STUDER
by HARMAN

Studer D21m

I/O System Components

Operating Instructions

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Prepared and edited by
Studer Professional Audio GmbH
Technical Documentation
Riedthofstrasse 214
CH-8105 Regensdorf – Switzerland
http://www.studer.ch

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Subject to change

For Your Own Safety and to Avoid Invalidation of the Warranty Please Read This Section Carefully

- **Read these instructions.**
- **Keep these instructions.**
- **Heed all warnings.**
- **Follow all instructions.**
- **Do not use this apparatus near water.**
- **Clean only with a dry cloth.**
- **Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.**
- **Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.**
- **Do not defeat the safety purpose of a polarised or grounding type plug. A polarised plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet**
- **Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.**
- **Only use attachments/accessories specified by the manufacturer.**
- **Use only with the cart, stand, tripod, bracket or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.**
- **Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as the power supply cord or plug is damaged, liquid has been spilled or objects fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.**

Note: **It is recommended that all maintenance and service on the product should be carried out by Studer or its authorised agents. Studer cannot accept any liability whatsoever for any loss or damage caused by service, maintenance or repair by unauthorised personnel.**

WARNING: **To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. Do not expose the apparatus to dripping or splashing and do not place objects filled with liquids, such as vases, on the apparatus.**

- **No naked flame sources, such as lighted candles, should be placed on the apparatus.**
- **Ventilation should not be impeded by covering the ventilation openings with items such as newspapers, table cloths, curtains etc.**

WARNING: **Do not use this apparatus in very dusty atmospheres, or in atmospheres containing flammable gases or chemicals.**

- **THIS APPARATUS MUST BE EARTHED. Under no circumstances should the safety earth be disconnected from the mains lead.**
- **The mains supply disconnect device is the mains plug. It must remain accessible so as to be readily operable when the apparatus is in use.**
- **If any part of the mains cord set is damaged, the complete cord set should be replaced. The following information is for reference only. The wires in the mains lead are coloured in accordance with the following code:**

- **Protective Earth (Ground): Green/Yellow (US: Green or Green/ Yellow)**
- **Neutral: Blue (US: White)**
- **Live (Hot): Brown (US: Black)**

As the colours of the wires in the mains lead may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

- **The wire which is coloured Green and Yellow must be connected to the terminal in the plug which is marked with the letter E or by the earth symbol.**
- **The wire which is coloured Blue must be connected to the terminal in the plug which is marked with the letter N.**
- **The wire which is coloured Brown must be connected to the terminal in the plug which is marked with the letter L.**

Ensure that these colour codes are followed carefully in the event of the plug being changed

- **This unit is capable of operating over a range of mains voltages, as marked on the rear panel.**

Lithium Battery

Installed lithium batteries must be replaced by the same or an equivalent type. Danger of explosion if batteries are incorrectly replaced or when terminals are shorted.

Installed lithium batteries must not be exposed to excessive heat such as direct sunshine, fire or the like.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Working Safely With Sound

Although your new console will not make any noise until you feed it signals, it has the capability to produce sounds that, when monitored through a monitor system or headphones, can damage hearing over time.The table below is taken from the Occupational Safety & Health Administration directive on occupational noise exposure (1926.52):

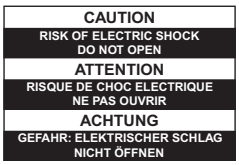
Permissible Noise Exposure:

Duration per day [h]	Sound level [dBA, slow response]
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
<0.25	115

Conforming to this directive will minimise the risk of hearing damage caused by long listening periods. A simple rule to follow is: The longer you listen, the lower the average volume should be. Please take care when working with your audio system – if you are manipulating controls which you don't understand (which we all do when we are learning), make sure your monitoring level is turned down. *Remember that your ears are the most important tool of your trade. Look after them, and they will look after you. Most importantly: Don't be afraid to experiment to find out how each parameter affects the sound; this will extend your creativity and help you to get the best results.*

A1 Safety Symbol Guide

For your own safety and to avoid invalidation of the warranty, all text marked with these symbols should be read carefully.



To reduce the risk of electric shock, do not remove covers. No user-serviceable parts inside. Refer servicing to qualified service personnel (i.e., persons having appropriate technical training and experience necessary to be aware of hazards to which they are exposed in performing a repair action, and of measures to minimize the danger of themselves).

The lightning flash with arrowhead symbol is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Headphones safety warnings contain important information and useful tips on headphone outputs and monitoring levels.

Assemblies or sub-assemblies of this product can contain opto-electronic devices. As long as these devices comply with Class I of laser or LED products according to EN 60825-1:1994, they will not be expressly marked on the product. If a special design should be covered by a higher class of this standard, the device concerned will be marked directly on the assembly or sub-assembly in accordance with the above standard.

A2 First Aid

In Case of Electric Shock:

Separate the person as quickly as possible from the electric power source:
- By switching the equipment off,
- By unplugging or disconnecting the mains cable, or
- By pushing the person away from the power source, using dry insulating material (such as wood or plastic).
- After having suffered an electric shock, always consult a doctor.

Warning!

Do not touch the person or his clothing before the power is turned off, otherwise you stand the risk of suffering an electric shock as well!

If the Person is Unconscious:

- Lay the person down
- Turn him to one side
- Check the pulse
- Reanimate the person if respiration is poor
- Call for a doctor immediately.

B General Installation Instructions

Please consider besides these general instructions also any product-specific instructions in the “Installation” chapter of this manual.

B1 Unpacking

Check the equipment for any transport damage. If the unit is mechanically damaged, if liquids have been spilled or if objects have fallen into the unit, it must not be connected to the AC power outlet, or it must be immediately disconnected by unplugging the power cable. Repair must only be performed by trained personnel in accordance with the applicable regulations.

B2 Installation Site

Install the unit in a place where the following conditions are met:

- The temperature and the relative humidity of the environment must be within the specified limits during operation of the unit. Relevant values are the ones at the air inlets of the unit (refer to Appendix 1).
- Condensation must be avoided. If the unit is installed in a location with large variation of ambient temperature (e.g. in an OB-van), appropriate precautions must be taken before and after operation (refer to Appendix 1).
- Unobstructed air flow is essential for proper operation. Air vents of the unit are a functional part of the design and must not be blocked in any way during operation (e.g. by objects placed upon them, placement of the unit on a soft surface, or installation of the unit within a rack or piece of furniture).
- The unit must not be heated up by external sources of heat radiation (sunlight, spotlights).

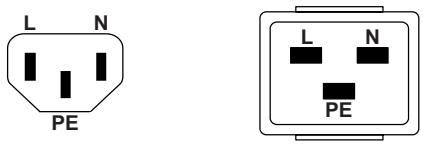
B3 Earthing and Power Supply

Earthing of units with mains supply (class I equipment) is performed via the protective earth (PE) conductor integrated in the mains cable. Units with battery operation (< 60 V, class III equipment) must be earthed separately.
Earthing the unit is one of the measures for protection against electrical shock hazard (dangerous body currents). Hazardous voltage may not only be caused by a defective power supply insulation, but may also be introduced by the connected audio or control cables.
If the unit is installed with one or several external connections, its earthing must be provided during operation as well as while the unit is not operated. If the earthing connection can be interrupted, for example, by unplugging the mains plug of an external power supply unit, an additional, permanent earthing connection must be installed using the provided earth terminal.
Avoid ground loops (hum loops) by keeping the loop surface as small as possible (by consequently guiding the earth conductors in a narrow, parallel way), and reduce the noise current flowing through the loop by inserting an additional impedance (common-mode choke).

Class I Equipment (Mains Operation)

Should the equipment be delivered without a matching mains cable, the latter has to be prepared by a trained person using the attached female plug (IEC 320 / C13 or IEC 320 / C19) with respect to the applicable regulations in your country.
Before connecting the equipment to the AC power outlet, check that the local line voltage matches the equipment rating (voltage, frequency) within the admissible tolerance. The equipment fuses must be rated in accordance with the specifications on the equipment.
Equipment supplied with a 3-pole appliance inlet (protection conforming to class I equipment) must be connected to a 3-pole AC power outlet in such a way that the equipment cabinet is connected to the protective earth.
For information on mains cable strain relief, please refer to Appendix 2.

Female Plugs (IEC320), Front-Side View:



IEC 320 / C13 IEC 320 / C19

European Standard (CENELEC)		North American Standard (NAS)
Brown	**L (Live)**	Black
Blue	**N (Neutral)**	White
Green/Yellow	**PE (Protective Earth)**	Green (or Green/Yellow)

Class III Equipment (Battery Operation up to 60 VDC)

Equipment of this protection class must be earthed using the provided earth terminal if one or more external signals are connected to the unit (see explanation at the beginning of this paragraph).

B4 Electromagnetic Compatibility (EMC)

The unit conforms to the protection requirements relevant to electromagnetic phenomena that are listed in guidelines 89/336/EC and FCC, part 15.

- The electromagnetic interference generated by the unit is limited in such a way that other equipment and systems can be operated normally.
- The unit is adequately protected against electromagnetic interference so that it can operate properly.

The unit has been tested and conforms to the EMC standards of the specified electromagnetic environment, as listed in the following declaration. The limits of these standards ensure protection of the environment and corresponding noise immunity of the equipment with appropriate probability. However, a professional installation and integration within the system are imperative prerequisites for operation without EMC problems.
For this purpose, the following measures must be followed:

- Install the equipment in accordance with the operating instructions. Use the supplied accessories.
- In the system and in the vicinity where the equipment is installed, use only components (systems, equipment) that also fulfill the EMC standards for the given environment.

- Use a system grounding concept that satisfies the safety requirements (class I equipment must be connected with a protective ground conductor) and that also takes into consideration the EMC requirements. When deciding between radial, surface, or combined grounding, the advantages and disadvantages should be carefully evaluated in each case.
- Use shielded cables where shielding is specified. The connection of the shield to the corresponding connector terminal or housing should have a large surface and be corrosion-proof. Please note that a cable shield connected only single-ended can act as a transmitting or receiving antenna within the corresponding frequency range.
- Avoid ground loops or reduce their adverse effects by keeping the loop surface as small as possible, and reduce the noise current flowing through the loop by inserting an additional impedance (e.g. common-mode choke).
- Reduce electrostatic discharge (ESD) of persons by installing an appropriate floor covering (e.g. a carpet with permanent electrostatic filaments) and by keeping the relative humidity above 30%. Further measures (e.g. conducting floor) are usually unnecessary and only effective if used together with corresponding personal equipment.
- When using equipment with touch-sensitive operator controls, please take care that the surrounding building structure allows for sufficient capacitive coupling of the operator. This coupling can be improved by an additional, conducting surface in the operator's area, connected to the equipment housing (e.g. metal foil underneath the floor covering, carpet with conductive backing).

C Maintenance

All air vents and openings for operating elements (faders, rotary knobs) must be checked on a regular basis, and cleaned in case of dust accumulation. For cleaning, a soft paint-brush or a vacuum cleaner is recommended.
Cleaning the surfaces of the unit is performed with a soft, dry cloth or a soft brush.
Persistent contamination can be treated with a cloth that is slightly humidified with a mild cleaning solution, such as dishwashing detergent.
For cleaning display windows, commercially available computer/TV screen cleaners are suited. Use only a slightly damp (never wet) cloth.
Never use any solvents for cleaning the exterior of the unit! Liquids must never be sprayed or poured on directly!
For equipment-specific maintenance information please refer to the corresponding chapter in the operating and service manuals.

D Electrostatic Discharge during Maintenance and Repair

Caution:

Observe the precautions for handling devices sensitive to electrostatic discharge!
Many semiconductor components are sensitive to electrostatic discharge (ESD). The lifespan of assemblies containing such components can be drastically reduced by improper handling during maintenance and repair. Please observe the following rules when handling ESD sensitive components:

- ESD sensitive components should only be stored and transported in the packing material specifically provided for this purpose.

- When performing a repair by replacing complete assemblies, the removed assembly must be sent back to the supplier in the same packing material in which the replacement assembly was shipped. If this should not be the case, any claim for a possible refund will be null and void.
- Unpacked ESD sensitive components should only be handled in ESD protected areas (EPA, e.g. area for field service, repair or service bench) and only be touched by persons wearing a wristlet connected to the ground potential of the repair or service bench by a series resistor. The equipment to be repaired or serviced as well as all tools and electrically semi-conducting work, storage, and floor mats should also be connected to this ground potential.
- The terminals of ESD sensitive components must not come in uncontrolled contact with electrostatically chargeable or metallic surfaces (voltage puncture, discharge shock hazard).
- To prevent the components from undefined transient stress and possible damage due to inadmissible voltages or compensation currents, electrical connections should only be established or separated when the equipment is switched off and after any capacitor charges have decayed.

E Repair

By removing housing parts or shields, energized parts may be exposed. For this reason the following precautions must be observed:

- Maintenance may only be performed by trained personnel in accordance with the applicable regulations.
- The equipment must be switched off and disconnected from the AC power outlet before any housing parts are removed.
- Even if the equipment is disconnected from the power outlet, parts with hazardous charges (e.g. capacitors, picture tubes) must not be touched until they have been properly discharged. Do not touch hot components (power semiconductors, heat sinks, etc.) before they have cooled off.
- If maintenance is performed on a unit that is opened while being switched on, no un-insulated circuit components and metallic semiconductor housings must be touched, neither with bare hands nor with un-insulated tools.

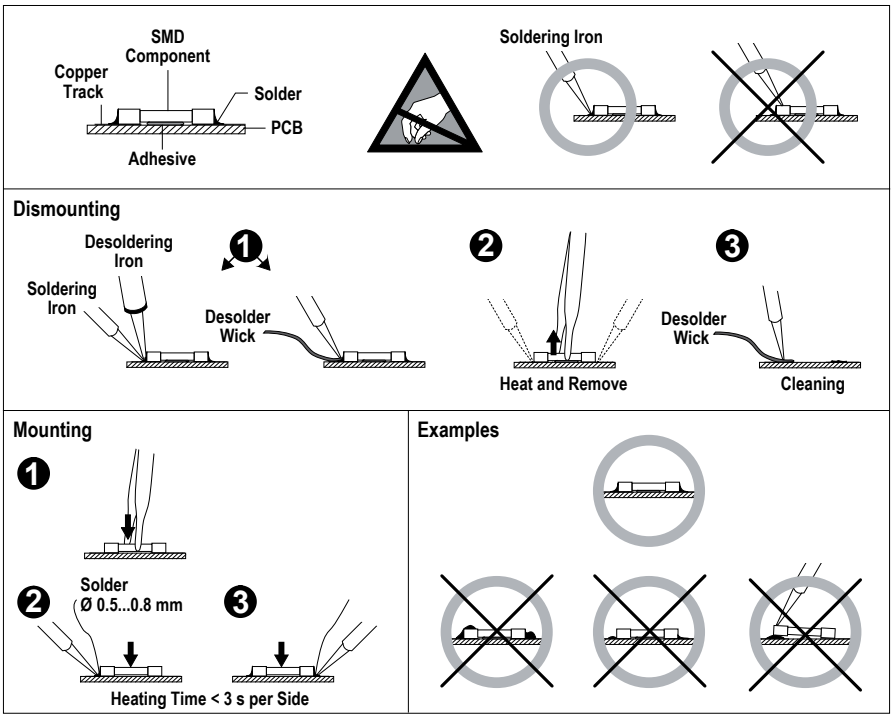
Certain components pose additional hazards:

- Explosion hazard from lithium batteries, electrolytic capacitors and power semiconductors (Observe the component's polarity. Do not short battery terminals. Replace batteries only by the same type).
- Implosion hazard from evacuated display units.
- Radiation hazard from laser units (non-ionizing), picture tubes (ionizing).
- Caustic effect of display units (LCD) and components containing liquid electrolyte.

Such components should only be handled by trained personnel who are properly protected (e.g. protection glasses, gloves).

E1 SMD Components

Studer has no commercially available SMD components in stock for service purposes. For repair, the corresponding devices have to be purchased locally. The specifications of special components can be found in the service manual. SMD components should only be replaced by skilled specialists using appropriate tools. No warranty claims will be accepted for circuit boards that have been damaged. Proper and improper SMD soldering joints are illustrated below.



F Disposal

Packing Materials

The packing materials have been selected with environmental and disposal issues in mind. All packing material can be recycled. Recycling packing saves raw materials and reduces the volume of waste.
If you need to dispose of the transport packing materials, please try to use recyclable means.

Used Equipment

Used equipment contains valuable raw materials as well as materials that must be disposed of professionally. Please return your used equipment via an authorized specialist dealer or via the public waste disposal system, ensuring any material that can be recycled is.
Please take care that your used equipment cannot be abused. To avoid abuse, delete sensitive data from any data storage media. After having disconnected your used equipment from the mains supply, make sure that the mains connector and the mains cable are made useless.

G Declarations of Conformity

G1 Class A Equipment - FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a 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.

This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Caution: *Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment. Also refer to relevant information in this manual.*

G2 CE Declaration of Conformity

We,
Studer Professional Audio GmbH,
CH-8105 Regensdorf,
declare under our sole responsibility that the product
Studer D21m, Digital I/O System
(from serial no. 0001)
to which this declaration relates, according to following regulations of EU directives and amendments

- Low Voltage (LVD):
  73/23/EEC + 93/68/EEC
- Electromagnetic Compatibility (EMC):
  89/336/EEC + 92/31/EEC + 93/68/EEC

is in conformity with the following standards or normative documents:

- Safety:
  EN 60950-1:2000 (Class I equipment)
- Safety of laser products:
  EN 60825-1:2004 + A11 + A2, EN60825-2:2000
- EMC:
  EN 55103-1/-2:1996, electromagnetic environments E2 and E4.

Regensdorf, November 12, 2004

B. Hochstrasser, President M. Lienert, Manager R&D

Appendix 1: Air Temperature and Humidity

General

Normal operation of the unit or system is warranted under the ambient conditions defined by *EN 60721-3-3, set IE32, value 3K3*.
This standard consists of an extensive catalogue of parameters, the most important of which are: ambient temperature +5...+40 °C, relative humidity 5...85% (i.e., no formation of condensation or ice); absolute humidity 1...25 g/m³; rate of temperature change < 0.5 °C/min. These parameters are dealt with in the following paragraphs.
Under these conditions the unit or system starts and works without any problem. Beyond these specifications, possible problems are described below.

Ambient Temperature

Units and systems by Studer are generally designed for an ambient temperature range (i.e. temperature of the incoming air) of +5 °C to +40 °C. When rack mounting the units, the intended air flow and herewith adequate cooling must be provided. The following facts must be considered:

- The admissible ambient temperature range for operation of the semiconductor components is 0 °C to +70 °C (commercial temperature range for operation).
- The air flow through the installation must provide that the outgoing air is always cooler than 70 °C.
- Average heat increase of the cooling air shall be about 20 K, allowing for an additional maximum 10 K increase at the hot components.
- In order to dissipate 1 kW with this admissible average heat increase, an air flow of 2.65 m³/min is required.

Example: A rack dissipating *P = 800 W* requires an air flow of *0.8 * 2.65 m³/min* which corresponds to *2.12 m³/min*.

- If the cooling function of the installation must be monitored (e.g. for fan failure or illumination with spot lamps), the outgoing air temperature must be measured directly above the modules at several places within the rack. The trigger temperature of the sensors should be 65 °C to 70 °C.

Frost and Dew

The unsealed system parts (connector areas and semiconductor pins) allow for a minute formation of ice or frost. However, formation of dew visible to the naked eye will already lead to malfunctions. In practice, reliable operation can be expected in a temperature range above –15 °C, if the following general rule is considered for putting the cold system into operation:
If the air within the system is cooled down, the relative humidity rises. If it reaches 100%, condensation will arise, usually in the boundary layer between the air and a cooler surface, together with formation of ice or dew at sensitive areas of the system (contacts, IC pins, etc.). Once internal condensation occurs, trouble-free operation cannot be guaranteed, independent of temperature.

Before putting into operation, the system must be checked for internal formation of condensation or ice. Only with a minute formation of ice, direct

evaporation (sublimation) may be expected; otherwise the system must be heated and dried while switched off.

A system without visible internal formation of ice or condensation should be heated up with its own heat dissipation, as homogeneously (and subsequently as slow) as possible; the ambient temperature should then always be lower than the one of the outgoing air.

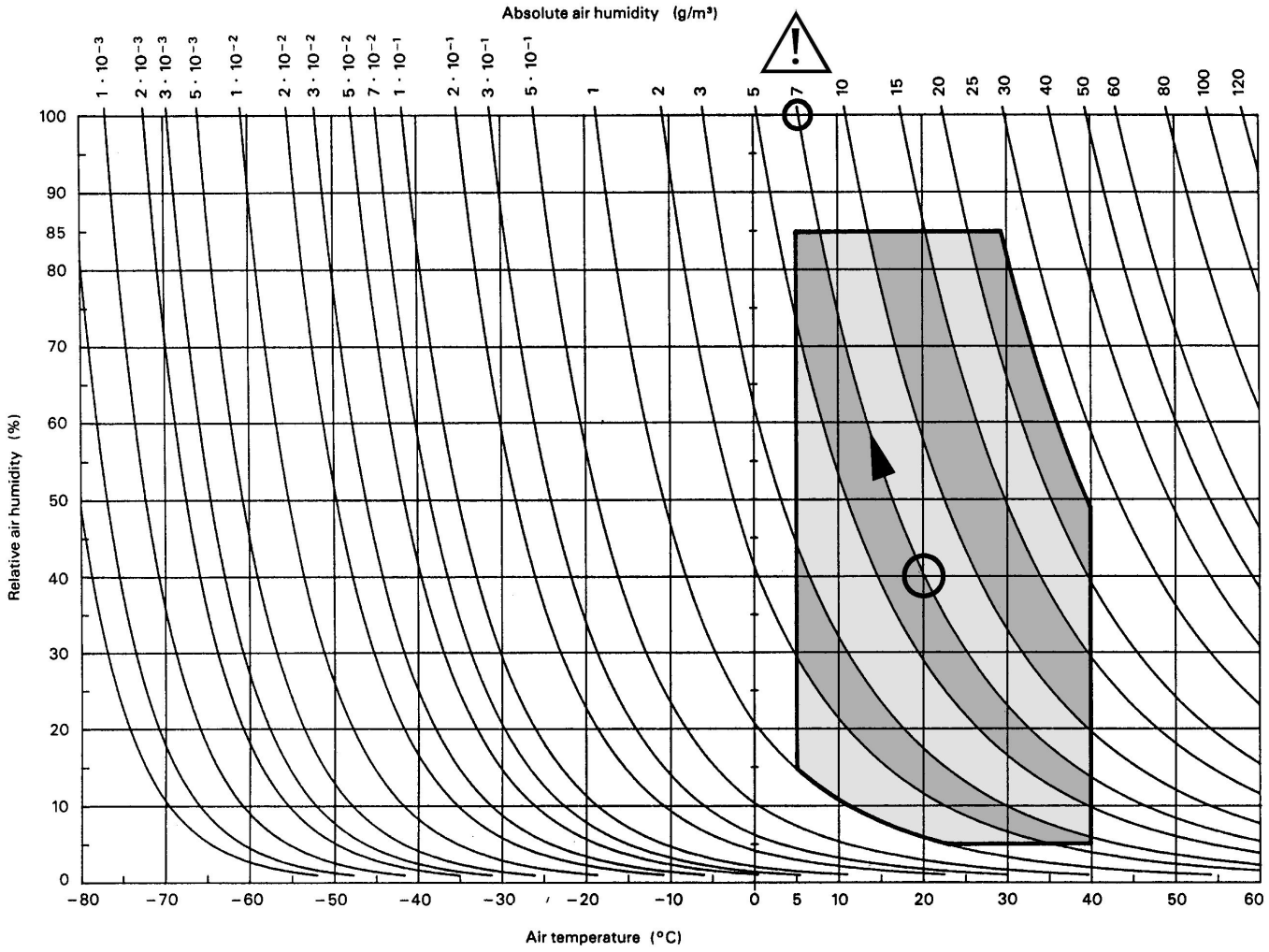
If it is absolutely necessary to operate the cold system immediately within warm ambient air, this air must be dehydrated. In such a case, the absolute humidity must be so low that the relative humidity, related to the coldest system surface, always remains below 100%.

Ensure that the enclosed air is as dry as possible when powering off (i.e. before switching off in winter, aerate the room with cold, dry air, and remove humid objects such as clothes from the room).

These relationships are visible from the following climatogram. For a controlled procedure, thermometer and hygrometer as well as a thermometer within the system will be required.

Example 1: An OB-van having an internal temperature of *+20 °C* and a relative humidity of *40%* is switched off in the evening. If the temperature falls below *+5 °C*, the relative humidity will rise to *100% (7 g/m³)*; dew or ice will be forming.

Example 2: An OB-van is heated up in the morning with air of *+20 °C* and a relative humidity of *40%*. On all parts being cooler than *+5 °C*, dew or ice will be forming.

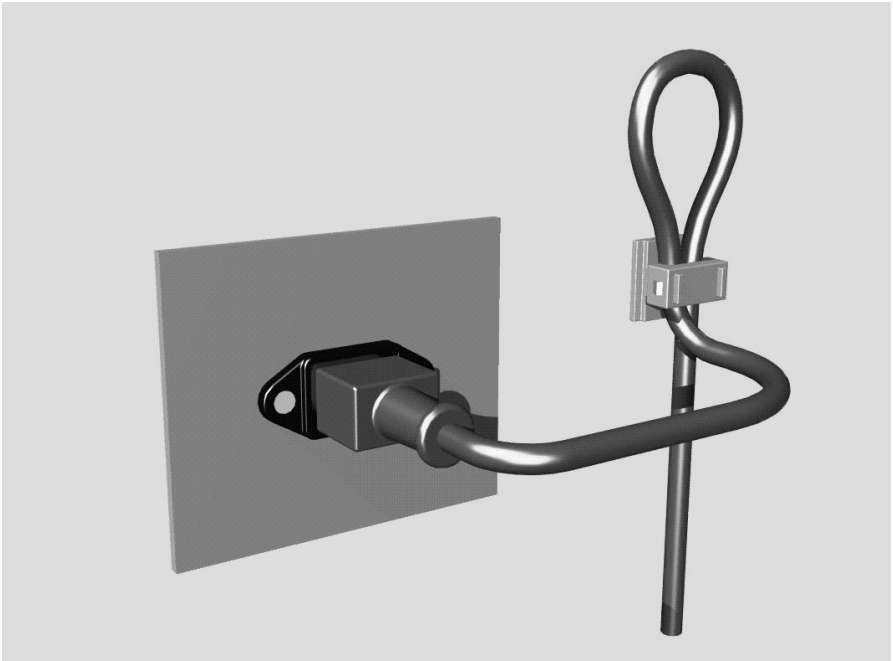


721-3-3 © CEI:1994

Climatogram for class 3K3

Appendix 2: Mains Connector Strain Relief

For anchoring connectors without a mechanical lock (e.g. IEC mains connectors), we recommend the following arrangement:



Procedure: The cable clamp shipped with your unit is auto-adhesive. For mounting please follow the rules below:

- The surface to be adhered to must be clean, dry, and free from grease, oil, or other contaminants. Recommended application temperature range is +20 °C to +40 °C.
- Remove the plastic protective backing from the rear side of the clamp and apply it firmly to the surface at the desired position. Allow as much time as possible for curing. The bond continues to develop for as long as 24 hours.
- For improved stability, the clamp should be fixed with a screw. For this purpose, a self-tapping screw and an M4 bolt and nut are included.
- Place the cable into the clamp as shown in the illustration above and firmly press down the internal top cover until the cable is fixed.

Appendix 3: Software License

Use of the software is subject to the Studer Professional Audio Software License Agreement set forth below. Using the software indicates your acceptance of this license agreement. If you do not accept these license terms, you are not authorized to use this software.

Under the condition and within the scope of the following Terms and Conditions, Studer Professional Audio GmbH (hereinafter 'Studer') grants the right to use programs developed by Studer as well as those of third parties which have been installed by Studer on or within its products. References to the license programs shall be references to the newest release of a license program installed at the Customer's site.

Programs Covered by the Agreement

License Programs of Studer

The following Terms and Conditions grant the right to use all programs of Studer that are part of the System and/or its options at the time of its delivery to the Customer, as well as the installation software on the original data disk and the accompanying documentation ('License Material'). In this Agreement the word 'Programs' shall have the meaning of programs and data written in machine code.

Using the software indicates your acceptance of this license agreement. If you do not accept these license terms, you are not authorized to use this software.

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Programs of third parties are all programs which constitute part of the System and/or its options at the time of delivery to the Customer but have not been developed by Studer. The following conditions are applicable to programs of third parties:

- The right to use third parties' programs is governed by the License Agreement attached hereto (if applicable), which is an integral part of this Agreement. The Customer shall sign any and all License Agreements for all further programs of third parties installed on the system. The Customer shall be deemed to have received all License Agreements upon delivery of the system and/or its options.
- Studer shall accept no responsibility or liability for, and gives no warranties (express or implied) as to the programs of third parties. The Customer waives any and all claims versus Studer for any consequential damages, which might occur due to defects of these programs.

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Principle

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The Customer is not entitled to alter or develop further the License Material except within the expressly permitted configuration possibilities given by the software installed on the system or elsewhere. All altered programs, including but not limited to the products altered within the permitted configuration possibilities, are covered by this License Agreement.

Reverse Engineering

Reverse engineering is only permitted with the express consent of Studer. The consent of Studer can be obtained but is not limited to the case in which the interface software can not be provided by Studer. In any case Studer has to be informed immediately upon complete or partial reverse engineering.

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Assignability

The rights granted to the Customer according to this License Agreement shall only be assignable to a third party together with the transfer of the system and/or its options and after the prior written consent of Studer.

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Studer's proprietary rights are acknowledged by the Customer. The Customer shall undertake no infringements and make no claims of any patent, registered design, copyright, trade mark or trade name, or other intellectual property right.

Warranty, Disclaimer, and Liability

For all issues not covered herewithin, refer to the 'General Terms and Conditions of Sales and Delivery' being part of the sales contract.

CONTENTS

1 GENERAL

1.1 Utilization for the Purpose Intended

The D21m system is intended for professional use.
It is presumed that the unit is operated only by trained personnel. Servicing is reserved to skilled technicians.
The electrical connections may be connected only to the voltages and signals designated in this manual.

1.2 First Steps

1.2.1 Unpacking and Inspection

Your new system is shipped in a special packing which protects the units against mechanical shock during transit. Care should be exercised when unpacking so that the surfaces do not get marred.
Check the condition of the equipment for signs of shipping damage. If there should be any complaints you should immediately notify the forwarding agent and your nearest Studer distributor.
Please retain the original packing material because it offers the best protection in case your equipment ever needs to be transported.

1.2.2 Installation

Primary Voltage

The power supply unit is auto-ranging; it can be used for mains voltages in a range of 100 to 240 VAC, 50 to 60 Hz.

Power Connection

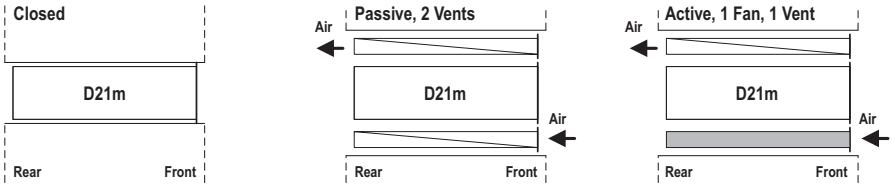
The attached female IEC 320/C13 mains cable socket has to be connected to an appropriate mains cable by a trained technician, respecting your local regulations. Refer to the 'Installation, Operation, and Waste Disposal' chapter at the beginning of this manual.

Earthing

This equipment must be earthed, due to the mains input filter network being connected to the mains earth.
Some consideration must be given to the earthing arrangement of the system, at the center of which is the frame. The frame is earthed to the mains earth via the power supply. Ground loops may occur where signal processing equipment, patched to the frame, has its signal earth commoned to the equipment chassis.

Temperature Regulations

The unit must not be used in conditions of excessive heat or cold, near any source of moisture, in excessively humid environments, or in positions where it is likely to be subjected to vibration or dust. The ambient temperature range for normal operation of the unit is +0 to +40 °C.
Under standard circumstances (open 19" frame) and an ambient temperature between 0 and +40 °C, the power dissipations listed below must not be exceeded. Please note that these figures may change for special environments, such as air-conditioned machine rooms, etc.



Operating Mode	Total Height	Max. Power Dissipation
Closed	3 U	40 W
Passive, with 2 vents	5 U	80 W
Active, w. 1 fan unit, 1 vent	5 U	200 W

Card No.	Card Name	Power Dissipation (approx.)
	Backplane with power supply	10 W
A949.0427	Mic/Line in card (transformerless)	11 W
A949.0428	Analog insert card	2 W
A949.0447	HD Mic/Line in card (transf.-balanced)	10 W
A949.0421	Line In card	7 W
A949.0420	Line out card	7 W
A949.0422	AES/EBU card	3.5 W
A949.0423	AES/EBU card with input SRC	4.5 W
A949.0424	AES/EBU card with input/output SRC	5.5 W
A949.0454	AES/EBU M2 card	3.7 W
A949.0455	AES/EBU M2 card with input SRC	4.5 W
A949.0456	AES/EBU M2 card with input/output SRC	5.4 W
A949.0430	MADI card, multi-mode fibre	4 W
A949.0431	MADI card, single-mode fibre	4 W
A949.0433	MADI card, twisted pair	4 W
A949.0425	ADAT I/O card	1.7 W
A949.0429	ADAT card, long-distance option	1.7 W
A949.0426	TDIF I/O card	1 W
A949.0452	3G SDI input card (16 channels)	4.5 W
A949.0442	SDI input/output card (8 channels)	4 W
A949.0451	3G SDI input/output card (16 channels)	4 W
A949.0443	Dolby® E/Digital decoder card, single	2.5 W
A949.0444	Dolby® E/Digital decoder card, dual	4 W
A949.0445	CobraNet® card	4.5 W
A949.0446	Aviom A-Net® card	2 W
-	EtherSound® card	3 W
-	RockNet® card	5 W
5029584	BCD DTMF decoder/GLITS generator card	0.5 W
5029586	BCD BLITS/GLITS generator card	0.5 W
5029587	BCD Minimixer card	0.5 W
5014376	Livewire card	7.5 W
5045044	Dante® card	3.5 W
5033340	BLU Link® card	approx. 5 W
5037475	Intercom BNC card	approx. 4.5 W
5037474	Intercom D-Type card	approx. 4.5 W
A949.0435	GPIO card	3 W
A949.0436	GPIO card with relay outputs	2 W
A949.0412	HD card S	5 W
A949.0415	HD RS422 card	5 W
A949.0411	MADI HD card, multi-mode fibre	5.5 W
A949.0413	MADI HD card, single-mode fibre	5.5 W
A949.0414	MADI HD card, twisted pair	5.5 W
A949.0437	Serial card	0.2 W
A949.0438	Serial Merger card	0.6 W
A949.0439	Serial RJ45 card	0.2 W
A949.0440	Dual Merger card	1.2 W

1.2.3 Adjustments, Repair, Cleaning

Danger

All internal adjustments as well as repair work on this product must be performed by expert technicians!

Replacing the Supply Unit

The primary fuse is located within the power supply module and cannot be changed. In case of failure, the complete power supply unit must be replaced. Please ask your nearest Studer representative.

Cleaning

Do not use any liquids to clean the exterior of the unit. A soft, dry cloth or brush will usually do.

For cleaning display windows, most of the commercially available window or computer/TV screen cleaners are suited. *Use only a slightly damp (never wet) cloth. Never use any solvent!*

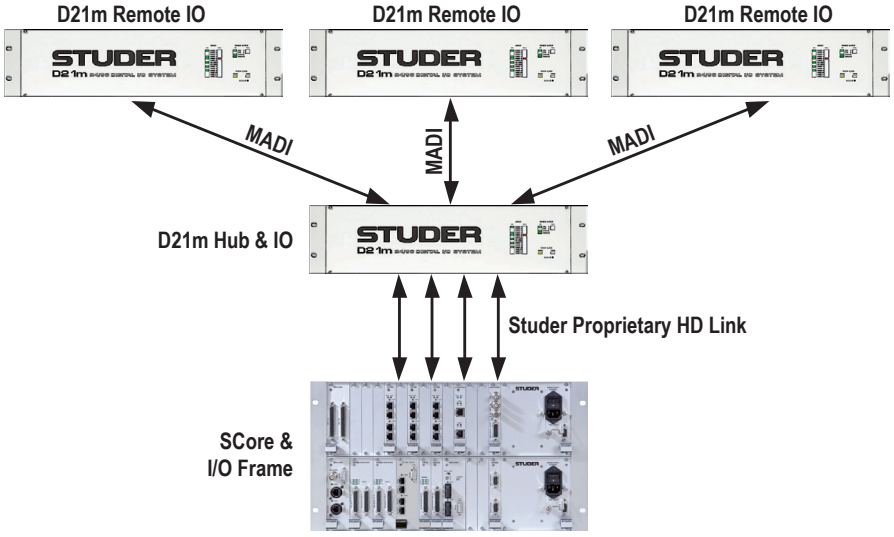
2 INTRODUCTION

The D21m I/O system provides very cost-effective inputs and outputs with maximum flexibility while maintaining the well-known Studer sound quality. It is the first Studer I/O system providing full 96 kHz operation. Different I/O modules can be plugged into a frame, providing I/O systems tailor-made to customer needs. And all this comes with an unequalled form factor. Full redundancy is available starting from power supplies going up to redundant interconnections and DSP cards.

Note The examples in this document use the SCore. Although most applications refer to this usage, the majority is also valid for use with the Performa core.

2.1 System Philosophy

When using the D21m I/O system the DSP core itself does not provide I/O, but is connected to the first D21m frame within the system (acting as a hub) by using Studer proprietary 'HD Link' technology. On the DSP core side, the connection is made to the DSP card(s) directly. Link distance is limited to 10 m, so the first I/O box should be located close to the DSP core. From that frame it is possible to run optical-fiber MADI links to multiple places, up to several kilometres away. By using this 'star' architecture it is ensured that a possible problem with one of the remote I/O boxes will not lead to a general breakdown of the whole I/O system. A maximum of six remote I/O boxes (stage boxes) may be connected to one hub frame. Should more I/O channels be required then multiples of the 'local frames' (hubs) may be used within the system.



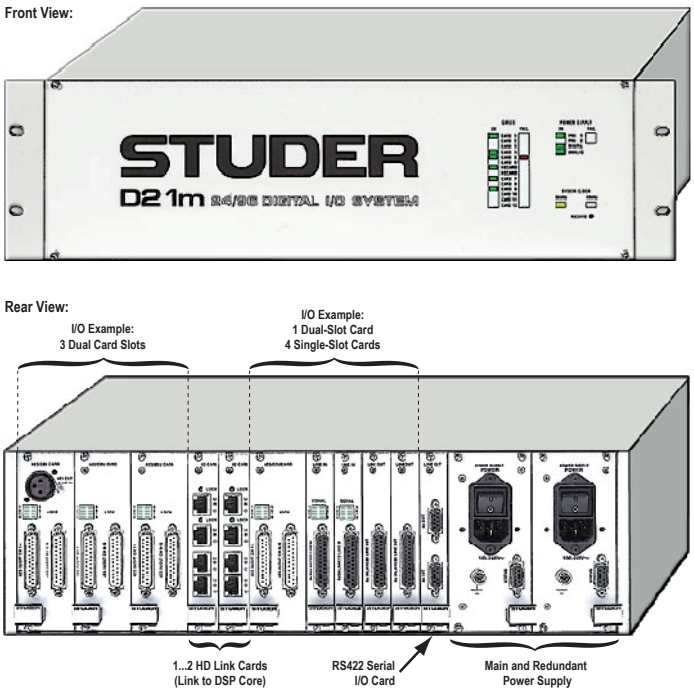
Redundancy issues are regarded as highly important. It is therefore possible to run any MADI links with redundant cables. The system is automatically switching to the redundant connection in case the primary connection should fail. For 96 kHz operation the second link can be used as a channel count extension, transferring a total of 64 MADI channels even at a 96 kHz sampling rate. The 'redundant' MADI link may also be used for sharing an I/O box between two consoles.

The MADI link between the first D21m frame (hub) and the remote I/O boxes, in addition, carries all control signals needed to control the microphone amplifier cards, to interrogate the state (health) of any remote I/O card and to dis-

play it within the console's system surveyor page. This is without sacrificing any audio channels within the MADI link. Additionally, an RS422 signal can be 'tunneled' through the MADI connection. In this way e.g. a MIDI device can be connected to the remote I/O box and find the 'extension' connector on the hub frame next to the core again.

Notes Unlike the Studer D19m I/O system, the D21m system is engineered as an I/O system for use together with a Studer digital console, i.e., using the D21m system as a 'standalone' analog-to-digital or digital-to-analog converter only works if MADI I/O is used on the digital side; for more information on this subject please refer to chapter 5.7. Inserting, e.g., an AES/EBU card and a Line input card and getting the A/D-converted signal out of the AES/EBU card directly is not possible. This can be done only if the audio is routed with a DSP core. Since the MADI signal to the D21m remote I/O box is used to synchronize the unit, a stable, low-jitter MADI signal is necessary in order to reach maximum audio quality. This is guaranteed by Studer equipment. However, two I/O boxes can be interconnected using MADI, where one of them must be switched to 'Master' mode. In such a case up to 64 audio channels may be transmitted between two frames (applicable for MADI HD cards A949.0411.23, A949.0413.22, A949.0414.20, or newer).

2.2 The Frame and Its Cards

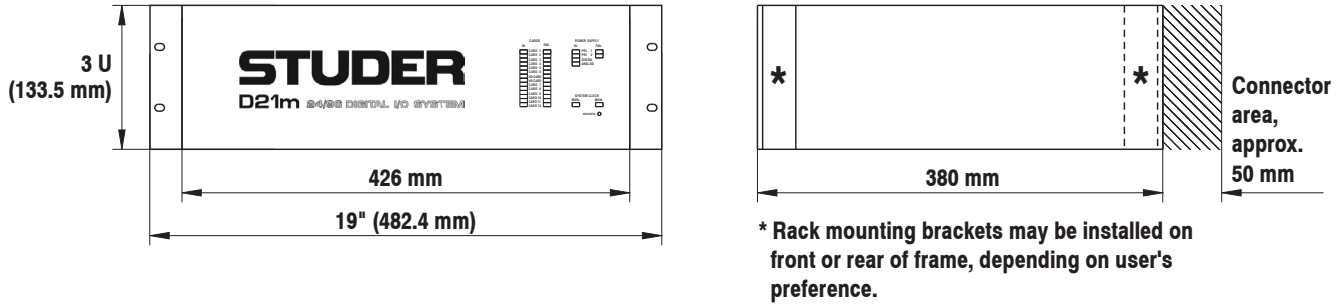


The 3 U frame provides 12 slots for I/O card insertion. Each card may provide a different number of I/O channels, depending on its capabilities (e.g. a microphone card provides four channels of microphone inputs, while an ADAT card provides 16 channels of inputs and outputs simultaneously). Some cards are mechanically occupying two slots, and therefore a maximum of 6 double-width cards may be inserted into a frame. An overview of the different cards currently available is given in chapter 6.1.

The frame hosts one or two 'High Density Link' cards (short: HD Link), providing the main audio connection to the DSP core. From the HD card(s) the signals are redirected to the different types of I/O cards in the frame. Therefore at least one HD card must be inserted in the frame.
The frame may be equipped with redundant power supplies, the status of which can be displayed in the Vista console's system surveyor page.
Please note that the rack mounting brackets may be installed either on the front (as shown on the opposite page) or on the rear of the frame.

2.3 Hub Frame

The difference between a D21m frame acting as a hub or as a remote I/O box is the type of HD Link and RS422 cards inserted. The HD Link card in the hub frame hosts four RJ45 connectors for connection to the DSP core, providing 192 channels (96 in case of the Performa core) of audio coming from the DSP core through 2 cables into the frame (audio outputs), as well as 192 channels from the frame through 2 cables into the DSP core (audio inputs). The length of the high-density link cables must not exceed 10 metres (30 feet).
If multiple remote I/O boxes are connected to one hub frame, more channels need to be transferred to the DSP core. In this case it is possible to insert a second HD card into the hub frame, expanding its capabilities to handle 384 inputs and outputs to the DSP core (192 outputs in case of the Performa core).



2.4 Remote I/O Frame

The frame placed remotely is equipped with a special MADI HD card. This version of the card is not equipped with the Studer proprietary high-density link but with standard MADI optical interfaces. This format allows transferring 64 channels of inputs and outputs between the remote I/O box and the hub frame simultaneously.
Frame dimensions are the same as shown in 2.3 above.

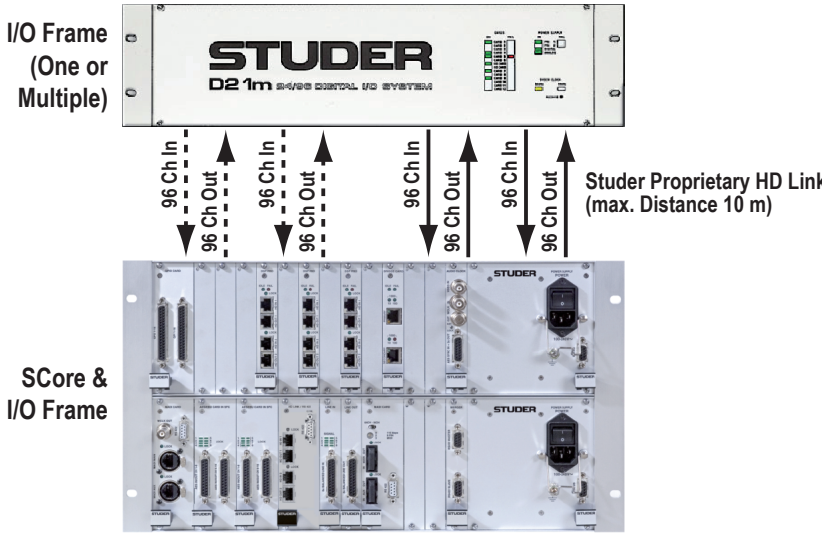
2.5 Vista Surveyor Software

The surveyor on the graphic controller (GC) screen of the Vista consoles will indicate the whole I/O system, including the health state of each I/O card and the power supplies. If the hardware found at startup time is not identical to what the system expects, the user is asked whether the expectations should permanently be changed or whether the user has temporarily changed the I/O configuration (such as having moved a remote I/O box to another place

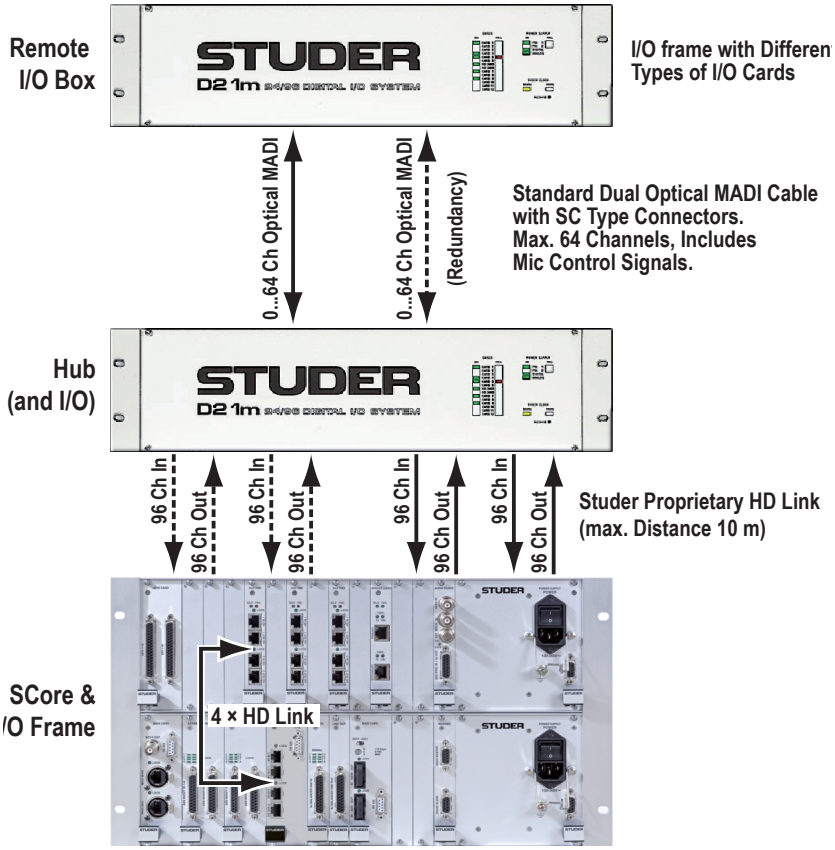
for the current production). In both cases the surveyor application indicates ‘green’, unless the user tells it to wait for the missing I/O components.
There is no need to tell the system which channel has a microphone preamplifier included, since this detection is done automatically. However, it is necessary to define which HD link of the hub frame is going to which PED21m card within the Performa DSP core. This is done in a software menu accessible for system administrators.

3 APPLICATIONS

3.1 Local I/O Only (Located Close to Core)



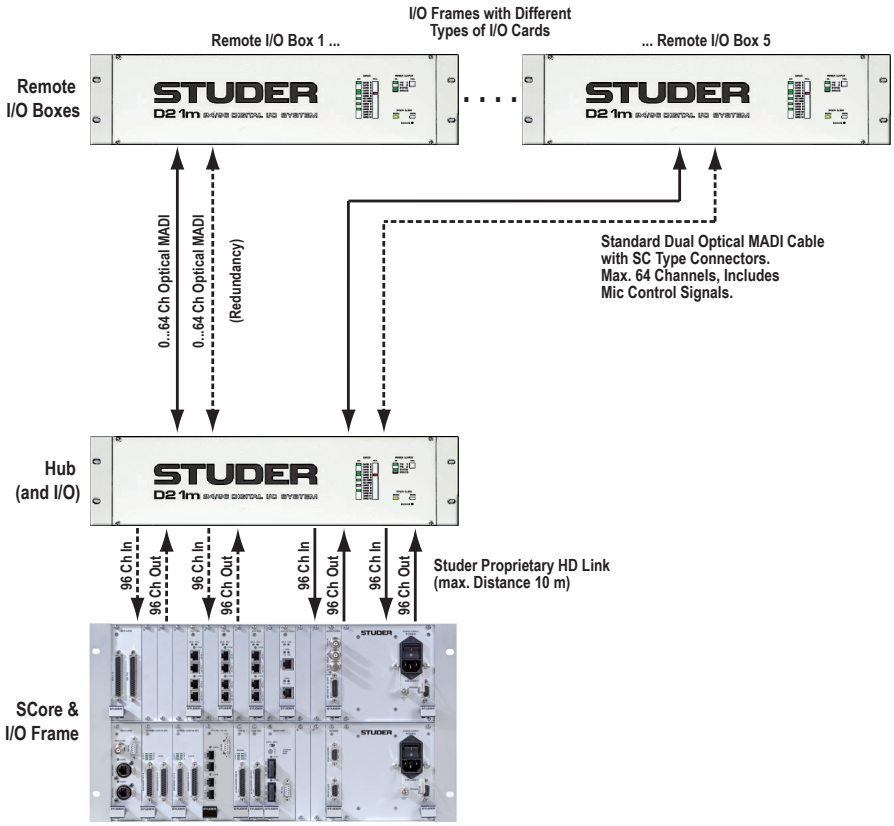
3.2 One I/O Box within Long Distance



Notes Both the remote I/O box and the local hub frame are standard D21m frames, providing the possibility to insert any I/O cards available for the D21m I/O system. The hub frame may therefore also be used for any audio I/O located close to the DSP core.
The channel count of the MADI link may be set in steps of eight channels

using card-internal DIP switches. In order to provide synchronization and surveyor information it is necessary to provide a MADI link to and from the remote I/O boxes at all times, even if the channel count should be set to 0.
The protocol switch on the front panel of the MADI I/O card may be set to '64 channel' to allow maximum usage of the available channels. This switch may only have to be set to '56 channel' protocol for operation with third-party MADI devices (in case no remote I/O box is connected to the MADI I/O card).
If 64 channels of MADI transmission are required when working at 96 kHz, the redundant MADI line can be used as a 'channel extension' for transmitting the MADI channels 33-64 (29-56). This must be set accordingly with a DIP switch on the MADI I/O card inserted in the hub frame.

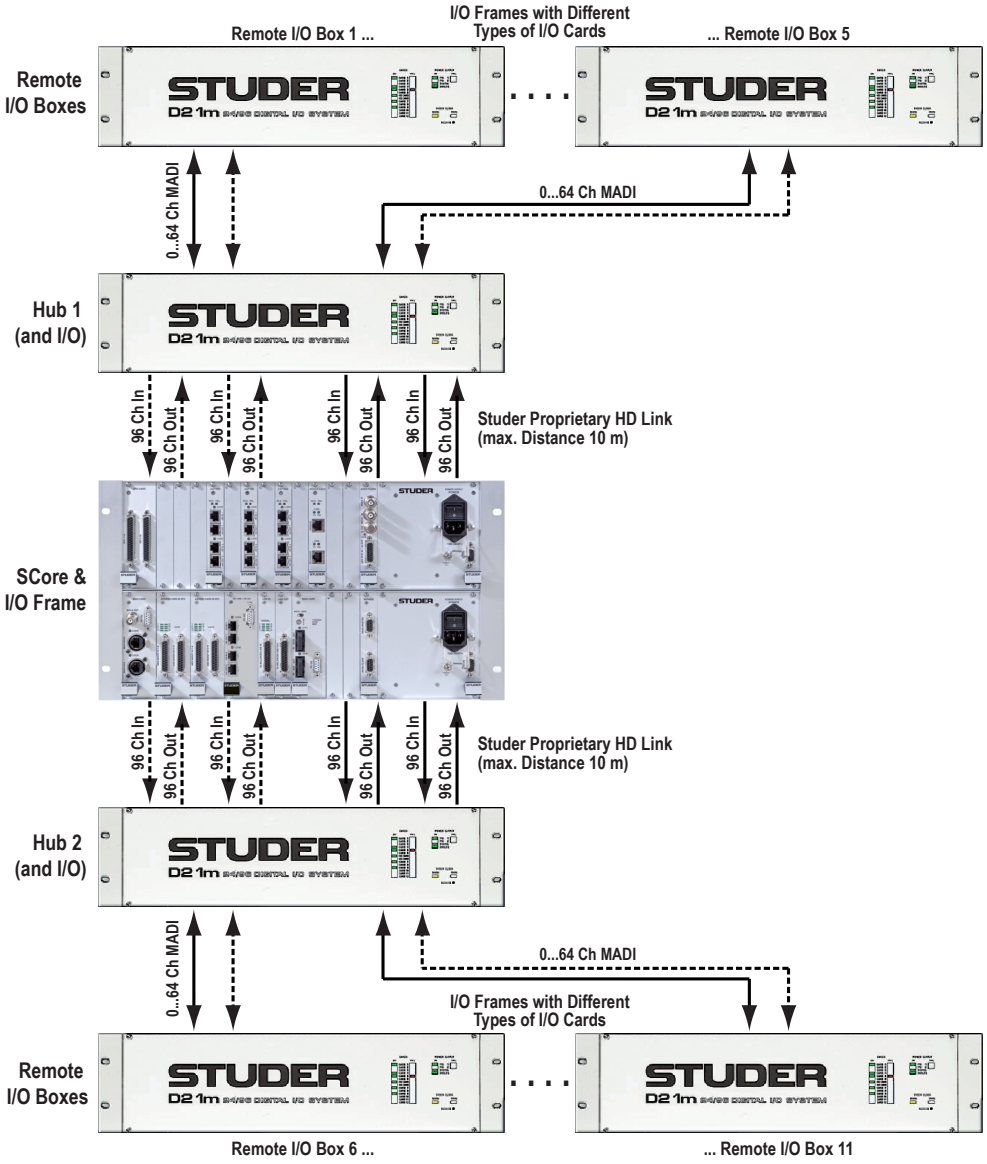
3.3 Multiple I/O Boxes, Long Distance



Notes Both the remote I/O box and the local hub frames are standard D21m frames, providing the possibility to insert any I/O card available for the D21m I/O system. The hub frame may therefore also be used for any audio I/O located close to the DSP core.
Up to 5 remote I/O boxes can be connected to one hub frame. The last slot is occupied with one ADAT card (or AES/EBU card in case of operation with the Performa core) in order to provide I/O for monitoring and talkback of the desk.
The channel count of the MADI link may be set in steps of eight channels using card-internal DIP switches. In order to provide synchronization and surveyor information it is necessary to provide a MADI link to and from the remote I/O boxes at all times, even if the channel count should be set to 0.
The protocol switch on the front panel of the MADI I/O card may be set to

'64 channel' allowing maximum usage of the available channels. This switch may only have to be set to '56 channel' protocol for operation with third-party MADI devices (in case no remote I/O box is connected to the MADI I/O card).
If 64 channels of MADI transmission are required when working at 96 kHz, the redundant MADI line can be used as a 'channel extension' for transmitting the MADI channels 33-64 (29-56). This must be set accordingly with a DIP switch on the MADI I/O card inserted in the hub frame.

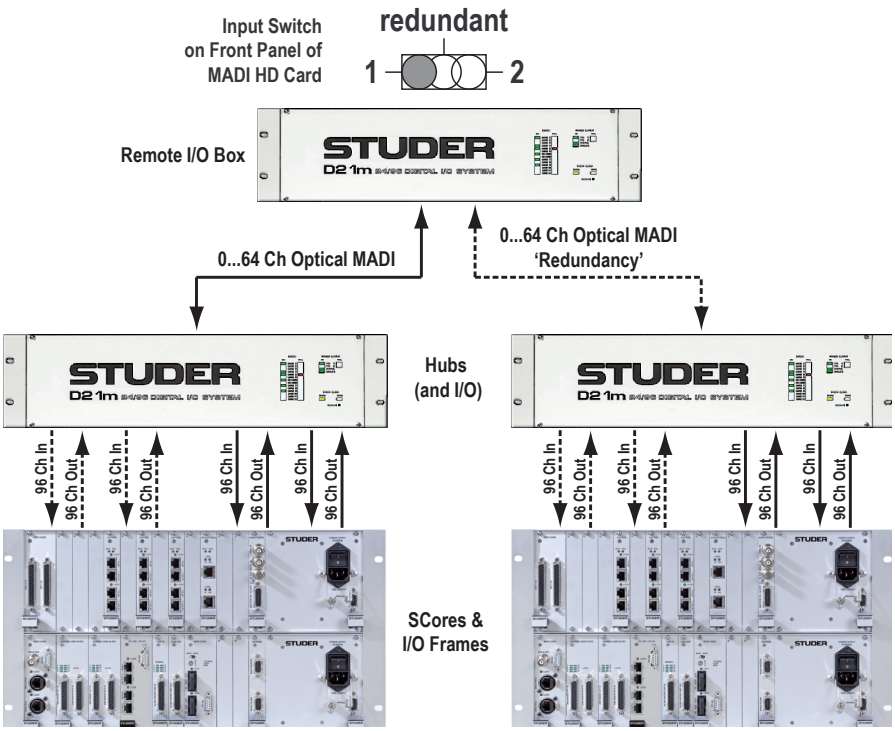
3.4 Multiple Hubs, Multiple I/O Boxes, Long Distance



Notes Both the remote I/O box and the local hub frames are standard D21m frames, providing the possibility to insert any I/O card available for the D21m I/O system. The hub frame may therefore also be used for any audio I/O located close to the DSP core.
Up to 6 remote I/O boxes can be connected per hub frame, except in the first hub frame, where one slot is occupied with one ADAT card (or AES/EBU card in case of operation with the Performa core) in order to provide I/O for monitoring and talkback of the desk.

The RS422 link for the second hub may be taken from the Vista desk by using a further RS422 port.
The channel count of the MADI link may be set in steps of eight channels using card-internal DIP switches. In order to provide synchronization and surveyor information it is necessary to provide a MADI link to and from the remote I/O boxes at all times, even if the channel count should be set to 0.
The protocol switch on the front panel of the MADI I/O card may be set to '64 channel' to allow maximum usage of the available channels. This switch may only have to be set to '56 channel' protocol for operation with third-party MADI devices (in case no remote I/O box is connected to the MADI I/O card).
If 64 channels of MADI transmission are required when working at 96 kHz, the redundant MADI line can be used as a 'channel extension' for transmitting the MADI channels 33-64 (29-56). This must be set accordingly with a DIP switch on the MADI I/O card inserted in the hub frame.

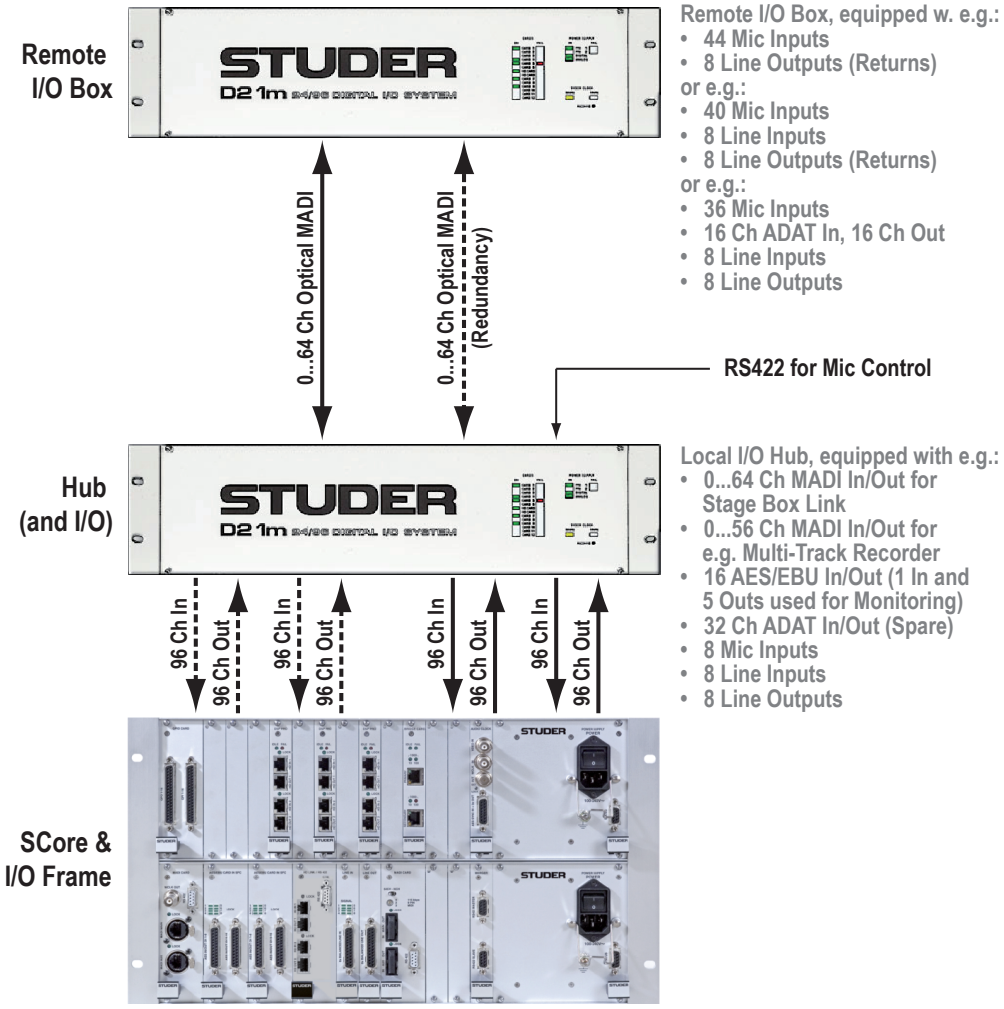
3.5 Shared I/O



It is possible to connect one remote I/O box to two hubs or consoles at the same time. This allows sharing of one box between two consoles. While the audio inputs are fed to both consoles, the outputs on that I/O box may only be fed by one of the two consoles at a time. An input selector switch on the MADI HD card determines from which console the audio outputs are fed. At the same time only the currently selected console will be able to display health information in the surveyor. If the switch is set to 'redundant', the remote I/O box jumps freely onto the second input in case the signal is lost on the main input. Unless the signal is interrupted on the redundant input, too, the system will not switch back to the main input in order to avoid undefined switching in case of a bad MADI connection.

