD conversion, but is always active for UHD up/down.

Audio Processing Delay Automatically tracks video processing delay.

Power

Input voltage range (primary & secondary)	100 to 240VAC, 47 to 63Hz, 1A, via three-pin IEC power socket
Power Consumption	68W

Mechanical

Temperature Range	0 to 40°C operating
Cooling	Internal fan, side venting
Weight	2.4 kg
Case Type	1RU, rack mounting
Dimensions	44mm x 430mm x 170mm (H x W x D)

Note: The AES audio connector may be assigned as either input or output.

3 Installation

Note: Refer to *Important Safety Information* on page iii before installing and connecting to power.

Unpacking the Unit

The unit is packed in a single cardboard box. Unpack the box carefully and check for any shortages or shipping damage. Report any shortages or shipping damage to Grass Valley immediately.

The box contains the following items:

- 1 x UHD converter unit.

Note: Retain the product packaging. It may be required if returning the unit to Grass Valley.

Rack Mounting the Unit

Ensure that sufficient space is available for the unit.

When installing the unit, place on a suitably specified and installed rack shelf and secure the unit using the front rack ears.

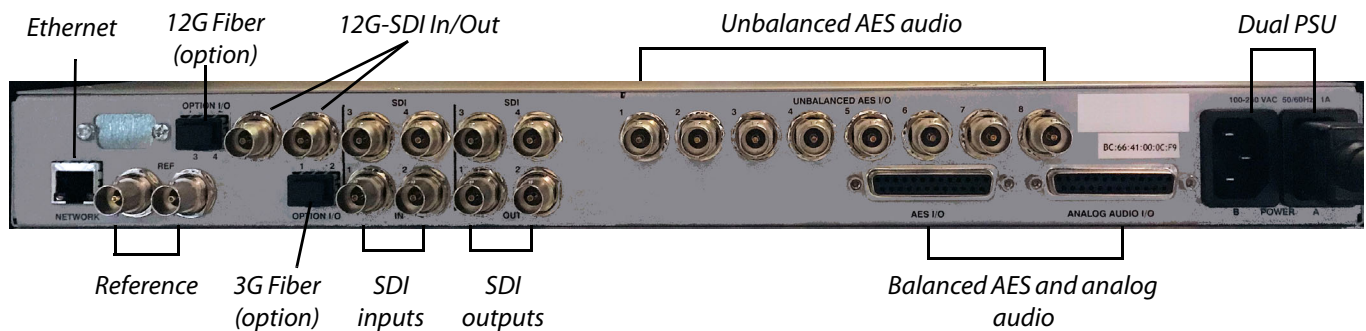
Ventilation

Ensure that there is a free flow of air at the front, rear, and sides of the unit in order to dissipate the heat produced during operation. Installations should be designed to allow for this.

Note: Do not obstruct the ventilation holes on the right-hand side of the unit. Damage to the equipment may result.

4 Connections

This section describes the physical input and output connections provided by the UHD range. The rear panel accommodates a variety of different connections, depending on the model. The illustration below shows the UHD1200 model with the AES audio option.



Input and Output Connections

Label	Description	Connector
12G SDI in	12G SDI input	1 x BNC
12G SDI out	12G SDI output	1 x BNC
SDI in 1, 2, 3, 4	SDI inputs	4 x BNC
SDI out 1, 2, 3, 4	SDI outputs	4 x BNC
Network	10/100 BaseT Ethernet connection	1 x RJ45
Reference	Reference loop	2 x BNC
Option I/O	Signal input/output	2 x dual SFP compatible
Unbalanced AES I/O (option)	Unbalanced AES audio input/output	8 x BNC
AES I/O (option)	Balanced AES audio input/output	1 x 25-way D-type
Analog Audio (option)	Analog audio input/output	1 x 25-way D-type
Power A, B	PSU inputs (primary, secondary)	2 x 3-pin IEC

Note: If one of the reference connectors is not in use, it must be fitted with a 75 Ohm BNC terminating plug. If not terminated correctly, genlock performance may be degraded.

Note: The option sockets allow for up to two dual Small Form Factor Pluggable (SFP) transceiver modules. The SFP modules can be used to add optional fiber connectivity, or optional I/O using HD BNC connectors.

Fiber Connectivity

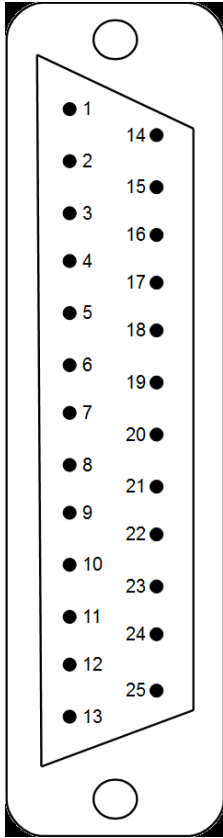
The UHD1200 is equipped with two dual fiber ports. These can be configured as one of the following:

- Dual HD/3G receiver (RX/RX)
- Single HD/3G/12G receiver (RX) (12G available only from the ports marked **3** and **4**)
- Dual transmitter (TX/TX)
- Transceiver (RX/TX)

Note: If no fiber option is fitted on the rear panel, do not remove the safety covers from the option sockets.

Audio Connection Pin Numbers (Option)

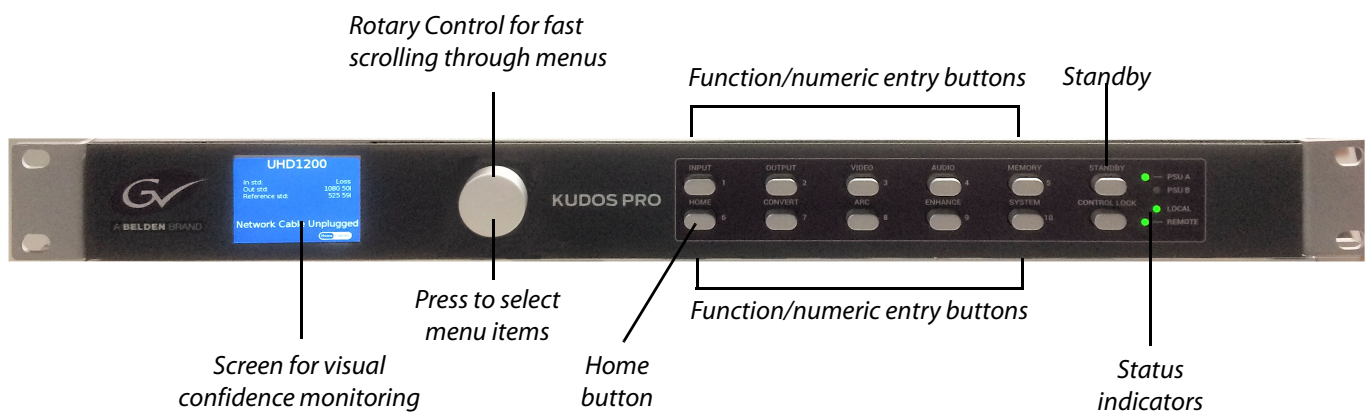
Balanced and Unbalanced AES audio and analog audio support are available as an option. Connection is via 25-way D-type, or 8 x BNCs for unbalanced AES. AES connectors can be configured as either input or output.

Analog Audio I/O		25 Way D-Type Connector	AES Audio I/O	
Channel	25 Way D-Type Pin		Channel	25 Way D-Type Pin
Chassis	1		Chassis	1
GND1	14		GND1	14
Analog Out 4+	2		Port 8+	2
Analog Out 4-	15		Port 8-	15
Analog Out 3+	3		Port 7+	3
Analog Out 3-	16		Port 7-	16
GND2	4		GND2	4
GND3	17		GND3	17
Analog Out 2+	5		Port 6+	5
Analog Out 2-	18		Port 6-	18
Analog Out 1+	6		Port 5+	6
Analog Out 1-	19		Port 5-	19
GND4	7		GND4	7
GND5	20		GND5	20
Analog In 4+	8		Port 4+	8
Analog In 4-	21		Port 4-	21
Analog In 3+	9		Port 3+	9
Analog In 3-	22		Port 3-	22
GND6	10		GND6	10
GND7	23		GND7	23
Analog In 2+	11		Port 2+	11
Analog In 2-	24		Port 2-	24
Analog In 1+	12		Port 1+	12
Analog In 1-	25		Port 1-	25
GND8	13		GND8	13

5 Front Panel Features

The front panel provides a user-friendly interface for complete control of the unit. Various buttons provide easy access to the unit's features.

Front Panel Layout



Front Panel Controls

Item	Description
Display	Shows either the output video or the menu options.
Rotary control	<p>Scrolls through the menu lists, selects menu options, and adjusts values.</p> <ul style="list-style-type: none"> • Rotate clockwise or anti-clockwise to scroll down or up through a menu list or to adjust values on a menu option. • Press to select a menu option or confirm changes. • Press and hold to jump to the Back option under a menu list. • Press and hold when entering parameter values to return the parameter to default value. • When at the Home screen, press to toggle between status display and video monitoring. • Rotate to display the 4 UHD quadrants on the front panel screen when using SQD input.
Home button	<p>Press to return to the default Home screen at any time.</p> <p>When on the Home screen, press the Home button to toggle between status display and video monitoring.</p>
Function/Numeric buttons	Provide direct access to menus and enable numeric input.

Item	Description
Standby button	<p>Turns the unit on or puts the unit into standby mode. Operation is as follows:</p> <p>Use Case 1 - unit connected to mains power with Standby button OFF:</p> <ul style="list-style-type: none">• When power is connected, PSU LEDs show green and fan runs for about 1.5s.• PSU LEDs then show red. <p>Use Case 2 - unit connected to mains power with Standby button OFF. Short press Standby button, i.e. < 1s:</p> <ul style="list-style-type: none">• PSU LEDs show red. When Standby button is pressed, PSU LEDs show green and fan runs for the duration of the button press.• PSU LEDs then show red. <p>Use Case 3 - unit connected to mains power with Standby button OFF. Long press Standby button, i.e. > 1s:</p> <ul style="list-style-type: none">• PSU LED(s) show red. When Standby button is pressed, PSU LEDs show green and remain lit after the button is released.• Splash screen is shown on unit display and unit powers up. <p>Use Case 4 - unit connected to mains power with Standby button ON. Long press Standby button, i.e. > 1s:</p> <ul style="list-style-type: none">• Unit begins shutdown, as indicated by black screen.• PSU LEDs show red and fan stops after 15s.
Control Lock button	<p>Press to lock the front panel controls.</p> <p>Press and hold for three seconds to unlock the front panel controls.</p>
PSU Status LEDs	<p>Shows the status of the dual PSUs.</p> <ul style="list-style-type: none">• PSU A illuminated green: PSU A (primary) in use.• PSU B illuminated green: PSU B (secondary) in use.• PSU illuminated red: unit in standby (power saving) mode.
Control Status LEDs	<p>Shows the monitoring status.</p> <ul style="list-style-type: none">• Local illuminated: local control enabled.• Remote illuminated: browser-based UI may be in use.

6 System Operation

The KudosPro UHD range can be controlled directly, using the front panel hardware buttons, or remotely, using either RollCall or a software UI in an HTML5-compliant browser window.

The operating instructions given here focus on operation via the front panel. Operation via the browser-based UI follows the same basic control sequences, and should be self-explanatory. See [Operation Using RollCall](#) on page 69 for information on using the unit with RollCall.

Turning the Unit On

- Press and hold the **Standby** button.

The PSU LED turns green and the splash screen is shown on the display. After a short period, the Home screen is displayed.

The Home Screen

The Home screen shows the following status information:

- Unit name;
- IP address;
- Input and output standard;
- Reference standard.

The Home screen can be displayed at any time by pressing the **Home** button.

Note: If no controls are used, the unit will automatically return to the Home screen after a few minutes.

Video Monitoring

To view the output video on the front panel monitor screen, first press the **Home** button to return to the Home screen. From here, pressing the rotary control or the Home button will toggle between Home screen and video monitor.

Using the Front Panel - Basics

The front panel buttons provide access to the KudosPro UHD control menus.

- Turn the rotary control clockwise to scroll down through a menu list, or anti-clockwise to scroll up.
- When on the required menu item, press the rotary control to select it.
- When a menu option that offers adjustment is selected, such as audio gain, the value can be adjusted by turning the rotary control. This allows control for fine-tuning values in small increments. When the desired value has been entered, press the rotary control to set the value.
- Select **Back** at the bottom of each menu page go back up a level, or simply select another front panel button to change to a different menu.
- To return to the Home screen, press the **Home** front panel button.

Notes

Press and hold the rotary control for a few seconds to jump to the **Back** option when in any menu list.

To reset any parameter back to its default value: from the parameter selected, press and hold the rotary control for a few seconds.

Entering Numeric Characters from the Front Panel

Fields requiring numeric input are displayed with a cursor. Use the rotary control to move the cursor to the required position, then press the appropriate front panel button to enter a value. Press the rotary control when complete.

Entering Numeric Characters from the Rotary Control

Where a parameter may be set from a range of values with only certain specific steps, numeric entry is via the rotary control:

- 1 Press the rotary control to show the current value, e.g. contrast.
- 2 Rotate the control clockwise to increment the value by each step, e.g. contrast increments in steps of 0.2 dB. Likewise, rotate the control counter-clockwise to decrement the value.
- 3 The value will not pass beyond its defined range, e.g. valid contrast adjustments are from -6.0 dB to 6.0 dB.
- 4 To return to default, press and hold the rotary control. The values are reset.
- 5 When the value is set as required, press the rotary control again to confirm and return to the last menu.

Selecting an Action Using On/Off

Where an action is available to turn a feature on or off using the rotary control:

- 1 Scroll the rotary control to the required item, e.g. **Video > Enable proc amp**.
- 2 Press the rotary control to view the current status, e.g. **On**.
- 3 To change the action, turn the rotary control until the desired action is visible, e.g. **Off**. Press the rotary control to select.

Resetting Menu Options to Default Values

To reset a menu option to its default value:

- With the menu option selected, press and hold the rotary control for a few seconds.

Front Panel Buttons

Input

Press **Input** to specify a video input source. Available functions are:

Menu Option	Operation
Input select	<p>Choose from:</p> <ul style="list-style-type: none"> • SDI 1 • SDI 2 • SDI 3 • SDI 4 <p>(SD, HD and 3G support only)</p> <ul style="list-style-type: none"> • Quad input - Selects UHD input via BNC inputs 1-4 (Quad link) or inputs 1-2 (Dual link). <p>Note: Audio and metadata are processed from Input 1 only. Audio and metadata on Inputs 2 - 4 are ignored.</p> <ul style="list-style-type: none"> • 12G UHD - Selects 12G BNC Input. Accepts HD, 3G, UHD 6G and UHD 12G. • SFP1 (if RX module fitted to slot 1). Accepts SD, HD and 3G. • SFP2 (if RX module fitted to slot 2). Accepts SD, HD and 3G. • SFP3 (if RX module fitted to slot 3). Accepts HD, 3G. • SFP4 (if RX module fitted to slot 4). Accepts HD, 3G, UHD 6G and UHD 12G. <p>The currently selected input is highlighted.</p>
UHD Interface	<p>Input format setting for Dual/Quad link interface only (BNCs 1-4). Choose from:</p> <ul style="list-style-type: none"> • Auto (default) - use embedded PID to identify Sample Interleaved format. If ST425-3/5 PID (0x96,0x97,0x98) is not detected, Square Division is enabled. • SQD - manually selects Square Division. • 2SI - manually selects ST425-3/5 format.
SDI 1-4 std status	<p>Reports interface standard on each input, e.g. 1080 59p-A, 1080 50i, etc. Loss = missing input.</p>
SDI 1-4 conn status	<p>Reports SD/HD/3G/UHD status of SDI Inputs 1-4, plus status of individual quad links from a UHD source. Valid values are:</p> <ul style="list-style-type: none"> • None: No connection detected. • OK: Connection present.
UHD std status	<p>Reports interface standard present on UHD quad-link inputs, e.g. 1080 59p-A, 1080 50i, etc. Loss = missing input.</p>

Menu Option	Operation
UHD conn status	SDI Inputs 1-4 Valid values are: <ul style="list-style-type: none"> • None: UHD has not been detected. • Inconsistent: The detected input is a possible UHD format but does not match the other inputs. • 2SI input [n]: Two-Sample Interleaved UHD has been detected. n indicates the channel number contained in the PID. Where this does not match the input number, it will be necessary to reconnect the inputs in the correct order. • SQD: Square Division UHD has been detected. • Error: [Inputs 2-4 only]. Indicates a timing error relative to input 1. UHD Inputs (Quad SDI, 12G SDI and SFP 3) Valid values are: <ul style="list-style-type: none"> • OK • None
12G BNC std status	Reports interface standard on each input, e.g. 1080 59p-A , 1080 50i , etc. Loss = missing input.
12G BNC conn status	Reports interface standard on each input, e.g. 1080 59p-A , 1080 50i , etc. Loss = missing input.
SFP 1-4 std status	Reports interface standard on each SFP, e.g. 1080 59p-A , 1080 50i , etc. Loss = SFP and input not present.

Note: The UHD1100/1200 automatically detects the input standard.

Output

Press **Output** to make settings and adjustments to the video output signal. Available functions are:

Menu Option	Operation
Out std	<p>Use this control to set the required output standard. Available options are listed on page 22.</p> <p>Note: 2160 23p-30p outputs are carried on -</p> <ul style="list-style-type: none"> • 4 x 1.5Gbps links when using Square Division; • 2 x 3Gbps Level C links (outputs A1 and A2) when using Sample Interleaved; • or 1 x 6Gbps link. <p>2160 50p-60p outputs are carried on 4 x 3Gbps links. Single-link 12G output is available via the 12G BNC connector (see <i>2SI Mode</i>, below).</p> <p>Scroll through the list until the required output standard is reached, then press to select. Press the rotary control again to confirm and return to the Output menu.</p> <p>Note: When input and output are both UHD, the output frame rate will follow the input frame rate.</p>
Current out std	Displays the output standard.
UHD interface	<p>Selects the output format. Choose from:</p> <ul style="list-style-type: none"> • 2SI: Sample-interleaved format. Allows 6G/12G output via the 12G BNC. • SQD (quad link): Square division format. Available only via output BNCs 1-4 and SFPs 1-4. When selected, the 12G output is not available as the 12G BNC is a duplicate of link 4.
2SI Mode	<p>When UHD Interface is set to 2SI, the output available on SFP3/4 and the 12G BNC can be selected as either 12G or Quad-link fiber:</p> <ul style="list-style-type: none"> • 12G - 12G BNC and SFP3/4 output UHD in 12G single-link format. • Quad SFP - SFP3/4 are set to output 3G quad-link channels 3 & 4 (channels 1 & 2 are output from SFP1/2). The 12G BNC outputs a copy of quad-link channel 4.
UHD 2SI PID	<p>Sets the embedded Payload ID for Sample Interleaved. Choose from:</p> <ul style="list-style-type: none"> • UHD - some quad link monitors may not operate with UHD PID. In these cases, select HD/3G. Note that 12G monitors will require a UHD PID. • HD/3G
UHD ANC embed	<p>Sets whether ANC (VANC + HANC) data is inserted on all links or just link 1.</p> <p>For non-UHD output standards, ANC is inserted on all output BNCs.</p>

Menu Option	Operation
Legalization	<p>The Legalizer ensures that the output video stays within the legal RGB gamut limit, making it suitable for the broadcast signal chain. To achieve this, the legalizer reduces the gain equally on all channels. Anything in the RGB space above the selected value (e.g. 700mV) is scaled down to that value. Anything in the RGB space below 0mV is clipped to 0mV. This is a good compromise between minimizing hue change and raising apparent brightness.</p> <p>Legalizer choices are:</p> <ul style="list-style-type: none">• Off• 700mV• 721mV• 735mV• 746mV
Test pattern	<p>Choose from:</p> <ul style="list-style-type: none">• Off• Black• Ramp• Bars
Default output	<p>Choose from:</p> <ul style="list-style-type: none">• Black• Mute - mutes SDI output.

Video

Press **Video** for controls allowing various types of signal processing to be applied to the signal being converted. Available functions are:

Process Amplifier (Proc Amp)

Allows video inconsistencies to be corrected.

Menu Option	Operation
Enable proc amp	Select On to activate Proc Amp functions.
Black level	Adjusts the black level from -100mV to +100mV in 0.8mV steps. Default is 0mV.
Contrast	Adjusts the contrast from -6dB to +6dB in 0.2dB steps. Default is 0dB.
Saturation	Adjusts the color saturation from -6dB to +6dB in 0.2dB steps. Default is 0dB.
Y gamma	Adjusts the luma gamma from 0.4 to 1.7 in 0.1 steps. Preset is 1.0.
Color correct	Allows corrections to be made to the video color. See Color Correct below.

Color Correct

Menu Option	Operation
Enable correct	Select On to activate Color correct functions.
Red lift	Red channel offset can be adjusted from -200mV to +200mV in steps of 0.8mV. Default is 0mV.
Red gain	Red gain can be adjusted from -6dB to +6dB in steps of 0.2dB. Default is 0dB.
Green lift	Green channel offset can be adjusted from -200mV to +200mV in steps of 0.8mV. Default is 0mV.
Green gain	Green gain can be adjusted from -6dB to +6dB in steps of 0.2dB. Default is 0dB.
Blue lift	Blue channel offset can be adjusted from -200mV to +200mV in steps of 0.8mV. Default is 0mV.
Blue gain	Blue gain can be adjusted from -6dB to +6dB in steps of 0.2dB. Default is 0dB.

Additional Video/Audio Delay

Menu Option	Operation
Delay	For progressive sources, this control adds additional video delay from 0 to 8 frames in steps of 1 frame. Preset = 0 frame. For interlaced sources, this control adds additional video delay from 0 to 8 fields in steps of 1 field. Preset = 0 field.

Audio

The **Audio** button allows you to access audio routing, shuffling and control menus.

Note: Embedded audio is supported by all models. Analog and AES audio are available only if the audio option has been purchased.

