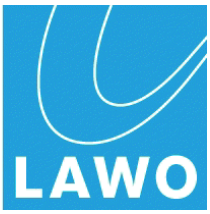
Networking Audio Systems




# V_pro8

## Installation & Operation Manual

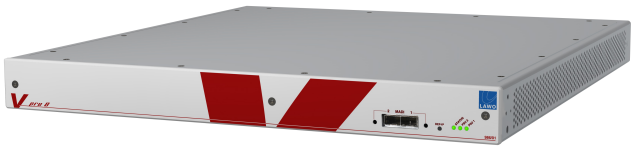
Version: 1.0/2
Edition: 17 November 2012

# Table of Contents

# Welcome

Welcome to the **V_pro8**, Lawo's compact and cost-efficient solution for connecting and converting video and audio signals:

**Front View**



**Rear View**

This documentation is designed for users and technicians, and covers installation and operation.

You can access more information by registering at www.lawo.de (click on **Login**). By registering you will receive the latest news for your product, and can download software and documentation.

## Marginal Notes

The following symbols are used to draw your attention to:

Points of clarification.

Useful tips and short cuts.

**Warning**

Warnings – alert you when an action should *always* be observed.

# Important Safety Instructions

## Warning

Exposure to excessive sound pressure levels can lead to impaired hearing and cause damage to the ear.

Please read and observe ALL of the following notes:

- Check all of the hardware devices for transport damage.
- Any devices showing signs of mechanical damage or damage from the spillage of liquids MUST NOT be connected to the mains supply or disconnected from the mains immediately by pulling out the power lead.
- All devices MUST be grounded using a grounded mains connection.
- All devices MUST be connected to the mains using the three-cord power leads supplied with the system. Only supply electrical interfaces with the voltages and signals described in these instructions.
- Do NOT use the system at extreme temperatures. Proper operation can only be guaranteed between temperatures of 0° C and 40° C and a maximum relative humidity of 90% (non-condensing).
- Only service staff may replace batteries.
- Servicing of components inside a device MUST only be carried out by qualified service personnel according to the following guidelines:
  - Before removing parts of the casing, shields, etc. the device MUST be switched off and disconnected from all mains.
  - Before opening a device, the power supply capacitor MUST be discharged with a suitable resistor.
  - Components that carry heavy electrical loads, such as power transistors and resistors, should NOT be touched until cool to avoid burns.
- Servicing unprotected powered devices may only be carried out by qualified service personnel at their own risk. The following instructions MUST be observed:
  - NEVER touch bare wires or circuitry.
  - Use insulated tools ONLY.
  - DO NOT touch metal semi-conductor casings as they can bear high voltages.

## Defective Parts/Modules

### Warning

- The **V_pro8** contains no user-serviceable parts. Therefore DO NOT open the devices other than to perform the procedures described in this manual.
- In the event of a hardware defect, please send the system component to your local service representative together with a detailed description of the fault. We would like to remind you to please check carefully whether the failure is caused by erroneous configuration, operation or connection before sending parts for repair. We recommend contacting our service department before sending parts for repair.

## First Aid (in the case of electric shock)

### Warning

- DO NOT touch the person or his/her clothing before power is turned off, otherwise you risk sustaining an electric shock yourself.
- Separate the person as quickly as possible from the electric power source as follows:
  - Switch off the equipment.
  - Unplug or disconnect the mains cable.
  - Move the person away from the power source by using dry insulating material (such as wood or plastic).
- If the person is unconscious:
  - Check their pulse and reanimate if their respiration is poor.
  - Lay the body down and turn it to one side. Call for a doctor immediately.
- Having sustained an electric shock, ALWAYS consult a doctor.

# Overview

This chapter provides an overview of the **V_pro8** and its key features:

# Introducing the V_Pro8

The **V_pro8** is a large de-embedder, embedder with routing plus video/audio processing and monitoring capabilities. It decodes different video and audio signals, and then transforms them from one format to another. By combining flexible signal routing with video and audio processing, the **pro8** can perform a number of different tasks in a single 1RU device:

Each unit provides:

- **8 x SDI in** - de-embedded to provide 8 video + 128 audio channels (1 video + 16 audio channels per SDI in).
- **8 x SDI out** - embedded to carry 8 video + 128 audio channels (1 video + 16 audio channels per SDI out).
- **2 x MADI in/out** - 128 audio input + 128 audio output channels (64 channels per MADI link).

The SDI connections support a wide range of 3G, HD (High Definition) and SD (Standard Definition) video standards. For details, please see Technical Data.

Video and audio can be re-assigned on a channel-by-channel basis. Thus, you can route a video signal to multiple outputs, embed new audio content into an SDI output and/or convert audio between SDI and MADI.

In addition, the **pro8** includes video and audio processing to deal with format conversion, frame syncing, colour correction, sample rate conversion and channel independent audio/video delay.

# Feature Summary

## Signal Routing

- **8 x 8 Video Matrix** - the video channel from any SDI input can be assigned to any SDI output.
- **384 x 384 Audio Matrix** - for each SDI output, embed up to 16 audio channels from any de-embedded SDI or MADI input. Similarly, for each MADI output channel, assign audio from any de-embedded SDI or MADI input.

## Video Processing

- **Frame Sync** (per channel) - to align incoming video signals to the reference.
- **Variable Delay** (per channel) - up to 8 frames, adjusted in 1 frame steps. Delay can be applied to the video input and/or output. An auto phaser can be enabled to align video input signals (within the line phaser range).
- **Format Conversion** (up to 2 channels simultaneously) - up/down/cross format and aspect ratio conversion. For example, you can convert a 1080i production to 720p and SD 16:9 or 4:3 at the same time.
- **Colour Correction** (per channel) - standard ProcAmp and RGB-style colour correction. An integrated Vectorscope or Waveform Monitor can be used to visualise the luminance and chrominance components.
- **Channel ID** and **Timecode Insertion** (per channel).

## Audio Processing

- **Sample Rate Conversion** (for all SDI in & out) - SRCs can be enabled, or disabled, on a group-by-group basis for all embedded and de-embedded SDI channels.
- **Variable Delay** (per channel) - up to 320 ms, adjusted in 1ms steps. Delay can be applied to the audio input and/or output, on a channel-by-channel basis.
- **Test tone Generator** (per SDI embedder) - switched to either 400Hz or 1kHz sine wave.

## Remote Control

Operational control is via a web browser interface, running on a computer connected to the **pro8** via Ethernet. The user interface provides fast and intuitive operation of all tasks. Multiple units can be remotely controlled from any network access point - just open a different browser session to each unit's IP address. In addition to controlling routing and parameters, the GUI provides:

- **Video Thumbnail Streaming** - to preview each of the 8 SDI output channels.
- **Audio PPM Metering** - for every audio input and output channel.
- **Status Monitoring** - for an overview of SDI and MADI inputs.

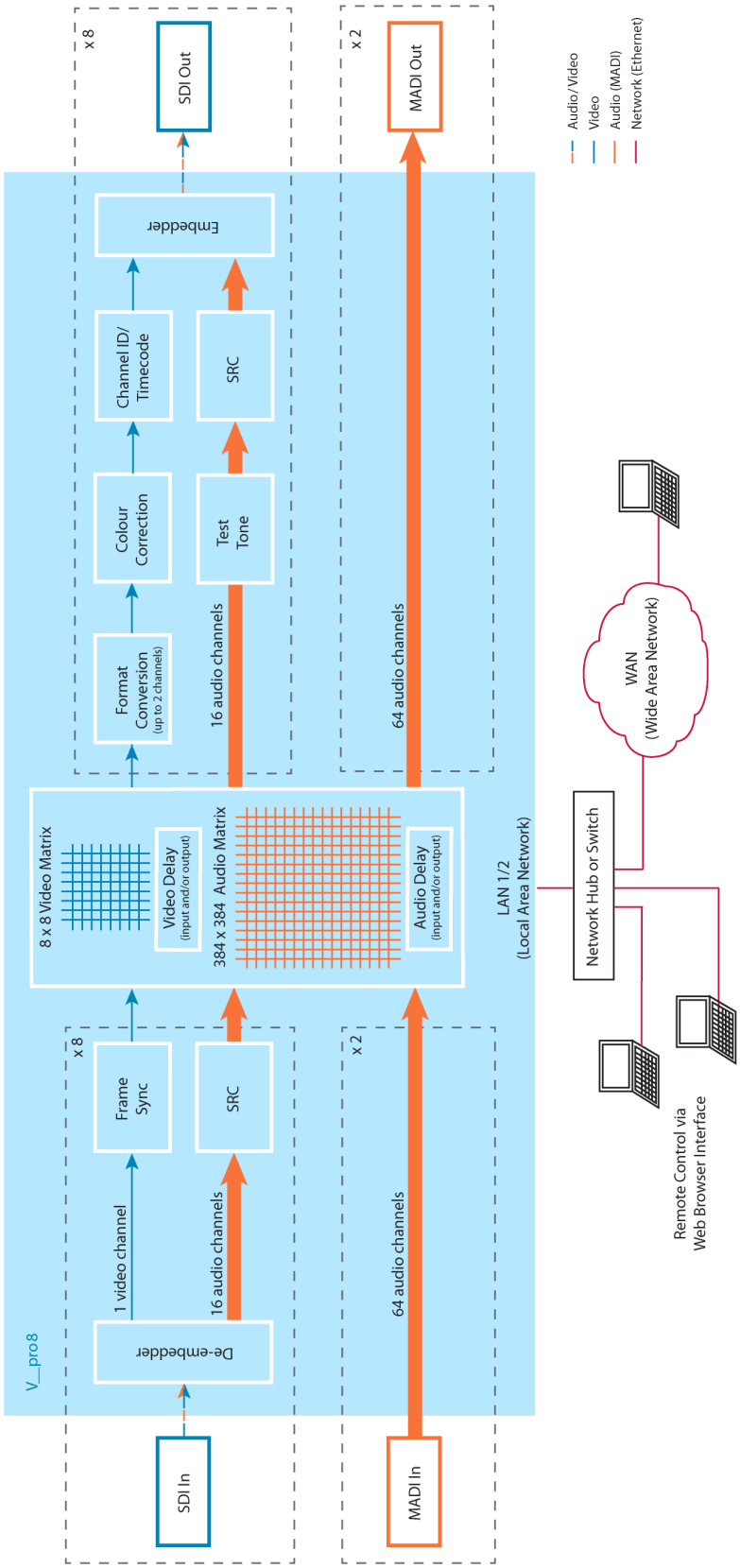
## Quad Split Monitoring

The MV (MultiView) output, available on BNC or DisplayPort connectors, provides local monitoring of up to 4 SDI inputs or outputs simultaneously.

## Redundancy

- **Redundant power supplies** - two independent power supplies are fitted to each unit; one main and one redundant.
- **Redundant MADI links** - front & rear panel connections operate in parallel to offer redundant in/out links.
- **Redundant network connection** - two LAN ports can connect to the control network.

# Signal Flow Block Diagram



# Licensing

The **pro8** comes with a range of licenses designed for different requirements.

Every unit supports:

- **Status Monitoring**
- **Signal Routing**
- **Frame Sync & SRC**
- **Variable Delay**
- **Channel ID, Timecode & Test Tone Insertion**

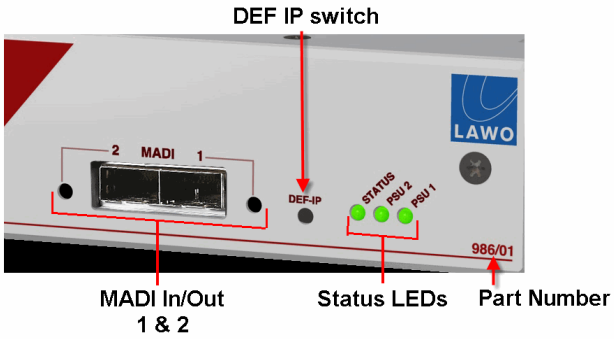
You may then add the following by purchasing and installing the relevant license. Multiple licenses may be combined as required:

- **Colour Correction** - YUV & RGB Colour Correction
- **Monitoring Package** - Quad split monitoring, Waveform monitoring (YUV & RGB) and the Vectorscope
- **Format Conversion 1** - one channel of video format conversion.
- **Format Conversion 1** - two channels of video format conversion.

In Version 1.0, licenses are pre-installed at the factory.

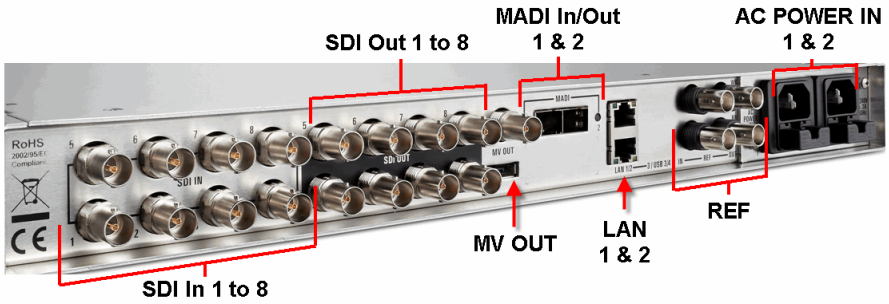
# Controls, Connectors & Indicators

## Front Panel Overview




| | |
|---|---|
| **MADI 1 & 2** | 2 x MADI in/out (AES 10).<br>Available on optical fibre LC connectors by fitting SFP adaptors.<br>The front and rear panel ports operate in parallel.<br>An LED for each port indicates the status:<br>• **Green** = MADI link is active.<br>• **Flashing Red** = MADI link is asynchronous.<br>• **Off** = no connection or MADI link is invalid. |
| **DEF-IP Switch** | This recessed switch resets the TCP/IP settings of the **pro8**.<br>Press and hold the switch, for around 5 seconds, while powering on. The Local Area Network connections are reset to:<br>• **LAN 1** IP address = **192.168.123.73**<br>• **LAN 2** IP address = **192.168.123.74**<br>• **LAN 1 & 2** Subnet Mask = **255.255.255.0**<br>For more details, see TCP/IP Configuration. |
| **STATUS LED** | Indicates the system status:<br>• **Blue** = unit is booting.<br>• **Green** = ready for operation.<br>• **Flashing Yellow** = network activity.<br>• **Red** = system error. |
| **PSU 1 & 2 LEDs** | Indicate the status of the two internal power supplies:<br>• **Green** = power supply is active.<br>• **Off** = power supply is inactive (no mains input or internal supply is faulty). |
| **Part Number** | The part number of your unit. |

# Rear Panel Overview




| | |
|---|---|
| **SDI IN 1 to 8** | 8 x SDI in on BNC (3G/HD/SD-SDI). |
| **SDI OUT 1 to 8** | 8 x SDI out on BNC (3G/HD/SD-SDI). |

Each SDI connection carries one digital video and 16 embedded audio channels. A wide range of 3G, HD and SD video standards are supported, please see Technical Data.

| | |
|---|---|
| **MV OUT** | MultiView output for local monitoring of up to 4 SDI outputs simultaneously. Two connector options are provided:<br>• 1 x BNC (3G).<br>• 1 x DisplayPort (for future implementation). |
| **MADI 1 & 2** | 2 x MADI in/out (AES 10).<br>Available on optical fibre LC connectors by fitting SFP adaptors.<br>The front and rear panel ports operate in parallel.<br>An LED for each port indicates the status:<br>• **Green** = MADI link is active.<br>• **Flashing Red** = MADI link is asynchronous.<br>• **Off** = no connection or MADI link is invalid. |
| **LAN 1 & 2** | 2 x Local Area Network on RJ45 (Ethernet).<br>These ports connect to your control computer, either directly or via a network switch or hub.<br>100 and 1000 Base-TX LAN speeds are supported (>= 100 Mbit/s is recommended for video thumbnail streaming). |
| **REF IN, OUT, LOOP & WK** | External Video reference and Wordclock signals on BNC:<br>• **IN** - video reference input (e.g. Tri-Level Sync or Black & Burst).<br>• **LOOP** - passive loop-thru output of the video **IN** (75-ohm termination required).<br>• **OUT** - video reference output, as selected by the user interface.<br>• **WK** - wordclock out. (In a future release, wordclock in or out as selected by the user interface). |
| **AC POWER IN 1 & 2** | 2 x mains AC power inputs on IEC (Auto sensing 100-240V VAC, 50/60Hz).<br>Only one supply is required to operate the system. For redundancy, connect both supplies, each to a separate AC mains circuit. |

# Installation & Configuration

This chapter covers the hardware installation of the **V_pro8**, and the configuration of your control computer, network and other settings:

# Computer System Requirements

To control parameters you will need an external computer, connected to the **pro8** via its Local Area Network port (**LAN 1** or **2**) and running a web browser session.

Your computer *MUST* meet or exceed the following requirements:

- **Network Interface Card**: operating at a speed of 100 or 1000 Base-TX LAN. A minimum speed of 100 Mbit/s is recommended for video thumbnail streaming.
- **Web Browser**: Mozilla Firefox, Google Chrome or Apple Safari (V6.0). Note that the Status -> MADI menu is slow when using Safari.
- **Screen Resolution**: >= 1440 x 900 is recommended, in order to view the full operating window without scrolling.

# Installation Checklist

To get your system operational, please complete each of the following steps:

1. Unpack and check the contents of the shipping box.
2. Fit any optical MADI port SFP transceivers.
3. Mount the unit.
4. Connect and turn on the power.
5. Connect and configure the network connection to your computer.
6. Open a web browser session.
7. Check the software revision and, if necessary, update your unit.
8. Connect the remaining video, audio and reference signals.
9. Configure the reference settings for your installation.

The rest of this chapter covers the steps in more detail.

# Packing List

Your shipping box includes:

- **V_pro8** unit
- Two IEC power cables (country-specific)
- Two 19" rack-mounting brackets for the frame
- Two SFP Optical Fibre Transceivers for MADI ports
- Documentation on CD

Check the contents, and in the event of any transport damage, please contact your local Lawo representative.

# Adaptor Installation

## MADI Port Adaptors

**Rear MADI Ports (no adaptors fitted)**


**Front MADI Ports (with Optical LC Duplex Connectors)**


The **pro8** is shipped with two SFP transceivers so that you may connect optical fibre to the MADI ports.

Either of the following transceivers are recommended:

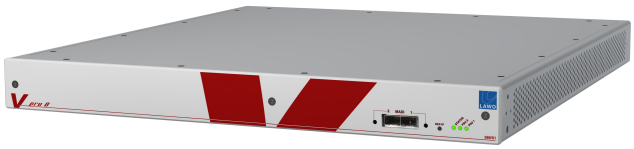
- Skylane SFP Transceiver (Part Number SFP13002EG0D000)
- Avago LC Duplex Connector Optical Interface (Part Number HFBR-57E0PZ).

Note that you will require an adaptor for each MADI connection - that's four adaptors in total, if you wish to connect MADI ports 1 & 2 at both the front and rear of the unit.

The SFP transceivers are hot-pluggable. To install, push each adaptor into the rectangular **MADI** slot. Press gently and firmly until the adaptor locks into position.

# Frame Installation

Front View



Rear View

The **pro8** can be mounted either in a 19" equipment rack or on a table top as follows:

- **19" Rack-Mounting** - fix the optional rack-mounting brackets to the front of the chassis. Then attach to a standard 19" equipment rack. Please install supporting slide bars to hold the weight of the unit.
- **Table Top** - the unit should be laid on a flat, horizontal surface.

Plug-in connectors are located at both the front and rear. Therefore, make sure that all connectors are accessible.
When using 19" racks with doors please leave enough room for the cables!

### Dimensions and Weight

- Width: 480.3mm (19“)
- Depth: 457.5mm (18")
- Height: 1RU
- Weight: 4.6kg (10 lbs and 2.26 oz)

### Temperature and Cooling

The unit is fitted with six fans inside, and ventilation holes on the left and right. Proper operation is guaranteed between temperatures of 0° C and 40° C and a maximum relative humidity of <= 90% non-condensing.

**Warning**

*DO NOT* obstruct the ventilation holes as to do so will prevent efficient cooling.

# Grounding & Power


## Grounding

The **pro8** is grounded via the 3-pin IEC power connectors on the rear of the unit.

### Warning

The unit must be on the same potential as all other system devices/modules.

For Scandinavian countries, ALWAYS use a grounded mains connection, to prevent the device from being grounded through Ethernet or other signal connections.

## Power

The unit is fitted with two independent power supplies:

- **Input Voltage:** 2 x auto sensing 100-240V VAC power supply, 50/60Hz nominal
- **Power Consumption:** < 100W
- **Connection:** 2 x IEC power connectors

Only one supply is required to operate the system. For redundancy, connect both supplies, each to a separate AC mains circuit. This will ensure continued operation if one of the mains circuits fails.

### Warning

Please observe all of the Safety Instructions *BEFORE* connecting power to the unit.

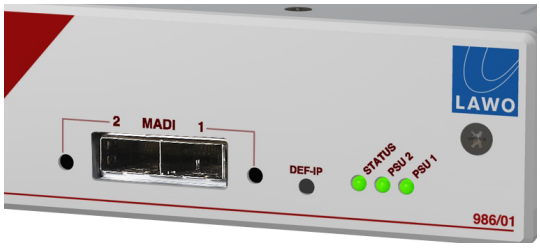
The device MUST be connected to the mains using the adaptors supplied with the system. Country-specific mains adaptors will be supplied with the system.

When running with multiple mains supplies, make sure that both circuits lie on the same ground potential. Otherwise, an internal bridge of two ground wires will lead to a ground loop!

# Powering On

The **pro8** has no on/off switch but starts automatically when either power supply is connected to the mains. Please install a master system power switch where applicable.

You will hear the fans begin to operate, and the LEDs on the front of the unit illuminate as follows:




➢ **STATUS LED**

- **Blue** = unit is booting.
- **Green** = ready for operation.
- **Flashing Yellow** = network activity.
- **Red** = system error. If the **STATUS** LED is red, then try powering the unit off and on. For further assistance, please contact your local Lawo representative or email service@Lawo.de.

➢ **PSU 1 and PSU 2 LEDs**

- **Green** = power supply is active.
- **Off** = power supply is inactive (no mains input or internal PSU is faulty).

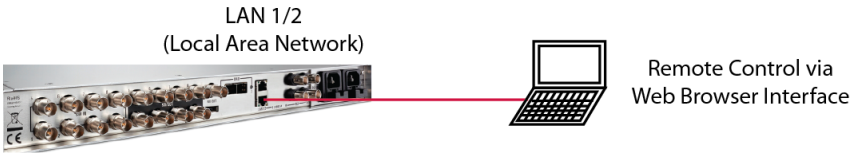
The system takes approximately 7 seconds to boot from power on, and loads the latest settings.

# Network Connection

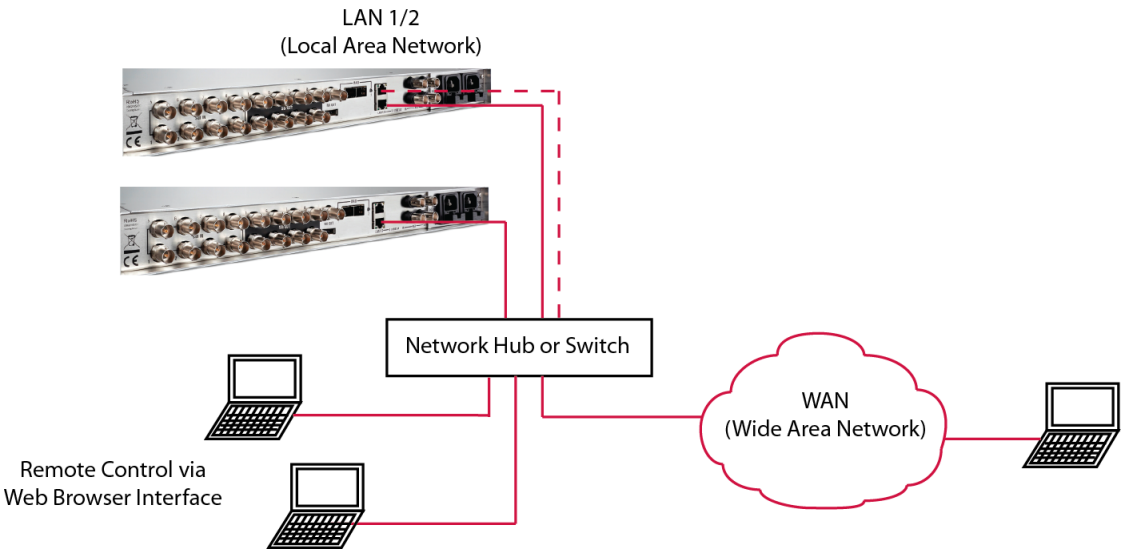
To control parameters, you will need to connect an external computer to the **pro8**, via its Local Area Network port (**LAN 1** or **2**), and open a web browser session.

The computer may connect either directly to the unit, or via a network switch or hub:

**Direct Connection:**




**Networked Connection:**



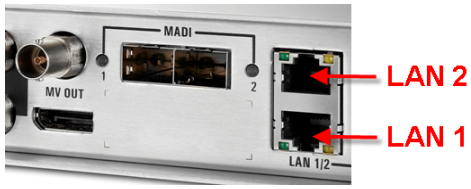

Each unit provides two LAN ports on the rear panel. In Version 1.0, these may be used for a main and redundant network connection. In a future software release, the second LAN port may be used to connect RAVENNA (audio over IP), or other control devices such as the Lawo mc²/Nova 73 or VSM.