4 SYSTEM EXAMPLES

4.1 System with Remote and Local I/O



Notes

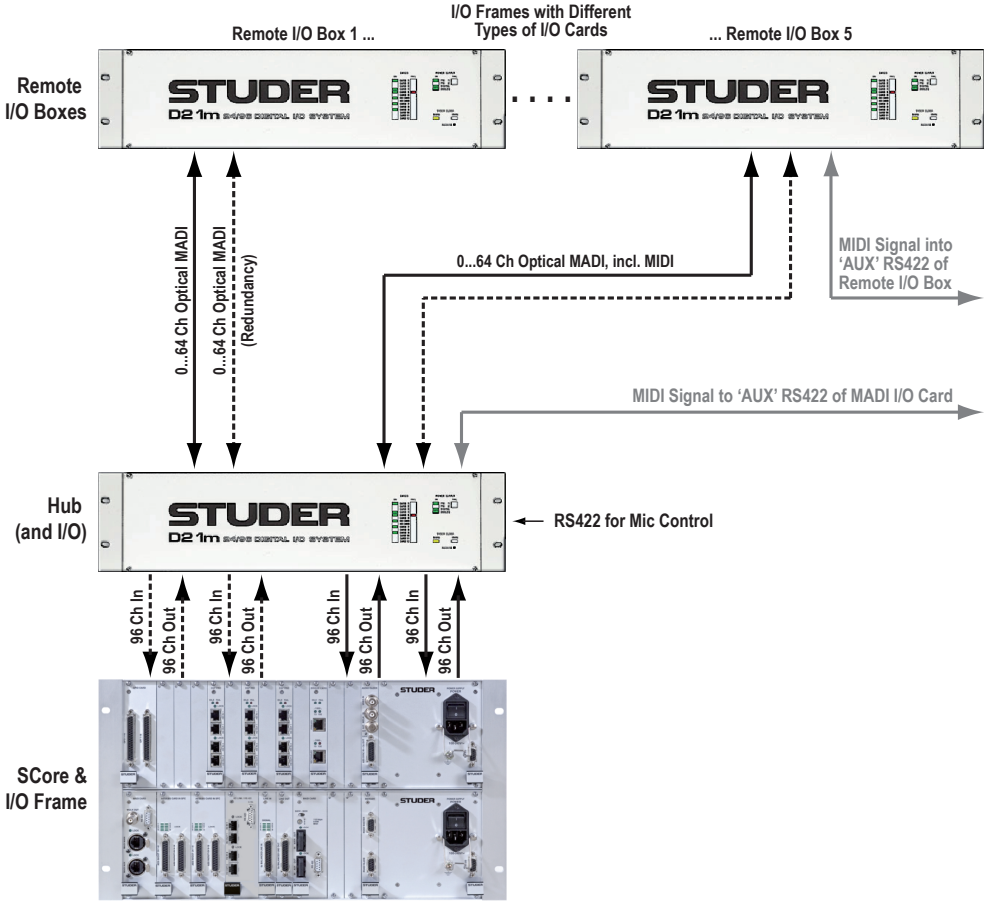
Some of the I/O cards are 'double-width', of which a maximum of 6 may be fitted into one D21m frame. When only using single-width cards, a maximum of 12 can be fitted. Therefore, e.g. a maximum of 48 microphone inputs may be fitted in one (full) frame. If outputs are required as well, up to 44 microphone inputs are possible since then at least one slot is used for an 8-channel line output card.

Input and Output cards may be inserted in any order. The system is filling up the MADI channels automatically, starting from the leftmost card subsequently to the right.

Since the MADI bandwidth can only be adjusted in steps of 8 channels, an odd number of microphone cards (providing 4 inputs each) will result in 4 MADI channels without audio.

The MADI HD card versions A949.0411.21/A949.0413.21 and newer support operation with two MADI HD cards in one frame, extending the total channel count between the hub frame and the remote I/O box to 128. The same channel count is reached in 96 kHz mode. *For details please refer to chapter 6.5.3.*

4.2 System with Remote MIDI Connection



Any serial signal, such as MIDI or Sony 9-pin (machine control) may be transmitted through a MADI connection without losing any audio bandwidth or microphone control of the remote I/O box. An RS422 connector labeled 'Aux' can be found on the MADI I/O card (hub frame side) as well as on the serial card of the remote I/O frame. This card is located between slot 12 and the power supplies. The required baud rate is set on the MADI I/O (local) and MADI HD (remote) cards.

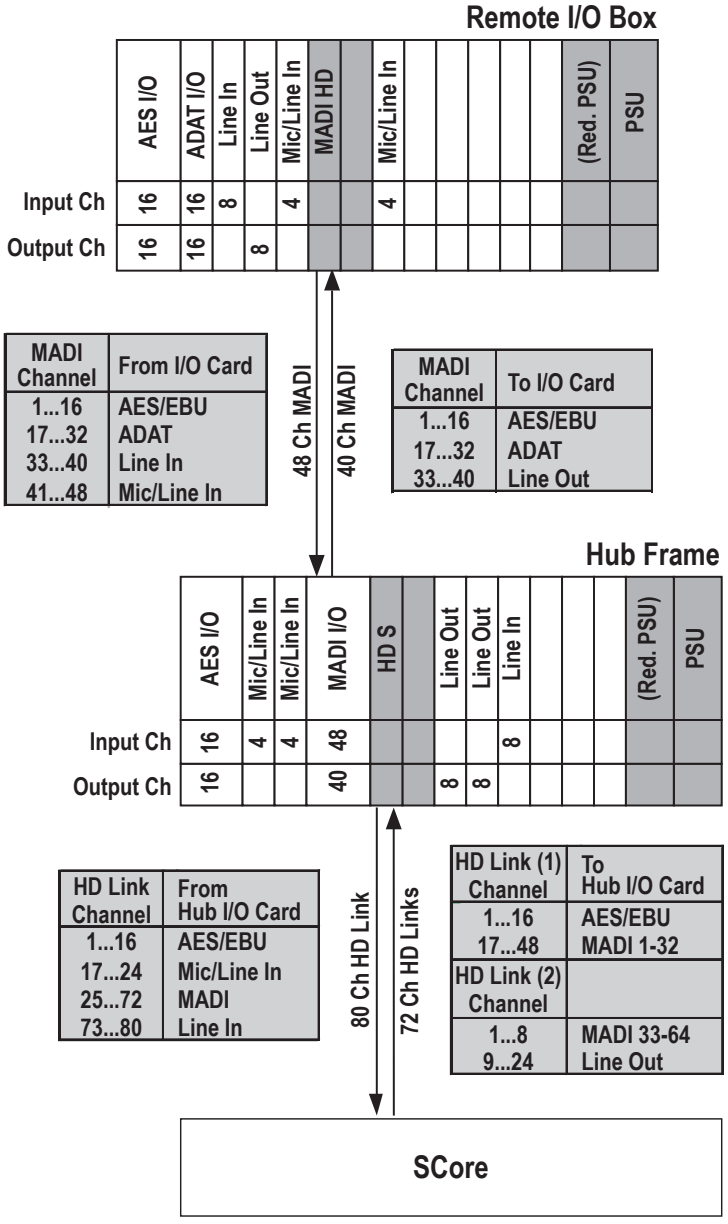
5 ADDITIONAL INFORMATION

5.1 Mapping of I/O Cards to MADI and HD Link Channels

The HD card is redirecting the audio channels from the different I/O cards into the Studer proprietary HD link format (in case of a hub) or MADI (in case of a remote I/O box). In order to design a complete I/O system, it is mandatory to know which channels of the I/O cards end up being redirected to which one of e.g. the 64 MADI channels. This will influence the way the configuration editor software is used and the labels are selected when starting the operation of a new system.

General rule: The HD card fills in all channels starting from the left side of the frame (slot 1) to the right. Input and output cards may therefore be mixed, but their order dictates the 'filling up' of MADI outputs from the frame. In the same way the order of outputs from left to right is defining which MADI inputs are being redirected to that card. The same rule applies for the Studer proprietary HD link format.

The following example illustrates the rules within a complex I/O system:



5.2 Special Case: Microphone/Line Input Card

The smallest modularity of channels used up within the MADI and Core link is eight. If an odd number of Mic/Line input cards is used, they should be inserted in pairs, with the last card in an odd slot (no. 1, 3, 5...). This single card will allocate 8 channels but only 4 of them will have audio. If a Mic/Line input card pair uses Analog Insert cards, they should be placed in the next double slot on the right, as shown in chapter 5.3.
For clearness, see the following examples:

Example 1

Input Cards	MADI Channel Usage
10 Mic/Line Input cards (40 channels)	1-40
2 Line Input cards (16 channels)	41-56

Example 2

Input Cards	MADI Channel Usage
9 Mic/Line Input cards (36 channels)	1-36 *(37-40 no audio)*
2 Line Input cards (16 channels)	41-56

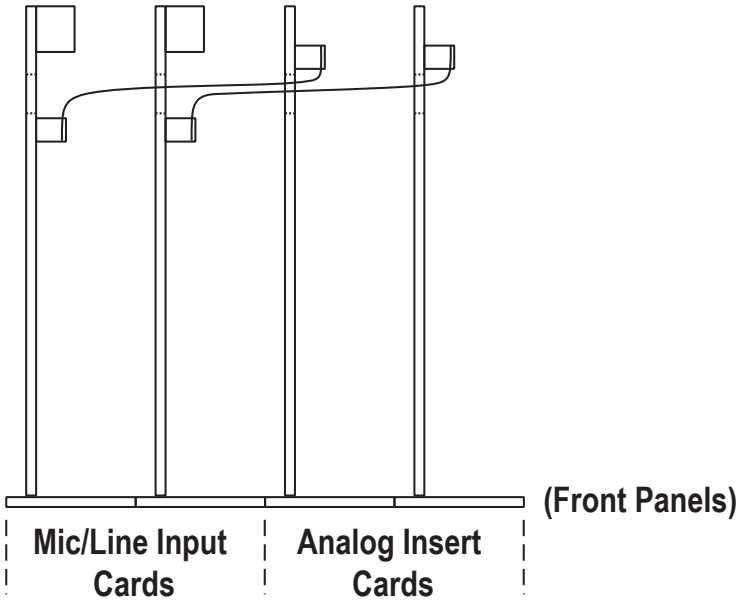
Example 3

Input Cards	MADI Channel Usage
9 Mic/Line Input cards (36 channels)	1-36 *(37-40 no audio)*
3 Line Input cards (24 channels)	41-64

5.3 Analog Insert Cards

Note *The Analog Insert card is supported by the Mic/Line input card A949.0427 only.*

If you plan to equip the I/O box with Analog Insert cards, it is wise to avoid channels without signal by installing two Mic/Line Input cards next to each other, followed by two Analog Insert cards to their right. The Analog Insert cards will be connected to 'their' Mic/Line Input card by a ribbon cable. After that, more Mic/Line Input cards may be inserted. This way all channels within the hub-to-core link will be carrying audio, since there is always a group of 8 channels inserted next to each other. The two Analog Insert cards will not use any channels within the link. The ribbon cables are lead through slots provided in both the Mic/Line Input and Analog Insert cards.



5.4 96 kHz Operation

D21m Frame

The D21m I/O system is fully supporting 96 kHz operation. For digital formats, the following standards are supported:

AES/EBU 2 channels are sent over one cable, both at 48 kHz and 96 kHz, just by doubling the clock frequency of the transmitted signal in 96 kHz operation.

MADI 0-64 channels are transmitted at 48 kHz (depending on the DIP switch settings), and 0-32 channels are transmitted at 96 kHz. In the latter mode, the clock frequency is doubled to 96 kHz, similar to the AES/EBU format. In order to reach 64 channels of transmission between remote I/O boxes and the hub frame at 96 kHz, the card's redundant MADI connections can be selected to transmit the 'lost' half of the first cable. This is done by a DIP switch on both the MADI I/O and the MADI HD cards.

ADAT At 96 kHz, only 8 channels are transmitted (4 per optical interface).

TDIF At 96 kHz, only 8 channels are transmitted.

MADI HD If more than 32 channels are required in 96 kHz mode, the AUX interface must be used as a 'channel extension' to the main interface (i.e., DIP switch #1 is OFF); it will then transmit channels 33-64 of the 96 kHz MADI signal. Subsequently, MADI connection redundancy will not be available in 96 kHz mode when exceeding a total channel count of 32 into or out of the remote I/O box.

Performa Core

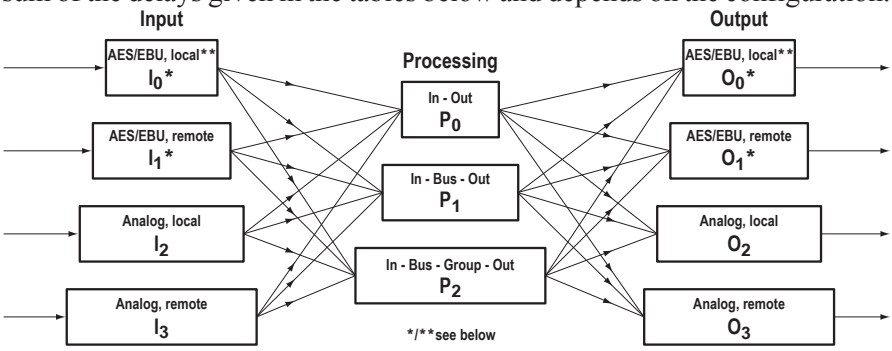
- For 96 kHz operation, the DSP core must only contain PE and PED21m cards and a MemNet card type A950.0621xx *(not A950.0620xx)* or newer.
- In addition, the Performa core must contain a 'Revision A' backplane.
- An external, high-quality (low-jitter) 96 kHz sync signal in AES/EBU format must be provided.
- The session configuration has to be re-calculated. Some I/O channels may then have no audio but will still show up in the patch window. This is due to the fact that some I/O cards (e.g. ADAT) will provide only half the number of audio channels at 96 kHz.

48 kHz		96 kHz	
I/O Card Configuration (from Left to Right)	HD Link Channel Usage	I/O Card Configuration (from Left to Right)	HD Link Channel Usage
AES/EBU (16 Channels)	1-16	AES/EBU (16 Channels)	1-16
ADAT (16 Channels)	17-32	ADAT (16 Channels)	17-32 *(25-32 no audio)*
Line Input (8 Channels)	33-40	Line Input (8 Channels)	33-40
Mic/Line Input (4 Channels)	41-44	Mic/Line Input (4 Channels)	41-44
Mic/Line Input (4 Channels)	45-48	Mic/Line Input (4 Channels)	45-48

Please note that the Studer proprietary HD link is providing 96 channels of inputs to and 48 channels of outputs from the Performa core, in both 48 kHz and 96 kHz operation.

5.5 Input/Output Delays

Different DSP core types as well as the different I/O cards cause different delays. Several facts require additional consideration. Total I/O delay is the sum of the delays given in the tables below and depends on the configuration.



D21m I/O
(Independent of Core Type)

Block	48 kHz		96 kHz	
	[smpl]	[µs]	[smpl]	[µs]
I_0 */**	0	0	0	0
I_1 *	7	146	7	73
I_2	38	792	38	396
I_3	45	938	45	469
O_0 */**	0	0	0	0
O_1 *	4	83	5	52
O_2	28	583	28	292
O_3	32	667	33	344

* Enabled input and output SRCs each cause an additional delay, depending on input and output sampling rates – for details refer to chapter 5.5.1.

** Local MADI, ADAT, and TDIF interfaces have approximately the same delay as the AES/EBU interface (±1-2 samples)

Processing / Compact SCore
(OnAir 3000)

Block	48 kHz	
	[smpl]	[µs]
P_0	16	333
P_1	37	771
P_2	53	1104

Processing / SCore Live
(OnAir 3000, Vista, Route 6000)

Block	48 kHz		96 kHz	
	[smpl]	[µs]	[smpl]	[µs]
P_0	16	333	18	188
P_1	34	708	36	375
P_2	47	979	49	510

Processing / Performa Core
(Vista)

Block	48 kHz		96 kHz	
	[smpl]	[µs]	[smpl]	[µs]
P_0	15	313	20	208
P_1	31	646	54	563
P_2	43	896	78	813

5.5.1 Additional SRC Delay

Enabled input and output SRCs each cause an additional delay (D) depending on the input and output sampling rates (f_{S_IN} and f_{S_OUT}).
Input and output delays can be calculated using the following formulas:

$$[1]\ f_{S\_IN} > f_{S\_OUT}:\ D = \frac{16}{f_{S\_IN}} + \frac{32}{f_{S\_OUT}}\ [s] \qquad [2]\ f_{S\_OUT} > f_{S\_IN}:\ D = \frac{48}{f_{S\_IN}}\ [s]$$

Examples *For a 96 kHz input signal and a 48 kHz system clock (i.e., the input SRC's output), the input delay is 40 output samples or 833 µs (formula [1]).*
For a 48 kHz system clock (i.e., the output SRC's input) and a 96 kHz output signal, the output delay is 96 output samples or 1 ms (formula [2]).

5.5.2 Additional Processing Delay

Processing Block	Compact SCore	SCore Live***	Comment
Limiter	1 ms	-	if active
Monitoring Module	1 sample	-	Signal path, e.g. to phones out
TB Sum / Monitor Sum	5 samples	5 samples	
Core-Core MADI Link	17 samples	17 samples	
Insert Send	5 samples	5 samples	
Output Sum*	16 samples	13 samples	
Program Output**	5 samples	5 samples	
Assignable Process	-	5 samples	e.g. fader, stereo -> mono

* Delay from a channel input to a summing output
** Delay from a summing output to a master/group output
*** Independent from the sampling rate (48 or 96 kHz)

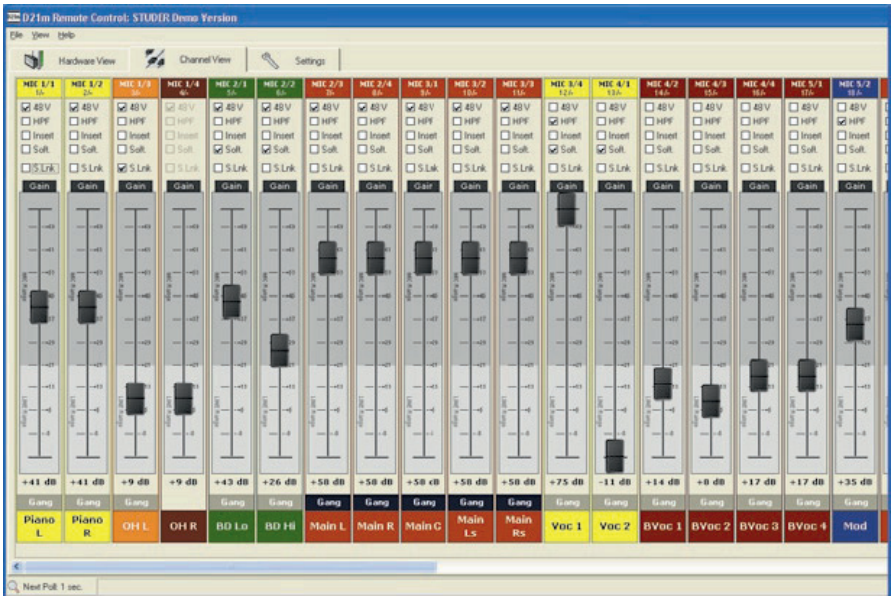
5.6 The MADI Interface: 64 or 56 Channels?

The D21m I/O system is fully supporting the MADI protocol of 56 channels (standard MADI) as well as 64 channels (not supported by all third-party MADI devices). Protocol selection is done on the front panel switch of the MADI I/O card. Between a D21m hub and a D21m remote I/O box always 64-channel format should be selected, since the MADI HD card in the remote I/O box expects the 64 channel protocol.

Note The protocol switch on the front panel of the MADI I/O card is not related to the channel count setting by the DIP switch on the card itself. In other words, you possibly only use 32 MADI channels (determined by DIP switch), but you nevertheless have to select whether the standard MADI protocol ('56 channels') or the extended version is used. The correct setting of the protocol switch on the front panel is purely depending on the third-party equipment connected to that MADI interface.

5.7 Standalone D21m I/O System

Previously only available for Studer digital mixing consoles, the D21m I/O system is now opened up for use with any audio equipment. With the introduction of the D21m remote control software, the microphone amps and A/D converters become available to a wide range of applications, such as recording, broadcast, and live sound.
A D21m I/O frame can be connected to any 3rd-party device using its optical MADI interface. The remote control software runs on a PC, connected to the I/O frame over an additional RS422 serial connection. This software may even rut at the same time as DAW software.
The I/O frame itself is highly modular, and it is possible to select from a variety of I/O cards. Thanks to the two MADI interfaces the D21m I/O keeps its channel count high even in 96 kHz mode. This makes this product ideal for any use with a Digital Audio Workstation (DAW). In 48 kHz mode the second MADI interface interface serves as a digital split output for feeding any additional audio device or as a redundant audio link.
In facilities containing Studer Vista consoles, the investment is broadened by the extreme versatility of the D21m stage boxes. One day they can be used on stage, connected to the Studer console, and the next day in the recording studio in order to bring superb audio quality to lower-cost recording equipment.



Remote Software

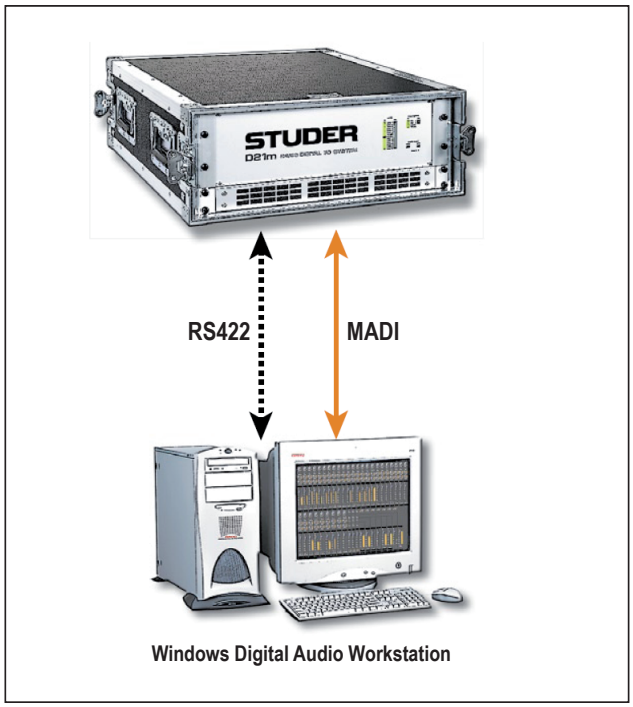
The control software is an application running under Microsoft Windows XP on any regular PC with an RS422 serial port. The software automatically detects the connected hardware and allows controlling the microphone amplifier's parameters, such as phantom power, high-pass filter, soft clipping, analog insert, gain, labeling and color coding the inputs, and stereo linking two subsequent channels.
These parameters may be stored and recalled using snapshot files. Spare inputs may be hidden from the screen, while the used ones can be arranged in any order. Operating speed is maximized by the ability to group inputs in a Vista-like way ('ganging').

MADI Interface

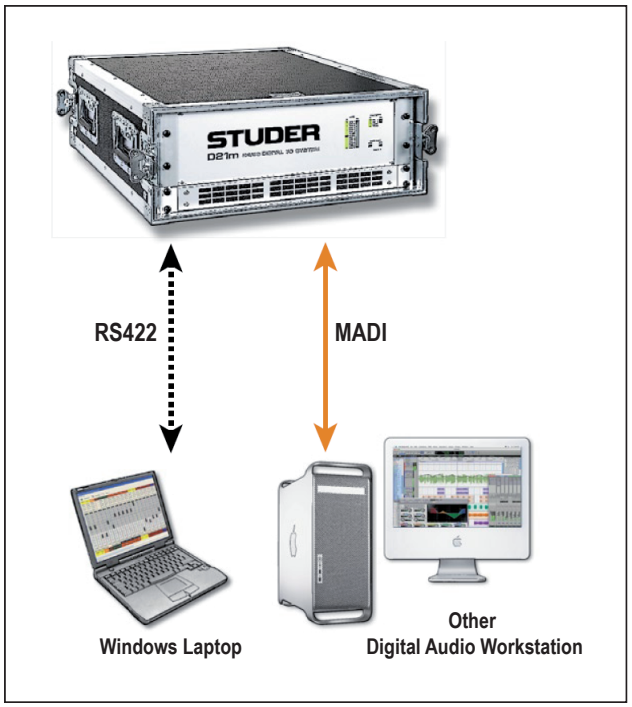
The MADI IF of the D21m frame supports both the standard MADI protocol with up to 56 audio channels as well as the extended protocol with 64 channels. Protocols are selected on the front panel of the frame.

The frame acts as a clock slave and synchronizes to the optical MADI signal. It therefore automatically detects the clock rate of the connected audio device. Supported clock rates are 44.1, 48, 88.2, and 96 kHz.
In 44.1 and 48 kHz mode the two MADI interfaces work in parallel. One of them may be used as a digital split output or for redundancy. In 88.2 or 96 kHz mode the MADI IF only transmits a maximum of 32 channels. Therefore the second MADI IF is used to bring back the original total channel count.

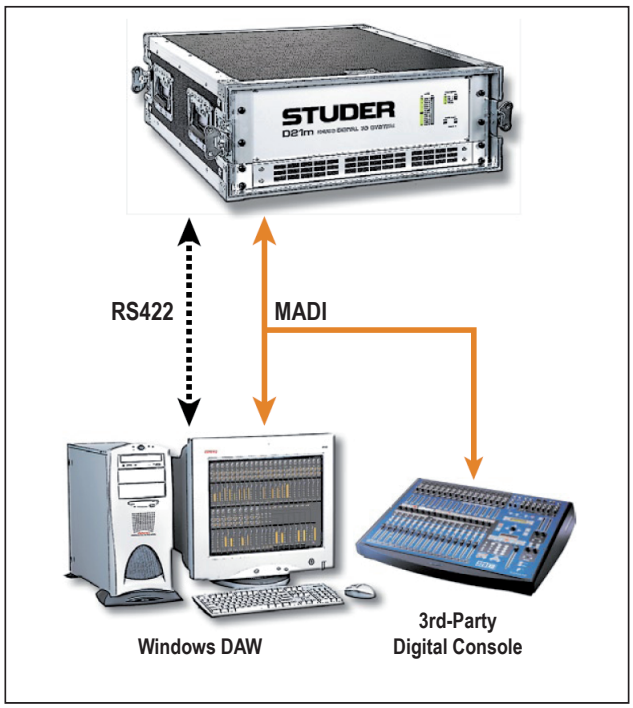
Application Examples



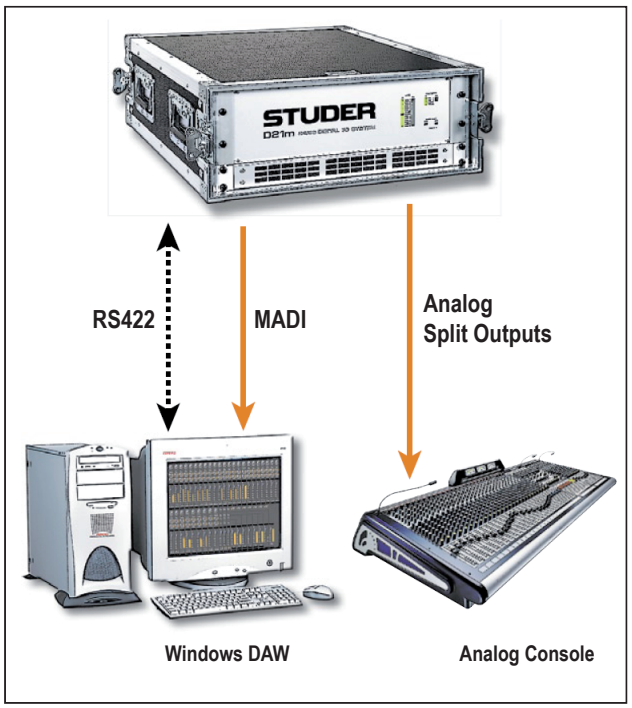
Recording with Windows DAW



Recording with non-Windows DAW



Live recording with 3rd-party digital PA console



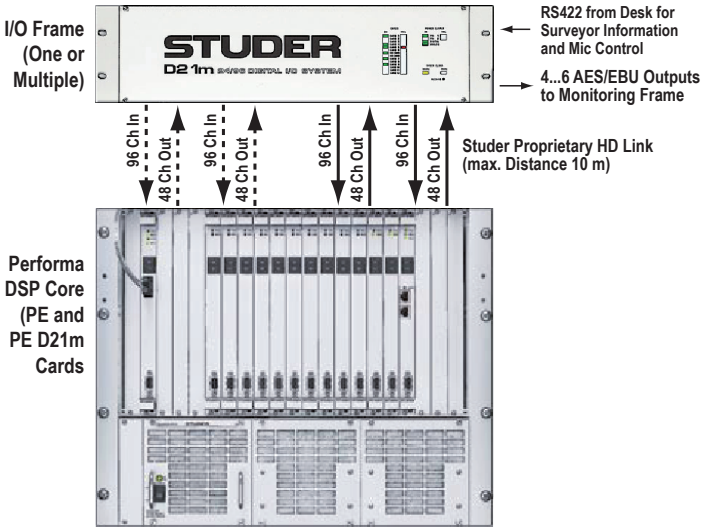
Live recording with analog PA console

5.8 Connection to the Performa Core

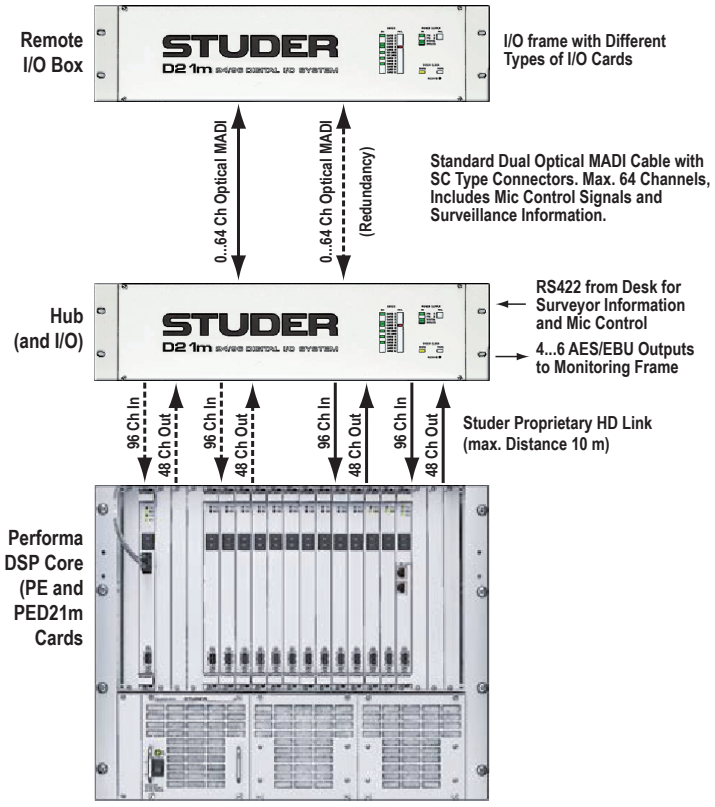
The Performa core is connected to the D21m I/O System in a similar way as the SCore. The main difference is that the HD link connection from the core towards the D21m I/O frame only carries up to 48 channels (at both 48 and 96 kHz). In order to implement a correct mapping of the I/O cards' channels to the HD Link, the 'Performa Mode' switch (or jumper) must be ON on the HD cards. In the Performa core, use of the PE-D21m card (A950.060622) is mandatory. Each card implements one HD link input with up to 96 channels, and one HD link output with up to 48 channels.

Application Examples

Local I/O Only (located close to the core)



Remote I/O Box (within long distance)



6 D21m MODULES

6.1 Available Cards

Name	I/O Format	# of Console Input Channels	# of Console Output Channels	Connector Type	Width (Slots)	Order No.
Analog I/O Cards						
Mic/Line Input (incl. Dir. Outs) *	Mic/Line	4	(4 Dir. Outs)	D25 f	single	A949.0427
Analog Insert *	Line	4	4	D25 f	single	A949.0428
HD Mic/Line Input with Input Transformers (incl. Dir. Outs) *	Mic/Line	4	(4 Dir. Outs)	D25 f	single	A949.0447
Analog Line In	Line	8	–	D25 f	single	A949.0421
Analog Line Out	Line	–	8	D25 f	single	A949.0420
Digital I/O Cards						
AES I/O M2 (no SRCs)	AES/EBU	8 stereo (16 mono)	8 stereo (16 mono)	2 × D25 f	double **	A949.0454
AES I/O M2 (Input SRCs)	AES/EBU	8 stereo (16 mono)	8 stereo (16 mono)	2 × D25 f	double **	A949.0455
AES I/O M2 (In/Out SRCs)	AES/EBU	8 stereo (16 mono)	8 stereo (16 mono)	2 × D25 f; ext. sync XLR	double **	A949.0456
MADI I/O */****	MADI	64 at 48 kHz (32 with redundancy, 64 without redundancy at 96 kHz)	64 at 48 kHz (32 with redundancy, 64 without redundancy at 96 kHz)	SC (optical) SC (optical) 2 × RJ45	double **	A949.0430 A949.0431 A949.0433
ADAT I/O	ADAT	16 at 48 kHz (8 at 96 kHz)	16 at 48 kHz (8 at 96 kHz)	TOSLINK (optical)	single	A949.0425 A949.0429
TDIF I/O	TDIF	16 at 48 kHz (8 at 96 kHz)	16 at 48 kHz (8 at 96 kHz)	2 × D25 f	double **	A949.0426
3G/HD/SD SDI Input	3G/SD/HD	8/16	–	2 × BNC	single	A949.0452
HD/SD SDI I/O	HD/SD	8	8	4 × BNC	single	A949.0442
3G/HD/SD SDI I/O	3G/HD/SD	16	16	4 × BNC	single	A949.0451
Dolby® E/Digital Decoder	AES/EBU	8 16	2 stereo (4 mono) 4 stereo (8 mono)	D15 f	single	A949.0443 A949.0444
CobraNet® I/O	CobraNet	32	32	2 × RJ45	single	A949.0445
Aviom A-Net® Output	A-Net	–	16	RJ45	single	A949.0446
EtherSound® I/O ***	AoIP	64	64	3 × RJ45	double **	–
Rocknet® I/O	RockNet	64/48 (dep. on sw mode)	32/48 (dep. on sw mode)	3 × RJ45 , BNC, USB	double **	–
BCD DTMF Dec./Glits Gen.	Internal	16	8	–	single	5029584
BCD Blits/Glits Gen.	Internal	–	8	–	single	5029586
BCD Minimixer M2	Internal	32	32	–	single	5029587
Livewire® I/O	AoIP	2 × 16	2 × 16	2 × RJ45	single	5014376
Dante®	AoIP	64	64	2 × RJ45 , BNC	double **	5045044
BLU Link®	BLU Link	32	32	2 × RJ45, D9 f	single	5033340
Intercom BNC	AES/EBU	8	8	4 × BNC	single	5037475
Intercom D-Type	AES/EBU	8	8	D25 f	single	5037474
Non-Audio I/O Cards						
GPIO w. Open-Collector Outp.	GPIO	16	16	2 × D25 f	double **	A949.0435
GPIO w. Relay Outputs	GPIO	16	16	2 × D37 f	double **	A949.0436
HD Cards						
HD S	HD Link	max. 96	max. 96	4 × RJ45	single	A949.0412
HD RS422	HD Link + RS422	max. 96	max. 96	4 × RJ45, D9 f	double **	A949.0415
MADI HD	MADI	64 at 48 kHz (32 with redundancy, 64 without redundancy at 96 kHz)	64 at 48 kHz (32 with redundancy, 64 without redundancy at 96 kHz)	SC (optical) SC (optical) RJ45	double **	A949.0411.3x A949.0413.3x A949.0414.3x
Serial / Merger Cards						
Serial	RS422	–	–	D9 f	single	A949.0437
Serial Merger	RS422	–	–	2 × D9 f	single	A949.0438
Serial RJ45	RS422	–	–	RJ45	single	A949.0439
Dual Merger RJ45	RS422	–	–	4 × RJ45	single	A949.0440

* The Analog Insert card belongs to the Mic/Line Input card A949.0427 *at its left*. The insert send signal is always present and may be used as an additional direct output. The insert return is activated from the console.
Please note that the Analog Insert card is not supported by the HD Mic/Line Input card A949.0447, and it does not communicate with the HD card.

** Double-width cards must be inserted into odd slot numbers (e.g. slots 1, 3, 5…).

*** The number of channels transmitted to and from a card may be defined in steps of 8 channels by using DIP switches on the card.

**** Regardless of the number of channels defined with the DIP switches, a switch on the front panel switches the MADI protocol between the standard 56-channel format and the extended 64-channel format. Therefore this switch may have to be set to '56 channel' protocol in order to operate correctly with third-party MADI devices. In this case the number of channels set internally should not exceed 56.

Supply / Miscellaneous			
Primary Power Supply Unit	A949.0404	**Fan Unit**	A949.0597
LED/PSII PCB	A949.0402	**XLR Break-Out Boxes**	div.
Extender Card	A949.0408	**AES/EBU on BNC Break-Out Box**	A949.0586
Air Deflector/Filter Unit	A949.0599	**GPIO Break-Out Box**	A949.0588

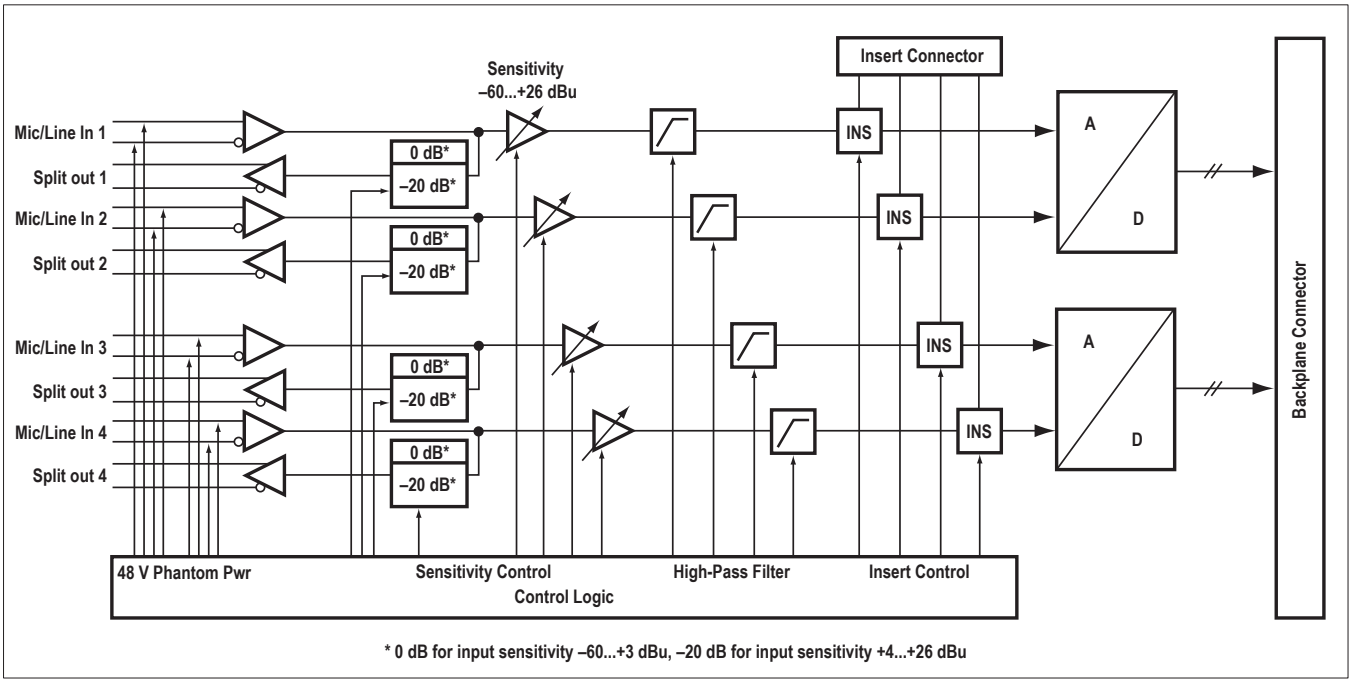
6.2 Analog I/O Cards

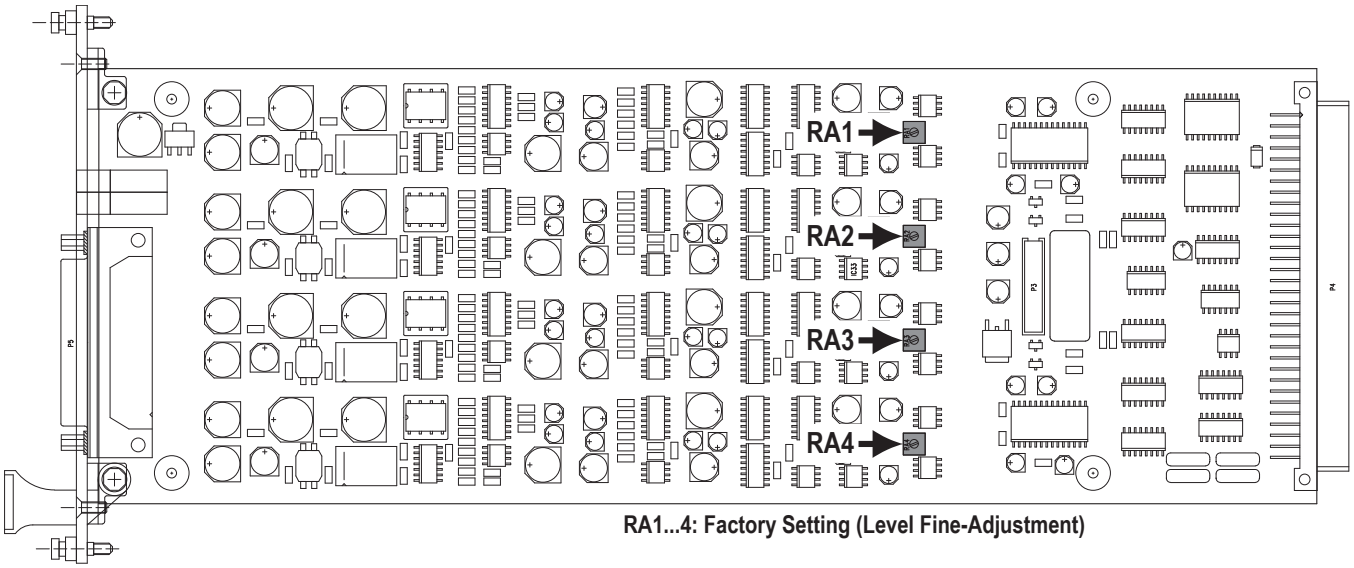
6.2.1 Mic/Line In Card (VISTA, OnAir, ROUTE 6000) A949.0427

Four analog microphone/line inputs, electronically balanced, with 24 bit, 44.1/48/88.2/96 kHz delta-sigma A/D converters. Four analog split outputs, electronically balanced. Green 'signal present' and yellow 'phantom power' indicators per channel. Mic/line sensitivity, gain setting in 1 dB steps, low-cut filter, soft clipping and 48 V phantom power on/off are controlled by the console software. Inputs and split outputs on a standard 25-pin D-type connector (female).

Gain setting: 15 dBu ≙ 0 dB_{FS}, unless otherwise noted.

Input sensitivity (for 0 dB_{FS})	–60…+26 dBu
Input impedance	1.8 kΩ
Split out gain (input sensitivity –60…+3 dBu)	0 dB
(input sensitivity +4…+26 dBu)	–20 dB
Split out impedance	50 Ω
Equivalent input noise (R_i 200 Ω, max. gain)	–124 dBu
Crosstalk (1 kHz)	< –110 dB
Frequency response (30 Hz-20 kHz)	–0.2 dB
THD&N (1 kHz, –1 dB_{FS})	< –97 dB_{FS}
(20 Hz-20 kHz, –30 dB_{FS})	< –111 dB_{FS}
CMRR (30 Hz-20 kHz, all gain settings)	> 55 dB
(1 kHz, input sensitivity –10 to +26 dBu for 0 dB_{FS})	typ. 100 dB
Low-cut filter	75 Hz / 12 dB/oct.
Input delay (local)	38 samples (0.79 ms @ 48 kHz)
(remote)	45 samples (0.94 ms @ 48 kHz)
Current consumption (7 V)	0.2 A
(±15 V)	0.25 A
Operating temperature	0-40 °C



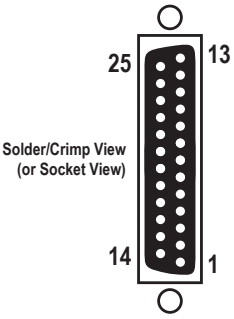


RA1...4: Factory Setting (Level Fine-Adjustment)

LEDs **PHANTOM 1-4** For each channel a yellow LED indicates that pantom power is on.
SIGNAL 1-4 For each channel a green LED indicates whether input signal is present; its brightness is a rough indication of the signal level.

Alignment **RA1-4** *Please note that the level fine-adjust trimmer potentiometers are factory-set. They need to be adjusted only after having repaired the card.*
Select 15 dBu input sensitivity. Feed an analog signal with a level of +6 dBu to one of the analog inputs. Measure the digital output level either on the MADI output or, after routing through the core, on one of the AES/EBU outputs. Adjust the level with the corresponding trimmer potentiometer to –9 dB_{FS}.

Connector Pin Assignment



4× BALANCED MIC IN/SPLIT OUT (25pin D-type, fem., UNC 4-40 thread)

Pin	Signal	Pin	Signal
1	CH 4 split out +	14	CH 4 split out –
2	CH 4 split out GND	15	CH 3 split out +
3	CH 3 split out –	16	CH 3 split out GND
4	CH 2 split out +	17	CH 2 split out –
5	CH 2 split out GND	18	CH 1 split out +
6	CH 1 split out –	19	CH 1 split out GND
7	CH 4 in +	20	CH 4 in –
8	CH 4 in GND	21	CH 3 in +
9	CH 3 in –	22	CH 3 in GND
10	CH 2 in +	23	CH 2 in –
11	CH 2 in GND	24	CH 1 in +
12	CH 1 in –	25	CH 1 in GND
13	n.c.		

Important!

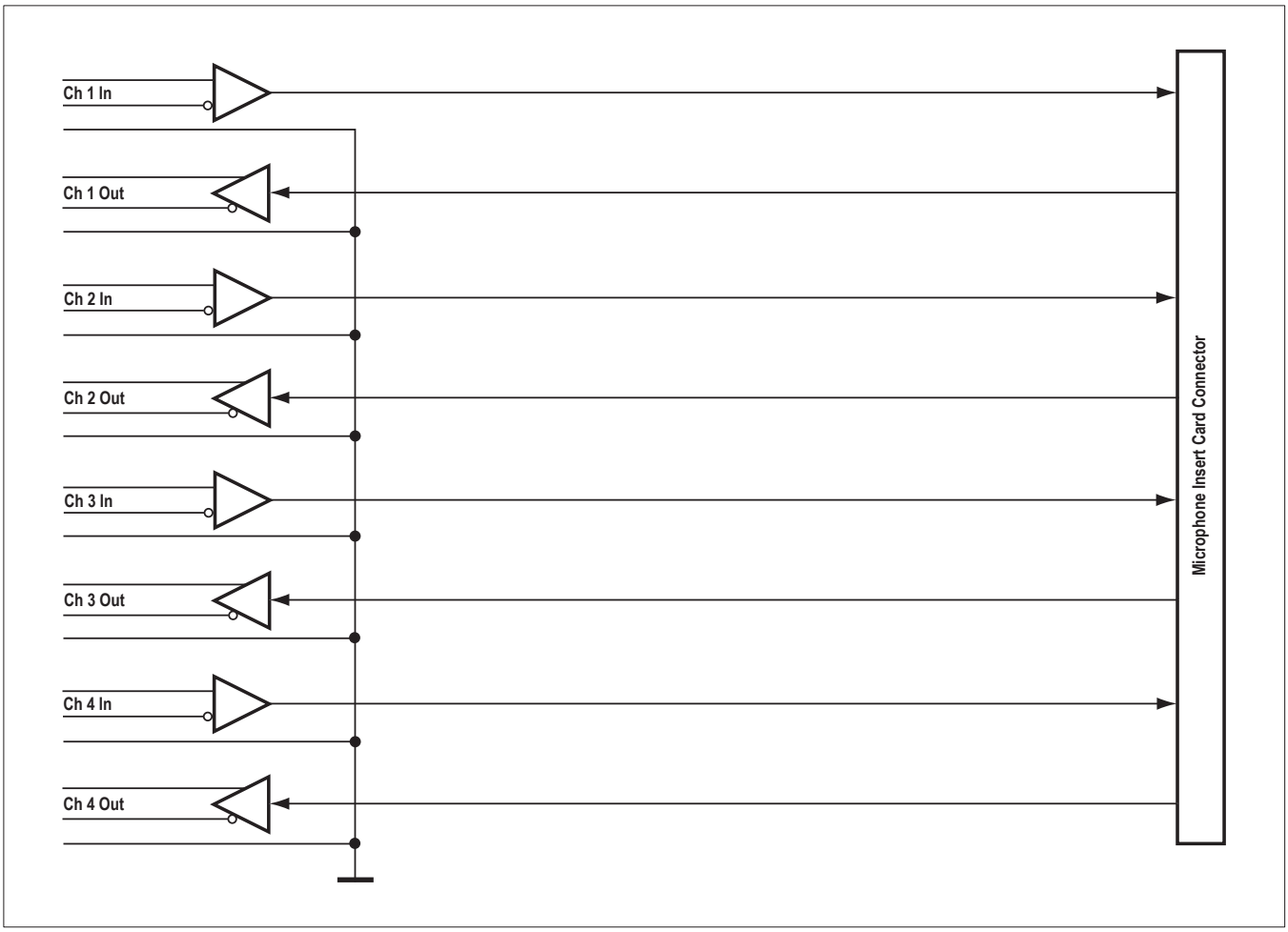
If wired correctly, the microphones are isolated from the D21m chassis. The circuit within the microphone takes its supply from pins 2 and 3 (+ and –) for the positive, and from pin 1 (GND) for the negative reference. If a patch bay is implemented, GND (pin 1 on XLR connector) of each microphone input must be connected to its corresponding GND pin, *but not to the chassis*. If the chassis is used as negative reference for a microphone instead of GND, the GND net of the D21m is pulled towards –48 V. This causes the HD link receivers not to work correctly or to be damaged, depending on the type and the number of microphones connected.
As a workaround, GND and chassis may be connected within the D21m frame. If currents flow between the chassis nets of multiple devices, the analog signals can be degraded in quality (e.g. perceivable as hum).

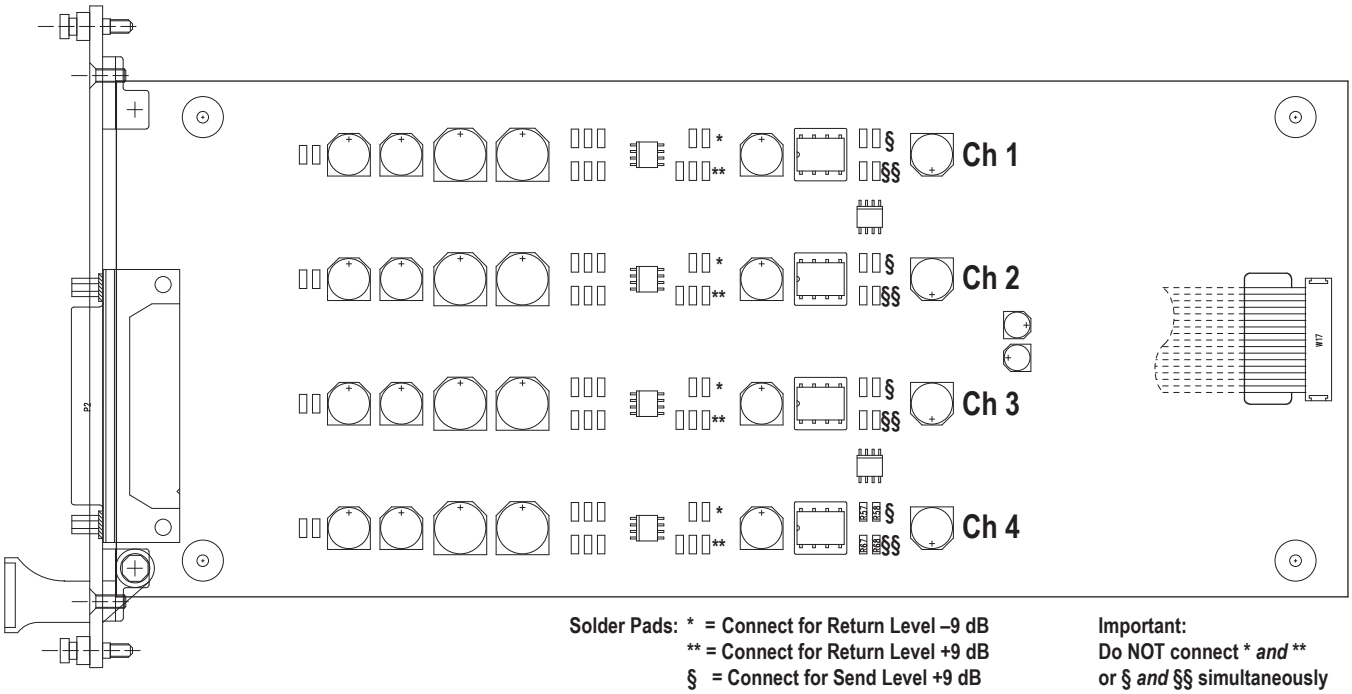
6.2.2 Analog Insert Card (VISTA, OnAir, ROUTE 6000) A949.0428

This card is intended for use with a D21m Mic/Line In card (A949.0427) and features four electronically balanced analog inserts. The insert sends are always active, return on/off is controlled by the console software (default off). Insert sends and returns on standard 25-pin D-type connector (female).
The connection to the Mic/Line In card is established with a ribbon cable.
It is recommended to place a pair of insert cards next to a pair of Mic/Line In cards in order to avoid HD Link channels without audio. For details on the card placement, refer to chapter 5.3.

Note *This card is only supported by the Mic/Line Input card A949.0427.*

In/out level (for 0 dB_{FS})	15 dBu (6 or 24 dBu w. soldering jumper)
Input impedance	10 kΩ
Output impedance	50 Ω
Current consumption (±15 V)	0.05 A
Operating temperature	0-40 °C





Solder Pads: * = Connect for Return Level –9 dB
** = Connect for Return Level +9 dB
§ = Connect for Send Level +9 dB
§§ = Connect for Send Level –9 dB

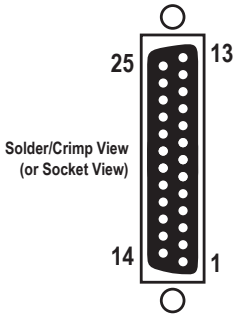
Important:
Do NOT connect * *and* ** or § *and* §§ simultaneously on the same channel!

Solder Pads

Nominal send/return levels are +15 dBu for full scale modulation. These levels may be boosted or cut by 9 dB (i.e., set to +6 dBu or +24 dBu) individually per channel and for send and return, refer to the illustration above.
Please note that the corresponding +9 dB and –9 dB solder pads must not be connected simultaneously.

Connector Pin Assignment

4× BALANCED LINE IN AND OUT (25pin D-type, fem., UNC 4-40 thread)



Pin	Signal	Pin	Signal
1	CH 4 out +	14	CH 4 out –
2	CH 4 out GND	15	CH 3 out +
3	CH 3 out –	16	CH 3 out GND
4	CH 2 out +	17	CH 2 out –
5	CH 2 out GND	18	CH 1 out +
6	CH 1 out –	19	CH 1 out GND
7	CH 4 in +	20	CH 4 in –
8	CH 4 in GND	21	CH 3 in +
9	CH 3 in –	22	CH 3 in GND
10	CH 2 in +	23	CH 2 in –
11	CH 2 in GND	24	CH 1 in +
12	CH 1 in –	25	CH 1 in GND
13	n.c.		

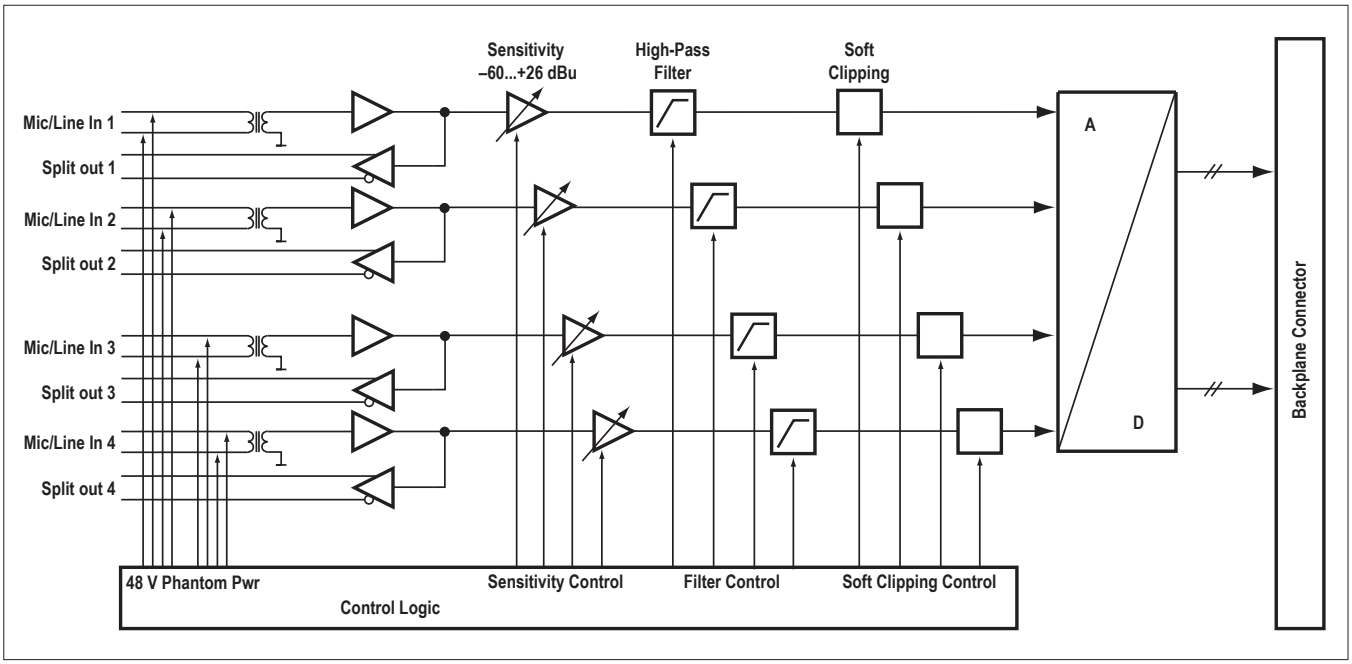
6.2.3 HD Mic/Line In Card (VISTA, OnAir, ROUTE 6000) A949.0447

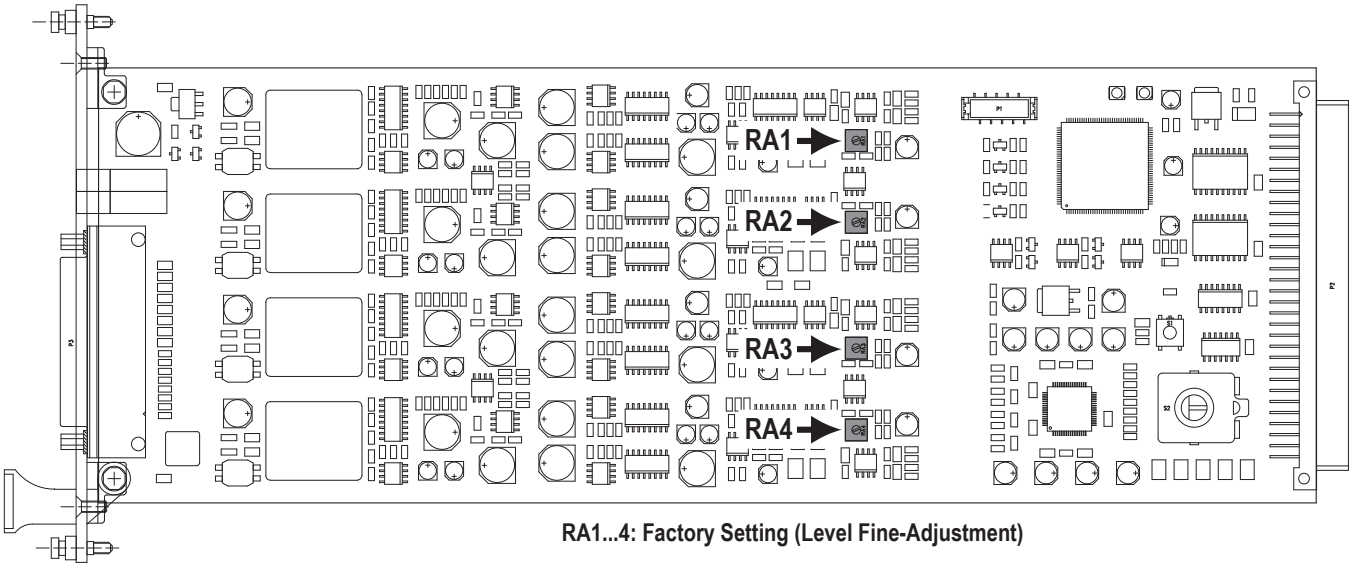
Four analog microphone/line inputs, transformer-balanced, with 24 bit, 44.1/48/88.2/96 kHz delta-sigma A/D converters. Four analog split outputs, electronically balanced. Green 'signal present' and yellow 'phantom power' indicators per channel. Mic/line sensitivity, gain setting in 1 dB steps, low-cut filter, soft clipping and 48 V phantom power on/off are controlled by the console software. Inputs and split outputs on a standard 25-pin D-type connector (female).

Notes *As opposed to the Mic/Line Input card A949.0427, the gain of the split outputs is always unity, i.e., 0 dB.*
This card does not support the Analog Insert Card A949.0428.