Terminology in this section:

- **Source audio** (input pairs or channels) refers to audio associated with the incoming source material, which could be embedded audio, balanced or unbalanced AES (audio option only) or analog audio (audio option only);
- **Process pairs or channels** (sometimes abbreviated to *process pr* in the menus) refer to audio processing channels, to which input audio pairs may be assigned;
- **Output pairs or channels** refer to audio coming from the processing channels which is routed to the unit outputs. Output audio can be embedded, balanced or unbalanced AES (audio option only) or analog (audio option only).

Audio menus are:

- Audio routing
- Audio shuffle
- Audio control
- Analog I/O (audio option only)
- AES I/O (audio option only)
- In pair status
- Out pair status

These are described in the sections below.

Audio Routing

To select the audio source to be passed to each audio processor, first select the process channel from the list of process pairs (1 to 8), then select the source audio pair from the list below to assign to the chosen channel.

Source Audio	Available Choices
Embedded audio	Embedded 1 - 8
AES	AES 1 - 8
Analog	Analog 1 - 2

For example, to use source audio from SDI Embedded 3 in audio processing channel 2:

- Press the **Audio** button on the front panel.
- Scroll to **Audio routing** then press the rotary control.
- Scroll to **Process pair 2** in the process pair list, then press the rotary control.
- Scroll to **Embedded 3** in the input pair list, then press the rotary control.
- Press the rotary control again to return to the previous menu.
- Scroll to the **Back** menu item and press the rotary control to return to the **Audio** menu.

Audio Shuffle

Audio shuffle allows routing from each process pair to the output. Facilities to invert audio phase and insert tone or silence are also available from this menu.

Assigning an Output from a Processing Channel

Select the required output channel from the list of channels (Channel 1 to Channel 16).

A menu of choices for the selected channel is displayed. For example, if Channel 1 is selected, the menu choices are:

Audio Shuffle	Available Choices
Ch [x] source	Select process channel from 1 to 16.
Invert phase	Causes the phase of left and right audio channels to be inverted. This is useful for dealing with input audio discrepancies. Choices are: <ul style="list-style-type: none"> • Off • On (default)
Ch [x] output	Choices are: <ul style="list-style-type: none"> • Use routing (default). • Tone (inserts tone into the chosen audio channel). • Silence (mutes the chosen audio channel).

Selecting **Ch [x] source** displays the available process pairs. From the list of process channels, choose the process channel to route to the chosen output channel (1 to 16):

Example 1: To assign process channel 2 to output SDI embedded channel 8:

- Press the **Audio** button on the front panel.
- Scroll to **Audio shuffle** then press the rotary control.
- Scroll to **Channel 8** in the output pair list, then press the rotary control.
- Scroll to **Ch 8 source** in the list, then press the rotary control.
- Scroll to **2** in the list, then press the rotary control.
- Scroll to the **Back** button, then press the rotary control again to return to the **Audio shuffle** main menu.

Example 2: To invert phase for a chosen audio channel:

- Select the required output channel from the list of channels (Channels 1 to 16)
- Turn **Invert phase** to **On**.

Note: Phase invert is available for PCM audio only.

Note: The **Audio Shuffle** menu allows any configuration of audio channels to be routed to the output. Illegal combinations will result in the output being forced to silence.

Note: If both audio channels of an audio pair have been derived from non-PCM audio channels, there are two possible states, **Non-PCM** or **Forced silence**. To be recognized as valid non-PCM (**N**), both channels must:

- Have come from the same input pair;
- Have the left and right channels the correct way round;
- Not have the phase inverted.

A failure of any of these conditions will cause the pair to be muted and the status to be reported as **Forced silence**.

Audio Control

Audio control adjusts the audio on each processing channel.

Audio Control	Available Choices
Audio gain	<p>Audio gain can be adjusted from -18dB to +18dB in steps of 0.1dB. Default is 0dB.</p> <p>Select the required output channel from the list of channels (Out Ch 1 to Out Ch 16), then adjust the gain using the rotary control. Alternatively, use the Master control to adjust the gain for all channels at once: individual channel gain offsets are preserved and limited at the maximum and minimum gain values.</p>
Delay	<p>Delay can be adjusted for each of the sixteen audio channels. The adjustment range is -40ms to +200ms in 1ms steps. The default value is 0ms.</p> <p>To adjust delay offset, first select the process channel from the process channel list (Process channel 1 to Process channel 16) then select the required delay offset using the rotary control. Alternatively, use the Master control to adjust the delay for all pairs at once: individual pair delay offsets are preserved and limited at the maximum and minimum delay values. With delay set to zero, the audio will be co-timed with the video.</p>
Delay status	Shows the total delay per channel in ms.
Global delay status	Shows the current total video delay through the unit in ms.
Dolby E align	<p>Dolby E alignment offset can be selected from -10 lines to +10 lines in steps of 1 line.</p> <p>Default is 0 lines.</p>
Tone freq	<p>Tone frequency can be selected from 100Hz to 10000Hz in steps of 100Hz.</p> <p>Default is 1000Hz.</p>

Notes

- 1 Global delay is applied to all channels. Individual channel delays are added/subtracted from this delay.
- 2 Channel delay is added instantaneously and will produce an audible disturbance.
- 3 Global delay is added or subtracted at the rate of 2ms/s, and does not produce an audible disturbance. Allow time for the global delay to settle to the desired value.
- 4 The maximum audio delay (video processing delay + added audio delay) is limited to 260ms.

Analog I/O (audio option only)

The **Analog I/O** menu allows output audio pairs to be mapped to the outgoing analog pairs.

Analog I/O	Available Choices
Out 1 source	Ch1 Pair 1 to Pair 8 Ch2 Pair 1 to Pair 8
Out 2 source	Ch1 Pair 1 to Pair 8 Ch2 Pair 1 to Pair 8
Out 1 level	Adjusts the analog audio DAC level for analog audio output Pair 1, from 12dB to 24dB in steps of 0.5dB. Default is 18dB.
Out 2 level	Adjusts the analog audio DAC level for analog audio output Pair 2, from 12dB to 24dB in steps of 0.5dB. Default is 18dB.
In 1 headroom	Adjusts the analog audio ADC headroom level for analog audio input Pair 1, from 12dB to 24dB in steps of 0.5dB. Default is 18dB.
In 2 headroom	Adjusts the analog audio ADC headroom level for analog audio input Pair 2, from 12dB to 24dB in steps of 0.5dB. Default is 18dB.

AES I/O (audio option only)

Balanced AES audio I/O is available via 25-way D-type connectors, and unbalanced AES via BNC connectors. Both are configurable as either input or output. See [Audio Connection Pin Numbers \(Option\)](#), on page 28 for balanced AES audio 25-way connector pin numbers.

Balanced or Unbalanced audio is selected from the **AES I/O** menu. Select **AES I/O**, then scroll to the bottom of the port list and select **AES bal/unbal**. Select **Balanced** or **Unbalanced** as required.

Each AES port can be selected from the AES port list (Port 1 to Port 8), and then be assigned as:

- **Input** (default), or
- **Output**, any of Ch1/Ch2 Pair 1 to Pair 8.

Input Pair Status

Options available for each input pair:

Source Audio	Options Available
Embedded audio	Embedded 1 - 8
AES	AES 1 - 8
Analog	Analog 1 - 2

Press the rotary control to view the input pair status:

- **PCM**: audio is PCM.
- **Loss**: no audio detected.
- **Data**: data detected on audio channel.
- **DolbyE**: DolbyE audio detected.

Out Pair Status

Status information is available for each output pair from the output pair list (Output pair 1 to Output pair 8).

- **PCM**
- **Muted**
- **Test tone**
- **Non-PCM**
- **Forced silence**

Note: The **Audio Shuffle** menu allows any configuration of audio channels to be routed to the output. Illegal combinations will result in the output being forced to silence.

If both audio channels of an audio pair have been derived from non-PCM audio channels, there are two possible states, **Non-PCM** or **Forced silence**. To be recognized as valid non-PCM, both channels must satisfy 3 conditions:

- Have come from the same input pair;
- Have the left and right channels the correct way round;
- Not have the phase inverted.

Failure of any of these conditions will cause the pair to be muted and the status to be reported as **Forced silence**.

Memory

The **Memory** button allows the unit to be reset to one of 10 previously saved configurations. Available functions are:

Menu Option	Operation
Memory Select	Press to select a memory to recall, save or clear.
Recall Memory	Press to load the contents of the selected memory.
Save Memory	Press to save current configuration to the selected memory. Please note network settings are NOT saved.
Clear Memory	Press to clear the selected memory.
Reset to Defaults	All controls are reset to their default values, except for network configuration and IP addresses.
Factory Reset	All controls are reset to their default values, including network configuration and IP addresses.

Home

Causes the Home page to be displayed.

Convert

Convert provides a set of solutions to enable optimized conversion of film-originated content. Film-originated content may be transported by standards supporting the original film frame rate, such as 1080 23.98p. Film-originated content may also be packed into interlaced standards using a rule-based method to map source frames to interlaced fields. In this case, the interlaced standard's content is described as having a *film cadence*.

In order to perform high quality conversion of film-originated content, the cadence must be identified and used to adapt the interpolation process. **Film mode** (see [Interlaced Inputs](#), on page 85, and below) also permits the synthesis of film cadence in the output.

Clean cut

Clean cut processing detects scene changes and prevents interpolation across the cut. Only permitted if film cadence is off.

Default = **On**.

Film mode

Use **Film mode** if input is interlaced (1080i or 525 or 625) and contains film-originated content. This adjusts the conversion aperture to give maximum vertical bandwidth.

Default = **Off**.

Note: This mode is relevant only for film originated content where the cadence is carried in an interlaced format. Where film-originated content is carried in a progressive format, Film mode should not be used.

Input cadence

The Input cadence menu allows the user to define any cadence associated with the input video.

Status

Displays the current cadence.

Enable

If the input content is film-originated with a 2:3 cadence, or simulates film-originated content, **Enable** should be set to **On**. Otherwise, it should be set to **Off**.

This feature is not available when converting UHD 59p to UHD 23p, or UHD 60p to UHD 24p.

Default = **Off**.

Example 1:

Input UHD 59p (with embedded 3:2 cadence), Output 1080 23p.

Input frame sequence: A, A, B, B, B, C, C, D, D, D ...

When cadence is **On** the output frame sequence will be: A, B, C, D ...

When cadence is **Off** the output will be a linear frame rate conversion.

2:3 Source

When set to **Automatic** (default) the input cadence will be determined by the cadence detection circuit. This feature is useful when the source material contains mixed cadences. When set to **Input timecode**, the user defines the relationship between timecode and the 2:3 sequence. This feature is useful when the source material contains known continuous 2:3. This setting removes any uncertainty that may be associated by use of the sequence detector (automatic mode).

2:3 Start hour

This control allows the user to define the position of timecode when the 2:3 sequence begins. The assumption is made that the start of the 2:3 sequence is aligned with the start of program and under normal working practices, that the start of program is coincident with an integer hour value.

This control is active only when **2:3** is set to **Input timecode** and Drop-Frame Timecode is present. For non-Drop Frame Timecode sources this control has no effect.

Control is available from 1 hour to 23 hours, in steps of 1 hour.

The default is 1 hour.

Insert cadence

Allows the insertion of film cadence on the output. Output frame rate must be 50, 59 or 60Hz. For all other output frame rates, cadence processing is automatically disabled.

Example 1:

Input 1080 23p, Output UHD 59p.

Input frame sequence: A, B, C, D ...

When cadence is **On** the output frame sequence will be A, A, B, B, B, C, C, D, D, D ...

When cadence is **Off** the output will be a linear frame rate conversion.

Example 2:

Input 720 25p, Output UHD 50p

Input frame sequence: A, B, C, D ...

When cadence is **On** the output frame sequence will be: A, A, B, B, C, C, D, D ...

When cadence is **Off** the output will be a linear frame rate conversion.

Enable

If the output content is required to have a film cadence associated with it, **Enable** should be set to **On**.

Default = **Off**

2:3 Source

If the output is 59Hz (60Hz) and a 2:3 cadence style is selected, this control allows the sequence to be locked to output timecode.

When set to **Free run** (default) the output 2:3 cadence starting point is not defined. The output will have continuous 2:3, but may vary from conversion to conversion.

When set to **Output timecode**, the user defines the point where the 2:3 sequence starts relative to timecode.

2:3 Start hour

This control allows the user to define the starting position of the **2:3** sequence with respect to timecode. It is active only when **2:3** is set to **Output timecode** and the Timecode generator is set to **Drop-Frame**, or, when following input timecode, the source has **Drop-Frame Timecode** present. When operating with non-Drop Frame Timecode this control has no effect.

Control is available from 1 hour to 23 hours, in steps of 1 hour. Default is 1 hour.

Colorimetry

Select **Colorimetry** to display the Colorimetry menu. Available functions are:

Menu Option	Operation
Input colorimetry	Input colorimetry setting for HD, 3G and UHD. SD is fixed at BT.601. Colorimetry in use is reported as shown: <ul style="list-style-type: none"> • Auto - Sample interleaved: use embedded PID to identify colorimetry. Square Division: selects BT.709. • BT.709 • BT.2020
Output colorimetry	Sets the output color standard for HD, 3G and UHD. Colorimetry in use is reported as shown: <ul style="list-style-type: none"> • Follow Input: Output colorimetry will be the same as the input colorimetry (as detected or forced). • BT.709 • BT.2020

SDR/HDR

The SDR/HDR menu allows HDR parameters to be configured.

HDR adjustments are available for some conversions only:

	SDR Out	HLG Out	PQ Out	S-Log3 Out
SDR In				
HLG In	Clip		PQ Level (out)	
PQ In	Clip	PQ Level (in) ³	PQ Level (out) ²	Clip ¹
S-Log3 In	Clip	Clip	PQ Level (out)	

Notes

- 1 A clip is applied for PQ levels (in) beyond 4000cd/m². Inputs graded at 4000cd/m² or less will not be clipped.
- 2 Where the selected PQ level (out) is less than the incoming PQ level, soft clipping is applied as recommended in BT.2390.
- 3 Use the **PQ Level** control to set the grading level of the incoming PQ signal. Setting the PQ level to 10k when the content is graded at 1k will result in a low-brightness output.

About Look-up Tables (LUTs)

Look-up Tables (LUTs) are used by the unit when performing color conversions. Custom look-up tables can be imported to use instead of the on-board default LUT, and may be imported in the form of .cube files. See

<https://www.images2.adobe.com/content/dam/acom/en/products/speedgrade/cc/pdfs/cube-lut-specification-1.0.pdf> for information on the Cube LUT specification.

Up to 32 files can be imported via the web interface. When imported, these are added to the **Pre-load List** and may be selected for use as needed.

Importing and Using a Custom LUT (Web Interface Only)

Importing a Custom LUT

- 1 Open a web browser window, type the unit's IP address (see [page 112](#)) into the address bar, and press RETURN. The browser connects to the unit, and a user interface allowing control of the unit is displayed:

The screenshot displays the web control interface with the following sections:

- Input:** Includes SDI 1-4, Quad UHD, SFP 1-2, and UHD Interface (Auto, 2SI, SQD) settings.
- Output:** Includes Output Standard (1080 59p-A), UHD Interface (2SI, SQD), Sample Interleaved PID (UHD, HD/3G), and UHD ANC Embed (Link 1, All Links) settings.
- Colorimetry:** Includes HD/UHD Input and Output colorimetry (Auto, BT.709, BT.2020) settings.
- SDR / HDR:** Includes Conversion Type, Input/Output Format, Clip, PQ Level, SDR Enhance, and LUT import options (Use Imported LUT, LUT Type, Import File Name, Import, Pre-load List, Delete LUT).

Browser Control Interface

The buttons at the top of the screen correspond to the RollCall control pages, and offer the same functionality. The UI is intuitive and easy to use.

- 2 In the **SDR/HDR** section, click **Choose File**; a Windows Browse dialog is displayed. Select the file to be uploaded, and click **Open**; the Browse dialog is closed, and the filename is displayed next to **Choose File**.
- 3 Click **Import**; the file is imported, and added to the **Pre-load List**. The **Status** is updated to **Done**.
Repeat for each LUT file to be imported.

Using a Custom LUT

- 1 Enable the **Use Imported LUT** checkbox.
- 2 Select the LUT to be used from the **Pre-load List** list.

A full list of SDR/HDR controls available from this page of the Web interface is provided below:

Detected Input

Displays the detected SDR/HDR transfer function. Valid values are:

- **SDR-TV**
- **HLG HDR-TV**
- **PQ HDR-TV**
- **Unspecified**

Bypass LUT

When enabled, causes the HDR/SDR look-up table to be ignored, meaning that input HDR or SDR values will not be changed on the output. Enable as required.

See [About Look-up Tables \(LUTs\)](#), on page 46, for more information.

Conversion Type

Controls whether **Display-Referred** or **Scene-Referred** should be used when performing PQ, HLG or S-Log3 HDR conversions. Select as required.

Options are:

- **Display Referred**
- **Scene Referred**

Input Format

Input gamma is set manually. Select from:

- **SDR**
- **HLG**
- **PQ**
- **S-log3**

Output Format

Select the output format to be used. Select from:

- **SDR**
- **HLG**
- **PQ**
- **S-log3**

Clip

With some HDR conversions, the maximum supported output level is lower than the source level. The Clip tool is provided to address this.

Select from:

- **Hard** - High brightness levels not supported in the selected output format are hard clipped to the maximum supported brightness level.
- **Soft** - Brightness levels close the maximum supported in the selected output format are progressively attenuated to avoid an abrupt cut-off. Soft clipping is a non-reversible process.

PQ Level

Sets the grading level (L_w) of the input (PQ > HLG) or output (PQ > PQ). Select from:

- **1k** (1000cd/m²)
- **2k**
- **4k**
- **10k** (10000cd/m²)

See *SMPTE ST 2084:2014 - Dynamic Range Electro-Optical Transfer Function of Mastering Reference Displays* for more information on PQ.

SDR Enhance

When converting SDR to any HDR mode, automatically increases the brightness of SDR content near peak white. Select from:

- **Off** - SDR is converted into HDR format without alteration.

- **Low** - High-brightness content is slightly increased in level.
- **Medium** - High-brightness content is increased in level further.
- **High** - High-brightness content is significantly raised in level.

Use Imported LUT

Enable check box if an imported LUT is to be used.

LUT Type

Selects input and output scaling of imported LUTs. Options are:

- **Type 1** (narrow input & narrow output, i.e. 64-940).
- **Type 2** (full range input, i.e. 0-1023, & narrow output).
- **Type 3** (narrow input and narrow output, but with processing of sub-blacks and super-whites, i.e. 0-1023).

Pre-load List

List of imported LUTs available. Select the LUT to be used from the list.

Delete LUT

Click to delete the LUT currently selected on the **Pre-load List**. Select **Confirm** to delete or **Cancel** to abandon the deletion.

ARC

Press **ARC** (Aspect Ratio Control) to specify the aspect ratio of a picture from a range of options, or to adjust the size and position of the picture manually.

Sync Mode

The **Sync mode** control reduces processing latency if there is no ARC (same format input to output, i.e. the unit is operating as a synchronizer). This gives the lowest latency. Options are:

- **Off** (default): normal operation. The ARC controls will function.
- **On**: If scaler features are inactive (no aspect ratio conversion) and **Sync mode** enabled, the scaler is bypassed, so reducing the processing latency. It is possible to bypass the scaler only when up-converting 1080p to UHD, down-converting UHD to 1080p or synchronizing (same standard/UHD format in and out). In all other modes the scaler is active and this control will have no effect on latency. Note that the **Vertical Filter** controls are disabled when Sync Mode is active.

Signaling Detected

Displays the currently detected signaling.

Post Scale

The **Post scaling** control enables the size and position of the picture to be adjusted manually.

Menu Option	Operation
Post scale enable	Off (default) On - Enables manual adjustment of aspect ratio. Note: These controls do not operate in UHD to UHD mode. Adjusting the picture size in any down or cross-conversion mode can increase the amount of visible alias. To avoid this it is recommended that the Horizontal and Vertical filters are set to Narrow 1 .
Size	Adjusts the size of the whole output image while maintaining the aspect ratio. Range is 80% to 120% in steps of 1%. Default is 100%.
Aspect	Adjusts the aspect ratio of the output image. Range is 70% to 150% in steps of 1%. Default is 100%.
Pan	Adjusts the horizontal position of the output image. Range is -50 to +50 pixels in steps of 1 pixel. Default is 0 pixels.
Tilt	Adjusts the vertical position of the output image. Range is -50 to +50 lines in steps of 1 line. Default is 0 lines.

Scaler Config

The **Scaler** offers preset controls for management of the aspect ratio. The following controls are available:

Scaler Presets

- **Use presets**: Enables all presets
- **SD input is 702**: Use for SD incoming content that uses a 702 sample line rather than a 720 sample line.
- **SD output is 702**: Generates SD output with a 702 sample active line.
- **Up convert**: Sets the SD to UHD aspect ratio conversion.

Available up convert presets are:

From (SD)	To (UHD)
4:3	16:9 vcrop (default)
4:3	4:3 PB
16:9 LB	16:9
16:9 An	16:9
14:9 LB	14:9 PB
14:9 PB	16:9 vcrop
4:3 PB	16:9 vcrop
4:3 PB	14:9 PB vcrop

LB = Letterbox, PB = Pillarbox, Vcrop = Vertical Crop, An = Anamorphic

- **Down convert:** Sets the UHD to SD aspect ratio conversion.

Available down convert presets are:

From (UHD)	To (SD)
16:9	4:3 hcrop (default)
16:9	16:9 LB
16:9	16:9 An
4:3 PB	4:3
14:9 PB	14:9 LB
14:9 PB	16:9 vcrop
4:3 PB	16:9 vcrop
4:3 PB	14:9 PB vcrop

LB = Letterbox, PB = Pillarbox, Vcrop = Vertical Crop, An = Anamorphic

- **SD/HD Cross convert:** Sets the SD to HD aspect ratio conversion.

Available cross convert presets are:

From (SD)	To (HD)
4:3	16:9 vcrop
4:3	4:3 PB
16:9 LB	16:9
16:9 An	16:9
14:9 LB	14:9 PB
16:9	4:3 hcrop
16:9	16:9 LB
16:9	16:9 An
4:3 PB	4:3
14:9 PB	14:9 LB
16:9 LB	4:3 hcrop
16:9 LB	16:9 An
16:9 LB	14:9 LB
16:9 An	4:3 hcrop

From (SD)	To (HD)
16:9 An	16:9 LB
16:9 An	14:9 LB
14:9 PB	16:9 vcrop
4:3 PB	16:9 vcrop
4:3 PB	14:9 PB vcrop

LB = Letterbox, PB = Pillarbox, Vcrop = Vertical Crop, An = Anamorphic

In Config

Configures the unit to respond to aspect signaling control. If input signaling is not present, **Force input format** (see below) can be used.