Use one, or both, of the **LAN** ports to connect the **pro8** to your computer or control network:

**Cable Type:** straight (1:1) or crossed Ethernet cable.

**Connector Type:** RJ45.

**Network Speed:** 100 and 1000 Base-TX LAN speeds are supported (>= 100 Mbit/s is recommended for video thumbnail streaming).



# TCP/IP Configuration

To establish network communication, you will need to configure the TCP/IP settings of your computer's Network Interface card and each **pro8** unit.

## pro8 TCP/IP Settings

The default settings, as shipped from the factory, are:

- **LAN 1** IP address = **192.168.123.73**
- **LAN 2** IP address = **192.168.123.74**
- **LAN 1 & 2** Subnet Mask = **255.255.255.0**

To reset a device to these settings, use the DEF IP switch on the front panel.
Once you have established a connection, an IP Address can be changed from the Settings -> Network menu.

## Direct Connection

If your computer is connected directly to the **pro8**, then configure your computer's Network Interface card as follows:

- **IP Address** - in the same range as that of the **pro8** LAN port.

For example, if the **pro8** IP Address is 192.168.123.73, then set your computer IP Address to 192.168.123.100.

- **Subnet Mask** - identical to that of the **pro8** LAN port (default Subnet Mask = 255.255.255.0).

The screenshots on the next page demonstrate this procedure.

## Connection via a Network Switch or Hub

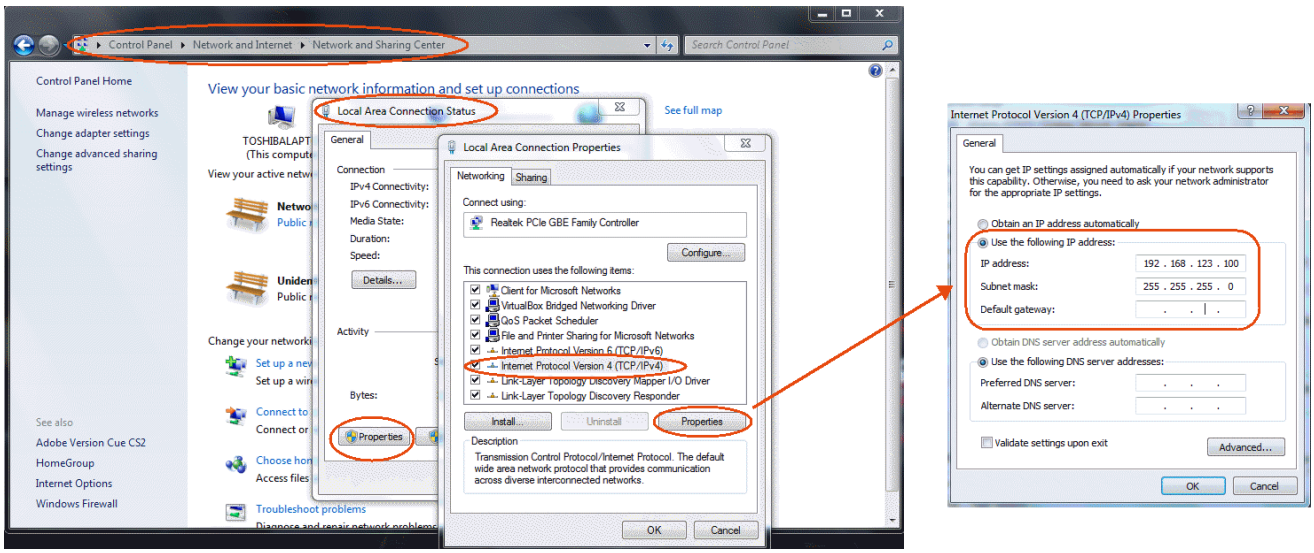
In a networked installation, it is likely that you will be connecting multiple devices and/or computers. Each device on the network requires a unique IP address which may be assigned either statically (Static IP) or dynamically (via DHCP). Please consult your network administrator for details.

In Version 1.0, the **pro8** supports Static IP addresses but not DHCP.
Therefore, you will need to manually configure the TCP/IP settings on each unit. To do this, connect your computer directly, open a web browser session and use the Settings -> Network menu to adjust the IP Address of **LAN 1** and/or **LAN 2**.

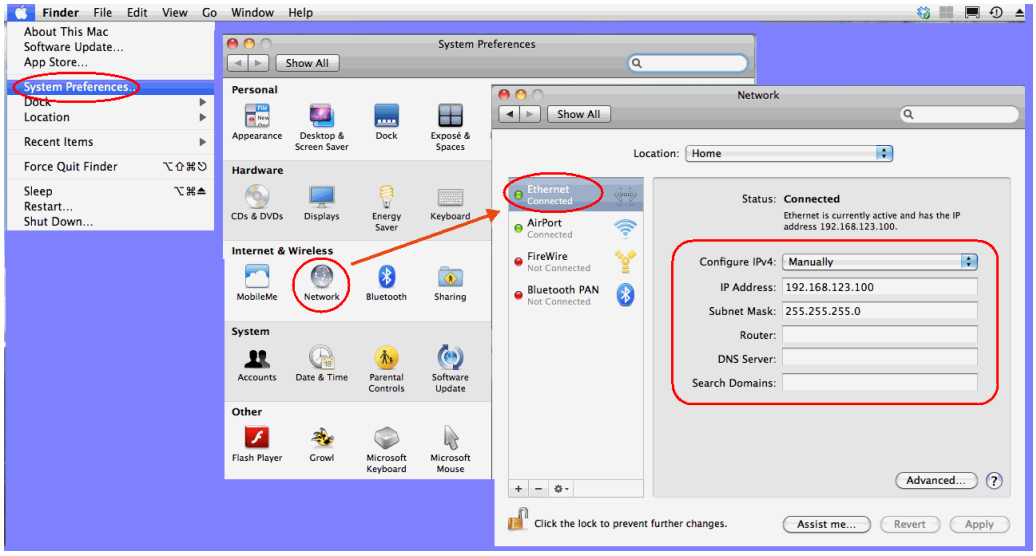
## Computer Network Interface IP Settings

The following screenshots demonstrate how to configure the TCP/IP settings of your computer's Network Interface card in Windows 7 and Mac OS X:

**Windows 7:**




**Mac OS X:**




You can find further information from www.microsoft.com or www.apple.com.

# Web Browser Control

Having connected and configured the network connection between your computer and **pro8**, you may open a web browser session to control the system's parameters.

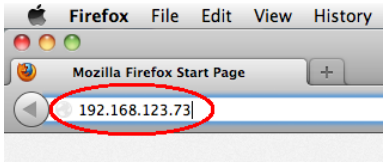
The following web browser applications are supported:

- **Mozilla Firefox**
- **Google Chrome**
- **Apple Safari** (V6.0) - note that the Status -> MADI menu is slow when using Safari.

They can be downloaded, free of charge, from the relevant providers.

1. Open your browser software, and enter the IP address of the **pro8** into the URL field.

For example, if the unit is set to its default IP address, and connected via **LAN 1**, you would type "http://192.168.123.73" and press Enter:




The browser connects and the login screen appears:


If the login screen does not appear, please see the troubleshooting tips.

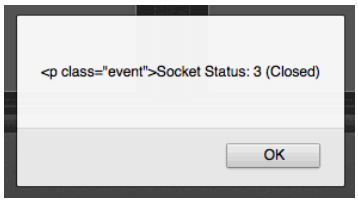
If you have signals connected, then you will see video thumbnails for each of the SDI outputs at the bottom of the screen. If no video signals are present, then the thumbnails are blank.

Note that video is monitored for the SDI Out, and not SDI In. Therefore, you will only see incoming video signals, if the video channel routing is set to as SDI In 1 to SDI Out 1, SDI In 2 to SDI Out 2, etc. See Signal Routing for details.

2. Click on the **Login** button to log in to the system - the button turns red, and the user interface main menus appear.


3. To "log out", close your browser window.

If, at any time, the following message appears, then the browser has lost its connection to the **pro8**:



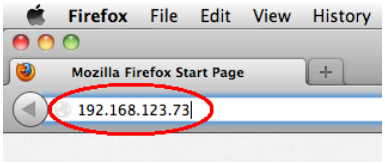

This may occur if the unit has lost power or its network communication, so check your physical connections.

4. Select **OK** and then click on the browser's **Refresh** button to reconnect - you are returned to the main menus.

The user interface may appear to operate, even without a browser connection. This is because the last known settings are cached into the browser's memory. When running with live video and audio, it is usually obvious if the connection has been lost. However, if you are working without signals present, and you close and ignore the "connection lost" message, be aware that you are NOT controlling parameters within the **pro8**!

# Troubleshooting the Browser Connection

If the login screen does not appear, then check the following:




- **URL Address** - this must match that of the **pro8** system. Remember that the IP address for the **LAN 1** and **LAN 2** connections will differ. See TCP/IP configuration.
- **Physical network connection** - in particular, that the **pro8** is connected via the correct LAN port - **LAN 1** or **LAN 2**. See Network Connection.
- **TCP/IP configuration** - if you are connecting via a network switch or hub, then try a direct connection to eliminate the network infrastructure. If the login screen still does not appear, then run a PING test to check your network communication.
- **Firewall** or **Antivirus Software** - some software may interfere with web browser communication. Try disabling your Firewall and/or Antivirus to eliminate them as the cause of the problem.

## PING Command

The PING command is a built-in Windows and Mac function, that allows you to test whether you have a valid network connection to and from any networked device.

Make sure that your computer is connected to the **pro8**'s LAN port, and that you have configured the TCP/IP settings of your computer's Network Interface card. Then run the test:

1. On a Windows PC, select **START -> Run…** and type **cmd** into the Run window followed by **OK**.

*This opens the DOS command prompt window.*

Alternatively:

1. On a Mac, open the **Terminal** program (found in the **Applications** -> **Utilities** folder).
2. Type the following to test the LAN 1 or LAN 2 connection:

**ping 192.168.123.73**

**ping 192.168.123.74**

If the IP Address has been changed from the default, then type the IP Address of your LAN port. If you do not know the IP address, then use the DEF IP switch to reset the IP settings.

4. Press **ENTER**.

*Your computer will now try to establish communication.*

- If the ping command fails, then the request will time out, and you will not receive any successful packets.

Check your physical network connections, and also the IP settings on your computer's network interface card.

- If the ping command is successful, then the result will show that the Sent packets have been successfully Received.

This confirms that the network communication is working. If your browser connection continues to fail, check the URL address and/or disable any Firewall or Antivirus software.

# Software Update

Having installed the unit and established web browser communication, it is a good idea to check the software revision and, if necessary, perform a software update.

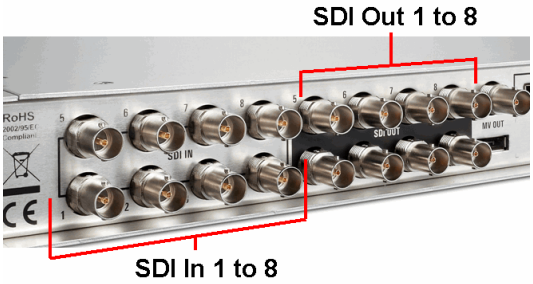
See Settings -> Software Update for details.

# Signal Connections

Having dealt with both power and network (LAN), the remaining front and rear panel connections are for video, audio and external reference signals:

- SDI Connections
- MV Out Connections
- MADI Connections
- External Reference Connections

## SDI Connections




8 x SDI inputs and 8 x SDI outputs on BNC connectors.

Each SDI connection carries one digital video and 16 embedded audio channels.

A wide range of 10-bit 3G, HD and SD video standards are supported, please see Technical Data.

# MV (MultiView) Out

**MV OUT:**


**External Display (shows any 4 SDI inputs or outputs simultaneously):**

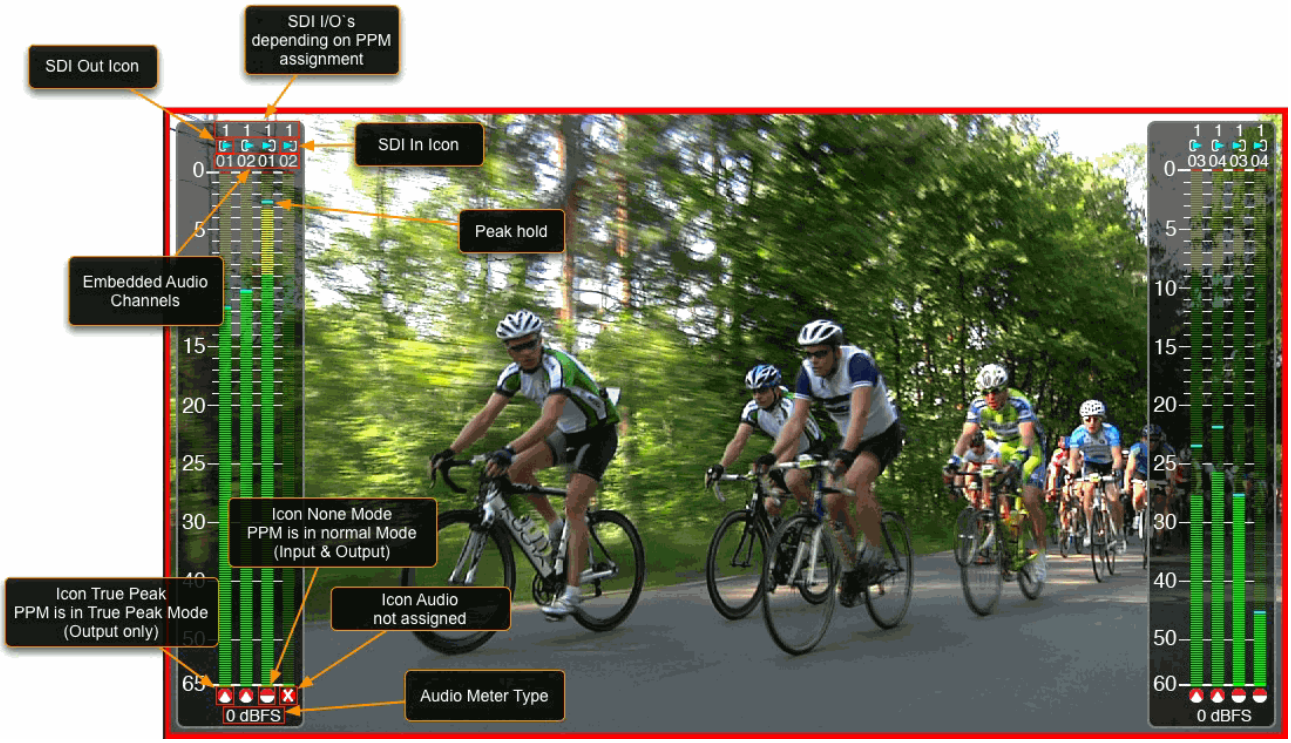
The **MV** (MultiView) **OUT** is used to provide local Quad Split monitoring of up to 4 SDI inputs or outputs simultaneously.

Two different connector options are provided:

- 1 x BNC (3G) - in a future release, HD-SDI will be supported.
- 1 x DisplayPort.

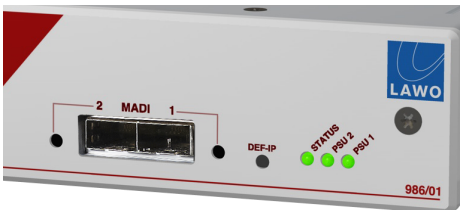
Once connected, Quad Split monitoring is configured from the user interface, see the Quad_Split menu.

On the external display, each monitor window provides the following information:



# MADI Connections

**Front Panel**




**Rear Panel**


The **pro8** provides two MADI in/out ports (**MADI 1** & **2**) available for connection from the front and/or rear panel.

Each port carries up to 64 input and output channels and conforms to AES10.

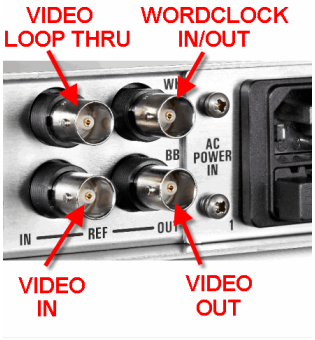
Connections are available on optical fibre LC connectors, once you have fitted the recommended SFP adaptors.

The front and rear ports operate in parallel. This allows you to configure main and redundant MADI links. Both front and rear MADI outputs are always active. For the return link, in Version 1.0, the first recognised and locked input is used. (In a future software release, you will be able to select the active MADI input (front or rear) from the user interface.)

An LED for each port indicates the status:

- **Green** = MADI link is active.
- **Flashing Red** = MADI link is asynchronous.
- **Off** = no connection or MADI link is invalid.

# External Reference Connections




The **pro8** provides four external reference connections:

- **IN** - external video reference input. Use this input to connect an analog video reference signal such as Tri-Level Sync or Black & Burst (BB). The following reference signal standards are supported:
  - Analog Genlock High Definition Tri-Level Sync (SMPTE-274M/296M)
  - Standard Definition 1V Black & Burst (SMPTE-170M/318M)
- **LOOP** - passive loop-thru output of the video **IN** (75-ohm termination required). Use this connection to daisy-chain an external video reference signal in and out of the **pro8**.

> The video **IN** connection must be properly terminated by fitting a 75-ohm terminator either on the **LOOP** connector (if unused), or on the LOOP THRU connector of the last "looped" device.

- **OUT** - video reference output. Use this connector to feed the system's video reference, as selected in the user interface, to an external device.
- **WK** - wordclock out. (In a future release, this bi-directional connection will be set to either wordclock in or out from the user interface).

# Reference Settings

The video and audio reference signals for the **pro8** are selected from the Reference Setting options in the **Timing** menu.

The system can be referenced to:

- Analog Genlock High Definition Tri-Level Sync (SMPTE-274M/296M) - connected to the rear panel's REF IN.
- Standard Definition 1V Black & Burst (SMPTE-170M/318M) - connected to the rear panel's REF IN.
- SDI - from any of the 8 digital SDI inputs.
- Internal

In Version 1.0, the audio reference is ALWAYS set to **Follow Video**. This means that the system is clocked from a single reference source. In a future software release, you will be able to clock video and audio signals independently.

# Operation (Web Browser Control)

This chapter covers the operation of the **pro8** from the web browser user interface.

Note that your software license will affect the available features and menus.

Please check that your computer meets the recommended system requirements for web browser control. We are assuming that you have powered on the **pro8**, and connected and configured a network connection to your computer.

The first part of this chapter covers the user interface and common tasks:

- Operating Principles
- Signal Routing
- Delay
- Other Processing
- Saving Your Settings

The second part covers each menu in detail:

- The Main Menus: Summary
- Status
- SDI In
- MADI In
- SDI Out
- MADI Out
- Quad Split
- Timing
- Settings

# Operating Principles

## Opening a Web Browser Session

Having connected and configured the network connection between your computer and **pro8**, you may open a web browser session to control the system's parameters.

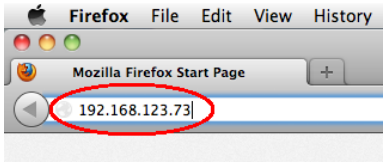
The following web browser applications are supported:

- **Mozilla Firefox**
- **Google Chrome**
- **Apple Safari** (V6.0) - note that the Status -> MADI menu is slow when using Safari.

They can be downloaded, free of charge, from the relevant providers.

1. Open your browser software, and enter the IP address of the **pro8** into the URL field.

For example, if the unit is set to its default IP address, and connected via **LAN 1**, you would type "http://192.168.123.73" and press Enter:




The browser connects and the login screen appears:


If the login screen does not appear, please see the troubleshooting tips.

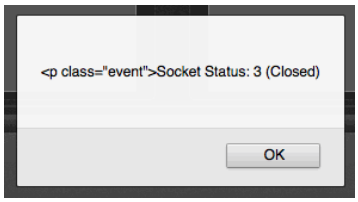
If you have signals connected, then you will see video thumbnails for each of the SDI outputs at the bottom of the screen. If no video signals are present, then the thumbnails are blank.

Note that video is monitored for the SDI Out, and not SDI In. Therefore, you will only see incoming video signals, if the video channel routing is set to as SDI In 1 to SDI Out 1, SDI In 2 to SDI Out 2, etc. See Signal Routing for details.

2. Click on the **Login** button to log in to the system - the button turns red, and the user interface main menus appear.


3. To "log out", close your browser window.

If, at any time, the following message appears, then the browser has lost its connection to the **pro8**:




This may occur if the unit has lost power or its network communication, so check your physical connections.

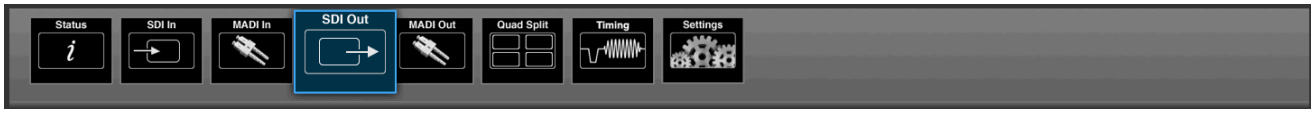
4. Select **OK** and then click on the browser's **Refresh** button to reconnect - you are returned to the main menus.

The user interface may appear to operate, even without a browser connection. This is because the last known settings are cached into the browser's memory. When running with live video and audio, it is usually obvious if the connection has been lost. However, if you are working without signals present, and you close and ignore the "connection lost" message, be aware that you are NOT controlling parameters within the **pro8**!

## Menu Selection & Navigation

After login you are presented with the main menu bar.

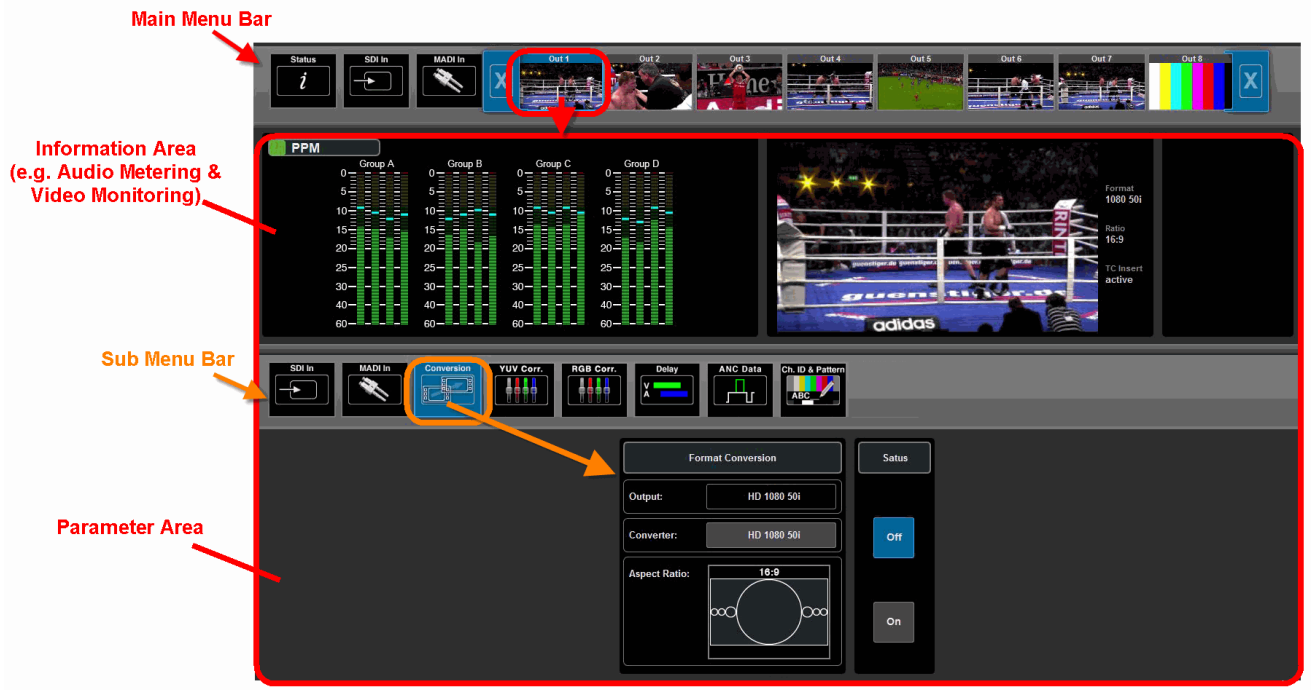
As you move your mouse over the menus, the buttons enlarge to emphasise your intended selection:




1. Click to select a main menu option - for example, **SDI Out**.

The window updates and the main menu bar expands; one of the inner options is automatically selected - e.g. SDI **Out 1**.

