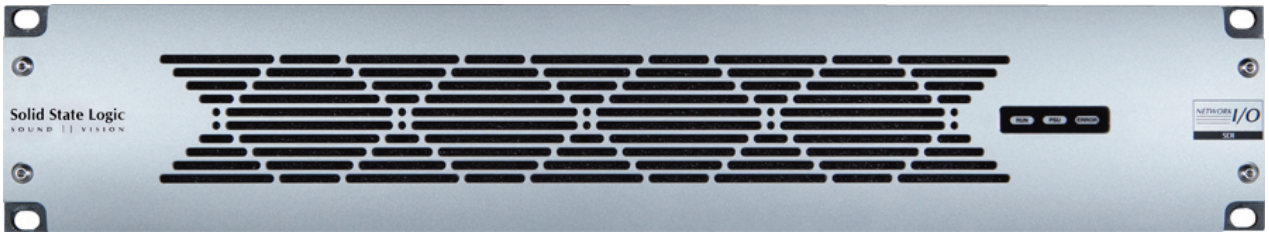
www.solidstatelogic.com



Network I/O – SDI

SDI to Routable Audio Network and/or MADI

User Guide

Network I/O SDI. This is SSL.

Solid State Logic
SOUND || VISION

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Document History

September 2014 – Initial Release 1.0

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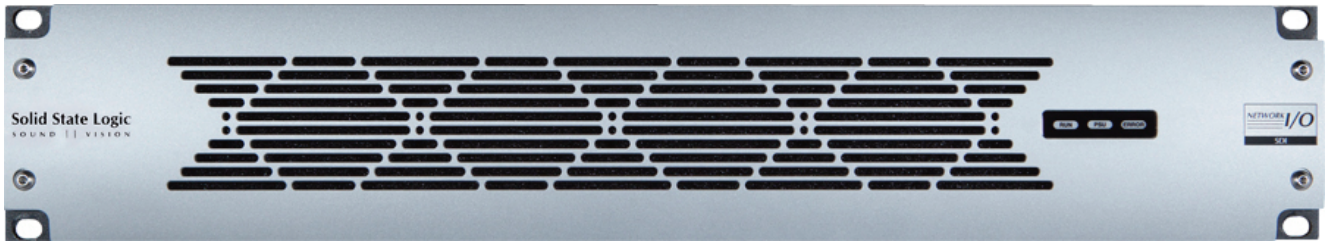
Introduction

Introduction

Network I/O – SDI is a broadcast specification bidirectional bridge between Embedded SDI Audio, a Dante IP Audio Network and industry standard MADI.



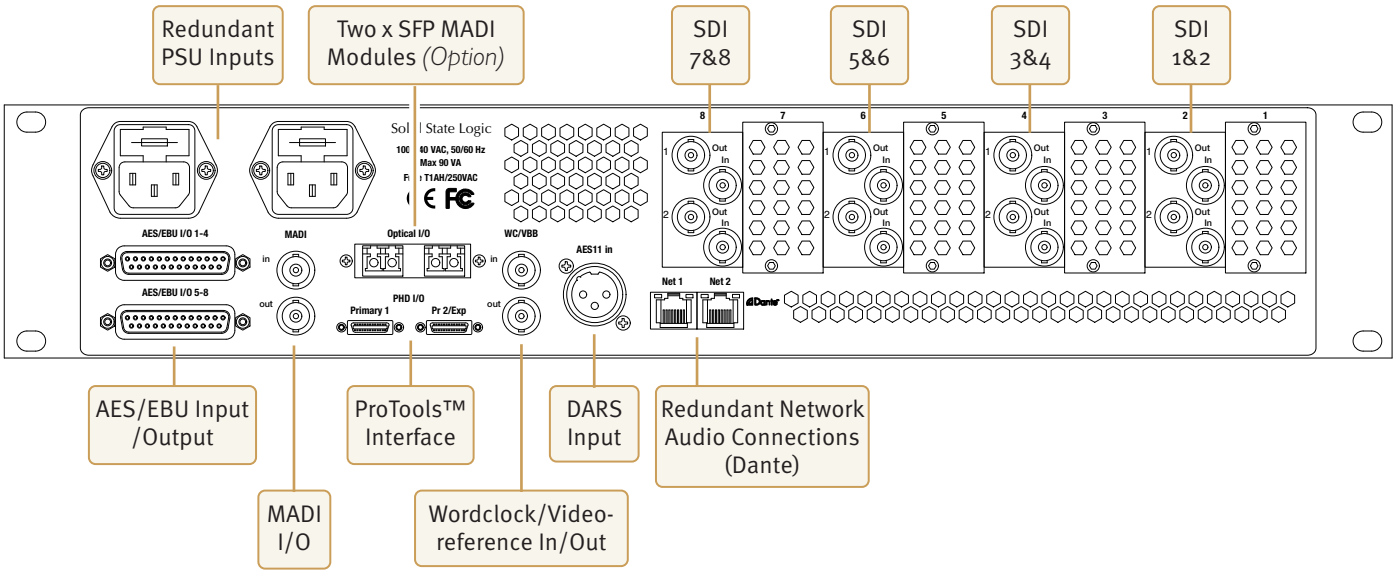
Includes eight 3G-SDI paths with embedders and de-embedders for 16 audio channels. The unit has dual Dante and triple MADI connectivity (2 x optical, 1 x coax). In addition to SDI-Dante bridging, SDI allows direct bridging between SDI and MADI infrastructure. Internal channel-by-channel routing enables flexible routing between all three domains, or can be used as a standalone audio router. As you would expect redundant PSUs provide reassurance in a 24-hour Broadcast environment.

For more information about Dante see Audinate's website: http://www.audinate.com/

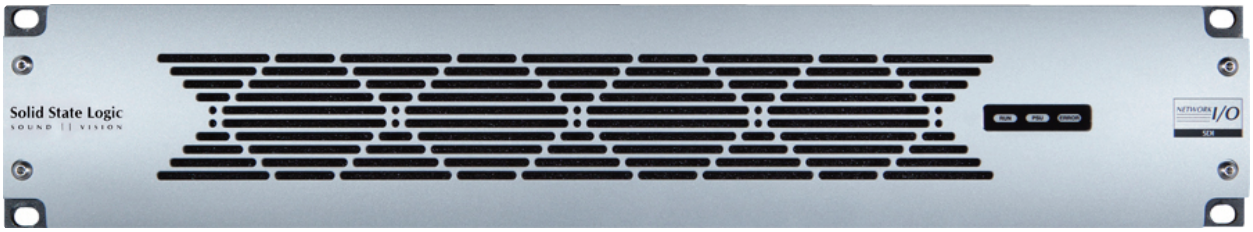
Key Features

- Interface between Embedded SDI audio, Dante and MADI
- Eight 3G-SDI paths with embedders and de-embedders for 16 audio channels
- Redundant: PSU, MADI ports, Dante Ports = Full Broadcast Spec Redundancy
- 2 x SFP optical and 1 x coax MADI I/O
- Internal channel-by-channel routing for all audio paths
- AES Connectivity
- SRC on the Audio path to and from SDI