Signaling Src

When an SD source contains more than one style of signaling, select the appropriate item:

- **SMPTE 2016** (default)
- **L23 ETSI**
- **L23 AFD**
- **VI SMPTE**
- **VI AFD**

Alternate Center Cut

Alternate center cut is **Off** by default. When off, behavior on receipt of certain specific AFD codes ignores protected regions. When **Alternate center cut** is **On**, the ARC behavior for these six specific codes will be to remove any black bars and also remove the gray bars that will leave the Alternative Center. The Alternative center will therefore be stretched to fit the screen so that the whole white area fills the screen. This will override **Fit to width, 14:9** and **Fit to height** settings, so that all three give the same output result. It also overrides the SD **Output format** control (Anamorphic or Normal). See SMPTE ST 2016-1:2009 *Format for Active Format Description and Bar Data*, pages 7-9.

Behavior with **Alternate center cut** on and off is shown in the table below:

AFD Format	Interpretation with Alt Center Cut = Off	Interpretation with Alt Center Cut = On
4:3 AFD 13	4:3	4:3 Alt 14:9
4:3 AFD 14	16:9 LB	16:9 LB Alt 14:9
4:3 AFD 15	16:9 LB	16:9 LB Alt 4:3
16:9 AFD 13	4:3 PB	4:3PB Alt 14:9
16:9 AFD 14	16:9	16:9 Alt 14:9
16:9 AFD 15	16:9	16:9 Alt 4:3

Force in format

- **Off** (default)
- **On** - Forces the input format to that selected below. Will be active when input signaling is not present.

SD in format

For SD inputs, manually select forced format from the list:

- **Normal** - use default aspect ratio

- **16:9 anamorphic** - horizontally squeezes a widescreen image to fit a standard 4:3 aspect ratio
- **16:9 letterbox** - preserves the original aspect ratio of film shot in a widescreen 16:9 aspect ratio, with bars visible at the top and bottom of the screen.
- **14:9 letterbox** - preserves the original aspect ratio of film shot in a widescreen 14:9 aspect ratio, with bars visible at the top and bottom of the screen.

HD/UHD in format

For HD/UHD inputs, manually select a format to force:

- **Normal** (default): use default aspect ratio
- **14:9 pillarbox**: preserves the original aspect ratio of HD content with a 14:9 aspect ratio, with bars visible at the sides of the screen.
- **4:3 pillarbox**: preserves the original aspect ratio of HD content with a 4:3 aspect ratio, with bars visible at the sides of the screen.

Out config

Convert scaling.

- **Fit to height**: Scales the image to fit the height of the screen while maintaining the aspect ratio.
- **Fit to width**: Scales the image to fit the width of the screen while maintaining the aspect ratio.
- **14:9**: Can scale either a 4:3 image for viewing on a 16:9 screen, or a 16:9 image for viewing on a 4:3 screen. This is a compromise in order to maintain the aspect ratio of the image, but will crop some of the image in the process (top and bottom when viewing 16:9, and left and right when viewing 4:3).

SD out format

- **Normal** (default): Use default aspect ratio
- **Anamorphic**: Horizontally squeezes a widescreen image to fit a standard 4:3 aspect ratio.

Out signaling

Controls the signaling defined on the output.

SMPTE 2016

Uses SMPTE 2016 signaling. Available controls are:

- **ST2016 mode** -
 - **Auto**: automatically sets the conversion based on a combination of the input and output standards.
 - **Pass**: passes SMPTE 2016 information through the unit unchanged.
 - **Force**: forces the conversion specified on the output.
 - **Delete**: deletes SMPTE 2016 information from the output signal.
- **Out line** - Selects the output line on which SMPTE 2016 information is placed.
- **Out line status** - Displays the line number on which SMPTE 2016 information is placed.

Note: In the SD domain, take care to avoid a line clash if embedded VITC and SMPTE 2016 are both enabled.

In the event of both VITC and SMPTE being required:

- For SD 625 signals, SMPTE2016 is relocated to the line before the VITC line, i.e. if VITC is at default 19 and 21, SMPTE2016 will be placed on either 18 or 20 respectively when there is a clash.
 - For SD 525 signals, SMPTE2016 is relocated to the line between the two VITC lines, i.e. if default VITC is on lines 14 and 16, SMPTE2016 will be placed on line 15 in the event of a clash.
-

Video Index

Configures **Video Index** (VI) signaling. Available controls are:

Control	Options
VI mode	<ul style="list-style-type: none"> • Auto (default): Automatically sets the conversion based on a combination of the input and output standards. • Pass: Passes VI information through the unit unchanged. • Force: Forces the conversion specified on the output. • Delete: Deletes VI information from the output signal.
Out format	<ul style="list-style-type: none"> • SMPTE (default): Outputs Video Index information according to SMPTE RP186. • AFD: Outputs Video Index information according to ARDSPEC1
VI pass data	<ul style="list-style-type: none"> • Off (default): VI data other than coded frame and AFD are blanked. • On: User data from the source VI are passed from the input to the output.

Line 23

Configures Line 23 (L23) signaling. Available controls are:

Control	Options
L23 mode	<ul style="list-style-type: none"> • Auto (default) - Automatically sets the conversion based on a combination of the input and output standards. • Pass - Passes L23 information through the unit unchanged. • Force - Forces the conversion specified on the output. • Delete - Deletes L23 information from the output signal.
L23 out format	<ul style="list-style-type: none"> • ETSI (default) - Outputs L23 information according to ETSI EN 300 294 v1.4.1. • AFD - Outputs L23 information according to West Country TV/HTV/Central TV L23_SPEC.doc 1997.
In line	Selects the input line from which the L23 information is read. The range is from line 10 to line 23 in one-line steps. Default = line 23
Out line	Selects the output line on which L23 information is placed. The range is from line 10 to line 23 in one-line steps. Default = line 23
Out line status	Displays line number of where the signaling is placed.
Force AFD user bits	<ul style="list-style-type: none"> • Off (default). • On - Enables up to four user-defined bits to be inserted.
AFD user bits value	From 0 to 15 in steps of 1. Preset = 0

Force mode

Inserts specific signaling codes regardless of the source aspect ratio.

SMPTE 2016: When enabled, inserts valid SMPTE 2016 data when none is present on the input. Available codes are:

4:3 AFD 0	16:9 AFD 0
4:3 AFD 1	16:9 AFD 1
4:3 AFD 2	16:9 AFD 2

4:3 AFD 3	16:9 AFD 3
4:3 AFD 4	16:9 AFD 4
4:3 AFD 5	16:9 AFD 5
4:3 AFD 6	16:9 AFD 6
4:3 AFD 7	16:9 AFD 7
4:3 AFD 8	16:9 AFD 8
4:3 AFD 9	16:9 AFD 9
4:3 AFD 10	16:9 AFD 10
4:3 AFD 11	16:9 AFD 11
4:3 AFD 12	16:9 AFD 12
4:3 AFD 13	16:9 AFD 13
4:3 AFD 14	16:9 AFD 14
4:3 AFD 15	16:9 AFD 15

SMPTE RP-186: When enabled, inserts valid RP-186 data when none is present on the input. Available codes are:

4:3 (default)
16:9

AFD: When enabled, inserts valid AFD codes when none are present on the input. Available codes are:

4:3 AFD 0	16:9 AFD 0
4:3 AFD 1	16:9 AFD 1
4:3 AFD 2	16:9 AFD 2
4:3 AFD 3	16:9 AFD 3
4:3 AFD 4	16:9 AFD 4
4:3 AFD 5	16:9 AFD 5
4:3 AFD 6	16:9 AFD 6
4:3 AFD 7	16:9 AFD 7

ETSI: When enabled, inserts valid ETSI codes when none are present on the input. Available codes are:

4:3 FF
14:9 Center
14:9 Top
16:9 Center
16:9 Top
> 16:9 Center
4:3 SP 14:9
16:9 FF

FF = Full Format

Enhance

The **Enhance** button provides horizontal and vertical enhancement tools. The main uses of the enhancer functions are to control aliasing in down-conversion, and to add a subjective impression of sharpness in up-conversion. Individual controls are available to make separate adjustments to horizontal and vertical detail, over different frequency bands, in order to achieve the desired subjective effect.

If no enhancement is required, ensure that **Preset** is selected.

Note: With the web browser interface, Enhancer controls are available from the **Video processing** menu.

UHD Up Convert

Note: These settings apply only when converting from SD/HD to UHD.

Preset

- **Confirm** to set all enhancers to default preset values.
- **Cancel** to leave enhancers at the current values.

Vertical Filter

- **Narrow**: Reduces vertical bandwidth of the HD source prior to up-conversion. May be useful when HD source contains excessive enhancement (ringing), which may be unacceptable in UHD.
- **Normal** (default): Passes all source vertical frequencies without attenuation or boost.
- **Boost 1**: Applies a small amount of boost within the HD frequency band. This can increase the visual sharpness of the up-converted image.
- **Boost 2**: Applies a larger amount of boost beginning at a lower frequency.
- **Boost 3**: Maximum boost. Transient overshoot will be visible.

Horizontal Filter

- **Narrow 2**: Reduces horizontal bandwidth of HD source prior to up-conversion. May be useful when HD source contains excessive enhancement (ringing), which may be unacceptable in UHD.
- **Narrow 1**: Applies a small reduction in horizontal bandwidth of HD source prior to up-conversion. May be useful when HD source contains some enhancement, which may be unacceptable in UHD.
- **Normal** (default): Passes all source horizontal frequencies without attenuation.

H Enhance Level

Applies horizontal frequency boost to make image visually sharper. Adaptive processing prevents an increase in noise level and excessive boost on textures.

- **Off** (default)
- **1**
- **2**
- **3**
- **4**
- **5**
- **6**

H Enhance Freq

Selects the frequency band to which the **H enhance** filter is applied.

- **Mid** (default)
- **High**

UHD Noise Reduce

Multi-band noise reduction reduces noise visibility in up-converted images, without introducing visual artifacts.

This process will not reduce noise that is already visible in the HD source.

- **Off** (default)
- **1**
- **2**

Clean Edge

Adaptive processing to remove 'ringing' often evident in up-conversion processing. Normally enabled.

- **Off** (default)
- **On**

UHD Transient H

Sharp vertical edge detail in the HD source, such as captions and graphics, is identified. The gradient of these transients is increased to occupy the full UHD bandwidth. Adaptive processing ensures that textures are preserved.

- **Off**
- **1**
- **2**
- **3**

UHD Transient V

Sharp horizontal edge detail in the HD source, such as captions and graphics, is identified. The gradient of these transients is increased to occupy the full UHD bandwidth. Some degradation of fine textures may be evident when using higher settings.

- **Off**
- **1**
- **2**
- **3**

UHD Down Convert

Note: These settings apply only when converting from UHD to SD/HD.

Preset

- **Confirm** to set all enhancers back to default preset values.
- **Cancel** to leave enhancers at the current values.

Vertical Filter

- **Narrow 3**: Reduces vertical bandwidth of the down-conversion process. May be useful when the UHD source contains high levels of mid-frequency content.
- **Narrow 2**: As above, but with less bandwidth reduction.
- **Narrow 1**: As above, but with minimal bandwidth reduction.
- **Normal** (default): Optimized bandwidth setting. Passes all vertical frequencies compatible with the HD output.

- **Wide 1:** Allows some alias frequencies to pass, which may give an apparent increase in picture sharpness.
- **Wide 2:** Allows a wider band of alias frequencies to pass.

Horizontal Filter

- **Narrow 2:** Reduces horizontal bandwidth of the down-conversion process. May be useful when the UHD source contains high levels of mid-frequency content.
- **Narrow 1:** As above, but with less bandwidth reduction.
- **Normal** (default): Optimized bandwidth setting. Passes all horizontal frequencies compatible with the HD output.
- **Wide 1:** Allows some alias frequencies to pass, which may give an apparent increase in picture sharpness.
- **Wide 2:** Allows a wider band of alias frequencies to pass.

H Enhance Level

Applies horizontal frequency boost to make image visually sharper. Adaptive processing prevents an increase in noise level and excessive boost on textures.

- **Off** (default)
- **1**
- **2**
- **3**
- **4**
- **5**
- **6**

H Enhance Freq

Boost can be set to operate on either the highest or mid frequencies.

- **Mid** (default)
- **High**

SD/HD Convert

Note: These settings apply only when converting between SD and HD.

Preset

- **Confirm** to set all enhancers back to preset values.
- **Cancel** to leave enhancers at the current values.

Vertical Filter

- **Narrow 2:** Reduces the vertical bandwidth of the conversion process.
- **Narrow 1:** As above but with less bandwidth reduction.
- **Normal** (default): Optimized bandwidth setting. Passes all vertical frequencies.
- **Wide:** For some down conversion modes, **Wide** allows extended bandwidth to pass. This may give an apparent increase in picture sharpness. In up conversion modes, this setting is the same as **Normal**.
- **Boost 1:** Boosts high frequencies with SD-HD or HD-HD conversions. For HD-SD, the bandwidth is increased further to allow more alias frequencies to pass.
- **Boost 2:** As Boost 1, but giving greater boost or more alias.

Horizontal Filter

- **Narrow 2:** Reduces the horizontal bandwidth of the conversion process. May be useful when down converting HD material containing high levels of mid-frequency content which results in interline flicker in the SD output.

- **Narrow 1:** As above but with less bandwidth reduction
- **Normal:** Optimized bandwidth setting. Passes all horizontal frequencies compatible with the output format.
- **Wide 1:** For HD to SD conversion, allows some alias frequencies to pass which may give an apparent increase in picture sharpness. Will have limited effect in HD to HD conversion.
- **Wide 2:** Allows more alias frequencies to pass with HD to SD.

H Enhance Level

Applies horizontal frequency boost to make image visually sharper. Adaptive processing prevents an increase in noise level and excessive boost on textures.

- **Off** (default)
- **1**
- **2**
- **3**
- **4**
- **5**
- **6**

H Enhance Freq

Boost can be set to operate on either the highest or mid frequencies.

- **Mid** (default)
- **High**

UHD/UHD Convert

Menu Option	Operation
Preset	Click to set all enhancers to default preset values.
Vertical filter	Select as required: <ul style="list-style-type: none"> • Narrow 2: Reduces the vertical bandwidth of the conversion process. • Narrow 1: As above but with less bandwidth reduction. • Normal (default): Optimized bandwidth setting. Passes all vertical frequencies. • Wide: For some down conversion modes, Wide allows extended bandwidth to pass. This may give an apparent increase in picture sharpness. In up conversion modes, this setting is the same as Normal. • Boost 1: Boosts high frequencies with SD-HD or HD-HD conversions. For HD-SD, the bandwidth is increased further to allow more alias frequencies to pass. • Boost 2: As Boost 1, but giving greater boost or more alias.

Menu Option	Operation
Horizontal filter	Select as required: <ul style="list-style-type: none">• Narrow 2: Reduces the horizontal bandwidth of the conversion process. May be useful when down converting HD material containing high levels of mid-frequency content which results in interline flicker in the SD output.• Narrow 1: As above but with less bandwidth reduction• Normal: Optimized bandwidth setting. Passes all horizontal frequencies compatible with the output format.• Wide 1: For HD to SD conversion, allows some alias frequencies to pass which may give an apparent increase in picture sharpness. Will have limited effect in HD to HD conversion.• Wide 2: Allows more alias frequencies to pass with HD to SD.
Horizontal enhance	Applies horizontal frequency boost to make image visually sharper. Adaptive processing prevents an increase in noise level and excessive boost on textures. Select a level as required. <ul style="list-style-type: none">• Off (default)• 1• 2• 3• 4• 5• 6
Frequency band	Boost can be set to operate on either the highest or mid frequencies. Select a level as required. <ul style="list-style-type: none">• Mid (default)• High

System

The **System** button enables you to access the unit's genlock, metadata and system parameters, such as network and RollCall settings.

Menu Option	Operation
Genlock	Locks the output video clock to the genlock source. See Genlock on page 61.
Timecode	Controls the unit's timecode options. See Timecode on page 62.
Metadata	Controls closed caption and teletext information. See Metadata on page 63.
ANC Bridge	Allows the ANC Bridge to be configured. See ANC Bridge on page 64.
Front Panel Lock	Press Control Lock and hold for three seconds to lock the front panel controls. Repeat to unlock.
Network	Controls network settings. See Network on page 66.
Serial number	Displays unit serial number.
Unit temperature	Displays unit temperature.
PSU A status	State and measured voltage (e.g. OK: 12Vdc ; or FAIL:missing) of PSU A.
PSU B status	State and measured voltage (e.g. OK: 12Vdc ; or FAIL:missing) of PSU B.
Software version	Displays current software version.

Genlock

Genlock locks the output video clock to the genlock source (input or reference), regardless of the video standard. If the genlock source and the video output are the same frame rate, for example, 50 Hz or 59.94 Hz, Genlock locks the output to the vertical phase of the genlock source, giving consistent and repeatable delay. If the video output frame rate differs from the genlock source frame rate, the output will 'clock lock' to the genlock source. Clock lock ensures that the output audio 48kHz clock remains locked to the genlock source.

When attempting to pass non-PCM audio (other than Dolby-E), ensure that Genlock is enabled. If using an external reference, it must be clock-locked to the input video.

Menu Option	Operation
Genlock source	<ul style="list-style-type: none"> • Reference (default): locks to the incoming reference. • Input: Locks output to input. When input and output frame rates are integer related, selecting Input will force the unit to a fixed processing delay. • Free run: locks the output video to an internal reference clock.
Reference status	Shows the status of the currently assigned reference. For example, if genlock is assigned to input, status shows Input followed by the current status of the input. If there is no signal on the assigned reference, status shows REF Loss.
Mode status	Reports: Selected lock mode, Output format, lock status (genlock, clocklock, freerun).
V timing	Adjusts the vertical timing of the output signal with respect to the reference signal, from line -1125 to line 1125 in steps of 1 line. Default = 0 lines
H timing	Adjusts the horizontal timing of the output signal with respect to the reference signal, from pixel -2640 to pixel 2640 in steps of 1 pixel. Default = 0 pixels

Note: Genlock timing adjustments will take effect only when the Genlock source is set to **Reference**.

Timecode

The Timecode menu enables you to set up and control the unit's timecode options for VITC (Vertical Interval Timecode), LTC (Linear Timecode), and ATC (Ancillary Timecode). In the HD domain, both Embedded VITC and Embedded LTC are supported. In the SD domain, VITC, ATC LTC, and ATC VITC are supported.

When present, timecode can be handed over from the input or internally generated. Where the input frame rate is 29.97 fps, both drop frame and non-drop frame modes are supported. For 29.97fps outputs, timecode can be configured as either drop frame or non-drop frame.

Menu Option	Operation
TC Status	Reports the output line containing timecode.
HD/UHD source	<ul style="list-style-type: none"> • Embedded LTC (default) • Embedded VITC
SD source	<ul style="list-style-type: none"> • VITC (Default) • Embedded LTC • Embedded VITC
TC mode	<ul style="list-style-type: none"> • Follow input (default): When active, only the selected source type of ANC packet is inserted into the output video. So, the action on timecode loss is applicable only to the selected ATC type. • Generate: Allows the user to generate timecode using the value entered in Gen TC Entry as a start point. The action taken on selection of the Generate mode depends on the previous timecode handling state: If the mode was Input trigger, the output timecode will jump to the timecode value in Gen TC Entry when Gen TC load is selected. If the mode was Follow input, the output timecode will jump to the timecode value in Gen TC Entry as soon as the mode is changed to Generate. When Generate mode is selected, both ATC, LTC and ATC VITC are embedded in the output.
Gen TC Entry	The value to be used as a start point when generating timecode. Enter as appropriate.
Gen TC load	Click Confirm to load the value entered in Gen TC Entry . Cancel will cancel the load.
On TC loss	<ul style="list-style-type: none"> • Freeze (default): freezes output timecode. • Free run: timecode free runs from the current timecode value.
Non-drop frame	Sets the timecode format. options are: <ul style="list-style-type: none"> • Drop frame • Non-drop frame (default)
VITC enable	<ul style="list-style-type: none"> • On (default) • Off
VITC line 525	Selects the output line on which VITC is placed when the output is 525. The range is from line 11 to line 17 in steps of 1 line. Default is line 14.
VITC line 625	Selects the output line on which VITC is placed when the output is 625. The range is from line 7 to line 20 in steps of 1 line. Default is line 19.
VITC line status	Reports the output line containing timecode.

Metadata

The **Metadata** menu allows control of all closed caption and teletext information. When upconverting or downconverting at the same frame rate, incoming SD or HD closed captions and subtitles are converted to the correct format in the HD or SD output.

There are three sub-menu choices:

- Closed captions
- Teletext
- SMPTE 2020

Closed Captions

The **Closed captions** controls allow closed captions to be enabled or disabled, and the input and output lines used to be specified.

Menu Option	Operation
In status	Reports the captions that have been detected.
CEA-608 out	<ul style="list-style-type: none"> • Off (default) • On
CEA-708 out	<ul style="list-style-type: none"> • Off (default) • On
CEA-708 out line	Selects the output line on which to insert CEA-708 packets; the range is from line 8 to line 20 in one-line steps. The default is line 10.
CEA-708 out status	Reports on which output line the captions are being inserted.

Teletext

The unit can pass World System Teletext (WST) for SD and RDD-08 teletext for HD. Teletext output can be enabled or disabled, and the input and output lines to be used specified.

SMPTE RDD08 - Up to 15 lines can be encoded in the OP47 packet. A maximum of three packets are allowed on the output, each with individual line number controls. The number of output OP47 packets is decided by the number of valid WST lines decoded on the input. The first five WST lines are encoded in the first OP47 packet, the next five in the second OP47 packet, and so on.

SMPTE 2031 - Up to 5 SMPTE 2031 packets are allowed to be inserted on the output, with each packet containing data from one SD teletext line. The first five lines selected on the input are encoded in the 2031 packet. All packets will be placed on the line selected by the **Out line** controls.