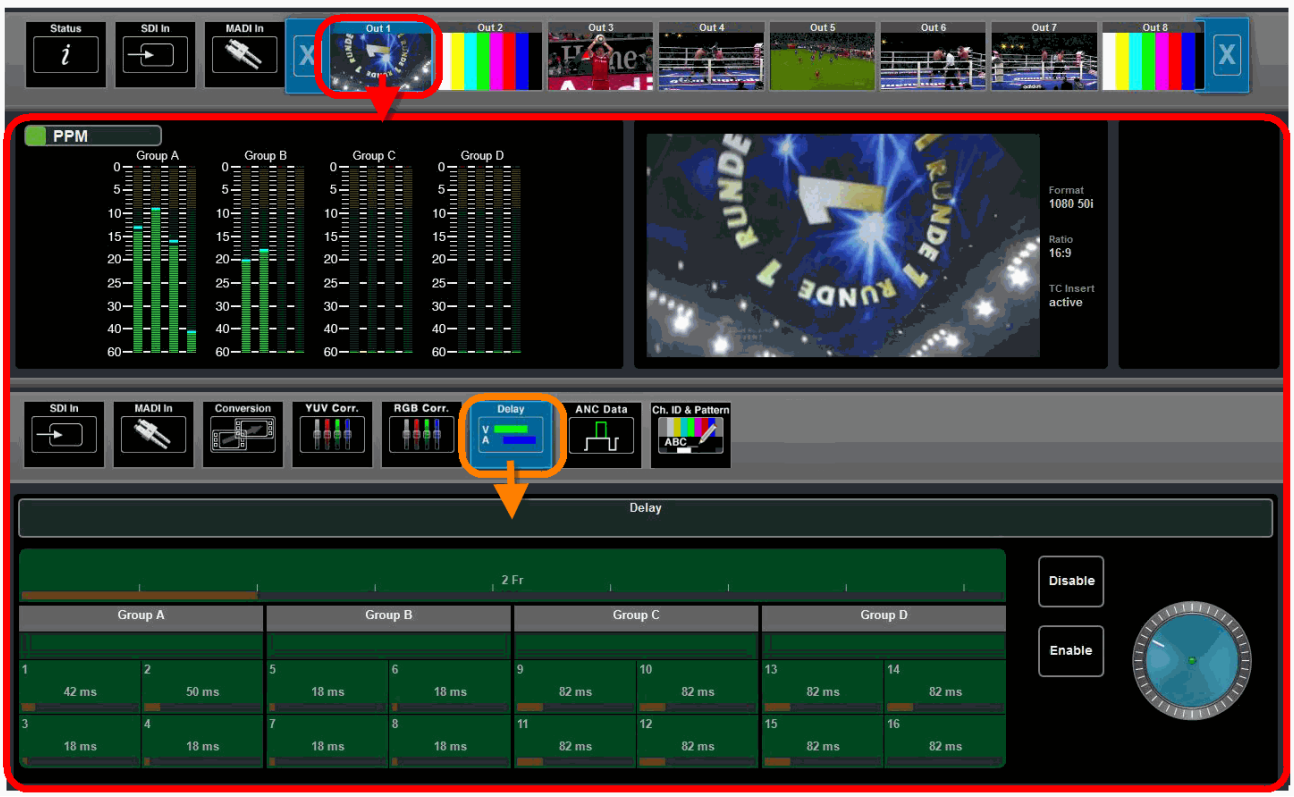
The operating window is now divided into two; the upper area displays information about the main menu selection (SDI **Out 1**), while the lower area provides access to its parameters:




If you have signals connected, then you will see audio levels on any metering and live video streaming. Note that video is only monitored for the SDI Out. Therefore, you will NOT see video thumbnails or the video preview if you select the **SDI In** main menu.

The left hand side of the information area can display different options. Click on the green button beside **PPM** to choose from **Timecode**, **Vectorscope**, **WFM** (WaveForm Monitor) or **PPM Meter**. See SDI Out: Display Options.

2. Click on a sub menu to access a different set of parameters - for example, **Delay**:




3. Click on one of the inner main menus - **Out 1** to **Out 8** - to access a different SDI output.

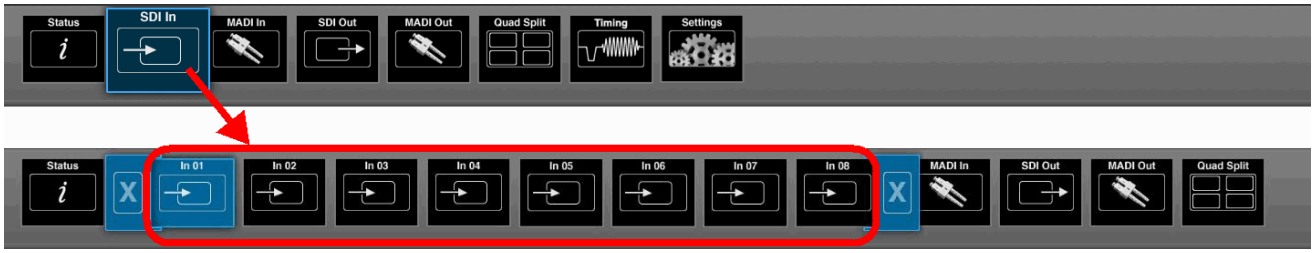
You can use this to quickly switch between SDI outputs and compare parameters.

## Expanding Menus

Some of the main and sub menus expand when you select them. For example:

1. Click on **SDI In** (main menu), and the menu bar expands to reveal further options - SDI **In 01** to **In 08**.

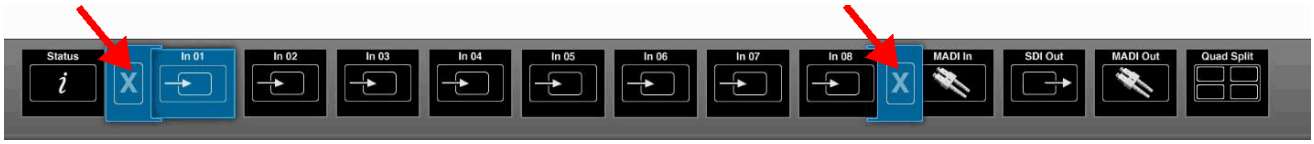
One of the inner options is always selected - in our example, SDI In **01**:




2. Click on a different SDI input - **In 01** to **In 08** - to switch between SDI inputs and compare information and parameters.

Note how the menus which were to the right of **SDI In** (**MADI In**, **SDI Out**, **MADI Out**, etc.) shift across the menu bar and, depending on your selection, disappear off screen.

3. To select a different main menu, click on it (if you can see it).
4. Or, collapse the expanded view, by clicking on either of the blue **X** buttons:




The menu bar returns to its normal size.

The sub menus work in a similar manner - for example:

1. Select **SDI Out** (main menu) and **MADI In** (sub menu) - **MADI In** expands to reveal the different MADI channel options:

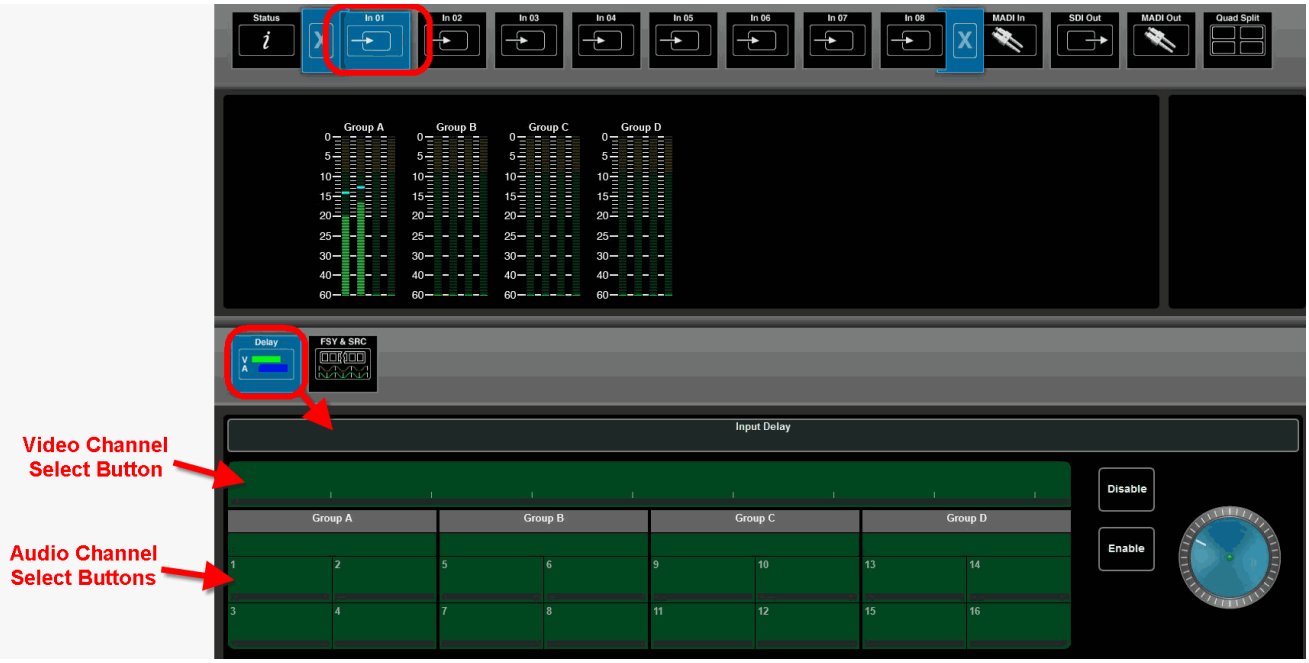

Whenever you return to a menu, your last sub selections remain open. For example, select **SDI In** (main menu) and **Delay** (sub menu). Then select **SDI Out** (main menu) and **Delay** (sub menu). If you now switch between **SDI In** and **SDI Out** from the main menu bar, both sub menu selections are set to **Delay**. This makes it very fast to switch between input and output delay parameters.

## Channel Selection & Parameter Control

For many operations, you will need to select a channel, or channels, and then adjust a parameter value. To demonstrate this, we are going to apply delay to one of the SDI inputs.

1. Select **SDI In** and **In 01** (main menu), and then select **Delay** (sub menu).

At the bottom of the operating window, you will see the **Input Delay** parameters for SDI **In 01**:




Each channel has its own select button. The green buttons indicate that we are looking at SDI channels. If you select **MADI In** (main menu) and **MADI Delay** (sub menu), then you will see blue channel select buttons.

2. Choose the channels you wish to adjust to clicking on the select buttons. You can either:

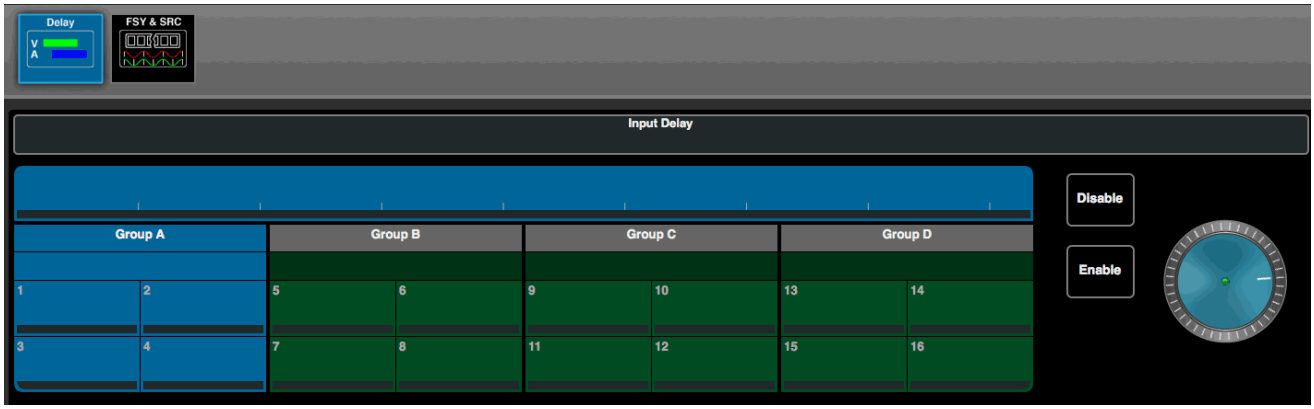
- Single-click to make additive selections.
- Double-click to make an isolated selection. This clears all other selections.

In either case, you can select an individual channel or a block of channels, by clicking directly on the numbered channel button OR clicking in between (on the black lines). See Multiple Channel Selection.

The channel buttons change colour as follows:

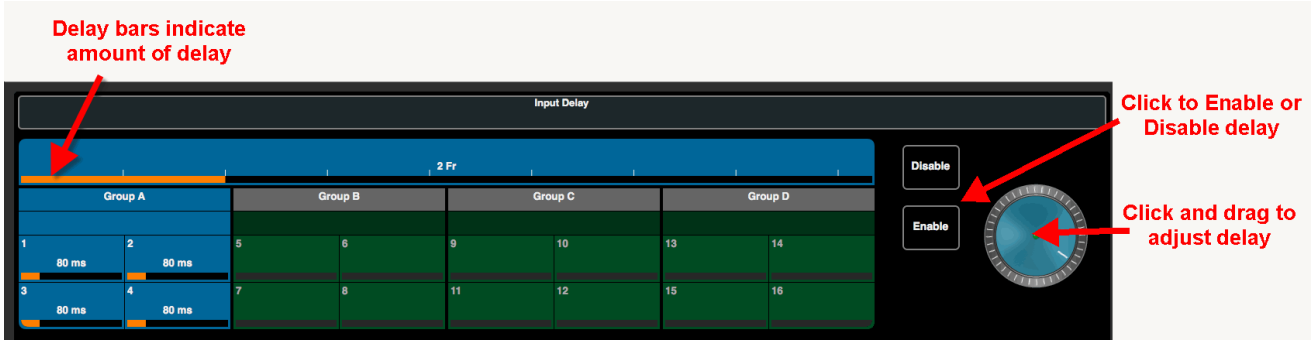
- **Light Blue** = selected channels.
- **Green** (or **Blue**) = unselected SDI (or MADI) channels.
- **Dark Blue** = a valid channel selection (you will see this colour as you hover your mouse over the buttons).

In our example, we have selected the video channel and audio channels 1 to 4:




3. Now, adjust the parameters - any changes are applied to all selected channels:

- Click on **Enable**, or **Disable**, to turn delay on or off.
- Click and drag on the delay wheel to change the amount of delay.

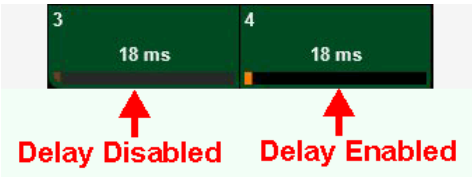



The amount of delay is indicated by the horizontal delay bar and frames/ms value inside each channel button.

If delay is enabled, then the delay bar is clear (Black or Orange).

If delay is disabled, then the delay bar is greyed out.

If channels which already have delay are adjusted, then any offsets are retained.




For more details on input and output delay, see Delay.

## Multiple Channel Selection

When you select channels for parameter control, you may select multiple channels in one operation.

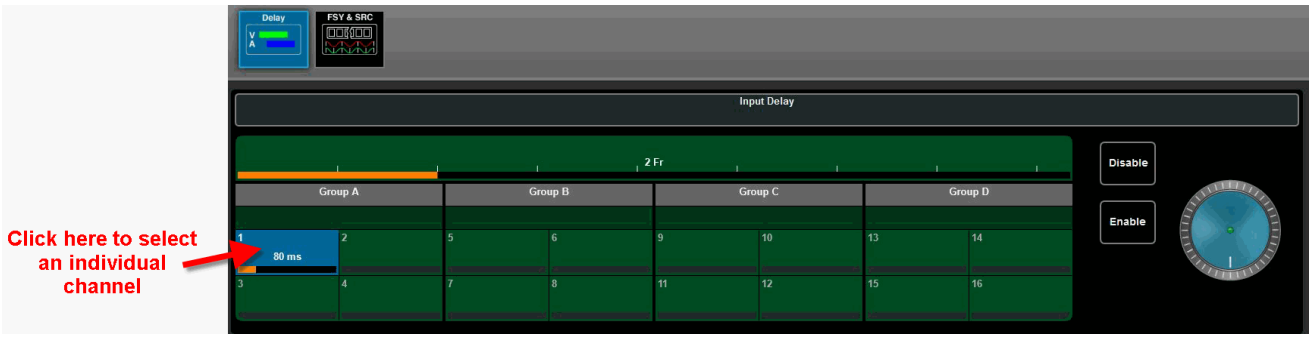
Remember that you can:

- Single-click to make additive selections. This allows you to make non-consecutive selections.
- Double-click to make an isolated selection. This clears all other selections first.

In each case, the channel select buttons turn dark blue as you hover your mouse, indicating which channel blocks can be selected.

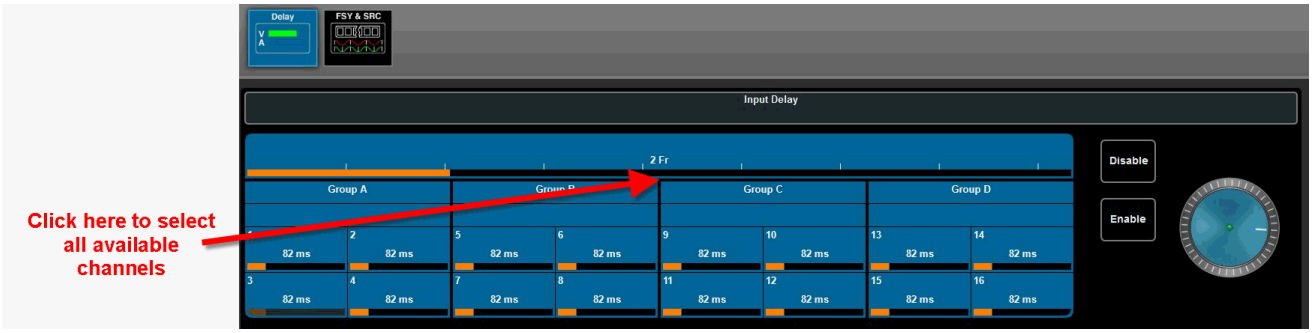
### ➢ To select an individual channel:

Click directly on the channel select button:

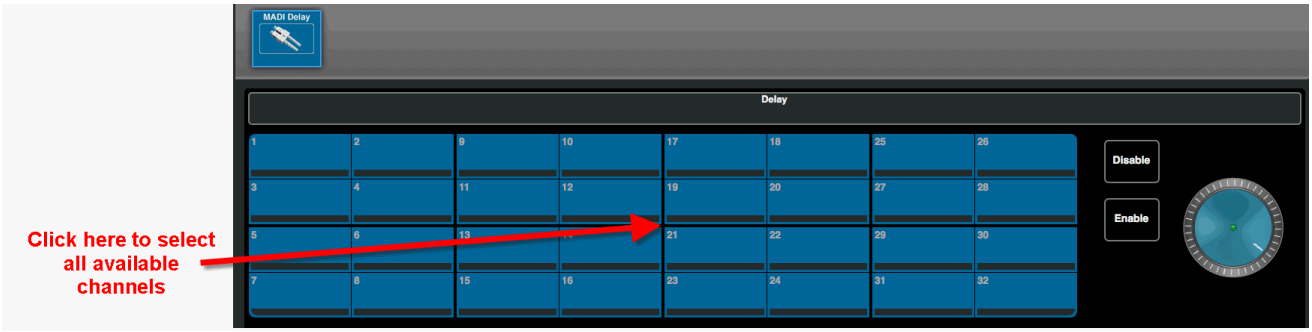



### ➢ To select all available channels

Click on the "T" formed by the black dividing lines between the video and audio channels (SDI):

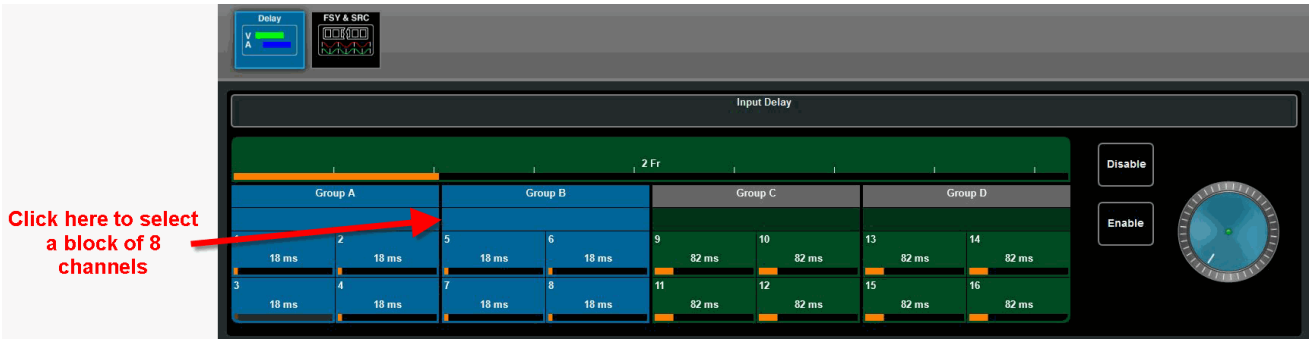



Or, click on the central dividing line of the audio channels (MADI):



### ➢To select a subset of channels

Click on the black dividing line in between the channels you wish to select - for example, between SDI Groups A and B:

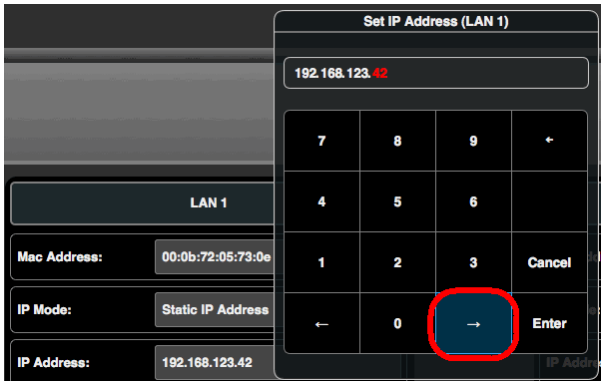



Or click on the grey **Group A**, **Group B**, **Group C**, **Group D** indicators to select all the audio channels in an SDI group.

## Data Entry

Sometimes you will need to enter a specific value using the on-screen numeric keypad. For example, to enter a timecode value or new IP address. In these instances:

1. Click on the left or right arrow buttons to highlight the correct set of digits (in red):




2. Use the on-screen numeric keyboard to enter a new value.
3. Click on **Enter** to confirm the data entry.

# Signal Routing

One of the most common tasks is to change the signal routing of video and audio channels within the **pro8**. The SDI Out and MADI Out main menus can be used to reassign video and audio signals on a channel-by-channel basis.

Use this function to route a video signal to multiple outputs, embed new audio content into an SDI output and/or convert audio between SDI and MADI formats.

### ➢ Valid Channel Assignments

Signal routing is output-driven - first, you select the output you wish to re-assign, and then you choose the new input(s):

- For each SDI output, you can assign the video channel from any SDI input, and up to 16 audio channels from any de-embedded SDI or MADI input. (Note that the embedded audio groups - A, B, C and D - can be enabled or disabled from the ANC sub menu).
- For each MADI output, you can assign audio from any de-embedded SDI or MADI input.

### ➢ Default Signal Routing

The default routing, shipped from the factory, passes signals directly through the **pro8**:

- SDI Inputs 1 to 8 are assigned to SDI Outputs 1 to 8 (video & audio).
- MADI Input channels 1 to 64 are assigned to MADI Output channels 1 to 64 for both MADI ports.

This means that as soon as you connect video to your SDI inputs, you can preview these signals from the login screen or SDI Out main menu (providing you haven't altered the default video channel assignments).

## ➢ Signal Routing Operation

1. First, select the output you wish to re-assign.

You can select any SDI output from the SDI Out main menu, or any set of MADI output channels from MADI Out. In our example, we have selected **SDI Out** and **Out 1**.

2. Then choose the new input type - either **SDI In** or **MADI In** (sub menu).

The parameter area updates to show the available input channels on the left (under **Input Table**) and the current assignments on the right (under **Output**):

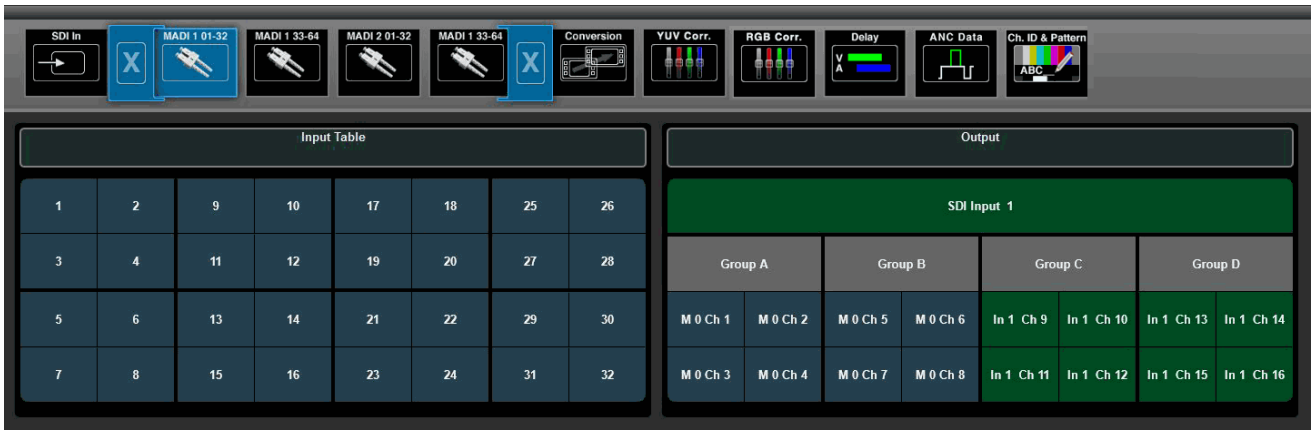

In our example, **SDI Out 1** is currently assigned from the video and audio channels of SDI **In 1**. By selecting the **MADI 1 01-32** sub menu, we can access the first 32 audio channels from MADI port 1.