Gain setting: 15 dBu ≙ 0 dB_{FS}, unless otherwise noted.

Input sensitivity (for 0 dB_{FS})	–60…+26 dBu
Input impedance	2.2 kΩ
Split out gain	0 dB
Split out impedance	100 Ω
Equivalent input noise (R_i 200 Ω, max. gain)	–124 dBu
Crosstalk (1 kHz)	< –110 dB
Frequency response (30 Hz-20 kHz)	–0.2 dB
THD&N (1 kHz, input level –6 dBu)	< –88 dB
(40 Hz-20 kHz, input level –30 dBu)	< –100 dB
CMRR (30 Hz-20 kHz, all gain settings)	> 60 dB
Low-cut filter	75 Hz, 12 dB/oct.
Input delay (local)	38 samples (0.79 ms @ 48 kHz)
(remote)	45 samples (0.94 ms @ 48 kHz)
Current consumption (7 V)	0.2 A
(±15 V)	0.25 A
Operating temperature	0-40 °C





RA1...4: Factory Setting (Level Fine-Adjustment)

LEDs

PHANTOM 1-4 For each channel a yellow LED indicates that pantom power is on.

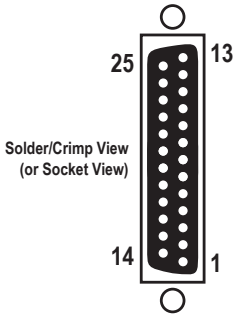
SIGNAL 1-4 For each channel a green LED indicates whether input signal is present; its brightness is a rough indication of the signal level.

Alignment

RA1-4 *Please note that the level fine-adjust trimmer potentiometers are factory-set. They need to be adjusted only after having repaired the card.*
Select 15 dBu input sensitivity. Feed an analog signal with a level of +6 dBu to one of the analog inputs. Measure the digital output level either on the MADI output or, after routing through the core, on one of the AES/EBU outputs. Adjust the level with the corresponding trimmer potentiometer to –9 dB_{FS}.

Connector Pin Assignment

4× BALANCED MIC IN/SPLIT OUT (25pin D-type, fem., UNC 4-40 thread)

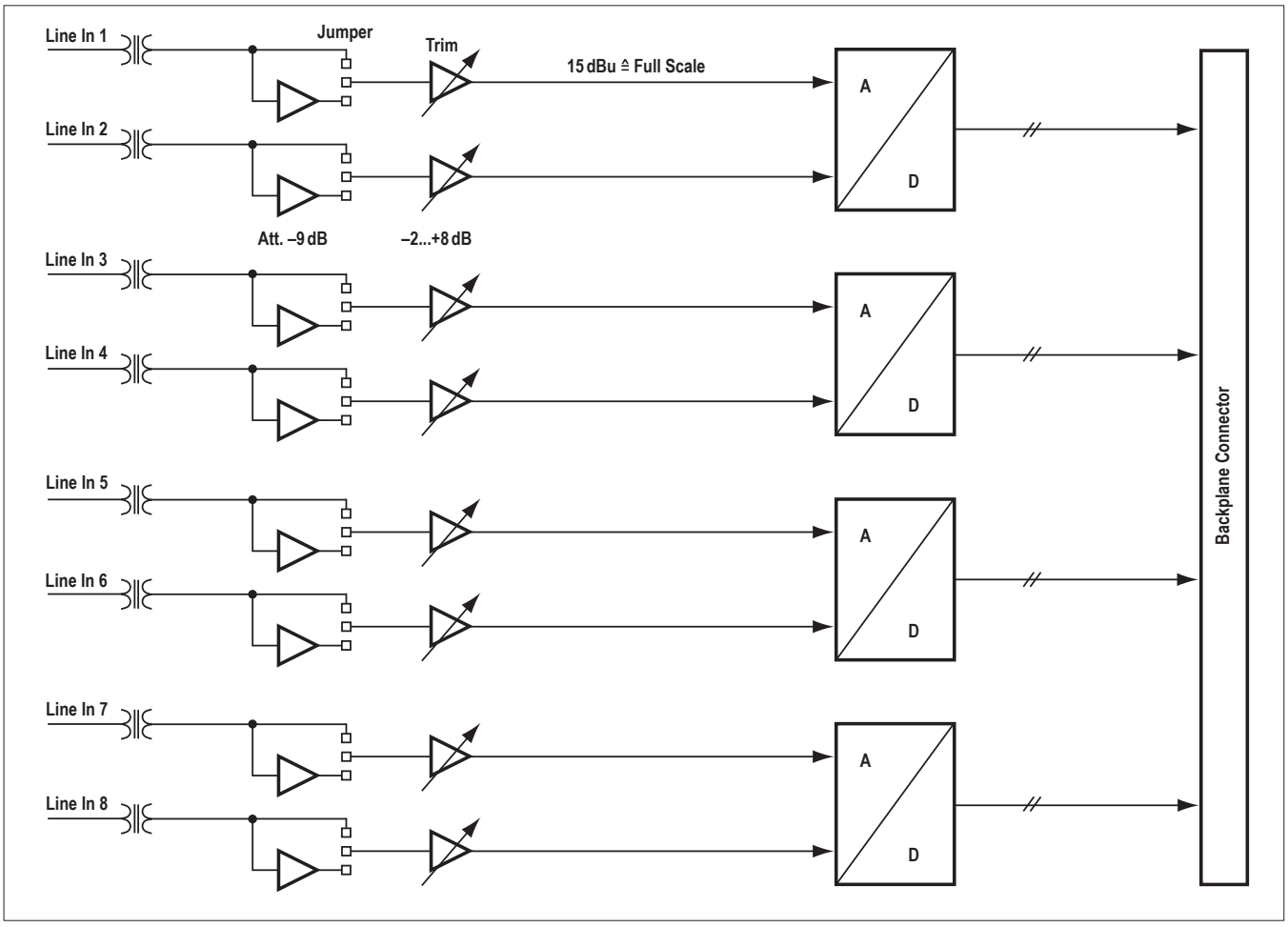


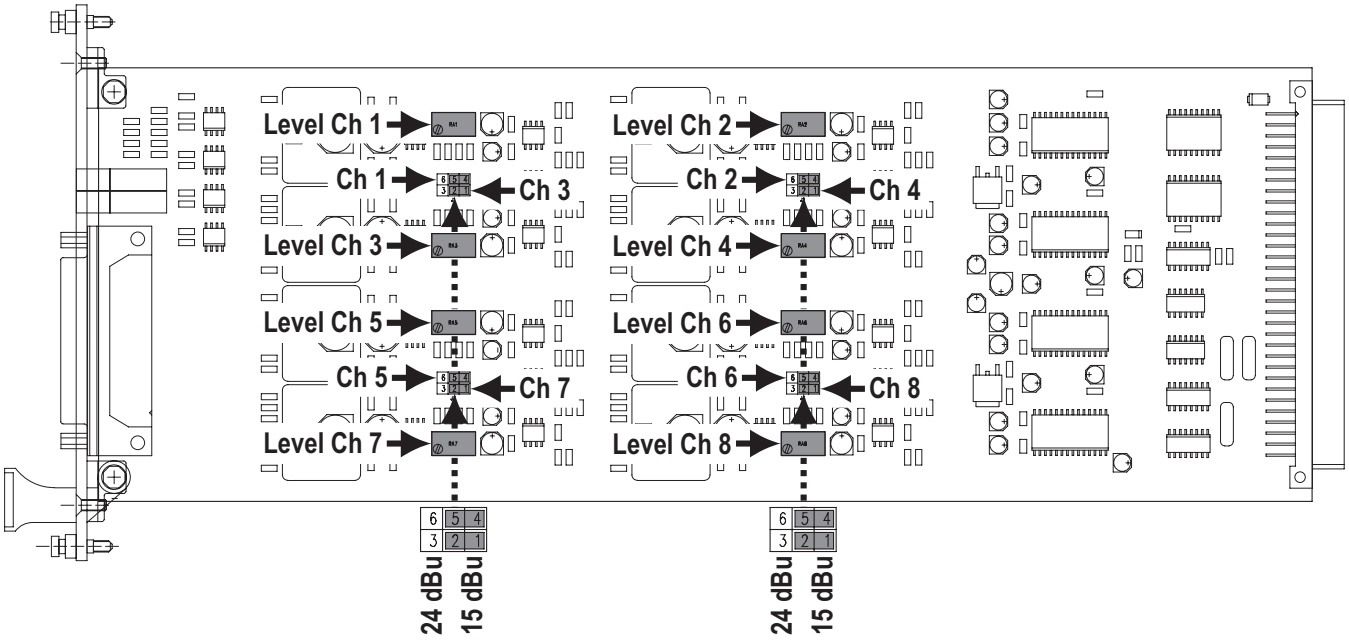
Pin	Signal	Pin	Signal
1	CH 4 split out +	14	CH 4 split out –
2	CH 4 split out GND	15	CH 3 split out +
3	CH 3 split out –	16	CH 3 split out GND
4	CH 2 split out +	17	CH 2 split out –
5	CH 2 split out GND	18	CH 1 split out +
6	CH 1 split out –	19	CH 1 split out GND
7	CH 4 in +	20	CH 4 in –
8	CH 4 in GND	21	CH 3 in +
9	CH 3 in –	22	CH 3 in GND
10	CH 2 in +	23	CH 2 in –
11	CH 2 in GND	24	CH 1 in +
12	CH 1 in –	25	CH 1 in GND
13	n.c.		

6.2.4 Line In Card (VISTA, OnAir, ROUTE 6000) A949.0421

Eight-channel line input card with 24 bit, 44.1/48/88.2/96 kHz A/D Converter, delta-sigma conversion. Transformer-balanced inputs. 96 kHz, 88.2 kHz, 48 kHz, or 44.1 kHz operation. 7-26 dBu input sensitivity. 'Signal present' LED indicator. Inputs on standard 25-pin D-type connector (female).

Input level (for 0 dB_{FS})	15/24 dBu (fixed, jumper-selectable), or 7-26 dBu (adjustable)
Input impedance	> 10 kΩ
Frequency response (20 Hz-20 kHz)	–0.2 dB
THD&N (35 Hz-20 kHz, –1 dB_{FS}, 15 dBu setting)	< –97 dB_{FS}
(1 kHz, –30 dB_{FS}, 15 dBu setting)	< –111 dB_{FS}
Crosstalk (1 kHz)	< –110 dB
Input delay (local)	38 samples (0.79 ms @ 48 kHz)
(remote)	45 samples (0.94 ms @ 48 kHz)
Current consumption (7 V)	0.42 A
(±15 V)	0.1 A
Operating temperature	0-40 °C



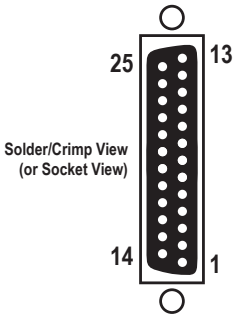


Jumpers **Level (Ch1-8)** Two positions each: 15 dBu (factory default) or 24 dBu.

LEDs **SIGNAL 1-8** For each of the eight channels a green LED indicates if input signal is present; its brightness is a rough indication of the signal level.

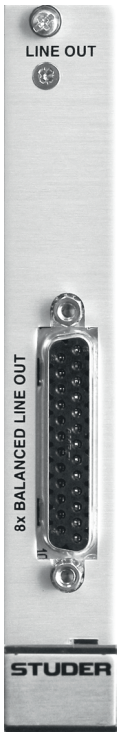
Alignment **RA1-8** *The trimmer potentiometers are factory aligned for 0 dB gain of the 'Trim' stage in the block diagram on the left.*
Set jumper to 15 dBu or 24 dBu. Feed an analog signal with a level of +6 dBu or +15 dBu, respectively, to one of the analog inputs. Measure the level on a digital output. Adjust the level with the corresponding LEVEL trimmer potentiometer to –9 dB_{FS}. If a different input sensitivity has to be adjusted, select the desired range with the jumper and use the LEVEL trimmer potentiometer to adjust to the desired level.
Repeat this alignment for all inputs.

Connector Pin Assignment **8× BALANCED LINE IN** (25pin D-type, female, UNC 4-40 thread)



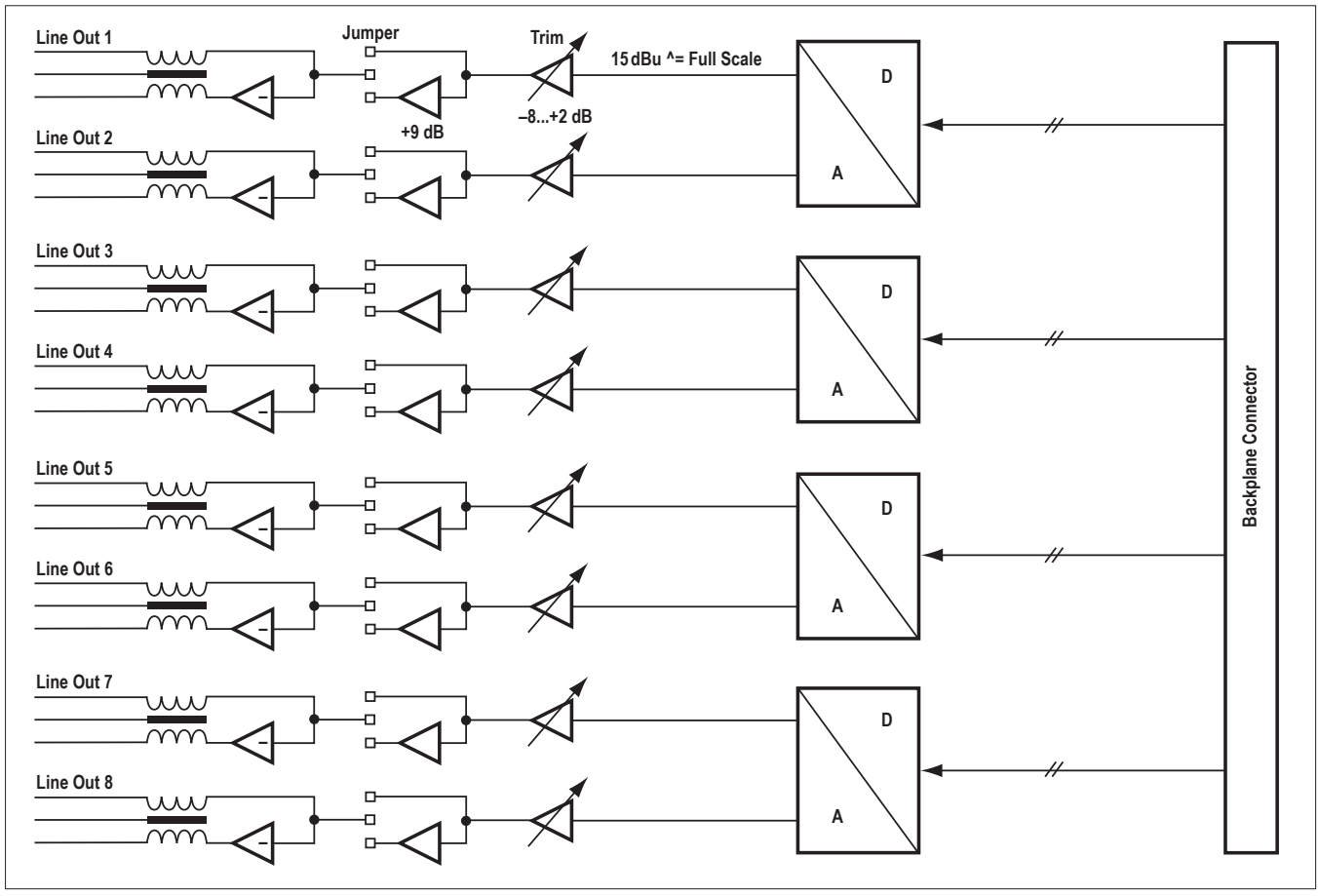
Pin	Signal	Pin	Signal
1	CH 8 in +	14	CH 8 in –
2	CH 8 in GND	15	CH 7 in +
3	CH 7 in –	16	CH 7 in GND
4	CH 6 in +	17	CH 6 in –
5	CH 6 in GND	18	CH 5 in +
6	CH 5 in –	19	CH 5 in GND
7	CH 4 in +	20	CH 4 in –
8	CH 4 in GND	21	CH 3 in +
9	CH 3 in –	22	CH 3 in GND
10	CH 2 in +	23	CH 2 in –
11	CH 2 in GND	24	CH 1 in +
12	CH 1 in –	25	CH 1 in GND
13	n.c.		

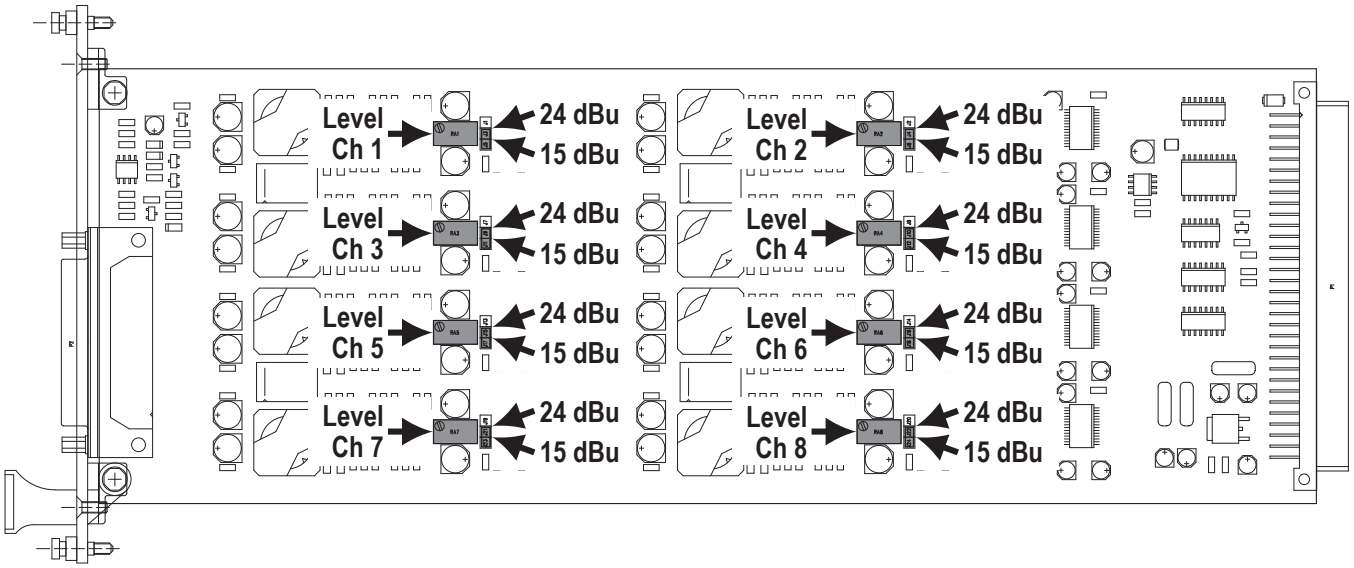
6.2.5 Line Out Card (VISTA, OnAir, ROUTE 6000) A949.0420



Eight-channel, 24 bit line output card with 24 bit D/A converters with 96 kHz, 88.2 kHz, 48 kHz, or 44.1 kHz operation. Electronically balanced outputs. 7…26 dBu max. output level. Outputs on standard 25-pin D-type connector (female).

Output level (for 0 dB_{FS})	15/24 dBu (fixed, jumper-selectable), or 7-26 dBu (adjustable)
Output impedance	40 Ω
Min. load (at +24 dBu)	600 Ω
Frequency response (20 Hz-20 kHz)	–0.2 dB
THD&N (20 Hz-20 kHz, –1 dB_{FS}, jumper at 15 dBu fixed)	< –90 dB_{FS}
(1 kHz, –30 dB_{FS}, jumper at 15 dBu fixed)	< –110 dB_{FS}
Crosstalk (1 kHz)	< –110 dB
Output delay (local)	28 samples (0.58 ms @ 48 kHz)
(remote)	32 samples (0.67 ms @ 48 kHz)
Current consumption (7 V)	0.23 A
(±15 V)	0.25 A
Operating temperature	0-40 °C



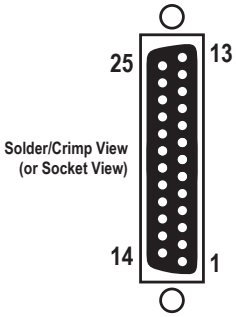


Jumpers **Level (Ch1-8)** Two positions each: 15 dBu (factory default) or 24 dBu.

Alignment **RA1-8** *The trimmer potentiometers are factory aligned for 0 dB gain of the 'Trim' stage in the block diagram on the left.*
Feed a digital audio signal with a level of –10 dB_{FS} to the card. Set the jumpers to either 15 or 24 dBu and measure on an output. Use the corresponding LEVEL trimmer potentiometers to set the output level to +5 or +14 dBu, respectively. If a different output level is required, select the desired range with the jumper and use the LEVEL trimmer potentiometer to adjust to the desired level.
Repeat this alignment for all outputs.

Connector Pin Assignment

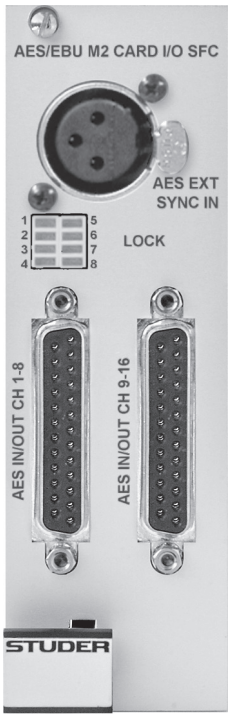
8× BALANCED LINE OUT (25pin D-type, female, UNC 4-40 thread)



Pin	Signal	Pin	Signal
1	CH 8 out +	14	CH 8 out –
2	CH 8 out GND	15	CH 7 out +
3	CH 7 out –	16	CH 7 out GND
4	CH 6 out +	17	CH 6 out –
5	CH 6 out GND	18	CH 5 out +
6	CH 5 out –	19	CH 5 out GND
7	CH 4 out +	20	CH 4 out –
8	CH 4 out GND	21	CH 3 out +
9	CH 3 out –	22	CH 3 out GND
10	CH 2 out +	23	CH 2 out –
11	CH 2 out GND	24	CH 1 out +
12	CH 1 out –	25	CH 1 out GND
13	n.c.		

6.3 Digital I/O Cards

6.3.1 AES/EBU M2 Cards (VISTA, OnAir, ROUTE 6000) A949.0454/.0455/.0456



AES/EBU input/output card with 16 Ch I/O, available in 3 different versions:

A949.0454xx without SRCs (Vista only)
A949.0455xx with input SRCs only
A949.0456xx with input and output SRCs (see adjacent picture).

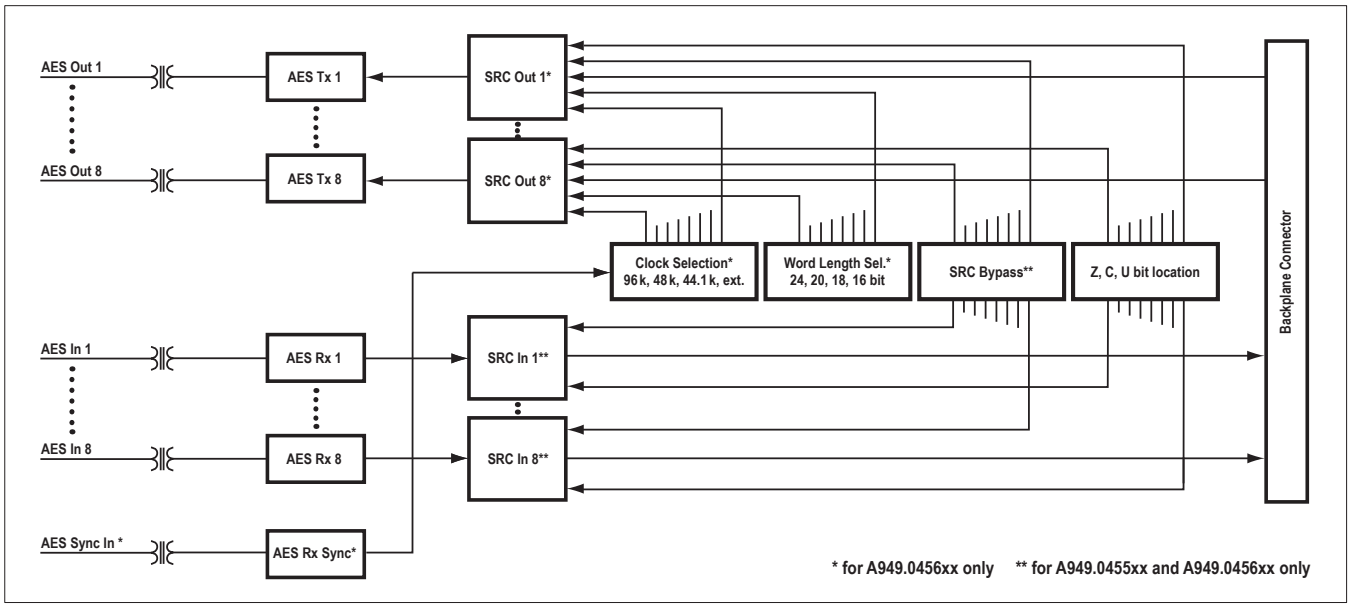
Selectable output sampling rates: 96 kHz, 48 kHz, 44.1 kHz, or external reference (22-108 kHz). Input and output SRCs can individually be bypassed per channel pair. Output dither and word length is selectable for every AES/EBU output to 24, 20, 18 or 16 bit (when the output SRC is enabled). Settings are made with DIP switches. Inputs and outputs are on standard 25-pin D-type connectors (female).

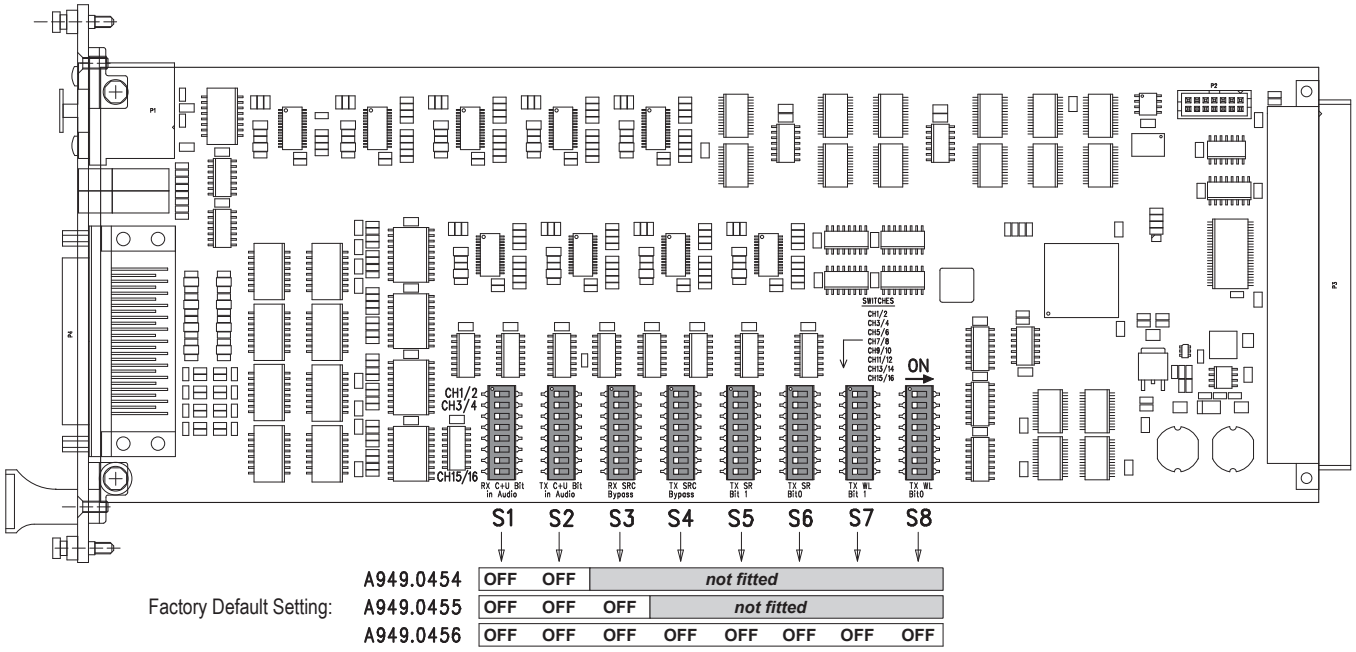
SRC Delay Enabled input and output SRCs each cause a delay (D) that depends on the SRC's input and output sampling rate (f_{S_IN} and f_{S_OUT}). Input and output delays can be calculated using the following formulas.

$$[1]\ f_{S\_IN} > f_{S\_OUT}:\ D = \frac{16}{f_{S\_IN}} + \frac{32}{f_{S\_OUT}}\ [s] \qquad [2]\ f_{S\_OUT} > f_{S\_IN}:\ D = \frac{48}{f_{S\_IN}}\ [s]$$

Examples: *For a 96 kHz input signal and a 48 kHz system clock (i.e., the 'output signal' of the input SRC), input delay is 40 output samples or 0.833 ms (formula [1]). For a 48 kHz system clock (i.e., the 'input signal' of the output SRC) and a 96 kHz output signal, output delay is 96 output samples or 1 ms (formula [2]).*

Input / output impedance		110 Ω
Input sensitivity		min. 0.2 V
Output level (into 110 Ω)		4.0 V
THD + noise		max. –115 dB
SRC range		22-108 kHz
Current consumption	(3.3 V)	A949.0454: 0.43 A/.0455: 0.67 A/.0456: 0.94 A
	(5 V)	0.45 A
Operating temperature		0-40 °C





LEDs **LOCK 1-8** These green LEDs are on if a valid AES/EBU signal is available at the inputs.

DIP Switches

S1 (C+U Bits in Audio) Specifies the usage of the ZCU bits. If OFF, the audio is standard 24 bit PCM; if ON, the LSBs of the audio carry the ZCU bits. This setting both defines at what position the ZCU bits are inserted (receiver) and which bits are used to generate the transmitted ZCU bits (transmitter). Default setting: all OFF.

S2 (C+U Bits Source) If OFF, a static, default ZCU pattern is generated at the transmitter side. If ON, the ZCU bits of the routed source (position depending on setting of S1) are used. Default setting: all OFF.

S3 (Input SRC Bypass) *(A949.0455 and A949.0456 only)* Bypassing (ON) or enabling (OFF) of the SRCs for individual AES/EBU input channels (i.e. audio channel pairs 1+2, 3+4, etc.). Default setting: all OFF.

S4 (Output SRC Bypass) *(A949.0456 only)* Bypassing (ON) or enabling (OFF) of the SRCs for individual AES/EBU output channels (i.e. audio channel pairs 1+2, 3+4, etc.). *For output word length reduction the output SRCs must be enabled. Refer to the paragraph below.* Default setting: all OFF.

S5, S6 (Output Sample Rate) *(A949.0456 only)* Used for setting the sample rate for the AES/EBU output channels (i.e. audio channel pairs 1+2, 3+4, etc.). Corresponding switches on S5 and S6 are used in pairs for each AES/EBU channel, according to the following table and the silkscreen on the PCB. Default setting: All OFF, corresponding to 48 kHz.

S5.x	S6.x	Output Sample Rate
OFF	OFF	48 kHz
OFF	ON	96 kHz
ON	OFF	44.1 kHz
ON	ON	External AES sync

If no valid signal is provided at the **AES EXT SYNC IN** connector but external sync is selected, the output sampling rate will be set to the system clock. Outputs set to 'external' can therefore be used in a very flexible way: Connect

no external sync signal if not necessary, and the output will be clocked with the internal system clock. As soon as an external sync signal is provided to the **AES EXT SYNC IN** connector, the output will automatically be clocked by the extermal sync signal.

S7, S8 (Output Word Length) *(A949.0456 only)* Used for setting the resolution (output word length) for the AES/EBU output channels (i.e. audio channel pairs 1+2, 3+4, etc.). Corresponding switches on S7 and S8 are used in pairs for each AES/EBU channel, according to the following table and the silkscreen on the PCB. Default setting: All OFF, corresponding to 24 bit.

S7.x	S8.x	Output Word Length
OFF	OFF	24 bit
OFF	ON	20 bit
ON	OFF	18 bit
ON	ON	16 bit

Note *For word length reduction the output SRCs must be set to enabled'; if so, the output word length is always 21 bit maximum. Whenever an SRC is enabled, the three least significant bits (LSB) are set to digital zero. This results in the specified dynamic range of 120 dB.*

Special Channel Status and User Bits Data Management

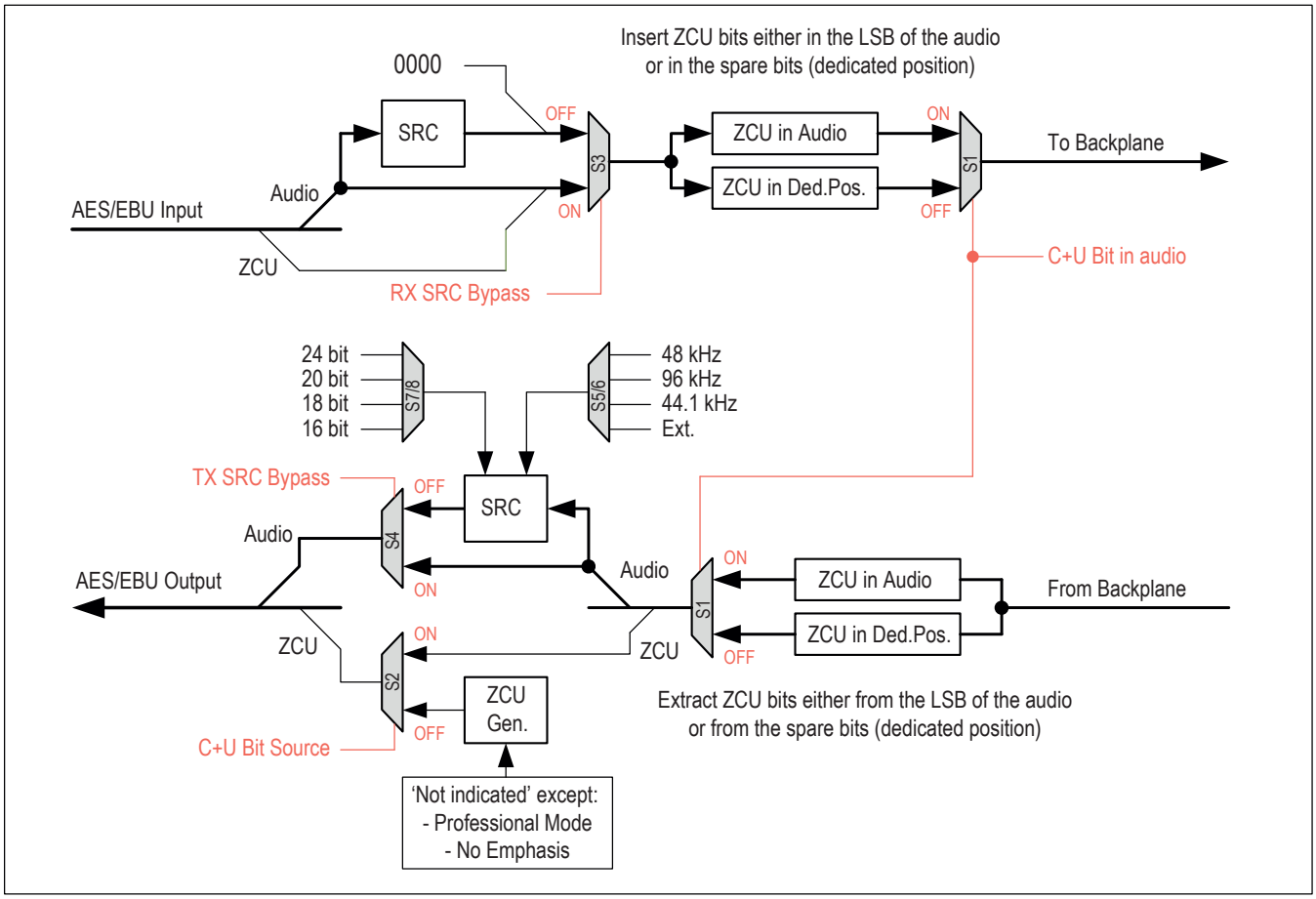
Some intercom systems use a standard AES stream to link control panels to the main base station. In addition to the audio, control data is encoded into the user bits of the AES stream. In order to allow an intercom remote control panel to be transmitted from a Studer stagebox to the base station, a special mode is available on these AES cards.

The channel status and users bits (CU bits) are extracted at the receiver side. Depending on the setting of DIP switch S1, the CU bits are either embedded into the two bottom LSBs of the audio (S1 = ON) or sent to the D21m backplane (S1 = OFF). In addition, the channel status data block start (Z bit) is also embedded into the bottom LSB of the audio to allow recovery of the block start at the destination AES transmitter. If the ZCU bits are embedded into the audio, the audio word length is reduced to 20 bits.

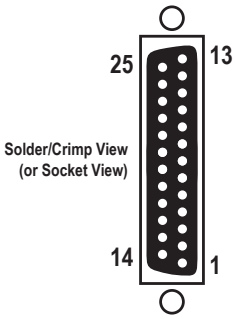
Note *The resulting audio data contains non-audio information in the four bottom bits of the 24 bit audio word and thus is no longer fully PCM. This non-PCM signal may be routed through Studer routers and the routing part of all Studer audio mixing systems, but will not pass through any active processing such as a channel path or sample rate converter.*

At the output side, an additional DIP switch (S2) allows the selection of the source of the transmitted ZCU bits. Either a default, static pattern (S2 = OFF) or the ZCU bits available from the backplane are encoded (S2 = ON). If S2 is ON then the bits from the position specified with S1 are encoded.

The following diagram illustrates the various DIP switches and their effect upon the data path.



Connector Pin Assignment



AES IN/OUT (2 × 25pin D-type, female, UNC 4-40 thread)

Pin	Signal 'CH 1-8'	Signal 'CH 9-16'	Pin	Signal 'CH 1-8'	Signal 'CH 9-16'
1	CH 7/8 out +	CH 15/16 out +	14	CH 7/8 out –	CH 15/16 out –
2	CH 7/8 out screen	CH 15/16 out screen	15	CH 5/6 out +	CH 13/14 out +
3	CH 5/6 out –	CH 13/14 out –	16	CH 5/6 out screen	CH 13/14 out screen
4	CH 3/4 out +	CH 11/12 out +	17	CH 3/4 out –	CH 11/12 out –
5	CH 3/4 out screen	CH 11/12 out screen	18	CH 1/2 out +	CH 9/10 out +
6	CH 1/2 out –	CH 9/10 out –	19	CH 1/2 out screen	CH 9/10 out screen
7	CH 7/8 in +	CH 15/16 in +	20	CH 7/8 in –	CH 15/16 in –
8	CH 7/8 in screen	CH 15/16 in screen	21	CH 5/6 in +	CH 13/14 in +
9	CH 5/6 in –	CH 13/14 in –	22	CH 5/6 in screen	CH 13/14 in screen
10	CH 3/4 in +	CH 11/12 in +	23	CH 3/4 in –	CH 11/12 in –
11	CH 3/4 in screen	CH 11/12 in screen	24	CH 1/2 in +	CH 9/10 in +
12	CH 1/2 in –	CH 9/10 in –	25	CH 1/2 in screen	CH 9/10 in screen
13	n.c.	n.c.			

6.3.2 MADI I/O Cards (VISTA, OnAir, ROUTE 6000) A949.0430/.0431/.0433

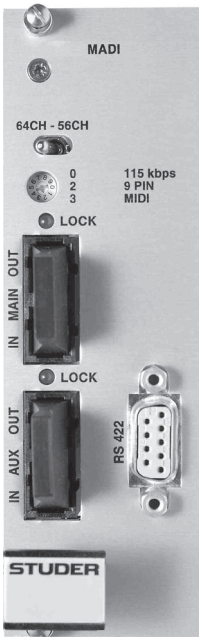
A949.0430xx Optical / multi-mode fibre
A949.0431xx Optical / single-mode fibre
A949.0433xx Twisted-pair (+ additional word clock out).

The MADI I/O cards can establish a 64-channel MADI input and output to the D21m frame, with 44.1/48/88.2/96 kHz operation. Three different versions are available:

Optical inputs and outputs are provided on SC connectors. The version with RJ45 connectors for twisted-pair cable features an additional word clock output on a BNC socket.

The auxiliary interface can be used as a redundant link or, in 96 kHz operation, to extend the number of channels from 32 back to 64. *Please note that in this mode the two cables may only be used to connect from one MADI card to another MADI card (i.e. it is not possible to link 32 channels to one MADI card, and the other 32 channels to a different one).*

It is possible to transmit any serial control signals, such as MIDI or Sony 9-pin (machine control) through a MADI connection without losing any audio bandwidth or microphone control of the remote I/O box. For this purpose, an RS422 connector is located on this card (hub frame side). The desired baud rate can be set with a rotary switch. The pinout of the RS422 connector can be set to 'device' or 'controller' with a DIP switch, depending on the 3rd party serial device connected.

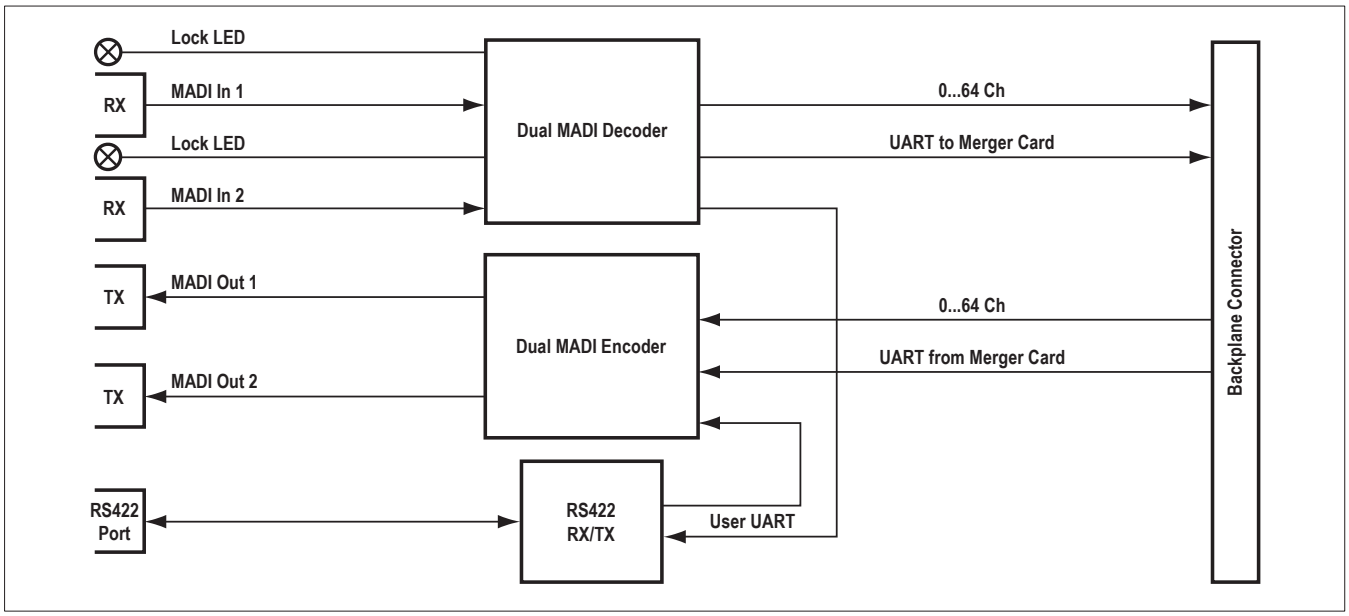


A949.0430
A949.0431

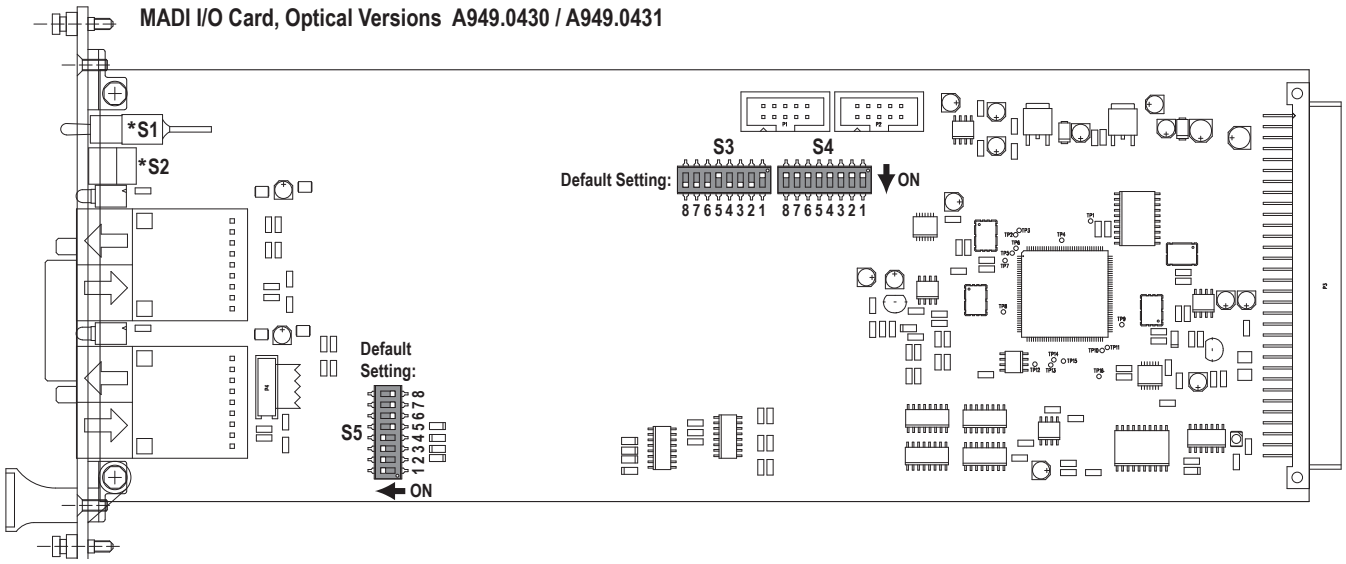
A949.0433

Max. cable length	(A949.0430, multi-mode fibre, wavelength 1300 nm*, ø either 62.5 or 50 µm)	2 km
	(A949.0431, single-mode fibre, wavelength 1300 nm*, ø 9 µm)	15 km
	(A949.0433, CAT5e or better, flexible braid)	75 m
	(A949.0433, CAT7, solid core)	120 m
Input frequencies		44.1/48/88.2/96 kHz ±100 ppm
Current consumption	(3.3 V)	0.4 A
	(5 V)	0.4 A
Operating temperature		0-40 °C

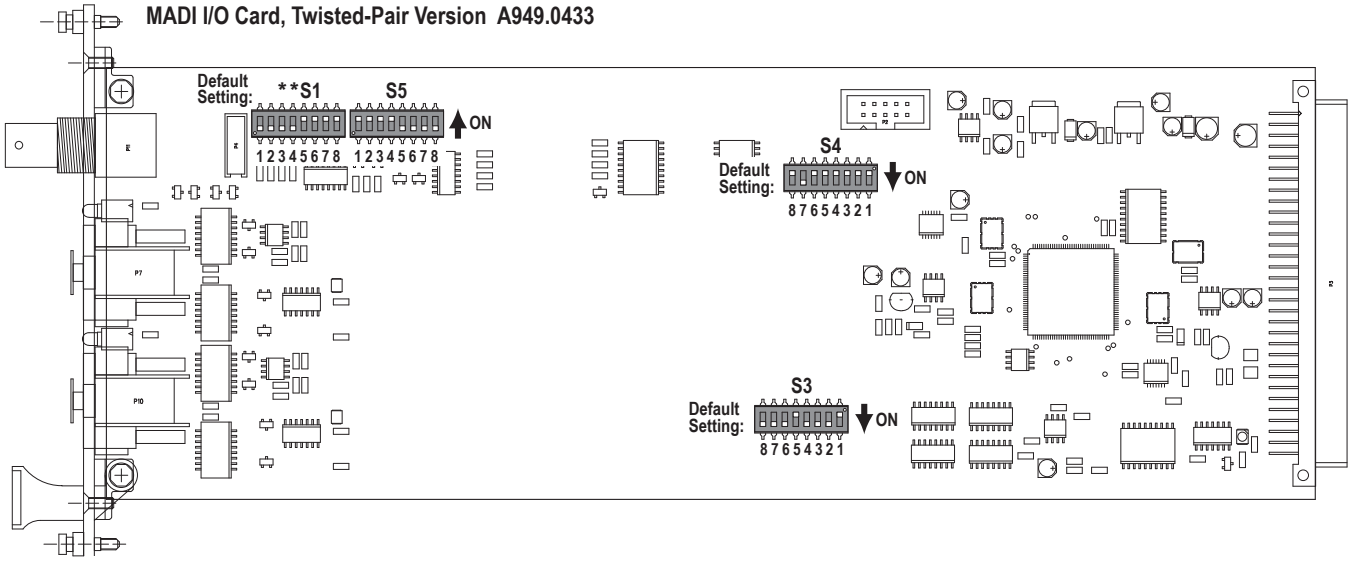
* *different wavelengths on request*



MADI I/O Card, Optical Versions A949.0430 / A949.0431



MADI I/O Card, Twisted-Pair Version A949.0433



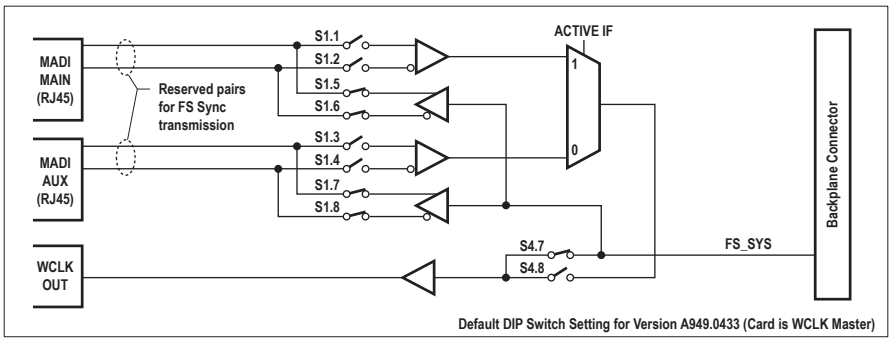
Switches

***S1** *(On versions A949.0430, A949.0431 only)*
Toggle switch for 64 (factory default) or 56 channel selection.

****S1** *(On version A949.0433 only)*
In case of connecting two cores, they must be synchronized. The twisted-pair cable version of the MADI card provides a reserved wire pair for both the main and aux RJ45 sockets on which the sync signal can be transferred. The sync transfer direction (from master to slave) is set using the DIP switches S1 and S4.7/.8. P*lease note that in such a case the twisted-pair wiring has to be done with a crossover cable. On the slave core, the WCLK output must be patched to the WCLK input of the audio clock card.*

(refer to the block diagram on the next page)

1	2	3	4	5	6	7	8	Setting
OFF	OFF	OFF	OFF	ON	ON	ON	ON	Card is Master *(factory default)*
ON	ON	ON	ON	OFF	OFF	OFF	OFF	Card is Slave
NO OTHER SETTINGS ALLOWED !								



***S2** *(On versions A949.0430, A949.0431 only)*
Rotary switch for baud rate selection of the RS422 user interface:

Position	Setting
0	115'200 bps *(factory default)*
1	57'600 bps
2	38'400 bps (9-pin)
3	31'250 bps (MIDI)
4	19'200 bps
5	9'600 bps
6-9	Reserved for future use

S3 DIP switch for D21m channel count setting:

1	2	3	4	5	6	7	8	Number of Channels
ON	ON	ON	ON	-	-	-	-	0 inputs
ON	ON	ON	OFF	-	-	-	-	8 inputs
ON	ON	OFF	ON	-	-	-	-	16 inputs
ON	ON	OFF	OFF	-	-	-	-	24 inputs
ON	OFF	ON	ON	-	-	-	-	32 inputs
ON	OFF	ON	OFF	-	-	-	-	40 inputs
ON	OFF	OFF	ON	-	-	-	-	48 inputs
ON	OFF	OFF	OFF	-	-	-	-	56 inputs
OFF	ON	ON	ON	-	-	-	-	64 inputs (factory default)
OFF : OFF	ON : OFF	ON : OFF	OFF : OFF	- : -	- : -	- : -	- : -	***NOT ALLOWED***
-	-	-	-	ON	ON	ON	ON	0 outputs
-	-	-	-	ON	ON	ON	OFF	8 outputs
-	-	-	-	ON	ON	OFF	ON	16 outputs
-	-	-	-	ON	ON	OFF	OFF	24 outputs
-	-	-	-	ON	OFF	ON	ON	32 outputs
-	-	-	-	ON	OFF	ON	OFF	40 outputs
-	-	-	-	ON	OFF	OFF	ON	48 outputs
-	-	-	-	ON	OFF	OFF	OFF	56 outputs
-	-	-	-	OFF	ON	ON	ON	64 outputs (factory default)
- : -	- : -	- : -	- : -	OFF : OFF	ON : OFF	ON : OFF	OFF : OFF	***NOT ALLOWED***

S4 DIP switch for MADI setting *(on version A949.0433, the switches 4-8 are used differently, as indicated below)*:

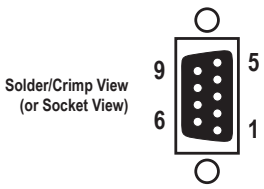
Card Versions	Switch	Setting		
ALL MADI Cards	**1**	OFF: AUX IF is used for channel extension at 96 kHz *(factory default)* ON: AUX IF is used for redundancy at 96 kHz *(in 48 kHz mode, AUX IF is used for redundancy regardless of the switch setting)*		
	2, 3	Both OFF: Standard operation *(factory default)* Both ON: No communication on system UART (used for Hub-Hub interconnection) *One ON and one OFF:* ***NOT ALLOWED****.*		
Optical Versions only (A949.0430, A949.0431)	**4-7**	Must be set to OFF *(factory default)*		
	8	Not used *(factory default: OFF)*		
Twisted-Pair Cable Version only (A949.0433)	**4**	**5**	**6**	**Baud Rate**
	OFF	OFF	OFF	115'200 bps *(factory default)*
	OFF	OFF	ON	57'600 bps
	OFF	ON	OFF	38'400 bps (9-pin)
	OFF	ON	ON	31'250 bps (MIDI)
	ON	OFF	OFF	19'200 bps
	ON	OFF	ON	9'600 bps
	ON ... ON	ON ... ON	OFF ... OFF	Reserved for future use
	7	**8**	**Setting (refer to **S1 above)**	
	ON	OFF	BNC output carries D21m system word clock *(factory default)*	
	OFF	ON	BNC output carries received word clock	

S5 DIP switch for RS422 pinout selection:

1	2	3	4	5	6	7	8	Setting
OFF	OFF	OFF	OFF	ON	ON	ON	ON	**RS422 Controller pinout**
ON	ON	ON	ON	OFF	OFF	OFF	OFF	**RS422 Device pinout** *(factory default)*
NOT OTHER SETTINGS ALLOWED!								

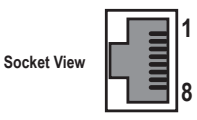
Connector Pin Assignments

CTRL (9pin D-type, female, UNC 4-40 thread)



Pin	RS422 Controller	RS422 Device
1	Chassis	Chassis
2	RxD –	TxD –
3	TxD +	RxD +
4	GND	GND
5	n.c.	n.c.
6	GND	GND
7	RxD +	TxD +
8	TxD –	RxD –
9	Chassis	Chassis

MADI MAIN / MADI AUX (8pin RJ45) *(on version A949.0433 only)*

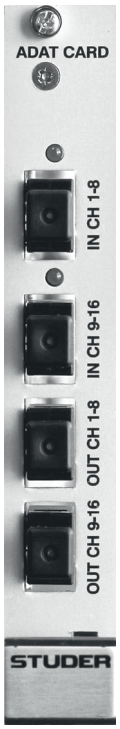


Pin	Signal
1	MADI TxD +
2	MADI TxD –
3	MADI RxD +
4	WCLK TxD/RxD +
5	WCLK TxD/RxD –
6	MADI RxD –
7	reserved
8	reserved

LEDs

LOCK On if a valid MADI signal is available at the input that is locked to the system clock.

6.3.3 ADAT I/O Cards (VISTA, OnAir, ROUTE 6000) A949.0425, A949.0429



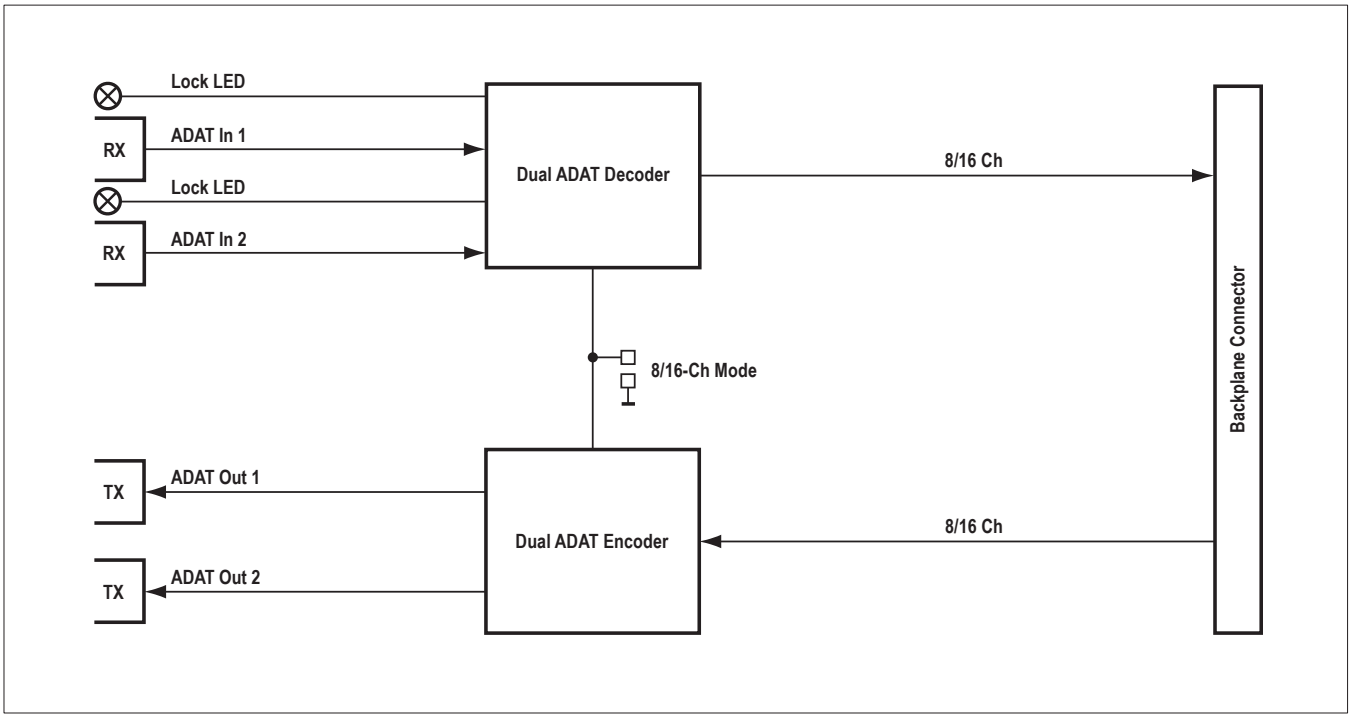
These cards feature two optical eight-channel ADAT inputs and outputs with 44.1/48/88.2/96 kHz operation. Two versions are available:

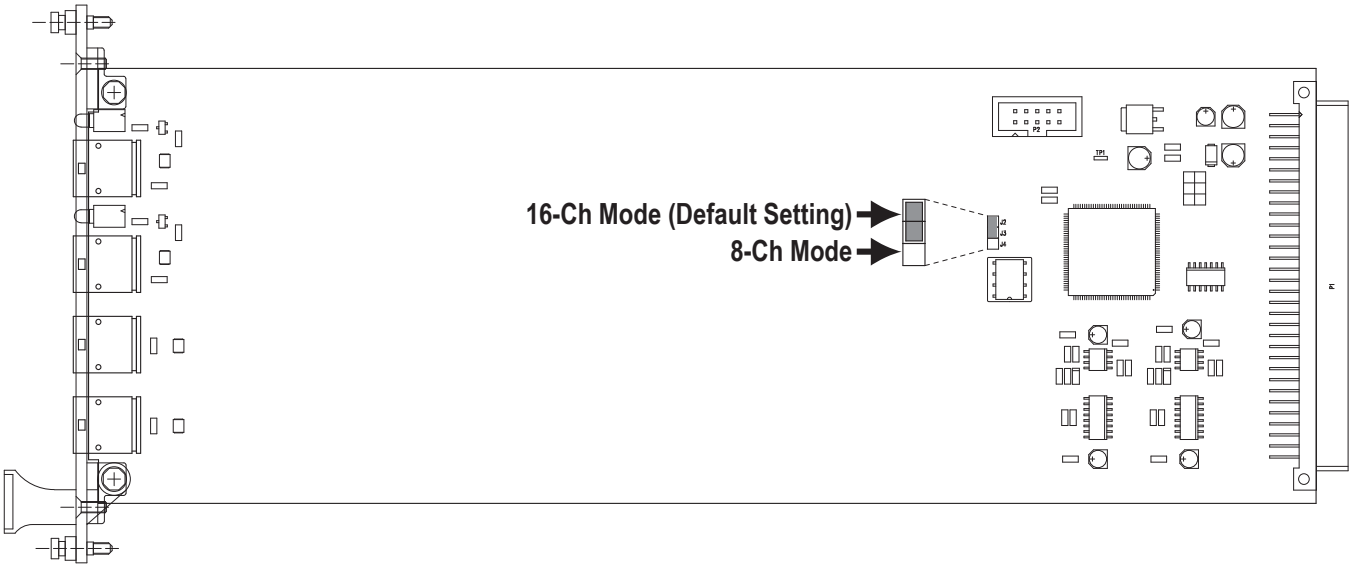
A949.0425xx Standard version for all-plastic fibre (APF)
A949.0429xx Long-distance version for plastic-clad fibre (PCF; optional).

Optical inputs and outputs are provided on TosLink connectors available in APF (980/1000 µm all-plastic fibre) and PCF (200/300 µm plastic-clad fibre) versions. In 96 kHz operation, the number of channels is limited to eight, i.e. four per I/O.

Maximum distance	(A949.0425, APF version)	5 m
	(A949.0429, PCF version)	300 m
		(on request: up to 1000 m)
Transmitter wavelength	(A949.0425, APF version)	660 nm
	(A949.0429, PCF version)	800 nm
Transmitter aperture	(A949.0425, APF version)	980/1000 µm
	(A949.0429, PCF version)	200/300 µm
Receiver wavelength	(both versions)	660 or 800 nm
Receiver aperture	(both versions)	200/300 µm*
Current consumption	(3.3 V)	0.1 A
	(5 V)	0.2 A
Operating temperature		0-40 °C

* use with 980/1000 µm AP fibre possible for distances up to 5 m.