Menu Option	Sub-Option	
SD VBI setup	WST Origin	WST origin line selection. Choose: <ul style="list-style-type: none"> • Off (default) • On for each of Line 7 - Line 22. In SD, the line number corresponds to the VBI line where the teletext data is present. In HD, the line number corresponds to the line number encapsulated within the RDD08 (OP47)/S2031 packet and not the line number on which the packets are present.
	WST In Status	Reports status for each of input Line 7 - Line 22.
	WST Out Status	Reports status for each of output Line 7 - Line 22.

Menu Option	Sub-Option	
RDD08/ST2031	In Packet Type	<ul style="list-style-type: none"> • SMPTE RDD08 (default) • SMPTE 2031
	Out Packet Enable	<ul style="list-style-type: none"> • Off (default) • On
	Out Packet Type	<ul style="list-style-type: none"> • SMPTE RDD08 (default) • SMPTE 2031
	RDD08	<p>Out line pkt 1: select line from 8 to 20. Default is line 10.</p> <p>Out line pkt 1 status: reports selected output line number.</p> <p>Out line pkt 2: select line from 8 to 20. Default is line 10.</p> <p>Out line pkt 2 status: reports selected output line number.</p> <p>Out line pkt 3: select line from 8 to 20. Default is line 10.</p> <p>Out line pkt 3 status: reports selected output line number.</p>
	ST2031	<p>Data UID select: for each of out packets 1 to 5, select from:</p> <ul style="list-style-type: none"> • EBU Teletext subtitle • EBU Teletext non-subtitle • Inverted teletext <p>Out line - all packets: select line from 8 to 20. Default is line 10.</p> <p>Out line - status: reports selected line number.</p>

SMPTE 2020

The UHD range allows insertion of SMPTE2020 Dolby metadata packets. Available controls are:

Control	Function
Output enable	Enables the insertion of SMPTE 2020 Dolby metadata packets.
Output line	Selects the output line on which to insert Dolby metadata. The range is from line 8 to line 20 in one-line steps. Default is line 12.
Packet type	Selects ST-2020 packet type. <ul style="list-style-type: none"> • A SMPTE 2020-2-2008 • B SMPTE 2020-3-2008
Output line - status	Reports on which output line the metadata is being inserted. If no line number is selected, OFF is displayed.

Note: If the line selected is already in use (by VITC, for example), the VANC embedding hierarchy will embed the SMPTE 2020 packet on the nearest available line.

ANC Bridge

Control	Function
Input (repeated for blocks 1 - 7):	
DID	Selects DID value (range 0 to 0xFF, default = 0).

Control	Function
SDID	Selects SDID value (range 0 to 0xFF, default = 0).
Field	Selects input field for packet detection. Options are: <ul style="list-style-type: none"> • 1 • 2
Status	Displays VANC or HANC and the detected line number.
Output (repeated for blocks 1 - 7):	
Enable	Enables insertion of the selected packet on the output.
Repeat packet	Used to insert packets on every frame when converting from: <ul style="list-style-type: none"> • Interlaced to high frame rate progressive. • Low frame rate progressive to interlaced. • Low frame rate progressive to high frame rate progressive. It is ignored in all other modes.
Field	Selects output field for packet detection. Options are: <ul style="list-style-type: none"> • 1 • 2
Field 1 line	Selects the output line for field 1. Range is the full field 1 range for each output standard. Defaults are: <ul style="list-style-type: none"> • [4 to 265] default = 10 (525) • [1 to 312] default = 14 (625) • [1 to 563] default = 11 (1080i) • [1 to 750] default = 11 (720p) • [1 to 1125] default = 11 (1080pA) • [1 to 563] default = 11 (1080pB)
Field 2 line	Selects the output line for field 2. Range is the full field 2 range for each output standard. Defaults are: <ul style="list-style-type: none"> • [266 to 525] default = 277 (525) • [313 to 625] default = 323 (625) • [564 to 1125] default = 573 (1080i) • N/A (720p) • N/A (1080pA) • [564 to 1125] default = 573 (1080pB)

Network

Control	Function
IP configuration	Select: <ul style="list-style-type: none"> • Fixed Address for the unit to use a fixed IP address. • DHCP for the unit to use an IP address assigned by DHCP.
Current IP configuration	Displays the current IP status. Possible values are: <ul style="list-style-type: none"> • Static • DHCP • OK • FAIL
Current IP address	Reports the IP address currently assigned to the unit.
Current IP gateway	Reports the IP address of the gateway currently used by the unit.
Current IP netmask	Reports the IP netmask currently used by the unit.
IP status	Reports whether the unit is using an IP address set manually or via DHCP. Possible values are: <ul style="list-style-type: none"> • Fixed address • DHCP
Set IP address	To manually assign an IP address: <ul style="list-style-type: none"> • Press the rotary control to select Set IP address; an input field is displayed. • Enter the required IP address, using the rotary control to move the cursor and the front panel buttons to enter numbers. • Press the rotary control when complete. <p>Note: this will not take effect until Apply IP changes is selected.</p>
Set IP gateway	To specify the IP gateway which the unit is to use: <ul style="list-style-type: none"> • Press the rotary control to select Set IP gateway; an input field is displayed. • Enter the IP address of the required gateway, using the rotary control to move the cursor and the front panel buttons to enter numbers. • Press the rotary control when complete. <p>Note: this will not take effect until Apply IP changes is selected.</p>
Set IP netmask	To specify the IP gateway which the unit is to use: <ul style="list-style-type: none"> • Press the rotary control to select Set IP netmask; an input field is displayed. • Enter the netmask to be used, using the rotary control to move the cursor and the front panel buttons to enter numbers. • Press the rotary control when complete. <p>Note: this will not take effect until Apply IP changes is selected.</p>
Apply IP changes	Select: <ul style="list-style-type: none"> • Confirm to commit the changes made to IP settings. • Cancel to leave IP settings at the current values.
Interface status	Reports network connection status.
MAC address	Reports the MAC number of the unit.

Control	Function
Ethernet:	
IP Config	Select: <ul style="list-style-type: none"> • Fixed Address for the unit to use a fixed IP address. • DHCP for the unit to use an IP address assigned by DHCP.

Control	Function
Current IP Config	Displays the current IP status. Possible values are: <ul style="list-style-type: none"> • Static • DHCP • OK • FAIL
IP Address	Enter the IP address to be used when Fixed Address is selected.
Current IP Address	Reports the IP address currently assigned to the unit.
IP Gateway	Enter the IP address of the gateway to be used when Fixed Address is selected.
Current IP Gateway	Reports the IP address of the gateway currently used by the unit.
IP Netmask	Enter the IP netmask to be used when Fixed Address is selected.
Current IP Netmask	Reports the IP netmask currently used by the unit.
Interface Status	Reports status of the IP interface.
MAC Address	Reports the MAC address of the UHD unit.
Apply IP Changes	Click to apply changes to IP config.
SNMP:	
Read Community	Enter the read community string. Default is "public".
Write Community	Enter the write community string. Default is "private".
MIB2 SysContact	Enter the name of the person responsible for the managed node.
MIB2 SysName	Enter the name of the managed node.
MIB2 SysLocation	Enter the physical location of the node.
Read/Write Port	Select the UDP read/write port for sending and receiving requests.
Trap 1 - Input change	Reports changes to input. To activate, set IP Address , Port and Community details as required, and click Enable .
Trap 2 - Reference change	Reports changes to the reference. To activate, set IP Address , Port and Community details as required, and click Enable .
Apply SNMP Changes	Click to apply changes to SNMP.
Options	<ul style="list-style-type: none"> • Control Enable • Traps Enable

Serial Number

Displays the unit serial number.

Unit Temperature

Displays the current temperature of the unit. This should not be allowed to exceed 60 deg.C.

PSU A Status

Displays the voltage currently being output by PSU A.

PSU B Status

Displays the voltage currently being output by PSU B.

Software Version

Displays version number of the software installed on the unit.

Control Lock

The front panel buttons can be disabled if required.

Press **Control Lock** and hold for three seconds to lock the front panel controls. Repeat to unlock.

Operation Using RollCall

This section contains information on using the KudosPro UHD range with RollCall.


Template Pages


The following pages are available for the UHD range. Please note that what is displayed on these pages is dependent on the unit's capabilities. So, the illustrations in this manual may differ somewhat from what is seen in your environment.

- **Input/Output** - see [page 70](#).
- **Video Processing** - see [page 76](#).
- **Convert Processing** - see [page 84](#).
- **ARC** - see [page 87](#).
- **Audio Routing** - see [page 95](#).
- **Audio Shuffle** - see [page 98](#).
- **Audio Control** - see [page 100](#).
- **Genlock** - see [page 103](#).
- **Timecode** - see [page 105](#).
- **Metadata** - see [page 107](#).
- **ANC Bridge** - see [page 110](#).
- **Network** - see [page 112](#).
- **Setup** - see [page 114](#).

Setting Values

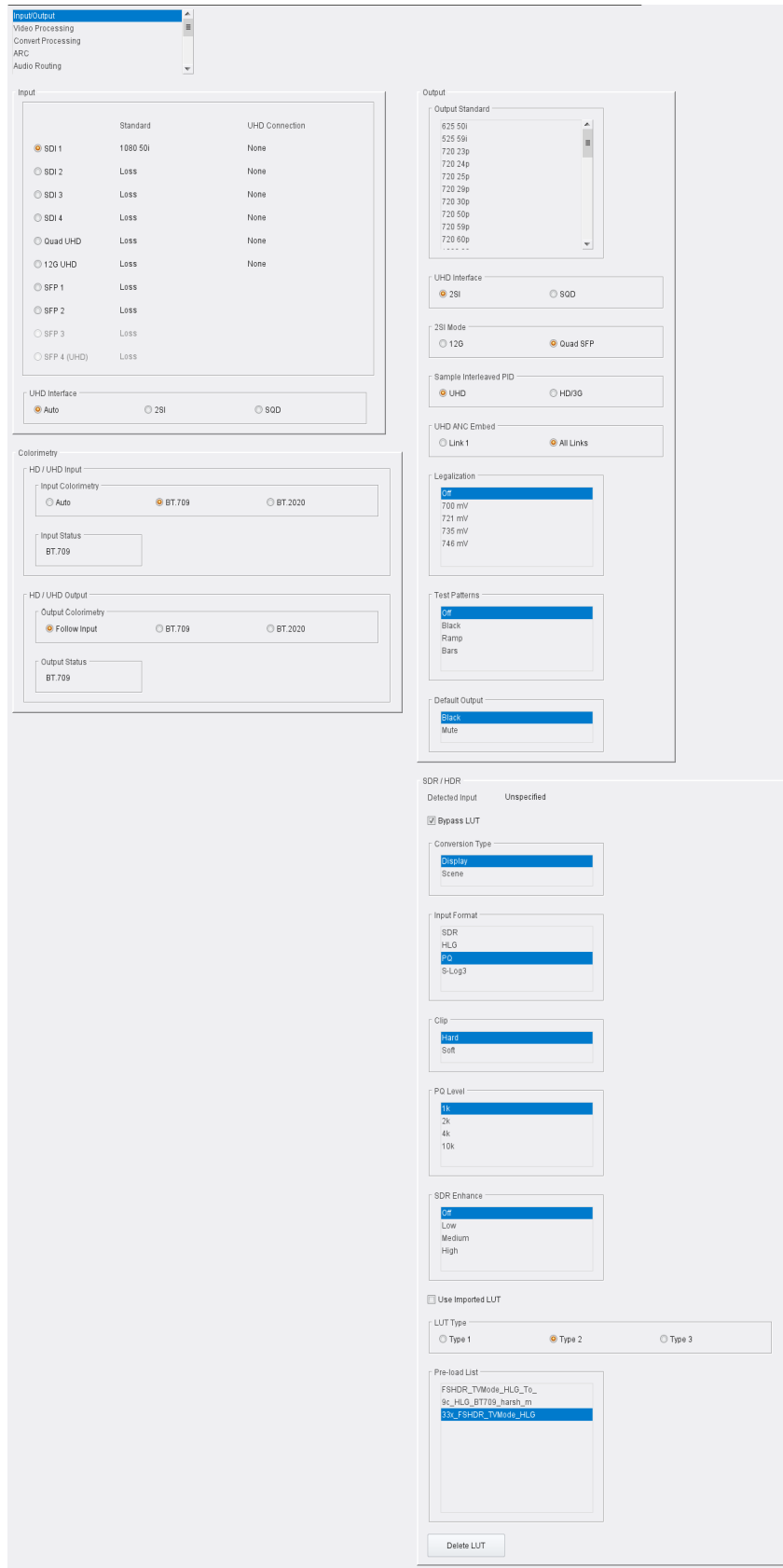
Many of the settings within the templates have values, either alpha or numeric.

When setting a value in a field, the value, whether text or a number, must be set by pressing the ENTER key, or clicking the  **Save Value** button.

Clicking an associated  **Preset Value** button returns the value to the factory default setting.

Input/Output

The Input/Output page allows input sources and output destinations to be selected.



Input/Output Page

The following facilities are available from this page:

Option	Operation
Input	Choose from: <ul style="list-style-type: none"> • SDI 1 • SDI 2 • SDI 3 • SDI 4 (HD and 3G support only) Note: Audio and metadata are processed from Input 1 only. Audio and metadata on Inputs 2 - 4 are ignored. <ul style="list-style-type: none"> • Quad UHD - Selects UHD input via BNC inputs 1-4 (Quad link) or inputs 1-2 (Dual link). • 12G UHD - Selects 12G BNC Input. Accepts HD, 3G, UHD 6G and UHD 12G. • SFP1 (if RX module fitted to slot 1). Accepts SD, HD and 3G. • SFP2 (if RX module fitted to slot 2). Accepts SD, HD and 3G. • SFP3 (if RX module fitted to slot 3). Accepts HD, 3G. • SFP4 (UHD) (if RX module fitted to slot 4). Accepts HD, 3G, UHD 6G and UHD 12G.
UHD Interface	Input format setting for Dual/Quad link interface (BNCs 1-4). Choose from: <ul style="list-style-type: none"> • Auto (default) - use embedded PID to identify Sample Interleaved format. If ST425-3/5 PID (0x96,0x97,0x98) is not detected, Square Division is enabled. • 2SI - manually selects ST425-3/5 format. • SQD - manually selects Square Division.
Colorimetry	<ul style="list-style-type: none"> • HD/UHD Input - Displays input colorimetry setting for HD, 3G and UHD. SD is fixed at BT.601. Colorimetry in use is reported as shown:. • Auto - Sample interleaved: use embedded PID to identify colorimetry. Square Division: selects BT.709. • BT.709 • BT.2020
Input Status	Displays the current input colorimetry standard.
HD/UHD output	Sets the output colorimetry standard for HD, 3G and UHD. Choose from: <ul style="list-style-type: none"> • Follow Input: Output colorimetry will be the same as the input colorimetry (as detected or forced). • BT.709 • BT.2020
Output Status	Displays the current output colorimetry standard.
Output Standard	Use this control to set the required output standard when the input is SD, HD or 3Gbps. Note: 2160 23p-30p outputs are carried on 4 x 1.5Gbps links in Square Division, or 2 x 3Gbps Level C links (outputs A1 and A2) in Sample Interleaved. 2160 50p-60p outputs are carried on 4 x 3Gbps links.
UHD Interface	Selects the output format. Choose from: <ul style="list-style-type: none"> • 2SI: Sample-interleaved format. Allows 6G/12G output via the 12G BNC. • SQD: Square division format. Available only via output BNCs 1-4 and SFPs 1-4. When selected, the 12G output is not available as the 12G BNC is a duplicate of link 4.

Option	Operation
2SI Mode	<p>When UHD Interface is set to 2SI, the output available on SFP3/4 and the 12G BNC can be selected as either 12G or Quad-link fiber:</p> <ul style="list-style-type: none"> • 12G - 12G BNC and SFP3/4 output UHD in 12G single-link format. • Quad SFP - SFP3/4 are set to output 3G quad-link channels 3 & 4 (channels 1 & 2 are output from SFP1/2). The 12G BNC outputs a copy of quad-link channel 4.
Sample Interleaved PID	<p>Sets the embedded Payload ID for Sample Interleaved. Choose from:</p> <ul style="list-style-type: none"> • UHD - some quad link monitors may not operate with UHD PID. In these cases, select HD/3G. Note that 12G monitors will require a UHD PID. • HD/3G
UHD ANC embed	<p>Sets whether ANC (VANC + HANC) data is inserted on all links or just link 1. Select as required.</p> <p>For non-UHD output standards, ANC is inserted on all output BNCs.</p>
Legalization	<p>The Legalizer ensures that the output video stays within the legal RGB gamut limit, making it suitable for the broadcast signal chain. To achieve this, the legalizer reduces the gain equally on all channels. Anything in the RGB space above the selected value (e.g. 700mV) is scaled down to that value. Anything in the RGB space below 0mV is clipped to 0mV. This is a good compromise between minimizing hue change and raising apparent brightness.</p> <p>Legalizer choices are:</p> <ul style="list-style-type: none"> • Off • 700mV • 721mV • 735mV • 746mV
Test Patterns	<p>Choose from:</p> <ul style="list-style-type: none"> • Off • Black • Ramp • Bars
Default output	<p>Choose from:</p> <ul style="list-style-type: none"> • Black • Mute

Option	Operation
SDR/HDR	<p>Allows SDR/HDR parameters to be set. HDR adjustments are available for some conversions only. See SDR/HDR on page 46 for more information.</p> <ul style="list-style-type: none"> • Detected Input - Displays the detected SDR/HDR transfer function: SDR-TV, HLG HDR-TV, PQ HDR-TV or Unspecified. • Bypass LUT - When enabled, causes the HDR/SDR look-up table to be ignored, meaning that input HDR or SDR values will not be changed on the output. Enable as required. See About Look-up Tables (LUTs) on page 74 for more information. • Conversion Type - Display Referred or Scene Referred. • Input format - Input gamma is set manually. Select from: <ul style="list-style-type: none"> • SDR • HLG • PQ • S-log3 • Output Format - Select the output format to be used. Select from: <ul style="list-style-type: none"> • SDR • HLG • PQ • S-log3 • Clip - With some HDR conversions, the maximum supported output level is less than the source level. The Clip tool is provided to address this. Select from: <ul style="list-style-type: none"> • Hard - High brightness levels not supported in the selected output format are hard clipped to the maximum supported brightness level. • Soft - Brightness levels close the maximum supported in the selected output format are progressively attenuated to avoid an abrupt cut-off. Soft clipping is a non-reversible process. • PQ Level - Sets the grading level (L_w) of the input (PQ > HLG) or output (PQ > PQ). Select from: <ul style="list-style-type: none"> • 1k (1000cd/m²) • 2k • 4k • 10k (10000cd/m²) <p style="text-align: center;"><i>See SMPTE ST 2084:2014 - Dynamic Range Electro-Optical Transfer Function of Mastering Reference Displays for more information on PQ.</i></p> • SDR Enhance - When converting SDR to any HDR mode, automatically increases the brightness of SDR content near peak white. Select from: <ul style="list-style-type: none"> • Off - SDR is converted into HDR format without alteration. • Low - High-brightness content is slightly increased in level. • Medium - High-brightness content is further increased in level. • High - High-brightness content is significantly raised in level.

Option	Operation
SDR/HDR	<ul style="list-style-type: none"> • Use Imported LUT - Enable if an imported custom look-up table (LUT) is to be used. See below for information on importing a LUT. • LUT Type - Selects input and output scaling of imported LUTs. <ul style="list-style-type: none"> • Type 1 - Narrow input and narrow output, i.e. 64-940. • Type 2 - Full range input, i.e. 0-1023, and narrow output. • Type 3 - Narrow input and narrow output, but with processing of sub-blacks and super-whites, i.e. 0-1023. • Pre-load List - Select the LUT to be used from the list. Active only if Use Imported LUT is enabled. • Delete LUT - Click to delete the LUT currently selected on the Pre-load List.

About Look-up Tables (LUTs)

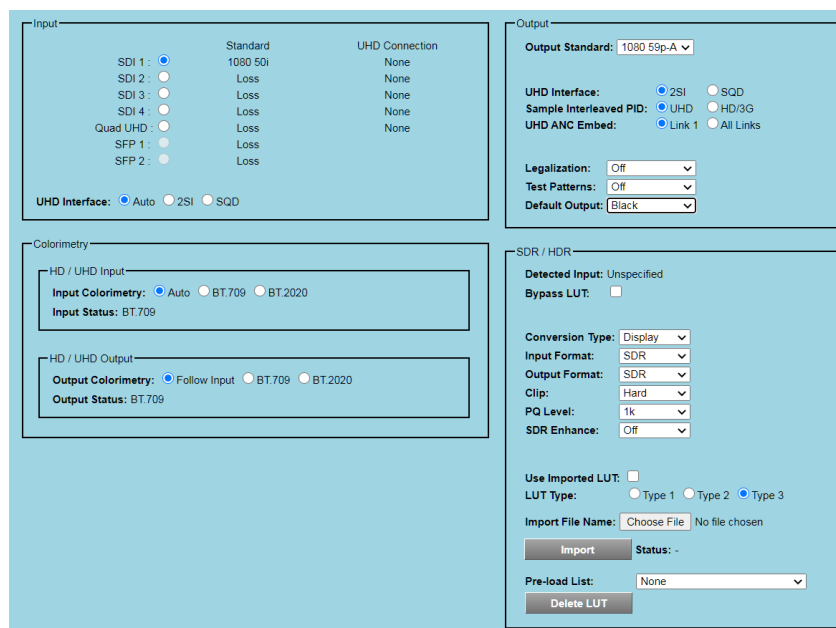
Look-up Tables (LUTs) are used by the unit when performing color conversions. Custom look-up tables can be imported to use instead of the on-board default LUT, and may be imported in the form of .cube files. For information on the Cube LUT specification, see <https://www.images2.adobe.com/content/dam/acom/en/products/speedgrade/cc/pdfs/cube-lut-specification-1.0.pdf>.

Up to 32 files can be imported, via the web interface. When imported, these are added to the **Pre-load List** and may be selected for use as needed.