Full Broadcast Specification



Front Panel Layout



Front Panel Indicators

RUN Green – Normal operation

PSU Green – Normal operation

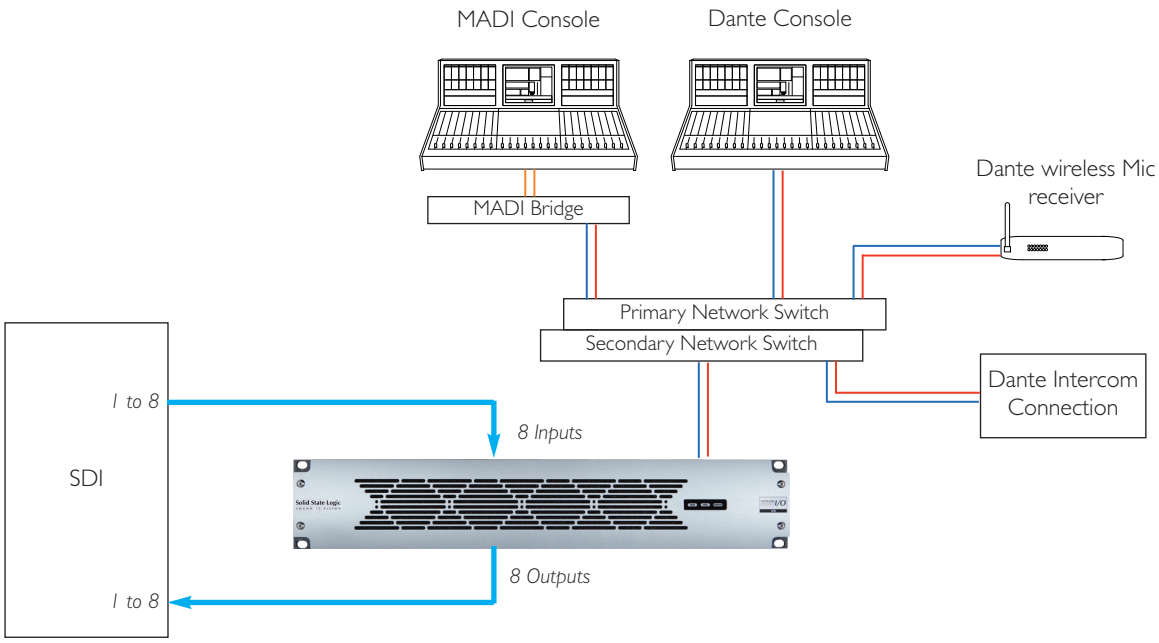
STATUS Off – Normal operation

Red – See *SDI Manager* software for fault details

Usage Cases

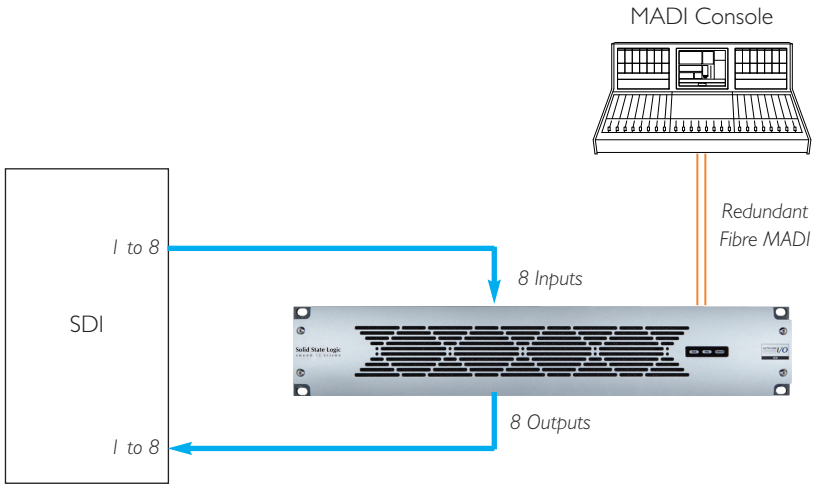
SDI can be used in a variety of scenarios:

Network I/O – SDI to Dante Infrastructure



- Add SDI audio to existing Dante infrastructure

Network I/O – SDI to MADI Infrastructure

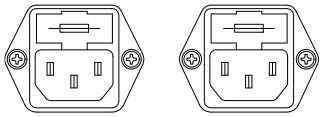


- Add SDI audio to MADI console

Hardware Connectivity

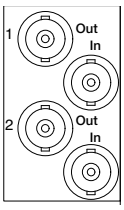
Power

Network I/O – SDI includes redundant PSU with IEC connectors, either supply can individually power the unit – both should be used for redundancy. Ideally these should be connected to separate mains supplies to provide external connection redundancy.



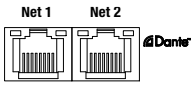
SDI

8 SDI inputs and 8 SDI outputs with auto format selection up to 3G SDI. These are video thru circuits with 16 channels of Audio De-Embedding and Embedding. Sample Rate Conversion (SRC) per audio group. The SDI circuits are represented in the *Network I/O – SDI Software Manager* as cards 2, 4, 6 and 8. Each card includes 32 audio channels 1-16 being SDI 1, 17-32 being SDI 2 on each card.

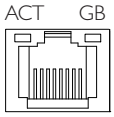


Network (Dante)

Primary and Secondary Dante connections (Net1 and Net2) are provided on RJ45 connectors. The Primary port is the control connection for the Network I/O SDI configuration tool.



A pair of LEDs per port provides network connection and activity information:

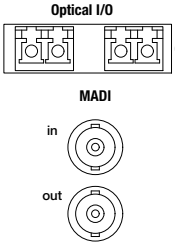


ACT flashes when there is network activity
GB shows solid green when connected to a gigabit network

Note: The Dante Controller application cannot be used on the secondary connection.

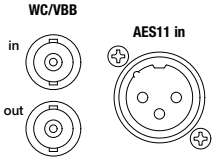
MADI

Three MADI ports can be provided: two fibre and one copper. The optional fibre ports can be configured to function as a redundant pair. The interface is via SFP sockets, for use with multimode or singlemode LC fibre cables. The third MADI port is via standard BNC connectors.



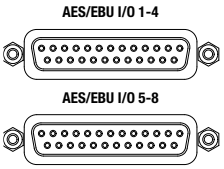
Sync

Video Sync or Word Clock input on BNC, plus AES11 sync input on XLR are provided. The unit can also be synchronized from the network (using Dante PTP) any of the MADI connections or AES inputs. The order of the sync preference can be defined using the software application.



AES

The AES connection on 25-way D-type connectors allow additional AES connectivity with Audio routing to any of the other connected devices.



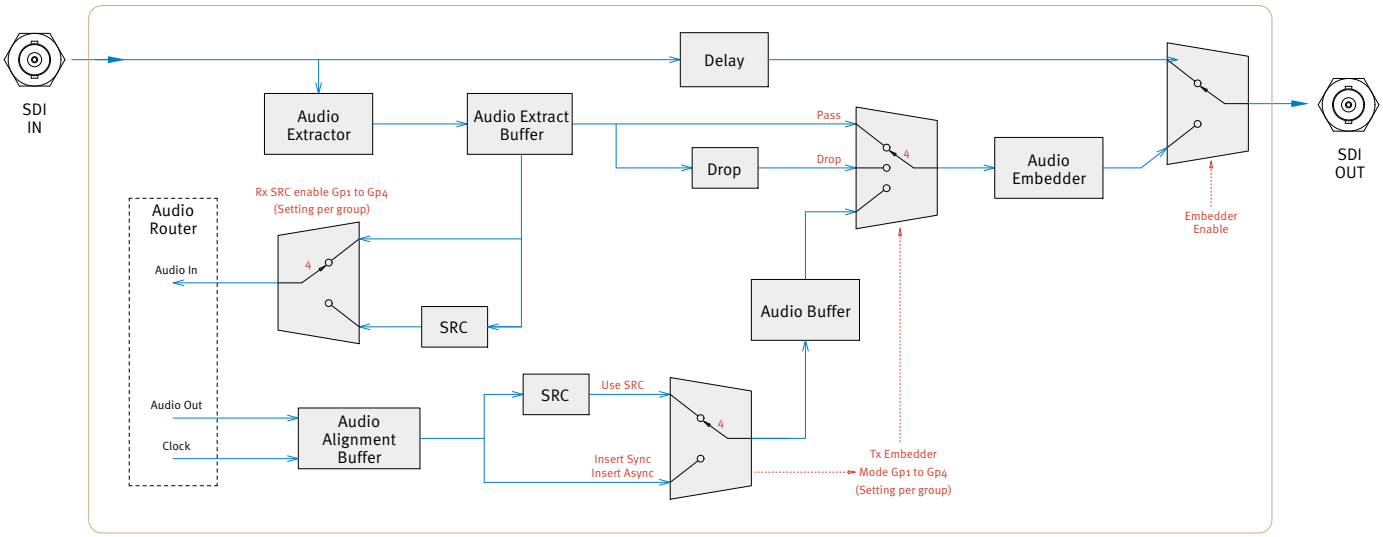
(PHD I/O)