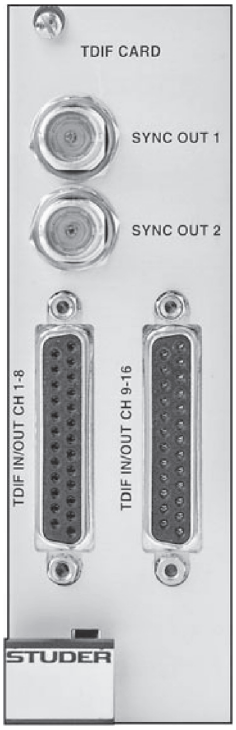


LEDs **IN CH 1-8, 9-16** These LEDs indicate that valid ADAT signals are available at the respective inputs.

Jumper **8/16 Ch Mode** In 96 kHz mode the card handles a total of 8 channels (4 per interface). In order to avoid different numbers of channels when switching from 96 kHz to 48 kHz and vice versa, it is possible to restrict the card to 8 channels even in 48 kHz mode. In such a case only the first interface (**IN/OUT CH 1-8**) is active, as shown in the table below.

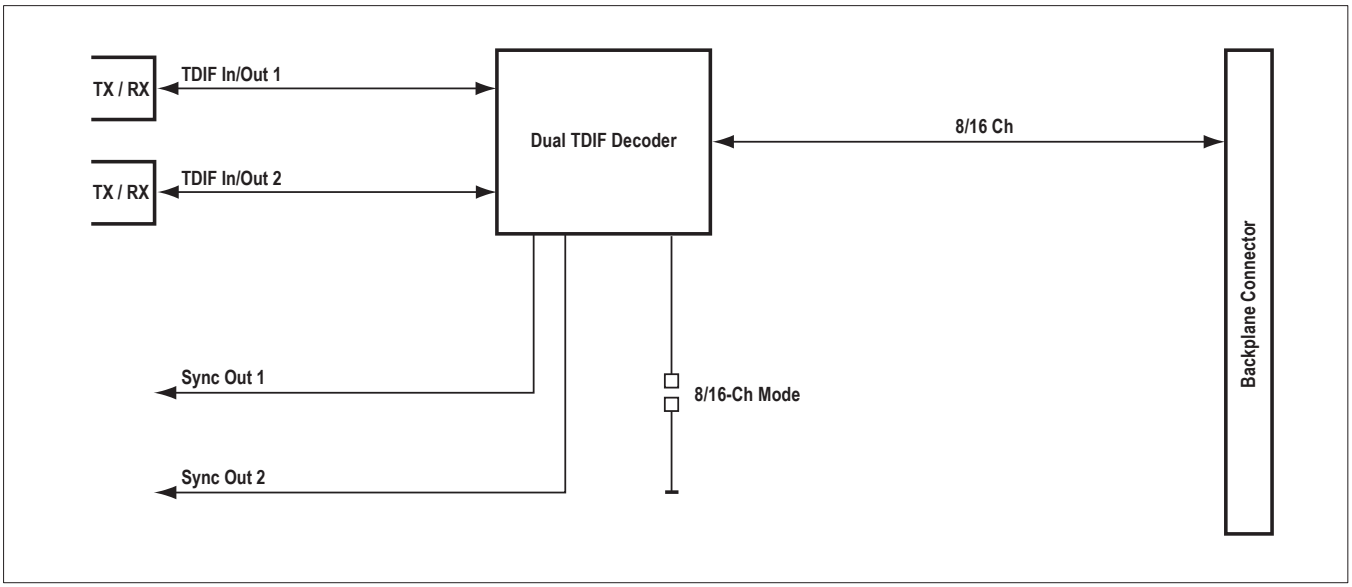
Jumper Setting	Channels on Backplane	Interface 1	Interface 2
16-Ch Mode (factory default)	16 in, 16 out	48 kHz: Ch 1-8	48 kHz: Ch 9-16
		96 kHz: Ch 1-4	96 kHz: Ch 5-8
8-Ch Mode	8 in, 8 out	48 kHz: Ch 1-8	48 kHz: unused
		96 kHz: Ch 1-4	96 kHz: Ch 5-8

6.3.4 TDIF I/O Card (VISTA, OnAir, ROUTE 6000) A949.0426



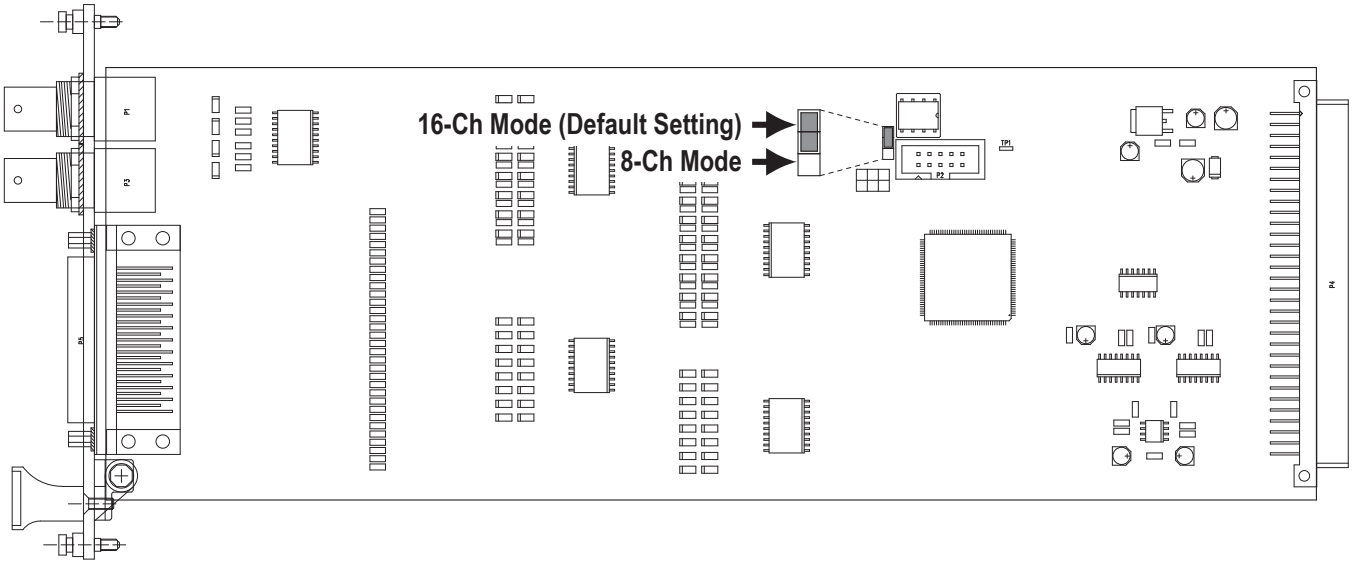
This card provides two eight-channel TDIF I/O interfaces with 96 kHz, 88.2 kHz, 48 kHz, or 44.1 kHz operation with wordclock sync outputs on BNC connectors. Inputs and outputs are provided on standard 25-pin D-type connectors (female).
In 96/88.2 kHz operation, the number of channels is limited to eight, i.e. four per I/O.

TDIF inputs/outputs	according to TDIF specifications
Current consumption (3.3 V)	5 mA
(5 V)	0.1 A
Operating temperature	0-40 °C

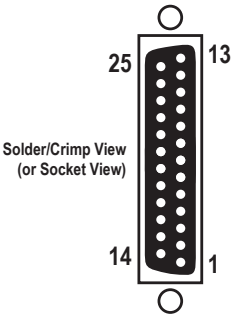


Jumper **8/16 Ch Mode** In 96 kHz mode the card handles a total of 8 channels (4 per interface). In order to avoid different numbers of channels when switching from 96 kHz to 48 kHz and vice versa, it is possible to restrict the card to 8 channels even in 48 kHz mode. In such a case only the first interface (**TDIF IN/OUT CH 1-8**) is active, as shown in the table below.

Jumper Setting	Channels on Backplane	Interface 1	Interface 2
16-Ch Mode (factory default)	16 in, 16 out	48 kHz: Ch 1-8	48 kHz: Ch 9-16
		96 kHz: Ch 1-4	96 kHz: Ch 5-8
8-Ch Mode	8 in, 8 out	48 kHz: Ch 1-8	48 kHz: unused
		96 kHz: Ch 1-4	96 kHz: Ch 5-8

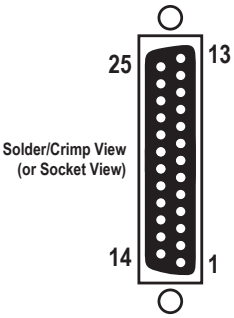


Connector Pin Assignment, 48 kHz Operation (2 × 25pin D-type, female, UNC 4-40 thread)



Pin	Signal CH 1-8	Signal CH 9-16	Pin	Signal CH 1-8	Signal CH 9-16
1	CH 1/2 out	CH 9/10 out	14	GND	GND
2	CH 3/4 out	CH 11/12 out	15	GND	GND
3	CH 5/6 out	CH 13/14 out	16	GND	GND
4	CH 7/8 out	CH 15/16 out	17	GND	GND
5	LRCK out	LRCK out	18	EMPH out	EMPH out
6	FS 0 out	FS 0 out	19	FS1 out	FS1 out
7	GND	GND	20	FS0 in	FS0 in
8	FS 1 in	FS 1 in	21	EMPH in	EMPH in
9	LRCK in	LRCK in	22	GND	GND
10	CH 7/8 in	CH 15/16 in	23	GND	GND
11	CH 5/6 in	CH 13/14 in	24	GND	GND
12	CH 3/4 in	CH 11/12 in	25	GND	GND
13	CH 1/2 in	CH 9/10 in			

Connector Pin Assignment, 96 kHz Operation (2 × 25pin D-type, female, UNC 4-40 thread)



Pin	Signal CH 1-8	Signal CH 9-16	Pin	Signal CH 1-8	Signal CH 9-16
1	CH 1 out	CH 5 out	14	GND	GND
2	CH 2 out	CH 6 out	15	GND	GND
3	CH 3 out	CH 7 out	16	GND	GND
4	CH 4 out	CH 8 out	17	GND	GND
5	LRCK out	LRCK out	18	EMPH out	EMPH out
6	FS 0 out	FS 0 out	19	FS1 out	FS1 out
7	GND	GND	20	FS0 in	FS0 in
8	FS 1 in	FS 1 in	21	EMPH in	EMPH in
9	LRCK in	LRCK in	22	GND	GND
10	CH 4 in	CH 8 in	23	GND	GND
11	CH 3 in	CH 7 in	24	GND	GND
12	CH 2 in	CH 6 in	25	GND	GND
13	CH 1 in	CH 5 in			

6.3.5 3G SDI Input Card (VISTA, OnAir, ROUTE 6000) A949.0452

The 3G/HD/SD SDI (serial digital interface) 16-channel de-embedder card is able to de-embed eight or 16 audio channels from SDI-SD as well as from SDI-HD and 3G (full HD) video streams. For the D21m I/O system it acts as an eight- or 16-channel audio input card. These two modes are determined by DIP switches located on the card.
The SDI standard defines up to 16 audio channels transmitted within a video signal. These 16 channels are divided into four groups of four each. The user can determine by hardware switches whether all four groups, or only groups 1&2, or only groups 3&4 will be de-embedded.
The card hosts SRCs (sampling rate converters) that are bypassed per default. When bypassed, the SDI card is fully compatible to receiving embedded Dolby® E audio data. The SRCs can be enabled in case the audio extracted from the SDI stream is not in sync with the local system. This means that the mixing console can run fully independent of the video sync used for SDI.
If the SRCs are bypassed, the card works at a sampling rate of 48 kHz only.

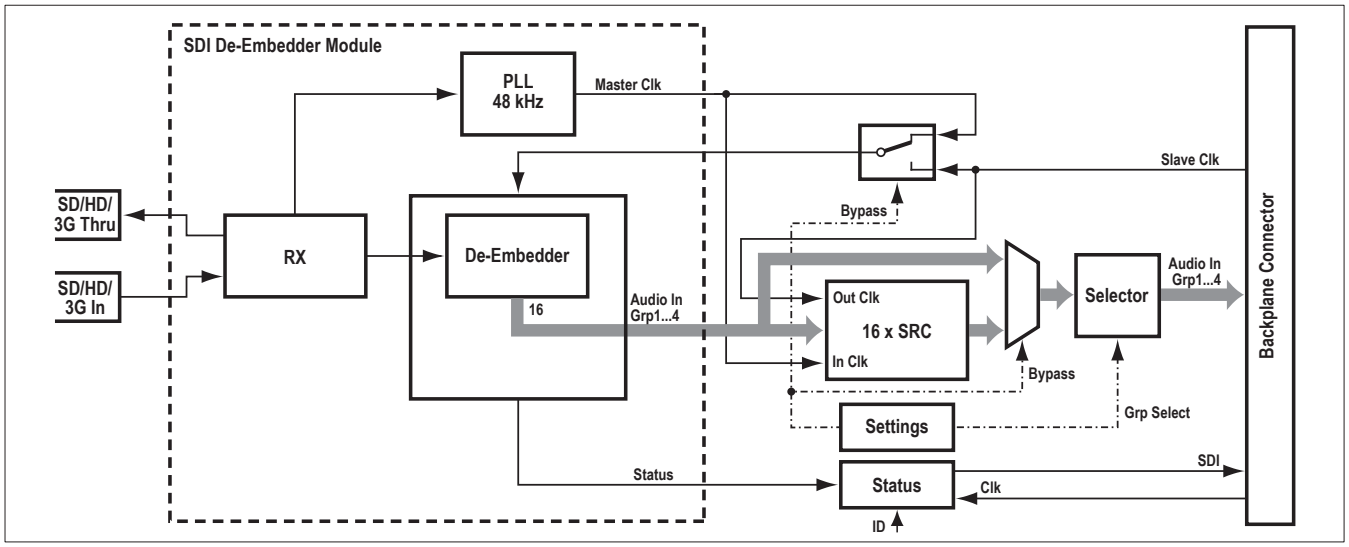
SRC Delay Enabled input and output SRCs each cause a delay (D) that depends on the SRC's input and output sampling rate (f_{S_IN} and f_{S_OUT}). Input and output delays can be calculated using the following formulas.

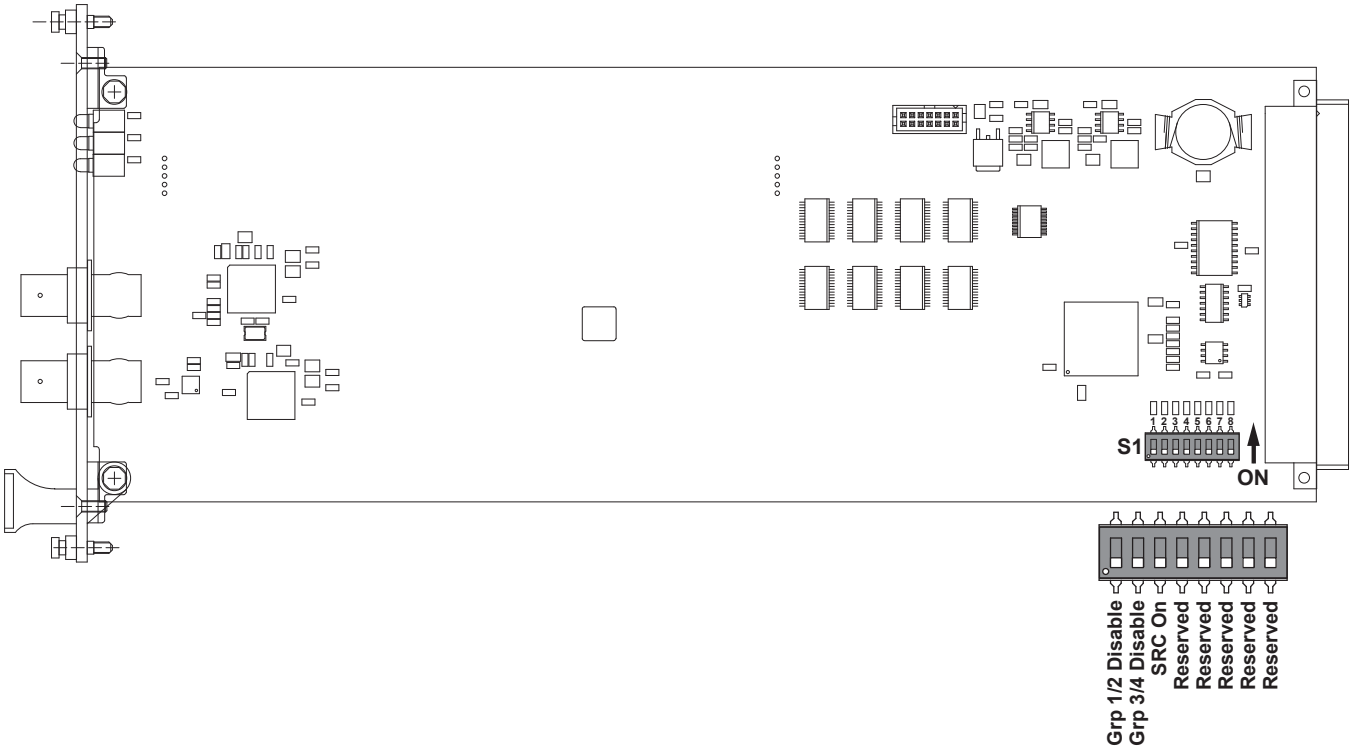
$$[1]\ f_{S\_IN} > f_{S\_OUT}:\ D = \frac{16}{f_{S\_IN}} + \frac{32}{f_{S\_OUT}}\ [s] \qquad [2]\ f_{S\_OUT} > f_{S\_IN}:\ D = \frac{48}{f_{S\_IN}}\ [s]$$

Examples: *For a 96 kHz input signal and a 48 kHz system clock (i.e., the 'output signal' of the input SRC), input delay is 40 output samples or 0.833 ms (formula [1]). For a 48 kHz system clock (i.e., the 'input signal' of the output SRC) and a 96 kHz output signal, output delay is 96 output samples or 1 ms (formula [2]).*

Operating modes	8- or 16-ch console input (de-embedder)
Selectable SDI groups	1&2, 3&4, or all
Connectors	IN, THROUGH (BNC, 75 Ω)
Cable length	max. 50 m
Latency* (de-embedder)	< 360 µs + D (D = SRC delay if active; s. above)
Current consumption (5 V)	0.9 A
Operating temperature	0-40 °C

* Audio latency times are identical for all channels and all groups.





LEDs

SDI LOCK (Green); indicates a valid (3G, HD or SD) SDI signal at the input.

HD (Yellow); indicates a valid HD SDI signal at the input.

3G (Yellow); indicates a valid 3G SDI signal at the input.

DIP Switches

S1.1, S1.2

S1.1	S1.2	Definition
OFF	OFF	All de-embedders active, card has 16 input channels
OFF	ON	Only groups 1 and 2 are de-embedded, card has 8 input channels
ON	OFF	Only groups 3 and 4 are de-embedded, card has 8 input channels
ON	ON	All de-embedders inactive, card has 0 input channels

S1.3

S1.3	Definition
OFF	SRCs bypassed *(factory default)*
ON	SRCs active

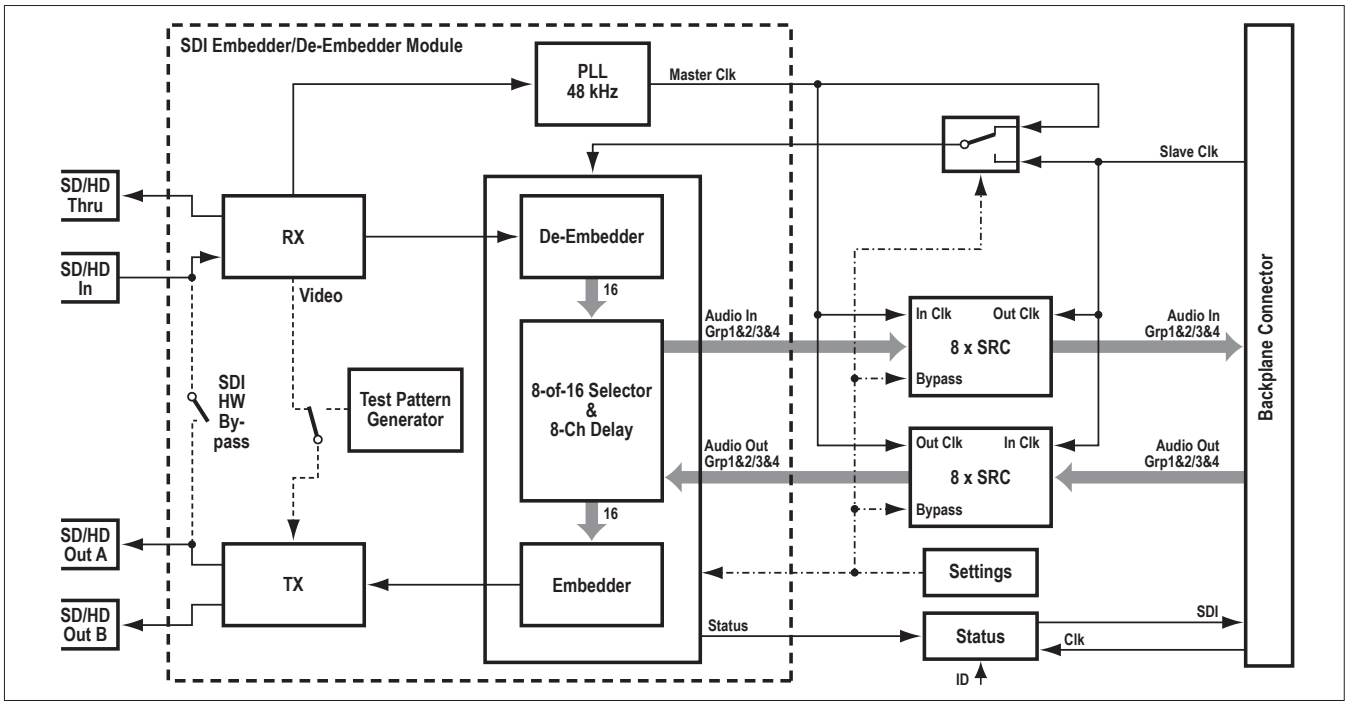
S1.4-S1.8 reserved

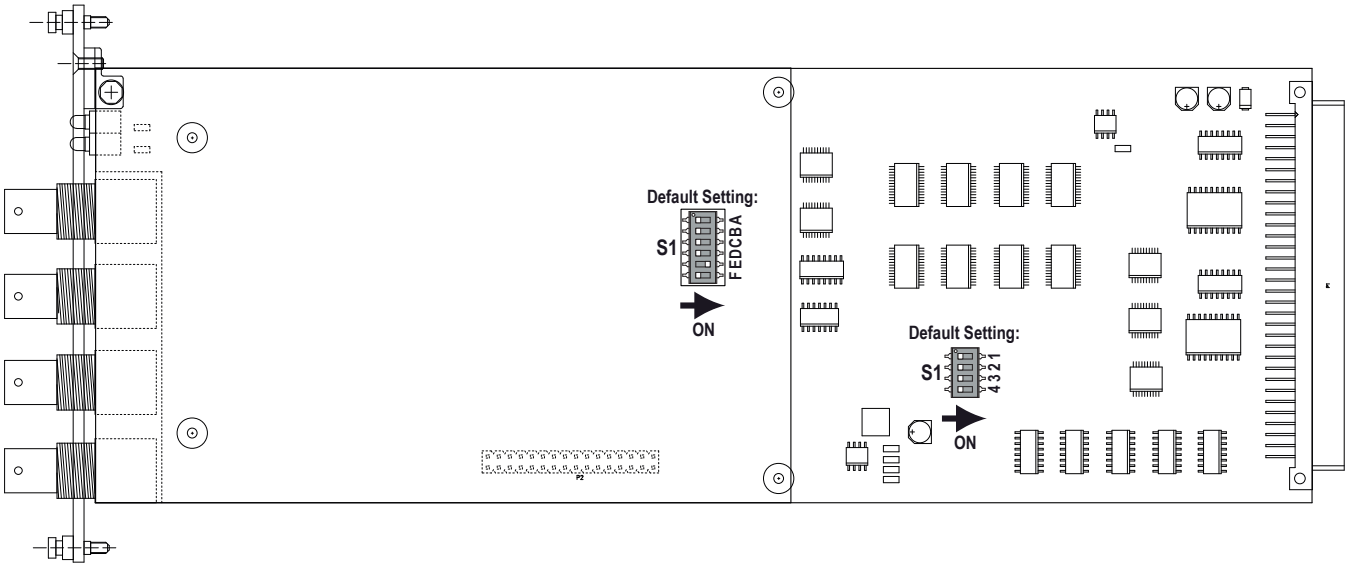
6.3.6 SDI I/O Card (VISTA, OnAir, ROUTE 6000) A949.0442

The HD/SD SDI (serial digital interface) embedder/de-embedder card is able to handle video signals according to the SD as well as the HD standard. It can act as an eight-channel embedder, an eight-channel de-embedder, or as a combination of the two. Therefore, for the D21m I/O system it may act as an eight-channel audio input card, an eight-channel audio output card, or an eight-channel input and output card. These three modes are determined by DIP switches located on the card.
The SDI standard defines up to 16 audio channels transmitted within a video signal. These 16 channels are divided into four groups of four channels each. The user can select which two groups are to be embedded or de-embedded by DIP switches on the card: either groups 1&2, or groups 3&4. It is also possible to clear the SDI data structure possibly present in the incoming video signal and to allocate the groups from scratch.
The D21m SDI card hosts sampling rate converters for both the audio inputs (de-embedding) and outputs (embedding). So the mixing console can run independent of the video sync used for SDI. The sampling rate converters can be bypassed. When bypassed, the SDI card is fully compatible to transmitting the Dolby® E audio format. If power is switched off, the input is hardware-bypassed to output A. *If the SRCs are bypassed, the card works at a sampling rate of 48 kHz only.*

Operating modes	8-ch console output (embedder) and/or 8-ch console input (de-embedder)
Selectable SDI groups	1&2, or 3&4
Connectors	IN, OUT A, OUT B, THROUGH (BNC, 75 Ω)
Cable length	max. 50 m
Audio latency* (de-embedder + embedder)	HD: <800 µs; SD: <2.6 ms
Current consumption (5 V)	1 A
Operating temperature	0-40 °C

* Audio latency times are identical for all channels and all groups.





LEDs

SDI LOCK Indicates a valid (HD or SD) SDI signal at the input.

HD Indicates a valid HD SDI signal at the input.

DIP Switches **S1**

Switch	Setting
1	OFF: Enable de-embedder *(factory default)*
2	OFF: Enable embedder *(factory default)*
3	OFF: SRC bypass *(factory default)*
4	reserved *(must always be OFF)*

DIP Switch on SDI Module

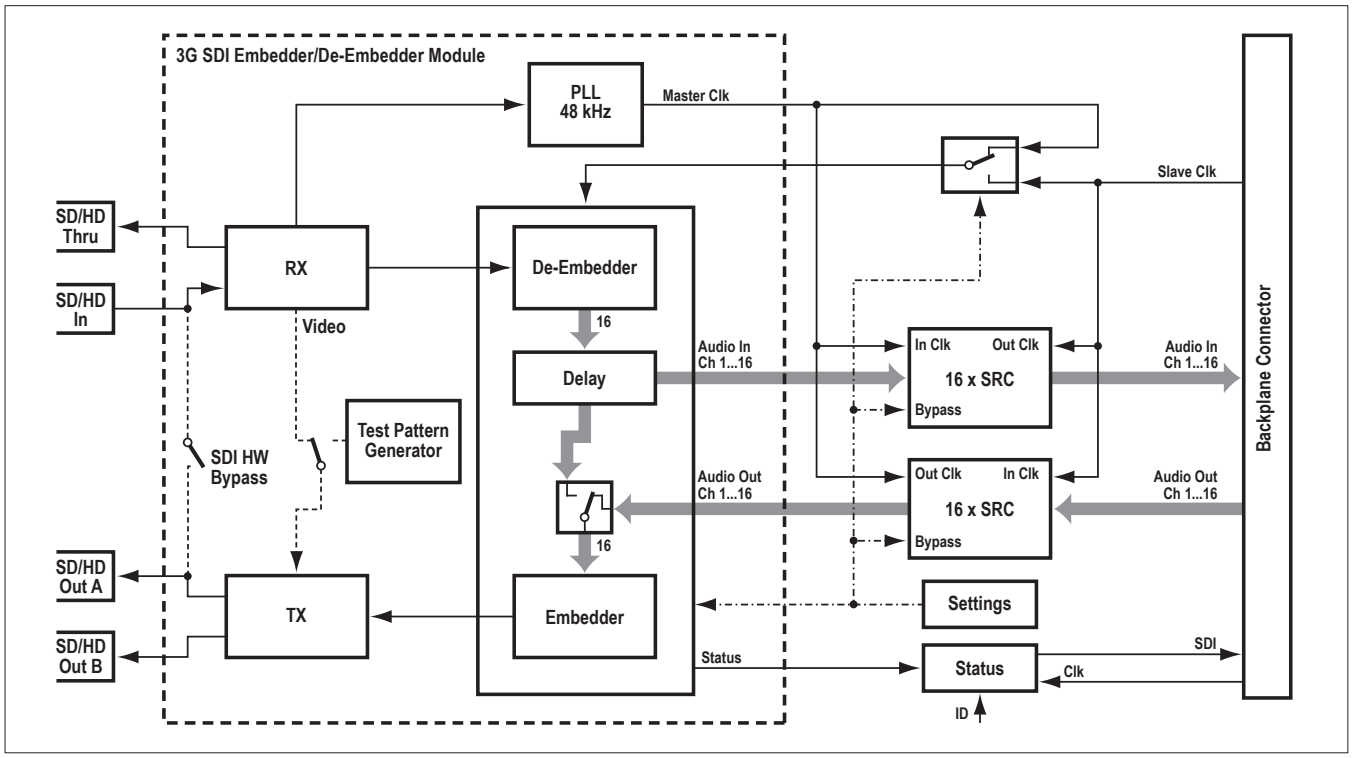
Switch	Setting
A	OFF: De-embedder groups 1&2 *(factory default)* ON: De-embedder groups 3&4
B	OFF: Embedder groups 1&2 *(factory default)* ON: Embedder groups 3&4
C	ON: All audio data in SDI will be cleared *(factory default: OFF)*
D	OFF: no delay *(factory default)* ON: 40 ms delay on all 8 SDI in channels
E	OFF: transparent for channel status bit ON: generate channel status bit *(factory default)*
F	OFF: NTSC 525 test pattern is generated if no SDI input signal is present *(factory default)* ON: NTSC 1080i60 test pattern if no SDI input signal is present

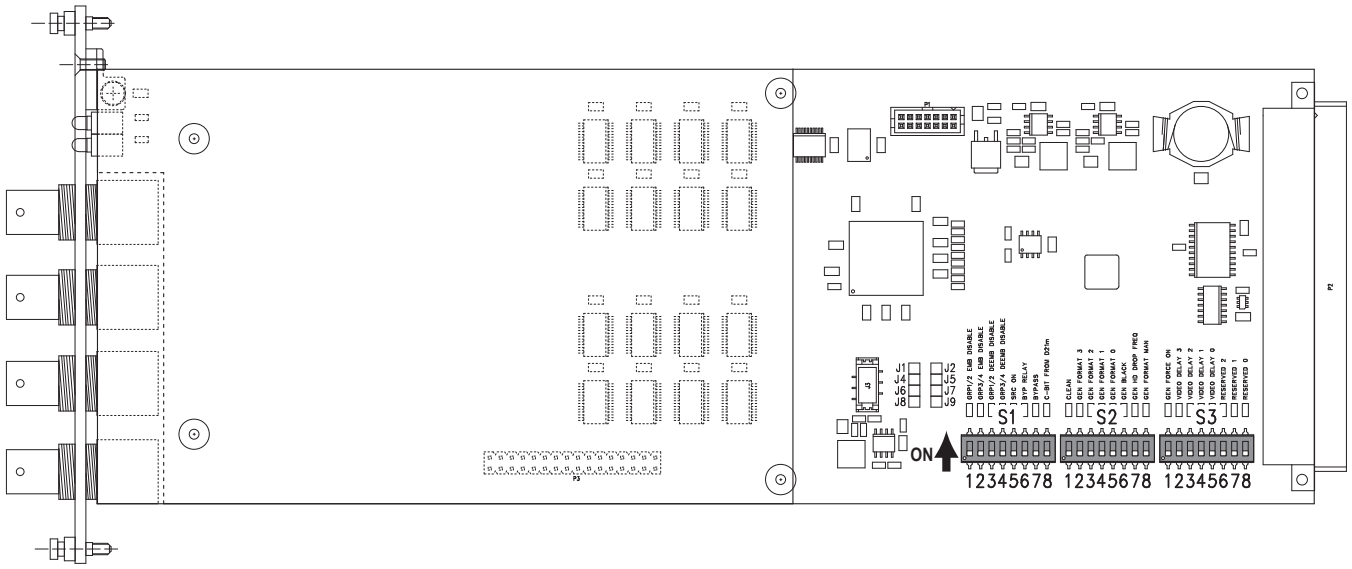
6.3.7 3G SDI I/O Card (VISTA, OnAir, ROUTE 6000) A949.0451

The 3G/HD/SD SDI (serial digital interface) embedder/de-embedder card is able to handle video signals according to the 3G (full HD), HD and SD standards; both level A and B versions of 3G signals are supported. Standard selection is performed automatically. The card can act as an eight- or 16-channel embedder, an eight- or 16-channel de-embedder, or any combination thereof. For the D21m I/O system it can be an eight- or 16-channel audio input card, an eight- or 16-channel audio output card, or an eight- or 16-channel input/output card. These modes are determined by DIP switches located on the card (or by software, if supported).
The SDI standard defines up to 16 audio channels transmitted within a video signal. These 16 channels are divided into four groups of four channels each. Selection of which channels are to be embedded or de-embedded is performed by DIP switches on the card (or by software, if supported): either groups 1&2, groups 3&4, or all. It is also possible to clear the SDI data structure possibly present in the incoming video signal and to allocate the groups from scratch.
The D21m SDI card hosts SRCs (sampling rate converters) for both the audio inputs (de-embedding) and outputs (embedding). So the mixing console can run independently of the video sync used for SDI. The sampling rate converters can be bypassed; if so, the SDI card is fully compatible to transmitting the Dolby® E audio format. If power is switched off, the input is hardware-bypassed to output A. *If the SRCs are bypassed, the card works at a sampling rate of 48 kHz only.*
Video signals can be delayed in frames; maximum delay is 4 frames (3G), 8 frames (HD) or 15 frames (SD). The delay can be set by DIP switches.
The test pattern generator is either automatically activated as soon as the SDI input signal is invalid, or manually. It either selects its output signal format according to the last valid SDI input signal or to the DIP switch setting on the card. Output signal is a black frame or a color bar frame, both with embedded audio. All generator settings and presets can be made with DIP switches on the card.

Operating modes	8- or 16-ch console output (embedder) and/or 8- or 16-ch console input (de-embedder)
Selectable SDI groups	groups 1&2, and/or groups 3&4
Connectors	IN, OUT A, OUT B, THROUGH (BNC, 75 Ω)
Cable length	max. 50 m
Video delay	max. 4 frames (3G); 8 frames (HD); 15 frames (SD)
Audio latency* (de-embedder + embedder)	3G/HD: <800 µs; SD: <2.6 ms
Current consumption (5 V)	1 A
Operating temperature	0-40 °C

***** Latency times are identical for all channels and all groups.





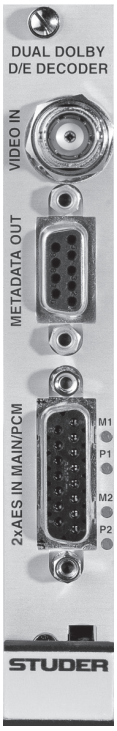
LEDs	**SDI LOCK**	Indicates a valid SDI signal at the input.
	HD	Indicates a valid (3G or HD) HD SDI signal at the input.
DIP Switches	**S1, S2, S3**	See next page *(factory default setting: All OFF)*

DIP Switch								Definition
S1.1	S1.2	S1.3	S1.4	S1.5	S1.6	S1.7	S1.8	
OFF	OFF	x	x	x	x	x	x	All embedders active, card has 16 output channels
OFF	ON	x	x	x	x	x	x	Only groups 1 and 2 will be embedded, groups 3 and 4 are transparent. Card has 8 output channels
ON	OFF	x	x	x	x	x	x	Only groups 3 and 4 will be embedded, groups 1 and 2 are transparent. Card has 8 output channels
ON	ON	x	x	x	x	x	x	All embedders inactive, card has 0 output channels
x	x	OFF	OFF	x	x	x	x	All de-embedders active, card has 16 input channels
x	x	OFF	ON	x	x	x	x	Only groups 1 and 2 will be de-embedded. Card has 8 input channels
x	x	ON	OFF	x	x	x	x	Only groups 3 and 4 will be de-embedded. Card has 8 input channels
x	x	ON	ON	x	x	x	x	All de-embedders inactive, card has 0 input channels
x	x	x	x	OFF	x	x	x	SRCs bypassed
x	x	x	x	ON	x	x	x	SRCs active
x	x	x	x	x	OFF	x	x	Signal not bypassed
x	x	x	x	x	ON	x	x	Signal bypassed (with relay)
x	x	x	x	x	x	OFF	x	Signal not bypassed
x	x	x	x	x	x	ON	x	Signal bypassed (electronically)
x	x	x	x	x	x	x	OFF	C-Bits newly generated
x	x	x	x	x	x	x	ON	C-Bits taken from D21m (reserve for future)

DIP Switch								Definition
S2.1	S2.2	S2.3	S2.4	S2.5	S2.6	S2.7	S2.8	
OFF	x	x	x	x	x	x	x	SDI Data structure not cleared
ON	x	x	x	x	x	x	x	SDI Data structure cleared
x	OFF	OFF	OFF	OFF	x	x	x	Generator format: 720 p 60 (HD)
x	OFF	OFF	OFF	ON	x	x	x	Generator format: 720 p 50 (HD)
x	OFF	OFF	ON	OFF	x	x	x	Generator format: 1080 i 60 (HD)
x	OFF	OFF	ON	ON	x	x	x	Generator format: 1080 p 30 (HD)
x	OFF	ON	OFF	OFF	x	x	x	Generator format: 1080 i 50 (HD)
x	OFF	ON	OFF	ON	x	x	x	Generator format: 1080 p 25 (HD)
x	OFF	ON	ON	OFF	x	x	x	Generator format: 1080 p 24 (HD)
x	OFF	ON	ON	ON	x	x	x	Generator format: 525 (SD)
x	ON	OFF	OFF	OFF	x	x	x	Generator format: 625 (SD)
x	ON	OFF	OFF	ON	x	x	x	Generator format: 625 (SD)
x	ON	OFF	ON	OFF	x	x	x	Generator format: 625 (SD)
x	ON	OFF	ON	ON	x	x	x	Generator format: 1080 p 60 (3G)
x	ON	ON	OFF	OFF	x	x	x	Generator format: 625 (SD)
x	ON	ON	OFF	ON	x	x	x	Generator format: 1080 p 50 (3G)
x	ON	ON	ON	OFF	x	x	x	Generator format: 625 (SD)
x	ON	ON	ON	ON	x	x	x	Generator format: Gen OFF
x	x	x	x	x	OFF	x	x	Generator output signal: Color bars
x	x	x	x	x	ON	x	x	Generator output signal: Black frame
x	x	x	x	x	x	OFF	x	Generator HD drop frequency: 74.25 MHz
x	x	x	x	x	x	ON	x	Generator HD drop frequency: 74.176 MHz
x	x	x	x	x	x	x	OFF	Generator format manual: Auto-format
x	x	x	x	x	x	x	ON	Generator format manual: Pre-selectef format

DIP Switch								Definition
S3.1	S3.2	S3.3	S3.4	S3.5	S3.6	S3.7	S3.8	
OFF	x	x	x	x	x	x	x	Generator active if lock fails
ON	x	x	x	x	x	x	x	Generator forced to active
x	OFF	OFF	OFF	OFF	x	x	x	Video delay: 0 frames
x	OFF	OFF	OFF	ON	x	x	x	Video delay: 1 frame
x	OFF	OFF	ON	OFF	x	x	x	Video delay: 2 frames
x	OFF	OFF	ON	ON	x	x	x	Video delay: 3 frames
x	...	...	...	...	x	x	x	...
x	ON	ON	OFF	ON	x	x	x	Video delay: 13 frames
x	ON	ON	ON	OFF	x	x	x	Video delay: 14 frames
x	ON	ON	ON	ON	x	x	x	Video delay: 15 frames
x	x	x	x	x	Reserved			

6.3.8 Dolby® E/Digital Decoder Card (VISTA, OnAir, ROUTE 6000) A949.0443/.0444



About Dolby® E

Dolby® E allows encoding of up to 8 mono audio channels and some metadata into a pair of two channels (e.g. AES/EBU) by using 20 audio bits thereof. Both encoding and decoding processes create one video frame of delay. Since the encoded data is packaged in sizes of one video frame it is possible to 'edit' the encoded stream, as long as the edits are synchronized with the video frames and the stream is not modified in any way (e.g. level changes applied). For more details on Dolby® E please refer to www.dolby.com.

The D21m Dolby® E/Digital decoder card is available in 2 versions:

A949.0443xx with one, or

A949.0444xx with two Dolby® E decoder modules.

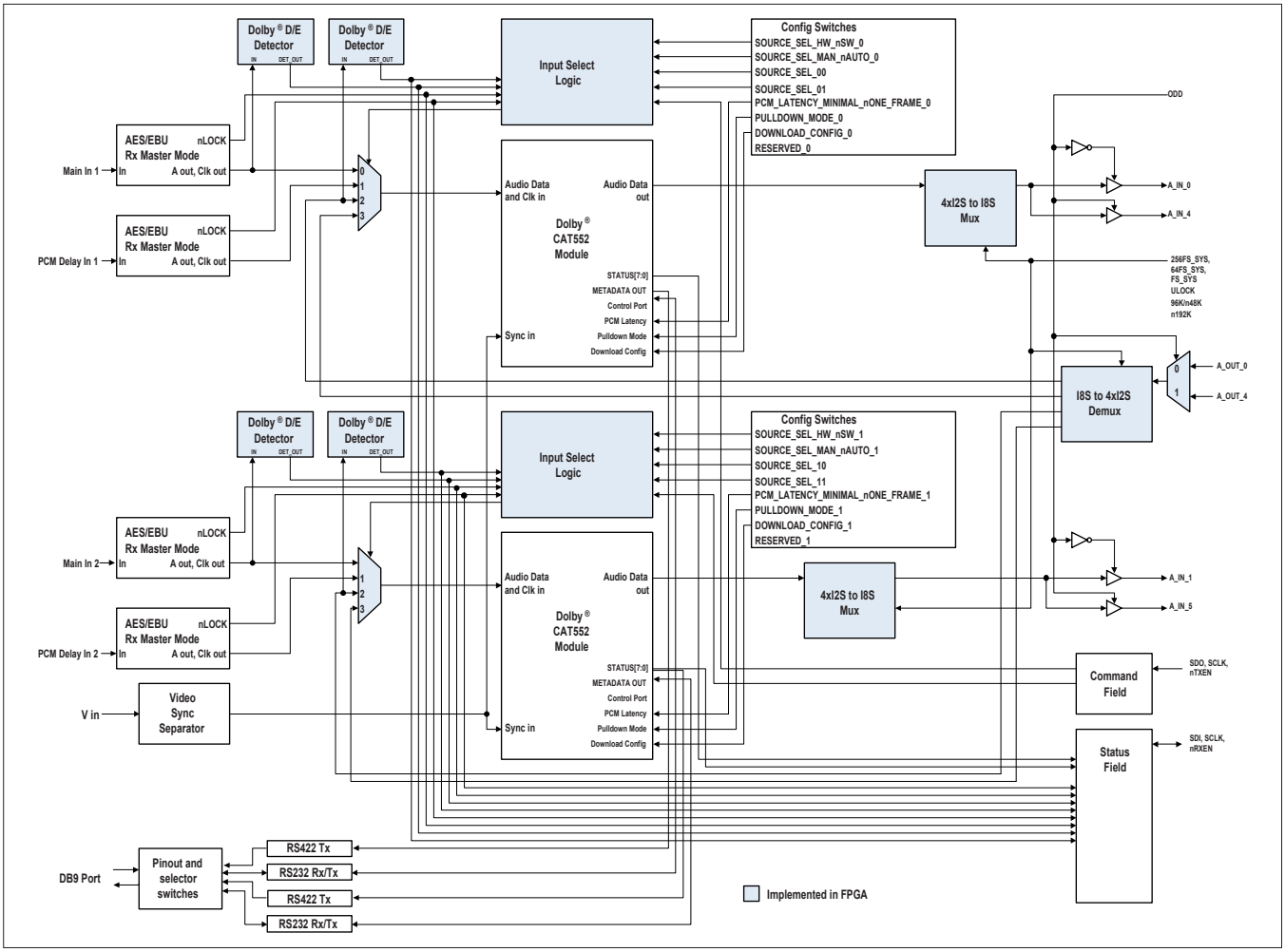
Each one is functionally similar to a Dolby® DP572 decoder. Both are operating independently; the information given below is valid independently for both decoders as well.

The dual-decoder card receives four AES/EBU pairs the front panel input, or eight mono channels from the console-internal patch (patch destinations). Each pair may contain a Dolby E or Dolby Digital encoded signal. The card returns a total of max. 16 channels to the console patch (patch sources).

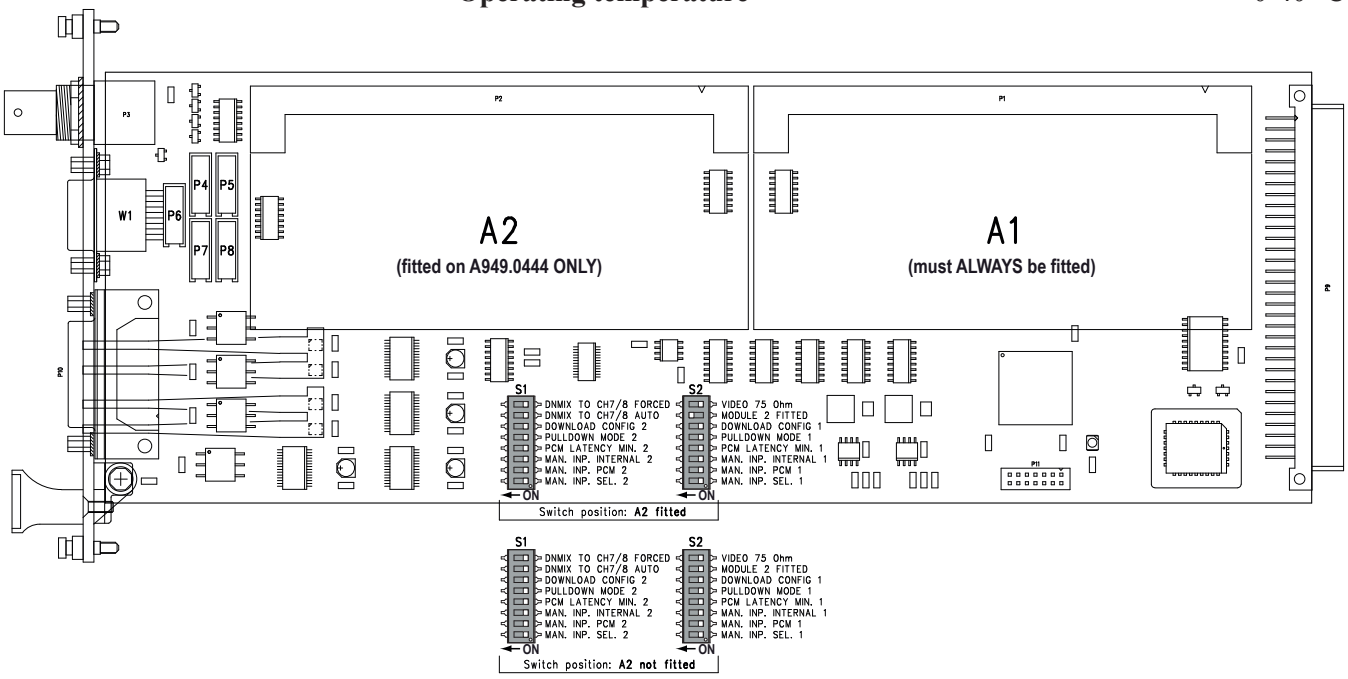
The single-decoder card returns up to eight channels to the console patch (eight sources) and shows eight inputs on the patch. Input channels 5-8 are unused.

Notes

Single-decoder cards only work correctly with the decoder module in position A1. Both cards work at sampling rates of 44.1 or 48 kHz only.



Current consumption	(3.3 V)	0.2 A
	(5 V)	0.8 A (A949.0443); 1.3 A (A949.0444)
Operating temperature		0-40 °C



LEDs

M1 / M2 Indicate that a valid AES/EBU signal is detected on main input 1/2.

P1 / P2 Indicate that a valid AES/EBU signal is detected on fallback input 1/2.

Note These LEDs do not indicate Dolby® E status, but just the lock status of the AES/EBU inputs on the front panel.

DIP Switches **S2.1 - S2.3**

S2.1	S2.2	S2.3	Module 1 Input Select
x	x	OFF	Automatic source selection *(factory default: All OFF)*
OFF	OFF	ON	Front port main
OFF	ON	ON	Front port PCM delay
ON	OFF	ON	Rear (backplane) main
ON	ON	ON	Rear (backplane) PCM delay

While it is possible to manually select individual inputs both from the front panel connectors as well as from the console-internal patch, the card hosts an automatic source selection mode where the inputs are chosen automatically according to the following priorities:

- Whenever a valid AES/EBU signal is detected (‘locked’ status) on the 15-pin front panel connector, this input has priority over the console-internal patch sources. Hence if it is requested to feed the decoder with a console-internal signal selected via the patch window, no valid AES/EBU input signal is allowed on the front panel connector.
- However, if no valid AES/EBU signal is detected on the front panel inputs, the card is getting its inputs from the console-internal patch. These inputs are referred to as ‘Rear/Backplane Inputs’. Selection is as follows:
  - Input 1, 2: Main priority input for Dolby® E signal, decoder 1.
  - Input 3, 4: Backplane input of decoder 1; is automatically selected in case no Dolby® E signal is present on main input (1, 2). Please note that a Dolby® E signal can be fed into this input, too, and it will be decoded correctly. However, if a Dolby® E signal is detected on the main input, this will be taken with higher priority.

S2.4

S2.4	PCM Latency (Module 1 only)
OFF	PCM signal is delayed by 1 video frame *(factory default)*
ON	PCM signal is minimally delayed

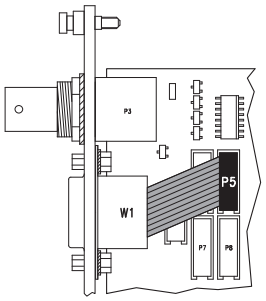
Decoding a Dolby® E stream always causes a delay of one video frame. In case a regular PCM signal is fed to the card, this can be delayed by one video frame, too. If required, this delay may be de-activated in order to pass through a PCM signal with a minimal delay. The front panel VIDEO IN sync input is used to detect video frames in order to delay the PCM signal accordingly. The video sync input does not necessarily have to be connected in case of Dolby® E , since the sync is indicated within the Dolby® E stream.

S2.5

S2.5	Module 1 Pulldown Mode
OFF	Pulldown mode is off *(factory default)*
ON	Pulldown mode is on

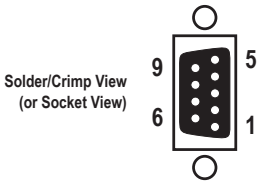
Pulldown mode ON allows the input of audio signals with a 'drop frame' sampling rate of 47.952 kHz instead of 48 kHz. The output, however, always runs at 48 kHz.

S2.6



S2.6	Module 1 Configuration Download
OFF	Standard operation *(factory default)*
ON	Configuration download via RS232

If firmware download to decoder module 1 is required, plug the short flat cable (W1) coming from the **METADATA OUT** front-panel socket to the PCB socket P5 (labeled UPDATE1).
The pin assignment of the **METADATA OUT** socket (9pin D-type, female, UNC 4-40 thread) in this case is as follows:



Pin	Signal	Pin	Signal
1	n.c.	6	n.c.
2	DOUT_1	7	n.c.
3	DIN_1	8	n.c.
4	n.c.	9	n.c.
5	n.c.		

S2.7

S2.7	Module 2 Installed
OFF	No *(factory default if not installed, i.e., for A949.0443)*
ON	Yes *(factory default if installed, i.e., for A949.0444)*

S2.8

S2.8	Video Termination
OFF	Hi-Z *(factory default)*
ON	75 Ω

S1.1 - S1.3

S1.1	S1.2	S1.3	Module 2* Input Select
x	x	OFF	Automatic source selection *(factory default: All OFF)*
OFF	OFF	ON	Front port main
OFF	ON	ON	Front port PCM delay
ON	OFF	ON	Rear (backplane) main
ON	ON	ON	Rear (backplane) PCM delay
			** if installed*

S1.4

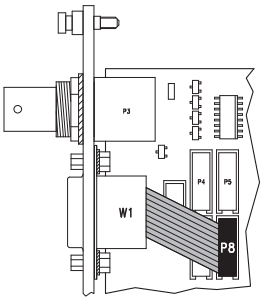
S1.4	PCM Latency (Module 2 only)
OFF	PCM signal is delayed by 1 video frame *(factory default)*
ON	PCM signal is minimally delayed

Same as S2.4 above, but for module 2.

S1.5

S1.5	Module 2 Pulldown Mode
OFF	Pulldown mode is off *(factory default)*
ON	Pulldown mode is on

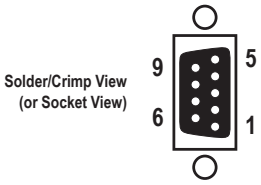
Same as S2.5 above, but for module 2.



S1.6

S1.6	Module 2 Configuration Download
OFF	Standard operation *(factory default)*
ON	Configuration download via RS232

If firmware download to decoder module 2 is required, plug the short flat cable (W1) coming from the **METADATA OUT** front-panel socket to the PCB socket P8 (labeled UPDATE2).
The pin assignment of the **METADATA OUT** socket (9pin D-type, female, UNC 4-40 thread) in this case is as follows:



Pin	Signal	Pin	Signal
1	n.c.	6	n.c.
2	DOUT_2	7	n.c.
3	DIN_2	8	n.c.
4	n.c.	9	n.c.
5	n.c.		

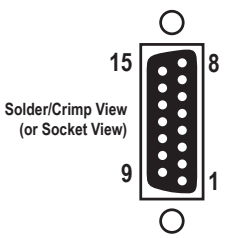
S1.7 / S1.8

S1.7	S1.8	Downmix to Ch 7/8 (or 15/16, resp.)
OFF	OFF	No downmix *(factory default)*
ON	OFF	Automatic downmix
OFF	ON	Forced downmix

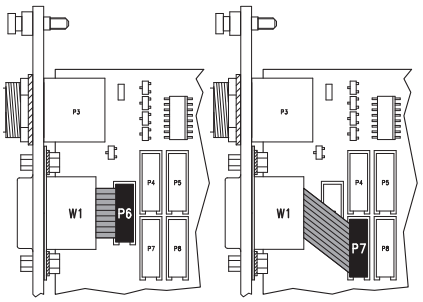
Metadata and Downmixing: A Dolby® E stream contains metadata with various information on the encoded signal. This information can be read out from the front panel connector. The D21m Dolby® E decoder card only uses this information in case a 2-channel stereo downmix is required from a 5.1-channel surround signal within the Dolby® E stream; then the decoder interprets the center and surround channel levels and uses them for the internal downmixer that is activated by the DIP switches S1.7 and S1.8. The downmix can be made constantly available and, subsequently, overwriting any audio data that was contained on these channels beforehand ('forced downmix'), or it is possible to 'fill' the channels 7/8 or 15/16 only if the metadata indicate that these channels are not being used otherwise (automatic downmix).

Connector Pin Assignments

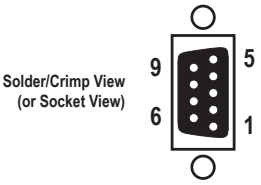
2× AES IN MAIN/PCM (15pin D-type, female, UNC 4-40 thread)



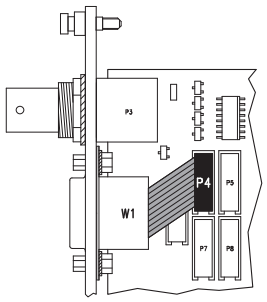
Pin	Signal	Pin	Signal
1	Main In 1 +	9	Main In 1 –
2	Main In 1 Chassis	10	PCM Delay In 1 Chassis
3	PCM Delay In 1 –	11	PCM Delay In 1 +
4	n.c.	12	n.c.
5	Main In 2 +	13	Main In 2 –
6	Main In 2 Chassis	14	PCM Delay In 2 Chassis
7	PCM Delay In 2 –	15	PCM Delay In 2 +
8	n.c.		



METADATA OUT (9-pin D-type, female)
The Metadata Out socket allows sending the meta data of either module or of both modules at once.
If the meta data of either decoder module 1 or 2 is required, plug the short flat cable (W1) coming from the **METADATA OUT** front-panel socket to the PCB socket P6 (labeled META1; *factory default*), or to PCB socket P7 (META2), respectively.
The pin assignment of the **METADATA OUT** socket (9pin D-type, female, UNC 4-40 thread) in this case is as follows:

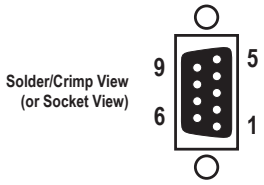


Pin	Signal	Pin	Signal
1	Chassis	6	GND
2	n.c.	7	n.c.
3	META_1+ / META_2+	8	META_1– / META_2–
4	GND	9	Chassis
5	n.c.		



If the meta data of both decoder modules is required, plug the short flat cable (W1) coming from the **METADATA OUT** front-panel socket to the PCB socket P4 (labeled META1+2).

Please note that in this case the pin assignment of the **METADATA OUT** socket (9pin D-type, female, UNC 4-40 thread) is *non-standard*:



Pin	Signal	Pin	Signal
1	Chassis	6	GND
2	n.c.	7	META_2–
3	META_1+	8	META_1–
4	META_2+	9	Chassis
5	n.c.		

Possible Pitfalls with Dolby® E

In order to transmit or record a Dolby® E encoded signal, *the whole signal path must be 100% transparent,* regarding the 20 audio bits contained within the data stream. In case of problems with decoding the Dolby® E signal and possibly getting white noise instead of the decoded signal, the whole signal path should be checked. It may be worthwhile verifying the following points:

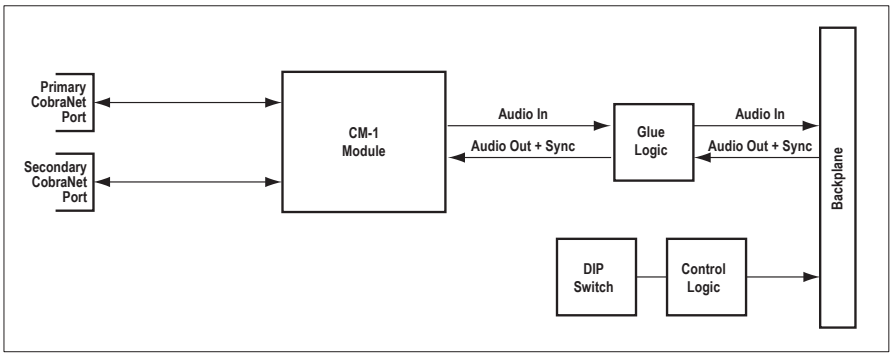
- Are there any sampling rate converters (e.g. when using the D21m Dolby® E decoder card together with the D21m SDI card) in the signal chain? If so, they must be bypassed; otherwise the Dolby® E stream is modified and cannot be decoded anymore.
- In case the signal is sourced from a video tape machine: Is the machine set up to be transparent for the recorded audio signals? Several machines require seting the tracks to 'DATA' mode in order to guarantee unity gain while recording or playing back Dolby® E streams.
- Is the card receiving the Dolby® E stream from the console-internal patch? If so, are both tracks patched to the correct two inputs of the card? (Decoder 1 main: channels 1 and 2; decoder 1 PCM: channels 3 and 4; decoder 2 main: channels 5 and 6; decoder 2 PCM: channels 7 and 8).
- If getting a wrong signal or no signal at all: Are any AES/EBU signals present at the front panel while console-internal streams should be decoded? If the card is in 'automatic source selection' mode, the front inputs have top priority, regardless whether a Dolby® E stream is recognized or not.

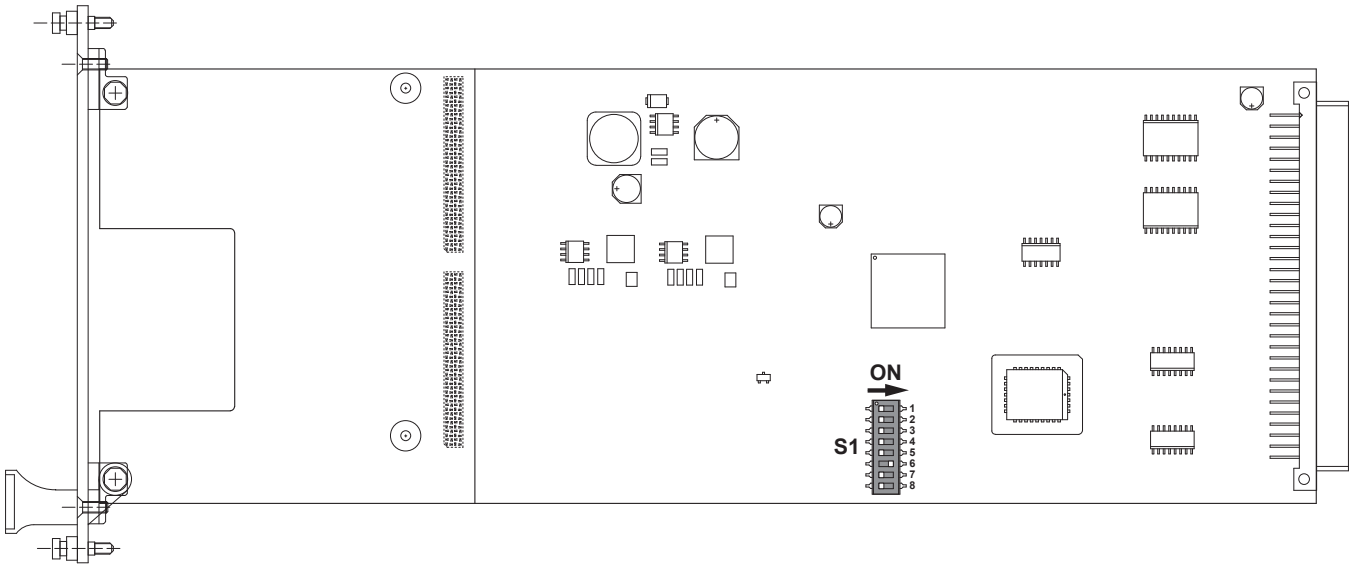
6.3.9 CobraNet® Card (VISTA, OnAir, ROUTE 6000) A949.0445

This card allows sending and receiving of up to 32 audio channels to/from a CobraNet®. DIP switches on the card allow setting the number of input or output channels seen by the console. Default setting is 32 output and no input channels. All settings of the CobraNet® module are made through SNMP. Per default, the module is configured to be the conductor (synchronization master) and providing multicast bundles 1-4 to the CobraNet® network. This setting is ideal for e.g. providing audio channels to a PA, installed sound, or monitoring system using CobraNet®.