**3.** To change the signal routing, drag and drop a channel, or block channels, from left to right - for example:


You can select an individual channel, or block of channels, by clicking either directly on the numbered channel buttons OR clicking in between (on the black lines). See Multiple Channel Assignment.

As you drag and drop, the target channels temporarily change colour to indicate a valid destination. This ensures that you can only make valid routing assignments.

**4.** When you are happy with the proposed target channels, release your mouse button to complete the operation - the **Output** area updates to indicate the new channel assignments:




The channel buttons are colour-coded as follows:

- **Green** = SDI (video and audio channels)
- **Blue** = MADI channels
- **Dark Blue** = a valid channel selection (you will see this colour as you hover your mouse over the **Input Table** or drag and drop onto the **Output** area).

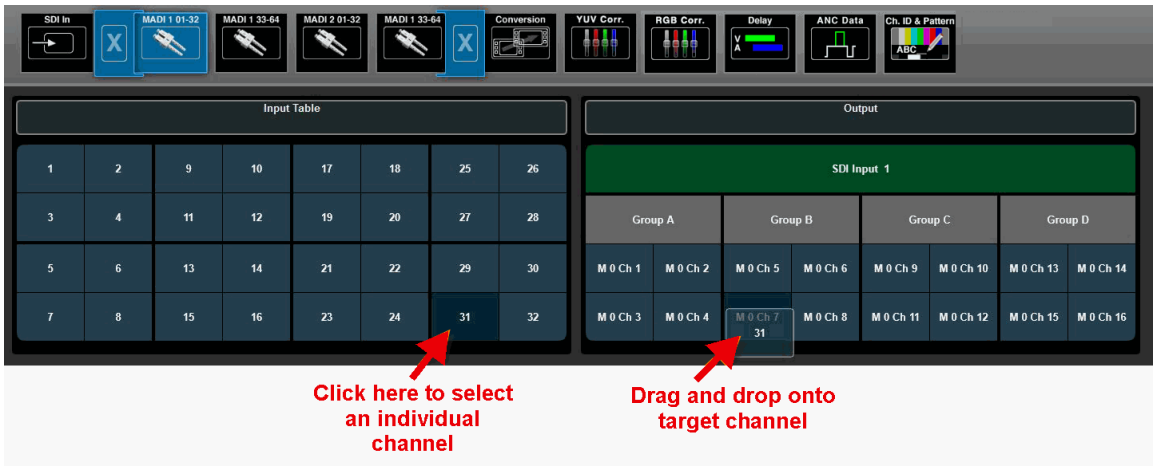
# Multiple Channel Assignment

When you assign channels from left (**Input Table**) to right (**Output**), you can select multiple channels in one operation. This allows you to change signal routing very quickly.

> In each case, the channel select buttons turn dark blue as you hover your mouse, indicating which channel blocks can be selected.

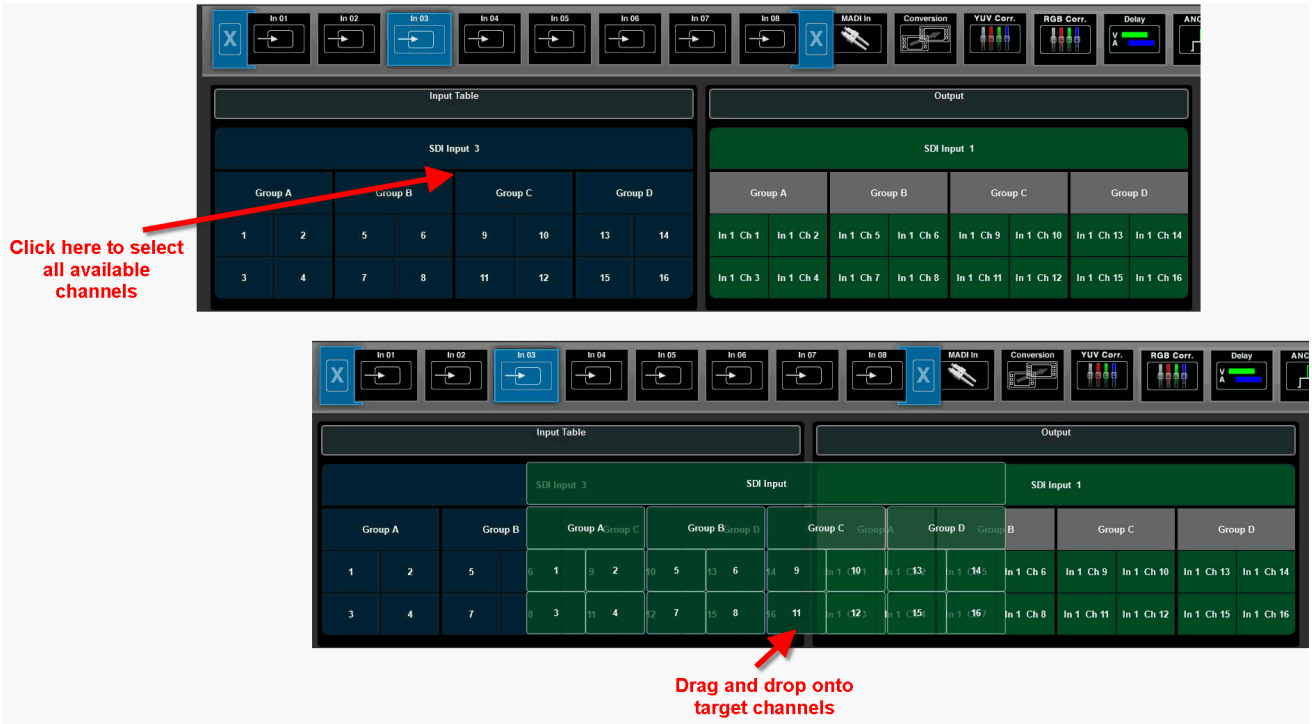
➢ **To assign an individual channel:**

Click directly on the channel select button, and drag and drop onto the target channel:




➢ **To assign all available channels (e.g. from SDI In to SDI Out)**

Click on the "T" formed by the black dividing lines between the video and audio channels, and drag and drop onto the first target channel:



### ➢ To assign a subset of channels

Click on the black dividing line in between the channels you wish to select - for example, between channels 3, 4, 5 and 6 - and drag and drop onto the first target channel.


Or click on the grey **Group A**, **Group B**, **Group C**, **Group D** indicators to select all the audio channels in an SDI group.

If multiple channels are selected, then they are assigned in a consecutive manner. So, in our example, MADI channels 1 to 8 are assigned to SDI channels 1 to 8.

You can drop onto any valid target channel. So, for example, release your mouse button over target channel 9 to assign the eight channels to SDI channels 9 to 16.

If you select more source channels than there are targets (for example, all 32 MADI channels), then the first channels from the selection are assigned.

# Delay

Variable delay is available for all SDI video, SDI audio and MADI audio channels. It can be applied at the input and/or output to the routing matrix on a channel-by-channel basis.

### ➢ Valid Delay Parameters

The maximum delay (input + output) is:

- 8 frames per video channel, adjusted in 1 frame steps.
- 320 ms per audio channel, adjusted in 1 ms steps.

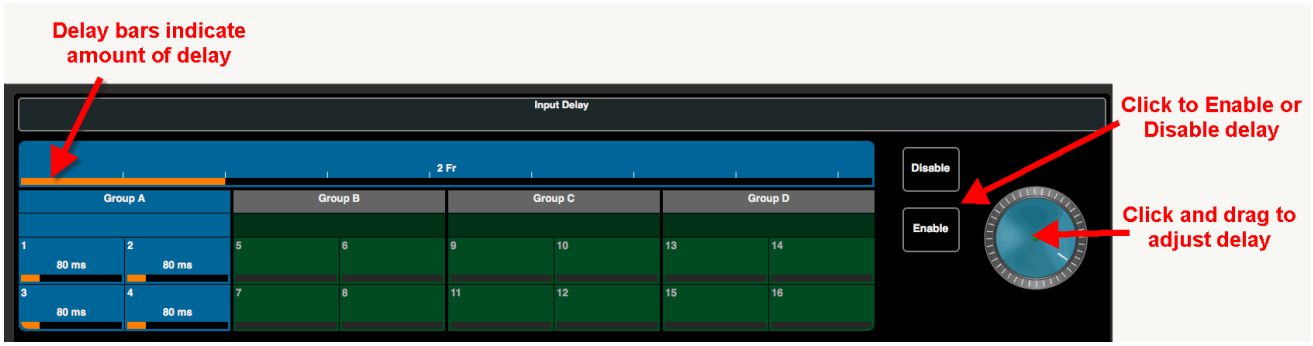
### ➢ Input Delay Operation

Input delay is applied at the input to the signal routing matrix, and therefore affects all destinations assigned from the delayed channels.

1. First, select the input you wish to delay.

You can select any SDI input from the SDI In main menu, or any set of MADI input channels from MADI In. In our example, we have selected **SDI In** and **In 01**.

2. And select the channels, see Channel Selection & Parameter Control.
3. Then adjust the delay parameters:

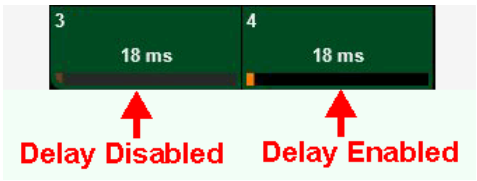



The amount of delay is indicated by the horizontal delay bar and frames/ms value inside each channel button.

If delay is enabled, then the delay bar is clear (Black or Orange).

If delay is disabled, then the delay bar is greyed out.

If channels which already have delay are adjusted, then any offsets are retained.



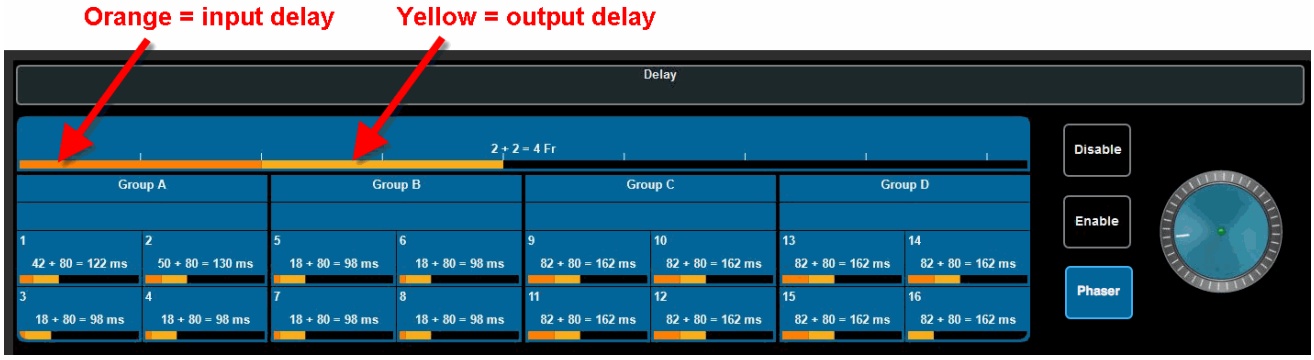
### ➢ Output Delay Operation

Output delay is controlled in a similar manner, but is applied at the output from the signal routing matrix, and therefore affects only the selected destination.

You can select any SDI output from the SDI Out main menu, or any set of MADI output channels from MADI Out.

As before, select the channels you wish to delay, and then adjust the parameters.

If the output channel is routed from an input channel with delay, then you will see both the input and output delay values:




The maximum delay per channel (input + output) cannot exceed 8 frames for video channels or 320ms for audio channels.

# Video & Audio Processing

The **pro8** provides the following video and audio processing:

➢ **Video Processing**

- **Frame Sync** (per channel) - see SDI In -> FSY & SRC.
- **Variable Delay** (per channel) - see Delay.
- **Auto Phaser** (per channel) - see SDI Out -> Delay.
- **Format Conversion** (up to 2 channels; license dependent) - see SDI Out -> Conversion.
- **Colour Correction** (per channel; license dependent) - see SDI Out -> YUV Corr and SDI Out -> RGB Corr.
- **Channel ID** and **Timecode Insertion** (per channel) - see SDI Out -> Ch.ID & Pattern.

➢ **Audio Processing**

- **Sample Rate Conversion** (for all SDI in & out) - see SDI In -> FSY & SRC.
- **Variable Delay** (per channel) - see Delay.
- **Test tone Generator** (per SDI embedder) - see SDI Out -> Ch.ID & Pattern.

# Saving Settings

The current settings are saved each time you power off the unit. When you power on, these settings are recalled. This ensures that the unit comes back as it was last used for fast recovery from a loss of power.

# The Main Menus: Summary

The rest of this chapter covers each menu in detail:

- **Status**
  - **SDI In** - check the video format, and status of embedded audio, timecode, etc.
  - **MADI** - check the status of the MADI ports (front & rear) and audio I/O channels.
  - **Frame** - check the status of the **pro8** frame, for example, power supply status & temperature.
- **SDI In** - meter the 16 embedded audio channels for any SDI input.
  - **Delay** - input delay (for each video and de-embedded audio channel).
  - **FSY & SRC** - video frame sync and audio sample rate conversion (for each de-embedded audio channel).
- **MADI In** - meter the audio channels from any MADI input.
  - **Delay** - input delay (for each audio channel).
- **SDI Out** - monitor the video plus timecode/colour components/audio for any SDI output.
  - **SDI In** & **MADI In** - assign channels from any SDI or MADI input.
  - **Conversion** - up/down/cross format and aspect ratio conversion for the video channel.
  - **YUV Corr.** - standard ProcAmp colour correction for the video channel.
  - **RGB Corr.** - RGB-style colour correction for the video channel.
  - **Delay** - output delay (for each video and de-embedded audio channel).
  - **ANC Data** - ancillary data such as embedded timecode, AFD and audio.
  - **Ch. ID & Pattern** - insert channel ID and timecode into the video channel, and test tone to all audio channels.
- **MADI Out** - meter the audio channels for any MADI output.
  - **SDI In** & **MADI In** - assign channels from any SDI or MADI input.
  - **Delay** - output delay (for each audio channel).
- **Quad Split** - configure local monitoring for the MV (MultiView) output.
- **Timing** - check the timing position of all 8 SDI inputs.
  - **Timing Pos.** - adjust the timing position of the **pro 8**, globally, with respect to the video reference. This sub menu also contains the **Reference Settings**, where you can select the system's video and audio reference.
  - **Ref Out** - options for the video reference output.

➢ **Settings**

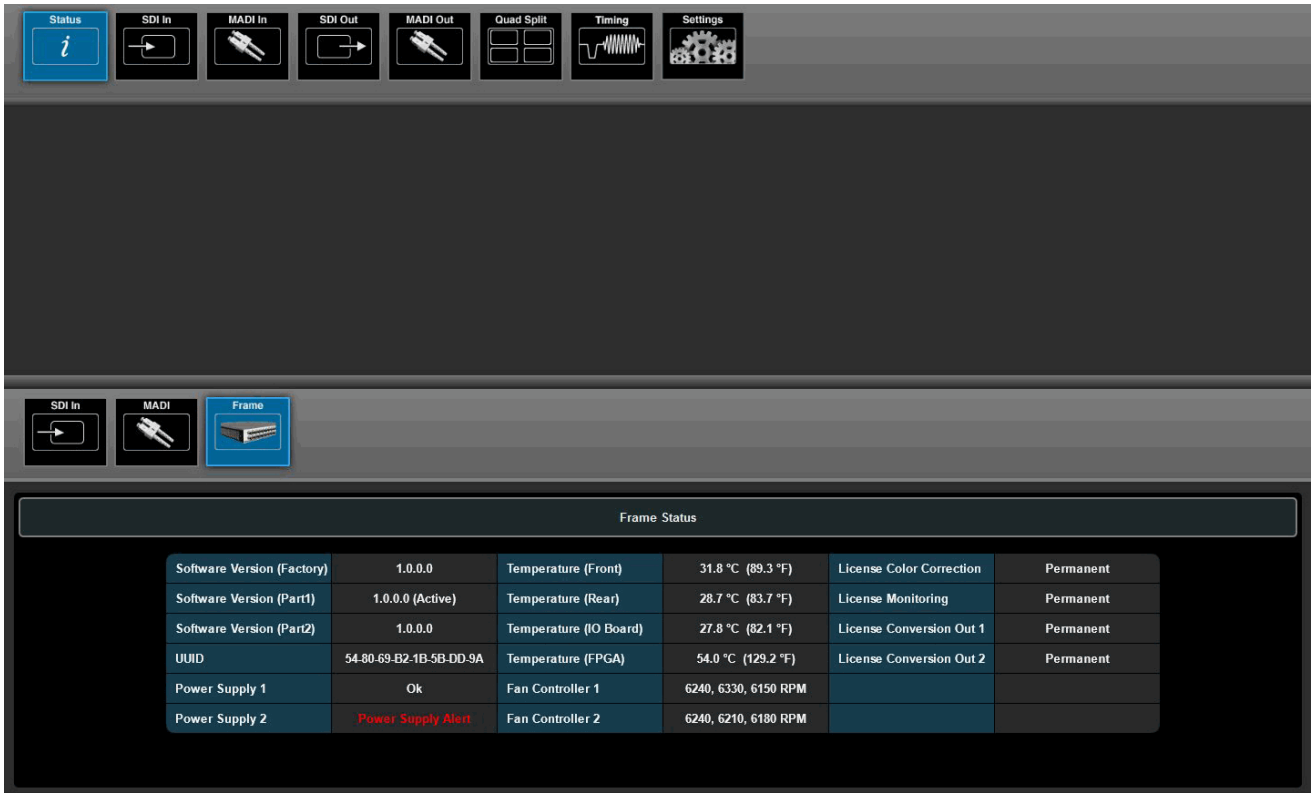
- **Network** - check the TCP/IP settings and Mac Address for the **LAN 1** and **LAN 2** network ports. You can change the IP address of each port from here.
- **Software Update** - check or update the software version of the **pro8**.

# Status

The **Status** menu displays information for each **SDI In** and **MADI** port, and for the **pro8** frame.

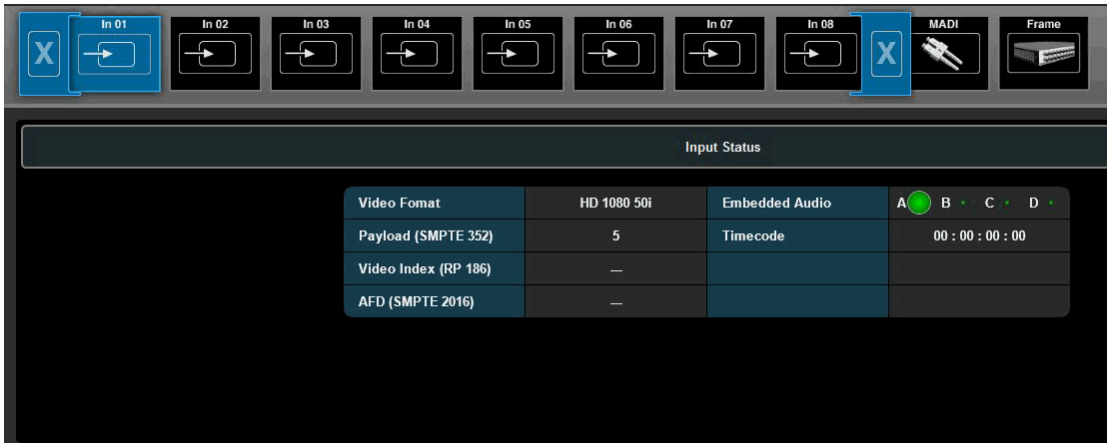
Use this menu to interrogate your SDI inputs, MADI links or **pro8** system.

The upper area of the operating window is unused. Status information is displayed in the lower half of the screen when you select a sub menu:



## Status -> SDI In

1. Select **Status -> SDI In**, and then select an input (**In01** to **In08**) from the sub menus:

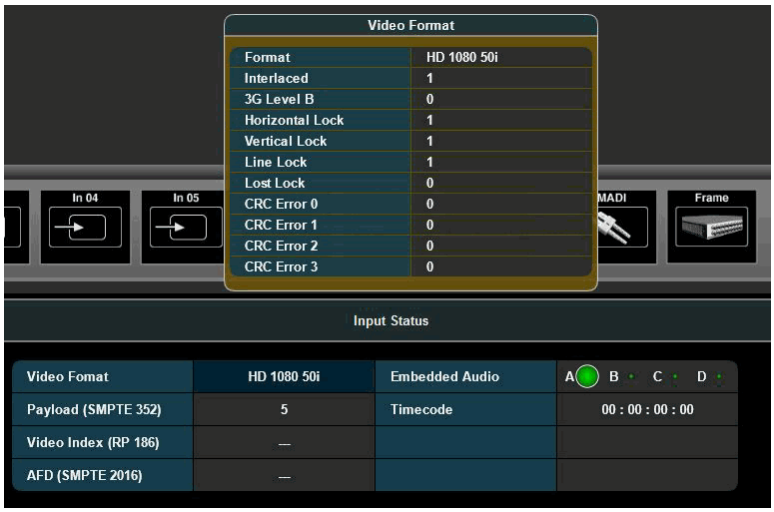



The fields display standard meta data contained within the SDI input stream:

- **Video Format** - describes the video format.
- **Payload** - the contents of the payload packet.
- **Video Index** - various information on the aspect ratio, colour, etc.
- **AFD** - the Active Format Description.
- **Embedded Audio** - information about the 16 embedded audio channels, such as sample rate, bit rate, PCM or Dolby E, etc. In our example, the green circle indicates that signal is present on at least one channel within SDI Group A.
- **Timecode** - embedded timecode (VITC 1, VITC 2 and LTC).

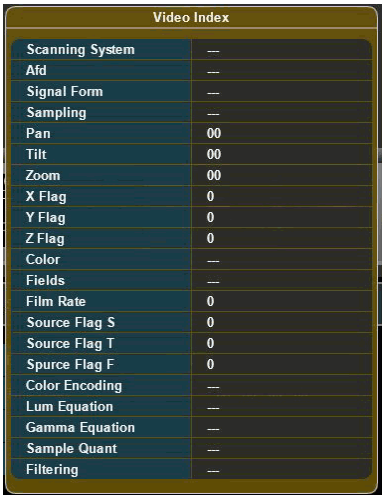
2. Click on a field to open a pop-up with further information:

**Video Format:**



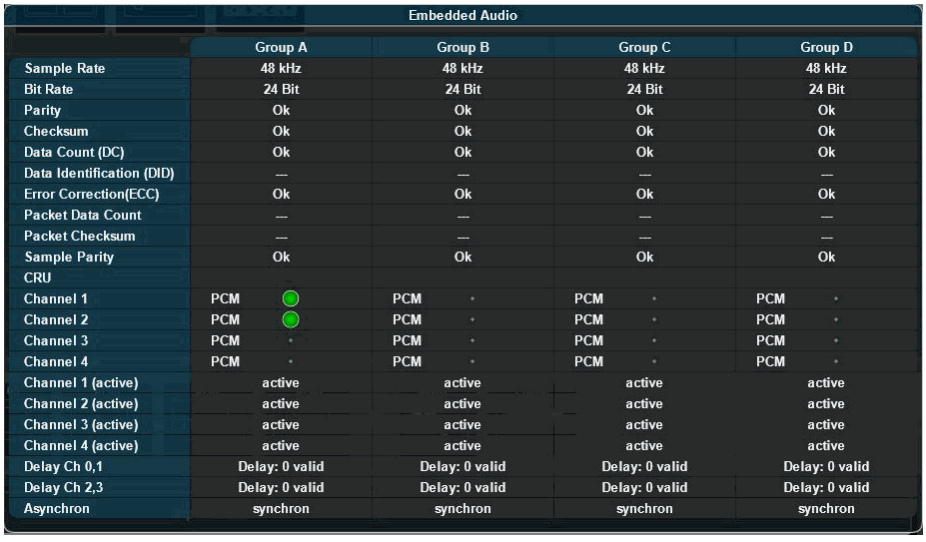
### Payload:


### Video Index:

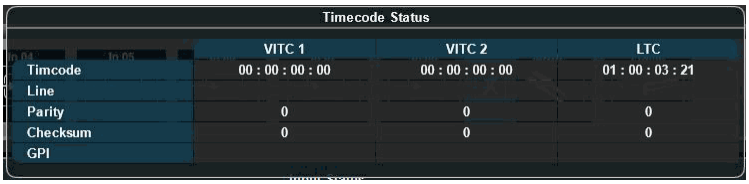



### AFD:


### Embedded Audio:

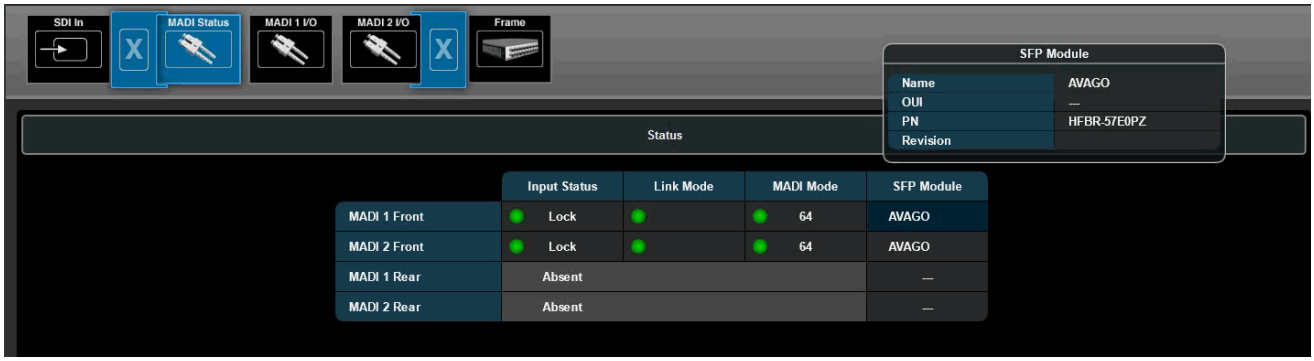


**Timecode:**


Timecode Status
VITC 1
VITC 2
LTC
Timcode
00 : 00 : 00 : 00
00 : 00 : 00 : 00
01 : 00 : 03 : 21
Line
Parity
0
0
0
Checksum
0
0
0
GPI

## Status -> MADI

1. Select **Status -> MADI**, and then select **MADI Status** from the sub menus:

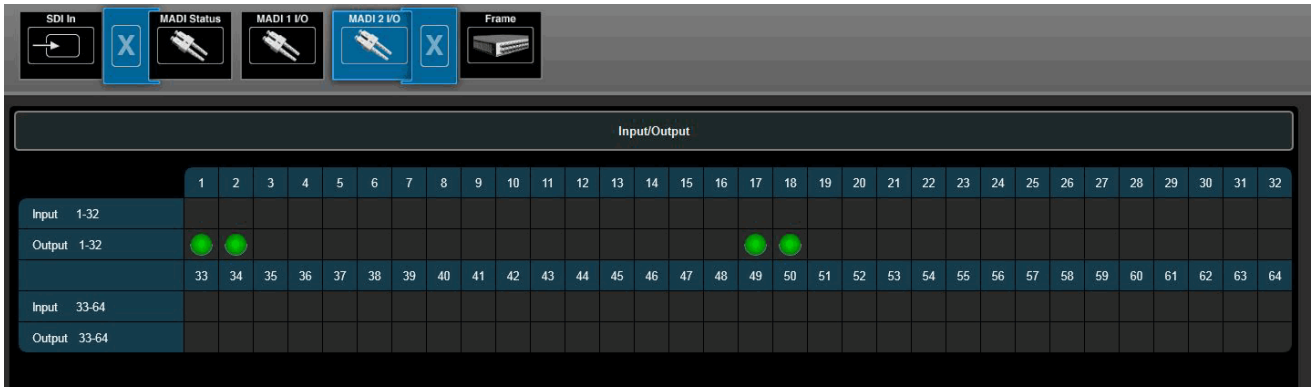



The fields provide information about each port, **MADI 1** & **2** for **Front** and **Rear** panel connections:

- **Input Status** - whether the MADI input data is locked.
- **Link Mode** - in a future software release, this field will select which MADI input is active (front or rear) to configure redundant connections. In Version 1.0, the first recognised and locked MADI input is used.
- **MADI Mode** - the number of channels per link, 64 or 56.
- **SFP Module** - the SFP adaptor type.