Importing a Custom LUT

Follow these steps to import a custom LUT:

- 1 Open a web browser window, type the unit's IP address (see [page 112](#)) into the address bar, and press RETURN. The browser connects to the unit, and a user interface allowing control of the unit is displayed:



Browser Control Interface

The buttons at the top of the screen correspond to the RollCall control pages, and offer the same functionality. The UI is intuitive and easy to use.

- 2 In the **SDR/HDR** section, click **Choose File**; a Windows Browse dialog is displayed. Select the file to be uploaded, and click **Open**; the Browse dialog is closed, and the filename is displayed next to **Choose File**.
- 3 Click **Import**; the file is imported, and added to the **Pre-load List**. The **Status** is updated to **Done**.

Repeat for each LUT file to be imported.

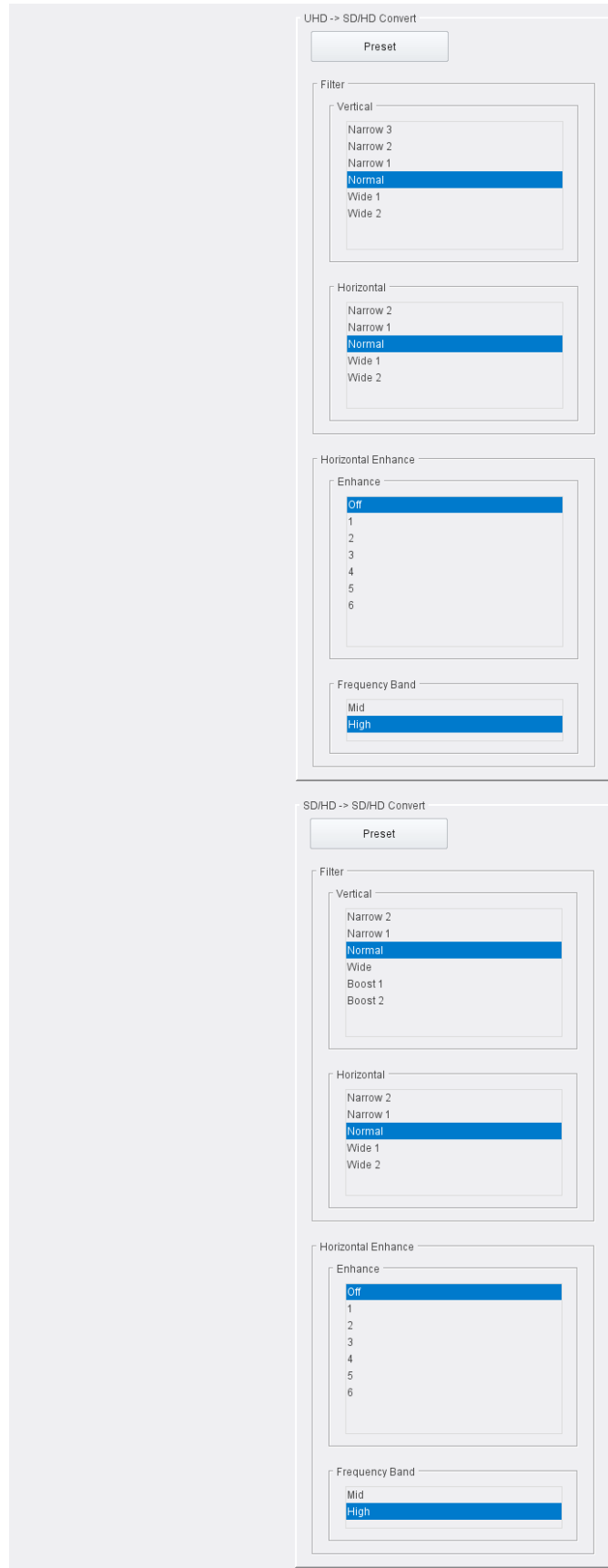
Video Processing

Provides controls allowing various types of signal processing to be applied to the signal being converted.

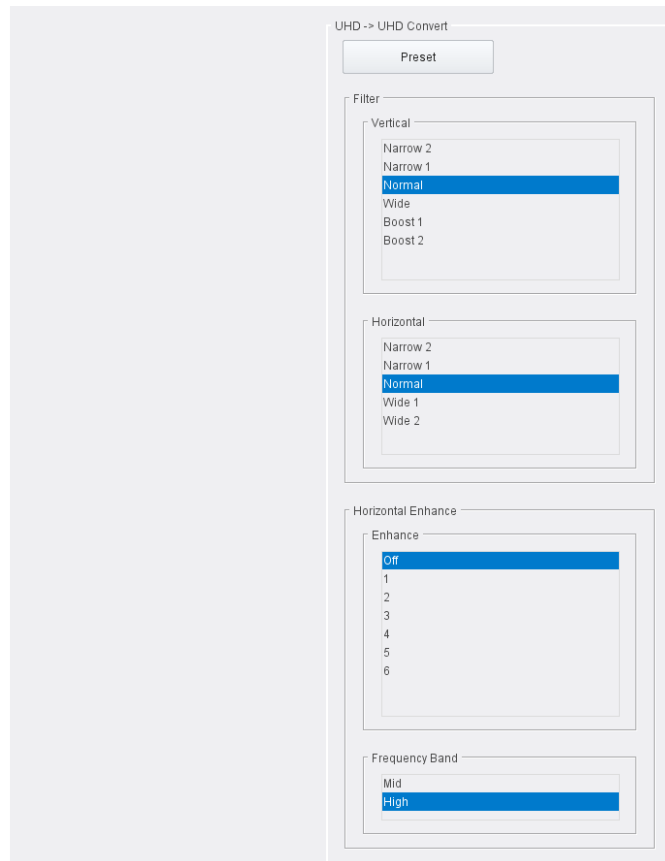
The screenshot displays the Video Processing control interface, organized into several sections:

- Video Processing Menu:** A vertical list on the top left containing "Video Processing" (highlighted), "Convert Processing", "ARC", "Audio Routing", and "Audio Shuffle".
- Proc Amp:** A section with an "Enable" checkbox and four sliders: Contrast (0.0dB), Saturation (0.0dB), Black Level (0.0mV), and Y Gamma (0.4).
- Color Correct:** A section with an "Enable" checkbox and six sliders: Red Lift (0.0mV), Red Gain (0.0dB), Green Lift (0.0mV), Green Gain (0.0dB), Blue Lift (0.0mV), and Blue Gain (0.0dB).
- Additional Video / Audio Delay:** A section with a "Delay" slider set to 0 frames.
- SD/HD -> UHD Convert:** A section with a "Preset" button and two filter menus: "Vertical" (with options: Narrow, Normal, Boost 1, Boost 2, Boost 3) and "Horizontal" (with options: Narrow 2, Narrow 1, Normal).
- Horizontal Enhance:** A section with an "Enhance" menu (options: Off, 1, 2, 3, 4, 5, 6) and a "Frequency Band" menu (options: Mid, High).
- Noise Reduce:** A section with a menu (options: Off, 1, 2).
- Edge Enhance:** A section with a checked "Clean Edge" checkbox and two transient enhance menus: "Horizontal Transient Enhance" (options: Off, 1, 2, 3) and "Vertical Transient Enhance" (options: Off, 1, 2, 3).

Video Processing Page (1)



Video Processing Page (2)



Video Processing Page (3)

The following facilities are available from this page:

Process Amplifier (Proc Amp)

Allows video inconsistencies to be corrected.

Menu Option	Operation
Enable	Select checkbox to activate Proc Amp functions.
Contrast	Adjusts the contrast from -6dB to +6dB in 0.2dB steps. Default is 0dB.
Saturation	Adjusts the color saturation from -6dB to +6dB in 0.2dB steps. Default is 0dB.
Black level	Adjusts the black level from -100mV to +100mV in 0.8mV steps. Default is 0mV.
Y gamma	Adjusts the luma gamma from 0.4 to 1.7 in 0.1 steps. Preset is 1.0.

Color Correct

Menu Option	Operation
Enable	Select checkbox to activate Color correct functions.
Red lift	Red channel offset can be adjusted from -200mV to +200mV in steps of 0.8mV. Default is 0mV.
Red gain	Red gain can be adjusted from -6dB to +6dB in steps of 0.2dB. Default is 0dB.
Green lift	Green channel offset can be adjusted from -200mV to +200mV in steps of 0.8mV. Default is 0mV.
Green gain	Green gain can be adjusted from -6dB to +6dB in steps of 0.2dB. Default is 0dB.
Blue lift	Blue channel offset can be adjusted from -200mV to +200mV in steps of 0.8mV. Default is 0mV.
Blue gain	Blue gain can be adjusted from -6dB to +6dB in steps of 0.2dB. Default is 0dB.

Additional Video/Audio Delay

Menu Option	Operation
Delay	For progressive sources, this control adds additional video delay from 0 to 8 frames in steps of 1 frame. Preset = 0 frame. For interlaced sources, this control adds additional video delay from 0 to 8 fields in steps of 1 field. Preset = 0 field.

SD/HD -> UHD Convert

Menu Option	Operation
Preset	Click to set all enhancers to default preset values.
Vertical filter	Select as required: <ul style="list-style-type: none"> • Narrow: Reduces vertical bandwidth of the HD source prior to up-conversion. May be useful when HD source contains excessive enhancement (ringing), which may be unacceptable in UHD. • Normal (default): Passes all source vertical frequencies without attenuation or boost. • Boost 1: Applies a small amount of boost within the HD frequency band. This can increase the visual sharpness of the up-converted image. • Boost 2: Applies a larger amount of boost beginning at a lower frequency. • Boost 3: Maximum boost. Transient overshoot will be visible.

Menu Option	Operation
Horizontal filter	Select as required: <ul style="list-style-type: none"> • Narrow 2: Reduces horizontal bandwidth of HD source prior to up-conversion. May be useful when HD source contains excessive enhancement (ringing), which may be unacceptable in UHD. • Narrow 1: Applies a small reduction in horizontal bandwidth of HD source prior to up-conversion. May be useful when HD source contains some enhancement, which may be unacceptable in UHD. • Normal (default): Passes all source horizontal frequencies without attenuation.
Horizontal enhance filter	Applies horizontal frequency boost to make the image visually sharper. Adaptive processing prevents an increase in noise level and excessive boost on textures. Select a level as required. <ul style="list-style-type: none"> • Off (default) • 1 • 2 • 3 • 4 • 5 • 6
Frequency band	Selects the frequency band to which the Horizontal enhance filter is applied. Select as required: <ul style="list-style-type: none"> • Mid (default) • High
Noise reduce	Multi-band noise reduction reduces noise visibility in up-converted images, without introducing visual artifacts. Select a level as required. Note this process will not reduce noise that is already visible in the HD source. <ul style="list-style-type: none"> • Off (default) • 1 • 2
Edge enhance	<ul style="list-style-type: none"> • Clean edge - Enable the checkbox to activate adaptive processing designed to remove 'ringing', often evident in up-conversion processing. • Horizontal transient enhance - Sharp vertical edge detail in the HD source, such as captions and graphics, is identified, and the gradient of these transients is increased to occupy the full UHD bandwidth. Adaptive processing ensures that textures are preserved. Select a level as required. <ul style="list-style-type: none"> • Off • 1 • 2 • 3 • Vertical transient enhance - Sharp horizontal edge detail in the HD source, such as captions and graphics, is identified, and the gradient of these transients is increased to occupy the full UHD bandwidth. Some degradation of fine textures may be evident when using higher settings. Select a level as required. <ul style="list-style-type: none"> • Off • 1 • 2 • 3

UHD -> SD/HD Convert

Menu Option	Operation
Preset	Click to set all enhancers to default preset values.
Vertical filter	Select as required: <ul style="list-style-type: none"> • Narrow 3: Reduces vertical bandwidth of the down-conversion process. May be useful when the UHD source contains high levels of mid-frequency content. • Narrow 2: As above, but with less bandwidth reduction. • Narrow 1: As above, but with minimal bandwidth reduction. • Normal (default): Optimized bandwidth setting. Passes all vertical frequencies compatible with the HD output. • Wide 1: Allows some alias frequencies to pass, which may give an apparent increase in picture sharpness. • Wide 2: Allows a wider band of alias frequencies to pass.
Horizontal filter	Select as required: <ul style="list-style-type: none"> • Narrow 2: Reduces horizontal bandwidth of the down-conversion process. May be useful when the UHD source contains high levels of mid-frequency content. • Narrow 1: As above, but with less bandwidth reduction. • Normal (default): Optimized bandwidth setting. Passes all horizontal frequencies compatible with the HD output. • Wide 1: Allows some alias frequencies to pass, which may give an apparent increase in picture sharpness. • Wide 2: Allows a wider band of alias frequencies to pass.
Horizontal enhance	Applies horizontal frequency boost to make image visually sharper. Adaptive processing prevents an increase in noise level and excessive boost on textures. Select a level as required. <ul style="list-style-type: none"> • Off (default) • 1 • 2 • 3 • 4 • 5 • 6
Frequency band	Boost can be set to operate on either the highest or mid frequencies. Select a level as required. <ul style="list-style-type: none"> • Mid (default) • High

SD/HD -> SD/HD Convert

Note: These settings apply only when converting between SD and HD.

Menu Option	Operation
Preset	Click to set all enhancers to default preset values.
Vertical filter	<p>Select as required:</p> <ul style="list-style-type: none"> • Narrow 2: Reduces the vertical bandwidth of the conversion process. • Narrow 1: As above but with less bandwidth reduction. • Normal (default): Optimized bandwidth setting. Passes all vertical frequencies. • Wide: For some down conversion modes, Wide allows extended bandwidth to pass. This may give an apparent increase in picture sharpness. In up conversion modes, this setting is the same as Normal. • Boost 1: Boosts high frequencies with SD-HD or HD-HD conversions. For HD-SD, the bandwidth is increased further to allow more alias frequencies to pass. • Boost 2: As Boost 1, but giving greater boost or more alias.
Horizontal filter	<p>Select as required:</p> <ul style="list-style-type: none"> • Narrow 2: Reduces the horizontal bandwidth of the conversion process. May be useful when down converting HD material containing high levels of mid-frequency content which results in interline flicker in the SD output. • Narrow 1: As above but with less bandwidth reduction • Normal: Optimized bandwidth setting. Passes all horizontal frequencies compatible with the output format. • Wide 1: For HD to SD conversion, allows some alias frequencies to pass which may give an apparent increase in picture sharpness. Will have limited effect in HD to HD conversion. • Wide 2: Allows more alias frequencies to pass with HD to SD.
Horizontal enhance	<p>Applies horizontal frequency boost to make image visually sharper. Adaptive processing prevents an increase in noise level and excessive boost on textures.</p> <p>Select a level as required.</p> <ul style="list-style-type: none"> • Off (default) • 1 • 2 • 3 • 4 • 5 • 6
Frequency band	<p>Boost can be set to operate on either the highest or mid frequencies. Select a level as required.</p> <ul style="list-style-type: none"> • Mid (default) • High

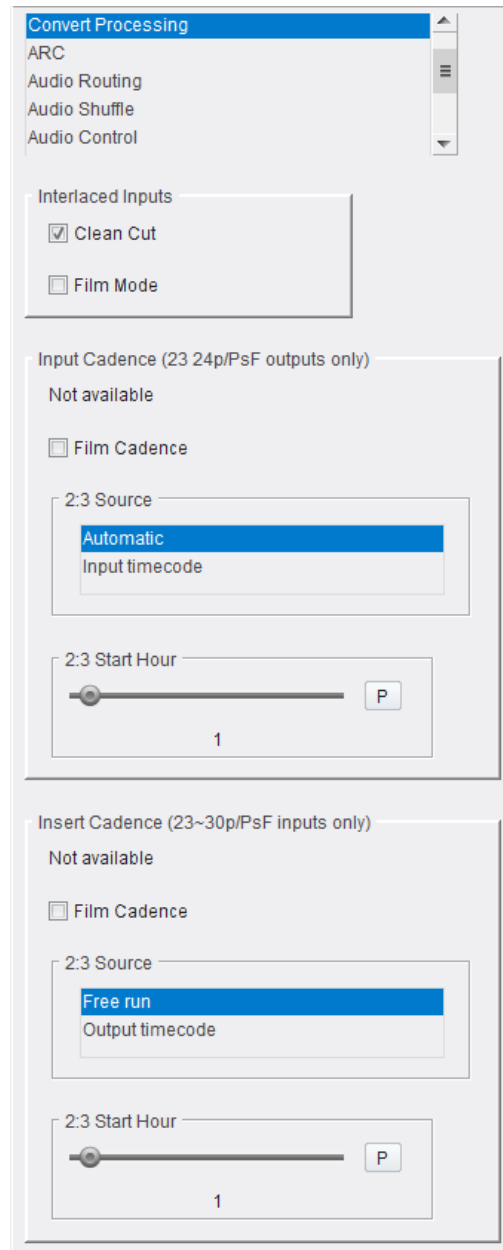
UHD -> UHD Convert

Menu Option	Operation
Preset	Click to set all enhancers to default preset values.
Vertical filter	Select as required: <ul style="list-style-type: none"> • Narrow 2: Reduces the vertical bandwidth of the conversion process. • Narrow 1: As above but with less bandwidth reduction. • Normal (default): Optimized bandwidth setting. Passes all vertical frequencies. • Wide: For some down conversion modes, Wide allows extended bandwidth to pass. This may give an apparent increase in picture sharpness. In up conversion modes, this setting is the same as Normal. • Boost 1: Boosts high frequencies with SD-HD or HD-HD conversions. For HD-SD, the bandwidth is increased further to allow more alias frequencies to pass. • Boost 2: As Boost 1, but giving greater boost or more alias.
Horizontal filter	Select as required: <ul style="list-style-type: none"> • Narrow 2: Reduces the horizontal bandwidth of the conversion process. May be useful when down converting HD material containing high levels of mid-frequency content which results in interline flicker in the SD output. • Narrow 1: As above but with less bandwidth reduction • Normal: Optimized bandwidth setting. Passes all horizontal frequencies compatible with the output format. • Wide 1: For HD to SD conversion, allows some alias frequencies to pass which may give an apparent increase in picture sharpness. Will have limited effect in HD to HD conversion. • Wide 2: Allows more alias frequencies to pass with HD to SD.
Horizontal enhance	Applies horizontal frequency boost to make image visually sharper. Adaptive processing prevents an increase in noise level and excessive boost on textures. Select a level as required. <ul style="list-style-type: none"> • Off (default) • 1 • 2 • 3 • 4 • 5 • 6
Frequency band	Boost can be set to operate on either the highest or mid frequencies. Select a level as required. <ul style="list-style-type: none"> • Mid (default) • High

Convert Processing

The Convert Processing page provides a set of solutions to enable optimized conversion of film-originated content. Film-originated content may be transported by standards supporting the original film frame rate, such as 1080 23.98p. Film-originated content may also be packed into interlaced standards using a rule-based method to map source frames to interlaced fields. In this case, the interlaced standard's content is described as having a *film cadence*.

In order to perform high quality conversion of film-originated content, the cadence must be identified and used to adapt the interpolation process. **Film mode** (see [Interlaced Inputs](#), on page 85) also permits the synthesis of film cadence in the output.



Convert Processing Page

The following facilities are available from this page:

Interlaced Inputs

Menu Option	Operation
Clean cut	Clean cut processing detects scene changes and prevents interpolation across the cut. Permitted only if Film cadence is not enabled (see section). Default = Off .
Film mode	Use Film mode if input is interlaced (1080i or 525 or 625) and contains film-originated content. This adjusts the conversion aperture to give maximum vertical bandwidth. Default = Off . Note: This mode is relevant only for film-originated content where the cadence is carried in an interlaced format. Where film-originated content is carried in a progressive format, Film mode should not be used.

Input cadence (23 24p/PsF outputs only)

The Input Cadence controls allow the user to define any cadence associated with the input video.

Menu Option	Operation
Status	Displays the current cadence.
Film Cadence	If the input content is film-originated with a 2:3 cadence, or simulates film-originated content, the Film cadence check box should be enabled. Otherwise, it should be disabled. Note: This feature is not available when converting UHD 59p to UHD 23p, or UHD 60p to UHD 24p. Default = Disabled . Example 1: Input UHD 59p (with embedded 3:2 cadence), Output 1080 23p. Input frame sequence: A, A, B, B, C, C, D, D ... When cadence is On the output frame sequence will be: A, B, C, D ... When cadence is Off the output will be a linear frame rate conversion.
2:3 Source	When set to Automatic (default), the input cadence will be determined by the cadence detection circuit. This feature is useful when the source material contains mixed cadences. When set to Input timecode , the user defines the relationship between timecode and the 2:3 sequence. This feature is useful when the source material contains known continuous 2:3. This setting removes any uncertainty that may be associated by use of the sequence detector (automatic mode).

2:3 Start hour	<p>This control allows the user to define the position of timecode when the 2:3 sequence begins. The assumption is made that the start of the 2:3 sequence is aligned with the start of program, and under normal working practices, that the start of program is coincident with an integer hour value.</p> <p>This control is active only when 2:3 is set to Input timecode and Drop-Frame Timecode is present. For non-Drop Frame Timecode sources this control has no effect.</p> <p>Control is available from 1 hour to 23 hours, in steps of 1 hour. The default is 1 hour.</p>
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Insert cadence (23~30p/PsF inputs only)

Allows the insertion of film cadence on the output. Output frame rate must be 50, 59 or 60Hz. For all other output frame rates, cadence processing is automatically disabled.

Example 1:

Input 1080 23p, Output UHD 59p.

Input frame sequence: A, B, C, D ...

When the **Film cadence** check box is enabled, the output frame sequence will be A, A, B, B, B, C, C, D, D, D ...

When the **Film cadence** check box is disabled, the output will be a linear frame rate conversion.

Example 2:

Input 720 25p, Output UHD 50p

Input frame sequence: A, B, C, D ...

When the **Film cadence** check box is enabled, the output frame sequence will be: A, A, B, B, C, C, D, D ...