For further information on CobraNet®, please refer to www.cobranet.info.

Current consumption (5 V) 800 mA
Operating temperature 0-40 °C





DIP Switch **S1** DIP switch for D21m channel count setting:

1	2	3	4	5	6	7	8	Number of Channels
OFF	OFF	OFF	OFF	-	-	-	-	0 inputs *(factory default)*
OFF	OFF	OFF	ON	-	-	-	-	8 inputs
OFF	OFF	ON	OFF	-	-	-	-	16 inputs
OFF	OFF	ON	ON	-	-	-	-	24 inputs
OFF	ON	OFF	OFF	-	-	-	-	32 inputs
OFF : ON	ON : ON	OFF : ON	ON : ON	- - -	- - -	- - -	- - -	***NOT ALLOWED***
-	-	-	-	OFF	OFF	OFF	OFF	0 outputs
-	-	-	-	OFF	OFF	OFF	ON	8 outputs
-	-	-	-	OFF	OFF	ON	OFF	16 outputs
-	-	-	-	OFF	OFF	ON	ON	24 outputs
-	-	-	-	OFF	ON	OFF	OFF	32 outputs *(factory default)*
- - -	- - -	- - -	- - -	OFF : ON	ON : ON	OFF : ON	ON : ON	***NOT ALLOWED***

6.3.9.1 CobraNet Card Card Setup

This section describes how to use a (laptop) PC running the CobraNet Discovery® utility in order to configure the CobraNet card settings. This applies to all versions of the card.

The configuration of the card will be dictated by the network or other devices that are being connected to the card, so it is not possible to give exact details for individual parameters, but this guide shows how to access and edit those parameters.

It is recommended that setting up a CobraNet network is carried out by an experienced person, but if more information is required, useful documents can be downloaded from the CobraNet website www.cobranet.info.

Installing CobraNet Discovery

CobraNet Discovery is a free utility provided by the manufacturers of CobraNet hardware, Cirrus Logic (http://www.cobranet.info/downloads/disco).

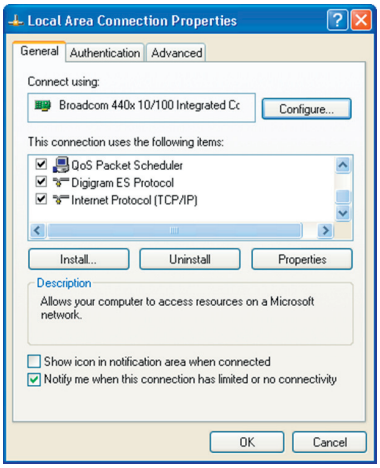
Any earlier version of CobraNet Discovery present on your computer, such as V3.0.2 or V3.4.2, should be uninstalled before. Install the latest version, as some earlier versions require special configuration changes in order to access the bundle configuration of the CobraNet card.

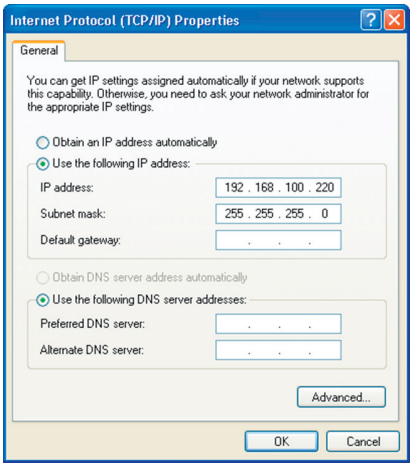
The latest version of the program (V4.0.2 or above) allows not only monitoring the CobraNet device parameters, but also the configuration of settings such as bundle numbers, latency and bit depth. The application can be downloaded from the website www.cobranet.info. Follow the Downloads link on that page. The installation is straightforward.

PC Ethernet Port Setup

First the PC's network port must be configured in such a way that it has a fixed IP address in order to communicate with the CobraNet card (Windows XP™ shown):

1 Click Start - Connect to - Show all connections - Local Area connection. Right-click on the 'Local Area Connection' icon and select 'Properties':

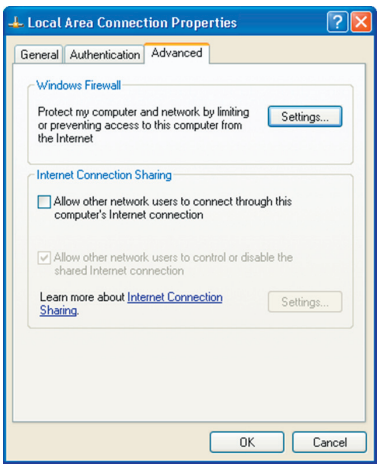


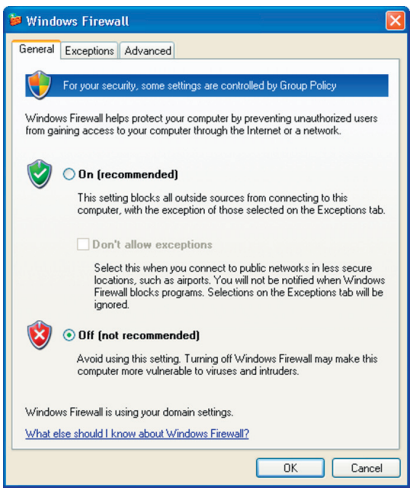


2 Select ‘Internet Protocol (TCP/IP)’ and click on ‘Properties’.

3 Select ‘Use the following IP address’ and enter IP address (192.168.100.220) and subnet mask (255.255.255.0), as shown above.
Click ‘OK’ to close the Internet Protocol (TCP/IP) Properties dialog box.

4 In the Local Area Connection box, select the ‘Advanced’ tab at the top, and then click on the Windows Firewall ‘Settings’ button:





Make sure the firewall is set to ‘Off’.
Click OK in the following dialogs to exit the Local Area Connection properties.

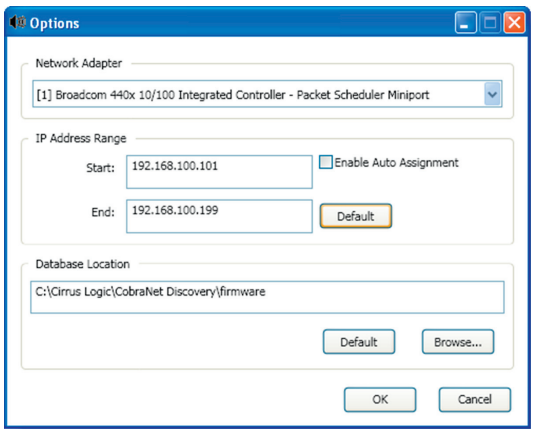
Note *You will have to reverse the above settings 1-4 if you subsequently need to connect the PC to a business LAN, so it is recommended to use a separate network port, if available.*

CobraNet Discovery Setup

1 Power up the console and connect the PC’s Ethernet port to the Primary port on the CobraNet card. This should be done with a ‘crossover’ Ethernet cable. Depending on the PC, a ‘straight’ cable may be used if the PC supports both cable types (most recent PCs do).
Alternatively, a network switch can be connected between the PC and the CobraNet card. In this case ‘straight’ cables would be used.
Using a switch also enables several other CobraNet devices to be connected to the PC at the same time as the console, and their configuration inspected and changed if necessary to match the console.
In case your system should contain BSS London components, make sure that *none* of their CobraNet parameters are changed using CNDiscovery.

Both LEDs on the CobraNet card should start flashing when connected to the PC.

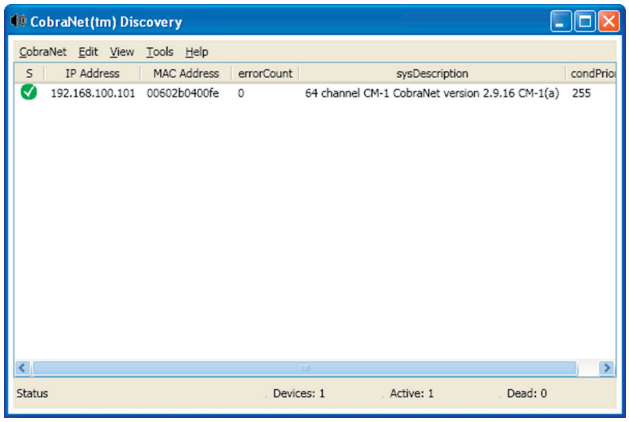
2 Start the CobraNet Discovery program and go to ‘Tools/Options’.



In the ‘Network Adapter’ section of the dialog, select the network controller that your PC uses for the Ethernet port to which the CobraNet card is connected.
In the ‘IP Address Range’ enter values as above (Start: 192.168.100.101; End: 192.168.100.199), and check the ‘Enable Auto Assignment box’.
Click OK and return to the main Discovery window.

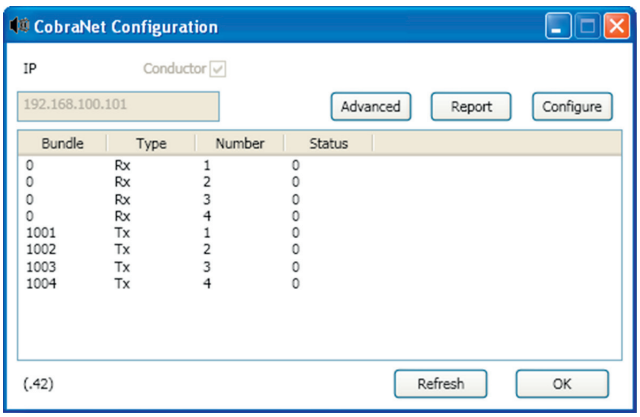
Note *This step must only be performed when you connect to the CobraNet card for the first time.*

3 You should now see the CobraNet module in the Discovery window, with a green ‘tick’ icon on the left and an IP address similar to that shown:



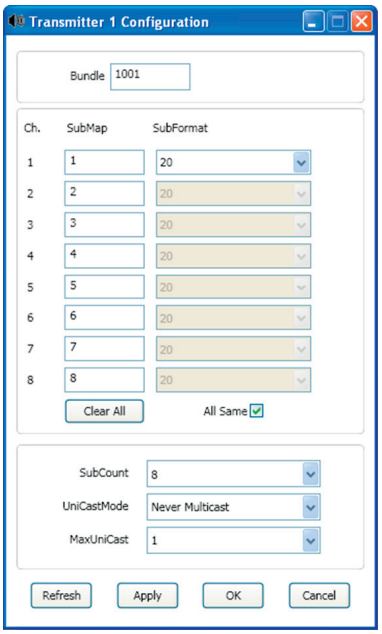
The IP address is only used for connecting to the configuration computer. The actual address does not matter, as long as it is in the same subnet as the PC’s Ethernet port. If you have followed the previous instructions correctly, it will be.

4 To configure the CobraNet card, click on the CobraNet device to select it, then choose Tools/Configure, or just double-click the device.
The Configuration box appears, showing the current bundle number setup.



You will need to change the bundle configuration of either the CobraNet card or the external equipment in such a way that the transmit (Tx) number of one matches the receive (Rx) number of the other, in order to pass audio.

5 The bundle numbers can now be changed as required by either directly editing the bundle number field, or selecting one of the four transmit or receive bundles and clicking the 'Configure' button, which opens a more detailed 'Configuration' dialog box:

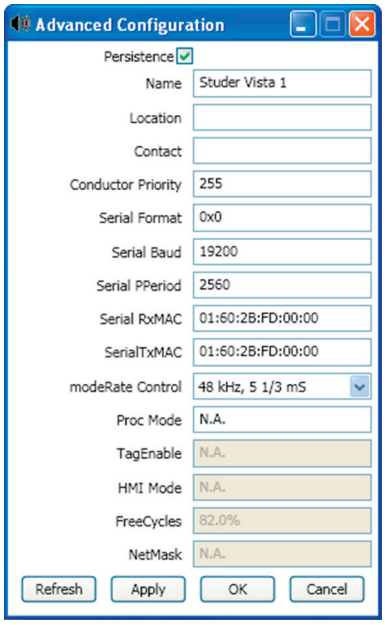


IMPORTANT! The CobraNet card is factory-set to have four transmit bundles (32 channels), but no receive bundles active.

The number of transmit and receive channels is also set on the CobraNet card PCB via DIP switches. These switches determine how many channels are available in the console's Input/Output patch touchscreen pages. Therefore, if the number of transmit and/or receive channels is changed from the default, the DIP switches on the CobraNet card must also be changed to match.

The SubFormat parameter allows the bit depth to be changed to match the network. Please note that if changing this to 24 bits, it is not possible to use all eight channels in the bundle.

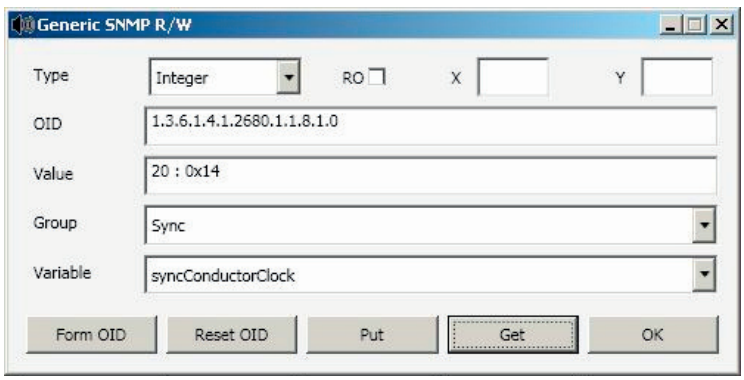
6 Changing latency, sample rate and card name:



Please *do not change* any fields different from the ones indicated below! In particular, the 'Persistence' box must never be unchecked, otherwise all setup data will be erased.
The 'Advanced Configuration' dialog box is used to set the latency and sampling rate of the CobraNet card (this is the parameter called 'modeRate Control'). These *must* match the other devices in the network, otherwise the system will not work.
Please note that with latency setting of 1.33 ms, only *seven channels per bundle* are allowed.

IMPORTANT! The 'Conductor Priority' parameter *must* be left at a value of 255. This is the highest priority and indicates that the console will always be the clock master for the entire network.
If necessary, the 'Name', 'Location' and 'Contact' fields can be changed to identify the console in more detail.
Do not change any other fields!
In particular, the 'Persistence' box must never be unchecked, otherwise all setup data will be erased.

7 Setting the SNMP variables:
This is also done with the CobraNet discovery utility. Enable SNMP by selecting the check box under 'Tools - Preferences'. A right-click on 'Device - Configure' will open a dialog in which you can perform the SNMP configuration.



The following default variables have to be modified:

Subtree	Name	Value	Comment
sync	syncConductorClock	20	External Master Clock with External Sample Synchronization
sync	syncPerformerClock	20	Esternal Master Clock with External Sample Synchronization
flash	flashPersistEnable	1	Makes parameters to be stored after power down
conductor	condPriority	255	set to highest priority
transmitters.txTable.txEntry	txChannel.1	1	Ch 1-8 are tx multicast bundle 1
transmitters.txTable.txEntry	txChannel.2	2	Ch 9-16 are tx multicast bundle 2
transmitters.txTable.txEntry	txChannel.3	3	Ch 17-24 are tx multicast bundle 3
transmitters.txTable.txEntry	txChannel.4	4	Ch 25-32 are tx multicast bundle 4

When Finished

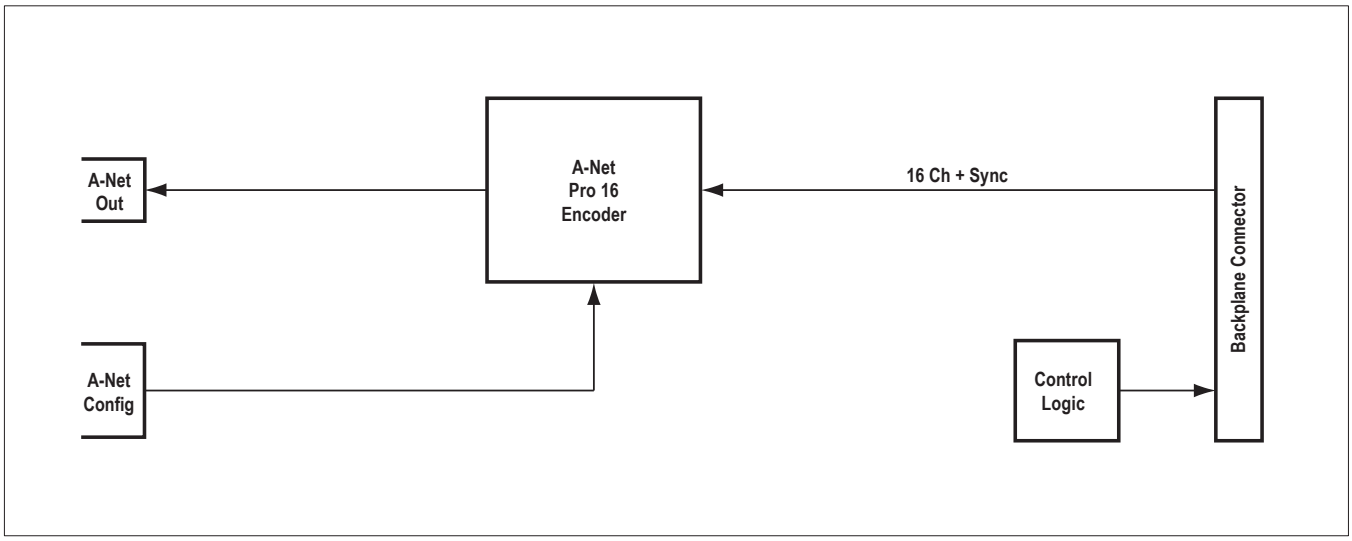
Please remember to reset the computer's IP address, subnet mask and to reactivate the Windows Firewall.

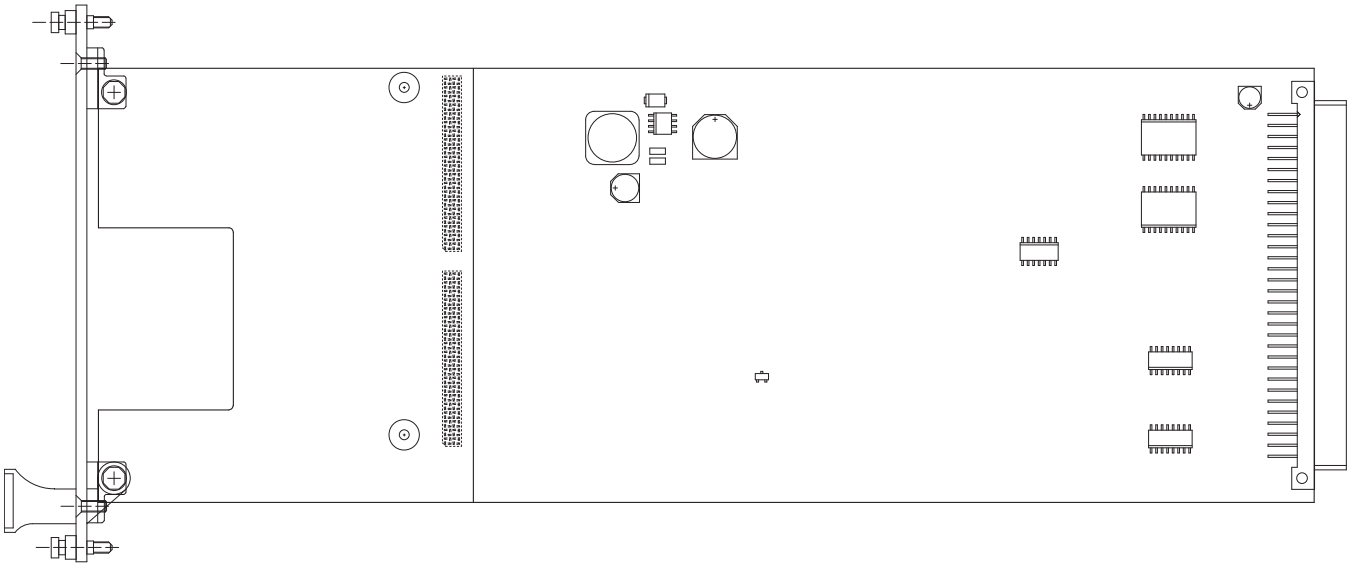
For more information on CobraNet parameters, please refer to www.cobranet.info

6.3.10 Aviom A-Net® Card (VISTA) A949.0446

This card allows implementing the head of an Aviom A-Net® Pro-16 chain. With this standard, 16 mono signals can be fed to an infinite number of Aviom personal mixers (such as the A-16 II) may be connected in a daisy chain configuration. The D21m A-Net® card will be the start of the chain and provide the audio and synchronization data to the chain. DIP switches on the front panel allow grouping two adjacent channels to one stereo channel, and generating a test tone.
This card works at sampling rates of 44.1 or 48 kHz only.

Current consumption (5 V)	250 mA
Operating temperature	0-40 °C

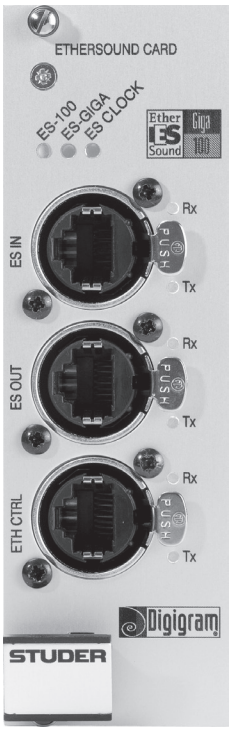




Front-Panel Switch

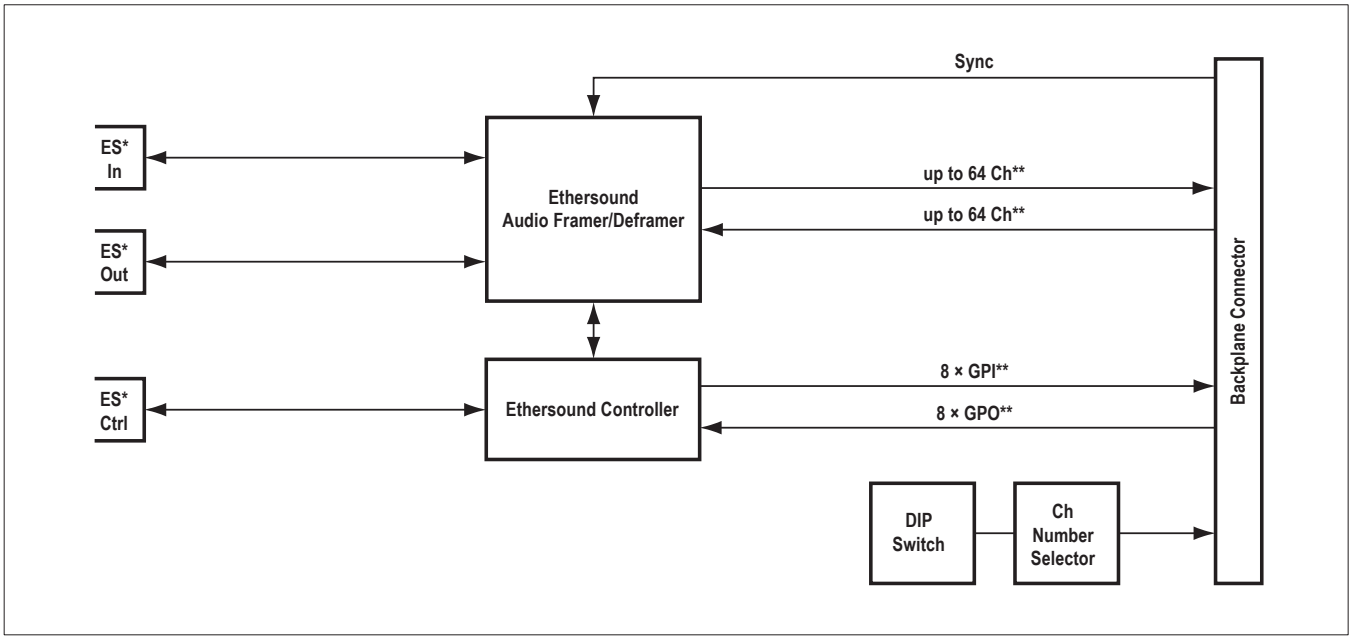
Position	Setting
1	OFF: Channels 1 and 2 are mono *(factory default)* ON: Channels 1 and 2 are a stereo group
2	OFF: Channels 3 and 4 are mono *(factory default)* ON: Channels 3 and 4 are a stereo group
3	OFF: Channels 5 and 6 are mono *(factory default)* ON: Channels 5 and 6 are a stereo group
4	OFF: Channels 7 and 8 are mono *(factory default)* ON: Channels 7 and 8 are a stereo group
5	OFF: Channels 9 and 10 are mono *(factory default)* ON: Channels 9 and 10 are a stereo group
6	OFF: Channels 11 and 12 are mono *(factory default)* ON: Channels 11 and 12 are a stereo group
7	OFF: Channels 13 and 14 are mono *(factory default)* ON: Channels 13 and 14 are a stereo group
8	OFF: Channels 15 and 16 are mono *(factory default)* ON: Channels 15 and 16 are a stereo group
9	OFF: Test tone generator off *(factory default)* ON: Test tone generator on

6.3.11 EtherSound® Card (VISTA, OnAir, ROUTE 6000) (Details: www.digigram.com)



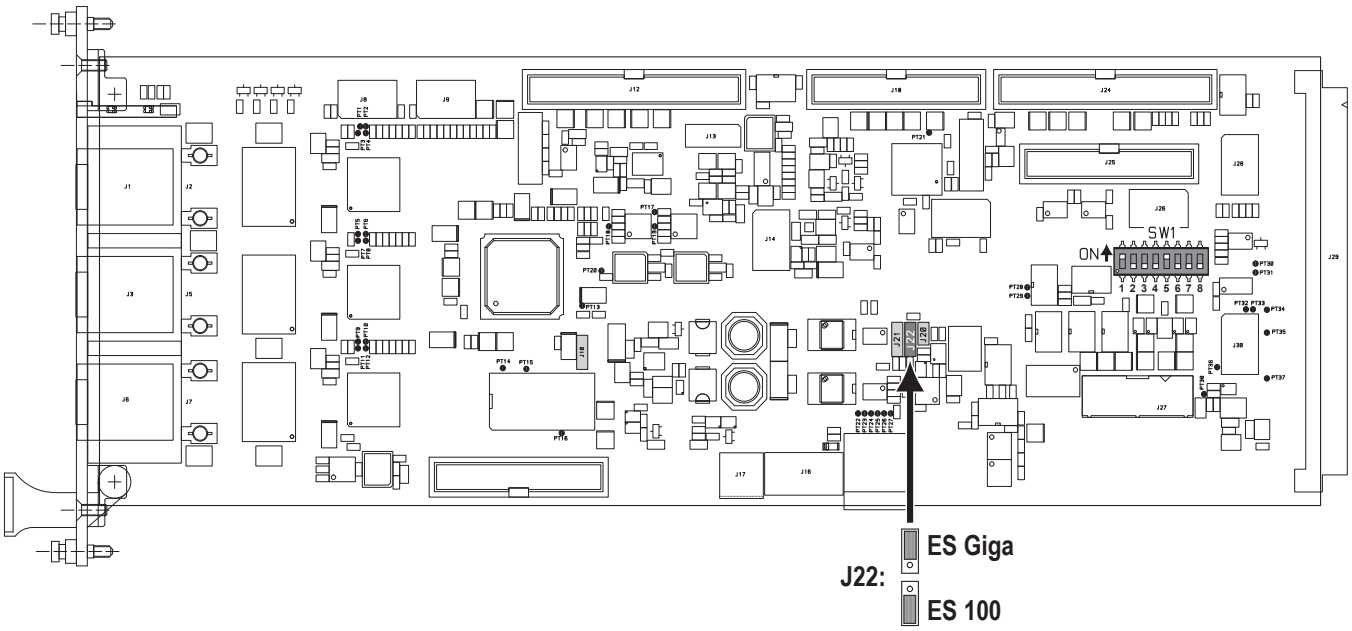
The EtherSound® card allows connecting the D21m I/O System to an EtherSound® network. Towards the D21m system, it acts similar to a MADI card combined with a GPIO card. The number of audio channels used can be configured with DIP switches. The included, virtual GPIO card allows, e.g., routing a GPO of the mixing console to the GPO of a distant EtherSound® device on the network. Configuration of the EtherSound® network is performed either through the ETH CTRL connector or from a remote location on the EtherSound® network, e.g. using the EtherSound® EScontrol software. The EtherSound® card works with EtherSound® ES-Giga System Transport networks or with EtherSound® ES-100 Audio Transport networks. The operating mode of the card (ES-100 or ES-Giga) is selected by setting jumper J22 (see opposite page). The selected mode will be displayed on the front panel LEDs.
The audio clock of the EtherSound® network must be synchronous with the D21m I/O system's audio clock. This is ensured either by using the EtherSound® card as clock source of the EtherSound® network, or by feeding the device that is actually the EtherSound® network clock source with a word clock synchronous with the D21m I/O system's audio clock.
This card works at sampling rates of 44.1 or 48 kHz (88.2/96 kHz ready).

Current consumption (5 V)	750 mA max.
Operating temperature	0-40 °C



* For more information on network topology and possible connections, please refer to the Ethersound documentation (www.ethersound.com).

** GPIs are GPOs on the Ethersound network, and vice versa. Audio outputs are audio inputs on the Ethersound network, and vice versa.



LEDs **ES-100 / ES-GIGA**
ES CLOCK

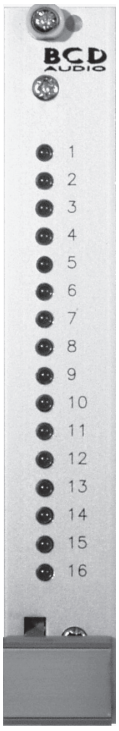
Indicate the mode selected with jumper J22.
Green: The card is the clock source of the EtherSound® network.
Red (only in case of a ring network topology): The card was defined to be the clock source of the EtherSound® network, but it is not, due to a device or cable failure in the ring.
Flashing red (only in case of a ring network topology): The card was not defined to be the clock source of the EtherSound® network, but it actually is, due to a device or cable failure in the ring located just next to the card.
Dark: The card is not the EtherSound® clock source.

DIP Switch **SW1**

DIP switch for D21m channel count setting:

1	2	3	4	5	6	7	8	Number of Channels
OFF	OFF	OFF	OFF	-	-	-	-	0 inputs
OFF	OFF	OFF	ON	-	-	-	-	8 inputs
OFF	OFF	ON	OFF	-	-	-	-	16 inputs
OFF	OFF	ON	ON	-	-	-	-	24 inputs
OFF	ON	OFF	OFF	-	-	-	-	32 inputs
OFF	ON	OFF	ON	-	-	-	-	40 inputs
OFF	ON	ON	OFF	-	-	-	-	48 inputs
OFF	ON	ON	ON	-	-	-	-	56 inputs
ON	OFF	OFF	OFF	-	-	-	-	64 inputs *(factory default)*
ON : ON	OFF : ON	OFF : ON	ON : ON	- - -	- - -	- - -	- - -	***NOT ALLOWED***
-	-	-	-	OFF	OFF	OFF	OFF	0 outputs
-	-	-	-	OFF	OFF	OFF	ON	8 outputs
-	-	-	-	OFF	OFF	ON	OFF	16 outputs
-	-	-	-	OFF	OFF	ON	ON	24 outputs
-	-	-	-	OFF	ON	OFF	OFF	32 outputs
-	-	-	-	OFF	ON	OFF	ON	40 outputs
-	-	-	-	OFF	ON	ON	OFF	48 outputs
-	-	-	-	OFF	ON	ON	ON	56 outputs
-	-	-	-	ON	OFF	OFF	OFF	64 outputs *(factory default)*
- - -	- - -	- - -	- - -	ON : ON	OFF : ON	OFF : ON	ON : ON	***NOT ALLOWED***

6.3.12 BCD DTMF / GLITS/BLITS / Minimixer Cards (Details: www.bcd-audio.co.uk)



The BCD 100421 card is designed to electrically and mechanically fit into a Studer D21m I/O frame and is one slot wide. It is based around an FPGA which embeds a fractional DSP processor designed by BCD Audio. The three versions of the card currently available are only differing by their firmware and by the use of the Option DIP switch, as detailed in the following paragraphs. The front panel LEDs are kept deliberately dim in order to minimise supply current, each card consumes less than 0.5 W.

Supported Product family	DTMF	GLITS/BLITS	Minimixer
Vista (from SW version)	not supported	V 5.1	not supported
OnAir (from SW version)	V 4.0	V 4.0	V 4.0
Route 6000 (from SW version)	V 2.2	V 2.2	V 2.2

For details on EBU stereo and multichannel line-up tones and BBC/SKY BLITS tone, please refer to http://tech.ebu.ch/docs/tech/tech3304.pdf.
For BBC GLITS tone, please refer to http://www.ips.org.uk/faq/index.php?title=Graham's_Line_Ident_Tone_System.
The tones are generated with the console's current sample rate of 44.1 or 48 kHz. 88.2/96 kHz operation is not supported.

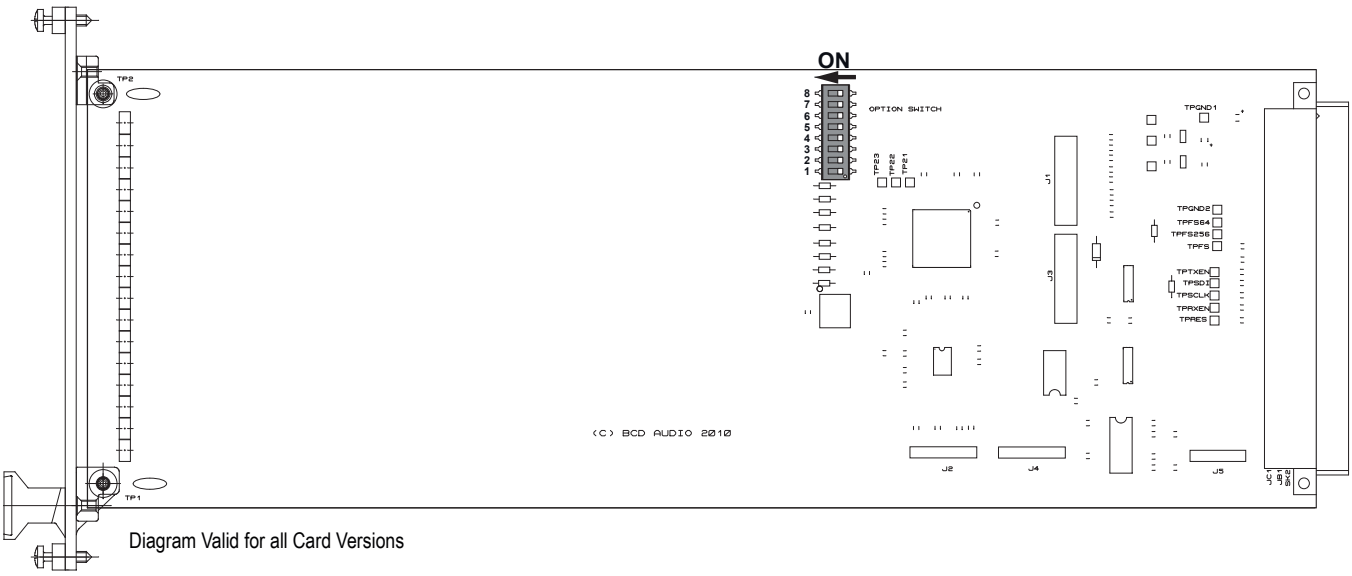


Diagram Valid for all Card Versions

6.3.12.1 DTMF/GLITS Card Version 5029584

This card version is used to detect DTMF tone on up to 16 incoming lines. It will generate a corresponding GP control signal when DTMF #1 is detected. The relevant front panel LED glows when the DTMF tone is present. In basic mode the card will offer 16 control output signals to the console to which control inputs named 'DTMF 1-16' can be routed in the configuration GUI. The 16 GP inputs will automatically appear in the configuration GUI's 'GPInputs' page**.** These may be connected to 'custom logic' gates and/or key LEDs for status display on the OnAir desk.

The basic concept is that reporters in the field can gain attention of the console operator by pressing the #1 key on their phone, and the relevant GPI triggers a key LED on the console surface via custom logic. An AGC system is implemented so that loud signals will not overload the detectors, and low-level signals remain detectable.

Segment 1 of the DIP switch can be set to ON to enable internal tone generators. In this mode the card will generate 8 GP control signals (to the console). The card output channels 1 and 2 provide GLITS stereo line-up tone at –18 dB_{FS}, and DTMF #1 tone on output channels 3 and 4. DTMF tone is 697+1209 Hz at –21 dB_{FS}.

'Option' DIP Switch Segment 1

	Option
ON	BBC GLITS and DTMF tones on
OFF	GLITS and DTMF tones off

Note Changing this switch requires that the D21m frame **RECONFIG** key is activated. The mapping of the ports will change then, possibly requiring changes to the desk configuration.

Segments 2-8 Spare, not used

6.3.12.2 GLITS/BLITS Card Version 5029587

In this version the card provides 8 audio outputs to the console. Stereo test tones are sent on channels 1 and 2, and surround tones on channels 3-8. The test signals are always active; the DIP switch segments 1 and 2 are used for signal selection. The top 8 LEDs show the sequence of the tones.

'Option' DIP Switch Segment 1

	Option
ON	EBU multichannel line-up tone (on outputs 3-8)
OFF	BBC/SKY BLITS tone (on outputs 3-8)

Segment 2

	Option
ON	EBU stereo line-up tone (on outputs 1 and 2)
OFF	BBC GLITS tone (on outputs 1 and 2)

Segments 3 & 4 Spare, not used

Segments 5-8

5	6	7	8	Calibration Level
OFF	OFF	OFF	OFF	–24 dB_{FS}
ON	OFF	OFF	OFF	–23 dB_{FS}
OFF	ON	OFF	OFF	–22 dB_{FS}
ON	ON	OFF	OFF	–21 dB_{FS}
OFF	OFF	ON	OFF	–20 dB_{FS}
ON	OFF	ON	OFF	–19 dB_{FS}
OFF	ON	ON	OFF	–18 dB_{FS}
ON	ON	ON	OFF	–17 dB_{FS}
OFF	OFF	OFF	ON	–16 dB_{FS}
ON	OFF	OFF	ON	–15 dB_{FS}
OFF	ON	OFF	ON	–14 dB_{FS}
ON	ON	OFF	ON	–13 dB_{FS}
OFF	OFF	ON	ON	–12 dB_{FS}
ON	OFF	ON	ON	–11 dB_{FS}
OFF	ON	ON	ON	–10 dB_{FS}
ON	ON	ON	ON	–9 dB_{FS}
Note: 6 dB ≙ 6.02 dB calibration is assumed above				

6.3.12.3 Minimixer M2 Card Version 5029586

In this version the same card is used to mix audio signals in a fixed configuration. Up to 32 card inputs (console outputs) and 32 card outputs (console inputs) may be available, depending on the DIP switch settings. Typical use of this card: Provide a simple sum of two or more signals to a single output. Refer to the block diagram on the next page.

For example, a presenter might wish to hear a mix of a console monitor selector and an external talkback system, or a simple mono sum of a stereo signal is required to feed a special output. DIP switches set the quantity of inputs and outputs the card consumes or feeds from/to the D21m backplane. This is useful if a small number of mixes is required and only few spare D21m channels are available.

The card also takes GP outputs from the desk to make changes to its control parameters, such as a 3 dB pad, mute, or signal inversion, as shown on the block diagram. The front panel LEDs show the state of these GP outputs.

Note Changing the DIP switches will require the D21m frame **RECONFIG** key to be activated. The mapping of the ports will change, possibly requiring changes to the desk configuration.

'Option' DIP Switch

Segment 1

	Option
ON	GLITS tone
OFF	1 kHz tone

Segment 2

	Option
ON	Outputs 9-12 (and 25-28 if selected): attenuated by 3 dB
OFF	Outputs 9-12 (and 25-28 if selected): 0 dB gain

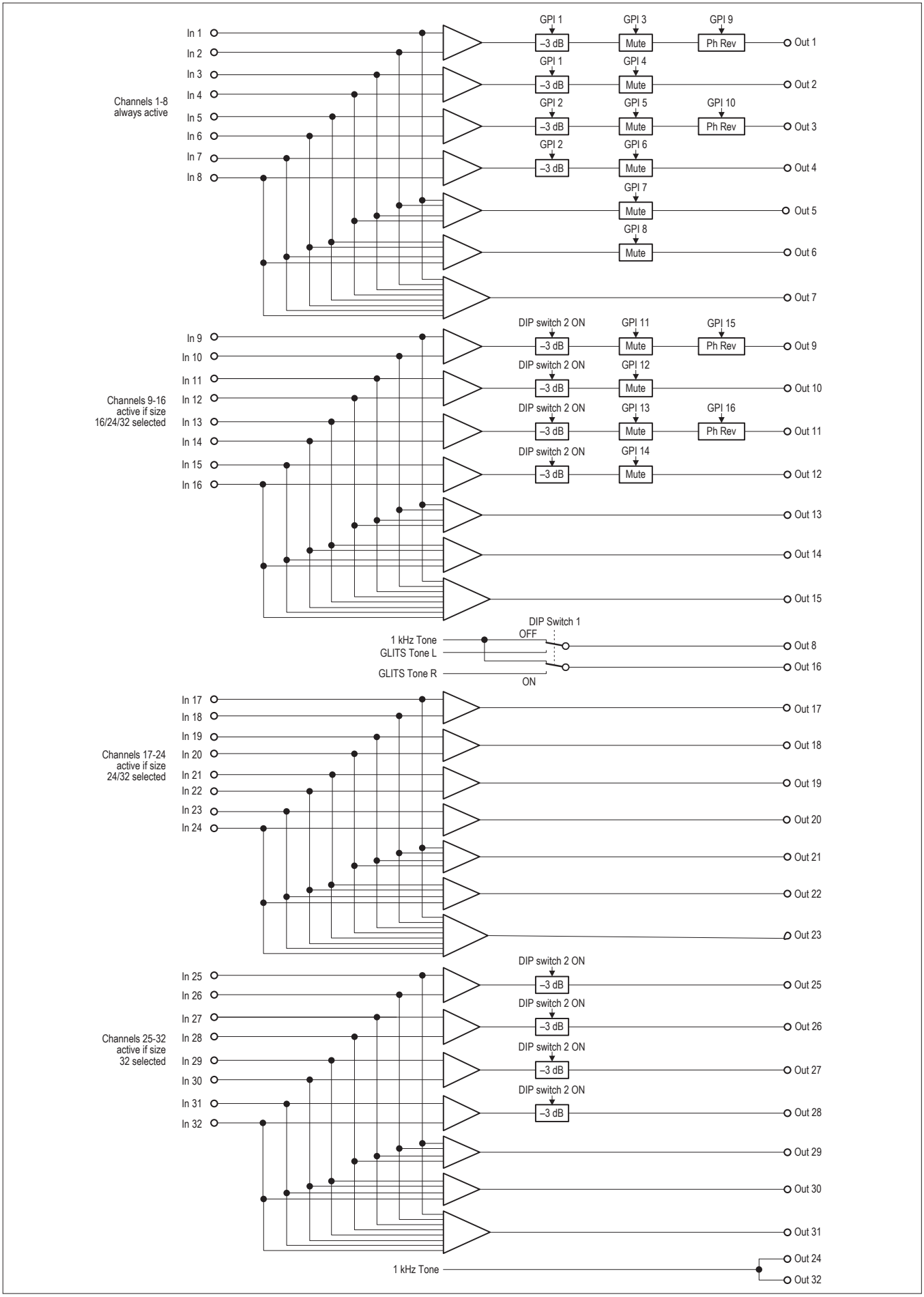
Segments 3-5 Spare, not used

Segment 6

	Option
ON	Ignore GPI 1-16
OFF	Read GPI 1-16

Segments 7&8

7	8	Option
OFF	OFF	8 inputs and outputs
ON	OFF	16 inputs and outputs
OFF	ON	24 inputs and outputs
ON	ON	32 inputs and outputs

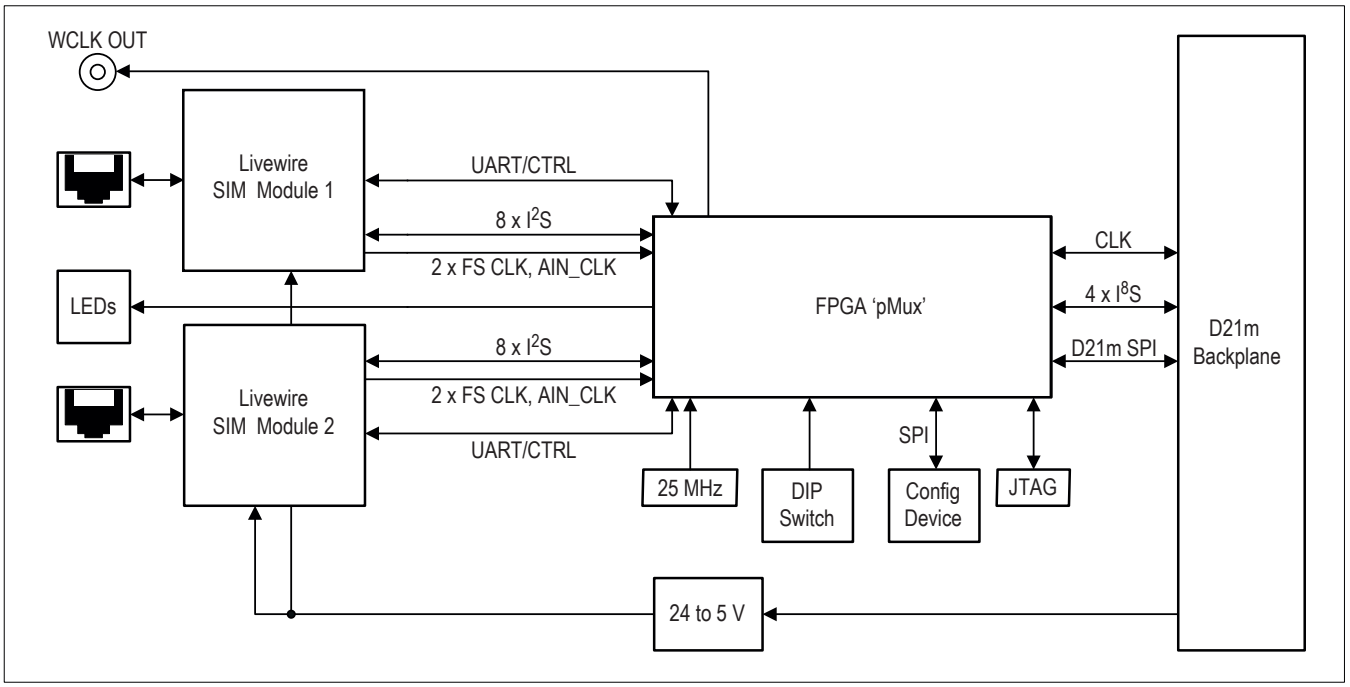

In 1
In 2
In 3
In 4
In 5
In 6
In 7
In 8
Channels 1-8
always active
GPI 1
–3 dB
GPI 3
Mute
GPI 9
Ph Rev
Out 1
GPI 1
–3 dB
GPI 4
Mute
Out 2
GPI 2
–3 dB
GPI 5
Mute
GPI 10
Ph Rev
Out 3
GPI 2
–3 dB
GPI 6
Mute
Out 4
GPI 7
Mute
Out 5
GPI 8
Mute
Out 6
Out 7
In 9
In 10
In 11
In 12
In 13
In 14
In 15
In 16
Channels 9-16
active if size
16/24/32 selected
DIP switch 2 ON
–3 dB
GPI 11
Mute
GPI 15
Ph Rev
Out 9
DIP switch 2 ON
–3 dB
GPI 12
Mute
Out 10
DIP switch 2 ON
–3 dB
GPI 13
Mute
GPI 16
Ph Rev
Out 11
DIP switch 2 ON
–3 dB
GPI 14
Mute
Out 12
Out 13
Out 14
Out 15
DIP Switch 1
OFF
1 kHz Tone
GLITS Tone L
GLITS Tone R
ON
Out 8
Out 16
In 17
In 18
In 19
In 20
In 21
In 22
In 23
In 24
Channels 17-24
active if size
24/32 selected
Out 17
Out 18
Out 19
Out 20
Out 21
Out 22
Out 23
In 25
In 26
In 27
In 28
In 29
In 30
In 31
In 32
Channels 25-32
active if size
32 selected
DIP switch 2 ON
–3 dB
Out 25
DIP switch 2 ON
–3 dB
Out 26
DIP switch 2 ON
–3 dB
Out 27
DIP switch 2 ON
–3 dB
Out 28
Out 29
Out 30
Out 31
1 kHz Tone
Out 24
Out 32

6.3.13 Livewire® Card (VISTA, OnAir, ROUTE 6000*) 5014376

One or several D21m Livewire cards can be plugged into a D21m frame and can be seamlessly integrated in an environment of Studer I/Os, consoles, and/or routers. This allows transferring audio data over Ethernet via Axia's Livewire technology – not only among Studer products featuring D21m card slots, but also in combination with 3rd-party components supporting the Livewire standard. The D21m Livewire card features 16 stereo channels in and out (8 per Ethernet connector). The channels are configurable with a DIP switch in groups: 0, 16 or 32 input signals, and 0, 16 or 32 output signals.
Please note that Livewire only 'knows' about stereo channel pairs. The D21m Livewire card, however, will split or combine these pairs on the D21m system's backplane into/from mono signals. Therefore, if mono channels are required, this can can only be realized via the console's configuration but not in the Livewire domain.
A word clock output is provided on the card and can be used for synchronizing other Livewire devices.

* Supported Product family	from SW Version
Vista	V 5.0
OnAir	V 5.0
Route 6000	V 2.2

Current consumption (24 V) 300 mA
(3.3 V) 60 mA
Operating temperature 0-40 °C



Integration In order to use Livewire audio and control data by Monitora via TCP/IP, the PC or Server with a radio automation software must have a virtual com port. Installing 'Virtual Serial Port' by Eltima, http://www.eltima.com/products/vspdxp/ is recommended.

In addition, the designated I/O setup needs to be configured in the OnAir console.
Besides interfacing to other Livewire hardware nodes, Studer's Livewire card can also connect to a virtual Livewire audio device. To connect to a virtual Livewire device, a Livewire virtual audio driver must be integrated by the 3rd party system, such as a radio automation. Audio can be played back then out of the 3rd party system to a Studer console via Livewire.
The radio automation system can control the OnAir console (routing, snapshots, faders) using the Monitora protocol (requires support of Monitora by the 3rd party system). It is also possible that the console triggers a playback by manually opening the dedicated console fader.

Notes

In order to have a reliable Livewire configuration, installation of a Livewire-recommended switch is mandatory (such as the Cisco 2960).
The Livewire card requires an update of OnAir software to version 5.0.
Livewire operation is limited to the standard sampling rate of 48 kHz.
GPIO over IP is currently not supported; however, the Monitora protocol may be used for controlling channel functions of the mixing console by the playout system. The console will need two separate Ethernet connections then – one for AoIP (Audio over Internet Protocol), the second for Monitora control.

Front Panel LEDs

LNK (Link)

When continuously illuminated, this LED indicates the presence of a live Ethernet link to another Ethernet 100BASE-T device, which means that a connection is present and some device is connected. It does not indicate the quality of the connection, however. If no Ethernet link is present, it will flash slowly.

LW (Livewire)

This LED indicates that the connected Ethernet segment has Livewire traffic present. If the **LNK** LED is illuminated but the **LW** LED is not, there are either no other Livewire devices connected, or the Ethernet switch has not been programmed to pass such traffic.

SY (Sync)

If sync packets are being received by the Livewire node, this LED will begin to flash. The LED will continue to flash until the Livewire node has locked its local clock to the network master. Once the local node's PLL is locked, the LED will illuminate continuously.

MST (Master)

The Livewire system employs a sophisticated master/slave clocking system over the Ethernet network. Any device may become the clock master by default, however this can be changed if desired. The system has the ability to automatically change to a different clock master if the current master is disconnected or otherwise inoperative. This happens transparently and without any audible glitches. The LED indicates that this node is currently acting as master.

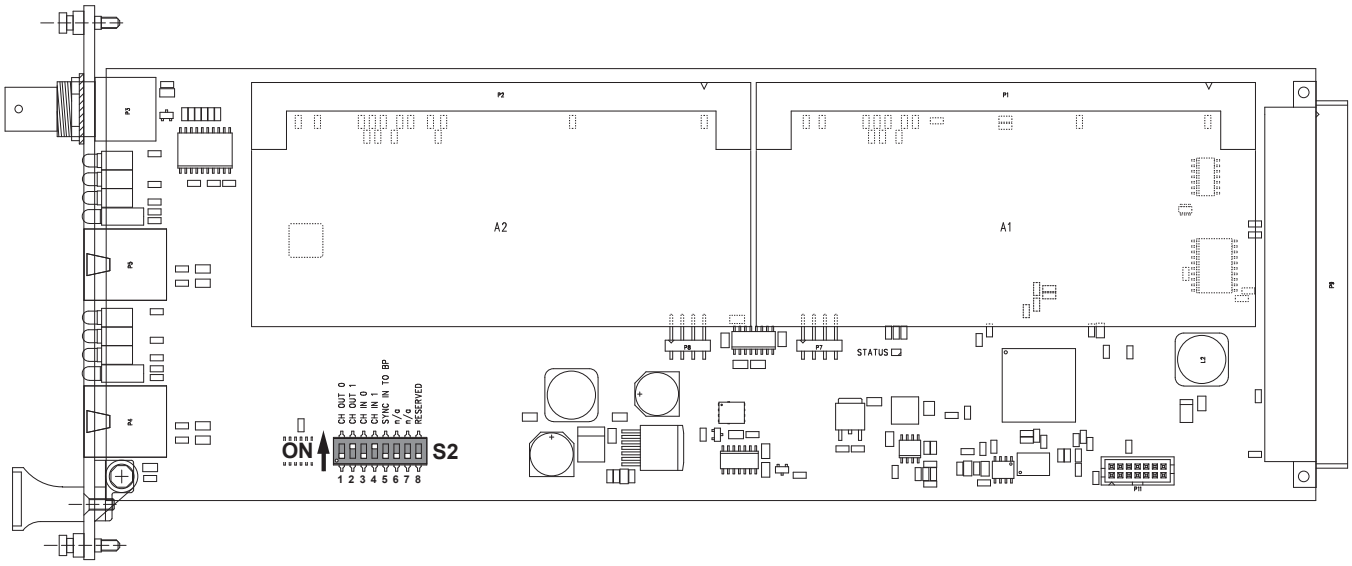
SY *and* MST

Only one of these two LEDs should be illuminated at a time. If neither LED illuminates, something is faulty. The **SY** LED indicates incoming clock information from another (master) Livewire node. The **MST** LED indicates that its node is acting as the master clock source for the Livewire network.

ERR (Error)

Both **ERR** LEDs alternately flash if the D21m frame has no lock or if it runs at a sampling rate different from 48 kHz.
The individual **ERR** LEDs are illuminated if

- the corresponding Livewire module has detected an internal error, or
- the UART communication fails, or
- the corresponding Livewire module is missing.



DIP Switch S2

Segments 1 & 2

1	2	Option
OFF	OFF	0 outputs
ON	OFF	16 outputs
OFF	ON	32 outputs *(factory default setting)*
ON	ON	not used

Segments 3 & 4

3	4	Option
OFF	OFF	0 inputs
ON	OFF	16 inputs
OFF	ON	32 inputs *(factory default setting)*
ON	ON	not used

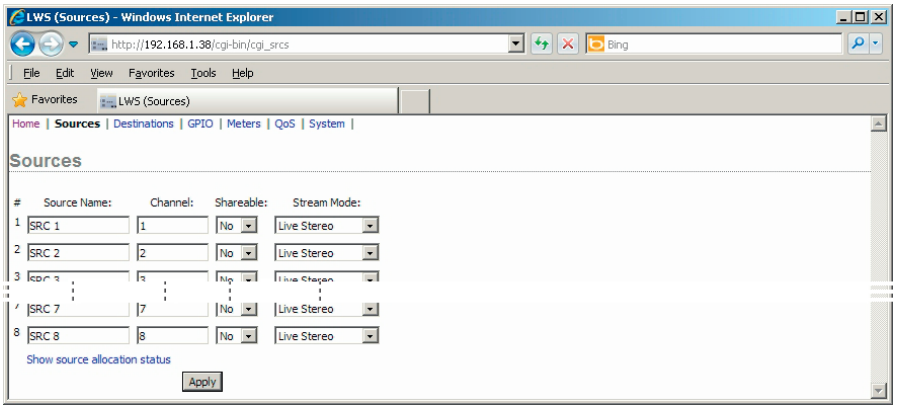
Segment 5 reserved for future use *(must always be OFF)*
Segments 6 & 7 not used *(factory default setting: OFF)*
Segment 8 reserved for future use *(must always be OFF)*

6.3.13.1 Configuration via Web GUI

Connect your computer to one of the card's ports with an Ethernet cable. Enter the IP address (default: 192.168.1.38) in the address line of your browser and hit Enter. Refer to the following chapter if the IP Address of your device is unknown. Login to open any page (user name: axia, no password required).

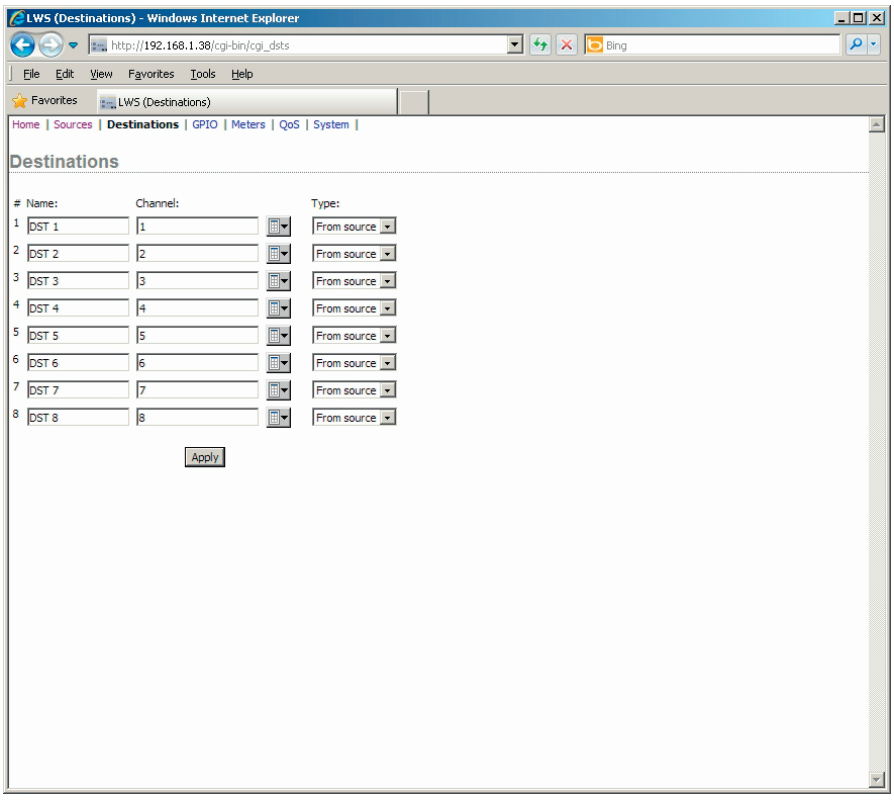
Sources Page

(Factory default settings shown).
Displays the source channels sent to the Livewire network by this module.



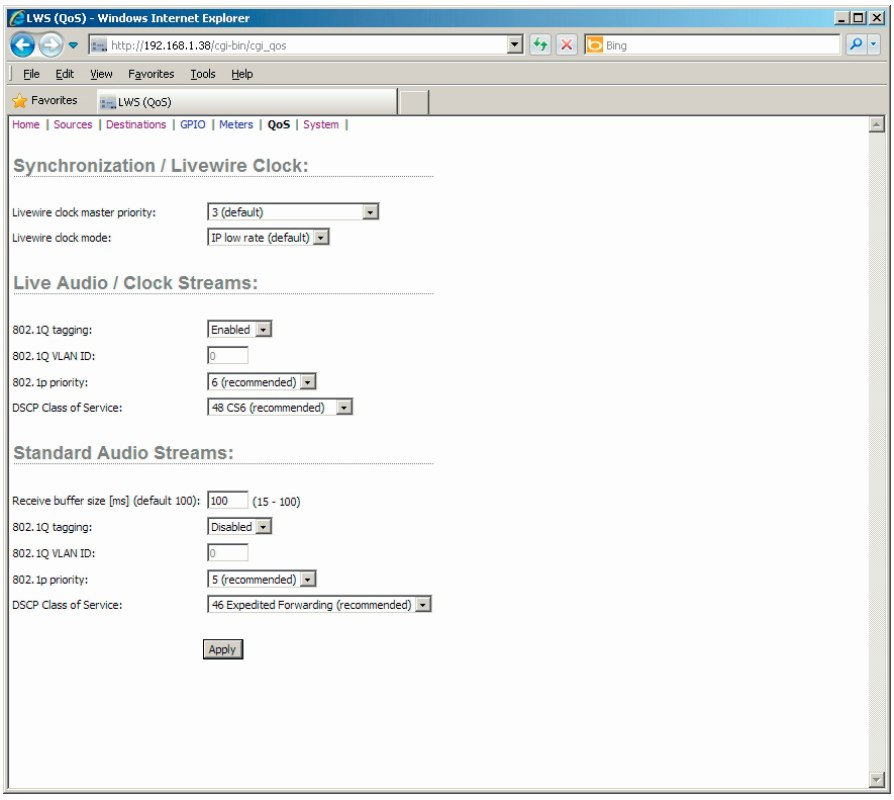
Destinations Page

(Factory default settings: Local loopback).
Displays the source channels received from the Livewire network by this module.