2. Click on the **SFP Module** name to open a pop-up with further information (shown above).

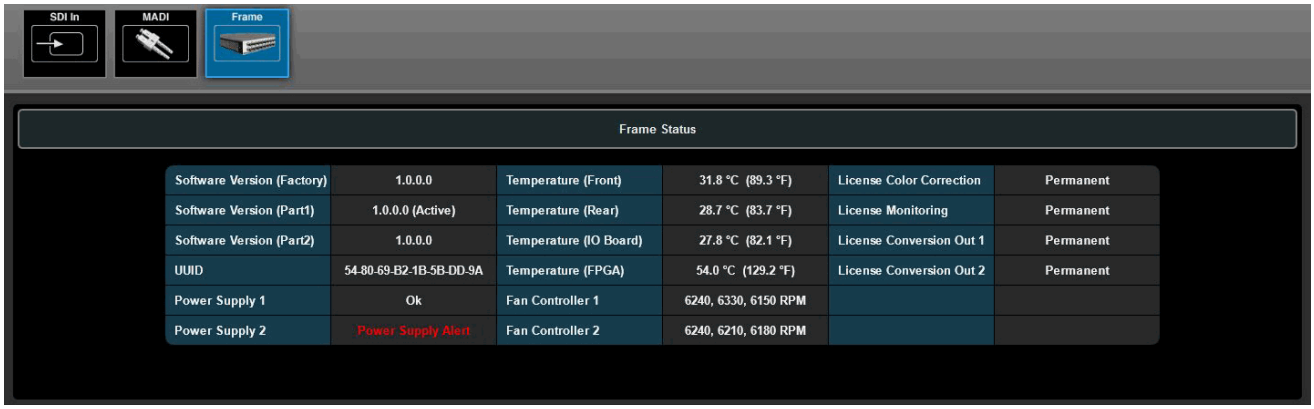
3. To interrogate the status of the MADI audio channels, select either **MADI 1 I/O** or **MADI 2 I/O** from the sub menus:




If signal is present on a MADI input or output, then a green circle appears - in our example, audio is present on MADI port 2, Outputs 1&2 and 17&18.

## Status -> Frame

1. Select **Status -> Frame**:




The fields provide general status information on the **pro8** frame:

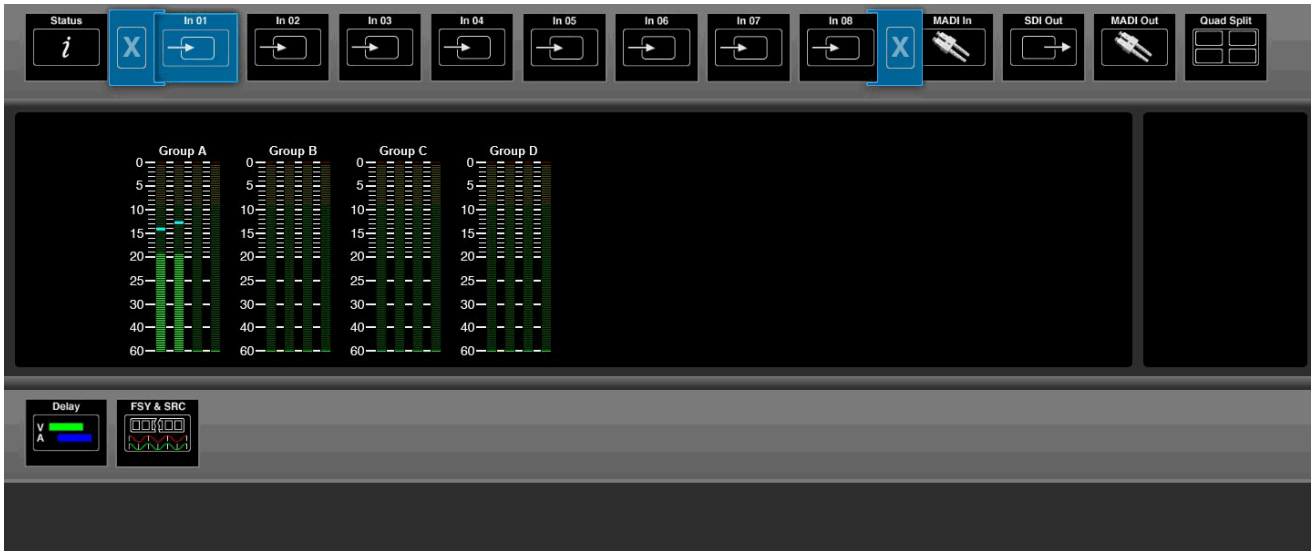
- **Software Version** - the current software versions. You can update the software from the Settings -> Software Update menu.
- **UUID** - Universally Unique Identifier. This number identifies your unit.
- **Power Supply 1 & 2** - the status of the two internal power supplies. In our example, power supply 1 has been disconnected from the mains input. See Grounding & Power for more details.
- **Temperature** - various readings from the unit's temperature sensors. See Frame Installation for recommended operating temperatures.
- **Fan Controller 1 & 2** - the fan speeds for each fan group.
- **License** - the license status for each of the **pro8** options.

# SDI In

This main menu displays audio metering and provides access to input delay (video and audio), video frame sync and audio sample rate conversion.

1. Select **SDI In** and an input (**In01** to **In08**) from the main menus.

In the upper part of the operating window you will see PPM metering for the 16 de-embedded audio channels:



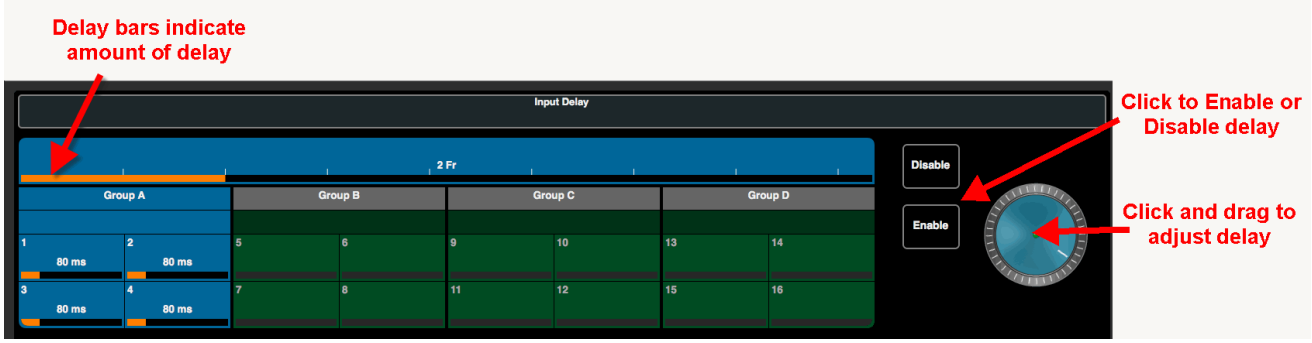

The meter scale is dBFS, and includes a peak hold indicator (green) and overload flag (red) if audio levels reach 0dBFS. The peak hold indicator clears automatically after a few seconds.

The lower half of the screen can be used to adjust **Delay** or **FSY & SRC** (Frame Synchronisation & Sample Rate Conversion) for the selected SDI input.

Note that video is not monitored for the SDI Inputs, so you will not see video thumbnails or a preview. To preview your incoming video, select SDI Out and change video channel routing accordingly.

## SDI In -> Delay

This sub menu adjusts input delay for the de-embedded video and audio channels.




For full details, see Delay.

## SDI In -> FSY & SRC

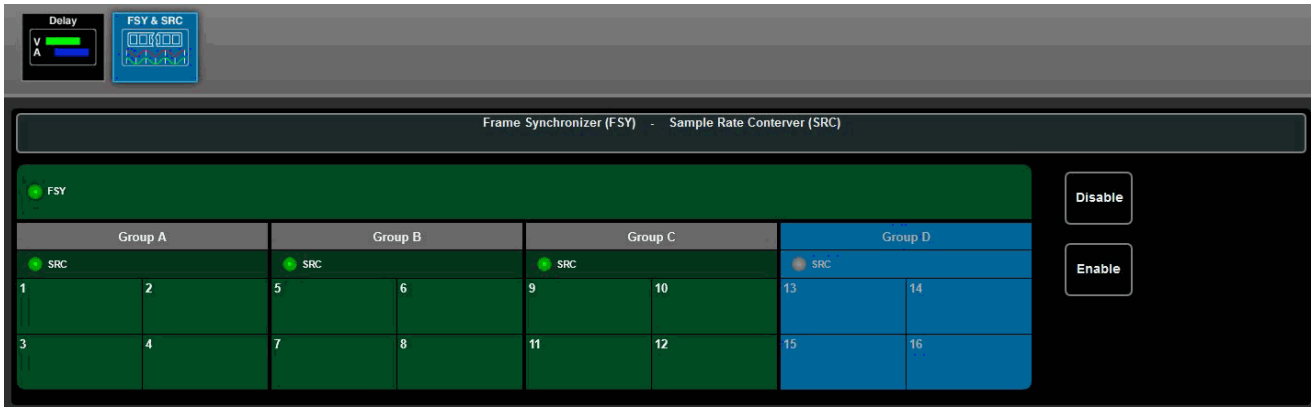
This sub menu adjusts frame synchronisation for the video, and sample rate conversion for the 16 de-embedded audio channels.

Use frame sync to align incoming video signals to the reference.
Use sample rate conversion if the audio sample rate is different from, or not locked to, the **pro8**'s audio reference signal, see Timing -> Reference Settings.

You should disable **SRC** for any audio channels carrying Dolby E signals.

**1.** Select the video and/or audio channels you wish to adjust - you can select audio channels in their groups (A to D), but not as individual channels.

**2.** Then click on **Enable**, or **Disable**, to adjust the frame sync or SRC on/off state for the selected channels:




The **FSY** and **SRC** indicators turn green (illuminated) when frame sync or sample rate conversion are enabled.

In our example, frame sync for the video channel and SRC for audio channels 1 to 12 are enabled; SRC is disabled on channels 13 to 16; channels 13 to 16 are selected (light blue select buttons).

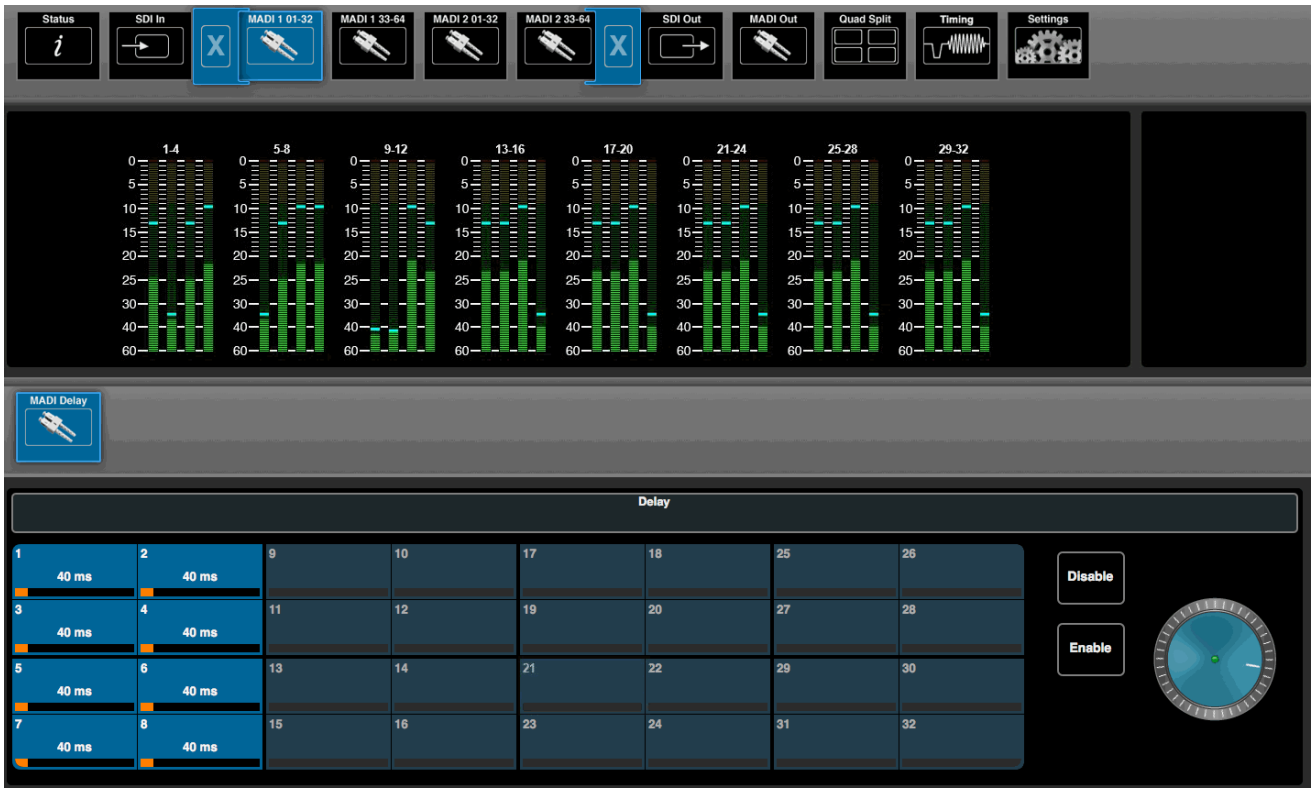
# MADI In

This main menu displays audio metering and provides access to input delay for all MADI input channels.

> You can configure redundant MADI ports by making connections to both the front and rear panel. Then select the active MADI input (front or rear) from the Status -> MADI menu.

1. Select **MADI In** and a set of channels (**MADI 1 1-32, MADI 1 33-64**, etc. ) from the main menus.

In the upper part of the operating window you will see audio metering for the 32 input channels:




The meter scale is dBFS, and includes a peak hold indicator (green) and overload flag (red) if audio levels reach 0dBFS. The peak hold indicator clears automatically after a few seconds.

The lower half of the screen can be used to adjust input **Delay**. For details, see Delay.

# SDI Out

This main menu is the principle menu for dealing with SDI signals. Here you can monitor the video and adjust signal routing and processing for any SDI output.

1. Select **SDI Out** and an output (**Out 1** to **8**) from the main menus.

In the upper part of the operating window you will see **Timecode** (or one of the other Display Options) plus a preview of the embedded video channel and information on its format, aspect ratio and timecode insertion:


If you have signals connected, then you will see audio levels on any metering and live video in the thumbnails and preview. If no signals are present, then these elements will be blank.

Note that the video preview is not streamed at broadcast quality. For broadcast quality, use the Quad Split monitoring feature via the MV SDI output.

The lower half of the screen is used to adjust signal routing and video or audio processing for the selected SDI output.

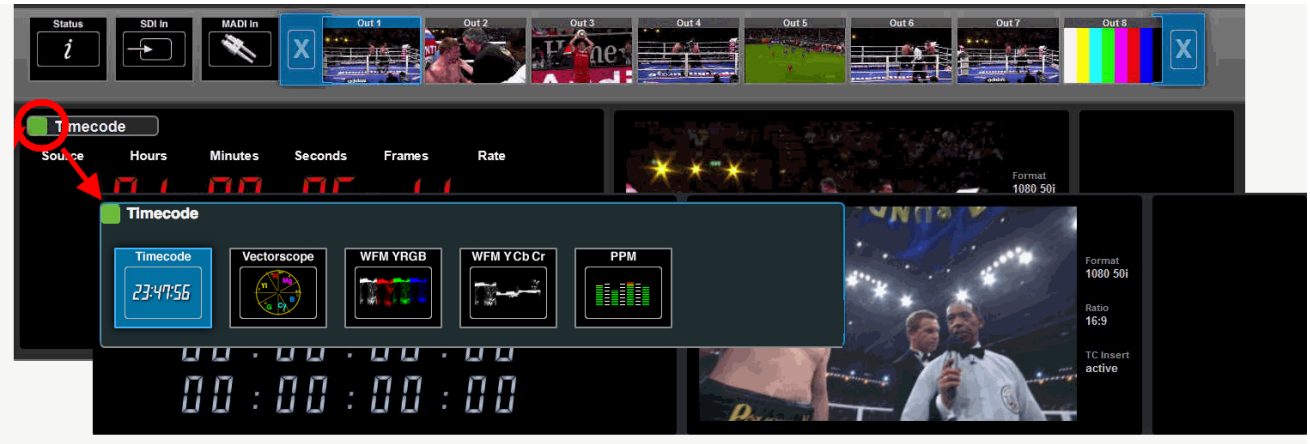
2. Select a sub menu from:

- SDI In & MADI In - re-assign channels from any SDI or MADI input.
- Conversion - up/down/cross format and aspect ratio conversion for the video channel.
- YUV Corr. - standard ProcAmp colour correction for the video channel.
- RGB Corr. - RGB-style colour correction for the video channel.
- Delay - output delay (for each video and embedded audio channel).
- ANC Data - ancillary data such as embedded timecode, AFD and audio.
- Ch. ID & Pattern - insertion of channel ID and timecode into the video channel, and test tone into all embedded audio channels.

## Display Options

The left hand side of the **SDI Out** page can display different options.

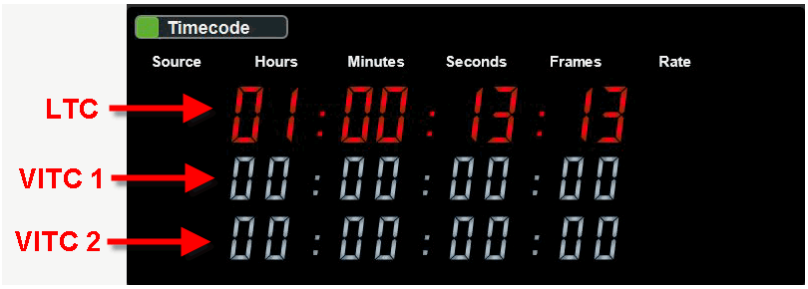
1. Click on the green button beside the current display (e.g. **Timecode**) to open the selector and choose a new option:




You must have the correct software license in order to access the **Vectorscope** and **WFM** options.

### ➢ Timecode

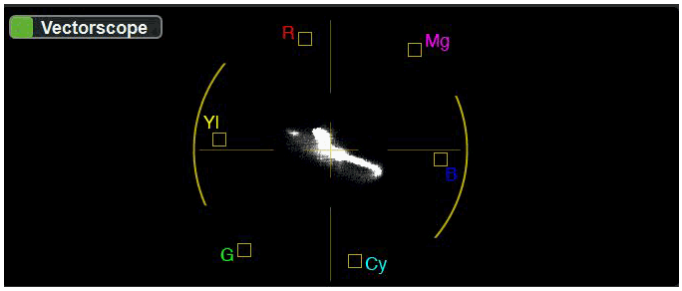
Displays the three embedded timecode streams (VITC 1, VITC 2 and LTC):




### ➢ Vectorscope

Vectorscope monitoring of the video channel.

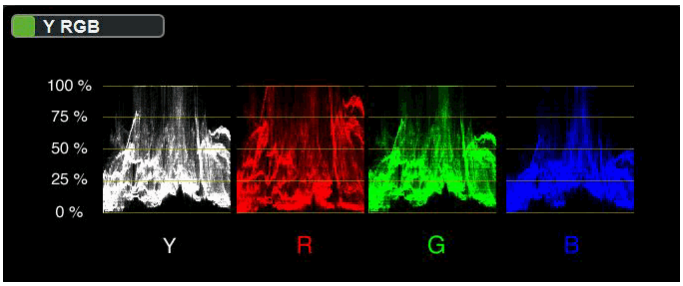
The X-Y plot compares the amplitude of different colour components (**R** = Red, **Mg** = Magenta, **B** = Blue, **Cy** = Cyan, **G** = Green, **Yl** = Yellow):



### ➢ WFM YRGB

Waveform monitoring of the video channel (**Y** = Luminance, **R** = Red, **G** = Green, **B** = Blue).

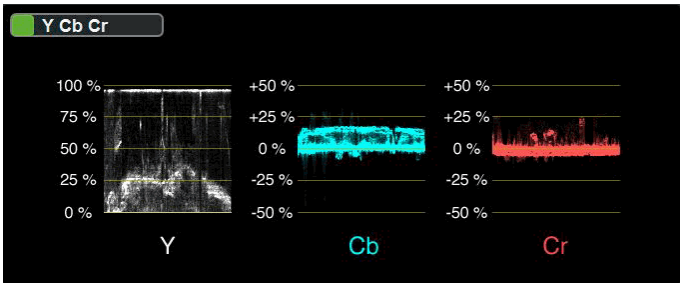
Compares the amplitude of luminance (black & white) and chrominance (RGB colour) components:




### ➢ WFM YCbCr

Waveform monitoring of the video channel (**Y** = Luminance, **Cb** = Chroma Blue, **Cr** = Chroma Red).

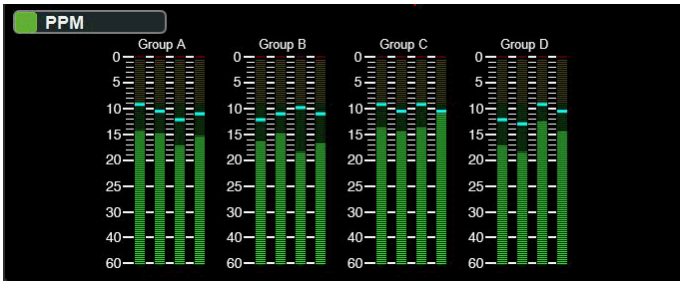
Similar to YRGB, but this time comparing luminance (black & white) with the colour difference components (CbCr):



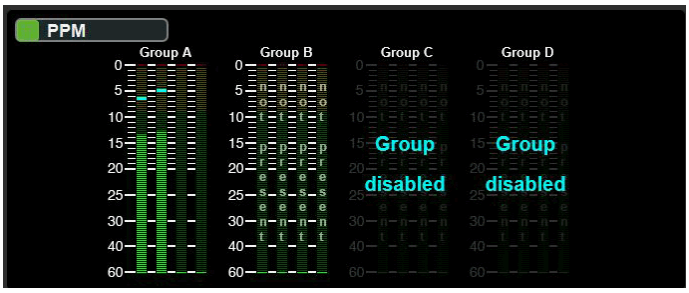

### ➢ PPM

Peak Programme Metering for the 16 embedded audio channels.

The meter scale is dBFS, and includes a peak hold indicator (green) and overload flag (red) if audio levels reach 0dBFS. The peak hold indicator clears automatically after a few seconds.