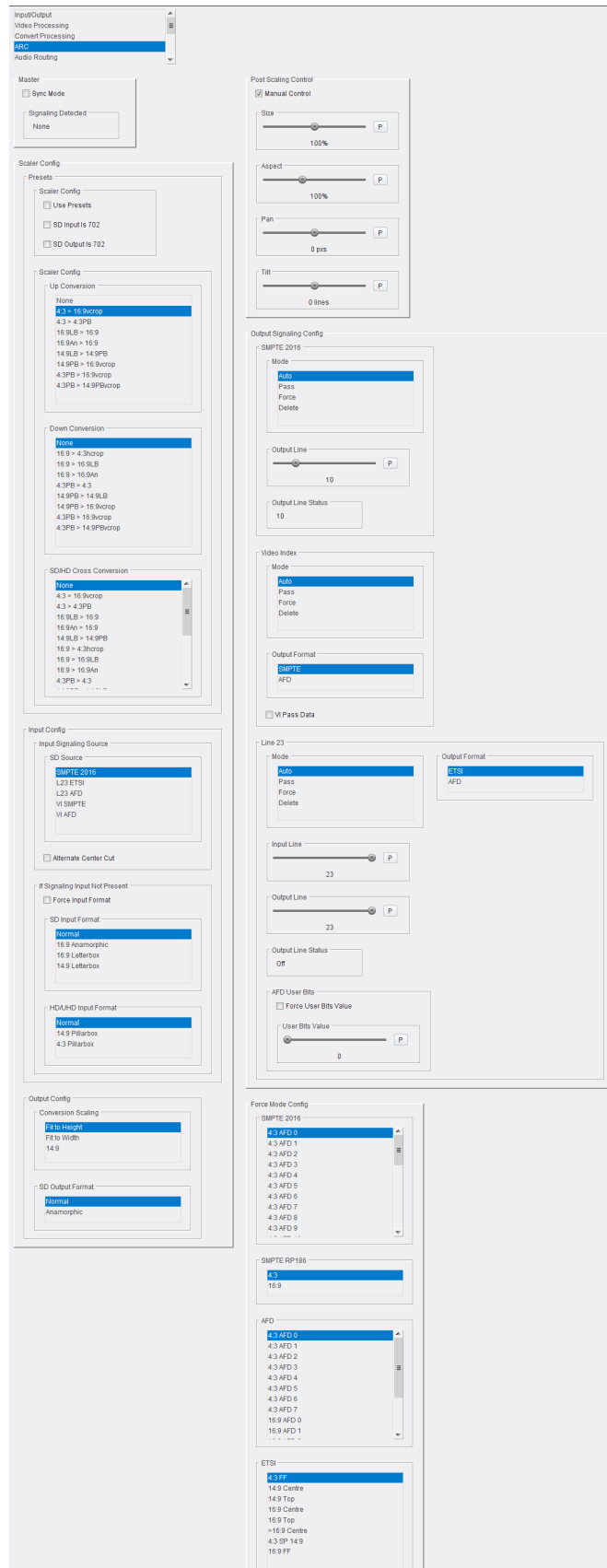
When the **Film cadence** check box is disabled, the output will be a linear frame rate conversion.

Default = **Disabled**

Menu Option	Operation
Status	Displays the current cadence.
2:3 Source	<p>If the output is 59Hz (60Hz) and a 2:3 cadence style is selected, this control allows the sequence to be locked to output timecode.</p> <p>When set to Free run (default) the output 2:3 cadence starting point is not defined. The output will have continuous 2:3, but may vary from conversion to conversion.</p> <p>When set to Output timecode, the user defines the point where the 2:3 sequence starts relative to timecode.</p>
2:3 Start hour	<p>This control allows the user to define the starting position of the 2:3 sequence with respect to timecode. It is active only when 2:3 is set to Output timecode and the Timecode generator is set to Drop-Frame, or, when following input timecode, the source has Drop-Frame Timecode present. When operating with non-Drop Frame Timecode this control has no effect.</p> <p>Control is available from 1 hour to 23 hours, in steps of 1 hour. Default is 1 hour.</p>

ARC

The ARC (Aspect Ratio Control) page allows the user to specify the aspect ratio of a picture from a range of options, or to adjust the size and position of the picture manually.



ARC Page

The following facilities are available from this page:

Master

Menu Option	Operation
Sync mode	<p>When Sync mode is enabled, processing latency is reduced if there is no ARC (same format input to output, i.e. the unit is operating as a synchronizer). This gives the lowest latency. Options are:</p> <ul style="list-style-type: none"> • Disabled (default): normal operation. The ARC controls will function. • Enabled: If scaler features are inactive (no aspect ratio conversion) and Sync mode enabled, the scaler is bypassed, so reducing the processing latency. It is possible to bypass the scaler only when up-converting 1080p to UHD, down-converting UHD to 1080p or synchronizing (same standard/UHD format in and out). In all other modes the scaler is active and this control will have no effect on latency. Vertical filter controls are disabled when Sync mode is active.
Signaling detected	Displays the currently detected signaling.

Scaler Config

The **Scaler** offers preset controls for management of the aspect ratio. The following controls are available:

Menu Option	Operation																		
Presets	<p>Select as required:</p> <ul style="list-style-type: none"> • Use presets: Enables presets. • SD input is 702: Use for incoming SD content that uses a 702 sample line rather than a 720 sample line. • SD output is 702: Generates SD output with a 702 sample line. 																		
Up conversion	<p>Sets the SD to UHD aspect ratio conversion. Available up-convert presets are:</p> <table border="1" data-bbox="821 1422 1356 1848"> <thead> <tr> <th>From (SD)</th> <th>To (UHD)</th> </tr> </thead> <tbody> <tr> <td>4:3</td> <td>16:9 vcrop (default)</td> </tr> <tr> <td>4:3</td> <td>4:3 PB</td> </tr> <tr> <td>16:9 LB</td> <td>16:9</td> </tr> <tr> <td>16:9 An</td> <td>16:9</td> </tr> <tr> <td>14:9 LB</td> <td>14:9 PB</td> </tr> <tr> <td>14:9 PB</td> <td>16:9 vcrop</td> </tr> <tr> <td>4:3 PB</td> <td>16:9 vcrop</td> </tr> <tr> <td>4:3 PB</td> <td>14:9 PB vcrop</td> </tr> </tbody> </table> <p>LB = Letterbox, PB = Pillarbox, Vcrop = Vertical Crop, An = Anamorphic</p>	From (SD)	To (UHD)	4:3	16:9 vcrop (default)	4:3	4:3 PB	16:9 LB	16:9	16:9 An	16:9	14:9 LB	14:9 PB	14:9 PB	16:9 vcrop	4:3 PB	16:9 vcrop	4:3 PB	14:9 PB vcrop
From (SD)	To (UHD)																		
4:3	16:9 vcrop (default)																		
4:3	4:3 PB																		
16:9 LB	16:9																		
16:9 An	16:9																		
14:9 LB	14:9 PB																		
14:9 PB	16:9 vcrop																		
4:3 PB	16:9 vcrop																		
4:3 PB	14:9 PB vcrop																		

Menu Option	Operation																																								
Down conversion	<p>Sets the UHD to SD aspect ratio conversion. Available down convert presets are:</p> <table border="1" data-bbox="767 331 1302 748"> <thead> <tr> <th data-bbox="767 331 1034 374">From (UHD)</th> <th data-bbox="1034 331 1302 374">To (SD)</th> </tr> </thead> <tbody> <tr> <td data-bbox="767 374 1034 421">16:9</td> <td data-bbox="1034 374 1302 421">4:3 hcrop (default)</td> </tr> <tr> <td data-bbox="767 421 1034 468">16:9</td> <td data-bbox="1034 421 1302 468">16:9 LB</td> </tr> <tr> <td data-bbox="767 468 1034 515">16:9</td> <td data-bbox="1034 468 1302 515">16:9 An</td> </tr> <tr> <td data-bbox="767 515 1034 562">4:3 PB</td> <td data-bbox="1034 515 1302 562">4:3</td> </tr> <tr> <td data-bbox="767 562 1034 609">14:9 PB</td> <td data-bbox="1034 562 1302 609">14:9 LB</td> </tr> <tr> <td data-bbox="767 609 1034 656">14:9 PB</td> <td data-bbox="1034 609 1302 656">16:9 vcrop</td> </tr> <tr> <td data-bbox="767 656 1034 703">4:3 PB</td> <td data-bbox="1034 656 1302 703">16:9 vcrop</td> </tr> <tr> <td data-bbox="767 703 1034 748">4:3 PB</td> <td data-bbox="1034 703 1302 748">14:9 PB vcrop</td> </tr> </tbody> </table> <p>LB = Letterbox, PB = Pillarbox, Vcrop = Vertical Crop, An = Anamorphic</p>	From (UHD)	To (SD)	16:9	4:3 hcrop (default)	16:9	16:9 LB	16:9	16:9 An	4:3 PB	4:3	14:9 PB	14:9 LB	14:9 PB	16:9 vcrop	4:3 PB	16:9 vcrop	4:3 PB	14:9 PB vcrop																						
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SD/HD Cross conversion	<p>Sets the SD to HD aspect ratio conversion. Available cross convert presets are:</p> <table border="1" data-bbox="767 911 1302 1809"> <thead> <tr> <th data-bbox="767 911 1042 954">From (SD)</th> <th data-bbox="1042 911 1302 954">To (HD)</th> </tr> </thead> <tbody> <tr> <td data-bbox="767 954 1042 1001">4:3</td> <td data-bbox="1042 954 1302 1001">16:9 vcrop</td> </tr> <tr> <td data-bbox="767 1001 1042 1048">4:3</td> <td data-bbox="1042 1001 1302 1048">4:3 PB</td> </tr> <tr> <td data-bbox="767 1048 1042 1095">16:9 LB</td> <td data-bbox="1042 1048 1302 1095">16:9</td> </tr> <tr> <td data-bbox="767 1095 1042 1142">16:9 An</td> <td data-bbox="1042 1095 1302 1142">16:9</td> </tr> <tr> <td data-bbox="767 1142 1042 1189">14:9 LB</td> <td data-bbox="1042 1142 1302 1189">14:9 PB</td> </tr> <tr> <td data-bbox="767 1189 1042 1236">16:9</td> <td data-bbox="1042 1189 1302 1236">4:3 hcrop</td> </tr> <tr> <td data-bbox="767 1236 1042 1283">16:9</td> <td data-bbox="1042 1236 1302 1283">16:9 LB</td> </tr> <tr> <td data-bbox="767 1283 1042 1330">16:9</td> <td data-bbox="1042 1283 1302 1330">16:9 An</td> </tr> <tr> <td data-bbox="767 1330 1042 1377">4:3 PB</td> <td data-bbox="1042 1330 1302 1377">4:3</td> </tr> <tr> <td data-bbox="767 1377 1042 1424">14:9 PB</td> <td data-bbox="1042 1377 1302 1424">14:9 LB</td> </tr> <tr> <td data-bbox="767 1424 1042 1471">16:9 LB</td> <td data-bbox="1042 1424 1302 1471">4:3 hcrop</td> </tr> <tr> <td data-bbox="767 1471 1042 1518">16:9 LB</td> <td data-bbox="1042 1471 1302 1518">16:9 An</td> </tr> <tr> <td data-bbox="767 1518 1042 1565">16:9 LB</td> <td data-bbox="1042 1518 1302 1565">14:9 LB</td> </tr> <tr> <td data-bbox="767 1565 1042 1612">16:9 An</td> <td data-bbox="1042 1565 1302 1612">4:3 hcrop</td> </tr> <tr> <td data-bbox="767 1612 1042 1659">16:9 An</td> <td data-bbox="1042 1612 1302 1659">16:9 LB</td> </tr> <tr> <td data-bbox="767 1659 1042 1706">16:9 An</td> <td data-bbox="1042 1659 1302 1706">14:9 LB</td> </tr> <tr> <td data-bbox="767 1706 1042 1753">14:9 PB</td> <td data-bbox="1042 1706 1302 1753">16:9 vcrop</td> </tr> <tr> <td data-bbox="767 1753 1042 1800">4:3 PB</td> <td data-bbox="1042 1753 1302 1800">16:9 vcrop</td> </tr> <tr> <td data-bbox="767 1800 1042 1848">4:3 PB</td> <td data-bbox="1042 1800 1302 1848">14:9 PB vcrop</td> </tr> </tbody> </table> <p>LB = Letterbox, PB = Pillarbox, Vcrop = Vertical Crop, An = Anamorphic</p>	From (SD)	To (HD)	4:3	16:9 vcrop	4:3	4:3 PB	16:9 LB	16:9	16:9 An	16:9	14:9 LB	14:9 PB	16:9	4:3 hcrop	16:9	16:9 LB	16:9	16:9 An	4:3 PB	4:3	14:9 PB	14:9 LB	16:9 LB	4:3 hcrop	16:9 LB	16:9 An	16:9 LB	14:9 LB	16:9 An	4:3 hcrop	16:9 An	16:9 LB	16:9 An	14:9 LB	14:9 PB	16:9 vcrop	4:3 PB	16:9 vcrop	4:3 PB	14:9 PB vcrop
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Input Config

Configures the unit to respond to aspect signaling control. If input signaling is not present, **Force input format** (see below) can be used.

Menu Option	Operation
Input signaling source	<p>When an SD source contains more than one style of signaling, select the appropriate item:</p> <ul style="list-style-type: none"> • SMPTE 2016 (default) • L23 ETSI • L23 AFD • VI SMPTE • VI AFD <p>Alternate center cut - Disabled by default.</p> <p>When disabled, behavior on receipt of certain specific AFD codes ignores protected regions. When Alternate center cut is enabled, the ARC behavior for these six specific codes will be to remove any black bars and also remove the gray bars that will leave the alternative center. The alternative center will therefore be stretched to fit the screen so that the whole white area fills the screen. This will override Fit to width, 14:9 and Fit to height settings, so that all three give the same output result. It also overrides the SD Output format control (Anamorphic or Normal). See SMPTE ST 2016-1:2009 <i>Format for Active Format Description and Bar Data</i>, pages 7-9.</p> <p>Behavior with Alternate center cut enabled and disabled is shown in the table below:</p>

AFD Format	Interpretation - Alt Center Cut Disabled	Interpretation - Alt Center Cut Enabled
4:3 AFD 13	4:3	4:3 Alt 14:9
4:3 AFD 14	16:9 LB	16:9 LB Alt 14:9
4:3 AFD 15	16:9 LB	16:9 LB Alt 4:3
16:9 AFD 13	4:3 PB	4:3PB Alt 14:9
16:9 AFD 14	16:9	16:9 Alt 14:9
16:9 AFD 15	16:9	16:9 Alt 4:3

LB = Letterbox, PB = Pillarbox

Menu Option	Operation
If signaling input not present	<p>Select as required:</p> <p>Force input format - This control allows an SD input format to be applied if a signaling input is not present. It is disabled by default.</p> <p>When enabled, the input format is forced to that selected from the SD Input Format and HD/UHD Input Format lists.</p> <p>Formats available are:</p> <ul style="list-style-type: none"> • SD Input Format <ul style="list-style-type: none"> • Normal - use default aspect ratio. • 16:9 Anamorphic - horizontally squeezes a widescreen image to fit a standard 4:3 aspect ratio. • 16:9 Letterbox - preserves the original aspect ratio of film shot in a widescreen 16:9 aspect ratio, with bars visible at the top and bottom of the screen. • 14:9 Letterbox - preserves the original aspect ratio of film shot in a widescreen 14:9 aspect ratio, with bars visible at the top and bottom of the screen. • HD/UHD Input Format <ul style="list-style-type: none"> • Normal (default): use default aspect ratio. • 14:9 pillarbox: preserves the original aspect ratio of HD content with a 14:9 aspect ratio, with bars visible at the sides of the screen. • 4:3 pillarbox: preserves the original aspect ratio of HD content with a 4:3 aspect ratio, with bars visible at the sides of the screen.

Output config

Select the required output from the **Conversion Scaling** and **SD Output Format** lists:

Menu Option	Operation
Conversion scaling	<ul style="list-style-type: none"> • Fit to height: Scales the image to fit the height of the screen while maintaining the aspect ratio. • Fit to width: Scales the image to fit the width of the screen while maintaining the aspect ratio. • 14:9: Can scale either a 4:3 image for viewing on a 16:9 screen, or a 16:9 image for viewing on a 4:3 screen. This is a compromise in order to maintain the aspect ratio of the image, but will crop some of the image in the process (top and bottom when viewing 16:9, and left and right when viewing 4:3).
SD output format	<ul style="list-style-type: none"> • Normal (default): Use default aspect ratio • Anamorphic: Horizontally squeezes a widescreen image to fit a standard 4:3 aspect ratio.

Post Scaling Control

The **Post scaling control** enables the size and position of the picture to be adjusted manually.

Option	Operation
Manual Control	<p>Disabled (default)</p> <p>Enabled - Enables manual adjustment of aspect ratio.</p> <p>Note: These controls do not operate in UHD to UHD mode. Adjusting the picture size in any down or cross-conversion mode can increase the amount of visible alias. To avoid this it is recommended that the Horizontal and Vertical filters are set to Narrow 1 (see section).</p>
Size	<p>Adjusts the size of the whole output image while maintaining the aspect ratio. Range is 80% to 120% in steps of 1%. Default is 100%.</p>
Aspect	<p>Adjusts the aspect ratio of the output image. Range is 70% to 150% in steps of 1%. Default is 100%.</p>
Pan	<p>Adjusts the horizontal position of the output image. Range is -50 to +50 pixels in steps of 1 pixel. Default is 0 pixels.</p>
Tilt	<p>Adjusts the vertical position of the output image. Range is -50 to +50 lines in steps of 1 line. Default is 0 lines.</p>

Output Signaling Config

Controls the signaling applied to the output.

Option	Operation
SMPTE 2016	<p>Available options are:</p> <ul style="list-style-type: none"> • Mode: <ul style="list-style-type: none"> • Auto - Automatically sets the conversion based on a combination of the input and output standards. • Pass - Passes SMPTE 2016 information through the unit unchanged. • Force - Forces the conversion specified on the output. • Delete - Deletes SMPTE 2016 information from the output signal. • Output line - Selects the output line on which SMPTE 2016 information is placed. • Output line status - Displays the line number on which SMPTE 2016 information is placed.

Notes

In the SD domain, take care to avoid a line clash if embedded VITC and SMPTE 2016 are both enabled.

In the event of both VITC and SMPTE being required:

- For SD 625 signals, SMPTE2016 is relocated to the line before the VITC line, i.e. if VITC is at default 19 and 21, SMPTE2016 will be placed on either 18 or 20 respectively when there is a clash.
- For SD 525 signals, SMPTE2016 is relocated to the line between the two VITC lines, i.e. if default VITC is on lines 14 and 16, SMPTE2016 will be placed on line 15 in the event of a clash.

Video Index

Configures Video Index (VI) signaling. Available controls are:

Option	Operation
Mode	<ul style="list-style-type: none"> • Auto (default): Automatically sets the conversion based on a combination of the input and output standards. • Pass: Passes VI information through the unit unchanged. • Force: Forces the conversion specified on the output. • Delete: Deletes VI information from the output signal.
Output format	<ul style="list-style-type: none"> • SMPTE (default): Outputs Video Index information according to SMPTE RP186. • AFD: Outputs Video Index information according to ARDSPEC1.
VI pass data	<ul style="list-style-type: none"> • Disabled (default): VI data other than coded frame and AFD are blanked. • Enabled: User data from the source VI are passed from the input to the output.

Line 23

Configures Line 23 (L23) signaling. Available controls are:

Option	Operation
Mode	<ul style="list-style-type: none"> • Auto (default) - Automatically sets the conversion based on a combination of the input and output standards. • Pass - Passes L23 information through the unit unchanged. • Force - Forces the conversion specified on the output. • Delete - Deletes L23 information from the output signal.
Output format	<ul style="list-style-type: none"> • ETSI (default) - Outputs L23 information according to ETSI EN 300 294 v1.4.1. • AFD - Outputs L23 information according to <i>West Country TV/HTV/Central TV L23_SPEC.doc 1997</i>.
Input line	Selects the input line from which the L23 information is read. The range is from line 10 to line 23 in one-line steps. Default = line 23.
Output line	Selects the output line on which L23 information is placed. The range is from line 10 to line 23 in one-line steps. Default = line 23.
Output line status	Displays line number of where the signaling is placed.
AFD user bits	<ul style="list-style-type: none"> • Force user bits value - allows user-defined bits to be inserted. Options are: • Disabled (default). • Enabled - Allows up to four user-defined bits to be inserted.
AFD user bits value	From 0 to 15 in steps of 1. Set as required. Default = 0.

Force mode config

Inserts specific signaling codes regardless of the source aspect ratio.

SMPTE 2016: When enabled, inserts valid SMPTE 2016 data when none is present on the input. Available codes are:

4:3 AFD 0	16:9 AFD 0
4:3 AFD 1	16:9 AFD 1
4:3 AFD 2	16:9 AFD 2
4:3 AFD 3	16:9 AFD 3
4:3 AFD 4	16:9 AFD 4
4:3 AFD 5	16:9 AFD 5
4:3 AFD 6	16:9 AFD 6
4:3 AFD 7	16:9 AFD 7
4:3 AFD 8	16:9 AFD 8
4:3 AFD 9	16:9 AFD 9
4:3 AFD 10	16:9 AFD 10
4:3 AFD 11	16:9 AFD 11
4:3 AFD 12	16:9 AFD 12
4:3 AFD 13	16:9 AFD 13
4:3 AFD 14	16:9 AFD 14
4:3 AFD 15	16:9 AFD 15

SMPTE RP-186: When enabled, inserts valid RP-186 data when none is present on the input. Available codes are:

4:3 (default)
16:9

AFD: When enabled, inserts valid AFD codes when none are present on the input. Available codes are:

4:3 AFD 0	16:9 AFD 0
4:3 AFD 1	16:9 AFD 1
4:3 AFD 2	16:9 AFD 2
4:3 AFD 3	16:9 AFD 3
4:3 AFD 4	16:9 AFD 4
4:3 AFD 5	16:9 AFD 5
4:3 AFD 6	16:9 AFD 6
4:3 AFD 7	16:9 AFD 7

ETSI: When enabled, inserts valid ETSI codes when none are present on the input. Available codes are:

4:3 FF
14:9 Center
14:9 Top
16:9 Center
16:9 Top
> 16:9 Center
4:3 SP 14:9
16:9 FF

FF = Full Format

Audio Routing

Provides control of audio routing.

Note: Embedded audio is supported by all models. Analog and AES audio are available only if a UHD with audio option has been purchased.