Other/future usage. Not currently implemented.

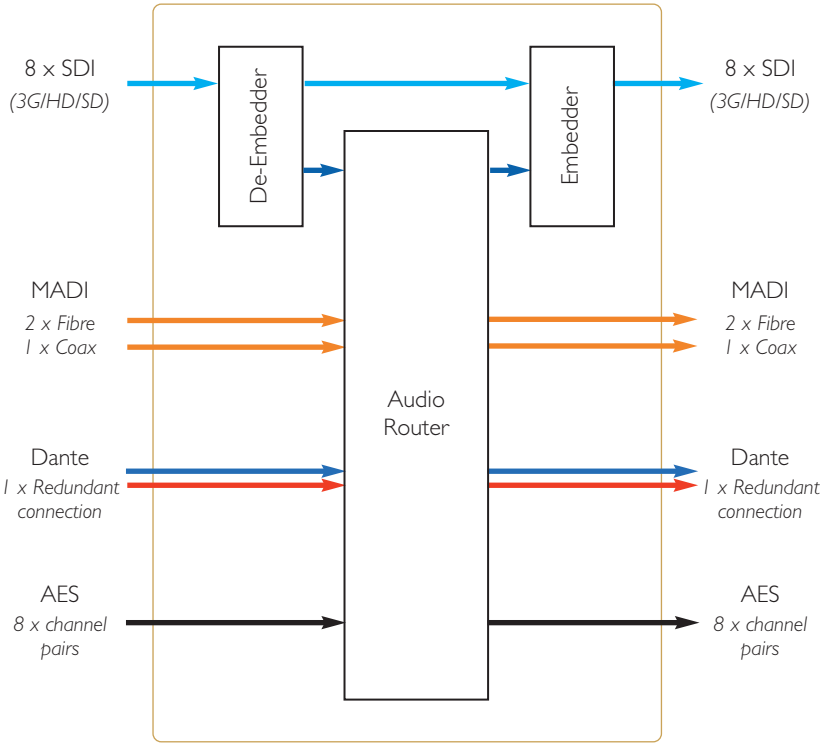
See Appendix C, page 18 for connector pinout information.

Block Diagrams

SDI Block Diagram



Audio Matrix Diagram



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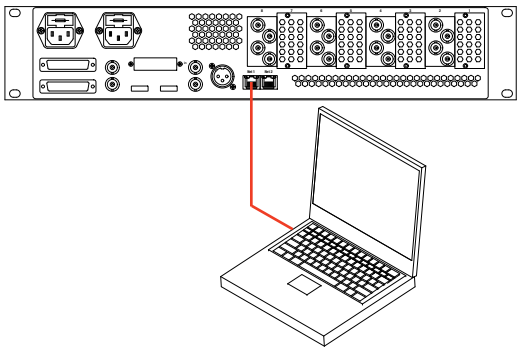
Connecting a PC

Network

Configuration of the SDI unit is carried out using the '*SDI Manager*' PC application. This programme can be downloaded from SSL's website here.

Connect a Windows™ PC to the ***Net 1*** connector on the SDI unit using a standard network cable.

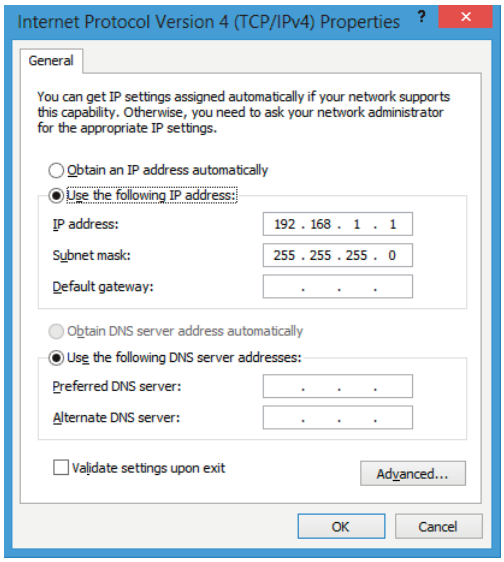


IP Address

SDI units are shipped with a static factory default IP address of **192.168.1.10** for the Network I/O controller.

It is likely that this will need to be changed – or set to automatic – in order to fit in with the network environment in which the unit is to be installed.

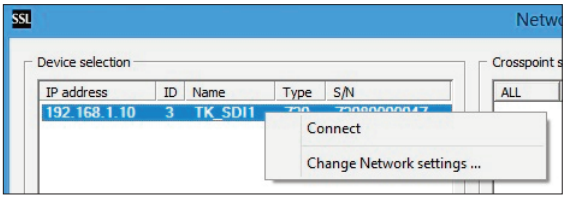
To do this, set your windows PC TCP/IP settings to a fixed address in the same domain as the SDI unit. *(As shown right.)*



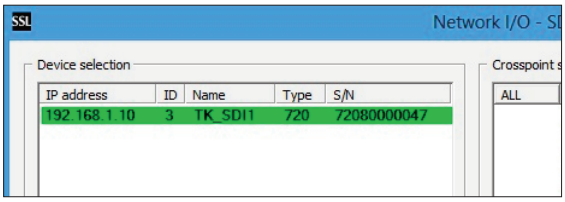
The SDI Manager connection uses a separate IP address from the Dante connectivity. Settings for the Dante Environment should only be managed through the Dante Controller software.

Run the *SDI Manager* application. If the IP address is correctly configured the unit will appear in the *Device Selection* pane of the software.

To connect to the SDI unit: right-click the IP address and click **Connect**.



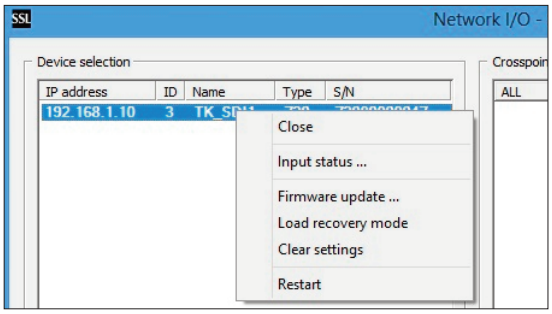
Once connected the unit will be highlighted green.



IP Address *Continued...*

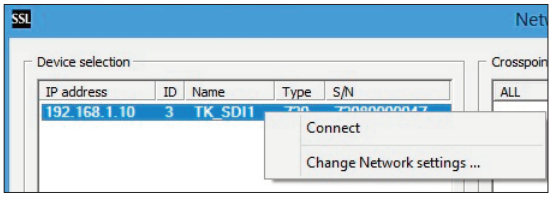
Having checked you can connect to the device, now close the connection by right-clicking and selecting **Close**.