If there is no audio assigned to an output channel, then you will see the text **not present** on the audio bargraph. Or, if the embedded audio group has been disabled (from SDI Out -> ANC), then you will see **Group disabled**:



## SDI Out -> SDI In/MADI In

The **SDI In** and **MADI In** sub menus are used to change the signal routing for the selected SDI output.


For full details, see Signal Routing.

Note that the embedded audio groups - A, B, C and D - can be enabled or disabled from the ANC sub menu.

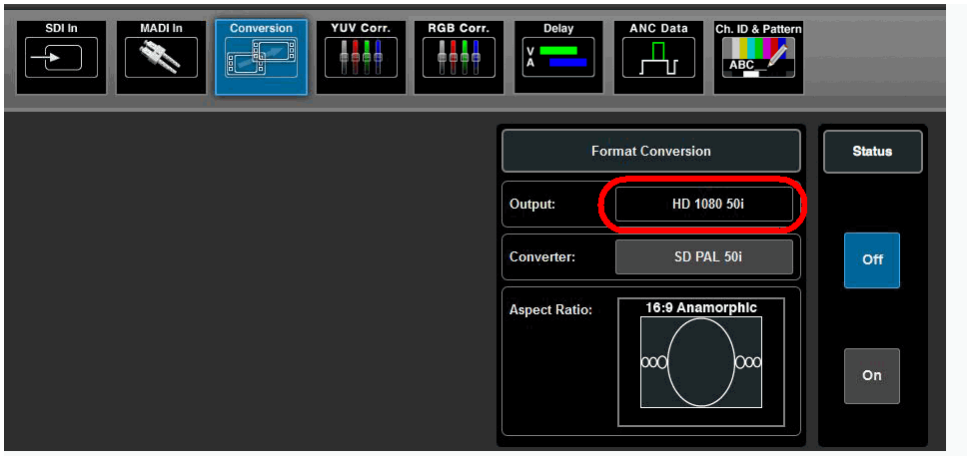
## SDI Out -> Conversion

This sub menu adjusts the format and aspect ratio of the video channel.

Use this function to convert between various HD and SD formats. For example, to convert a 1080i production to 720p or SD 16:9 to 4:3.

You must have the correct software license in order to access this menu; the **pro8** supports format conversion of up to 2 video channels simultaneously.

The current video format is displayed in the **Output** field:

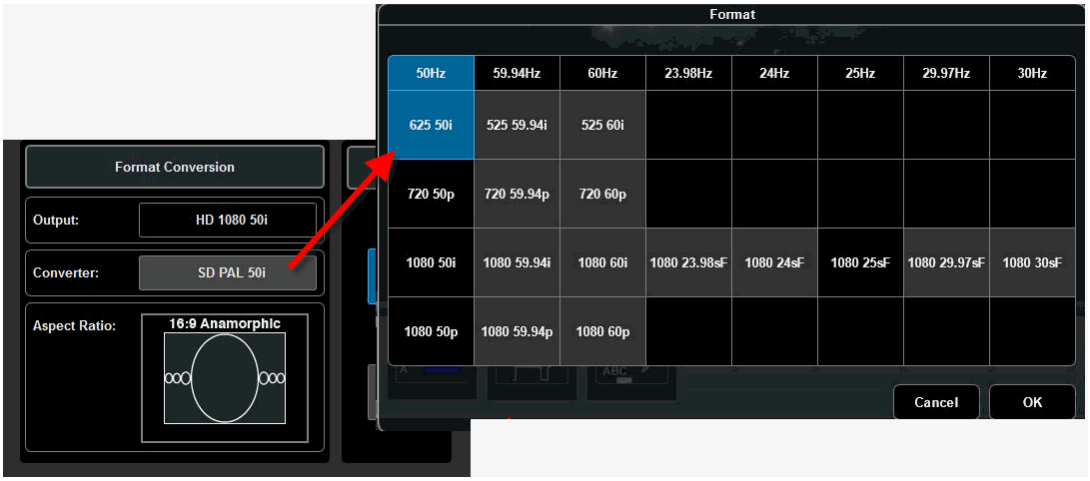



To change the format:

1. Click on the **Converter** button to choose a new output format.
2. Click on **Aspect Ratio** to select a new preset.
3. Then select the Status **On** button to apply the conversion - the **Output** field updates accordingly.

### ➢ Converter Options

The 'Format' pop-up displays a range of video format options; black buttons can be selected; grey buttons cannot (as they are not supported by the current video reference). In our example, we can select any 50Hz format or derivatives such as 1080 25sF:

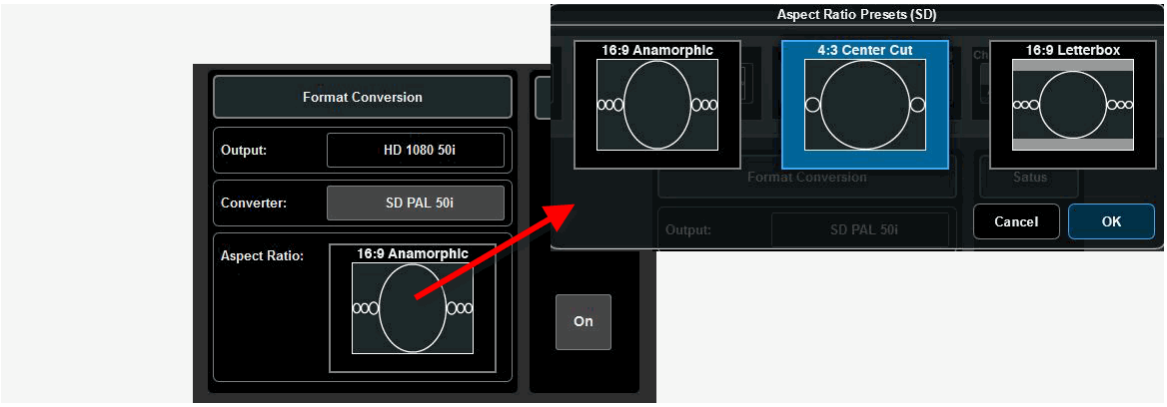



You can change which options are black (selectable) by changing the **Video Reference** and/or **Format** field in the Timing -> Timing Pos menu.

### ➢ Aspect Ratio Options

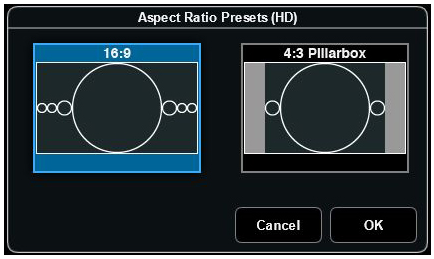
The 'Aspect Ratio Presets' offer a choice of either SD or HD presets depending on your incoming video and the output **Converter** setting. The graphics show what will happen to the picture.

#### Standard Definition Presets




- **16:9 Anamorphic** - an incoming 16:9 image is squeezed to fit onto a 4:3 screen.
- **4:3 Center Cut** - an incoming 4:3 image is unchanged.
- **16:9 Letterbox** - an incoming 16:9 image is sized to fit onto a 4:3 screen. The proportions of the image are retained, but black bars appear at the top and bottom of the screen.

### High Definition Presets




- **16:9** - an incoming 16:9 image is unchanged.
- **4:3 Pillarbox** - an incoming 4:3 image is sized to fit onto a 16:9 screen. The proportions of the image are retained, but black bars appear at the sides of the screen. This option is also known as "Barn Doors".

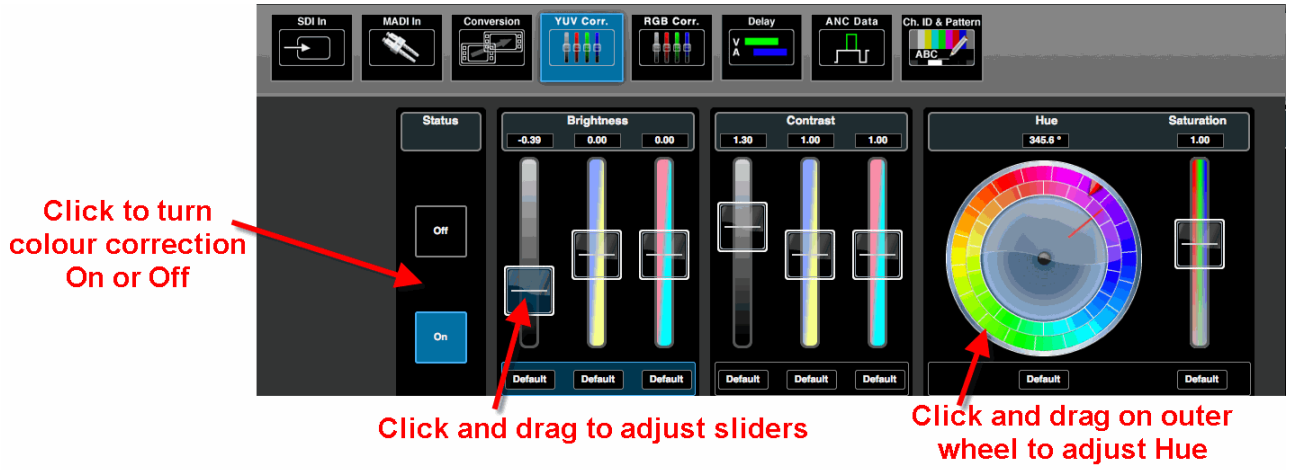
Remember to set the Status to **On**, to apply your new **Converter** and **Aspect Ratio** settings.

## SDI Out -> YUV Corr

This sub menu provides colour correction for the video channel using standard Proc Amp controls (YUV). Alternatively, you can use RGB_Corr. Both sets of controls affect the luminance (black & white) and chrominance (colour) components of the embedded video channel.

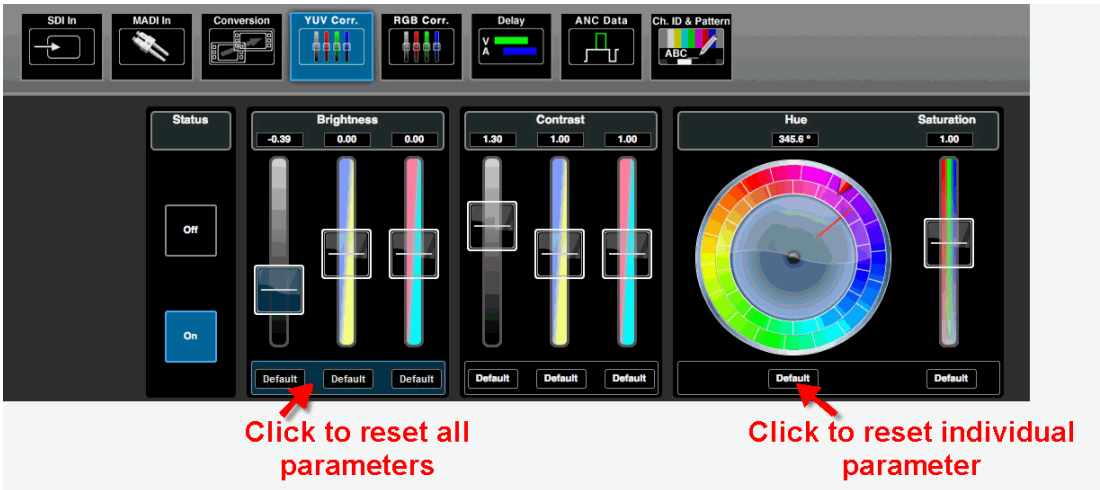
Select either the **Vectorscope** or **WFM (YCbCr)** display options to visualise luminance and chrominance as you make adjustments.

You must have the correct software license in order to access this menu.




To apply colour correction:

1. Select the Status **On** button to enable the controls.
2. Click and drag on a slider to adjust its value. For **Brightness** and **Contrast**, you can adjust the Luminance (Y) and colour difference (U & V) components.
3. Click and drag on the outer colour wheel to adjust the **Hue** - you can use the inner wheel, which remains static, for reference.
4. To reset a parameter, click on its **Default** button. Or, click between the buttons to reset a parameter block:



## SDI Out -> RGB Corr

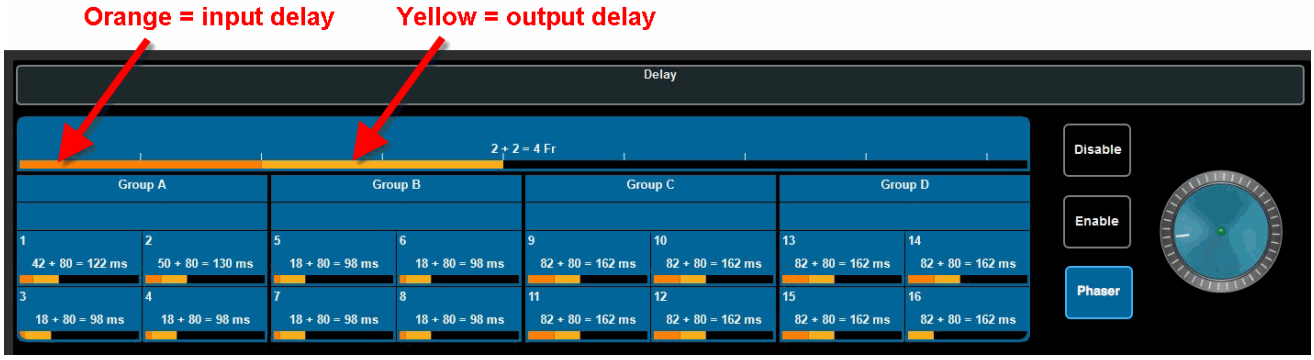
This sub menu provides colour correction for the video channel using YRGB. This provides an alternative method of control to YUV Corr. For example, to assist with RGB camera matching.

The method of control is very similar, except that this time you may adjust the Luminance (Y) and individual colour (RGB) components:


See YUV Corr for details on operating the controls.

## SDI Out -> Delay

This sub menu adjusts output delay for the embedded video and audio channels:




For full details, see Delay.

In addition, it can be used to enable or disable the auto phaser (the default setting is **Phaser** on).

The auto phaser is used to align video input signals within the line phaser range (2 lines for the **pro8**). It ensures the smallest processing delay between the video input and video output, if the incoming video signal's timing position matches the range of the studio's timing environment.

If the incoming video signal doesn't match the auto phaser range, then the timing of the input signal must be modified (externally to the **pro8**). Or, if this is not possible, the **pro8**'s frame synchroniser can be enabled to solve the problem, but note that this introduces a one video frame delay.

# SDI Out -> ANC (Ancillary Data)

This sub menu adjusts the **Timecode**, **AFD** code and **Audio** groups which are embedded into the SDI output:

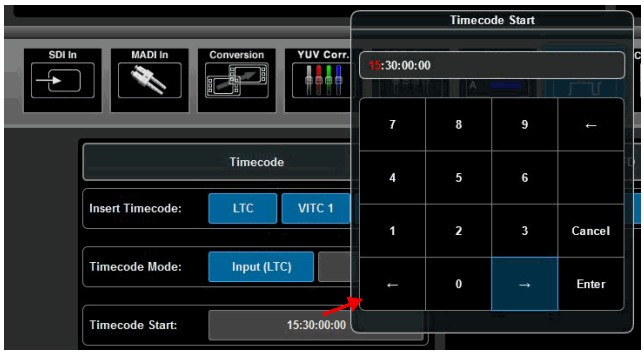

Blue buttons indicate an active setting; grey buttons are inactive.

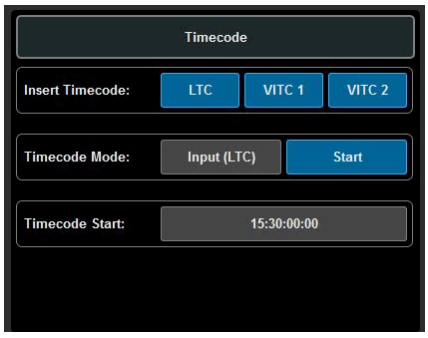
### ➢ Timecode

LTC, VITC1 and VITC 2 timecode may be embedded into the SDI output from the assigned SDI input stream:

1. Enable the **LTC**, **VITC 1** and/or **VITC 2** (**Insert Timcode**) buttons to embed each of the timecode streams - all three may be selected if you wish.
2. For LTC, two **Timecode Modes** available:

- **Input** - takes timecode from the assigned SDI input stream.
- **Start** - enables a "free run" mode:
  - First, click on the **Timecode Start** box to enter the start timecode (for help, see Data Entry).
  - Then click on **Start** to set the timecode running.



### ➢ AFD

Enable the **Insert AFD Code** button to copy the AFD code from the assigned SDI input stream:


The AFD (Active Format Description) code is embedded into digital video signals, to control the way in which a 16:9 image is adapted for a 4:3 display.

Note that the AFD code will be modified if Format Conversion is active and changes the aspect ratio of the SDI output.

### ➢ Audio

Enable the **Group A** to **D** buttons to embed audio groups into the SDI output. In our example, only Groups A and B will be embedded. Note that your selections are reflected in the PPM metering for output:

## SDI Out -> Ch.ID & Pattern

This sub menu can be used to insert a channel ID and timecode into the video channel, and test tone into all 16 audio channels.


➢ **To insert an output ID:**

**1.** Select either of the **Output ID** buttons (blue = on; grey = off). Only one button may be selected at a time:

- **ID** - inserts text, as entered in the **Output ID Name** field.
- **Src: Input x** - inserts the channel ID embedded in the source's video channel (in our example, from SDI Input 3).

The insert appears on the video preview; its position is shown in the **ID Position** fields.

**2.** If **ID** is selected, click on the **Output ID Name** button to open an on-screen keyboard and enter a new text string. You can display up to 16 characters (or 8 characters plus timecode, if the **Timecode** insert is enabled).

**3.** Click and drag on the insert box, in the video preview, to adjust the ID's position. Or, click on the **X Pos** and **Y Pos** buttons to enter a numerical value.

➢ **To insert timecode:**

**1.** Select the **Timecode** button (blue = on; grey = off). Note that you will see the timecode value inside the button if timecode is present.

The timecode appears in the insert box, after the output ID if both are enabled.

➢ **To enable Audio Test Tone**

**1.** Select either of the **Audio Tone** buttons (blue = on; grey = off). Only one button may be selected at a time:

- **1kHz (-18dB)** - routes a 1 kHz sine wave to all 16 embedded audio channels.
- **400Hz (-18dB)** - routes a 400 Hz sine wave to all 16 embedded audio channels.

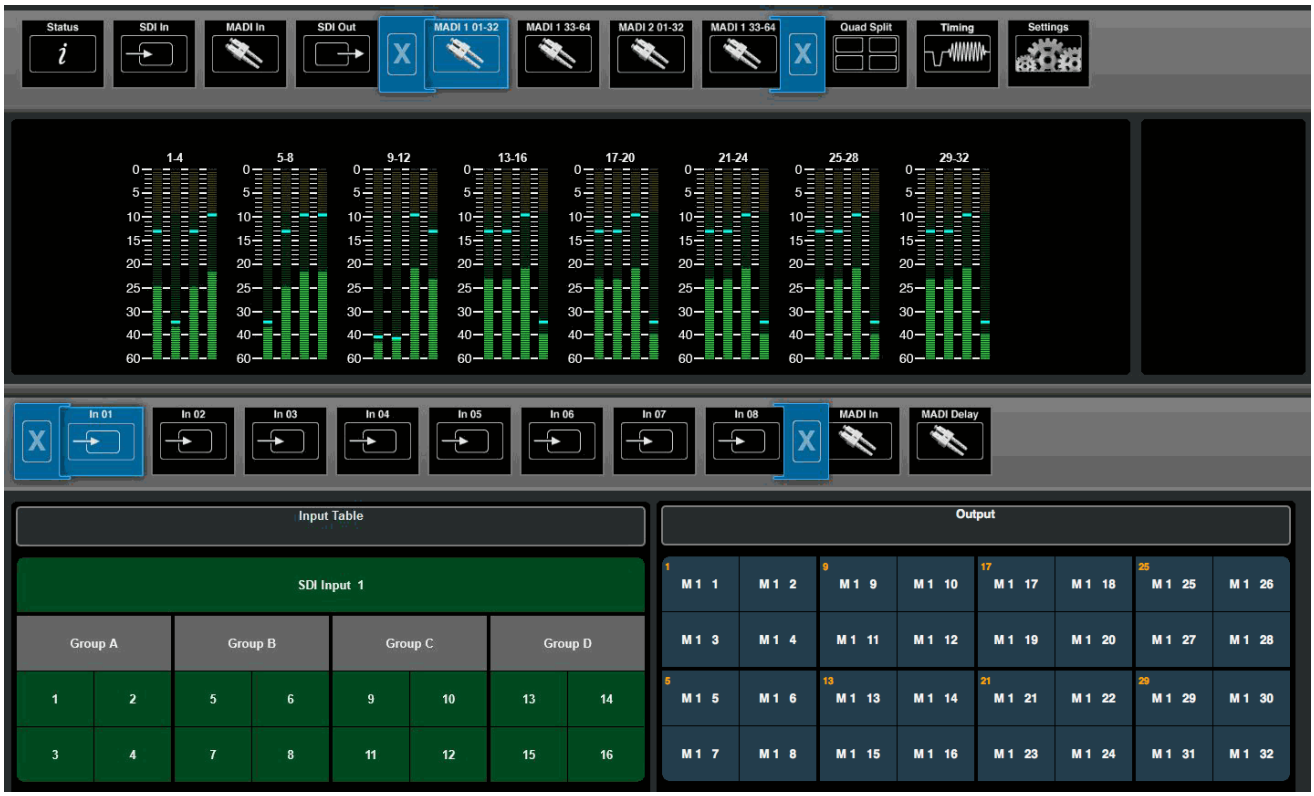
# MADI Out

This main menu displays audio metering and provides access to signal routing and output delay for all MADI output channels.

> You can configure redundant MADI ports by making connections from both the front and rear panel.

1. Select **MADI Out** and a set of channels (**MADI 1 1-32, MADI 1 33-64**, etc. ) from the main menus.

In the upper part of the operating window you will see audio metering for the 32 output channels:




The meter scale is dBFS, and includes a peak hold indicator (green) and overload flag (red) if audio levels reach 0dBFS. The peak hold indicator clears automatically after a few seconds.

The lower half of the screen can be used to adjust signal routing or delay, see Signal Routing and Delay.

# Quad Split

This main menu controls the four **Monitor** outputs (**1** to **4**) which can be viewed on an external display connected to the MV (MultiView) OUT:

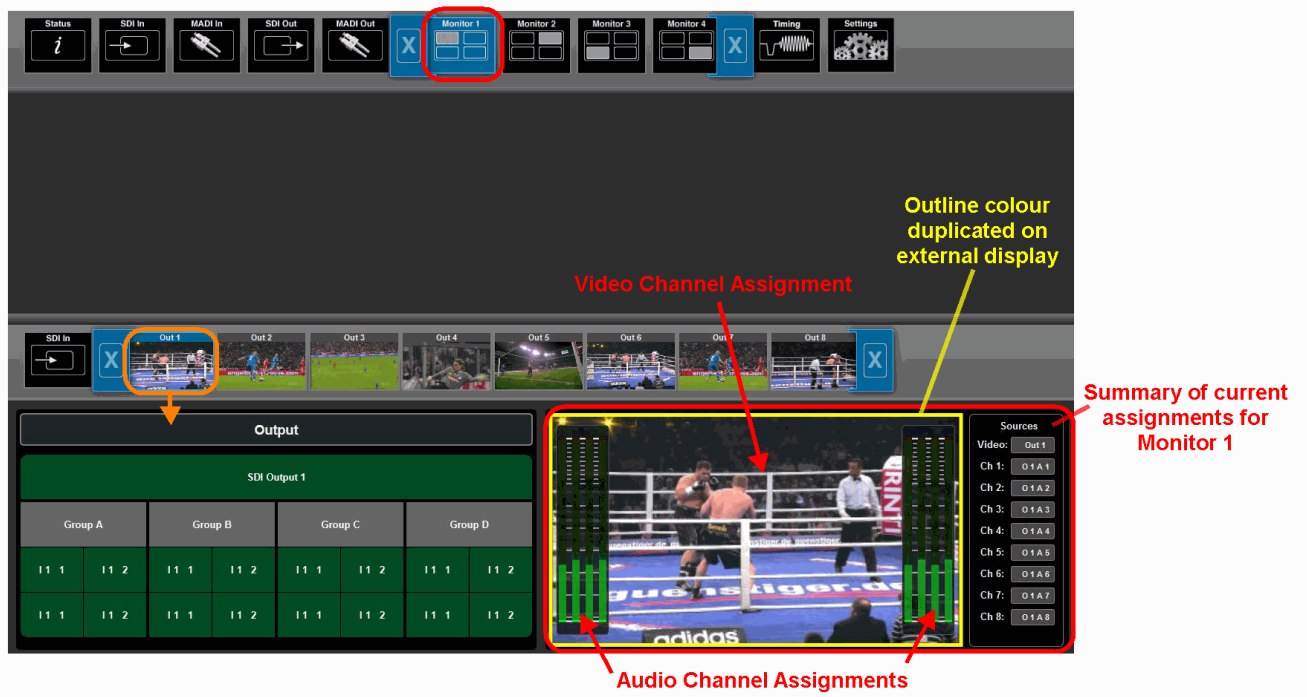
**External Display (shows any 4 SDI inputs or outputs simultaneously):**

1. Select **Quad Split** and a **Monitor** (**1** to **4**) from the main menus.

You must have the correct software license in order to access this menu.