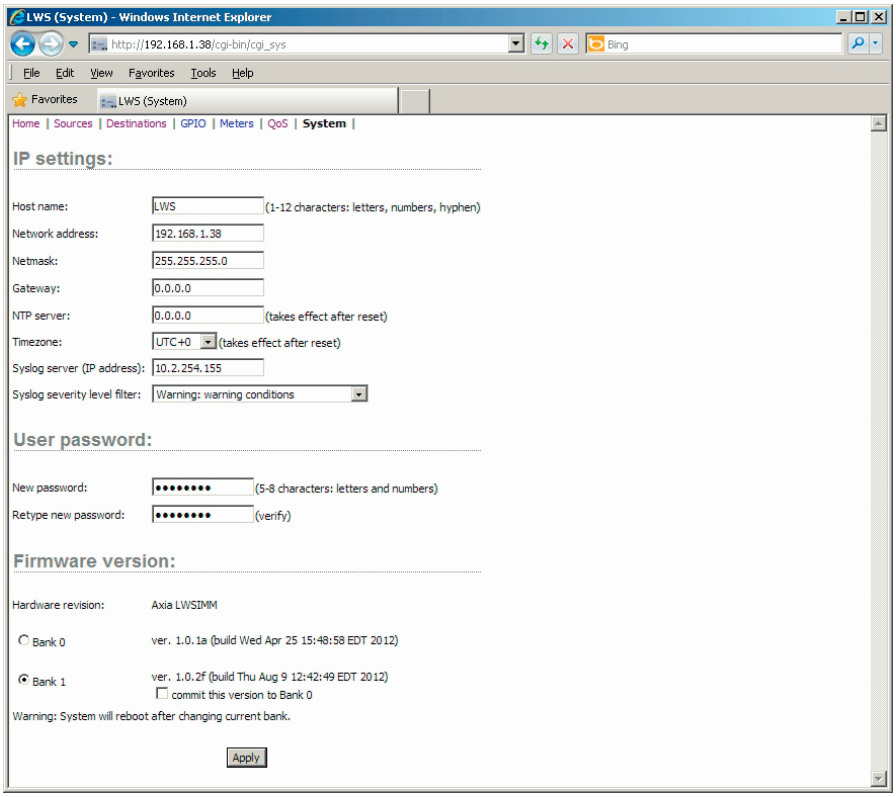


QoS (Quality of Service) Page

(Factory default settings shown).
If this module will be used as Livewire clock master, select '7 (always master)' for 'Livewire clock master priority'.



System Page (Factory default settings shown). Use ‘Network address’ to change the IP address.
This page can also be used for firmware updates. Switch to ‘Bank 0’, upload the new firmware to ‘Bank 1’ and switch back to ‘Bank 1’.

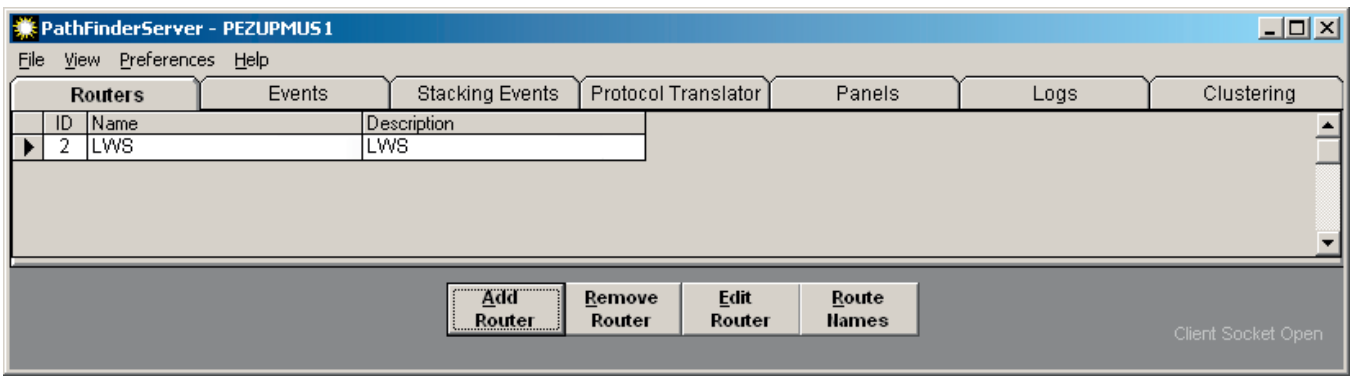


Note Repeat this procedure for the second Livewire SIM module if required.

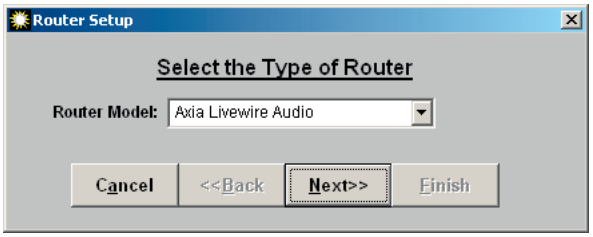
6.3.13.2 Livewire Network Node Detection

In order to retrieve unknown IP addresses in the network proceed as follows:

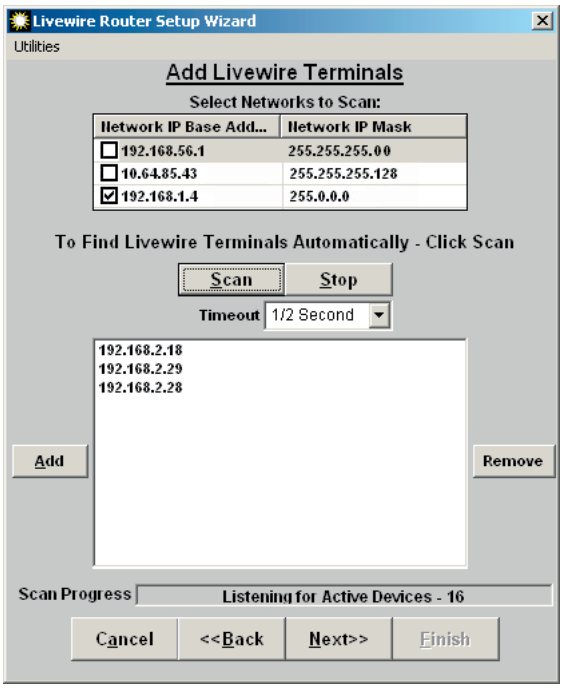
- Install Pathfinder PC/PRO on your computer (download from www.axiaaudio.com; use the ‘PathfinderPC Server x.xx Release’ link). The free version has restricted functionality but is sufficient for our purposes. It is specified for computers running Windows® XP but also seems to be compatible with Windows® 7.
- Connect your computer to the network.
- Start PathFinderServer. Skip the License Dialog by a click on ‘Exit’. After confirming to work in restricted functionality mode, the following window pops up:



- Select ‘Add Router’.

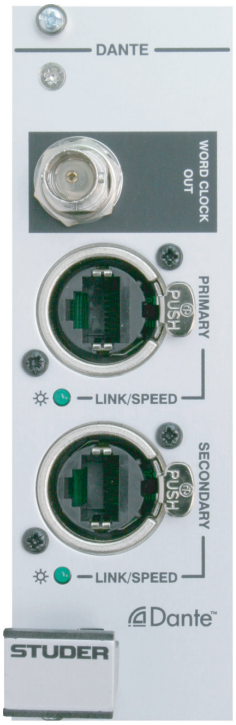


- Select ‘Axia Livewire Audio’ as ‘Router Model’ and click ‘Next’.



- Select the network adapter according to your Livewire setup and click ‘Scan’.
- In the lower window you can see all Livewire nodes available, regardless of the network adapter IP settings. Livewire uses a broadcast message to advertise Livewire nodes.

6.3.14 D21m Dante™ Card (VISTA, OnAir, ROUTE 6000*) 5045044

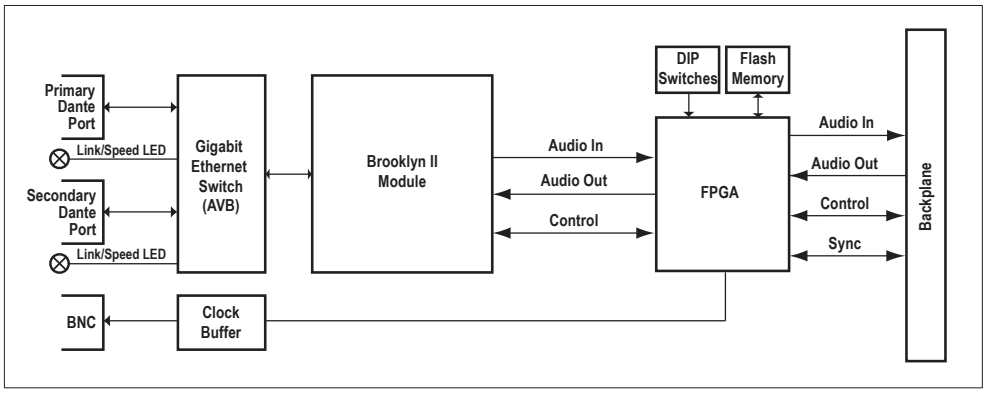


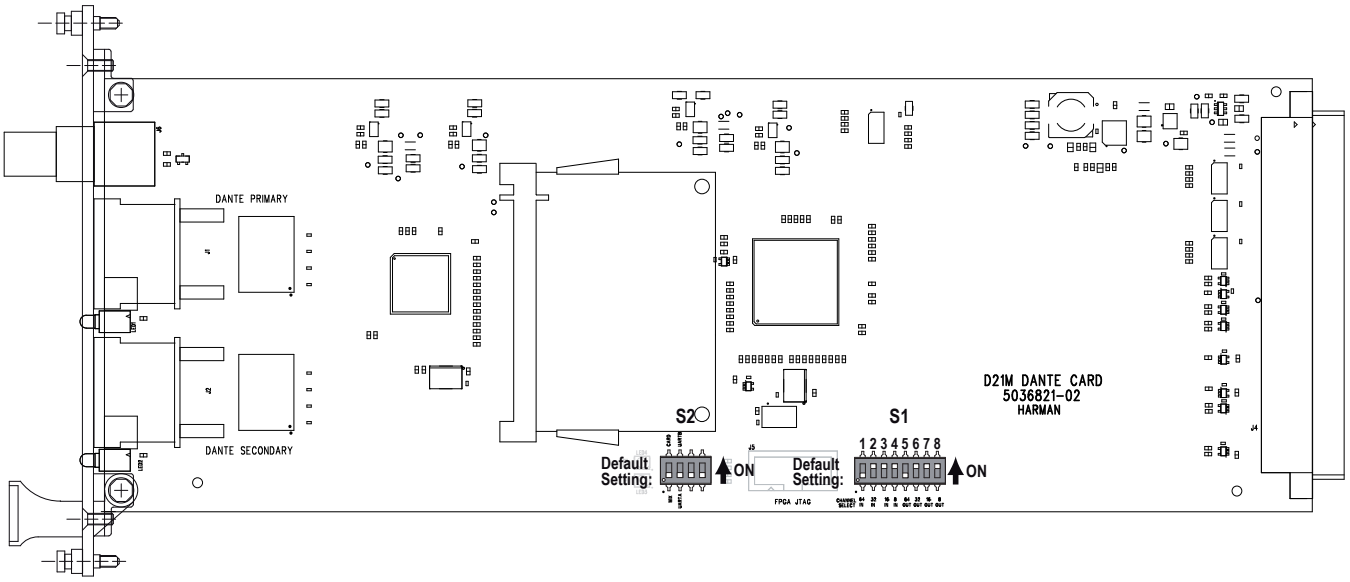
The D21m Dante™ card is a 64 x 64 interface between a Studer console or router and any Dante™ compatible device from HARMAN or other 3rd party manufacturers.The D21m Dante™ card needs a double slot in the D21m frame.
Dante™ provides a digital audio network that uses standard Internet Protocols over both 100 Mbps and 1 Gbps Ethernet. Dante™ uses audio independent, high accuracy network synchronization standards to ensure all Dante™ devices are synchronized at all times. Dante runs on standard computer networking hardware, and does not require dedicated network infrastructure.

* Supported Product family	from SW Version
Vista	V 5.0
OnAir	V 6.1
Route 6000	V2.2.14 Patch 02

For further information on Dante™, please refer to www.audinate.com.

Max. Cat5e cable length	max. 100m recommended
Sampling Rate	only 48 kHz supported
Power consumption	3.5 W
Operating temperature	0-40 °C





6.3.14.1 Configuring the Dante Card

Connections between the Dante cards are set using a tool, in this case the Dante Controller software from Audinate®. As communication across the Dante network is essentially between named cards and channels, the configuration must be correct to ensure cards talk and listen to the correct/desired channels on the Dante network.
This user guide summarises the process and provides a simple worked example; full setup details and configuration tools are downloadable from the Audinate web site www.audinate.com.
In addition it is necessary to set the clock status of the Dante card both within the network and in relation to the console hardware. This is described below.

6.3.14.2 Channel count setup

The Dante card uses 64 in and 64 out channels by default, but can be restricted to use less input or output channels if required. For example, if only output channels are required on the Dante card, the input channels can be set to 0, to maximise the number of input channels available for other cards.
The DIP switch S1 on the Dante card main PCB is used to set the input and output channel count, in steps of 8chs from 0 to 32 channels. Refer to the diagram on the next page which shows the location of the channel count DIP switch S1 and the factory default setup of 64 in/64 out.

S1 DIP switch for D21m channel count setting:

1	2	3	4	5	6	7	8	Number of Channels
ON	ON	ON	ON	-	-	-	-	0 inputs
ON	ON	ON	OFF	-	-	-	-	8 inputs
ON	ON	OFF	ON	-	-	-	-	16 inputs
ON	ON	OFF	OFF	-	-	-	-	24 inputs
ON	OFF	ON	ON	-	-	-	-	32 inputs
ON	OFF	ON	OFF	-	-	-	-	40 inputs
ON	OFF	OFF	ON	-	-	-	-	48 inputs
ON	OFF	OFF	OFF	-	-	-	-	56 inputs
OFF	ON	ON	ON	-	-	-	-	64 inputs (factory default)

OFF : OFF	ON : OFF	ON : OFF	OFF : OFF	- - -	- - -	- - -	- - -	***NOT ALLOWED***
-	-	-	-	ON	ON	ON	ON	0 outputs
-	-	-	-	ON	ON	ON	OFF	8 outputs
-	-	-	-	ON	ON	OFF	ON	16 outputs
-	-	-	-	ON	ON	OFF	OFF	24 outputs
-	-	-	-	ON	OFF	ON	ON	32 outputs
-	-	-	-	ON	OFF	ON	OFF	40 outputs
-	-	-	-	ON	OFF	OFF	ON	48 outputs
-	-	-	-	ON	OFF	OFF	OFF	56 outputs
-	-	-	-	OFF	ON	ON	ON	64 outputs (factory default)
- - -	- - -	- - -	- - -	OFF : OFF	ON : OFF	ON : OFF	OFF : OFF	***NOT ALLOWED***

6.3.14.3 Sync Setup

The Dante card can act as either a Master clock source for the Dante network, or as a clock slave. If there is only one console on the network, this will generally be set as the clock master for the network, but in cases with more than one console, or where another device acts as the clock master, it will be necessary to set the console's Dante card to be a clock slave. The Dante clock master/slave status is set up using Dante Controller software (see later in this guide), but in addition to the Dante clock setup, the card's clock status within the local system has to be set. This is done using a DIP switch S2 on the Dante card main PCB. Refer to the diagram on the previous page for the location and setting of this switch.

MIX Select this position to make the Dante module lock to the console's internal Wordclock, only to be used when the Dante card is set as the Preferred Master for the Dante network. This setting is the factory default.

CARD Select this position to make the console lock to the Dante network clock, to be used when the Dante card is set up as a slave on the network. Note: In this case, a BNC wordclock cable must be connected from the Wordclock Out BNC connector on the Dante card, to the console's Wordclock IN.

S2 DIP switch for Sync and UART setting:

Switch	Setting
1	OFF: Selects Sync to local system (MIX) *(factory default)* ON: Selects Sync to Dante card (CARD)
2	OFF: Selects UART A *(factory default)* ON: Selects UART B
3	reserved for future use
4	reserved for future use

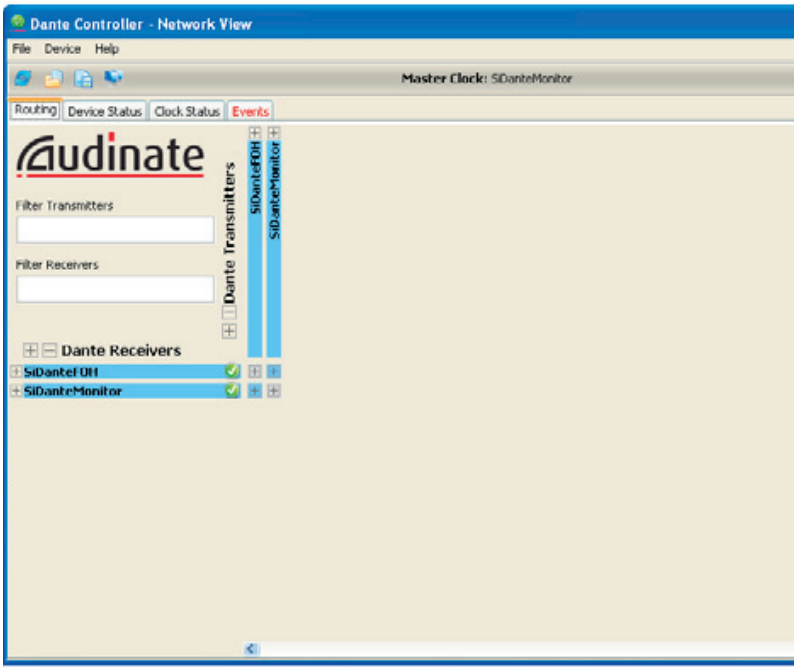
6.3.14.4 Setting up the Dante card for operation on the network

As mentioned earlier, it is necessary to use a software tool connected externally to the card, in order to route audio from the card to/from another Dante-enabled device.

1. Download and install latest Dante Controller software from www.audinate.com.

2. Connect a Mac/PC to the Dante card, this may be via a switch/router or direct to either the PRIMARY or SECONDARY ports. The LINK indicator on the card will begin to flash indicating an active connection.
   NOTE: A crossover cable is not required as the network ports on the Dante card are auto-MDIX.

3. Start the Dante Controller application, after a few moments a screen similar to the one below will appear:

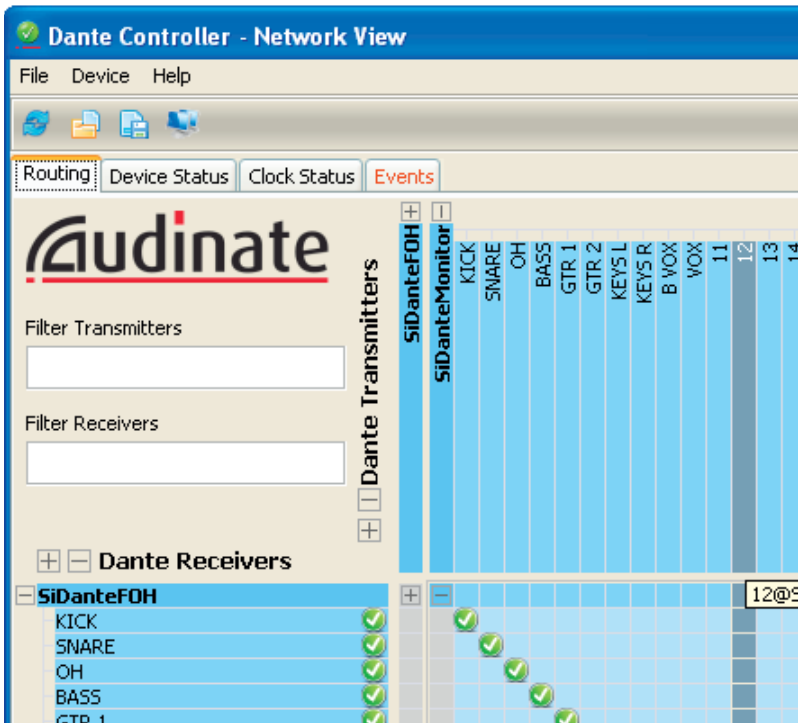


Using Dante

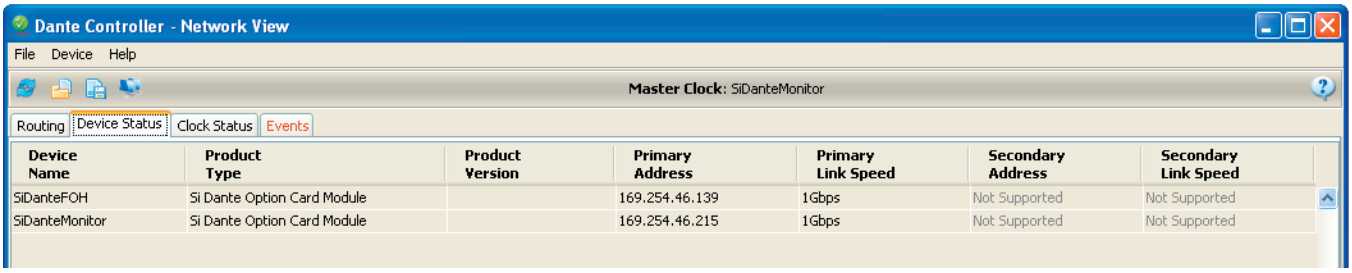
The following sections cover basic setup and use of the D21m Dante cards. For detailed information regarding Dante please refer to information on Audinate's web site www.audinate.com.

Network View

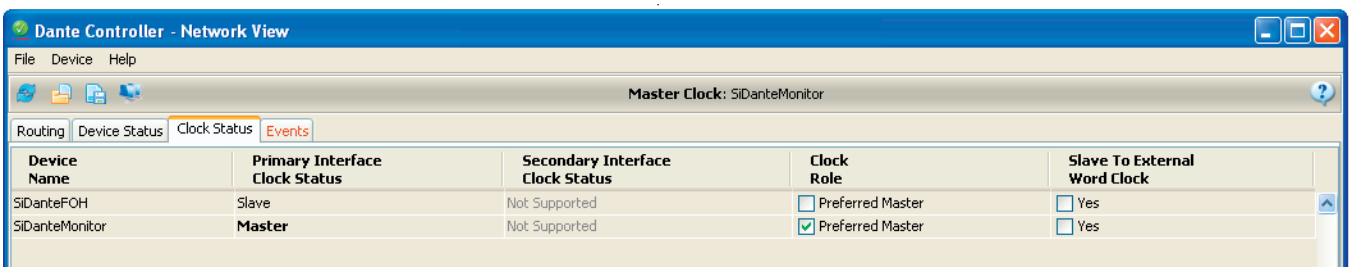
Routing – Matrix view of routing (click on a '+' symbol to expand the matrix view).
NOTE: Although Dante Controller software can work through a firewall some information such as Device Config, Network Config, Dante Controller etc. may not be accessible until the firewall is disabled or a port to Dante is opened.



Device Status Displays information about discovered Dante devices; doubleclick a device name to enable its configuration :



Clock Status View and edit Dante Network clock configuration :

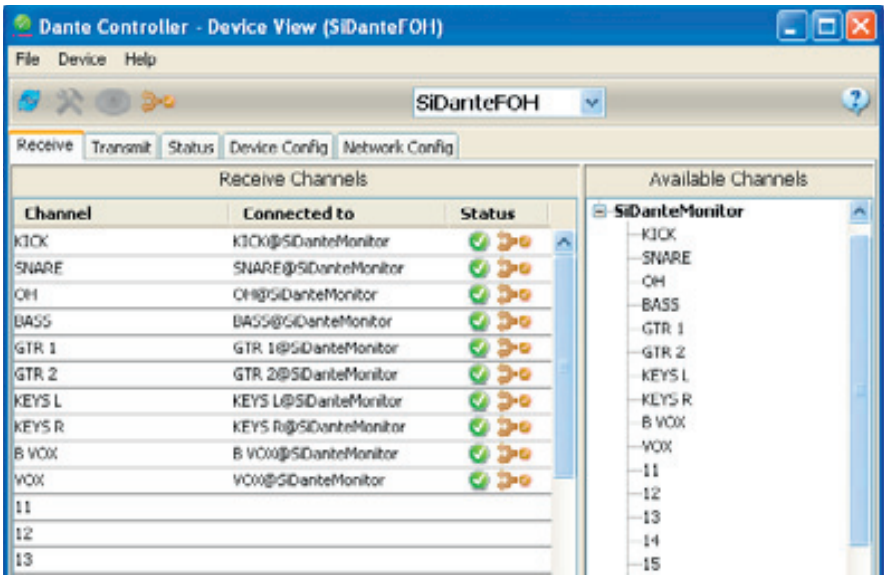


Clock Role Setting a single '**Preferred Master**' will ensure that device is selected as the clock master, if two or more devices are set for 'Preferred Master' the master will be elected by the Dante system.

Note Clock Status settings apply to the clocking of the Dante network, attached devices such as consoles must be clocked to/from the Dante network as appropriate or required in any given system.
'Slave to External Word Clock': When checked the Dante card will clock from the console internal word clock, if not checked the host device must be clocked to the Dante card or system word clock as appropriate or required in

the given system.

Device View The Device View allows viewing and editing of a selected Dante device.

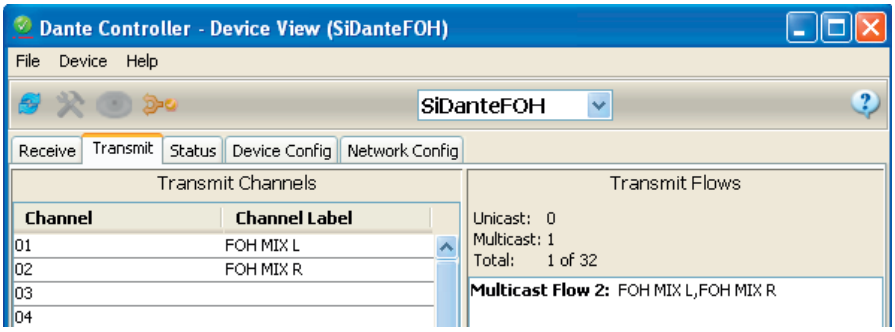


Receive This tab presents information about all channels being received, and channels available to the current device. The tab is arranged into two areas:

Receive Channels: Lists the Rx channels in the left pane of the window. It shows whether or not they are connected and, if connected, the channel they are connected to and the status of that connection.

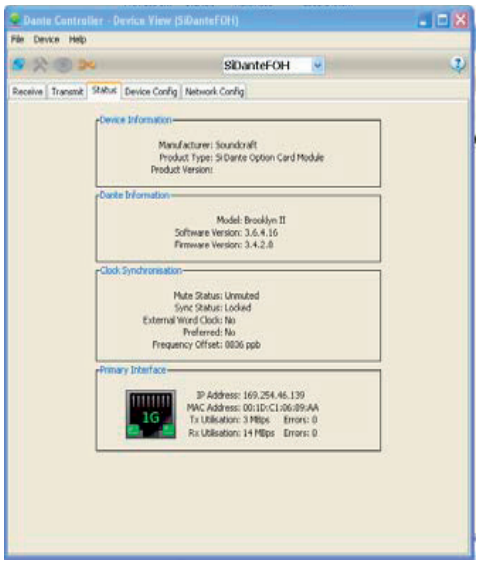
Available Channels: On the right pane of the window, lists the Tx channels from other devices that are available for subscription by the current device. You may drag and drop **Available Channels** to **Receive Channels**.

Transmit This tab is used to view and edit the transmit configuration of a device :

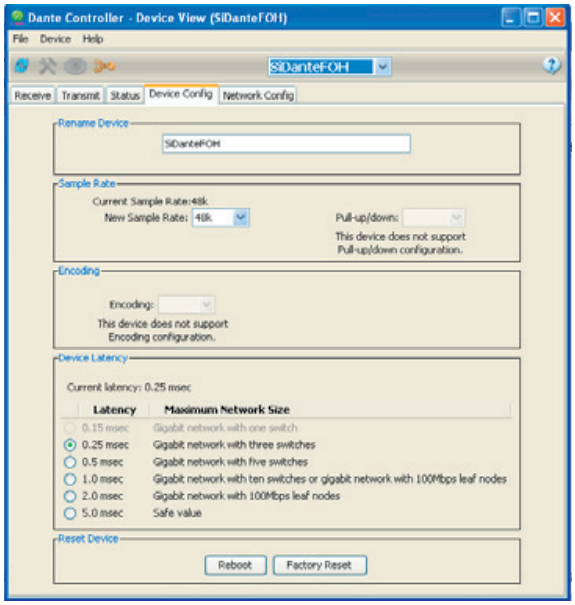


Transmit Channels: The area on the left pane of the tab shows the Tx channels for the device, and any userdefined channel label. It allows the user to create labels for transmit channels. Input to the table is filtered to prevent illegal characters from being used in channel labels. To change a Tx channel label doubleclick on the label and type in a new one. Tx channel labels must be unique on a single device.

Status The **Status** tab is used to view information about a Dante device, this information may be required for trouble shooting and checking software / firmware is up-to-date.



Device Config This tab on the device view allows viewing and editing of the following device specific parameters :



Rename Device: Allows renaming of the Dante device.

Sample Rate: 48K – this is fixed and cannot be edited.

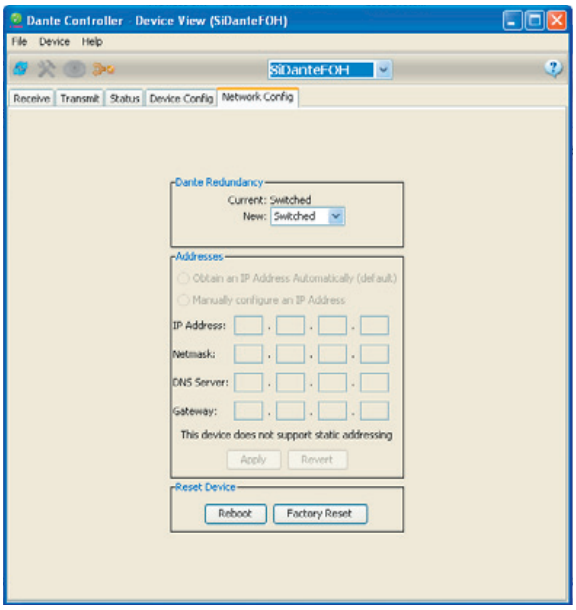
Latency: Allows selection of an appropriate latency.

Note The 0.15 msec setting is unavailable on D21m Dante cards as these include an internal ethernet switch.

Factory Reset: Allows remote reboot of the Dante interface and to reapply factory settings. Following a reboot it is recommended to power-cycle the console. **Factory Reset** wipes the following device configuration settings:

- User-defined device name
- User-defined channel labels
- Clock configuration (clock master / external clock master setting)
- Static IP addresses
- Redundancy configuration
- Sample rate setting (including pull-up/down)
- Latency setting
- Any existing audio routes

Network Config This tab enables viewing and editing of Dante Redundancy mode.



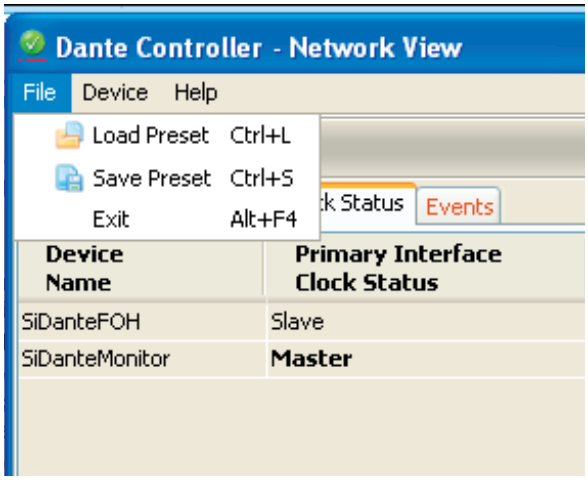
Switched mode : When set to **Switched**, the secondary Ethernet port will behave as a standard switch port, allowing daisy-chaining through the device.

Redundant mode : When set to **Redundant**, the device will duplicate Dante audio traffic to both Ethernet ports, allowing the implementation of a redundant network via the secondary port.

All devices on a Dante network MUST be set to the same mode (**Switched** or **Redundant**), otherwise the network will not function reliably.

Dante Presets Although patching to and from the D21m Dante card in the console is stored as part of a snapshot, the configuration and routing of the Dante cards and Dante audio streams is not.

In the event a Dante card is replaced or similar, the 'new' card will require-configuring, this may be done manually or by loading a previously stored preset from the 'File' menu of the Dante Controller software :



6.3.14.5 Virtual Sound Card

The Audinate Dante™ Virtual Soundcard software allows connection of a PC/Mac to a Dante audio network. This system allows the computer to record from and playback to the Dante network using most common DAW packages. Dante Virtual Soundcard uses the Ethernet port on the computer to communicate with the Dante network; no special hardware is required other than installing Dante Virtual Soundcard software.
One DVS license token is provided FOC with the card, this license can only be installed on one specific computer.

6.3.15 D21m BLU Link™ Card (VISTA, OnAir, ROUTE 6000*) 5033340

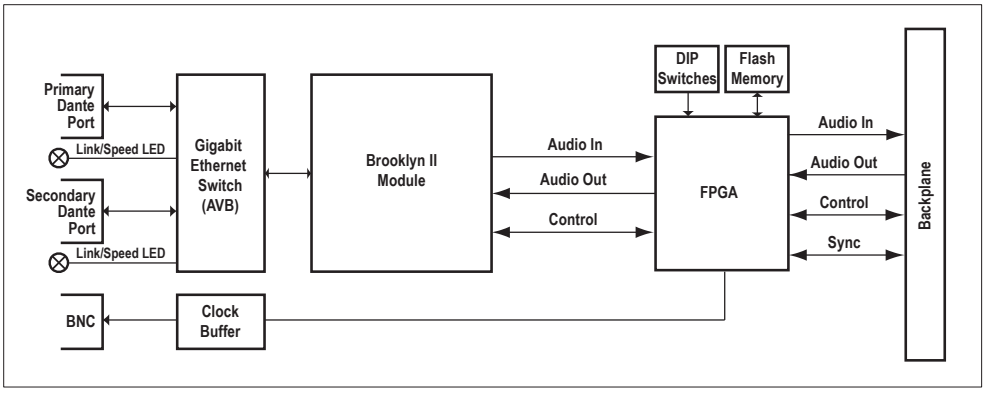
The D21m BLU Link card is a 32 x 32 interface between a Studer console or router and the Soundweb London digital audio bus, informally known as BLU Link. The card allows connection to a wide variety of Harman products equipped with a BLU Link interface, such as BSS London BLU 800, dbx® PMC or Crown® PIP-BLU interfaces amongst others.

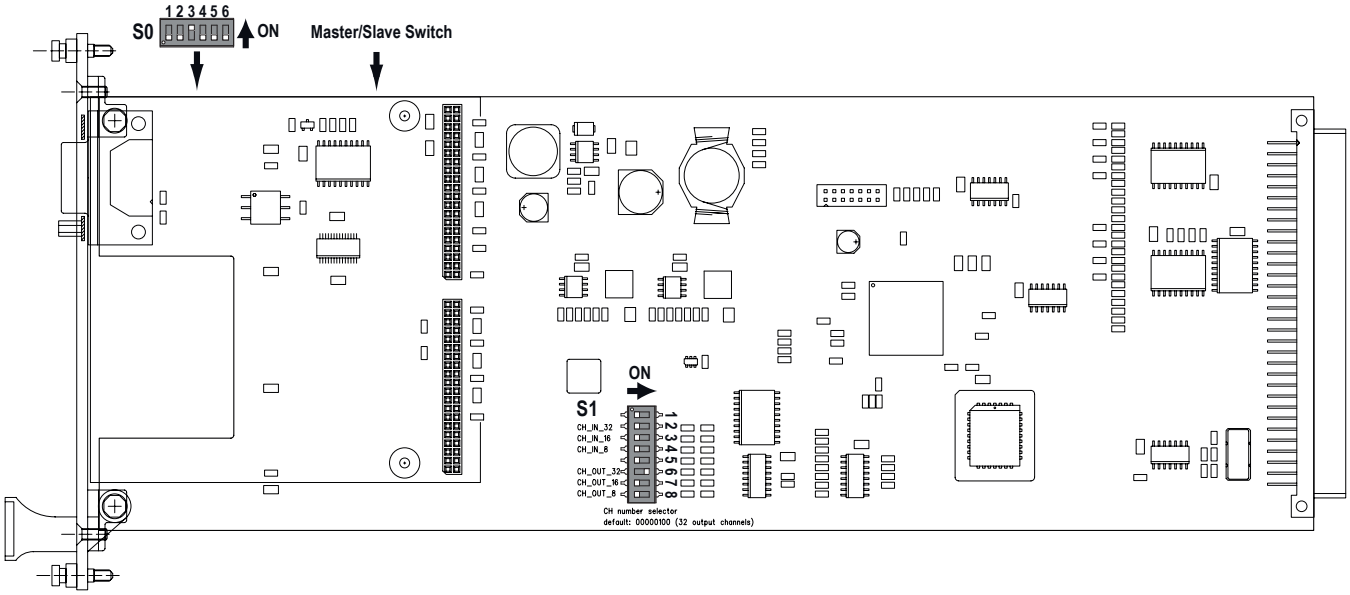
BLU Link is a low latency, fault tolerant digital audio bus of 256 channels which gives a distance of 100m between compatible BLU Link enabled devices using standard CAT5e cabling. To increase the distance between devices the BSS Audio MC-1 fibre optic media converter can be used to span over 10km using single mode fibre.

Additional information about the Soundweb London BLU Link digital audio bus may be found on the BSS web site www.bssaudio.com

* Supported Product family	from SW Version
Vista	V 5.1
OnAir	V 6.1
Route 6000	V2.2.14 Patch 02

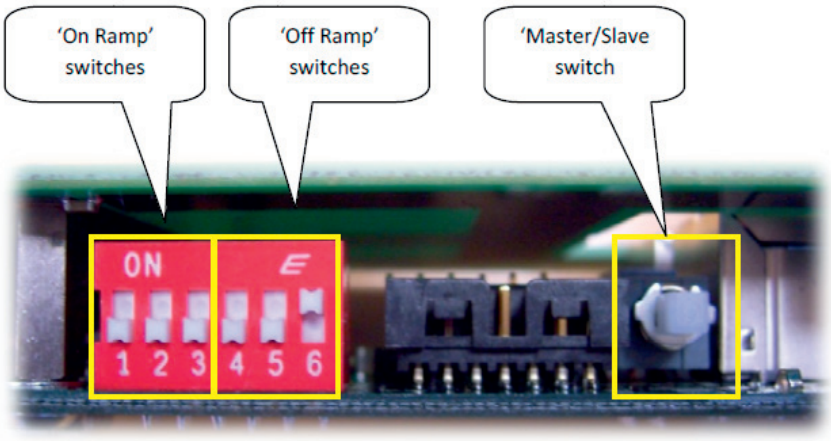
Max. Cat5e cable length	100 m
Sample Rate	only 48 kHz supported
Power consumption	approx. 5 W
Operating temperature	0-40 °C





6.3.15.1 Configuring the BLU Link Card

Before the BLU Link card .may be used, the switches that define master / slave status and channel assignment must be configured. These switches are accessed by removing the card from its slot and looking at the top side of the 'dual-pcb' section.



Master / Slave switch

The master / slave switch determines the clock source for the BLU Link network.

- When set as master (switch set IN) the BLU Link card clocks the network from the consoles clock. There can only be one master BLU Link card in the system.
- When any other device is set as the master, the BLU Link card needs to be configured as slave (switch set OUT).

When operating in slave mode, provision must be made to clock the console or router from the BLU Link network by connecting an external cable (supplied with the card), from the 9-pin DSub connector Wordclock out socket on the BLU Link card, to the BNC Wordclock IN socket of the SCoreLive or Compact SCore. When this cable is connected, the green LOCK LED will

illuminate next to the Cores Wordclock in BNC socket. Failure to connect the sync cable in slave mode will result in occasional audio clicks.

Channel assign DIP switch S0

The channel assign switches dictate which group of channels on the BLU Link network the card "listens" and "speaks" to.
DIP switch S0 has six switches. The leftmost three switches (1-3) are used to select the on-ramp bank (card speaks to BLU Link). The rightmost three switches (4-6) are used to select the off-ramp bank (card listens to BLU Link). Channels not used by the BLU Link card are simply passed "through".

DIP Switches S0 BLU Link network channel assign setting:

BLU Link On-Ramp (Outputs from console)			
1	2	3	Selected Channels
OFF	OFF	OFF	1-32
OFF	OFF	ON	33-64
OFF	ON	OFF	65-96
OFF	ON	ON	97-128
ON	OFF	OFF	129-160
ON	OFF	ON	161-192
ON	ON	OFF	193-224
ON	ON	ON	225-256

BLU Link Off-Ramp (Inputs to console)			
4	5	6	Selected Channels
OFF	OFF	OFF	1-32
OFF	OFF	ON	33-64
OFF	ON	OFF	65-96
OFF	ON	ON	97-128
ON	OFF	OFF	129-160
ON	OFF	ON	161-192
ON	ON	OFF	193-224
ON	ON	ON	225-256

Note Whenever the On Ramp and Off Ramp selections match, no audio is extracted from BLU Link, but instead the audio being sent out of the card will be looped back and will appear on the BLU Link input channels.

6.3.15.2 Channel count setup

The BLU Link card uses 32 in and 32 out channels by default, but can be restricted to use less input or output channels if required. For example, if only output channels are required on the BLU Link card, the input channels can be set to 0, to maximise the number of input channels available for other cards.

DIP Switch S1 DIP switch for D21m channel count setting:

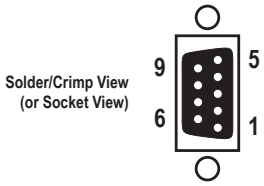
1	2	3	4	5	6	7	8	Number of Channels

not used				not used				
	OFF	OFF	OFF		-	-	-	0 inputs
	OFF	OFF	ON		-	-	-	8 inputs
	OFF	ON	OFF		-	-	-	16 inputs
	ON	OFF	OFF					32 inputs
	-	-	-		OFF	OFF	OFF	0 outputs
	-	-	-		OFF	OFF	ON	8 outputs
	-	-	-		OFF	ON	OFF	16 outputs
	-	-	-		ON	OFF	OFF	32 outputs (factory default)

6.3.15.3 Sync Setup

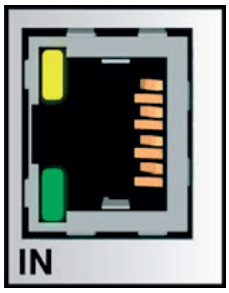
The card is shipped with a short Wordclock sync cable (9-pin D to BNC) for connection to the console's Wordclock input when the console has to slave to the BLU link network (In the case of a card installed in a stagebox, an extension BNC cable may be required, depending on relative location of local rack and stagebox).
Please also verify that the cards master / slave switch is in the correct position (described on previous page).

Connector Pin Assignment P1 **Wordclock Out** (9-pin D-type, female)



Pin	Signal
4	Wordclock Out (TTL)
9	Signal GND
5	Chassis GND
8	Chassis GND

6.3.15.4 BLU Link LED indicators



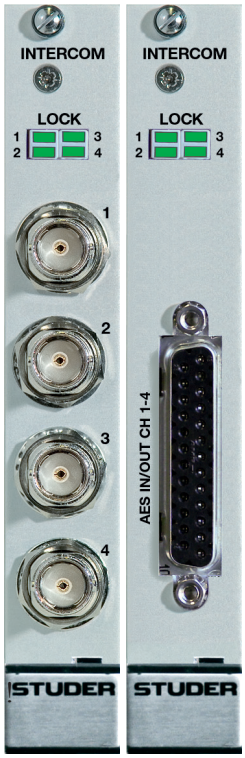
Each BLU Link port features two LED's which are indicating the status:

- Yellow LED : lights when the port is 'alive' indicating the card has booted and ready for use.
- Green LED : lights when it is connected correctly to another BLU Link device.

6.3.15.5 Connecting BLU Link devices

BLU Link devices interconnect using standard Cat5e UTP Ethernet cable. Connections must be made from the OUT of one device to the IN of the next device.
Redundancy is achieved by linking the OUT of the last device into the IN of the first device.

6.3.16 D21m Intercom Card (VISTA, OnAir, ROUTE 6000*) 5037474/5037475



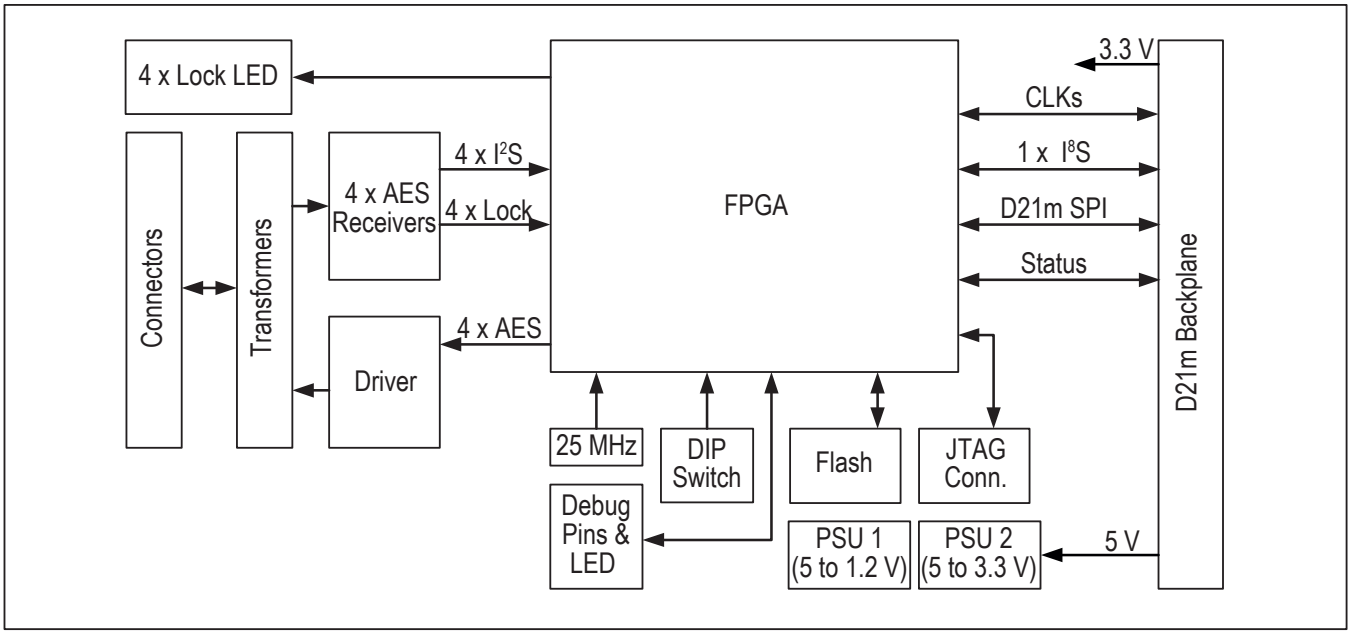
5037475 5037474

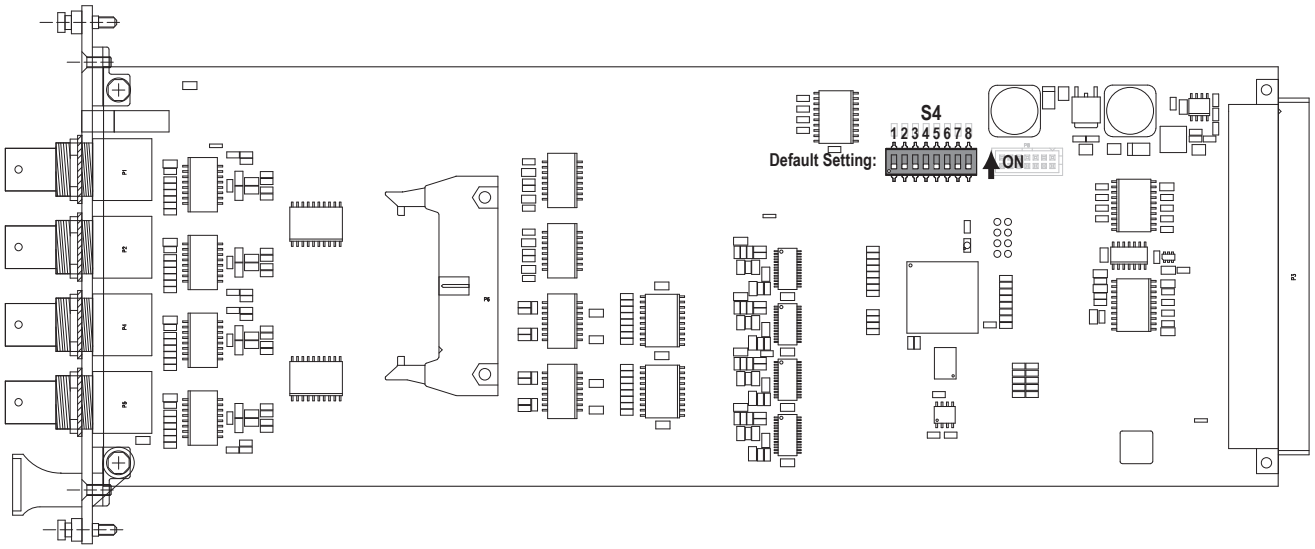
The D21m Intercom card features four bi-directional stereo AES3 ports and serves as an interface to intercom panels. As physical interface, four BNC connectors are used. The AES3 data is transferred in both directions over each BNC connector using hybrid circuits.

As an assembly option, the card can be fitted with a 25-pin D-type connector instead of the BNC sockets. In this version the card may also be used as a smaller alternative to the D21m AES M2 I/O-card with conventional 110 Ω balanced circuits.

* Supported Product family	from SW Version
Vista	V 5.0
OnAir	V 6.0
Route 6000	V 2.2

No. of channels	4 stereo inputs and outputs
Input / output impedance BNC version (5037475)	75 Ω
Input / output impedance D-type (5037474)	110 Ω
Sampling Rate	only 48kHz supported
SRCs	none
Power consumption	approx 4.5 W
Operating temperature	0-40 °C





The D21m Intercom card allows the C and U bits of the AES word to be transparently transmitted from one Intercom card to any other Intercom card in the D21m system. Transparent C and U bits are necessarry for the intercom panels to communicate with the intercom mainframe. This is achieved by routing the C and U bits into the LSBs of the AES audio word - hence the audio wordlength is reduced to 20 bit.

Note *The resulting audio data contains non-audio information in the four bottom bits of the 24 bit audio word and thus is no longer fully PCM. This non-PCM signal may be routed through Studer routers and the routing part of all Studer audio mixing systems, but will not pass through any active processing such as a channel path or sample rate converter.*

LEDs

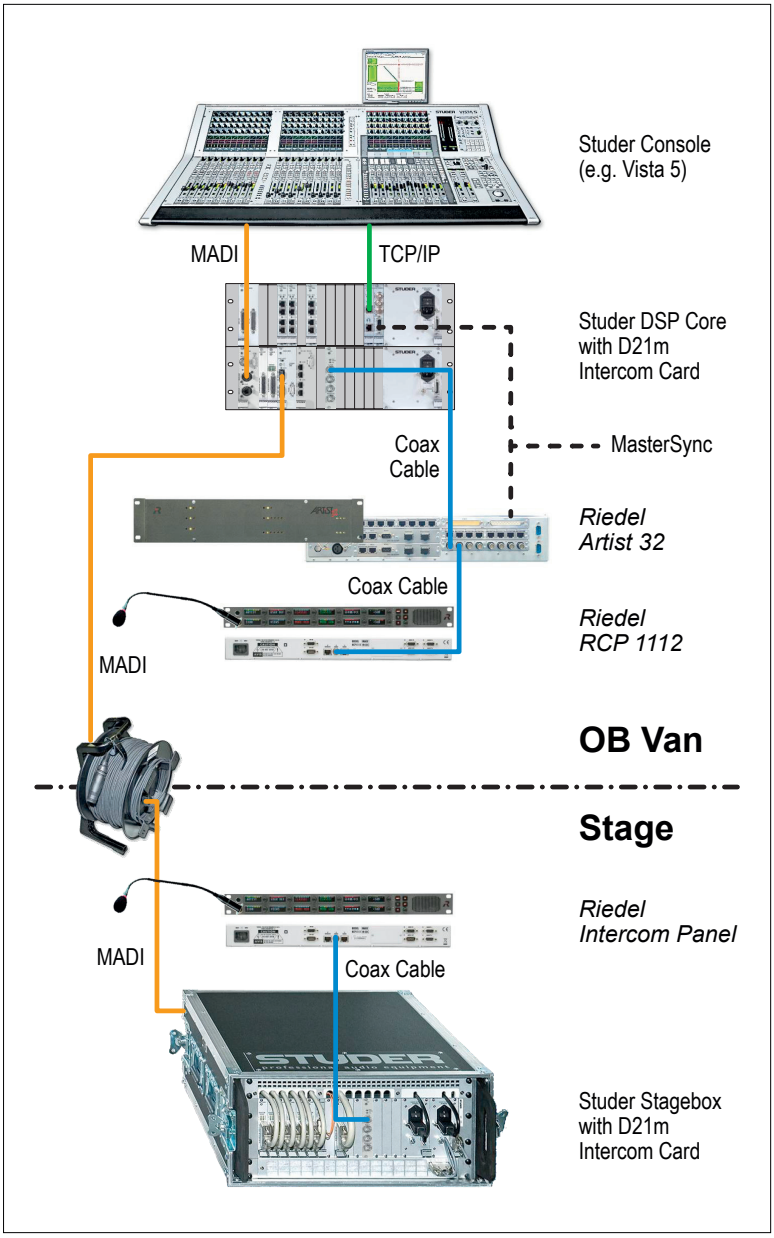
LOCK 1-4 These green LEDs are on if a valid AES/EBU signal is available at the inputs.

Note *Only 48 kHz sampling rate is supported. In case of usage with any other sampling rate, the outputs of the card are muted and the lock LEDs flash in a periodic pattern to indicate that the card is used with an unsupported sampling rate.*

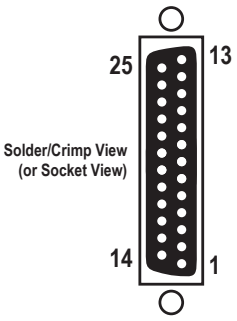
S4 DIP Switch :

Switch	Setting
1	OFF : C/U bits in dedicated bits (factory default) ON : C/U bits in audio
2	OFF : default pattern (factory default) ON : transparent data stream
3	reserved for future use, OFF : factory default
4	reserved for future use, OFF : factory default
5	reserved for future use, OFF : factory default
6	reserved for future use, OFF : factory default
7	OFF : suppress line reflections when using 75 ohm BNC line (factory default) ON : suppression inactive (always locked)
8	OFF : enable short delay at BNC (suppression still works when all outputs have the same audio signal and are patched from BNC/BNC (factory default) ON : not allowed

Application example with Riedel Artist intercom components :



Connector Pin Assignment

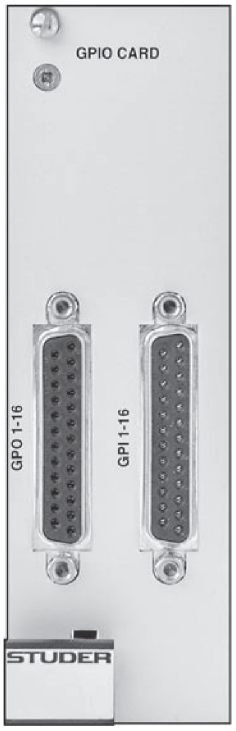


AES IN/OUT (25pin D-type, female, UNC 4-40 thread)

Pin	Signal 'CH 1-8'	Pin	Signal 'CH 1-8'
1	CH 7/8 out +	14	CH 7/8 out –
2	CH 7/8 out screen	15	CH 5/6 out +
3	CH 5/6 out –	16	CH 5/6 out screen
4	CH 3/4 out +	17	CH 3/4 out –
5	CH 3/4 out screen	18	CH 1/2 out +
6	CH 1/2 out –	19	CH 1/2 out screen
7	CH 7/8 in +	20	CH 7/8 in –
8	CH 7/8 in screen	21	CH 5/6 in +
9	CH 5/6 in –	22	CH 5/6 in screen
10	CH 3/4 in +	23	CH 3/4 in –
11	CH 3/4 in screen	24	CH 1/2 in +
12	CH 1/2 in –	25	CH 1/2 in screen
13	n.c.		

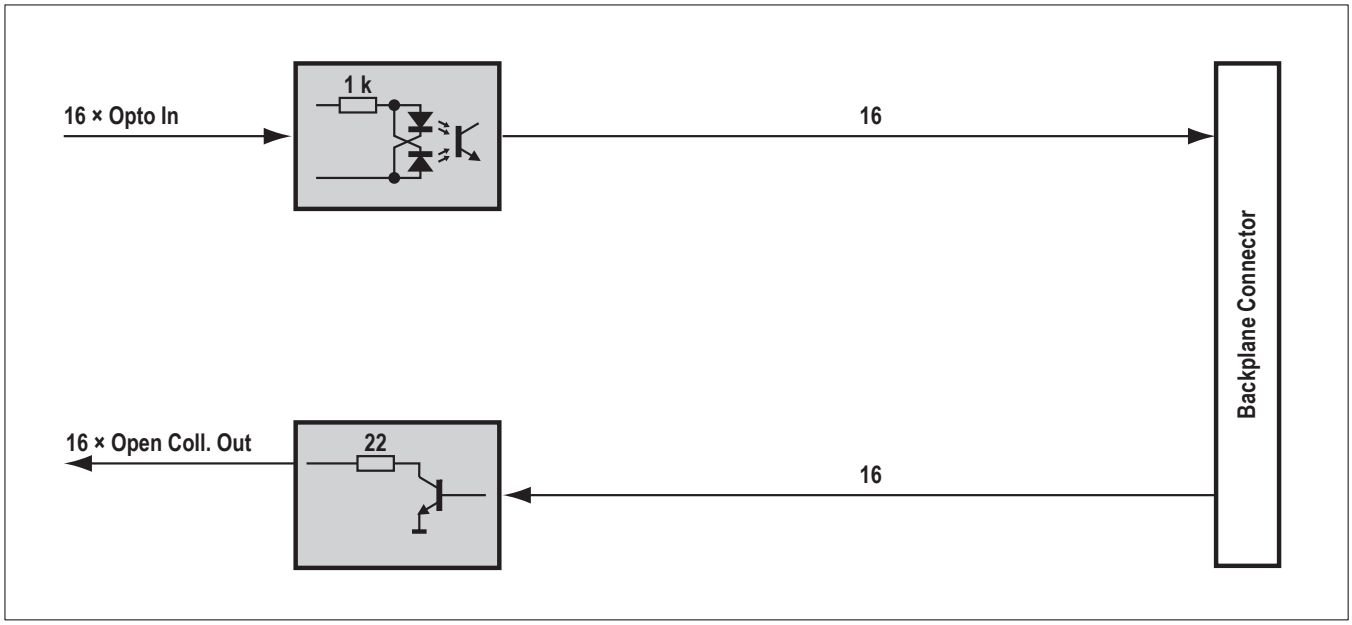
6.4 Non-Audio I/O Cards

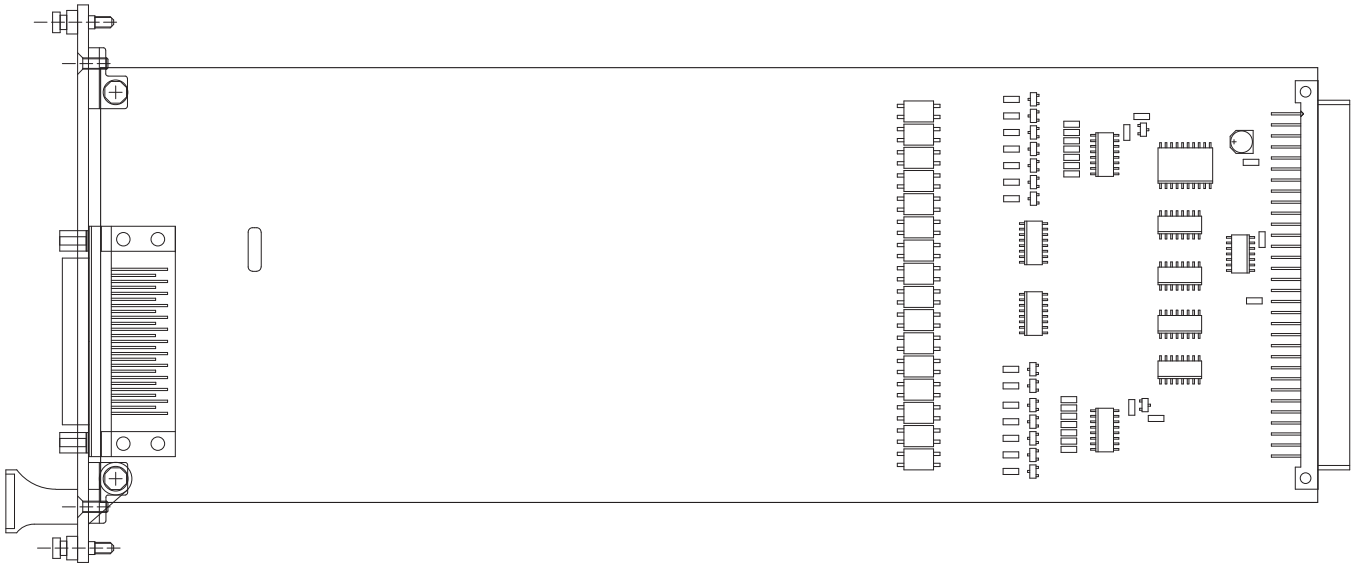
6.4.1 GPIO Card (VISTA, OnAir, ROUTE 6000) A949.0435



For general-purpose input/output control signals, this card provides 16 electrically isolated opto-coupler inputs (5-12 VDC) and 16 open-collector outputs. 5 VDC supply pins are available. Inputs and outputs on standard 25-pin D-type connectors (female).

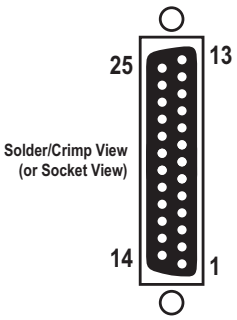
Current consumption (5 V)	max. 0.65 A
Operating temperature	0-40 °C





Connector Pin Assignment

GPI 1-16 / GPO 1-16 (25pin D-type, female, UNC 4-40 thread)



Pin	Signal 'GPI 1-16'	Signal 'GPO 1-16'	Pin	Signal 'GPI 1-16'	Signal 'GPO 1-16'
1	GPI 1-4 common	GPO 1	14	GPI 11	GPO 14
2	GPI 1	GPO 2	15	GPI 12	GPO 15
3	GPI 2	GPO 3	16	GPI 13-16 common	GPO 16
4	GPI 3	GPO 4	17	GPI 13	GND (0 V)
5	GPI 4	GPO 5	18	GPI 14	GND (0 V)
6	GPI 5-8 common	GPO 6	19	GPI 15	GND (0 V)
7	GPI 5	GPO 7	20	GPI 16	GND (0 V)
8	GPI 6	GPO 8	21	GND (0 V)	GND (0 V)
9	GPI 7	GPO 9	22	V_{CC} (+5 V) *	V_{CC} (+5 V) *
10	GPI 8	GPO 10	23	V_{CC} (+5 V) *	V_{CC} (+5 V) *
11	GPI 9-12 common	GPO 11	24	V_{CC} (+5 V) *	V_{CC} (+5 V) *
12	GPI 9	GPO 12	25	V_{CC} (+5 V) *	V_{CC} (+5 V) *
13	GPI 10	GPO 13	** 650 mA max. total*		

Application

Inputs

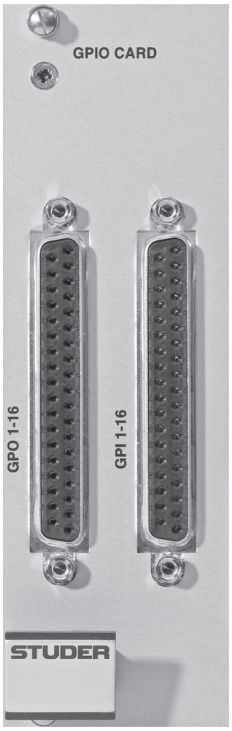
Control inputs can be used either with the internal +5 VDC supply voltage, or with external voltages (5-12 VDC), regardless of the polarity. For higher voltages (48 V max.), appropriate series resistors *must* be used, see table below. Please note that the control inputs are arranged in groups of four, each group having one of the control connections in common. Total current supplied by all +5 VDC pins of one card *must not* exceed 650 mA.