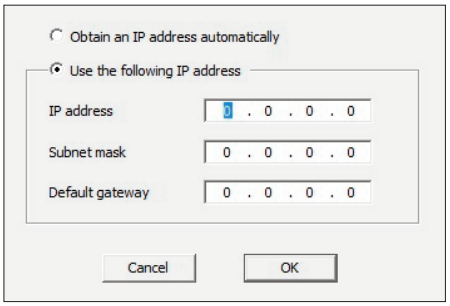
The IP settings cannot be altered whilst the unit is active.



Right-click on the target device and select **Change Network Settings...**

This will allow you to set the SDI unit into DHCP mode or to select a fixed address to suit your requirements.



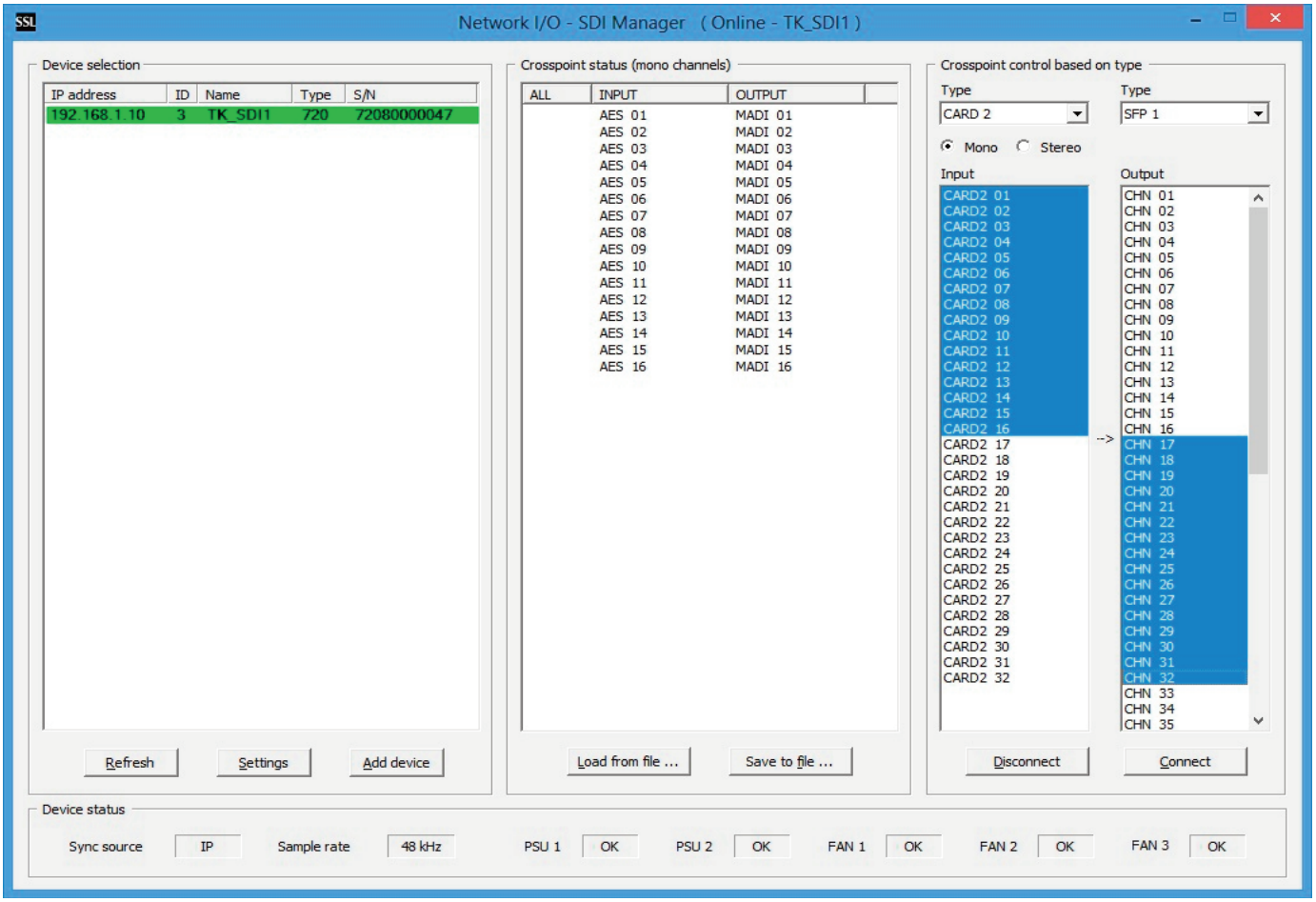


Note: Your computer network settings must now be updated to match those of the SDI unit.

Software Features

The *Network I/O – SDI Manager* software window is divided into four panes:

- **Device Selection** shows available units and their connection status
- **Crosspoint Status** shows current connections and the buttons for file access
- **Crosspoint Control** is used to create or remove connections
- **Device Status** displays hardware information plus some basic interface settings



Loading and Saving Files

Routing Files

Routing connection files are loaded and saved using the Load from file ... and Save to file ... buttons in the centre pane of SDi Manager. Routing files are given the extension .xpt (crosspoint).

For the majority of cases Network I/O – SDI will be preconfigured to be used in a specific scenario. SSL provides 3 general usage-case files that can be loaded onto the SDI unit. These configurations are:

1. 16 channels per SDI to and from the pair of MADI SPFs
2. 8 channels per SDI to and from the first MADI SFP
3. 8 channels per SDI to and from the Dante connection

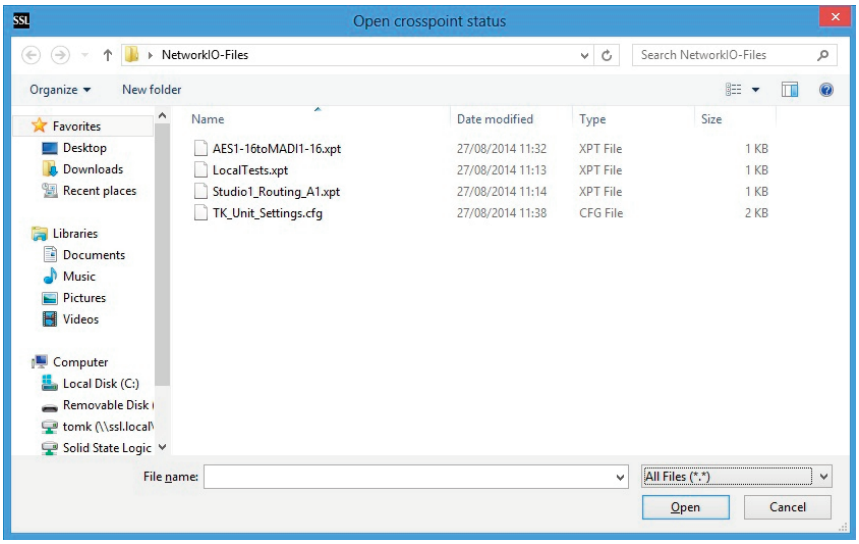
The files (.xpt) for each of these scenarios can be obtained here: Crosspoint Files

*Note that when loading a crosspoint (.xpt) file, it will **ADD** the new routes to those already in the configuration – it does not automatically clear the current routing.*

Device Configuration Files

Device configurations can also be stored using the **Load** and **Save** buttons in the centre pane – these files are stored as .cfg (configuration) files.