The screenshot displays the Audio Routing interface with the following sections:

- Routing Mapping:** A grid with 8 columns (Pair 1-8) and 14 rows (Embedded 1-8, AES 1-8, Analogue 1-2). Yellow dots indicate active connections: Embedded 1 to Pair 1, Embedded 2 to Pair 2, Embedded 3 to Pair 3, Embedded 4 to Pair 4, Embedded 5 to Pair 5, Embedded 6 to Pair 6, Embedded 7 to Pair 7, and Embedded 8 to Pair 8.
- Input Status:** A list of inputs and their status: Embedded 1-8 (Loss), AES 1-8 (Loss), Analogue 1 (PCM), Analogue 2 (PCM).
- Analog Output:** Two panels for Out 1 and Out 2, each with a list of Pair 1-8.
- Analog Levels:** Four sliders for In 1 ADC headroom, In 2 ADC headroom, Out 1 DAC level, and Out 2 DAC level, all set to 18.0dB.
- AES I/O:** Eight panels (AES 1-8) each with a 'Use As Input' button and a list of Pair 1-8.
- AES Balanced / Unbalanced:** A dropdown menu currently set to 'Balanced'.

Audio Routing page

Audio Terminology:

- **Source audio** (input pairs or channels) refers to audio associated with the incoming source material, which could be embedded audio, balanced AES (audio option only) or analog audio (audio option only);
- **Process pairs or channels** (sometimes abbreviated to *process pr* in the menus) refer to audio processing channels, to which input audio pairs may be assigned;
- **Output pairs or channels** refer to audio coming from the processing channels which is routed to the unit outputs. Output audio can be embedded, balanced or unbalanced AES (audio option only) or analog (audio option only).

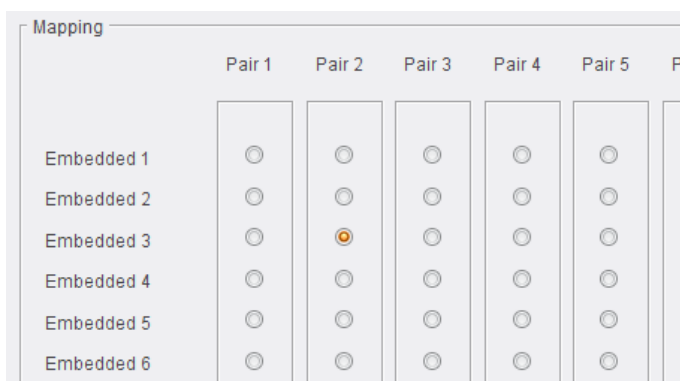
Operation

To select the audio source to be passed to each audio processor, select the process channel from the list of process pairs (1 to 8), and select the source audio to assign to the chosen channel:

Source Audio	Available Choices
Embedded audio	Embedded 1 - 8
AES	AES 1 - 8
Analog	Analog 1 - 2

For example, to use source audio from SDI Embedded 3 in audio processing channel 2:

- Open the **Audio routing** page.
- In the **Mapping** section, select the button in the position where the **Process pair 2** column intersects with the **Embedded 3** row:



Audio Routing Selection

Analog Output

The **Analog Output** lists allow output audio pairs to be mapped to outgoing analog pairs. Select an output pair for each analog audio output as required.

Analog Levels

Allows adjustment of analog audio levels.

Analog Level	Operation
In 1 ADC headroom	Adjusts the analog audio ADC headroom level for analog audio input Pair 1, from 12 dB to 24 dB in steps of 0.5 dB. Preset is 18 dB.
In 2 ADC headroom	Adjusts the analog audio ADC headroom level for analog audio input Pair 2, from 12 dB to 24 dB in steps of 0.5 dB. Preset is 18 dB.

Analog Level	Operation
Out 1 DAC level	Adjusts the analog audio DAC level for analog audio output Pair 1, from 12 dB to 24 dB in steps of 0.5 dB. Preset is 18 dB.
Out 2 DAC level	Adjusts the analog audio DAC level for analog audio output Pair 2, from 12 dB to 24 dB in steps of 0.5 dB. Preset is 18 dB.

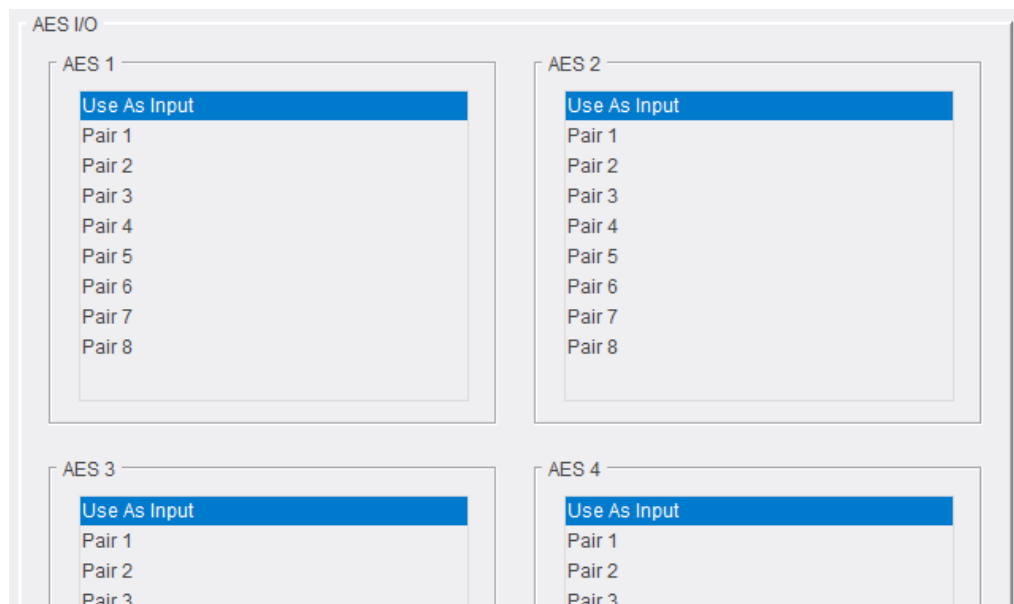
Input Status

Displays the status of each input. Possible values are:

- **PCM:** audio is PCM.
- **Loss:** no audio detected.
- **Data:** data detected on audio channel.
- **DolbyE:** DolbyE audio detected.

AES I/O

AES audio I/O is available via 8 bi-directional ports, each of which can be configured as either an input or an output.



AES I/O Configuration

To configure a port, locate it on the AES x port lists, then select either:

- **Use As Input**, or
- A pair to set as an output.

AES Balanced/Unbalanced

Enables either balanced or unbalanced audio. Select as required.

Audio Shuffle

Audio shuffle allows routing from each process pair to the output. Facilities to invert audio phase and insert tone or silence are also available here.



Audio Shuffle page

Notes

The **Audio Shuffle** menu allows any configuration of audio channels to be routed to the output. Illegal combinations will result in the output being forced to silence.

If both audio channels of an audio pair have been derived from non-PCM audio channels, there are two possible states, **Non-PCM** or **Forced silence**. To be recognized as valid non-PCM (**N**), both channels must:

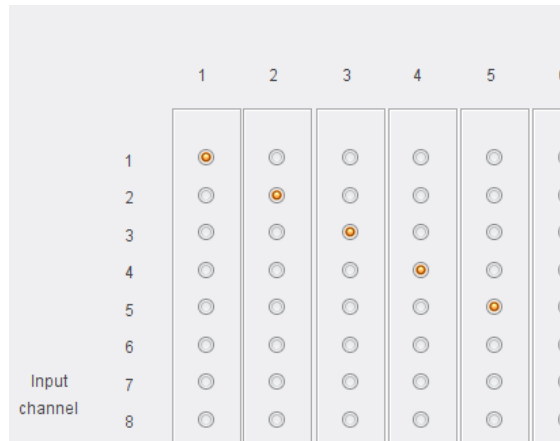
- Have come from the same input pair;
- Have the left and right channels the correct way round;
- Not have the phase inverted.

A failure of any of these conditions will cause the pair to be muted and the status to be reported as **Forced silence**.

Assigning an output from a processing channel

To use source audio from Input 3 in Output 3:

- Open the **Audio Shuffle** page.
- In the **Mapping** section, select the button in the position where the **Input Channel 3** column intersects with the **Output Channel 3** row:



Audio Shuffle Selection

Additional processing options are available:

Invert Phase - Causes the phase of left and right audio channels to be inverted. This is useful when dealing with input audio discrepancies. Enable channel check boxes as required.

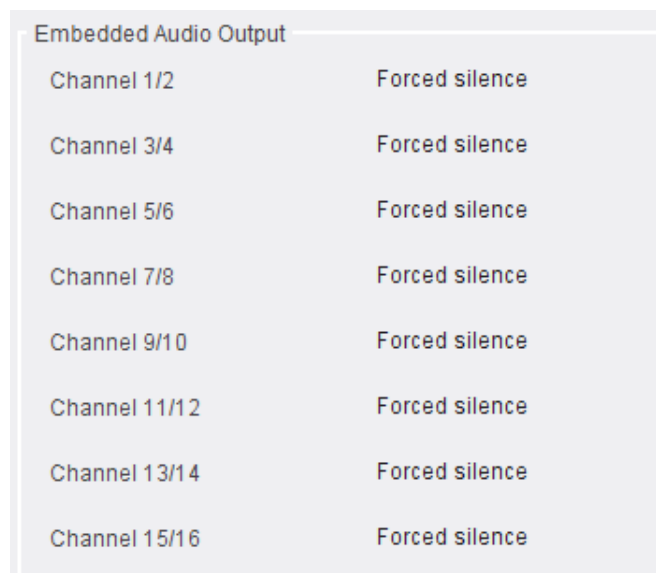
Note: Phase invert is available only for PCM audio.

Router Output: Routing - Passes audio to output without performing additional processing.

Router Output: Tone - Inserts a tone into the selected audio channel.

Router Output: Silence - Mutes the selected audio channel.

The settings made here are displayed on the **Embedded Audio Output** pane:



Embedded Audio Output pane

Possible values are:

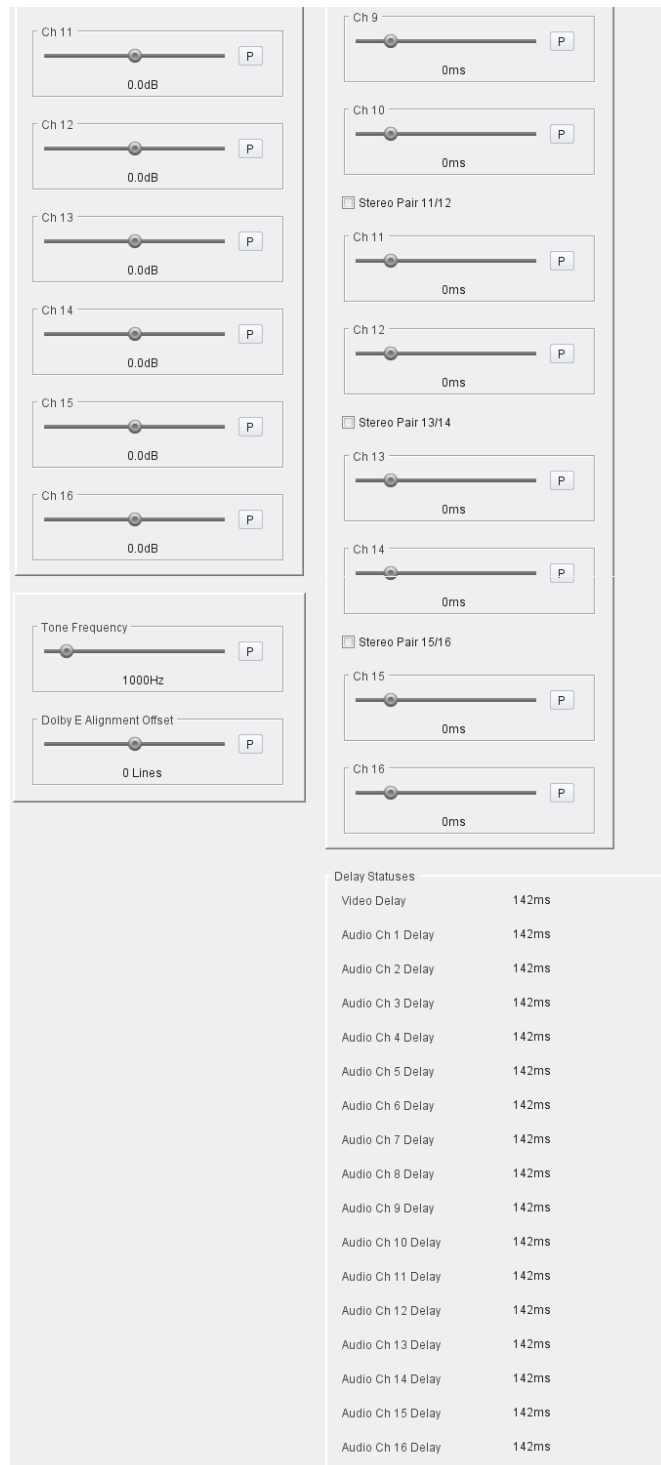
- **Routed**
- **Tone**
- **Forced Silence**

Audio Control

The Audio Control page provides tools to adjust the audio on each processing channel.



Audio Control page (1)



Audio Control page (2)

The following facilities are available from this page:

Audio Control	Available Choices
Gain	Audio gain can be adjusted from -18dB to +18dB in steps of 0.1dB. Default is 0dB. Use the channel sliders to adjust the gain on individual channels. Alternatively, use the Master control to adjust the gain for all channels at once.

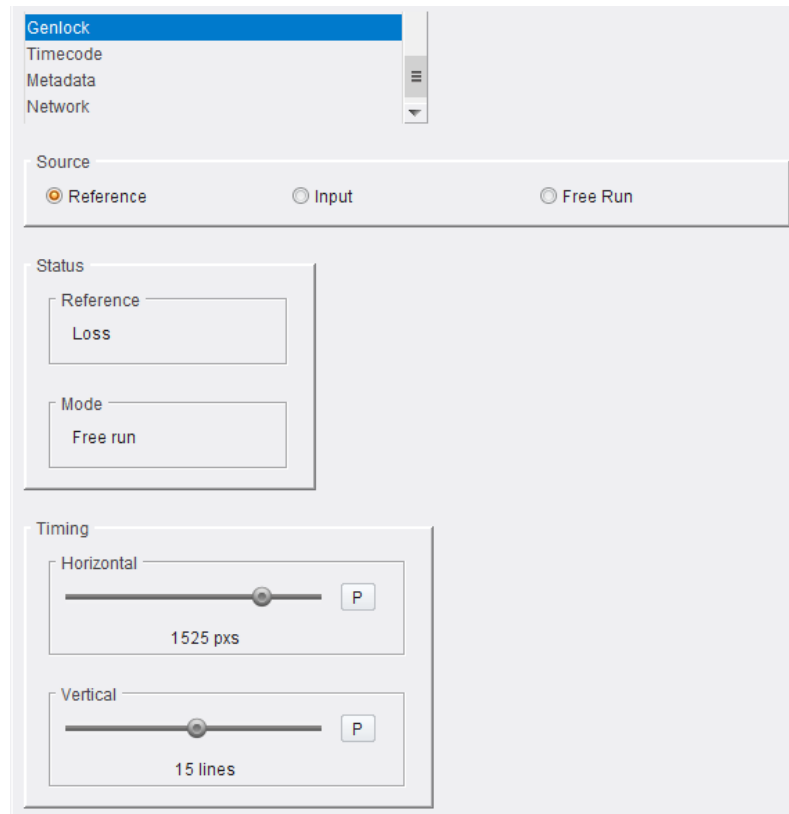
Audio Control	Available Choices
Tone frequency	Tone frequency can be selected from 100Hz to 10000Hz in steps of 100Hz. Default is 1000Hz.
Dolby E alignment offset	Dolby E alignment offset can be selected from -10 lines to +10 lines in steps of 1 line. Default is 0 lines.
Delay	Delay can be adjusted for each of the sixteen audio channels. The adjustment range is -40ms to +200ms in 1ms steps. The default value is 0ms. To adjust delay offset, first select the process channel from the process channel list (Process channel 1 to Process channel 16) then select the required delay offset using the sliders. Alternatively, use the Master control to adjust the delay for all pairs at once: individual pair delay offsets are preserved and limited at the maximum and minimum delay values. With delay set to zero, the audio will be co-timed with the video.
Delay statuses	Shows the total delay per channel in ms.
Video delay	Shows the current total video delay through the unit.

Notes

- Global delay is applied to all channels. Individual channel delays are added/subtracted from this delay.
 - Channel delay is added instantaneously and will produce an audible disturbance.
 - Global delay is added or subtracted at the rate of 2ms/s, and does not produce an audible disturbance. Allow time for the global delay to settle to the desired value.
 - The maximum audio delay (video processing delay + added audio delay) is limited to 260ms.
-

Genlock

The Genlock page provides control over system interaction with timing references.



Genlock page

Genlock locks the output video clock to the genlock source (input or reference), regardless of the video standard. If the genlock source and the video output are the same frame rate, for example, 50 Hz or 59.94 Hz, Genlock locks the output to the vertical phase of the genlock source, giving consistent and repeatable delay. If the video output frame rate differs from the genlock source frame rate, the output will 'clock lock' to the genlock source. Clock lock ensures that the output audio 48kHz clock remains locked to the genlock source.

When attempting to pass non-PCM audio (other than Dolby-E), ensure that Genlock is enabled. If using an external reference, it must be clock-locked to the input video.

The following facilities are available from this page:

Menu Option	Operation
Source	<ul style="list-style-type: none"> • Reference (default): locks to the incoming reference. • Input: Locks output to input. When input and output frame rates are integer related, selecting Input will force the unit to a fixed processing delay. • Free run: locks the output video to an internal reference clock.
Status	Shows the status of the currently assigned reference. For example, if genlock is assigned to input, status shows Input followed by the current status of the input. If there is no signal on the assigned reference, status shows Loss .
Mode	Reports: Selected lock mode, Output format, lock status (genlock , clocklock , freerun).

Menu Option	Operation
V timing	Adjusts the vertical timing of the output signal with respect to the reference signal, from line -1125 to line 1125 in steps of 1 line. Default = 0 lines
H timing	Adjusts the horizontal timing of the output signal with respect to the reference signal, from pixel -2640 to pixel 2640 in steps of 1 pixel. Default = 0 pixels

Note: Genlock timing adjustments will take effect only when the Genlock source is set to **Reference**.

Timecode

The Timecode page enables setup and control of the unit's timecode options for VITC (Vertical Interval Timecode), LTC (Linear Timecode), and ATC (Ancillary Timecode). In the HD domain, both Embedded VITC and Embedded LTC are supported. In the SD domain, VITC, ATC LTC and ATC VITC are supported.

Timecode page

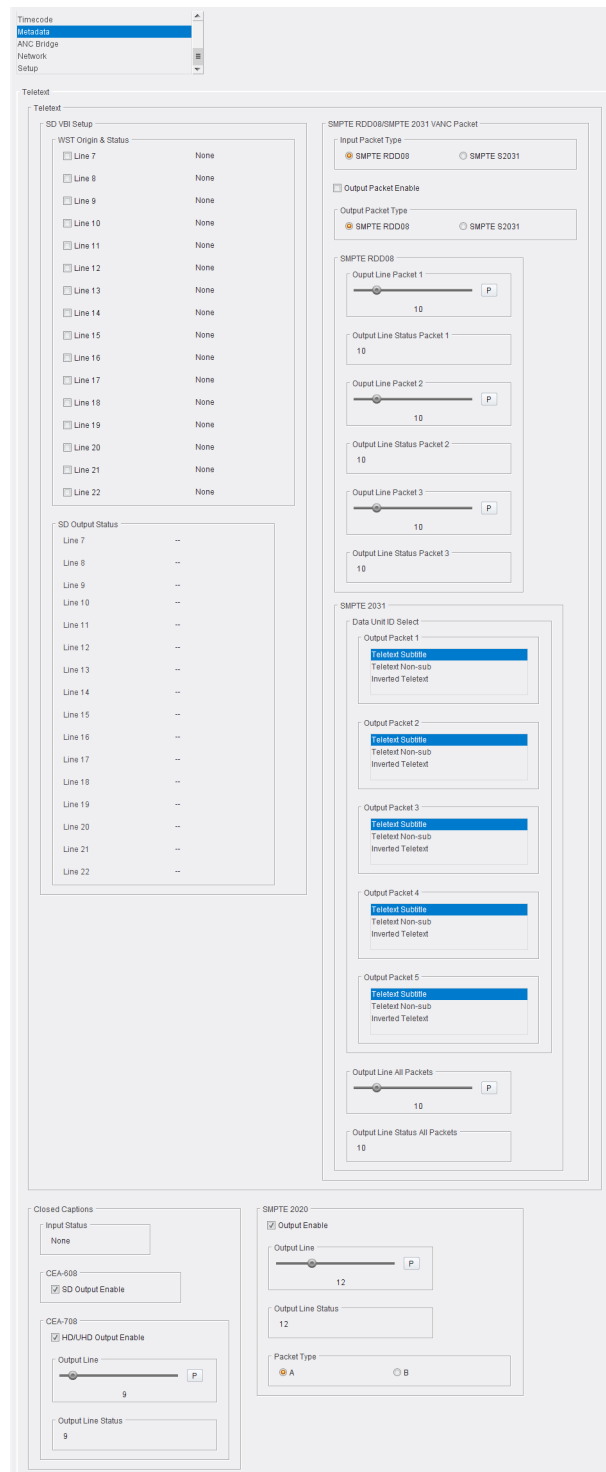
When present, timecode can be handed over from the input or internally generated. Where the input frame rate is 29.97 fps, both drop frame and non-drop frame modes are supported. For 29.97fps outputs, timecode can be configured as either drop frame or non-drop frame.