Input Voltage	Series Resistor
24 VDC	2.2 kΩ min.
36 VDC	3.3 kΩ min.
48 VDC	4.7 kΩ min.

Outputs

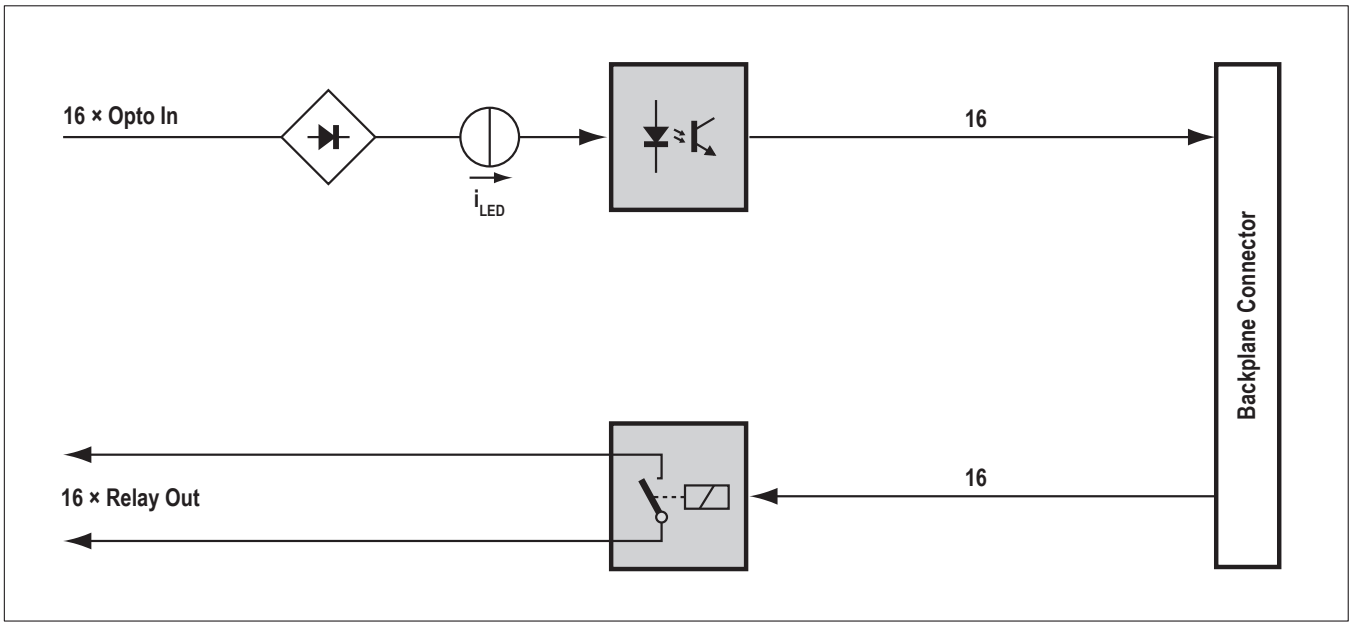
Control outputs are open-collector outputs pulling to GND if active. For activating e.g. relays or LEDs, either the internal +5 VDC supply voltage or external voltages of up to 24 VDC may be used. Output current *must not* exceed 50 mA per output. Please make sure to use appropriate series resistors if necessary. Total current supplied by all +5 VDC pins of one card *must not* exceed 650 mA.

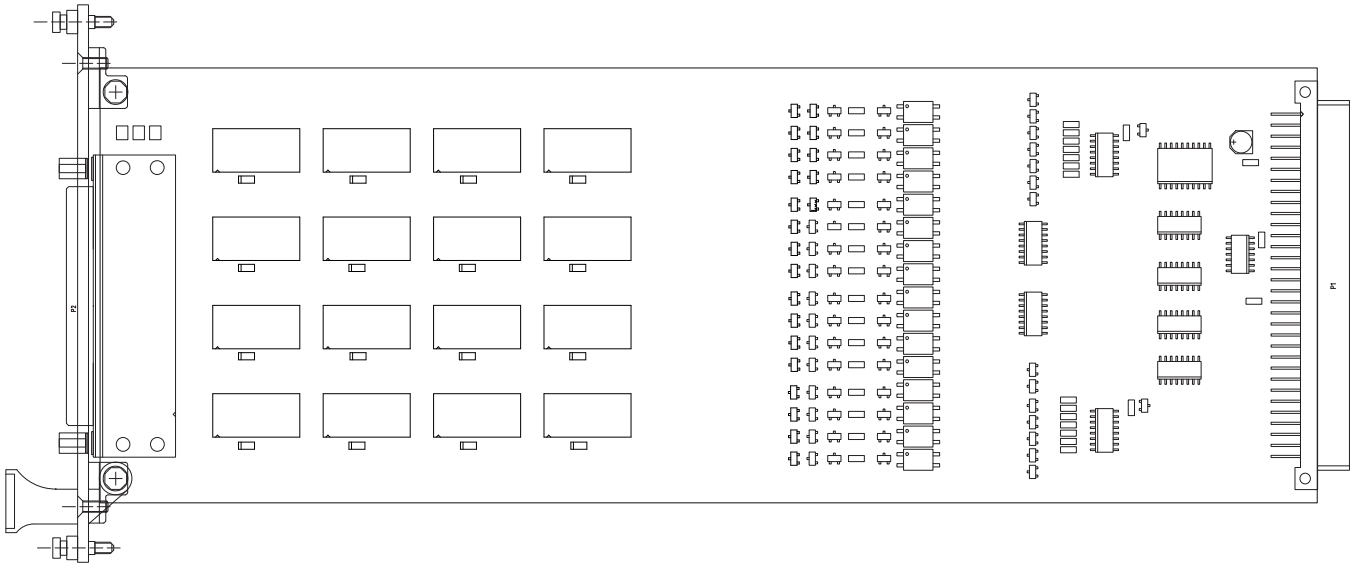
6.4.2 GPIO Card with Relay Outputs (VISTA, OnAir, ROUTE 6000) A949.0436



For general-purpose applications requiring total electrical isolation, this card provides 16 electrically isolated opto-coupler inputs with integrated current sink (5-24 VDC) and 16 electrically isolated outputs using SPST relay contacts. 5 VDC supply pins are available. Inputs and outputs on standard 37-pin D-type connectors (female).

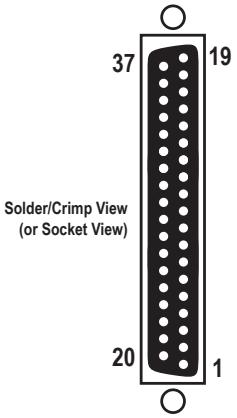
Current consumption (5 V) 0.8 A max. (earlier version: 1.1 A max.)
Operating temperature 0-40 °C
Output contact rating 0.5 A/125 VAC; 0.7 A/30 VDC; 0.3 A/100 VDC





Connector Pin Assignment

GPI 1-16 / GPO 1-16 (37pin D-type, female, UNC 4-40 thread)



Pin	Signal 'GPI 1-16'	Signal 'GPO 1-16'	Pin	Signal 'GPI 1-16'	Signal 'GPO 1-16'
1	GPI 1a	GPO 1a	20	GPI 1b	GPO 1b
2	GPI 2a	GPO 2a	21	GPI 2b	GPO 2b
3	GPI 3a	GPO 3a	22	GPI 3b	GPO 3b
4	GPI 4a	GPO 4a	23	GPI 4b	GPO 4b
5	GPI 5a	GPO 5a	24	GPI 5b	GPO 5b
6	GPI 6a	GPO 6a	25	GPI 6b	GPO 6b
7	GPI 7a	GPO 7a	26	GPI 7b	GPO 7b
8	GPI 8a	GPO 8a	27	GPI 8b	GPO 8b
9	GPI 9a	GPO 9a	28	GPI 9b	GPO 9b
10	GPI 10a	GPO 10a	29	GPI 10b	GPO 10b
11	GPI 11a	GPO 11a	30	GPI 11b	GPO 11b
12	GPI 12a	GPO 12a	31	GPI 12b	GPO 12b
13	GPI 13a	GPO 13a	32	GPI 13b	GPO 13b
14	GPI 14a	GPO 14a	33	GPI 14b	GPO 14b
15	GPI 15a	GPO 15a	34	GPI 15b	GPO 15b
16	GPI 16a	GPO 16a	35	GPI 16b	GPO 16b
17	GND (0 V)	GND (0 V)	36	V_{CC} (+5 V) *	V_{CC} (+5 V) *
18	GND (0 V)	GND (0 V)	37	V_{CC} (+5 V) *	V_{CC} (+5 V) *
19	GND (0 V)	GND (0 V)	*** 600 mA max. total**		

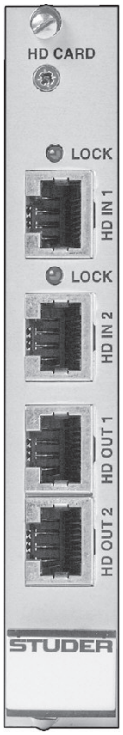
Application

Inputs Control inputs (GPI Xa/b) are completely independent and electrically isolated. They may be used either with the internal +5 VDC supply voltage, or with external voltages of 5-24 VDC, regardless of the polarity. Total current supplied by all +5 VDC pins of one card *must not* exceed 600 mA.

Outputs Control outputs (GPO Xa/b) are completely independent, electrically isolated relay contacts, closed if active. Contact rating is 0.5 A for 125 V_{AC}, 0.7 A for 30 VDC, or 0.3 A for 100 VDC. The +5 VDC supply voltage or the ground (GND) terminals, together with the relay contacts, may be used to generate an output signal. Total current supplied by all +5 VDC pins of one card *must not* exceed 600 mA.

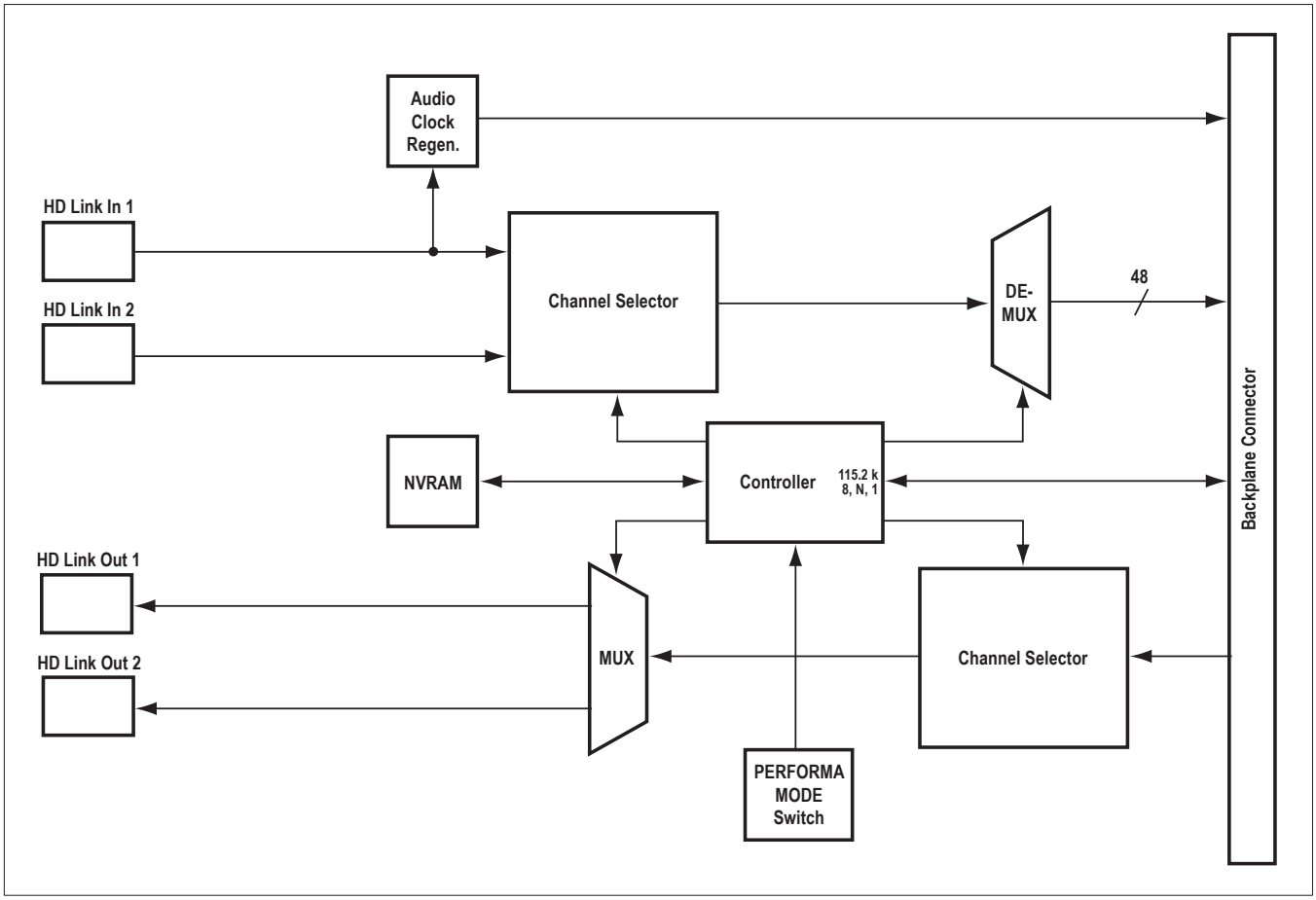
6.5 HD Cards

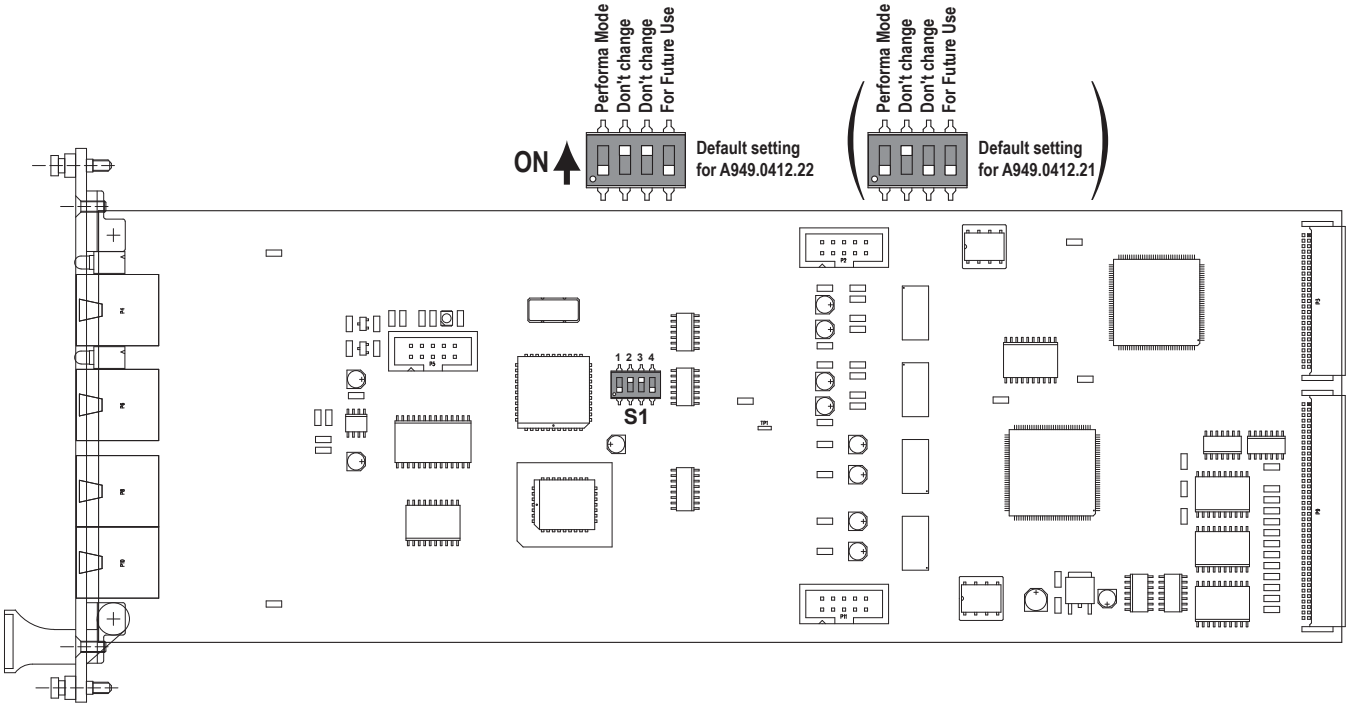
6.5.1 HD Card S (OnAir and ROUTE 6000) A949.0412



The D21m HD card S provides the link to the DSP core systems. Each input and output can handle up to 96 channels in each supported sampling rate (in combination with the Performa core, the number of I/O channels is restricted to 48). The system clock used is taken from the host DSP system, so no extra synchronization is needed.
The card detects all other I/O cards that are inserted into the D21m system and displays their presence on the front panel of the frame. Once all audio interface cards are plugged in, pressing the **RECONFIG** key on the front panel confirms the configuration to the system. Then all cards are activated and their audio signals are fed into the HD link.

Host link interface cable type		CAT-5 UTP Cable
Cable length		up to 10 m
Connector		RJ-45
Capacity of one CAT-5 connection		96 channels
Current consumption	(3.3 V)	approx. 600 mA
	(5.0 V)	<50 mA
Operating temperature		0-40 °C





LEDs **LOCK** On if a valid signal is available at the input that is locked to the system clock.

DIP switch

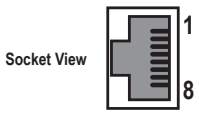
When using the Performa core, only 48 channels can be transmitted from the core to the D21m system. In order not to lose audio data, the channel selector of the HD card S has to be configured to this mode by setting switch #1 of DIP switch S1 to the ON position.

The other three switches #2-4 have to remain in their default positions and must not be changed.

Note The default settings for the card versions A949.0412.21 and A949.0412.22 are different, as shown in the diagram above.

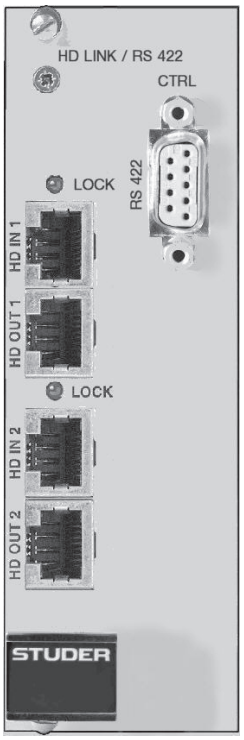
Connector Pin Assignment

HD IN 1/2 / HD OUT 1/2 (8pin RJ45)



Pin	Signal (Input)	Signal (Output)
1	Rx 0 +	Tx 0 +
2	Rx 0 –	Tx 0 –
3	Rx 1 +	Tx 1 +
4	Rx Clk +	Tx Clk +
5	Rx Clk –	Tx Clk –
6	Rx 1 –	Tx 1 –
7	Rx 2 +	Tx 2 +
8	Rx 2 –	Tx 2 –

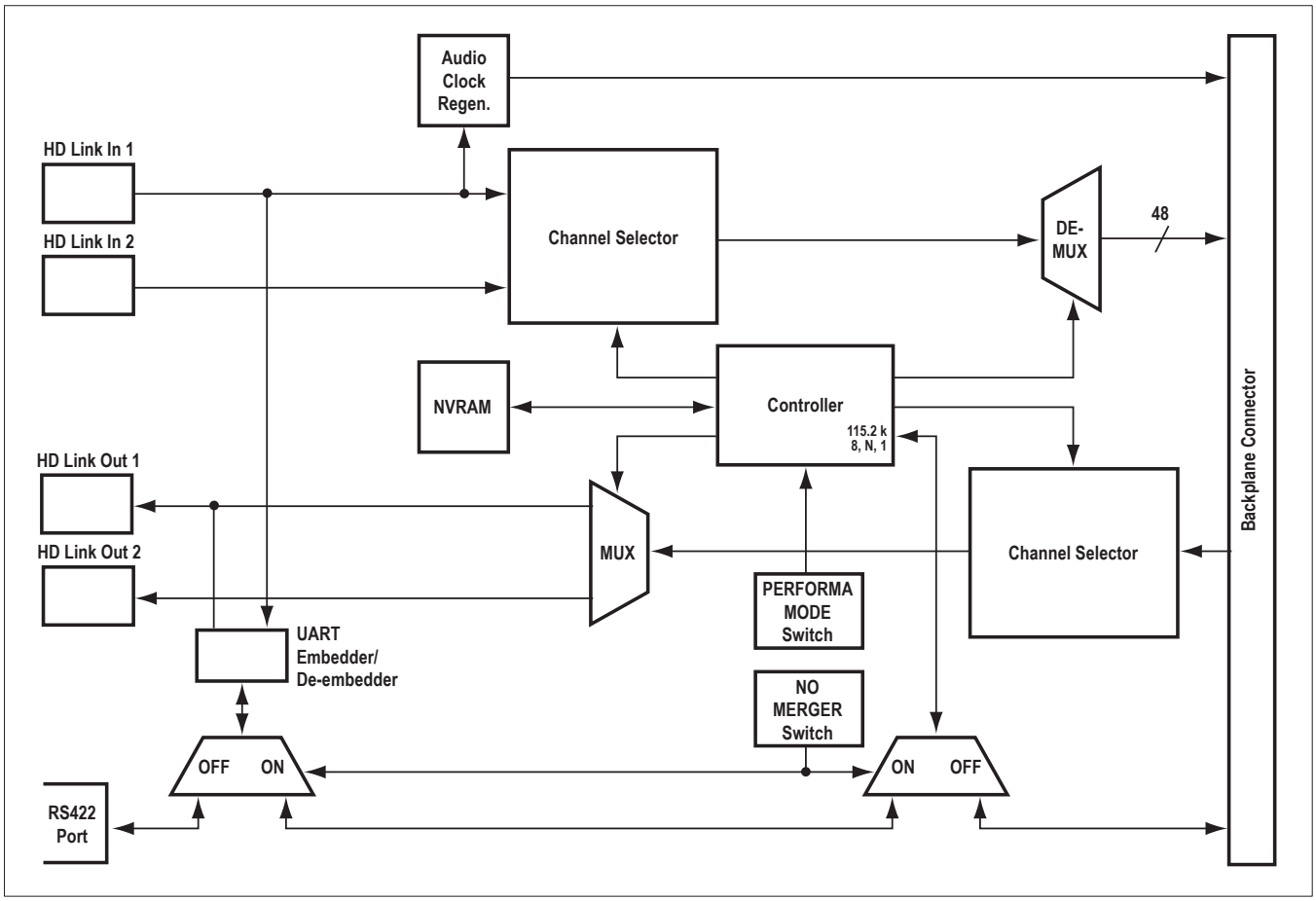
6.5.2 HD RS422 Card (VISTA) A949.0415

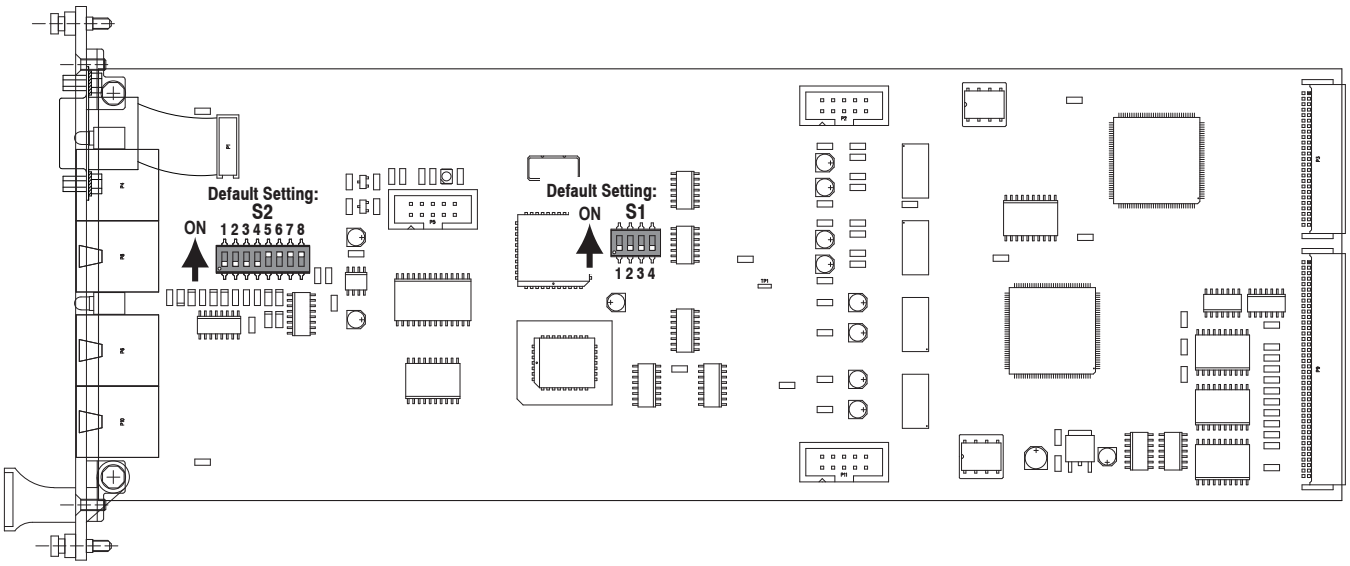


HD The D21m HD RS422 card provides the link to the DSP core systems. Each input and output can handle up to 96 channels in each supported sampling rate (in combination with the Performa core, the number of I/O channels is restricted to 48). The system clock used is taken from the host DSP system, so no extra synchronization is needed.
The card detects all other I/O cards that are inserted into the D21m system and displays their presence on the front panel of the frame. Once all audio interface cards are plugged in, pressing the **RECONFIG** key on the front panel confirms the configuration to the system. Then all cards are activated and their audio signals are fed into the HD link.

RS422 RS422 serial control data from the HD link may be transmitted either to the card's RS422 port (then, the controller is connected to the backplane for use with merger), or to the controller (then the RS422 port is deactivated); selection is done with a DIP switch.
The pinout of the RS422 connector can be set to 'device' or 'controller' with a DIP switch, depending on the 3rd-party serial device connected.

Host link interface cable type		CAT-5 UTP Cable
Cable length		up to 10 m
Connector		RJ-45
Capacity of one CAT-5 connection		96 channels
Max. RS422 cable length		1000 m
Current consumption	(3.3 V)	approx. 600 mA
	(5.0 V)	<50 mA
Operating temperature		0-40 °C





LEDs

LOCK On if a valid signal is available at the input that is locked to the system clock.

DIP Switches

S1

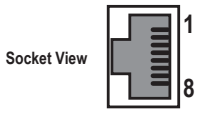
Switch	Setting
1	OFF: Standard mode, 96 channels on each HD IN *(factory default)* ON: Performa mode, 48 channels on each HD IN
2	OFF: Control data is passed from HD link to RS422 port *(factory default);* controller connected to backplane, for use with merger ON: Control data is passed from HD link to controller; RS422 port inactive
3 4	reserved *(factory default: OFF)*

S2 DIP switch for pinout selection of the front-panel RS422 connector

1	2	3	4	5	6	7	8	Setting
ON	ON	ON	ON	OFF	OFF	OFF	OFF	RS422 device pinout
OFF	OFF	OFF	OFF	ON	ON	ON	ON	RS422 controller pinout *(factory default)*
NO OTHER SETTINGS ALLOWED!								

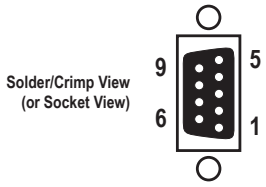
Connector Pin Assignments

HD IN 1/2 / HD OUT 1/2 (8pin RJ45)



Pin	Signal (Input)	Signal (Output)
1	Rx 0 +	Tx 0 +
2	Rx 0 –	Tx 0 –
3	Rx 1 +	Tx 1 +
4	Rx Clk +	Tx Clk +
5	Rx Clk –	Tx Clk –
6	Rx 1 –	Tx 1 –
7	Rx 2 +	Tx 2 +
8	Rx 2 –	Tx 2 –

CTRL RS422 (9pin D-type, female, UNC 4-40 thread)



Pin	RS422 Controller	RS422 Device
1	Chassis	Chassis
2	RxD –	TxD –
3	TxD +	RxD +
4	GND	GND
5	n.c.	n.c.
6	GND	GND
7	RxD +	TxD +
8	TxD –	RxD –
9	Chassis	Chassis

6.5.3 MADI HD Cards (VISTA, OnAir, ROUTE 6000) A949.04113x/.04133x/.04143x

A949.04113x Optical / multi-mode fibre version
A949.04133x Optical / single-mode fibre version
A949.04143x Twisted-pair version.

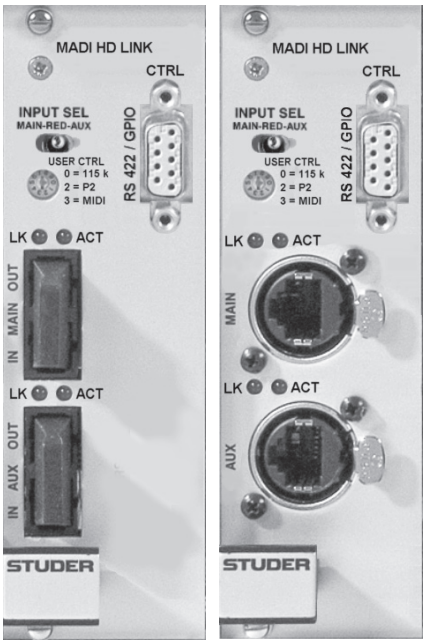
The D21m MADI HD card is plugged into an HD card slot in the remote I/O box and provides the link to the hub frame. 3 versions are available:

The two interfaces offer up to 64 audio channels with 44.1/48/88.2/96 kHz operation, together with embedded control and user-accessible serial connection in each direction.

Starting with order nos. A949.041130, A949.041330 and A949.041430, the MAIN/AUX switchover can be made using an additional GPIO on the card; it utilizes the same connector as the RS422 interface. Depending on the desired RS422 or GPIO mode, a flat cable has to be plugged accordingly on the card. Refer to the component layout drawings on the next page. If RS422 is selected, these cards are compatible with the earlier versions A949.04112x, A949.04132x and A949.04142x (see chapter 6.8.2).

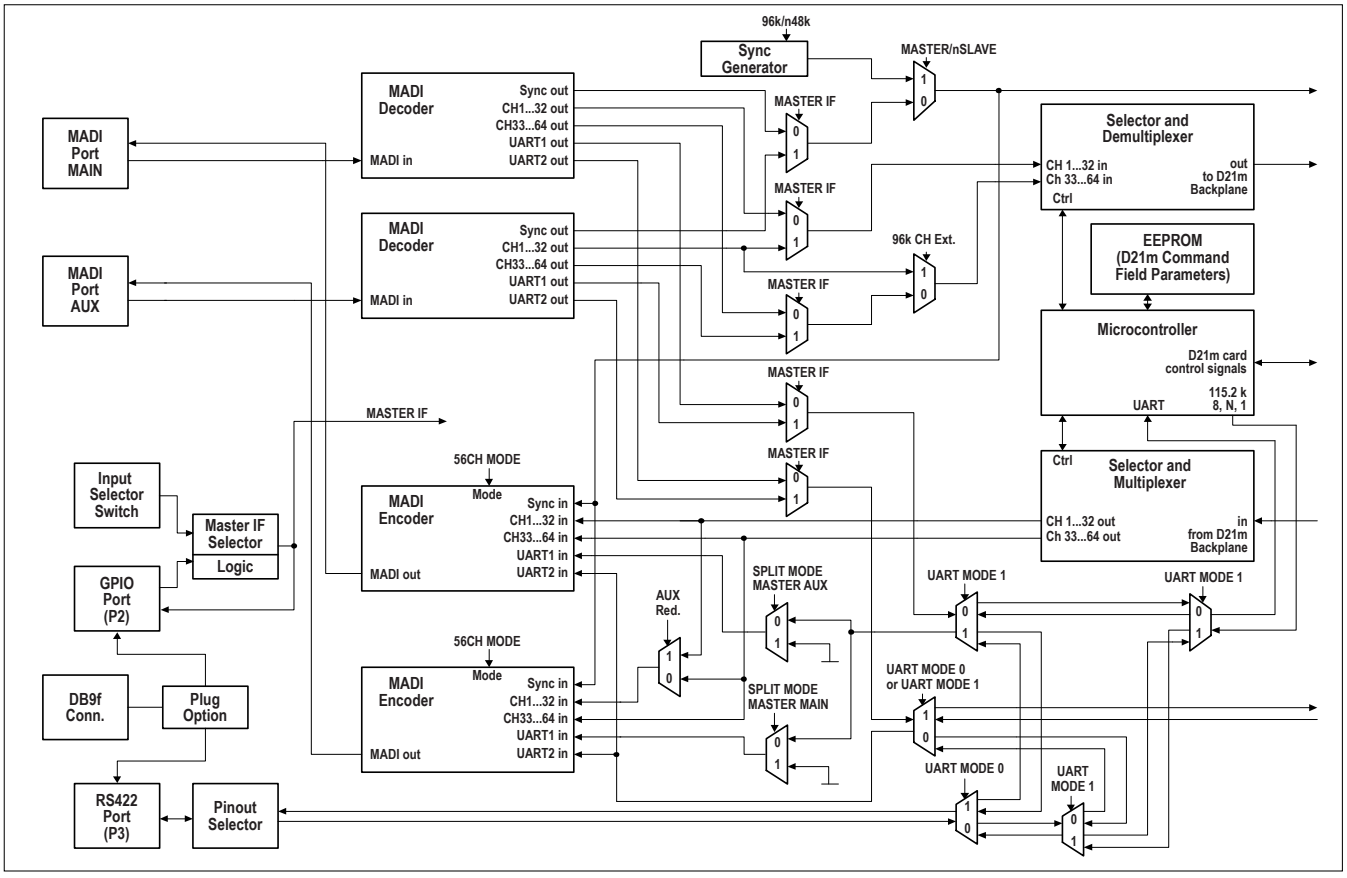
The auxiliary interface can be used as a redundant link or, in 88.2/96 kHz operation, to extend the number of channels from 32 back to 64.

In slave mode, the cards extract the system clock from the incoming MADI signals and provide it to the entire remote I/O box. They detect all other I/O cards that are inserted into the D21m system and display their presence on the front panel of the frame. Once all audio interface cards are plugged in, pressing the **RECONFIG** key on the front panel confirms the configuration to the system. Then all cards are activated and their audio signals are fed into the MADI link. If switched to master mode, the cards run with an internal 48 or 96 kHz reference.



A949.04113x
A949.04133x

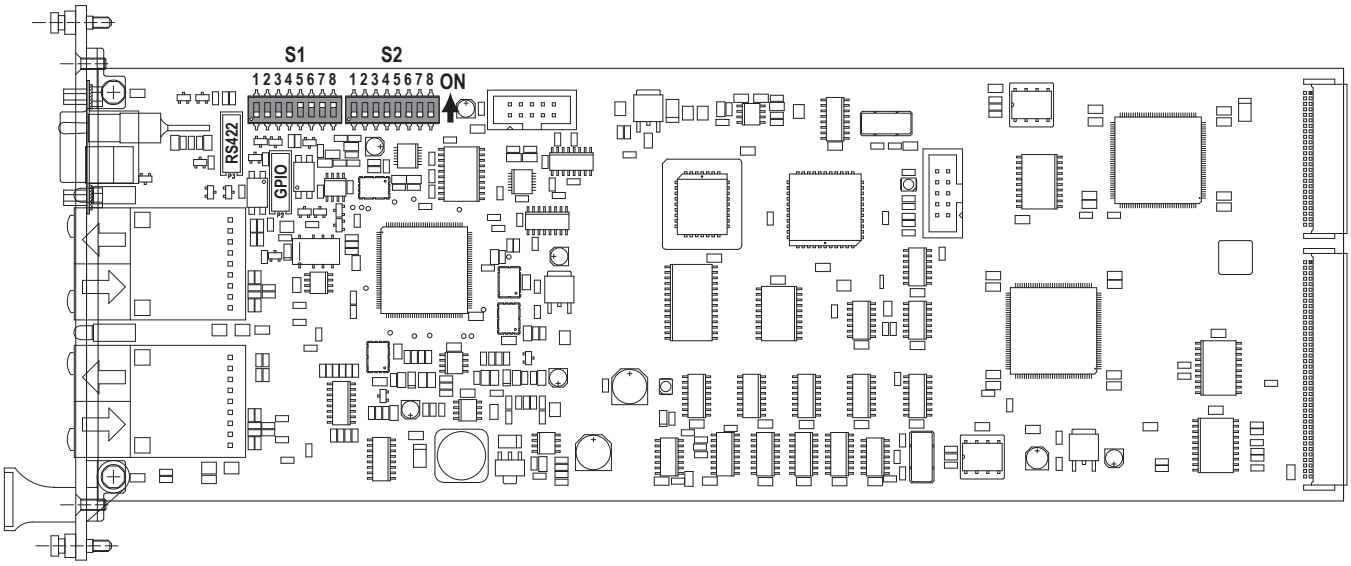
A949.04143x



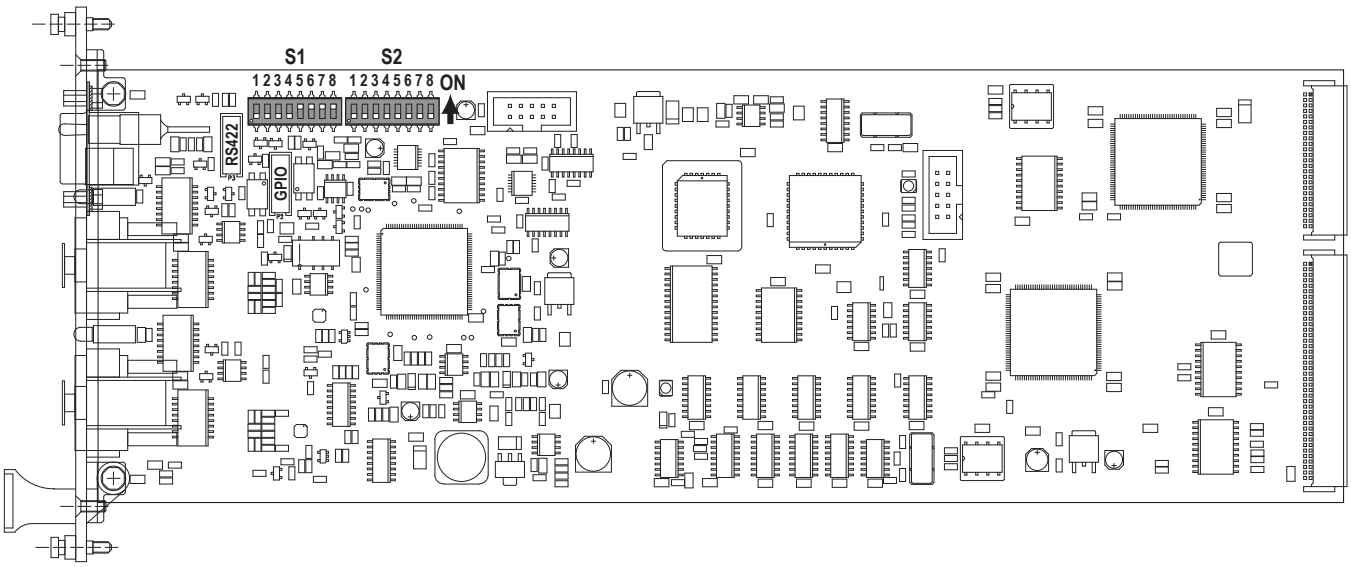
Max. cable length (A949.0411, multi-mode fibre, wavelength 1300 nm*, ø 62.5 or 50 µm)	2 km
(A949.0413, single-mode fibre, wavelength 1300 nm*, ø 9 µm)	15 km
(A949.0414, CAT5e or better, flexible braid)	75 m
(A949.0414, CAT7, solid core)	120 m
Input sampling rates	44.1/48/88.2/96 kHz ±100 ppm
Current consumption (3.3 V/5 V)	0.9 A/0.25 A
Operating temperature	0-40 °C

** different wavelengths on request*

A949.04113x, A949.04133x



A949.04143x



LEDs

LK ('lock') On if a valid MADI signal is present at the input.

ACT On if the MADI port (Main or AUX) is active.

Switches

S1 DIP switch for pinout selection of the front-panel RS422 connector

1	2	3	4	5	6	7	8	Setting
ON	ON	ON	ON	OFF	OFF	OFF	OFF	Device pinout
OFF	OFF	OFF	OFF	ON	ON	ON	ON	Controller pinout *(factory default)*
NO OTHER SETTINGS ALLOWED!								

S2 DIP switch for MADI setting

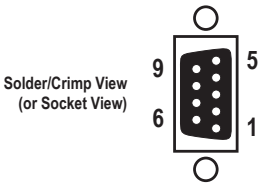
Switch	Setting		
1	OFF: AUX is used as CH33-64 at 88.2 / 96 kHz *(factory default)* ON: AUX is used as redundant port at 88.2 / 96 kHz		
2	OFF: 64 MADI channels *(factory default)* ON: 56 MADI channels (standard setting for legacy products)		
3, 4	**3**	**4**	
	OFF	OFF	MADI1 – Microcontroller / MADI 2 – Front connector *(factory default)*
	ON	OFF	MADI1 – Microcontroller / MADI 2 – Backplane
	OFF	ON	Microcontroller – Front connector / MADI 2 – Backplane
	ON	ON	MADI1 – Front connector / MADI 2 – Backplane
			[Block diagram: UART MODE 1]
			[Block diagram: UART MODE 0]
5	OFF: Slave – clock from MADI signal *(factory default)* [Block diagram: MASTER/nSLAVE = 0]		
	ON: Master – clock from local generator [Block diagram: MASTER/nSLAVE = 1]		
6	OFF: Master mode sampling rate 48 kHz *(factory default)* [Block diagram: 96k/n48k = 0]		
	ON: Master mode sampling rate 96 kHz [Block diagram: 96k/n48k = 1]		
7, 8	reserved *(factory default: OFF)*		

S3 (or GPIO Port) 3-position toggle switch for interface selection (**MAIN - RED**undant **- AUX**).
MAIN: MADI input is forced to MAIN port (split mode master AUX = 0)
RED*: MADI input is used from either MAIN or AUX port
AUX: MADI input is forced to AUX Port (split mode master MAIN = 1).
** S3 has to be set to* **RED** *for interface selection via the GPIO port, as well as for 96 kHz/64-channel operation.*

S4 Rotary switch for baud rate selection of the MADI 2 link

Position	Setting
0	115'200 bps *(factory default)*
1	57'600 bps
2	38'400 bps (9-pin)
3	31'250 bps (MIDI)
4	19'200 bps
5	9'600 bps
6-9	Reserved for future use

Connector Pin Assignments



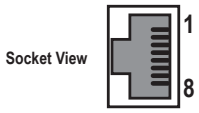
CTRL RS 422 / GPIO (9pin D-type, female, UNC 4-40 thread)

Pin	RS422 Controller	RS422 Device	GPIO
1	Chassis	Chassis	+5 VDC, 200 mA max.
2	RxD –	TxD –	force to AUX
3	TxD +	RxD +	force to MAIN
4	GND	GND	GND
5	n.c.	n.c.	Relay contact (off = MAIN, on = AUX)
6	GND	GND	GND
7	RxD +	TxD +	force to AUX
8	TxD –	RxD –	force to MAIN
9	Chassis	Chassis	Relay contact (off = MAIN, on = AUX)

Inputs The inputs (pins 2/7 and pins 3/8) are completely independent and electrically isolated. They may be used either with the internal +5 VDC supply voltage, or with external voltages of 5-24 VDC, regardless of the polarity. *Total current supplied by the +5 VDC pin must not exceed 200 mA.*

Output The output (pins 5/9) is a completely independent, electrically isolated relay contact, closed if AUX is selected. Contact rating is 0.5 A for 125 VAC, 1 A for 30 VDC, or 0.3 A for 100 VDC. The +5 VDC supply voltage or the ground (GND) terminals, together with the relay contacts, may be used to generate an output signal. *Total current supplied by the +5 VDC pin must not exceed 200 mA.*

MADI MAIN / MADI AUX (8pin RJ45)
(on twisted-pair cable version A949.0414 only)



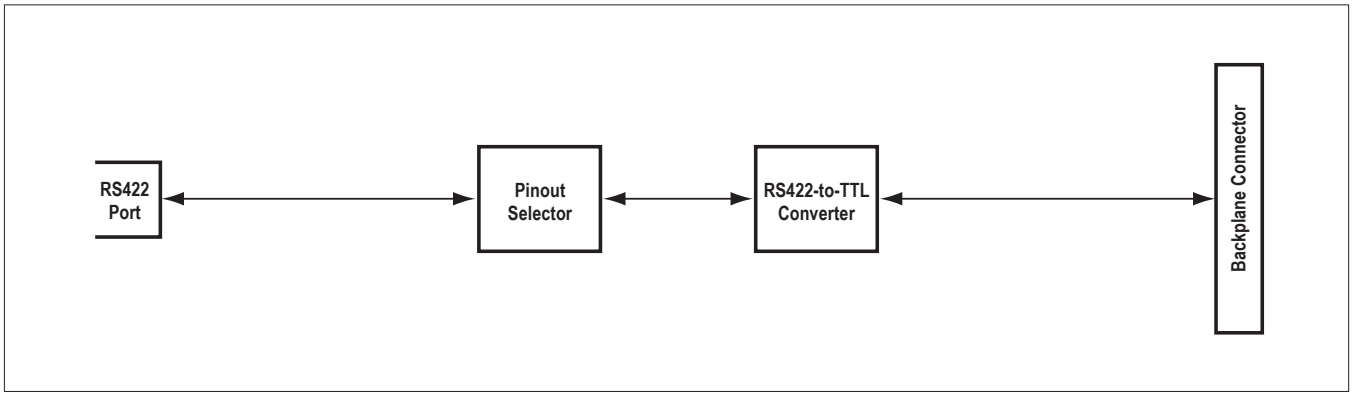
Pin	Signal
1	MADI RxD +
2	MADI RxD –
3	MADI TxD +
4	WCLK TxD/RxD +
5	WCLK TxD/RxD –
6	MADI TxD –
7	reserved
8	reserved

6.6 Serial/Merger Cards

6.6.1 Serial Card (VISTA) A949.0437

It is possible to transmit any RS422 serial signals, such as MIDI or Sony 9-pin (machine control) through a MADI connection without losing any audio channels or microphone control of the remote I/O box.
A 9-pin D-type connector can be found on the MADI I/O card (hub frame side) as well as on the serial card of the remote I/O frame. This card is located between slot 12 and the power supplies. The required baud rate is set on the MADI HD card with a rotary switch.
The pinout of the RS422 connector can be set to 'device' or 'controller' with a DIP switch, depending on the 3rd-party serial device connected.

Max. RS422 cable length	1000 m
Current consumption (5 V)	20 mA
Operating temperature	0-40 °C



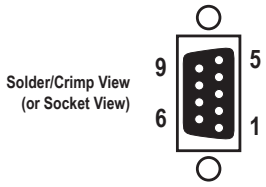
DIP Switch

S1, DIP switch for RS422 pinout selection:

1	2	3	4	5	6	7	8	Setting
OFF	OFF	OFF	OFF	ON	ON	ON	ON	RS422 Controller pinout
ON	ON	ON	ON	OFF	OFF	OFF	OFF	RS422 Device pinout *(factory default)*
NO OTHER SETTINGS ALLOWED!								

Connector Pin Assignment

RS422 MASTER (9-pin D-type, female)



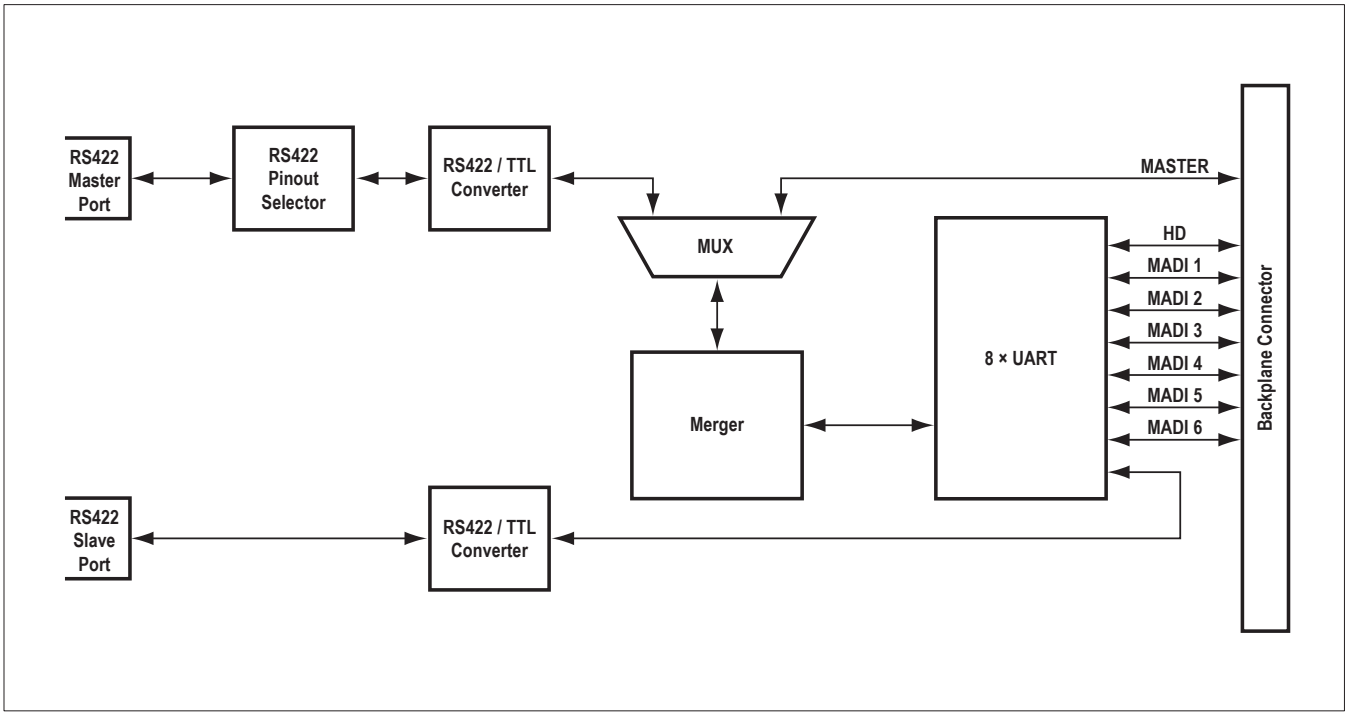
Pin	RS422 Controller	RS422 Device
1	Chassis	Chassis
2	RxD –	TxD –
3	TxD +	RxD +
4	GND	GND
5	n.c.	n.c.
6	GND	GND
7	RxD +	TxD +
8	TxD –	RxD –
9	Chassis	Chassis

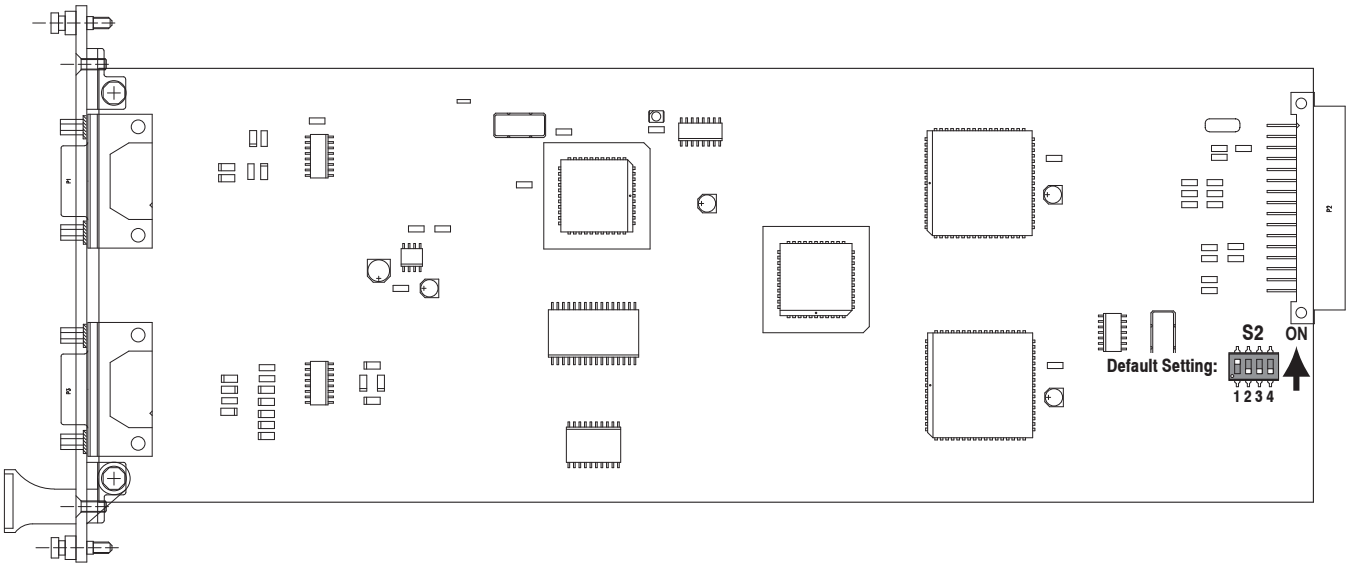
6.6.2 Serial Merger Card (VISTA) A949.0438

This card is used to feed any Studer-internal control signals into the hub I/O frame. A serial connection is made between the Studer product (such as a Vista or OnAir 3000 console) and the **MASTER** connector of the card.
In SCore Live applications where the card is installed in the core frame or in external D21m hubs, the host port must always be accessed through the front-panel **MASTER** connector; this selection is done with a DIP switch that has been added in versions A949.0438.22 and up.

Note An RS422 patch cable is required in order to connect the control signals embedded in the HD link data stream via the HD/RS422 card and the serial Merger card to the D21m backplane. Order no. C089.201171 (9-pin D-type, 28 cm).
In case of an OnAir 3000 console, the **SLAVE** connector may be used to connect a second local I/O frame.

Max. RS422 cable length	1000 m
Current consumption (5 V)	80 mA
Operating temperature	0-40 °C



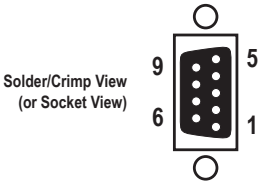


DIP Switch **S2** DIP switch for master port selection *(versions A949.0438.22 and up)*:

1	2	3	4	Setting
OFF				Depending on location: – SCore: Master port connected to bridge/host card – D21m stand-alone mode: Master port connected to front-panel MASTER socket
ON				Master port forced to front-panel MASTER socket (in SCore and D21m locations) *(factory default)*
	OFF	OFF	OFF	reserved - ***NO OTHER SETTINGS ALLOWED!***

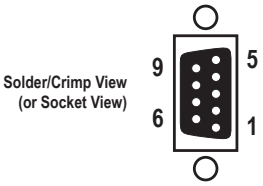
Connector Pin Assignment

RS422 MASTER (9pin D-type, female, UNC 4-40 thread)



Pin	RS422 Device Pinout
1	Chassis
2	TxD –
3	RxD +
4	GND
5	n.c.
6	GND
7	TxD +
8	RxD –
9	Chassis

RS422 SLAVE (9pin D-type, female, UNC 4-40 thread)

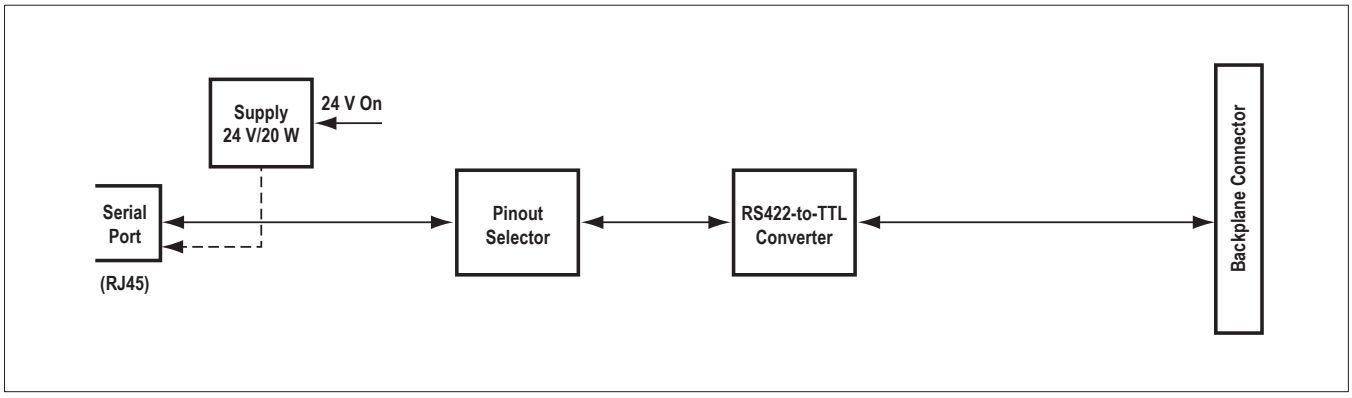


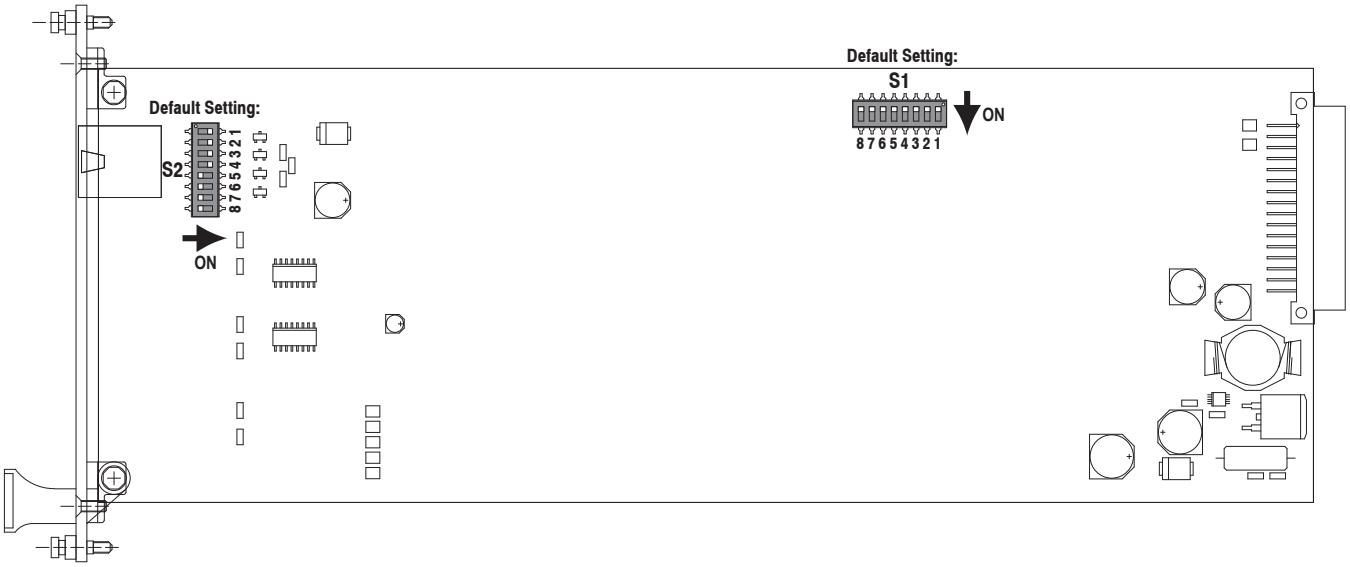
Pin	RS422 Controller Pinout
1	Chassis
2	RxD –
3	TxD +
4	GND
5	n.c.
6	GND
7	RxD +
8	TxD –
9	Chassis

6.6.3 Serial RJ45 Card (OnAir and ROUTE 6000) A949.0439

It is possible to transmit any RS422 serial signals, such as MIDI or Sony 9-pin (machine control) through a MADI connection without losing any audio channels or microphone control of the remote I/O box.
The pinout of the 8-pin RJ45 connector can be set to 'device' or 'controller' with a DIP switch, depending on the serial device connected. Standard Ethernet UTP wiring for connecting the hub frame to the serial card. may be used.
An OnAir 3000 desk module connected to the RJ45 connector may be supplied by the card (24 V; 20 W max.), can be activated with a DIP switch.

Max. UTP (CAT5) cable length		25 m
Current consumption	(5 V)	20 mA
	(5 V, 24 V supply loaded)	5 A
Operating temperature		0-40 °C





DIP Switches

S1 DIP switch for parameter setting:

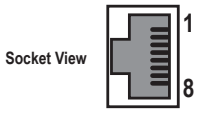
No.	Setting
1-5	not used. *Default: OFF*
6	ON: +24 VDC supply switched to pins 1 and 2 of the RJ45 connector (used for supplying an OnAir 3000 desk module). *Default: OFF*
7-8	not used. *Default: OFF*

S2 DIP switch for RS422 pinout selection:

1	2	3	4	5	6	7	8	Setting
OFF	OFF	OFF	OFF	ON	ON	ON	ON	RS422 Controller pinout
ON	ON	ON	ON	OFF	OFF	OFF	OFF	RS422 Device pinout *(factory default)*
NO OTHER SETTINGS ALLOWED!								