For further details, see *Other Settings* on page 11.



The example shown contains three crosspoint routing files and one device configuration file.

Default view is for .xpt files only. To see .cfg files, select "All Files"

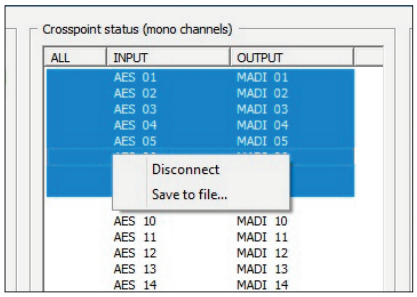
Custom Routing

In certain circumstances there may be a requirement to deviate from the default routing in these typical scenarios.

Removing Routes

The centre *Crosspoint Status* pane of the SDI Manager shows all currently connected routes.

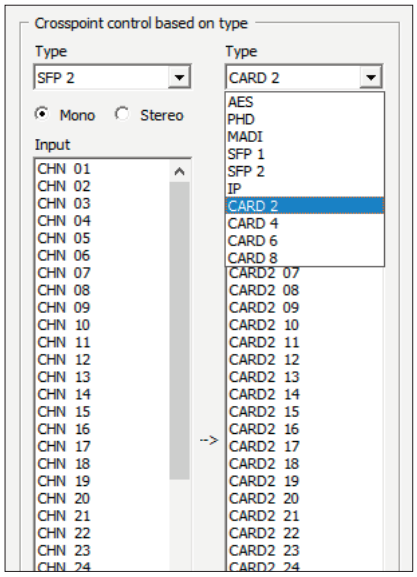
Select Individual or multiple routes using the left mouse button. Right-click and then select **Disconnect** from the option box.



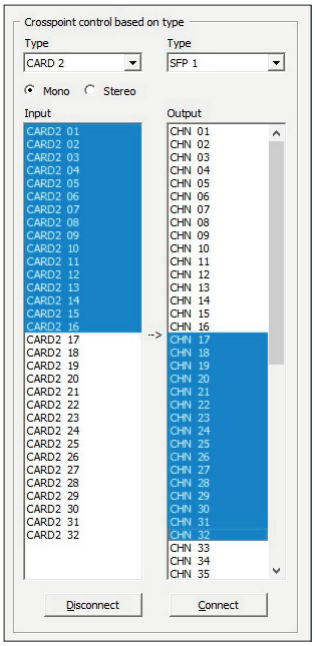
To speed up selection, use the 'shift' key and mouse to select a range and use 'ctrl' and the mouse to select multiple individual instances.

Adding Routes

The third pane in SDI manager allows any internal routes to be connected. Sources show in the left column, with destinations in the right. Above each respective column is a drop down with each physical grouping of IO:



AES	16 channels AES D-sub	
PHD	Protools HD *future usage*	
MADI	MADI Coax connection – up to 64 channels	
SFP 1	MADI optical SFP 1 – up to 64 channels	
SFP 2	MADI optical SFP 2 – up to 64 channels	
IP	Dante connection (1-64)	
Card 2	(01-16)	SDI 1 (1-16)
	(17-32)	SDI 2 (1-16)
Card 4	(01-16)	SDI 3 (1-16)
	(17-32)	SDI 4 (1-16)
Card 6	(01-16)	SDI 5 (1-16)
	(17-32)	SDI 6 (1-16)
Card 8	(01-16)	SDI 7 (1-16)
	(17-32)	SDI 8 (1-16)



Individual (Mono) Route Selection

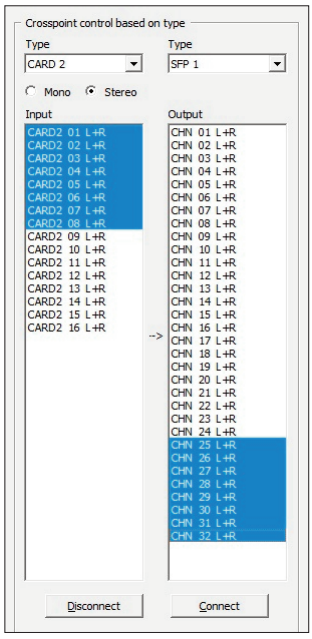
Routes are connected by highlighting sources and destinations in their respective columns and clicking Connect.

The selected routes will now be added to the existing routes shown in the crosspoint status window.

Disconnect can also be used in this pane of the software to remove routes based on the destination(s) selected.

When stereo signals are available in adjacent odd/even pairs, these may be routed together by selecting the **Stereo** button below the card type selector.

It is possible to perform one-to-many routing (i.e. distribution) or simultaneous one-to-one routing. If a differing number of sources or destination is selected then the number of routes made will be equal to the lower number of I/O selected in either column.



Stereo Route Selection

Other Settings

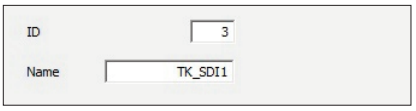
Other settings on specific SDI units are accessed via the Settings button at the lower centre of the left pane in the software window. Each of the tabs is described in the following section.

Configuration changes can be saved from any of the page tabs.

Note that saving any changes will require a restart of the unit.

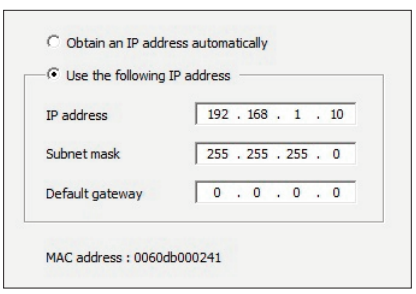
ID

- ***Name*** – A text field available for naming individual units. The name will be displayed in the *Device Selection* pane of SDI Manager.
- ***ID*** can be set for user identification of units which have the same name.



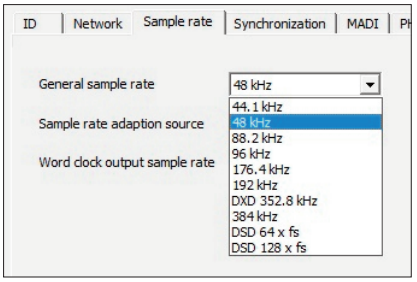
Network

A repeat of the information shown in the "Change Network Settings..." pop-up but including the MAC address.



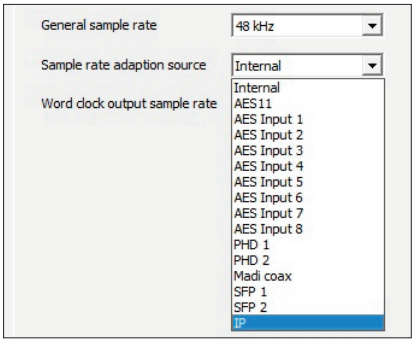
Sample Rate

➪ ***General Sample Rate*** – Set the general sample rate for the SDI unit to match the wider environment.

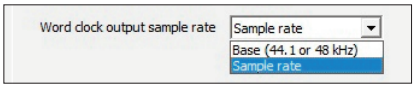


➪ ***Sample Rate Adaptation Source*** allows the unit's sample rate to be automatically adjusted as an external device changes.

The adaption source can be set to any of the separate or embedded clock reference signals.