On the lower right you will see the current assignments for the selected Monitor (e.g. **Monitor 1**). Note that the coloured outline (yellow) is duplicated on the external display. This provides easy identification for each of the four monitor positions.

The lower left is used to select SDI inputs or outputs for assignment.

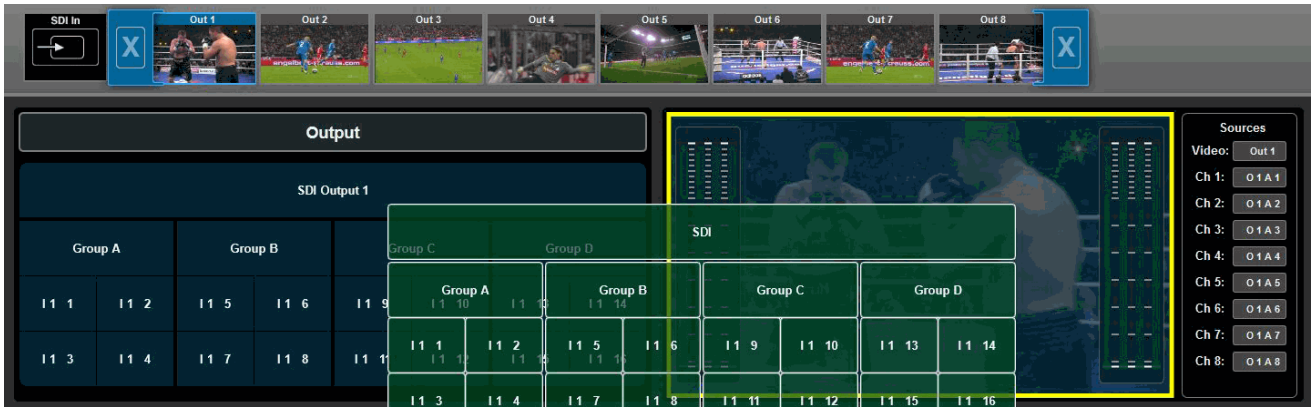


## Quad Split -> SDI In/SDI Out

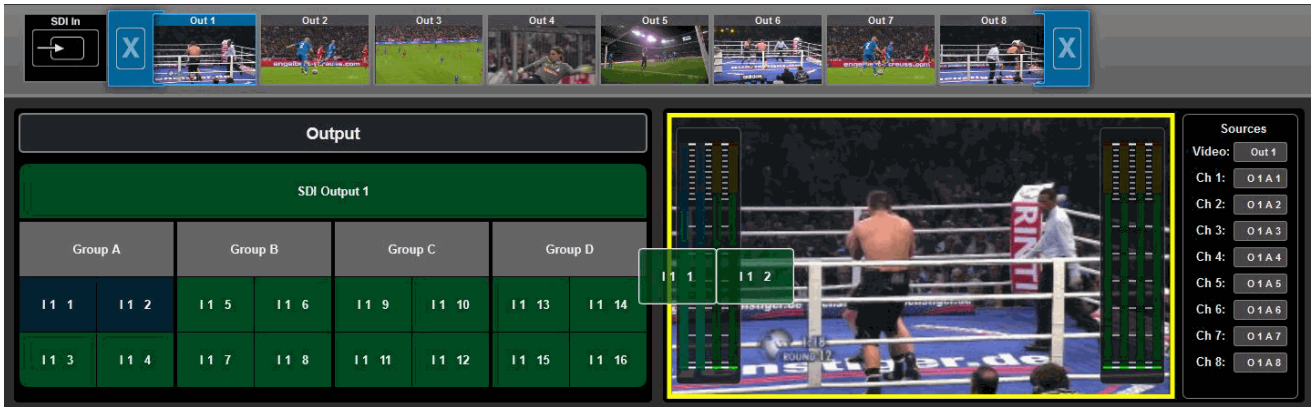
Use the **SDI In** or **SDI Out** sub menus to assign new sources to the **Monitor** output. The method is very similar to other I/O assignments, see Signal Routing.

You can choose video and audio channels, independently, from any of the eight SDI inputs or outputs.

For example, to assign all channels (video and audio) from SDI output 1, select **SDI Out 1**, and drag and drop all channels from left to right:




Or, to assign a new pair of audio audio channels only, drag and drop the audio channels onto the appropriate bargraph meters:




After each new assignment, the **Sources** summary updates.

For more information on connecting the Quad Split output, or to see what is shown on the external display, see MV (MultiView) OUT.

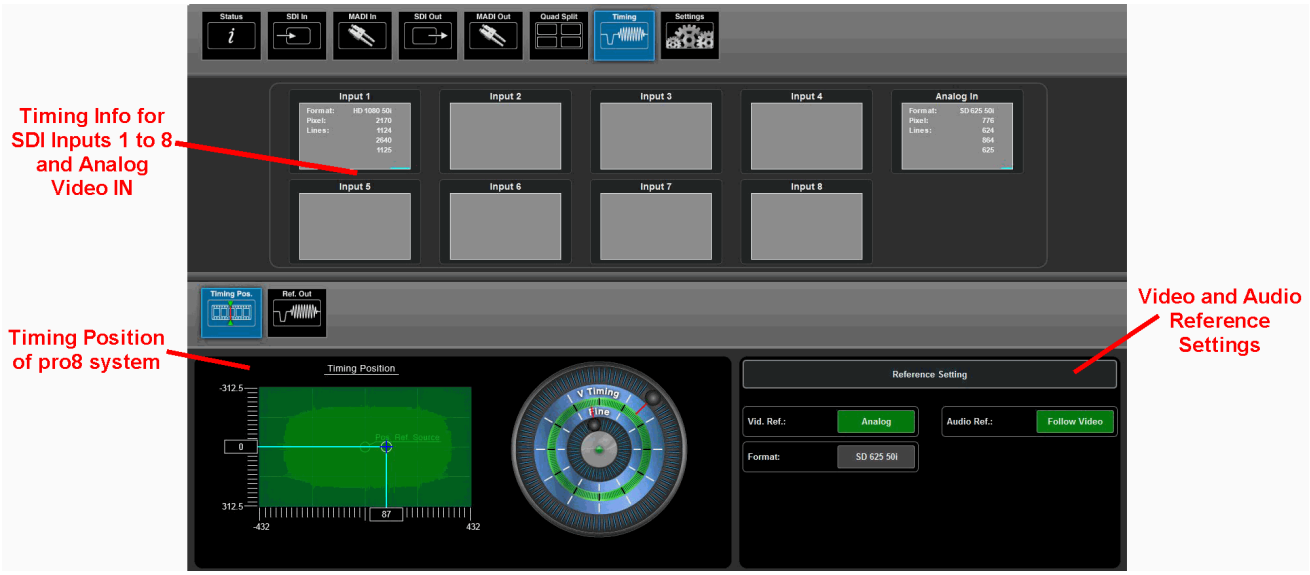
# Timing

This main menu deals with the timing position of the **pro8** and its video and audio reference signals. All settings are applied globally.

1. Select the **Timing** (main menu).

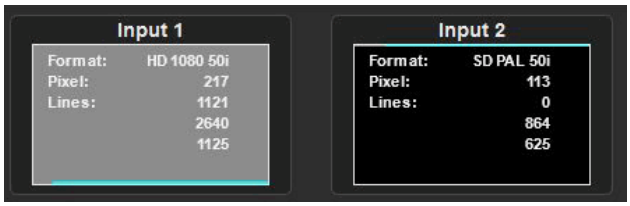
In the upper part of the operating window you will see timing information for all 8 SDI inputs - **Input 1** to **Input 8** - and the **Analog In** (external video reference IN).

The lower half of the screen can be used to adjust the **Timing Position** (including **Reference Settings**) or the **Ref Out** (options for the video reference OUT).




### ➢ Timing Information for SDI Inputs

Each box displays the video format and pixel/line content for the SDI input. If the incoming picture signal is locked to the **pro8**'s video reference, then the fields are stable. If the picture is not locked (for example, you have disconnected the video reference signal), then the horizontal turquoise bar moves from left to right, and the pixel/line fields fluctuate:

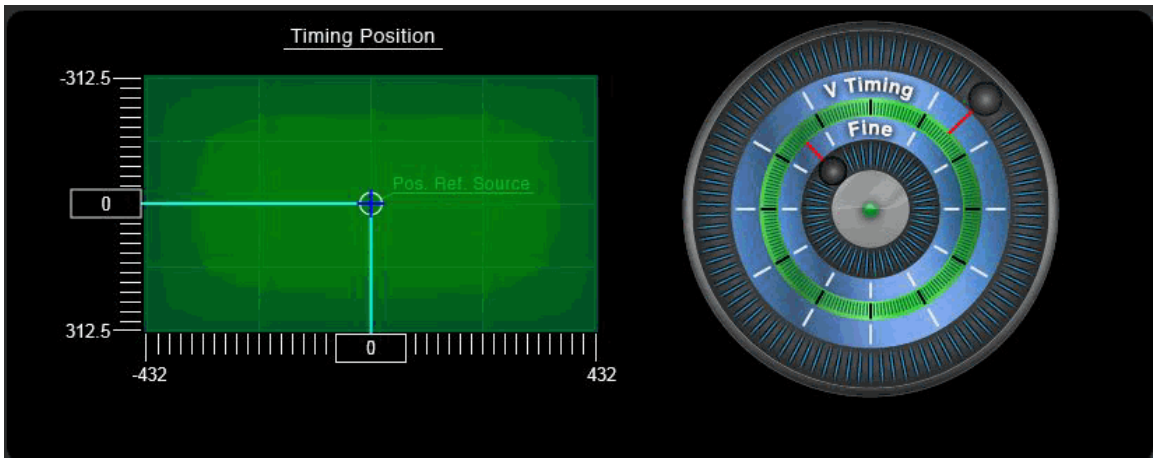


## Timing Position

This area adjusts the timing position of the **pro8** system with respect to its video reference signal.

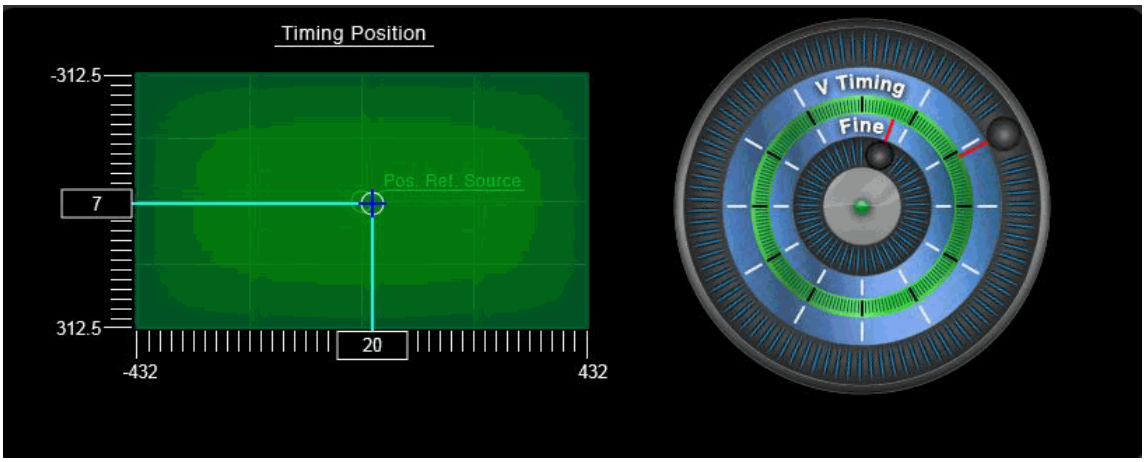
You can use this parameter to set an offset between the **pro8** and an external video reference. For example, while installing your system. Select the external video reference signal using the Video Ref field.

The default timing position is shown below. The graph displays pixels (X axis) versus lines (Y axis):



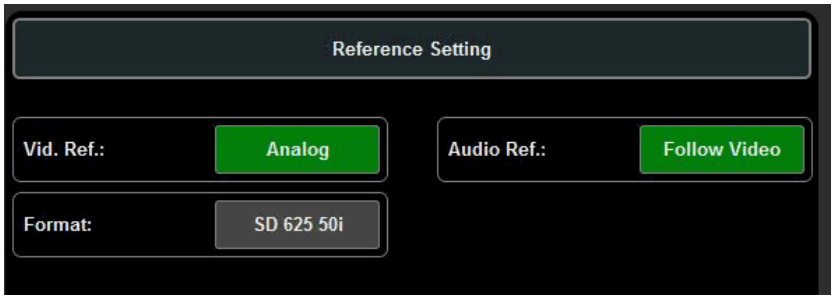

2. Click and drag the inner timing wheel to adjust the pixel position.
3. Click and drag the outer timing wheel to adjust the line position.

The timing position of the **pro8** moves. You will see the new position compared to that of the reference source on the XY display:



## Reference Settings

This area selects the video and audio reference signals for the **pro8** system:

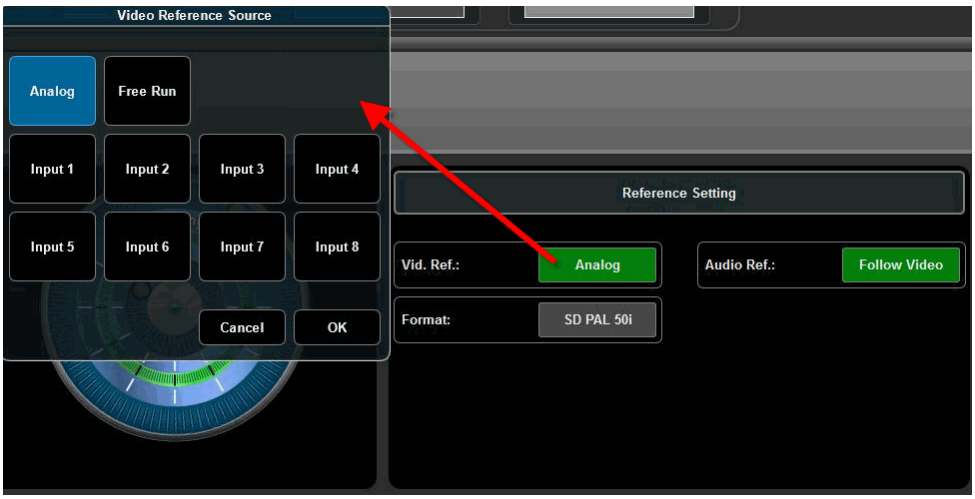



Green buttons indicate an active setting; red buttons are inactive. The buttons are used as follows:

- **Vid. Ref.** - selects the video reference signal (in our example, **Analog**).
- **Format** - affects the video format options which may be selected in the SDI Out -> Conversion and Timing -> Ref Out. If the **Video Ref** is set to an external reference such as **Analog**, then the system automatically detects the format and defines the available Format conversion options.
- **Audio Ref.** - selects the audio reference signal (in our example, **Follow Video**).

### ➢ Video Reference Options

**1.** Click on the current video reference - e.g. **Analog** - to open the 'Video Reference Source' selector:




Choose from:

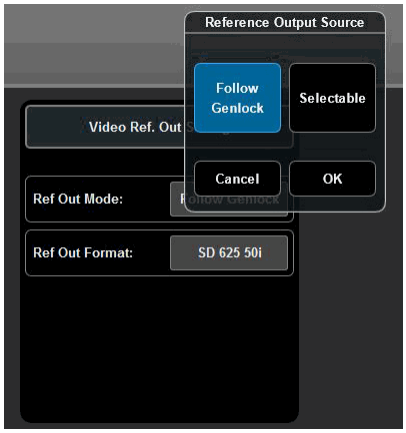
- **Analog** = the external video reference input connected to the rear panel. Supported reference signal formats are:
  - Analog Genlock High Definition Tri-Level Sync (SMPTE-274M/296M).
  - Standard Definition 1V Black & Burst (SMPTE-170M/318M).
- **Free Run** = the **pro8**'s internal reference.
- **Input 1** to **Input 8** = any of the 8 digital SDI inputs.

### ➢ Audio Reference Options

In Version 1.0, the audio reference is ALWAYS set to **Follow Video**. This means that the system is clocked from a single reference source. In a future software release, you will be able to lock audio independently, either to an external Wordclock signal or to free run.

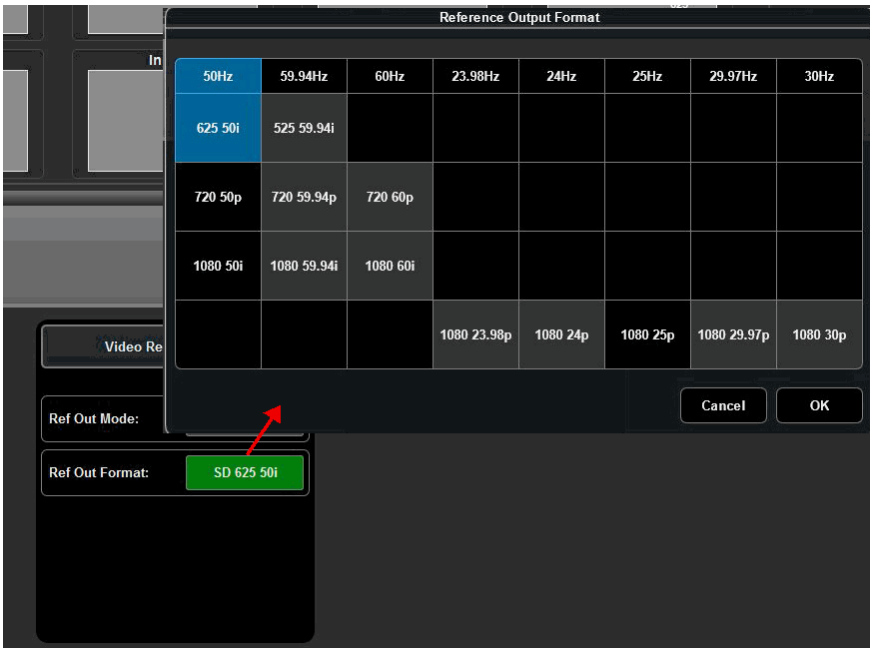
## Ref Out

This sub menu selects options for the video reference output on the **pro8**'s rear panel:




Two different **Ref Out Mode**s are available:

- **Follow Genlock** - the video output follows the Master Genlock.
- **Selectable** - click on **Ref Out Format** to select the video output format; black buttons can be selected; grey buttons cannot (as they are not supported by the current video reference). In our example, we can select any 50Hz format or derivatives such as 1080 25p:




You can change which output format options are black (selectable) by changing the **Video Reference** and/or **Format** field in the Timing -> Timing Pos menu.

# Settings

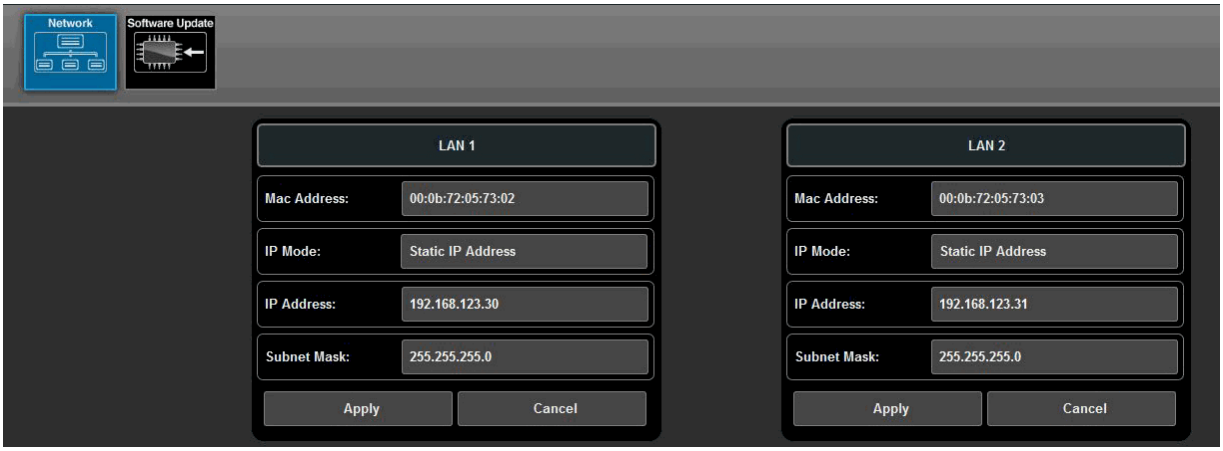
This main menu provides access to system settings.

The upper area of the operating window is unused. Use the sub menus to access:

- **Network** - check the TCP/IP settings and Mac Address for the **LAN 1** and **LAN 2** network ports. You can change the IP address and subnet mask of each port from here.
- **Software Update** - check the software version of the **pro8** or perform a software update.

## Settings -> Network

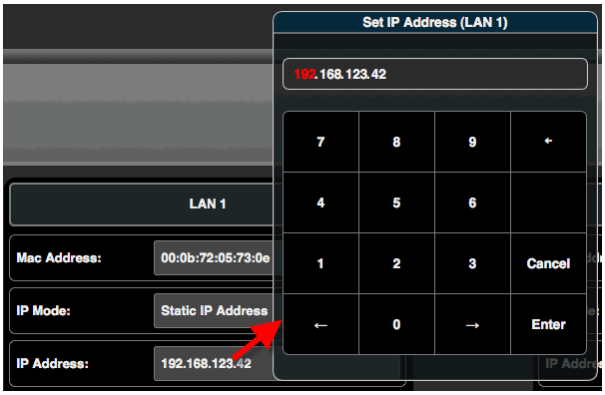
Use this sub menu to check the TCP/IP settings and Mac Address for the **LAN 1** and **LAN 2** network ports:

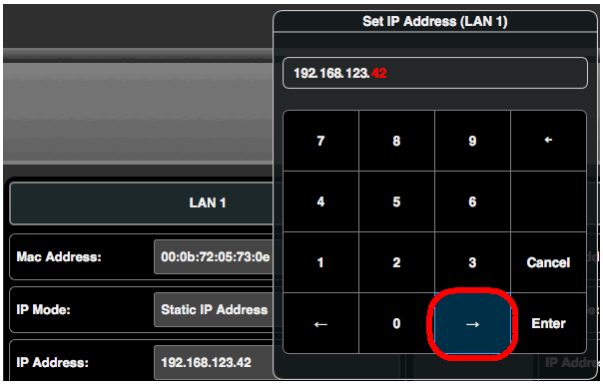



All fields except **IP Address** and **Subnet Mask** are for display purposes and cannot be altered.

➢ **To change the TCP/IP settings of either LAN port:**

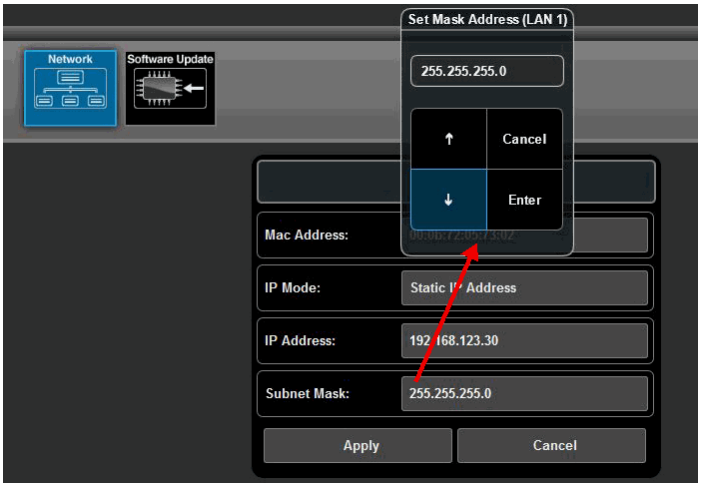
**1.** Click on the current **IP Address** to open the pop-up selector. Click on the right arrow button to highlight the correct set of digits; use the numeric keyboard to enter a new value and click **Enter**.




*The **IP Address** field updates.*

2. Click on the current **Subnet Mask** to open the pop-up selector. Click on the up or down arrow buttons to adjust the subnet mask and click **Enter**.




*The **Subnet Mask** field updates.*

3. When you are happy with the new IP settings, click on **Apply**.

The LAN port settings are reset. Providing your computer's Network Interface Card is within the same IP range, the browser automatically reconnects, and you are returned to the login screen.

Both LAN ports will be disconnected for a short time, after changes to the Network settings are applied.