The following facilities are available from this page:

Menu Option	Operation
Source	HD/UHD: <ul style="list-style-type: none"> • Embedded LTC (default) • Embedded VITC SD: <ul style="list-style-type: none"> • VITC (Default) • Embedded LTC • Embedded VITC
Status	Reports the output line containing timecode.
Processing	Mode: <ul style="list-style-type: none"> • Follow input (default): When active, only the selected source type of ANC packet is inserted into the output video. So, the action on timecode loss is applicable only to the selected ATC type. • Generate: Allows the user to generate timecode using the value entered in Generator Timecode Entry as a start point. The action taken on selection of the Generate mode depends on the previous timecode handling state: if the mode was Input trigger, the output timecode will jump to the timecode value in Generator Timecode Entry when Generator Timecode Load is selected. If the mode was Follow Input, the output timecode will jump to the timecode value in Generator Timecode Entry as soon as the mode is changed to Generate. When Generate mode is selected, both ATC, LTC and ATC VITC are embedded in the output. On Timecode Loss: <ul style="list-style-type: none"> • Freeze (default): freezes output timecode. • Free run: timecode free runs from the current timecode value.
Generator	<ul style="list-style-type: none"> • Timecode Entry: The value to be used as a start point when generating timecode. Enter as appropriate. • Timecode Load: Click to load the value entered in Generator Timecode Entry.
Drop Frame	Select: <ul style="list-style-type: none"> • Drop Frame • Non-drop Frame (default)
SD Embedding	VITC enable: Select as required. <ul style="list-style-type: none"> • Enabled (default) • Disabled Output line (625): <ul style="list-style-type: none"> • Selects the output line on which VITC is placed when the output is 625. The range is from line 7 to line 20 in steps of 1 line. Default is line 19. Output line (525): <ul style="list-style-type: none"> • Selects the output line on which VITC is placed when the output is 525. The range is from line 11 to line 17 in steps of 1 line. Default is line 14. Output line status: <ul style="list-style-type: none"> • Reports the output line containing timecode.

Metadata

The Metadata page provides control of closed caption and teletext information. When upconverting or downconverting at the same frame rate, incoming SD or HD closed captions and subtitles are converted to the correct format in the HD or SD output.



Metadata page

The following facilities are available from this page:

Teletext

The unit can pass World System Teletext (WST) for SD and RDD-08 teletext for HD. Teletext output can be enabled or disabled, and the input and output lines to be used specified.

SMPTE RDD08 - Up to 15 lines can be encoded in the OP47 packet. A maximum of three packets are allowed on the output, each with individual line number controls. The number of output OP47 packets is decided by the number of valid WST lines decoded on the input. The first five WST lines are encoded in the first OP47 packet, the next five in the second OP47 packet, and so on.

SMPTE 2031 - Up to 5 SMPTE 2031 packets are allowed to be inserted on the output, with each packet containing data from one SD teletext line. The first five lines selected on the input are encoded in the 2031 packet. All packets will be placed on the line selected by the **Out line** controls.

Menu Option	Sub-Option	
SD VBI setup	WST Origin & Status	Choose: <ul style="list-style-type: none"> • Disabled (default) • Enabled for each of Line 7 - Line 22.
	SD Output Status	Reports status for each of output Line 7 - Line 22.
SMPTE RDD08/SMPTE ST2031 VANC Packet	Input Packet Type	Select as required: <ul style="list-style-type: none"> • SMPTE RDD08 (default) • SMPTE 2031
	Output Packet Enable	Select as required: <ul style="list-style-type: none"> • Disabled (default) • Enabled
	Output Packet Type	Choose: <ul style="list-style-type: none"> • SMPTE RDD08 (default) • SMPTE 2031
	SMPTE RDD08	Select: <ul style="list-style-type: none"> • Output Line Packet 1: select line from 8 to 20. Default is line 10. • Output Line Status Packet 1: reports line number. • Output Line Packet 2: select line from 8 to 20. Default is line 10. • Output Line Status Packet 2: reports line number. • Output Line Packet 3: select line from 8 to 20. Default is line 10. • Output Line Status Packet 3: reports line number.
	SMPTE ST2031	Data Unit ID Select: for each of output packets 1 - 5, select from: <ul style="list-style-type: none"> • Teletext subtitle • Teletext non-subtitle • Inverted teletext
		<ul style="list-style-type: none"> • Output Line All Packets: select line from 8 to 20 as required. Default is line 10.
		<ul style="list-style-type: none"> • Output Line Status All Packets: reports output line number.

Closed Captions

The **Closed Captions** controls allow closed captions to be enabled or disabled, and the input and output lines used to be specified. Available controls are:

Menu Option	Operation
Input status	Reports captions that have been detected.
CEA-608	Select whether to enable SD Output: <ul style="list-style-type: none"> • Off (default) • On
CEA-708 out	Select whether to enable HD/UHD Output: <ul style="list-style-type: none"> • Disabled (default) • Enabled
CEA-708 output line	Selects the output line on which to insert CEA-708 packets; the range is from line 8 to line 20 in one-line steps. The default is line 10.
CEA-708 output line status	Reports output line on which the captions are being inserted.

SMPTE 2020

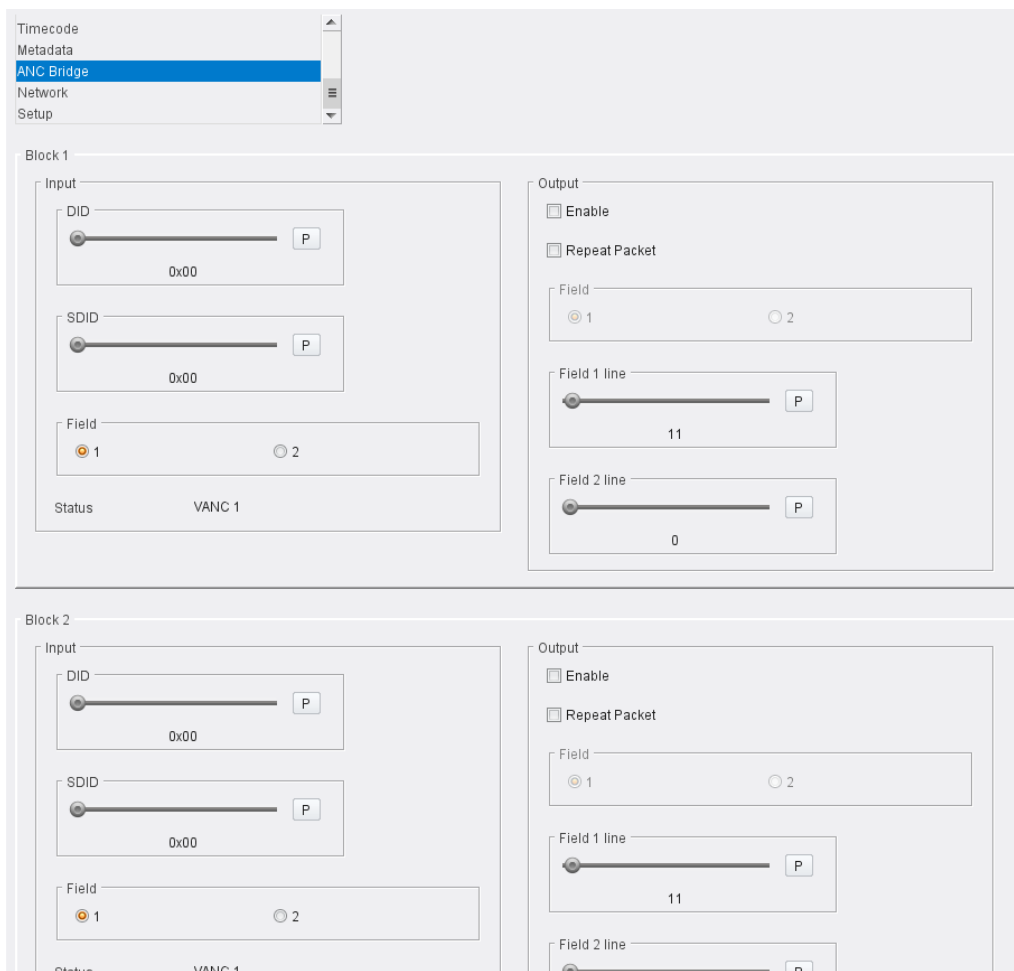
The UHD range allows insertion of SMPTE2020 Dolby metadata packets. Available controls are:

Control	Function
Output Enable	Enables the insertion of SMPTE 2020 Dolby metadata packets. Choose: <ul style="list-style-type: none"> • Disabled (default) • Enabled for each of Line 7 - Line 22.
Output Line	Selects the output line on which to insert Dolby metadata. The range is from line 8 to line 20 in one-line steps. Default is line 12.
Output Line Status	Reports on which output line the metadata is being inserted. If no line number is selected, OFF is displayed.
Packet Type	Select ST-2020 packet type: <ul style="list-style-type: none"> • A SMPTE 2020-2-2008 • B SMPTE 2020-3-2008

Note: If the line selected is already in use (by VITC, for example), the VANC embedding hierarchy will embed the SMPTE 2020 packet on the nearest available line.

ANC Bridge

The ANC Bridge page allows the ANC Bridge to be configured.



ANC Bridge page

The following facilities are available from this page:

Control	Function
Input (repeated for blocks 1 - 7):	
DID	Selects DID value (range 0 to 0xFF, default = 0).
SDID	Selects SDID value (range 0 to 0xFF, default = 0).
Field	Selects input field for packet detection. Options are: <ul style="list-style-type: none"> • 1 • 2
Status	Displays VANC or HANC and the detected line number.
Output (repeated for blocks 1 - 7):	
Enable	Enables insertion of the selected packet on the output.
Repeat packet	Used to insert packets on every frame when converting from: <ul style="list-style-type: none"> • Interlaced to high frame rate progressive. • Low frame rate progressive to interlaced. • Low frame rate progressive to high frame rate progressive. It is ignored in all other modes.

Control	Function
Field	Selects output field for packet detection. Options are: <ul style="list-style-type: none"> • 1 • 2
Field 1 line	Selects the output line for Field 1. Range is the full Field 1 range for each output standard. Move the slider to select the required output line. Defaults are: <ul style="list-style-type: none"> • [4 to 265] default = 10 (525) • [1 to 312] default = 14 (625) • [1 to 563] default = 11 (1080i) • [1 to 750] default = 11 (720p) • [1 to 1125] default = 11 (1080pA) • [1 to 563] default = 11 (1080pB)
Field 2 line	Selects the output line for Field 2. Range is the full Field 2 range for each output standard. Move the slider to select the required output line. Defaults are: <ul style="list-style-type: none"> • [266 to 525] default = 277 (525) • [313 to 625] default = 323 (625) • [564 to 1125] default = 573 (1080i) • N/A (720p) • N/A (1080pA) • [564 to 1125] default = 573 (1080pB)

Network

The Network page allows network settings to be configured.

The screenshot displays the Network configuration page. At the top left, a navigation menu includes 'Timecode', 'Metadata', 'Network' (highlighted), and 'Setup'. The main content is divided into two sections: Ethernet and SNMP.

Ethernet Section:

- IP Config:** A dropdown menu is set to 'Fixed Address'. Below it, 'DHCP' is selected.
- IP Address:** 172.19.81.146. Includes 'S' and 'P' buttons.
- IP Gateway:** 172.19.71.20. Includes 'S' and 'P' buttons.
- IP Netmask:** 255.255.224.0. Includes 'S' and 'P' buttons.
- Current IP Config:** A column with 'Fixed address' labels.
- Fixed address:** 172.19.81.146, 172.19.71.20, 255.255.224.0.
- Interface Status:** Network connected.
- MAC Address:** BC:66:41:00:03:6C.
- Apply IP Changes:** A button.

SNMP Section:

- Read Community:** public. Includes 'S' and 'P' buttons.
- Write Community:** private. Includes 'S' and 'P' buttons.
- MIB2 SysContact:** www.s-a-m.com. Includes 'S' and 'P' buttons.
- MIB2 SysName:** System name. Includes 'S' and 'P' buttons.
- MIB2 SysLocation:** Location name. Includes 'S' and 'P' buttons.
- Read/Write Port:** 161. Includes 'S' and 'P' buttons.
- Trap 1 - Input Change:**
 - Enable
 - IP Address:** 0.0.0.0. Includes 'S' and 'P' buttons.
 - Port:** 162. Includes 'S' and 'P' buttons.
 - Community:** public. Includes 'S' and 'P' buttons.
- Trap 2 - Reference Change:**
 - Enable
 - IP Address:** 0.0.0.0. Includes 'S' and 'P' buttons.
 - Port:** 162. Includes 'S' and 'P' buttons.
 - Community:** public. Includes 'S' and 'P' buttons.
- Apply SNMP Changes:** A button.
- Options:**
 - Control Enable
 - Traps Enable
 - Resend all Traps:** A button.

Network page

The following functions are available:

Control	Function
Ethernet:	
IP Config	Select: <ul style="list-style-type: none"> • Fixed Address for the unit to use a fixed IP address. • DHCP for the unit to use an IP address assigned by DHCP.
Current IP Config	Displays the current IP status. Possible values are: <ul style="list-style-type: none"> • Static • DHCP • OK • FAIL
IP Address	Enter the IP address to be used when Fixed Address is selected.
Current IP Address	Reports the IP address currently assigned to the unit.
IP Gateway	Enter the IP address of the gateway to be used when Fixed Address is selected.
Current IP Gateway	Reports the IP address of the gateway currently used by the unit.
IP Netmask	Enter the IP netmask to be used when Fixed Address is selected.
Current IP Netmask	Reports the IP netmask currently used by the unit.
Interface Status	Reports status of the IP interface.
MAC Address	Reports the MAC address of the UHD unit.
Apply IP Changes	Click to apply changes to IP config.
SNMP:	
Read Community	Enter the read community string. Default is "public".
Write Community	Enter the write community string. Default is "private".
MIB2 SysContact	Enter the name of the person responsible for the managed node.
MIB2 SysName	Enter the name of the managed node.
MIB2 SysLocation	Enter the physical location of the node.
Read/Write Port	Select the UDP read/write port for sending and receiving requests.
Trap 1 - Input change	Reports changes to input. To activate, set IP Address, Port and Community details as required, and click Enable .
Trap 2 - Reference change	Reports changes to the reference. To activate, set IP Address, Port and Community details as required, and click Enable .
Apply SNMP Changes	Click to apply changes to SNMP.
Options	<ul style="list-style-type: none"> • Control Enable • Traps Enable Select check boxes as required.

Note: Each SNMP Agent needs to be configured with Read and Write community values. The community provides a very rudimentary level of security. If a GET request is received from an SNMP Manager and the Read community value in the GET message matches the read community value set in the agent, the agent will respond with the value requested. Similarly, when an agent receives a SET command, the Write community value must match. By default most SNMP Agents have a read community value of *Public* and a write community value of *Private*. To prevent unauthorized access to a device, these values should be changed by the user.

Setup

The Setup page displays basic information about the module, such as the serial number and software version. Use the functions on the page to restart the module or to return all settings to their factory or default settings.

The screenshot shows the 'Setup' page interface. At the top, there is a blue header with the word 'Setup' and a dropdown arrow. Below this, the page is divided into several sections:

- Status:** A table-like section with the following data:

Serial Number	-
Software Version	1.0.1
Temperature	42C
PSU A	Off
PSU B	12.1Vdc
- Front Panel:** A section containing a 'Lock' checkbox.
- Reset:** A section containing two buttons: 'Default' and 'Factory'.
- Memories:** A section containing a list of radio buttons labeled 'Memory 1' through 'Memory 10'. 'Memory 1' is selected. To the right of this list are three buttons: 'Recall', 'Save', and 'Clear'. Below the list is a label 'Last Recalled Memory' with a value of '-'.

Setup page

The following functions are available:

Control	Function
Status:	
Serial number	Unit serial number.

Control	Function
Software version	Currently installed software version number.
Temperature	Current unit temperature.
PSU A	Displays the voltage currently being output by PSU A.
PSU B	Displays the voltage currently being output by PSU B.
Front panel - Lock	Enable check box to lock the front panel controls.
Reset	Click to reset the unit. Choose from: <ul style="list-style-type: none"> • Default - All controls are reset to their default values, except for network configuration and IP addresses. • Factory - All controls are reset to their default values, including network configuration and IP addresses.
Memories	Allows the unit to be reset to one of 10 previously saved configurations. Available functions are: <ul style="list-style-type: none"> • Memory - Select a memory to recall, save or clear. • Recall - Click to load the contents of the selected memory. • Save - Click to save current configuration to the selected memory. Note network settings are NOT saved. • Clear - Click to clear the selected memory.
Last Recalled Memory	Displays the last memory to be recalled.

Operation Via Web Browser

The KudosPro UHD range can be operated from a web browser as well as from the front panel. Simply type the unit's IP address, shown on the bottom of the Home screen, into a browser address bar. This will open a user interface allowing control of the KudosPro UHD unit:

The screenshot displays the web browser control interface for the KudosPro UHD unit, organized into four main sections:

- Input:** A table showing connection status for various inputs. SDI 1 is selected with a radio button. Below the table, the UHD Interface is set to Auto.
- Output:** The Output Standard is set to 1080 59p-A. UHD Interface is set to 2SI. Sample Interleaved PID is set to UHD. UHD ANC Embed is set to Link 1. Legalization, Test Patterns, and Default Output are all set to Off.
- Colorimetry:** Input Colorimetry is set to Auto, resulting in an Input Status of BT.709. Output Colorimetry is set to Follow Input, resulting in an Output Status of BT.709.
- SDR / HDR:** Detected Input is Unspecified. Conversion Type is Display. Input and Output Formats are SDR. Clip is Hard. PQ Level is 1k. SDR Enhance is Off. LUT Type is Type 3. The Import File Name field is empty, and the Pre-load List is set to None.

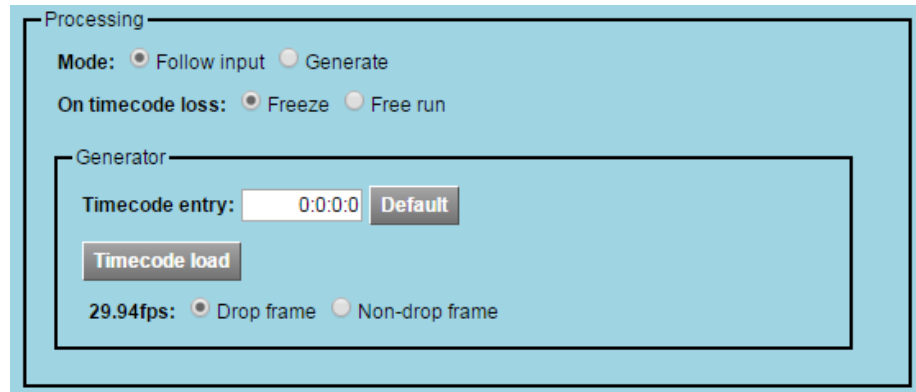
Browser Control Interface - UI Input and Output

The buttons at the top of the screen correspond to the buttons on the front panel, and offer the same functionality. Layout of the controls is a little different to those on the unit - sliders are used to set values for instance, and audio routing and shuffling are set by selecting items in a matrix - but the UI is intuitive and easy to use.

Browser-only Operations

Setting a Timecode Start Point

- 1 Open a suitable browser window, type the unit's IP address into the address bar and press RETURN. The browser connects to the unit and the UI is displayed.
- 2 Click **Timecode**; the Timecode page is displayed:



Browser Control Interface - Timecode Processing

- 3 Enter the required **Timecode Entry**, and click **Timecode Load**; the new start point is set.

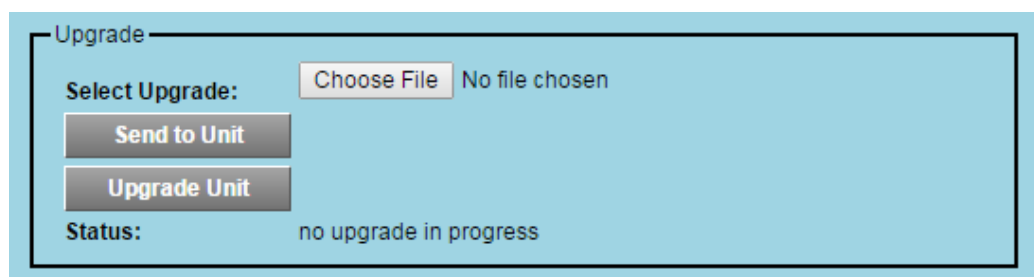
System Software Upgrade

Currently, upgrading the unit's software can be performed via the browser GUI only. Follow the instructions below to install these updates.

Note: The browser UI utilizes HTML5, and therefore requires the use of a modern browser. The UI has been tested with Chrome, Firefox and Internet Explorer/Edge. Please be aware that, at the time of writing, Internet Explorer does **not** allow the update package to be uploaded to the unit, although the upgrade itself can be performed using IE. Until this has been resolved, we recommend that Firefox or Chrome be used when upgrading units. Some minor cosmetic changes may be noticed in the web UI depending on the web browser.

- Ensure that the upgrade package is readily accessible before beginning the upgrade.
- The upgrade process will take around 15 minutes. The unit will not be able to be used until the process is complete.

- 1 Open a suitable browser window, type the unit's IP address into the address bar and press RETURN. The browser connects to the unit and the UI is displayed.
- 2 Click **Setup**; the Setup page is displayed. Scroll down to the **Upgrade** section:



Browser Control Interface - Software Upgrade

- 3 Click **Choose File**; a standard Windows Browse dialog is displayed. Navigate to the upgrade package, select it and click **Open**; the Browse dialog is closed, and the package name is displayed next to **Choose File**.
- 4 Click **Send to Unit**; the software is copied to the unit. When the copy is complete, the user is prompted to start the upgrade; click **Upgrade Unit** to begin.
Progress of the upgrade is displayed in the **Status** field; note that the unit will reboot as part of the process.
- 5 When the upgrade is complete, a confirmatory message will be displayed. Successful completion is also confirmed by the **Software Version** field at the top of the Setup page, which should reflect the new software version.

Recovery Mode

If the upgrade fails, because of network failure for instance, the UHD unit will restart in **Recovery** mode. In this case, repeat the upgrade installation procedure described above.



Grass Valley Technical Support

For technical assistance, contact our international support center at 1-800-547-8949 (US and Canada) or +1 530 478 4148.

To obtain a local phone number for the support center nearest you, please consult the Contact Us section of Grass Valley's website, www.grassvalley.com.

An online form for e-mail contact is also available from the website. Customers with a support contract should call their personalized number, which can be found in their contract, and be ready to provide their contract number and details.

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