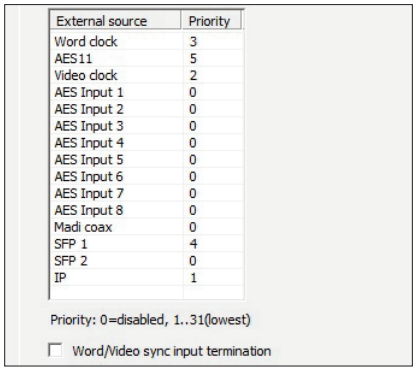


➪ ***Word Clock Output Sample Rate*** – Used to set the word clock to 48kHz or 44.1kHz (for use if the general sample rate is a higher rate e.g. 96kHz – sometimes called legacy mode).



Synchronization

Set the hierarchy of clock sources. Double-click in the *Priority* cell to alter the settings.



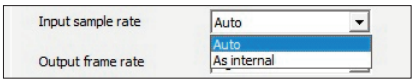
Word/Video Sync Termination

Select the sync termination box to add 75Ω terminator to the sync input BNC.

MADI

Note that these settings apply to the BNC MADI signal only. The optional SFP fibre MADI ports are configured from the *Optional Module* tab.

➪ ***Input Sample Rate*** can be determined automatically from the incoming signal or locked to the internal clock.

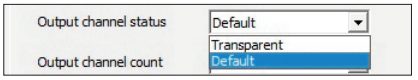


➪ ***Output Frame Rate*** sets the frame rate of the MADI signal (for use at 96kHz):

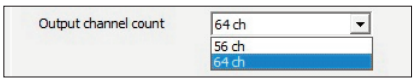
- High – 96kHz framing pattern
- Legacy – 48kHz framing pattern

➪ ***Output Channel Status*** controls user-bit data handling:

- Transparent – Provides pass-through of user bits
- Default – Removes user bits



➪ ***Output Channel Count*** – Select 56- or 64-channels

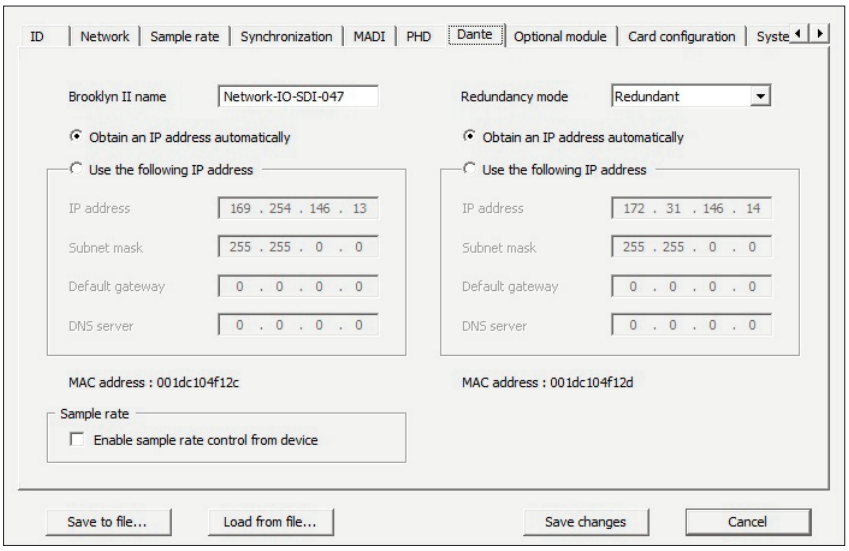


PHD

For future use.

Dante

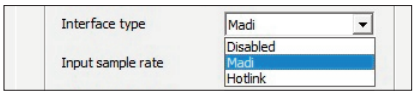
It is recommended that these settings are managed using the *Dante controller* application only and not via SDI Manager. The information relating to the interface is included for clarity. *See page 16 for information relating to Dante Controller.*



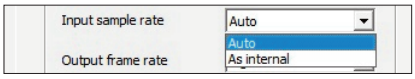
Optional Module (MADI SFP Fibre)

Each of the SFP fibre MADI interfaces, SFP 1 and SFP 2, has its own settings pane.

➪ ***Interface Type*** should be set to Madi – hotlink is not supported.

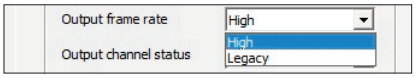


➪ ***Input Sample Rate*** can be determined automatically from the incoming signal or locked to the internal clock.



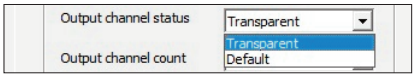
➪ ***Output Frame Rate*** sets the frame rate of the MADI signal (for use at 96kHz):

- High – 96kHz framing pattern
- Legacy – 48kHz framing pattern

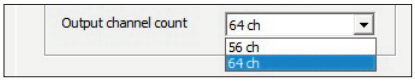


➪ ***Output Channel Status*** controls user-bit data handling:

- Transparent – Provides pass-through of user bits
- Default – Removes user bits



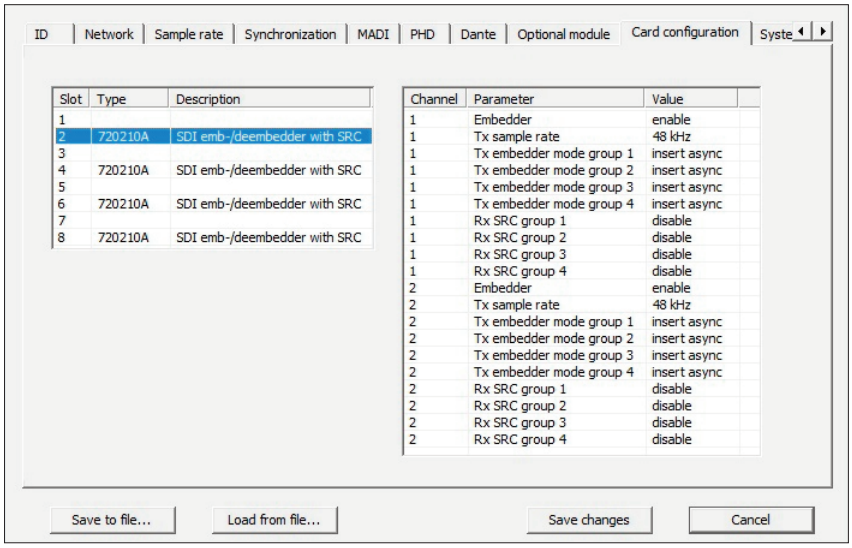
➪ ***Output Channel Count*** – Select 56- or 64-channels.



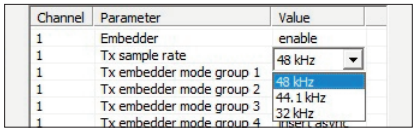
Card Configuration

This settings tab provides the configuration control for each of the four, 2-channel SDI interface cards.

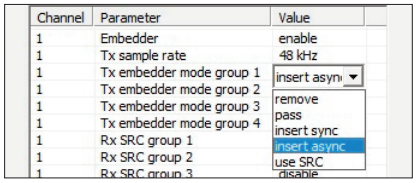
The left window is used to select the interface pairs and changes are made in the **Value** column of the right window. Double-click in the appropriate field to alter settings.



- ***Embedder*** – Each channel can be enabled or disabled.
- ***TX Sample Rate*** can be set to 48kHz, 44.1kHz or 32kHz.



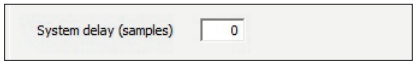
- ***Tx Embedder Mode Group 1–4*** controls the signal parameters for each group through the card:
  - Remove – Drops the audio completely
  - Pass – Disables the embedder for that group
  - Insert Sync – Use when Audio and Video references are synchronous
  - Insert Async – Use when Audio and Video references have the same sample rate but are asynchronous
  - Use SRC – Transmitter SRC can be enabled or disabled for each of the audio groups



- ***Rx SRC Group 1–4*** – Receive Sample rate conversion can be enabled or disabled for each of the audio groups.