## Settings -> Software Update

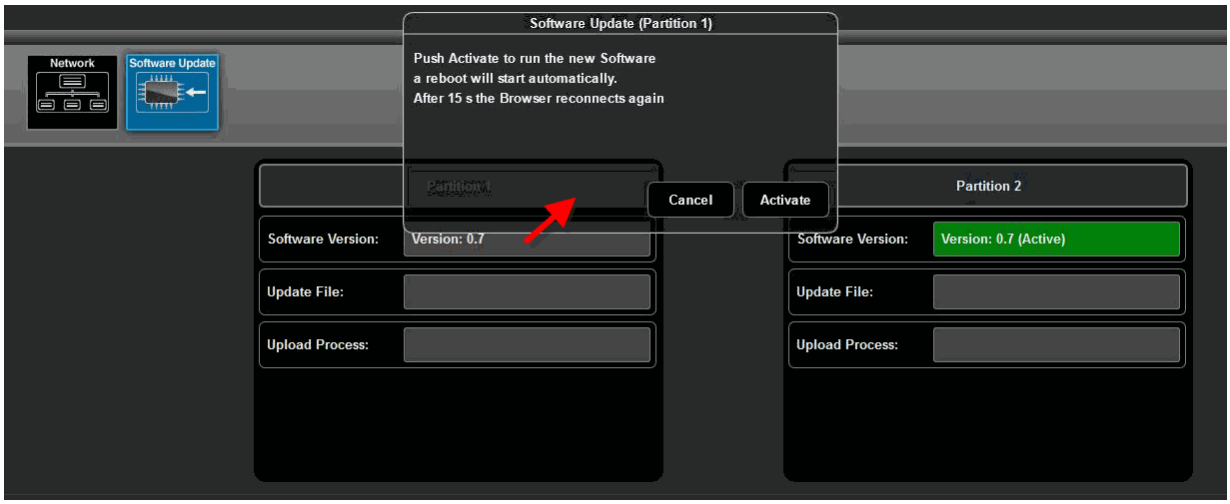
This sub menu can be used to check or update the **pro8** software.

The system includes three flash data partitions. Partition 0 is factory-installed and is not accessible to the user. Partitions 1 and 2 may be installed with different software so that you may boot from either version.

When you open the **Software Update** menu, you will see the current versions installed on each partition. The active partition is shown in green - for example, **Partition 1**:

➢ **To boot from the alternate partition:**

1. Click in the inactive **Software Version** field:




2. Select **Activate** to confirm the reboot. While the system reboots, you will see a count down:


At the end of the reboot, the web browser automatically reconnects and you are returned to the login screen.

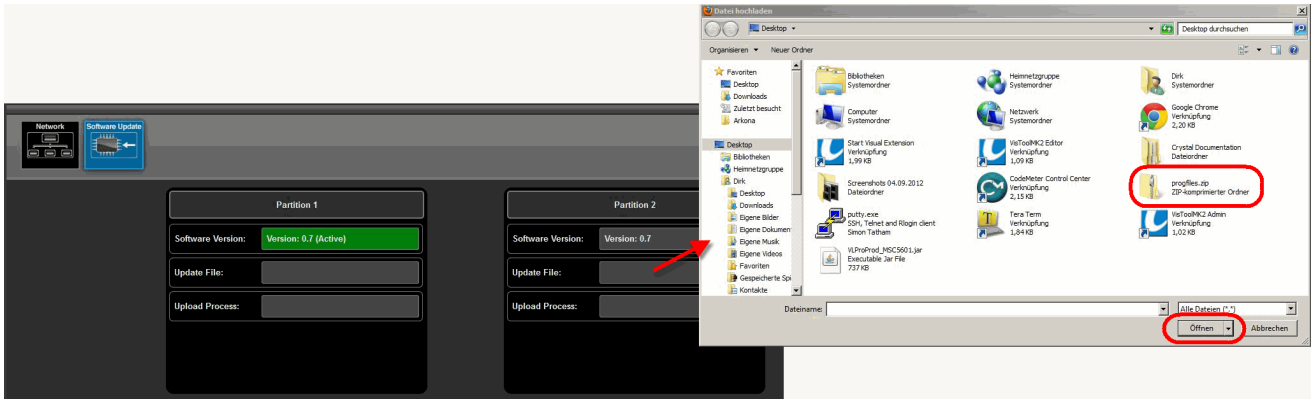
➢ **To install and boot a new version of software:**

Note that settings are deleted after rebooting from new software.
Audio is muted during the installation process.

1. First download or copy the new software file onto your computer. Do not unzip the file.

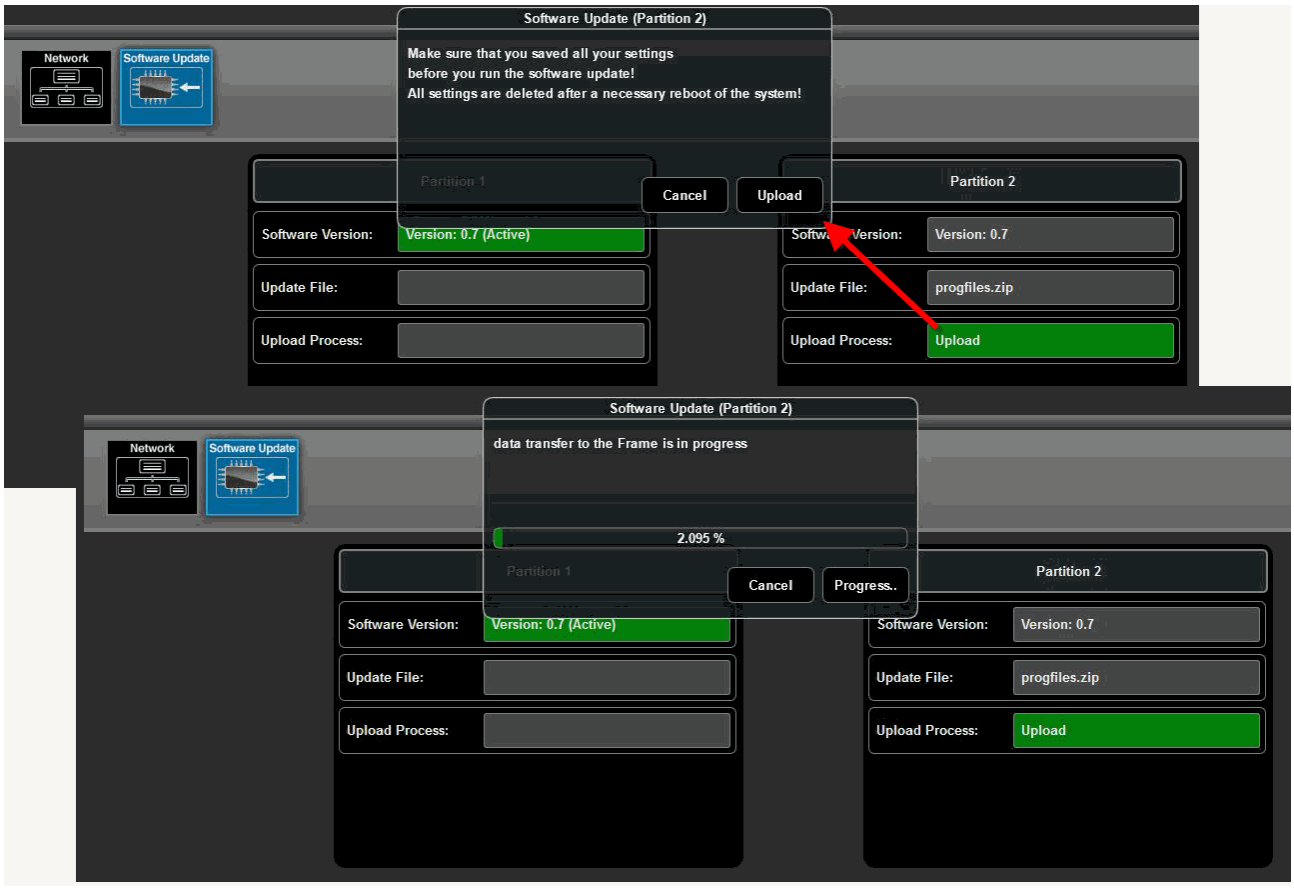
You can download the latest **pro8** software release from the Lawo website by registering at www.lawo.de (click on **Login** and then navigate to the **Downloads** area).

2. Then click on the **Update File** button to open a file browser window. Select the software file (**progfiles.zip**) and click on **Open**:

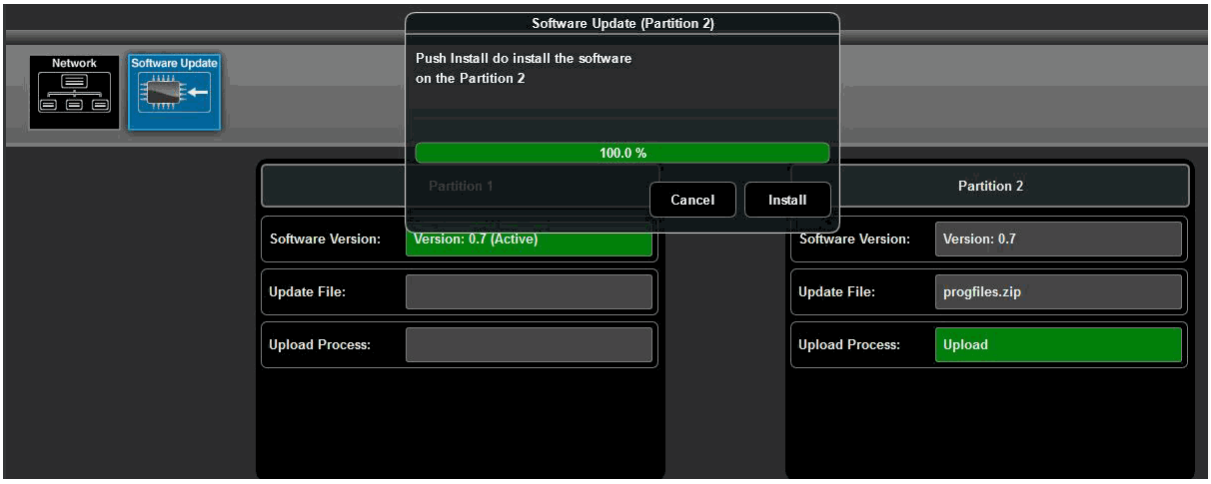



The **Update File** field shows the file name and a green **Upload** button appears:

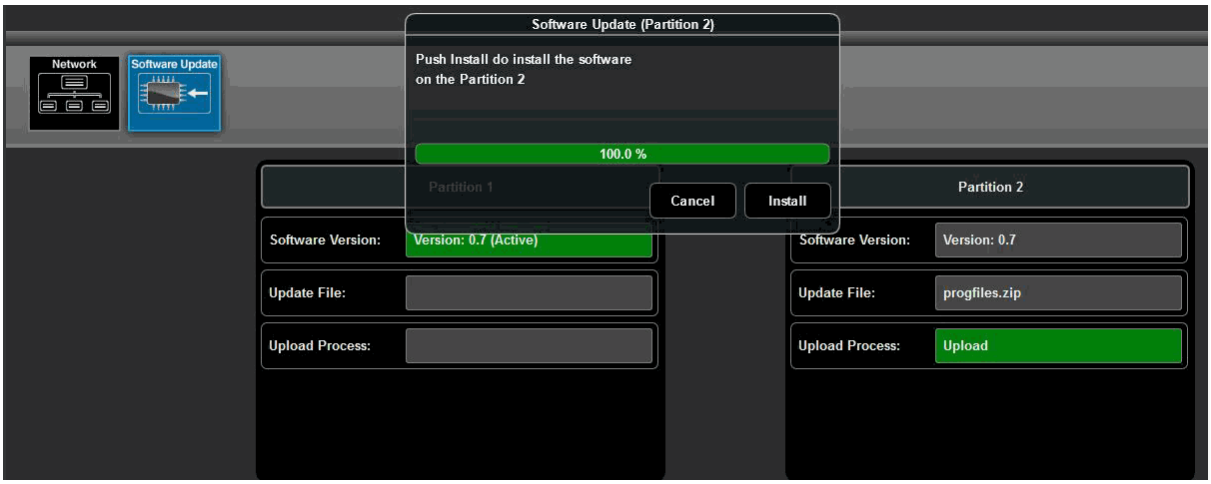
**3.** Click on **Upload** and then **Upload** again to start the file transfer to the system - this may take a few minutes; the progress is displayed on the pop-up window:



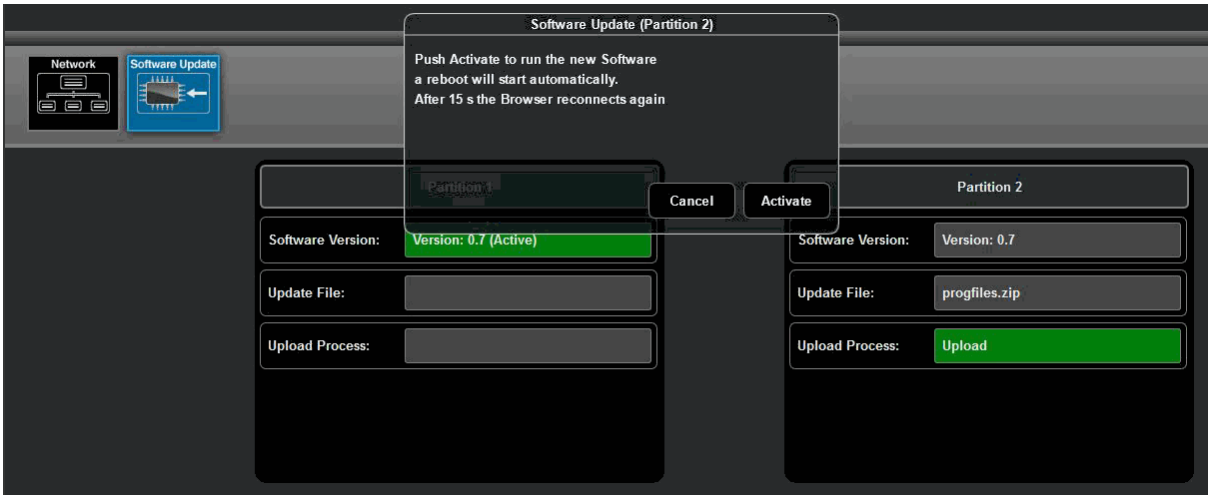

At the end of the file transfer, the following instruction appears:



4. Click on **Install** to start the software installation - this may take a few minutes; the progress is displayed on the pop-up window:




5. At the end of the installation, select **Activate** to boot from the new software:




While the system reboots, you will see a count down.

At the end of the reboot, the web browser automatically reconnects and you are returned to the login screen.

If you have any problems with the software installation, please contact your local Lawo representative or email service@Lawo.de.

# Technical Data

### Video Signal Connections

- 8 x 3G/HD/SD-SDI inputs via BNC
- 8 x 3G/HD/SD-SDI outputs via BNC
- 1 x 3G Quad Split monitoring output via BNC
- 1 x Quad Split monitoring output via DisplayPort

### Supported Video Standards

- 2,97Gbps Video Standards (1080p):
  - 1080p 60Hz SMPTE-424M, 425M Level A & Level B
  - 1080p 59.94Hz SMPTE-424M, 425M Level A & Level B
  - 1080p 50Hz SMPTE-424M, 425M Level A & Level B
- 1,485Gbps Video Standards (HD):
  - 1080i 60Hz SMPTE-274M(4),-292M(D)
  - 1080i 59.94Hz SMPTE-274M(5),-292M(E)
  - 1080i 50Hz SMPTE-274M(6),-292M(F)
  - 1080p 30/29.97/25/24/23.976sf(*)
  - 1080p 30Hz SMPTE-274M(7)-292M(G)
  - 1080p 29.97Hz SMPTE-274M(8)-292M(H)
  - 1080p 25Hz SMPTE-274M(9)-292M(I)
  - 1080p 24Hz SMPTE-274M(10)-292M(J)
  - 1080p 23.976Hz SMPTE-274M(11)-292M(K)
  - 720p 60Hz SMPTE-296M(1),-292M(L)
  - 720p 59.94Hz SMPTE-296M(2),-292M(M)
  - 720p 50Hz SMPTE-296M(2),-292M(M)
- 270Mbps Video Standards (SD):
  - 576i 16:9 and 4:3 SMPTE-259M(C)
  - 480i 16:9 and 4:3 SMPTE-259M(C)

(*) not for Format Conversion

### Reference Signal Connections

- Black & Burst/Tri-Level input via BNC
- Black & Burst/Tri-Level output via BNC
- Black & Burst/Tri-Level loop thru via BNC
- Wordclock output via BNC

### Supported Reference Signal Standards

- Analog Genlock High Definition Tri-Level Sync (SMPTE-274M/296M)
- Standard Definition 1V Black & Burst (SMPTE-170M/318M)
- SDI

### Audio Signal Connections

- 2 x MADI/AES10 optical in/out with LC connectors via SFP adaptor (front & rear connectors operate in parallel to offer redundant MADI links)
- SDI embedded audio

### Supported Audio Standards

- SMPTE 272M-ABCJ
- SMPTE 299/48
- SMPTE 337
- MADI / AES10

### Network Connections & Standard

- 2 x RJ45 Gigabit Ethernet
- 100/1000 LAN speeds supported (>=100 recommended for video thumbnail streaming)

### Internal Processing

- Video 10 bit 4:2:2
- Audio 24 bit

### Routing Matrix Crosspoints

- Video 8 x 8
- Audio 384 x 384

### Audio De-embedder

- Status & error monitoring for every channel
- Sample rate converter for every de-embedded channel

### Audio Embedder

- Embedding of up to 16 channels per SDI, selectable from any de-embedded channel or MADI input
- Sample rate converter for every embedded channel

### Audio Processing Features

- Variable delay, 1–320 ms per mono channel in steps of 1ms

### Video Processing Features

- Variable delay, 1-8 frames per channel in steps of 1 frame
- Frame Sync per channel
- RGB Colour Correction & Proc Amp per channel
- 2 x Channel Format & Aspect Ratio U/D/X Conversion, allowing multi-format output
- Quad Split Monitoring: shows input and output signals with identification, tally and audio metering
- Channel ID and Timecode Generator/Inserter
- Thumbnail generation, LAN accessible

### Latency

- SRC disabled: < 2 ms
- Format conversion: 1 frame (including de-interlacing)
- Quad Split Monitoring: 1 frame

### Control & Monitoring

- IP-based Web Browser Interface, includes Waveform Monitoring and Vectorscope
- Front LED status indication

### Power

- 2 x Auto sensing 100-240V VAC power supply, 50/60Hz nominal on IEC connector
- Power Consumption < 100W

### Environmental Data

- Storage temperature -20°C to +70°C (-4° F to +158° F)
- Operating temperature +0°C to +40°C (+32° F to +104° F)
- Relative humidity <= 90% non-condensing
- Electromagnetic environment: E2 (EN55103-1,-2)

### Mechanical Data

- Width: 480.3mm (19“)
- Depth: 457.5mm (18")
- Height: 1RU
- Weight: 4.6kg (10 lbs and 2.26 oz)

# Glossary

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| **3G** | 3G is a HD-SDI format which operates at 2,97Gbit/s. This is a higher data rate than used by 1,485Gbit/s HD-SDI. There are two versions of the 3G-SDI format - Level A, used for 1080p high data rate signals, and Level B, used to carry two 1,485Gbit/s HD-SDI signals down a single wire. |
| **1080i** | Used to describe a picture resolution of 1920 x 1080 pixels, which uses interlaced (i) scanning. See Frame. |
| **1080p** | Used to describe a picture resolution of 1920 x 1080 pixels, which uses progressive (p) scanning. See Frame. |
| **720p** | As for 1080p, but the picture resolution is 1280 x 720 pixels. |
| **16:9** | Describes the picture's aspect ratio (Width : Height) used in cinema screen and widescreen digital TV. The ratio is used in all High Definition, and some Standard Definition TV. |
| **4:3** | Describes the picture's aspect ratio (Width : Height) used in PAL or NTSC TV. |
| **48kHz or 44.1kHz** | See Sample Rate. |
| **AFD** | Active Format Description<br>A code number which is embedded in digital video signals, to control the way in which a 16:9 image is adapted for a 4:3 display. The AFD code describes the portion of the 16:9 image which is important and should therefore be presented to the 4:3 viewer. The AFD code can be changed on a programme by programme basis, so that a consumer set top box can react to programme material from different productions and eras. |
| **Anamorphic** | Video which is squeezed or stretched to fit a particular screen size. |
| **Aspect Ratio** | Width versus Height of the video screen. Common aspect ratios are 16:9 (widescreen TV) and 4:3. |
| **Bargraph** | An optical display instrument in the shape of a LED bar for displaying audio signal level. |
| **Chrominance** | Chroma or C for short.<br>Chrominance is used in video systems to convey the colour information of the picture, and is paired with Luminance (Y) which represents the brightness of the image.<br>Chroma is usually represented as two color-difference components: U = Blue - Luma, and V = Red - Luma. The U and V components are also known as Cb (Chroma blue) and Cr (Chroma red).<br>RGB sources, such as the output of a camera, are usually converted into YUV so that video systems can process the brightness (Y) and colour information (U and V) separately. This is useful as the human eye is more sensitive to luminance (Y), than to changes in chrominance (UV). |

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| **dB** | deciBel<br>A unit of transmission giving the ratio of two powers. Used in audio to represent changes in signal level.<br>The number of bels is the logarithm to the base 10 of the ratio of the two powers. One decibel equals one tenth of a bel. |
| **dBu** | dBu is used to describe audio signal levels within the analogue domain, and is a measure of absolute voltage level based on 0dBu = 0.775 Volts (RMS). dBu is often used to indicate nominal broadcast operating levels. For example, in the EBU normal broadcasting level = +6dBu. |
| **dBFS** | dB Full Scale<br>dBFS is used to describe audio signal levels within the digital domain. 0dBFS describes the system's internal clipping point; this is the maximum level which may be handled by the system without signal distortion. For example, your system may be set for +18dBu = 0dBFS. If your normal broadcast level is +6dBu then this leaves an operating headroom of 12dB. |
| **Frame** | A video frame consists of all the information required to reproduce a still picture image. Each frame is made up of several horizontal picture elements known as lines. To form a moving picture, several frames are scanned per second, creating a frame rate.<br>Interlaced scanning systems (i) capture every odd line, and then every even line on alternate scans of the picture frame; this creates two fields per video frame. Progressive scanning (p) is smoother than interlaced scanning, as all lines are captured on every scan of the picture frame.<br>Common frame rates used in television standards include 25 frames per second (fps) and 29.97 fps. In NTSC television, 525 interlaced horizontal lines are scanned at 29.97 frames per second. In the PAL system, 625 interlaced horizontal lines are scanned at 25 frames per second.<br>When you apply a video delay of one frame, you delay the picture by a single, still image. The time this represents, in milliseconds, depends on the frame rate. |
| **Frame Synchroniser** | A device used to match the timing of an incoming video source to the timing of a reference signal. The frame synchroniser essentially takes a picture of each frame of incoming video and then immediately outputs it with the correct synchronisation to match that of the reference signal. The result is to align the incoming video signal and create a stable image. An unsynchronised signal can produce picture flicker. |
| **Gain** | Adjusting the gain of a signal results in a change in the perceived level or amplitude. An increase in gain (positive values) results in amplification and a reduction in gain (negative values) in attenuation. |
| **HD** | High Definition.<br>This terms refers to video signals of a higher resolution than Standard Definition (SD). HD video may be transmitted in various standards including 1080p, 1080i and 720p, where "p" and "i" stand for progressive and interlaced scan. Please see Technical Data for supported video standards. |
| **Interlaced Scan** | See Frame. |

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| **Luminance** | Luma or Y for short.<br>Luminance (Y) is used in video systems to convey the brightness, or black and white component, of the picture. It is paired with Chrominance (C) which is usually represented as two color-difference components: U = Blue - Luma, and V = Red - Luma.<br>RGB sources, such as the output of a camera, are usually converted into YUV so that video systems can process the brightness (Y) and colour information (U and V) separately. This is useful as the human eye is more sensitive to luminance (Y), than to changes in chrominance (UV). |
| **MADI** | Multichannel Audio Digital Interface<br>MADI, or AES10, is an industry-standard interface that carries multiple channels of digital audio. It supports serial digital transmission over coaxial cable or fibre-optic lines of 28, 56, or 64 channels; and sampling rates of up to 96 kHz with resolution of up to 24 bits per channel. |
| **ms** | milliseconds<br>Unit of time measurement |
| **Nova73** | A stand-alone audio routing matrix with networking capabilities; this is a large matrix related to the $mc^2$ series of Lawo consoles. |
| **Overload** | Occurs when the signal level is too large for the system, resulting in signal distortion. |
| **ProcAmp** | Video Processing Amplifier.<br>A device that stablises the composite video signal, regenerates the synchronising pulses and can make other adjustments to the video signal. |
| **Progressive Scan** | See Frame. |
| **Routing** | Signal Routing<br>Term used to describe the connection made between an input and output. |
| **Sample Rate** | The speed at which the internal processing of the system takes samples respective to values from a continuous, analogue audio signal to make a discrete, digital one. For example, when running at 48kHz, incoming analogue audio is sampled at a rate of 48000 values per second. |
| **SD** | Standard Definition<br>This term refers to video signals that are not considered to be High Definition (HD). The two most common SD signal types are 576i and 480i, which use 576 and 480 interlaced lines per video frame. SD video may use an aspect ratio of 4:3 or 16:9. Please see Technical Data for supported video standards. |
| **SDI** | Serial Digital Interface |
| **Vectorscope** | A vectorscope is a special type of oscilloscope used in both audio and video applications to display an X-Y plot of two signals. The aim is to reveal details about the relationship between the signals.<br>The **pro8** provides a Vectorscope, within its graphical user interface, to measure the relationship between the different colour components of the video signal. |

**Waveform Monitor**

A waveform monitor (WFM) is a special type of oscilloscope used in video applications to measure and display the level, or voltage, of a video signal with respect to time.

The **pro8** provides two types of waveform monitor within its graphical user interface:

YRGB which monitors Luminance (Y) plus the individual Red (R), Green (G) and Blue (B) colour components.

YCbCr (or YUV) which monitors Luminance (Y) plus the two colour difference components: Chroma blue (Cb or U) and Chroma red (Cr or V).