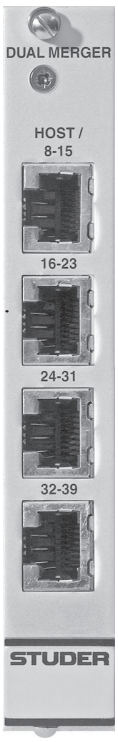
Connector Pin Assignment

HOST (8pin RJ45)



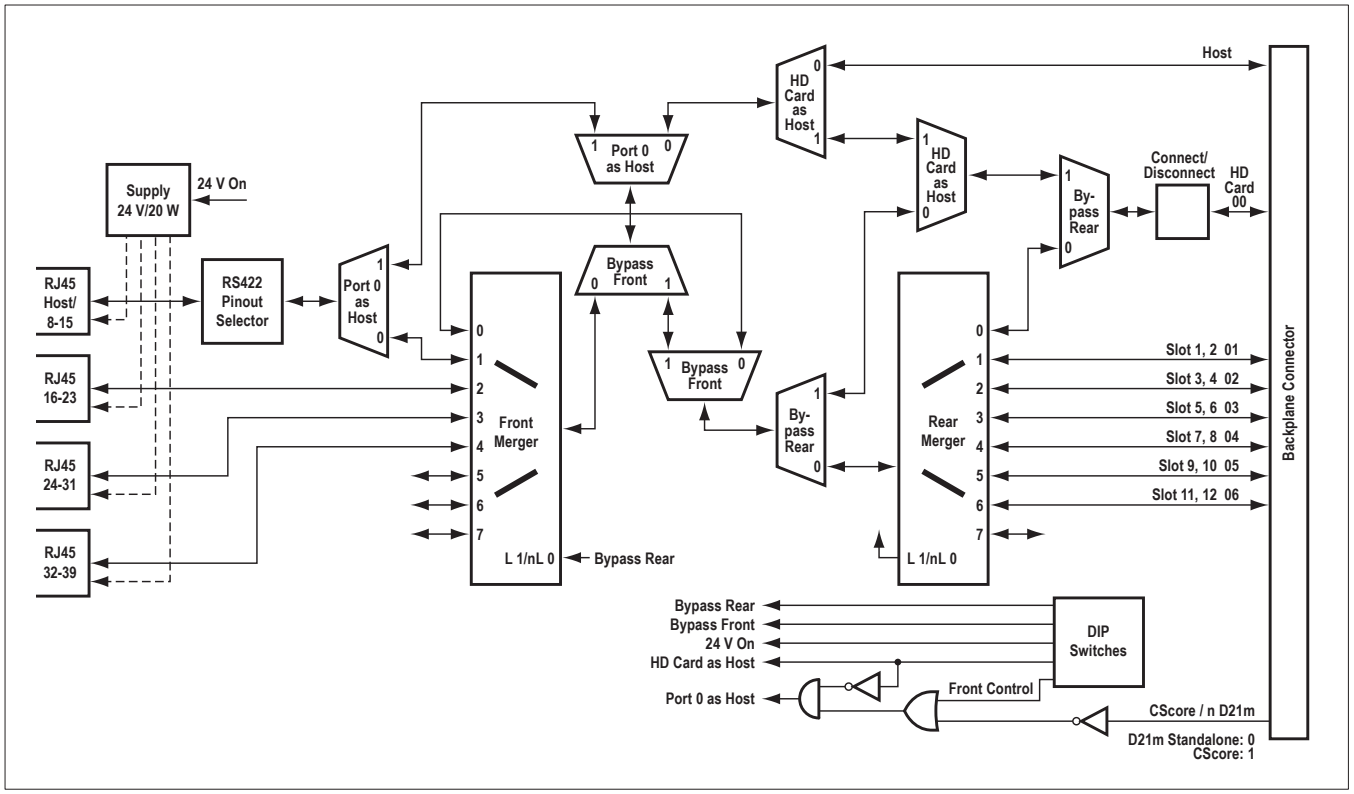
Pin	RS422 Controller	RS422 Device
1	* n.c.	* n.c.
2	* n.c.	* n.c.
3	TxD +	RxD +
4	RxD +	TxD +
5	RxD –	TxD –
6	TxD –	RxD –
7	GND	GND
8	GND	GND
* or +24 VDC if SW 6 of DIP switch 1 is set to ON		

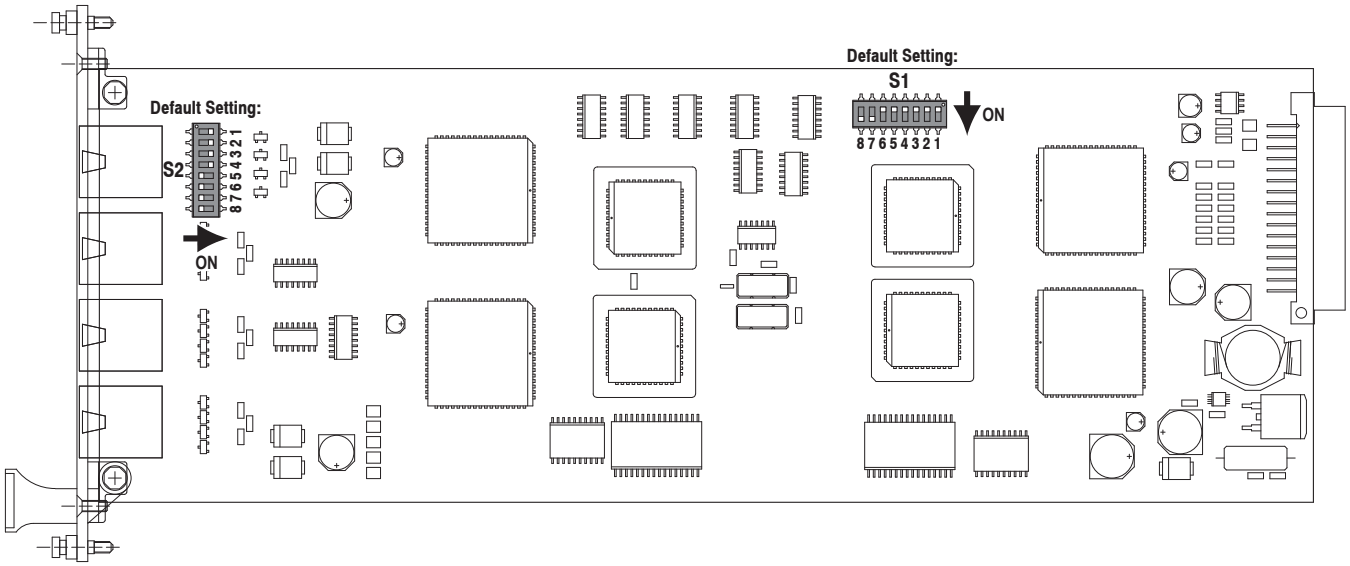
6.6.4 Dual Merger Card (OnAir and ROUTE 6000) A949.0440



This card is used to feed any Studer-internal control signals into the hub I/O frame. A serial connection is made between the Studer product (such as Vista or OnAir 3000 consoles) and the **HOST** connector of the card. In certain SCore applications the host port is connected internally through the backplane. The non-host ports may be used to connect other local I/O frames. OnAir 3000 desk modules connected to the RJ45 connectors may be supplied by the card (24 V; 20 W total per Dual Merger card), can be activated with a DIP switch.

Max. CAT5 cable length		25 m
Current consumption	(5 V)	160 mA
	(5 V, 24 V supply loaded)	5.16 A
Operating temperature		0-40 °C





DIP Switches

S1 DIP switch for parameter/routing setting:

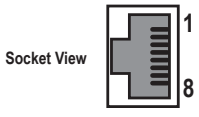
No.	Setting	Default Setting
1	ON: Bypass rear	OFF
2	ON: Bypass front	OFF
3	ON: Front control	OFF
4	ON: HD card as host	OFF
5	not used	OFF
6	ON: +24 VDC supply switched to pins 1 and 2 of all RJ45 connectors simultaneously (used for supplying OnAir 3000 desk modules)	OFF
7	* ON: HD card connect	ON
8	* ON: HD card connect	ON
*** Must be set to identical positions**		

S2 DIP switch for RS422 pinout selection of the **HOST/8-15** connector:

1	2	3	4	5	6	7	8	Setting
OFF	OFF	OFF	OFF	ON	ON	ON	ON	RS422 Controller pinout
ON	ON	ON	ON	OFF	OFF	OFF	OFF	RS422 Device pinout *(factory default)*
NO OTHER SETTINGS ALLOWED!								

Connector Pin Assignment

HOST (8pin RJ45)



Pin	RS422 Controller	RS422 Device
1	* n.c.	* n.c.
2	* n.c.	* n.c.
3	TxD +	RxD +
4	RxD +	TxD +
5	RxD –	TxD –
6	TxD –	RxD –
7	GND	GND
8	GND	GND
* or +24 VDC if SW 6 of DIP switch 1 is set to ON		

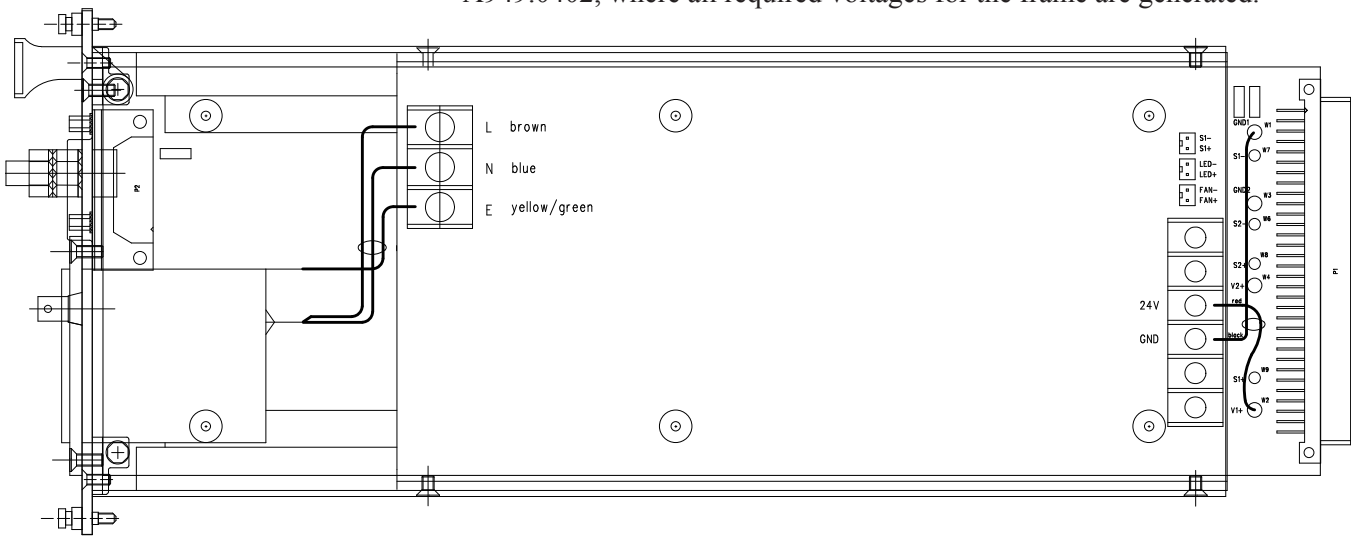
Note *The three lower connectors* **16-23**, **24-31**, *and* **32-39** *are always wired in 'controller' mode and cannot be switched to 'device' mode.*

6.7 Power Supply and Miscellaneous

6.7.1 Primary Power Supply

A949.0404 (earlier version: A949.0403)

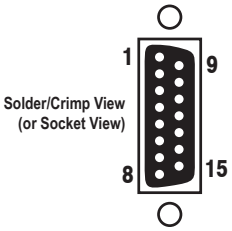
The D21m I/O frame may be equipped with either one or, for redundancy purposes, with two primary power supply units.
The module used is a primary switching AC/DC converter with an input voltage range of 90-264 VAC/50-60 Hz, automatic power factor correction and a standard IEC mains inlet. Output is 24 VDC/max. 8.5 A. *It contains no adjustable elements; if the internal primary fuse should fail, the unit must be returned to the factory for repair.*
The primary power supply unit(s) is/are plugged directly into the PSII PCB A949.0402, where all required voltages for the frame are generated.



FAN/STATUS Connector

This front-panel connector (15-pin D-type f for A949.0404; 9-pin D-type f for A949.0403) is used to output an electrically isolated status signal when the primary power supply (or one of them) should fail. The contacts of a relay located on the LED/PSII PCB are available on this connector, as well as a +24 VDC supply and ground. The relay is energized as long as all supply voltages are ok, pins 4 and 6 (or pins 1 and 2 on A949.0403) are connected then. In case of failure of any of the frame's supply voltages, pins 6 and 8 (or pins 2 and 3 on A949.0403) are connected. The connector in addition allows supplying a fan unit (A949.0597); for the 15-pin connector on the current version A949.0404 a 1:1 m/f cable (C089.201167)is used.
Please note that only the connector of the right-hand primary PSU can be used for the status and supply signals, even if two primary power supply units are installed in the D21m I/O frame.

Pin Assignment

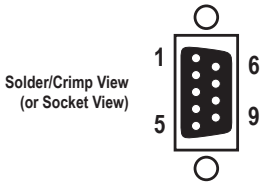


FAN/STATUS (15pin D-type, female, UNC 4-40 thread) on A949.0404:

Pin	Signal	Pin	Signal
1	+24 VDC (fan supply, 650 mA max.)	9	GND
2	reserved - *do not connect!*	10	n.c.
3	GND	11	n.c.
4	* Relay NO (normally ope n)	12	reserved - *do not connect!*
5	** Fan supply OK (active low)	13	** Fan in (active low)
6	* Relay COMMON	14	reserved - *do not connect!*
7	GND	15	n.c.
8	Relay NC (normally closed)		

* Connected if everything is ok ** Status signals, foreseen for fan supervision

STATUS *(9pin D-type, female, UNC 4-40 thread) on earlier version A949.0403:*

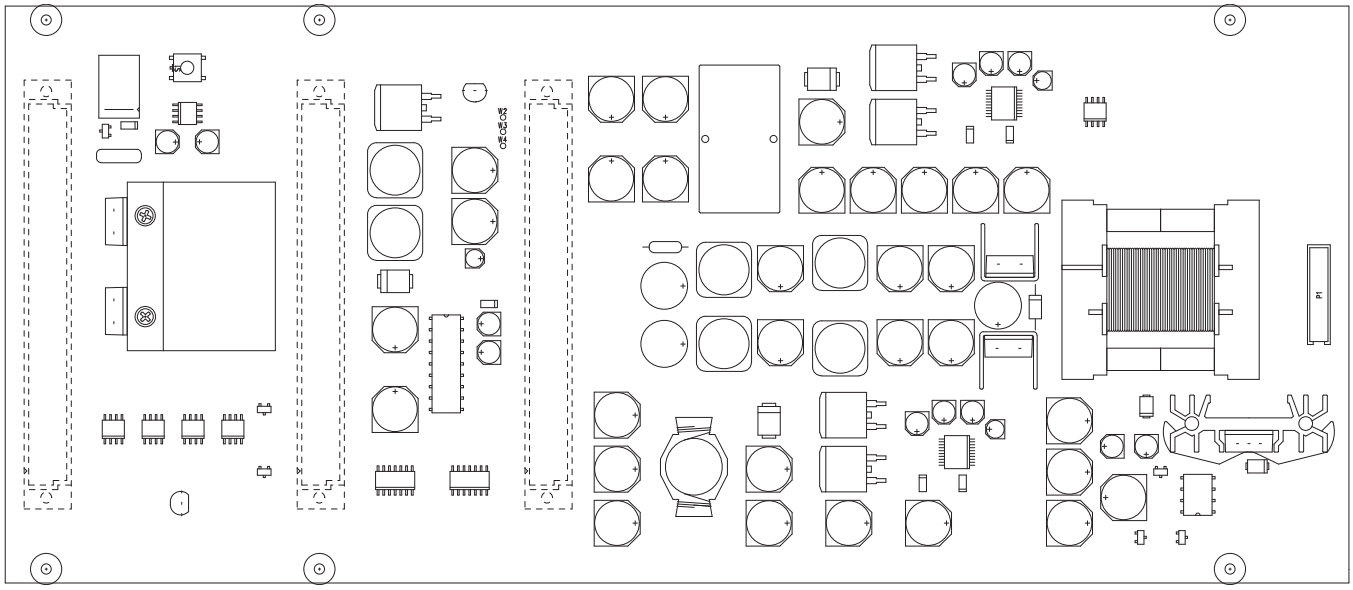


Pin	Signal
1	* Relay NO ('normally open')
2	* Relay COMMON
3	Relay NC ('normally closed')
4	n.c.
5	n.c.
6	+24 VDC (650 mA max.)
7	n.c.
8	GND
9	GND
	* Closed if everything is ok

6.7.2 LED/PSII PCB

A949.0402

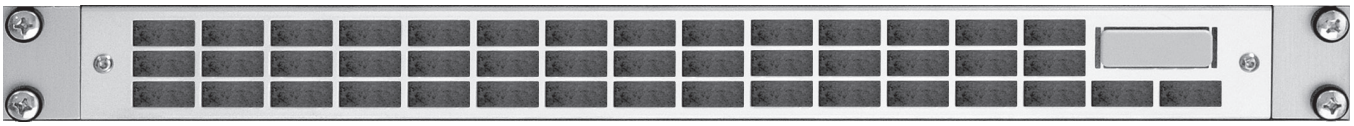
The primary power supply unit(s) as well as the frame's backplane PCB are directly plugged to the PSII PCB. It generates all the DC voltages required by the frame from the 24 VDC delivered by the primary power supply unit(s), and it constantly monitors all supply voltages. As long as everything is ok, a relay is energized. In case of failure of any one of the supply voltages, the relay releases. Both NO and NC relay contacts are available on the **FAN/ STATUS** front panel connector *of the right-hand primary PSU only*.



The PSII PCB contains no adjustable elements.

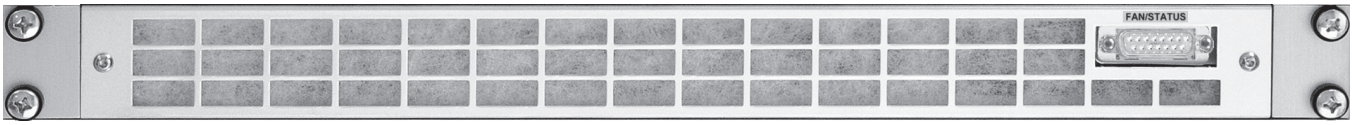
The LED part of the PCB (not shown here) is located behind the frame's front panel and connected with a ribbon cable to P1 of the PSII PCB; it indicates available/missing cards and supply voltages as well as the boot sequence and errors while booting.

6.7.3 Air Deflector/Filter Unit A949.0599



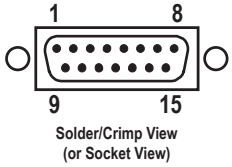
If a D21m I/O frame has a power dissipation of less than 80 W, air deflector/filter units should be used on top of and below the frame. For frames dissipating more power, an air deflector/filter unit should be used on top of the frame, combined with a fan unit (see below) at its bottom. If space is available, a second air deflector/filter unit may be used below the fan unit, increasing the air intake cross-section and thus improving the cooling efficiency.
For more information on cooling and guidelines for power dissipation estimation refer to chapter 1.2.2, paragraph 'thermal considerations'.

6.7.4 Fan Unit A949.0597



In cases where the power dissipation of a D21m I/O frame exceeds 80 W, active cooling is imperative. If no cooling system for the whole rack is used, this 1U fan unit is required underneath the D21m frame. Seven fans draw air in from the front (filtered) and from the bottom (unfiltered) and blow it out upward. The bottom is open and allows installing an additional air deflector/filter unit underneath the fan unit as described above, increasing the air intake cross-section. In most cases, however, closing the fan unit's bottom with a piece of metal sheet is sufficient.
For power supply to the fans and fan status monitoring, two connectors are provided, one at the front, the second at the rear of the unit. They are connected in parallel so that either one can be used, depending on the application. If any of the fans should have a short or open circuit, the alarm signal is triggered.
A 15-pin D-type cable (order no. C089.201167) for connection to the primary PSU is required.
Please note that currently the fan monitoring is implemented for the use of the fan unit within an SCore Live only.
For more information on cooling as well as guidelines for power dissipation estimation refer to chapter 1.2.2, paragraph 'thermal considerations'.

Pin Assignment



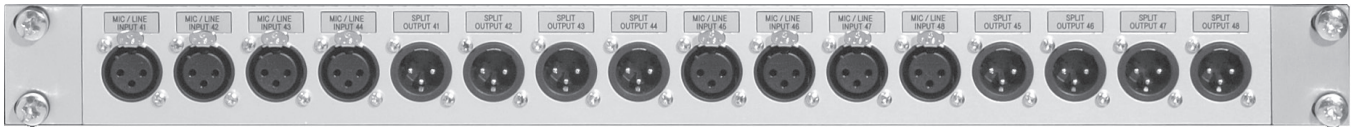
FAN/STATUS (15pin D-type, male, UNC 4-40 thread)

Pin	Signal	Pin	Signal
1	$+V_{cc}$ (+15-24 V)	9	GND
2	n.c.	10	n.c.
3	GND	11	reserved (NTC)
4	n.c.	12	n.c.
5	Alarm relay + (open collector pulling up to V_{cc} if active)	13	GND
6	n.c.	14	n.c.
7	GND	15	reserved (Alarm LED+)
8	n.c.		

6.7.5 Break-Out Boxes

For implementing low-granularity standard terminals, a set of passive break-out boxes has been developed.

6.7.5.1 XLR Break-Out Boxes



This box is implemented as a configurable, modular system. The empty box (A949.0580) can be equipped with different options for the left and right part. The picture above shows a break-out box equipped with two options no. 3 for microphone inputs (2 × 4 XLR 3f) and the corresponding split outputs (2 × 4 XLR 3m). On the rear of the box two 25-pin D-type sockets (f) are provided for connection to the card(s) . For matching cables please refer to chapter 6.7.6.

Available Options

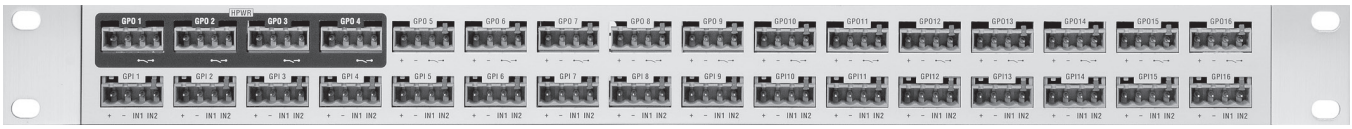
Option	Description	Order no.	Remarks
1	8 × XLR f to 1 × DB25 f	A949.0581	for 1 × Line input
2	8 × XLR m to 1 × DB25 f	A949.0582	for 1 × Line output
3	4 × XLR f / 4 × XLR m to 1 × DB25 f	A949.0583	for 1 × Mic input/Split output or 1 × Mic Insert send/return or 1 × AES/EBU input/output
4	8 × XLR f to 2 × DB25 f	A949.0584	for 2 × Mic input or 2 × AES/EBU input
5	4 × XLR f to 1 × DB25 f, 4 × blank cover	A949.0585	for 1 × Mic input or 1 × AES/EBU input
6	8 × blank cover	8 × C031.030111	

All XLR connectors can be custom-labeled with an inlay label.

6.7.5.2 AES/EBU on BNC Break-Out Box A949.0586

This 19”/1 U box allows converting AES/EBU signals from balanced to unbalanced on BNC connectors and vice-versa. Each connector pair (in and out) can be custom-labeled with an inlay label. On the rear of the box four 25-pin D-type sockets (f) are provided for connection to the AES/EBU cards. For matching cables please refer to chapter 6.7.6.
Maximum cable lengths are 10 m for the D-type cables, and 100 m for the BNC cables.

6.7.5.3 GPIO Break-Out Box A949.0588



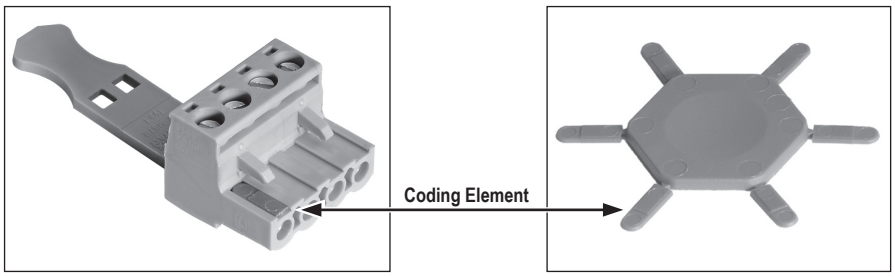
For easier wiring of single GPI and/or GPO signals, this break-out box can be used. 16 GPI signals and 12 of the 16 GPO signals of a GPIO card with relay outputs (A949.0436) are wired to single, 4-pin Combicon terminals (see below), providing the relay contacts or opto-coupler inputs, as well as GND and a short circuit-proof 5 VDC supply.

If voltages exceeding 50 V (AC or DC) are switched, the break-out box must be placed within a closed rack in order to avoid shock hazards by touching the contacts!

Four of the 16 GPO signals (GPO 1-4, *marked in black on the front panel*) are connected to solid-state relays whose power terminals are wired to the Combicon terminals. These power contacts can switch AC loads from 24-240 V with a maximum total current of 5 A over all 4 relays.

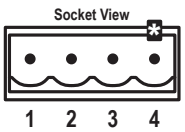
For safety reasons, these four terminals have no additional GND and 5 V supply. All remaining low-voltage terminals (GPI 1-16, GPO 5-16) are coded on pin #4 in order to prevent high-voltage connectors being inserted by mistake.

The high-voltage connectors must be coded, as shown below; six coding elements (order no. C054.251100) are included with the break-out box.



Eight 4-pin Combicon connectors with screw terminals (C054.251104) are included with the break-out box. If more connectors are required, please order separately. On the rear of the box two 37-pin D-type sockets (f) are provided for connection to the GPIO card. For matching cables please refer to chapter 6.7.6.

Pin Assignment



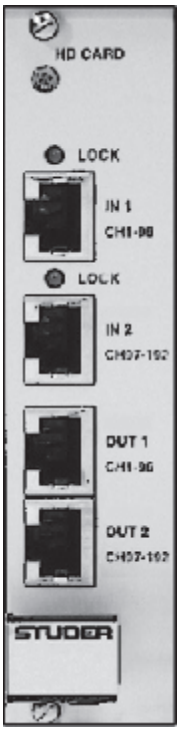
Pin	GPO 1-4 (Outputs) (upper row, **coded*)	GPO 5-16 (Outputs) (opper row, *uncoded*)	GPI 1-16 (Inputs) (lower row, *uncoded*)
1	n.c.	+5 V	+5 V
2	n.c.	GND	GND
3	Power Relay, Contact 1	GPO Relay, Contact 1	Optocoupler Input 1
4	Power Relay, Contact 2	GPO Relay, Contact 2	Optocoupler Input 2

6.7.6 Cables

Description	Length [m]	Order no.
DB25 and DB37 Cables		
DB25 m-m 1:1 cable, 8 × shielded	0.45	C089.201161
DB25 m-m 1:1 cable, 8 × shielded	0.9	C089.201174
DB25 m-m 1:1 cable, 8 × shielded	1.5	C089.201170
DB37 m-m 1:1 cable	0.9	C089.201178
DB25 m to XLR Adapter Cables		
DB25 m to 8 × XLR f (Line In)	3	C054.212402
DB25 m to 8 × XLR m (Line Out)	3	C054.212403
DB25 m to 4 × XLR f + 4 × XLR m (for Mic In/Split Out, Mic Insert Send/Return, or AES/EBU In/Out)	3	C054.212401
Optical Cables		
SC to SC, multi-mode (62.5 / 125 µm)	1	C089.100016
SC to SC, multi-mode (62.5 / 125 µm)	2	C089.100013
SC to SC, multi-mode (62.5 / 125 µm)	3	C089.100015
SC to SC, multi-mode (62.5 / 125 µm)	5	BD10.33205705
SC to SC, multi-mode (62.5 / 125 µm)	10	BD10.33205710
SC to SC, multi-mode (62.5 / 125 µm)	15	BD10.33205715
SC to SC, multi-mode (62.5 / 125 µm)	20	BD10.33205720
SC to SC, multi-mode (62.5 / 125 µm)	25	BD10.33205725
SC to SC, multi-mode (62.5 / 125 µm)	30	BD10.33205730
SC to SC, multi-mode (62.5 / 125 µm)	35	BD10.33205735
SC to SC, multi-mode (62.5 / 125 µm)	40	BD10.33205740
SC to SC, multi-mode (62.5 / 125 µm)	50	BD10.33205750
SC to SC, multi-mode (62.5 / 125 µm)	60	BD10.33205760
SC to SC, multi-mode (62.5 / 125 µm)	65	BD10.33205765
SC to SC, multi-mode (62.5 / 125 µm)	100	BD10.33210022
SC to SC, multi-mode (62.5 / 125 µm)	130	BD10.33213022
SC to SC, single mode (9 / 125 µm)	2	BD10.33215702
SC to SC, single mode (9 / 125 µm)	40	BD10.33215740
Neutrik OpticalCon Heavy-Duty Cables		
Assembled cable on drum	50	C089.100151
Assembled cable on drum	100	C089.100152
Assembled cable on drum	150	C089.100153
Assembled cable on drum	200	C089.100154
Bulkhead adapter, OpticalCon to LC	-	C089.100150
Patch cable, LC to SC	5	C089.100159

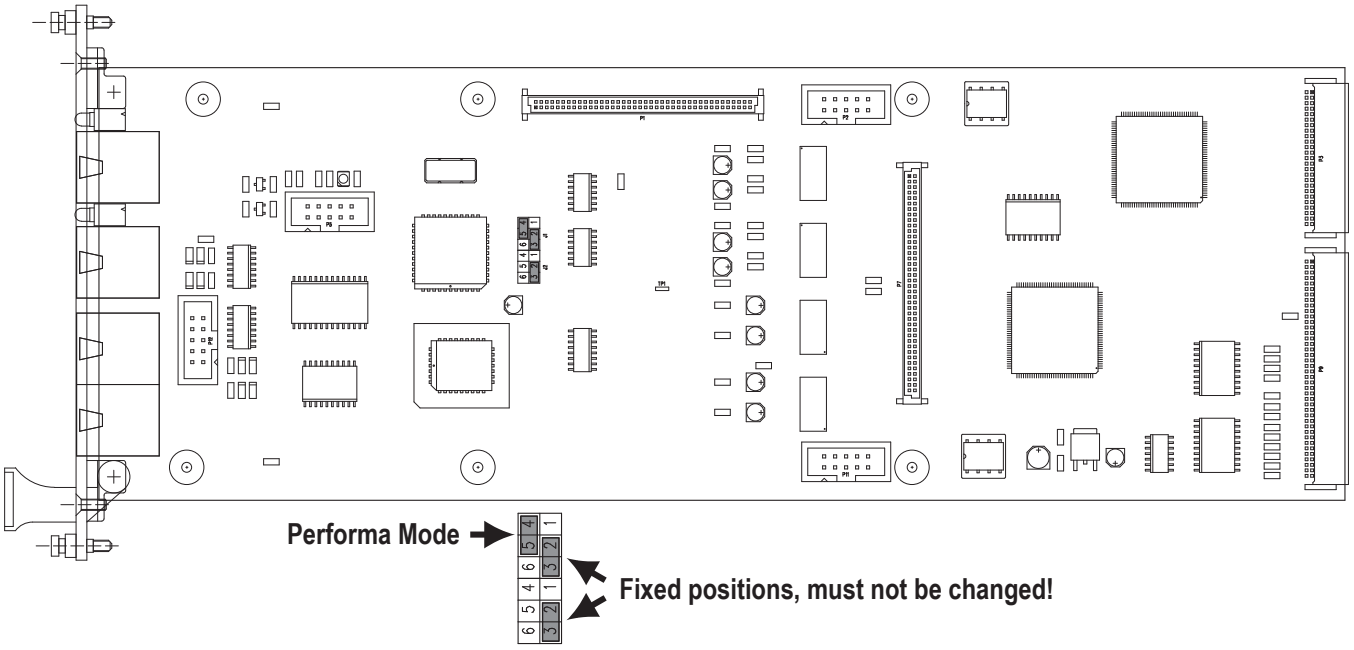
6.8 Discontinued Components *(not available for new systems)*

6.8.1 HD Card *(discontinued)* A949.0410



Please note that this card has been replaced by the D21m HD card S and is not available for new systems.
The D21m HD card provides the link to the DSP core systems. Each input and output can handle up to 96 channels in each supported sampling rate (in combination with the Performa core, the number of I/O channels is restricted to 48). The system clock used is taken from the host DSP system, so no extra synchronization is needed.
The card detects all other I/O cards that are inserted into the D21m system and displays their presence on the front panel of the frame. Once all audio interface cards are plugged in, pressing the **RECONFIG** key on the front panel confirms the configuration to the system. Then all cards are activated and their audio signals are fed into the HD link.

Host link interface cable type		CAT-5 UTP Cable
Cable length		up to 10 m
Connector		RJ-45
Capacity of one CAT-5 connection		96 channels
Current consumption	(3.3 V)	approx. 600 mA
	(5.0 V)	<50 mA
Operating temperature		0-40 °C



LEDs **LOCK** On if a valid signal is present at the input that is locked to the system clock.

Jumpers When using the Performa core, only 48 channels can be transmitted from the core to the D21m system. In order not to lose audio data, the channel selector of the HD Card has to be configured to this mode by a jumper on the card.
The other two jumpers have to remain in their default positions and must not be changed.

Connector Pin Assignment See chapter 'HD Card S'.

6.8.2 MADI HD Cards *(discontinued)* A949.04112x, A949.04132x, A949.04142x

The D21m MADI HD card is plugged into an HD card slot in the remote I/O box and provides the link to the hub frame. 3 versions are available:

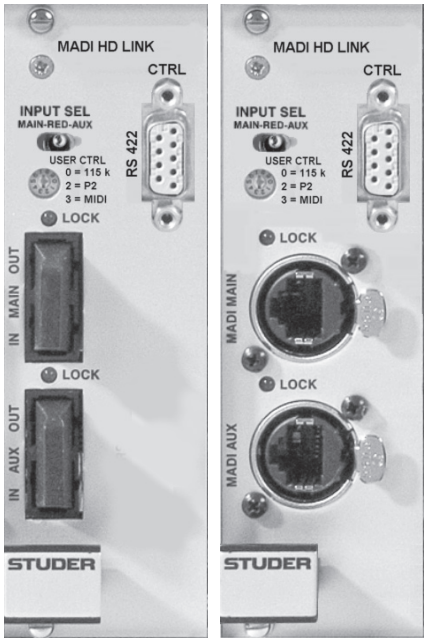
A949.04112x Optical / multi-mode fibre version
A949.04132x Optical / single-mode fibre version
A949.04142x Twisted-pair version.

Please note: Starting with order nos. A949.041124 and A949.041323, resp., the MADI HD cards have been equipped with the larger dual-slot front panel containing an additional RS422 control connector. At the same time the MADI HD card with RJ45 connectors (A949.04142x) was introduced.
They are no exact replacements for the newer versions A949.04113x, A949.04133x and A949.04143x (see chapter 6.5.3). However they may be used instead as long as the GPIO main/aux switchover is not required.

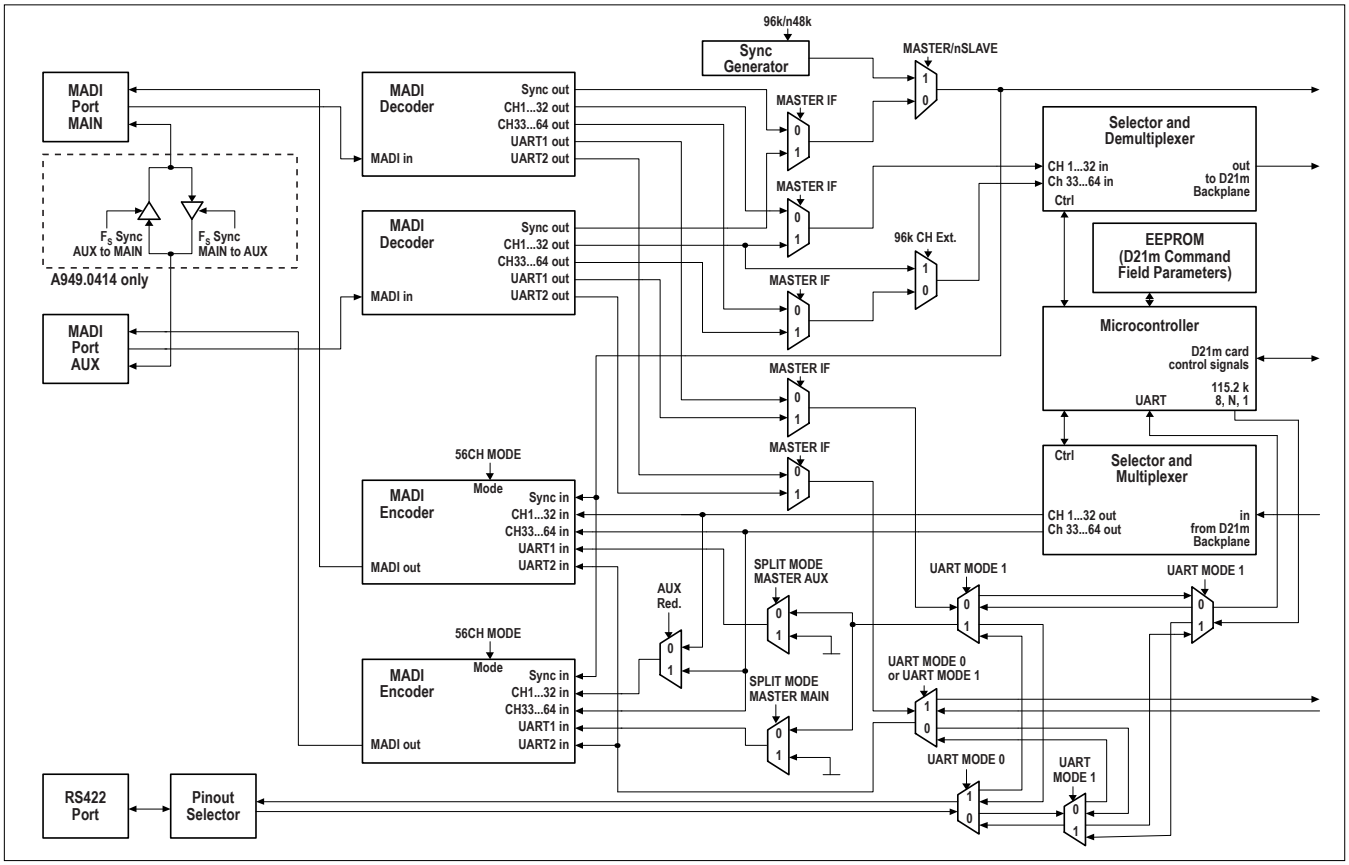
The two interfaces offer up to 64 audio channels with 44.1/48/88.2/96 kHz operation, together with embedded control and user-accessible RS422 serial connection in each direction.

The aux interface can be used as a redundant link or, in 88.2/96 kHz operation, to extend the number of channels from 32 back to 64.

In slave mode, the cards extract the system clock from the incoming MADI signals and provide it to the entire remote I/O box. They detect all other I/O cards that are inserted into the D21m system and display their presence on the front panel of the frame. Once all audio interface cards are plugged in, pressing the **RECONFIG** key on the front panel confirms the configuration to the system. Then all cards are activated and their audio signals are fed into the MADI link. If switched to master mode, the cards run with an internal 48 or 96 kHz reference.

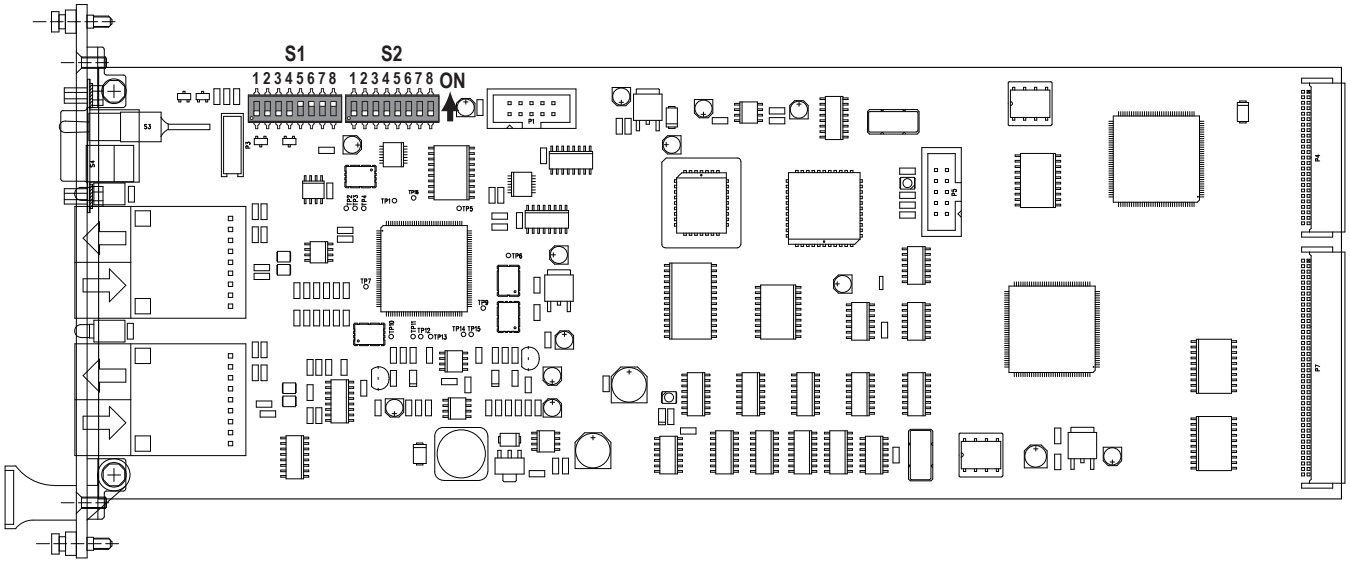


A949.04112x **A949.04132x** **A949.0142x**

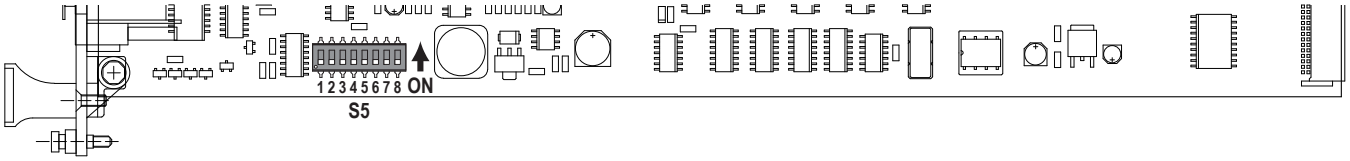


Max. cable length (A949.0411, multi-mode fibre, wavelength 1300 nm*, ø 62.5 or 50 µm) 2 km
(A949.0413, single-mode fibre, wavelength 1300 nm*, ø 9 µm) 15 km
(A949.0414, CAT5e or better, flexible braid) 75 m
(A949.0414, CAT7, solid core) 120 m
Input sampling rates 44.1/48/88.2/96 kHz ±100 ppm
Current consumption (3.3 V/5 V) 0.9 A/0.25 A
Operating temperature 0-40 °C
* *different wavelengths on request*

A949.04112x, A949.04132x



A949.04142x (S1 and S2: see above)



LEDs **LOCK** On if a valid MADI signal is present at the input.

Switches/Connectors See chapter 'MADI HD Cards' and the exceptions listed below.

Exceptions:

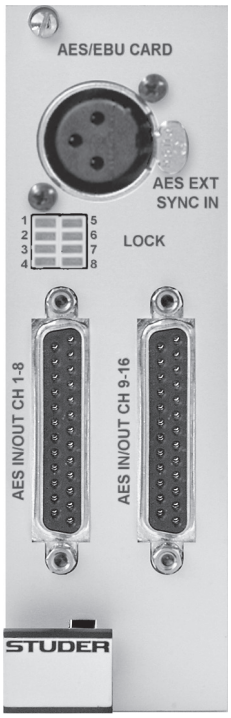
S3 Since the cards described here do not feature the GPIO interface switch-over, the '**RED'** center position of this switch needs to be selected only for 96 kHz/64-channel operation.

S5 DIP switch for FS Sync forward selection (on A949.04142x only):

1	2	3	4	5	6	7	8	
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	No forward *(factory default)*
ON	ON	ON	ON	OFF	OFF	OFF	OFF	Main to AUX
OFF	OFF	OFF	OFF	ON	ON	ON	ON	AUX to Main
NO OTHER SETTINGS ALLOWED!								

CTRL RS422 No GPIO pinout selectable.

6.8.3 AES/EBU I/O Cards *(discontinued)* A949.0422, A949.0423, A949.0424



AES/EBU input/output card with 16 Ch I/O, available in 3 different versions:

A949.0422xx without SRCs (Sampling Rate Converters; Vista only)
A949.0423xx with input SRCs only
A949.0424xx with input and output SRCs (see adjacent picture).

Selectable output sampling rates: 96 kHz, 48 kHz, 44.1 kHz, or external reference (22-108 kHz). Input SRCs can be bypassed individually. Output SRCs can be bypassed in groups of four. Output dither is selectable for every AES/EBU output from 24 bit, 20 bit, 18 bit or 16 bit. Settings are made with jumpers. Inputs and outputs on standard 25-pin D-type connectors (female).

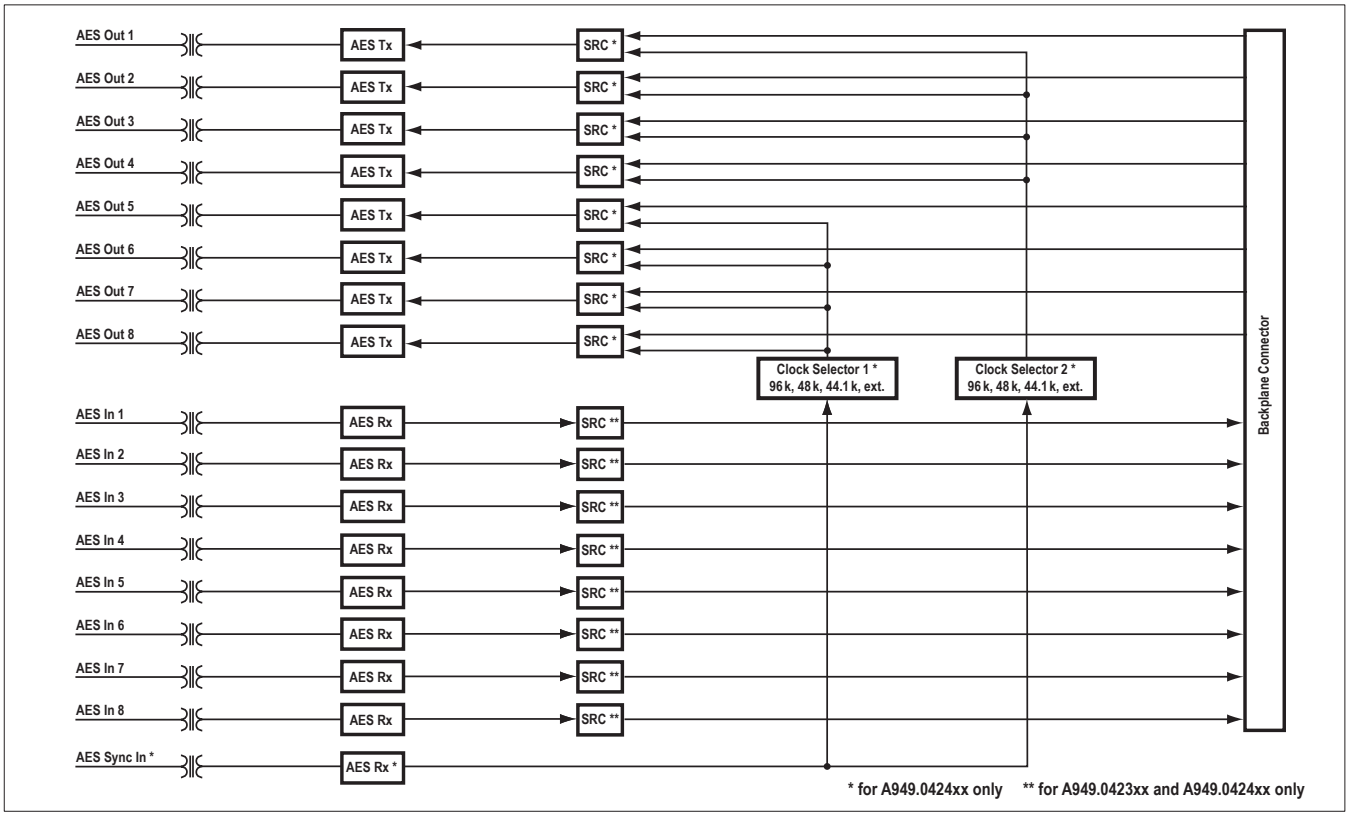
SRC Delay Enabled input and output SRCs each cause a delay (D) that depends on the SRC's input and output sampling rate (f_{S_IN} and f_{S_OUT}). Input and output delays can be calculated using the formulas below.

$$[1]\ f_{S\_IN} > f_{S\_OUT}:\ D = \frac{16}{f_{S\_IN}} + \frac{32}{f_{S\_OUT}}\ [s] \qquad [2]\ f_{S\_OUT} > f_{S\_IN}:\ D = \frac{48}{f_{S\_IN}}\ [s]$$

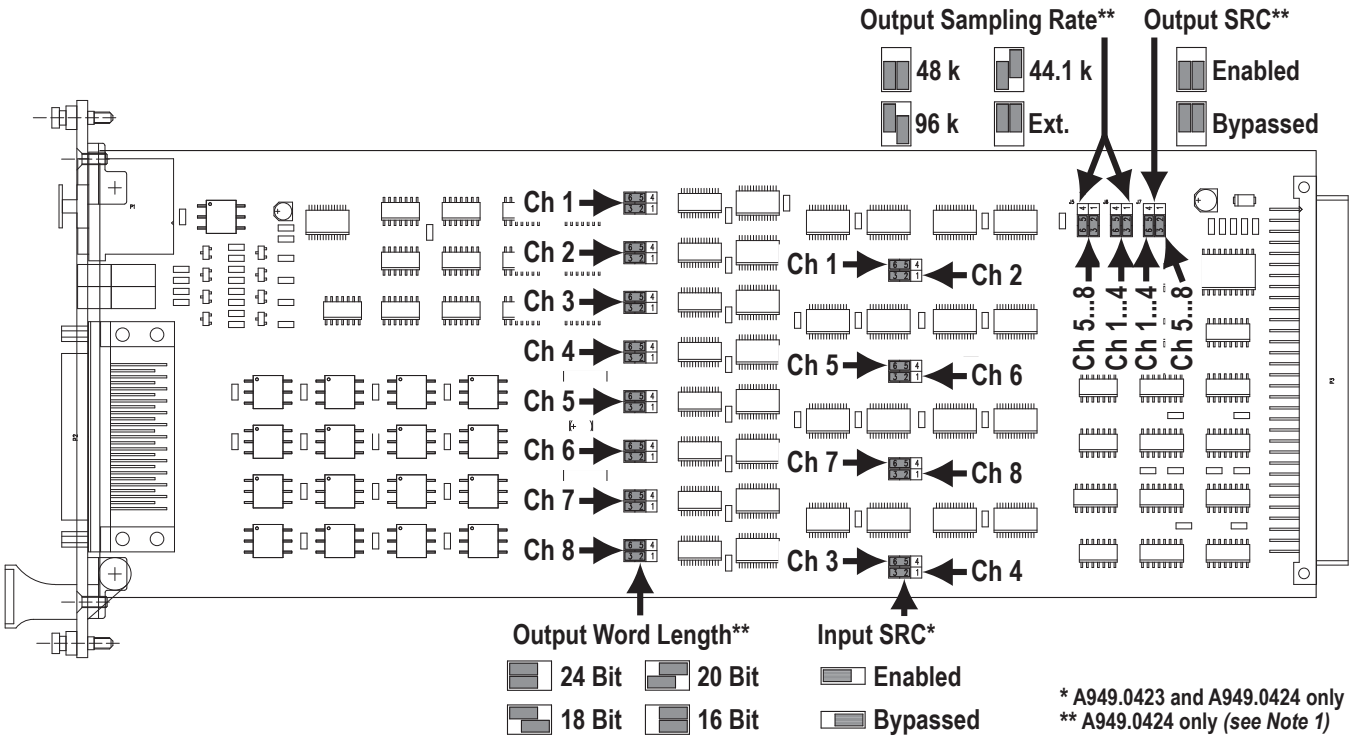
Examples:

- *For a 96 kHz input signal and a 48 kHz system clock (i.e., the 'output signal' of the input SRC), input delay is 40 output samples or 0.833 ms (formula [1]).*
- *For a 48 kHz system clock (i.e., the 'input signal' of the output SRC) and a 96 kHz output signal, output delay is 96 output samples or 1 ms (formula [2]).*

Note *If the core is operating with a 44.1 or 88.2 kHz system clock, the output sampling rate will be 44.1 or 88.2 kHz, regardless of the jumper selection, unless the external sync input is used and* **Ext.** *is selected. In such a case the output sampling rate corresponds to the one of the external sync signal.*



Input / output impedance	110 Ω
Input sensitivity	min. 0.2 V
Output level (into 110 Ω)	3.3 V
SRC range	22-108 kHz
Current consumption (3.3 V)	A949.0422: 0.2 A/.0423: 0.4 A/.0424: 0.6 A
(5 V)	0.65 A
Operating temperature	0-40 °C



LEDs **LOCK 1-8** These green LEDs are on if a valid AES/EBU signal is available at the inputs.

Jumpers **Output Word Length** *(A949.0424 only)* Used to set the resolution (output word length) for outputs 1-8.

Please note that for a word length reduction the output SRCs must be set to **Enabled***; if so, the output word length is always 21 bit maximum. Whenever an SRC is enabled, the three least significant bits (LSB) are set to digital zero. This results in the specified dynamic range of 120 dB.*

Input SRC *(A949.0423 and A949.0424 only)* Enabling or bypassing of the SRCs for individual AES/EBU input channels.

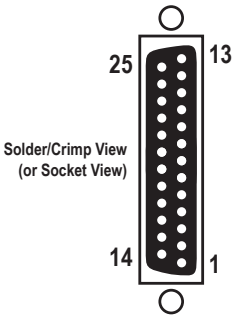
Output Sampling Rate *(A949.0424 only)* The output sampling rate may be set for the AES/EBU output channel groups 1-4 and 5-8; selection from 44.1 kHz, 48 kHz, 96 kHz, or synchronized by the signal at the **AES EXT SYNC IN** connector *(see 'Note' above)*.

If no valid signal is provided at the **AES EXT SYNC IN** connector but **Ext.** is selected, the output sampling rate will be set to the system clock. Outputs set to **Ext.** can therefore be used in a very flexible way: Connect no external sync signal, if not necessary, so that the output will be clocked with the internal system clock. As soon as an external sync signal is provided to the **AES EXT SYNC IN** connector, the output will be clocked with the ext. sync signal.

Output SRC / WL Reduction *(A949.0424 only)* Enabling/bypassing of the output SRCs, separate for the AES/EBU output channel groups 1-4 and 5-8. *Please note that for word length reduction the output SRCs must be set to* **Enabled**.

Connector Pin Assignment

AES IN/OUT (2 × 25pin D-type, female, UNC 4-40 thread)



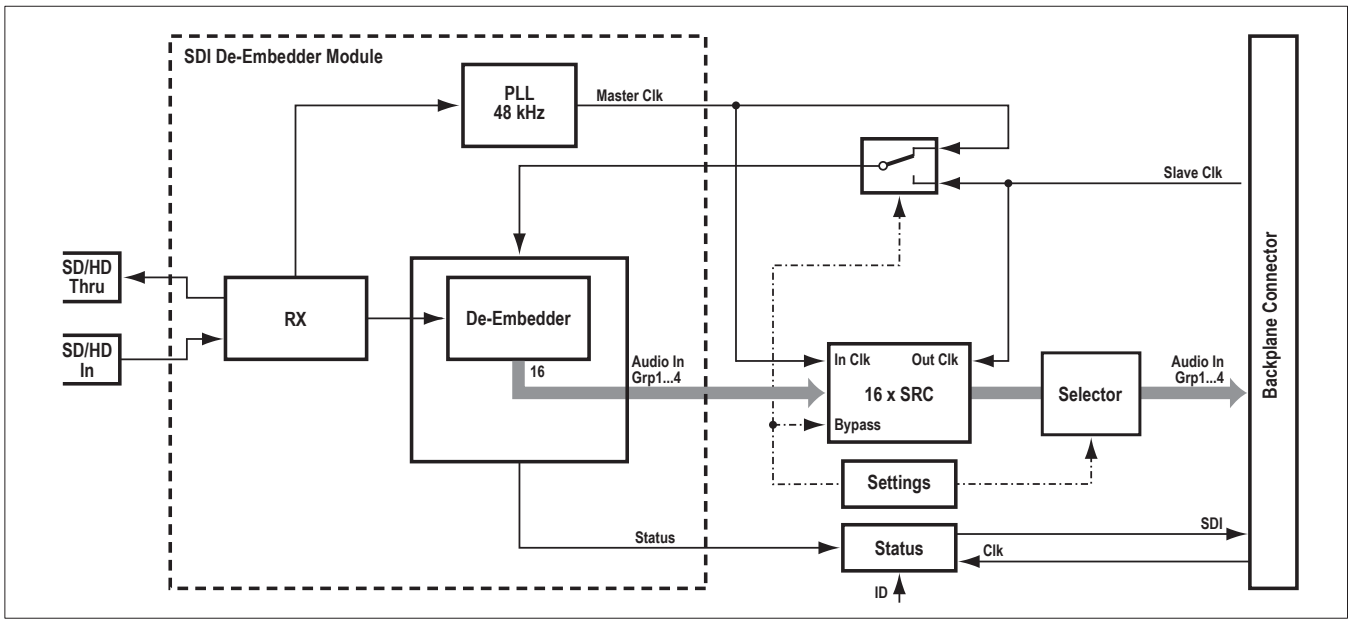
Pin	Signal 'CH 1-8'	Signal 'CH 9-16'	Pin	Signal 'CH 1-8'	Signal 'CH 9-16'
1	CH 7/8 out +	CH 15/16 out +	14	CH 7/8 out –	CH 15/16 out –
2	CH 7/8 out screen	CH 15/16 out screen	15	CH 5/6 out +	CH 13/14 out +
3	CH 5/6 out –	CH 13/14 out –	16	CH 5/6 out screen	CH 13/14 out screen
4	CH 3/4 out +	CH 11/12 out +	17	CH 3/4 out –	CH 11/12 out –
5	CH 3/4 out screen	CH 11/12 out screen	18	CH 1/2 out +	CH 9/10 out +
6	CH 1/2 out –	CH 9/10 out –	19	CH 1/2 out screen	CH 9/10 out screen
7	CH 7/8 in +	CH 15/16 in +	20	CH 7/8 in –	CH 15/16 in –
8	CH 7/8 in screen	CH 15/16 in screen	21	CH 5/6 in +	CH 13/14 in +
9	CH 5/6 in –	CH 13/14 in –	22	CH 5/6 in screen	CH 13/14 in screen
10	CH 3/4 in +	CH 11/12 in +	23	CH 3/4 in –	CH 11/12 in –
11	CH 3/4 in screen	CH 11/12 in screen	24	CH 1/2 in +	CH 9/10 in +
12	CH 1/2 in –	CH 9/10 in –	25	CH 1/2 in screen	CH 9/10 in screen
13	n.c.	n.c.			

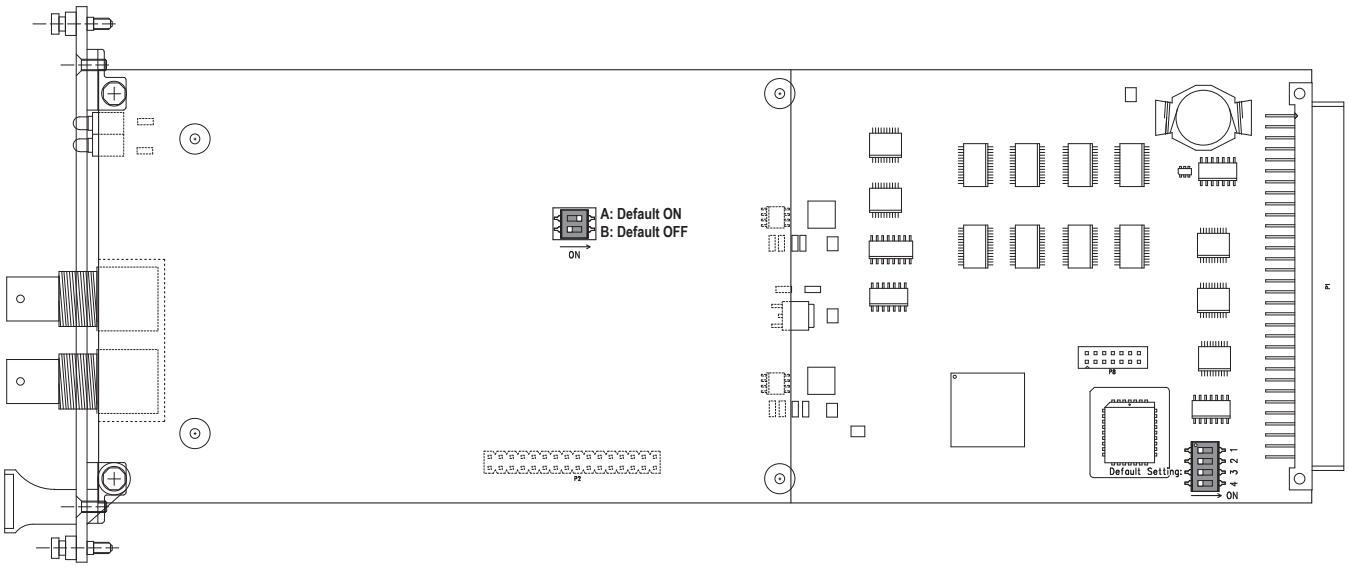
6.8.4 SDI Input Card *(discontinued)* A949.0441

The HD/SD SDI (serial digital interface) 16-channel de-embedder card is able to de-embed eight or 16 audio channels from SDI-SD as well as from SDI-HD video streams. For the D21m I/O system it acts as an 8- or 16-channel audio input card. These two modes are determined by DIP switches located on the card.
The SDI standard defines up to 16 audio channels transmitted within a video signal. These 16 channels are divided into four groups of four each. The user can determine by hardware switches whether all four groups, or only groups 1&2, or only groups 3&4 will be de-embedded.
The card hosts SRCs (sampling rate converters) that are bypassed per default. When bypassed, the SDI card is fully compatible to receiving embedded Dolby® E audio data. The SRCs can be enabled in case the audio extracted from the SDI stream is not in sync with the local system. This means that the mixing console can run fully independent of the video sync used for SDI. *If the SRCs are bypassed, the card works at a sampling rate of 48 kHz only.*

Operating modes	8- or 16-ch console input (de-embedder)
Selectable SDI groups	1&2, 3&4, or all
Video connectors	IN, THROUGH (BNC, 75 Ω)
Audio latency* (in combination with D21m embedder card)	HD: <800 µs SD: <2.6 ms
Current consumption (5 V)	1 A
Operating temperature	0-40 °C

***** Audio latency times are identical for all channels and all groups.





LEDs

SDI LOCK	Indicates a valid (HD or SD) SDI signal at the input.
HD	Indicates a valid HD SDI signal at the input.

DIP Switches **S1**

Switch	Setting
1	OFF: 16-channel mode *(factory default)* ON: 8-channel mode
2	OFF: Group 1/2 used in 8-channel mode *(factory default)* ON: Group 3/4 used in 8-channel mode
3	OFF: SRC disabled *(factory default)* ON: SRC enabled
4	reserved *(must always be OFF; factory default)*

DIP Switch on SDI Module

Switch	Setting
A	reserved *(default: ON)*
B	reserved *(default: OFF)*