System Delay

Not currently implemented.

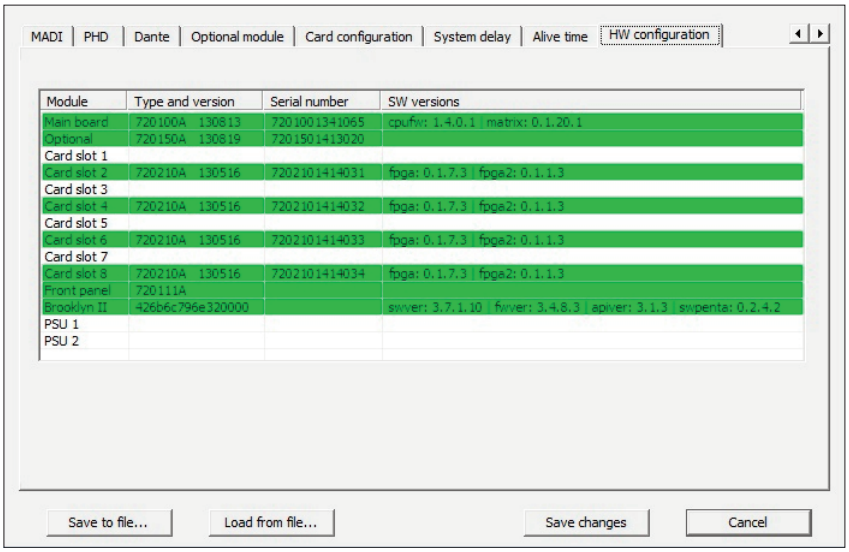


Alive Time

Not currently implemented.

Hardware Configuration

This tab provides rack hardware and software version details. It is for information only and no settings are available.



Dante Controller Basic Settings

When using SDI with a Dante network all the Dante and other network settings should be set from Audinate's *Dante Controller* software (downloadable for OSX and Windows here: Dante Controller). Detailed instruction for this software can be found in the Dante Controller Manual – this guide gives you some basics that will allow you to get started.

Registration with Audinate is necessary before files become available for download.

Network Config

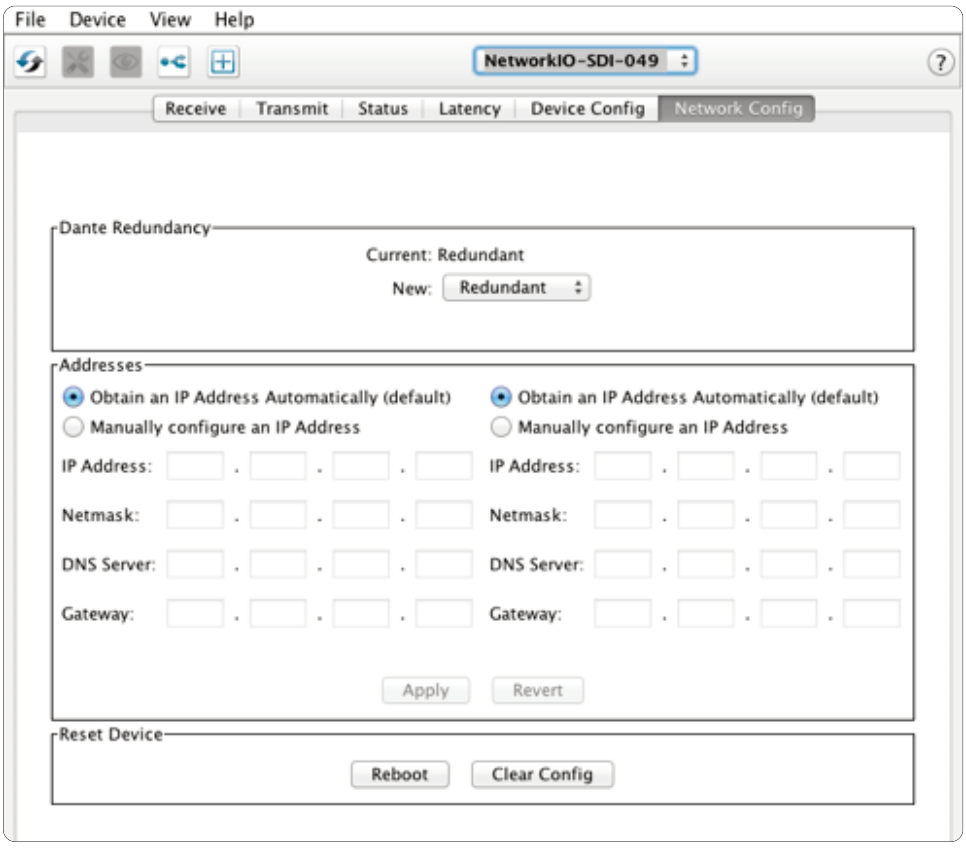
Each Dante device requires an IP address for communication – both the Primary and Secondary Network ports can be set to either DHCP or Fixed Addresses. The Primary and Secondary ports must be kept on separate networks or VLANS. This document covers the basics of connecting MADI Bridge to a pair of simple networks.

Please consult a network specialist for network design when considering more complex networks.

Key things to help you with IP addressing:

If either (or both) networks does not have a DHCP server and the Primary or Secondary network ports are set to DHCP then either (or both) will resolve to a link local address, eg. 169.254.x.x. This will take slightly longer to be functional from a power-up state but will always work.

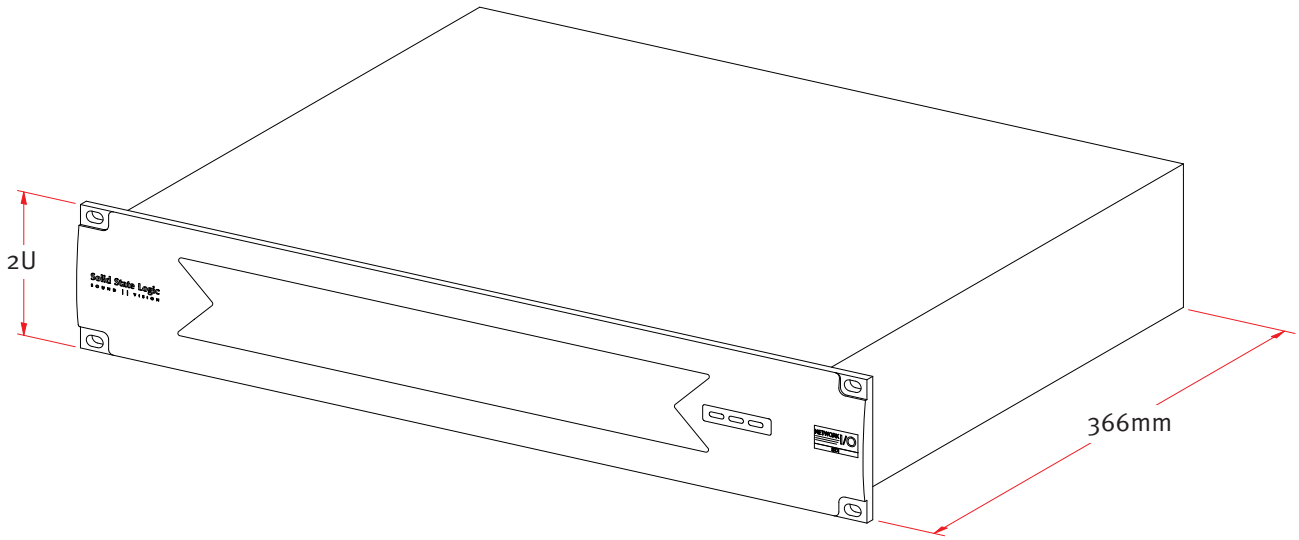
If using fixed addressing the primary and secondary ports need to be on different subnets.



Appendices

Appendix A – Specifications

Parameter	Value	Notes
Depth	366mm (14.5")	
Height	89mm (3.5")	*2 RU*
Width	438mm (17.25")	*Excluding rack ears*
Width	482mm (19")	*Including rack ears*
Weight	6.1kg (13.4 lb)	
Power	‹ 90 VA	
Boxed size	500 x 500 x 160mm (19 x 19 x 6.3")	
Boxed weight	7.6kg (16.7 lb)	



Appendix B – Supported Video Sync Rates

Video Format	Field Rate (Hz)	Frame Rate (Hz)	Notes
PAL	50	25	
PAL 24	48	24	
NTSC	59.94	29.97	

Appendix C – Connector Pinouts

AES/EBU Inputs/Outputs (1–8, 9–16)		
Location:	Rear Panel	
Connector Type:	25-way D-type female	
Pin	*Description*	*Notes:*
1	Out channels 7/8 +	*Outputs*
14	Out channels 7/8 -	
2	Ground	
15	Out channels 5/6 +	
3	Out channels 5/6 -	
16	Ground	
4	Out channels 3/4 +	
17	Out channels 3/4 -	
5	Ground	
18	Out channels 1/2 +	
6	Out channels 1/2 -	
19	Ground	
7	In channels 7/8 +	*Inputs*
20	In channels 7/8 -	
8	Ground	
21	In channels 5/6 +	
9	In channels 5/6 -	
22	Ground	
10	In channels 3/4 +	
23	In channels 3/4 -	
11	Ground	
24	In channels 1/2 +	
12	In channels 1/2 -	
25	Ground	
13	n/c	

AES 11 In (DARS)		
Location:	Rear Panel	
Connector Type:	XLR 3-pin female	
Pin	*Description*	*Notes:*
1	Chassis (Screen)	
2	+ve Signal	
3	-ve Signal	

Appendix D – Safety Notices

General Safety

- Please read and keep this document.
- Adhere to all warnings and follow instructions.
- This Electrical equipment should not be used near water.
- Cleaning should only be with dry cloths or products compatible with electrical devices – never when the unit is powered.
- Keep the unit free of dust and use in a clean environment.
- Do not use near any heat source of in direct sunlight.
- Do not used near naked flames.
- Do not place heavy objects on the unit.
- Do not obstruct the ventilation cutouts in the unit.
- Mount in an adequately supported 19' rack.
- Only use attachments/accessories recommended by the manufacturer.
- Unplug the device during lightning storms or long periods of unuse.
- The unit can only be serviced by qualified personnel – Seek immediate service if:
  - The unit has been exposed to moisture
  - The unit has been dropped
  - The unit does not operate normally
- Do NOT modify this unit - alterations may affect performance, safety and/or international compliance standards.
- SSL does not accept liability for damage caused by maintenance, repair or modification by unauthorised personnel.

Installation Notes

- When installing this apparatus either fix it into a standard 19" rack or place the apparatus on a secure level surface.
- When this apparatus is rack mounted, fit all rack screws. Rack shelves are recommended for this apparatus.
- Allow a 1U gap above and below this apparatus for cooling.
- Ensure that no strain is placed on any cables connected to this apparatus. Ensure that all such cables are not placed where they can be stepped on, pulled or tripped over.

Power Safety

- The unit is not supplied with a mains lead allowing you to use IEC distribution of mains cables of your choice. Any mains cable used is required to fulfill the following standard:
- Use mains cords with the rating: AC - 50/60Hz, 100-240V. 0.4-0.2A each cord.
- The unit should ALWAYS be earthed with the earth on both the IEC sockets (when both are used).
- Please use - complaint 60320 C13 TYPE SOCKET. When connecting to supply outlets ensure that appropriate sized conductors and plugs are used to suit local electrical requirements.
- Maximum cord length should be 4.5m (15').
- The cord should bear the approval mark of the country in which it is to be used.
- The appliance coupler is used as the disconnect device, ensure that it is connected to an unobstructed wall outlet.
- The unit is designed for connection to single phase supplies only.
- The clear markings regarding redundant power supplies detailed on the unit must be transferred into the installation to ensure both power sources are removed before qualified personnel service the unit.

GB The apparatus shall be connected to mains socket outlets with a protective earthing connection
FIN Laite on liitetťävä suojamaadoituskoskettimilla va rustettuumpistorasiaan
NOR Apparatet må tikoples jordet stikkontakt **SWE** Apparaten skall anslutas till jordat uttag

ATTENTION! This equipment must be Earthed. Refer to manual for installation instructions.

CAUTION! Disconnect all power sources before removing any panel (s). No user-serviceable parts inside - to be serviced only by qualified personnel.

WARNING! Un-Earthed metal parts may be present inside enclosure. Check for hazardous voltages before touching.

For protection against risk of fire - replace only with same type / rating of fuse. Do not expose to rain or moisture.

For EU:

Network I/O SDI is CE compliant and fully conforms with the current protection requirements of the European community council directives on EMC and LVD. Note that any cables supplied with SSL equipment may be fitted with ferrite rings at each end. This is to comply with the current regulations and these ferrites should not be removed.

Any modifications to this equipment may adversely affect the CE compliance of this product.

Environmental Declaration

The symbol shown here, which is on the product or its packaging, indicates that this product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste using a designated collection point for recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can dispose of your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the product.

RoHS notice

Solid State Logic has conformed and this product has conformed to European Union's Directive 2011/65/EU on Restrictions of Hazardous Substances (RoHS) as well as the following sections of California law which refer to RoHS, namely sections 25214.10, 25214.10.2, and 58012, Health and Safety Code; Section 42475.2, Public Resources Code.

For USA

To the User:

1. Do not modify this unit! This product, when installed as indicated in the instructions contained in the installation manual, meets FCC requirements.
2. Important: This product satisfies FCC regulations when high quality shielded cables are used to connect with other equipment. Failure to use high quality shielded cables or to follow the installation instructions may cause magnetic interference with appliances such as radios and televisions and will void your FCC authorisation to use this product in the USA.
3. Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Electromagnetic Compatibility

EN55103-1:2009, EN55103-2:2009 Environments E1, E2, E3 and E4

Initial in-rush current: 0.6A, 5 sec in-rush current: 0.6A

To maintain electromagnetic compatibility SSL recommends using shielded and foiled twisted pair Ethernet cables of Cat 5e standard or above where applicable.

EMC Performance Criteria

Audio inputs and outputs at -18dBFS. Noise ‹ -74dBFS.

Environmental

Temperature:	*Operating*:	+5 to 45 deg. C	*Non-operating*:	-20 to 50 deg. C
Relative Humidity:	*Operating*:	20 to 80% Humidity Max. wet bulb: 29 deg. C (non-condensing)	*Non-operating*:	5 to 90%
Vibration	*Operating*:	‹ 0.2 G (3-100Hz)	*Non-operating*:	‹ 0.4 G (3-100Hz)
Shock	*Operating*:	‹ 2 G (10ms max.)	*Non-operating*:	‹ 10 G (10ms max.)
Altitude	*Operating*:	0 to 3000m (above sea level)	*Non-operating*:	0 to 12000m

Notes

Solid State Logic
SOUND | | VISION

Visit SSL at: www.solidstatelogic.com

1st Release – August 2014

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