

Studer D2Im

I/O System Components





The D21m I/O System

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 customers needs. And all this comes with an unequalled form factor. Full redundancy is available on power supplies as well as I/O links.

System Philosophy

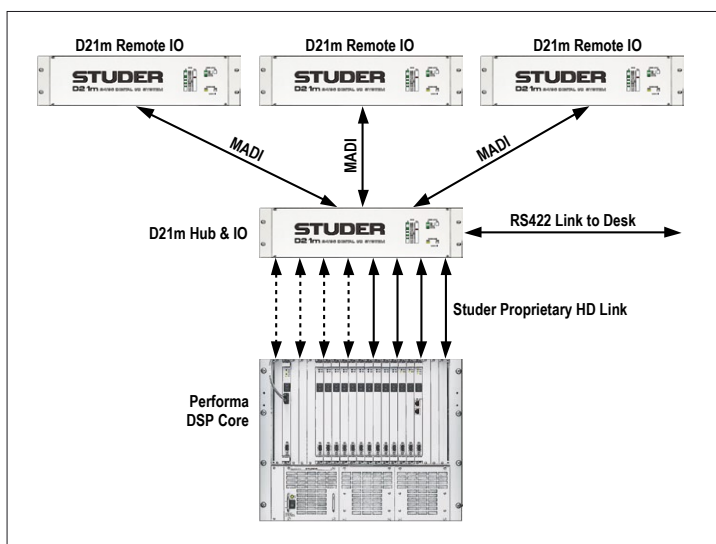
When using the D21m I/O system the DSP core itself does not provide I/O, but is connected to the first D21m frame within the system (acting as a hub) by using Studer proprietary “HD Link” technology. On the core side the connection is made to PED21m cards. These are standard processing cards with additional linking capabilities. This 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 kilometers 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. In case more I/O channels should be required it is possible to have multiples of the “local frames” (hubs) 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 it is possible to use the second link as a channel count extension, transferring a total of 64 MADI channels even at 96 kHz sampling frequency. The “redundant” MADI link may also be used for sharing an I/O box between two consoles.

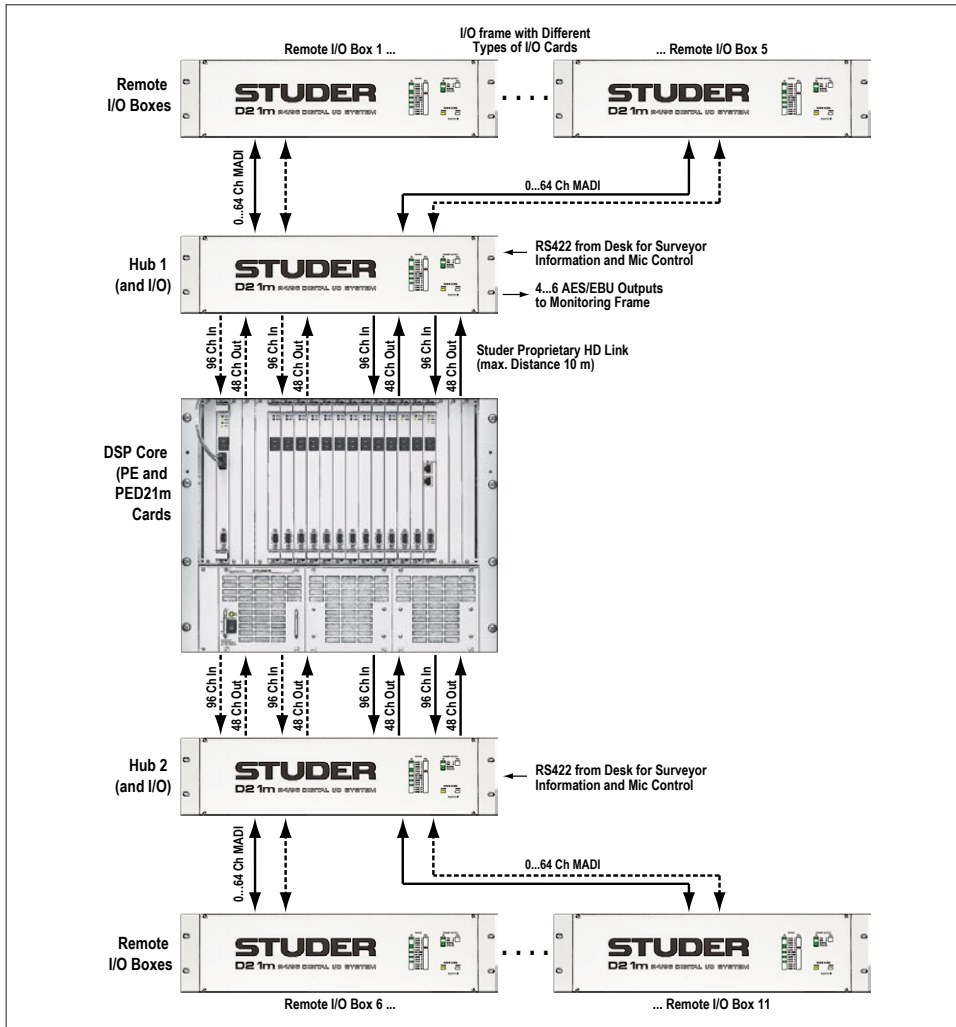
The MADI link between the first D21m frame (hub) and the remote I/O boxes in addition carries all control signals needed to control the microphone amplifier cards, to interrogate the state (health) of any remote I/O card and to display it within the console’s system surveyor page. This is without sacrificing any audio channels within the MADI link. Additionally, it is possible to “tunnel” an RS422 signal through the MADI connection. In this way it is possible to e.g. connect a MIDI device 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. Using the D21m system as a “standalone” analog-to-digital or digital-to-analog converter is only possible if MADI I/O is used on the digital side. It is e.g. not possible to insert a AES/EBU card and a Line In card and get the A/D-converted signal out of the AES/EBU card directly. This is only possible 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.

It is however possible to interconnect two I/O boxes using MADI, whereby 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 1.949.411.23, 1.949.413.22, 1.949.414.20 or newer). This mode is often referred to as “Digital Snake”.



Application: Full-Size System



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 for an AES/EBU card in order to provide I/O for monitoring and talkback of the Vista desk.

The RS422 link for the second hub may be taken from the Vista desk by using a further RS422 port.

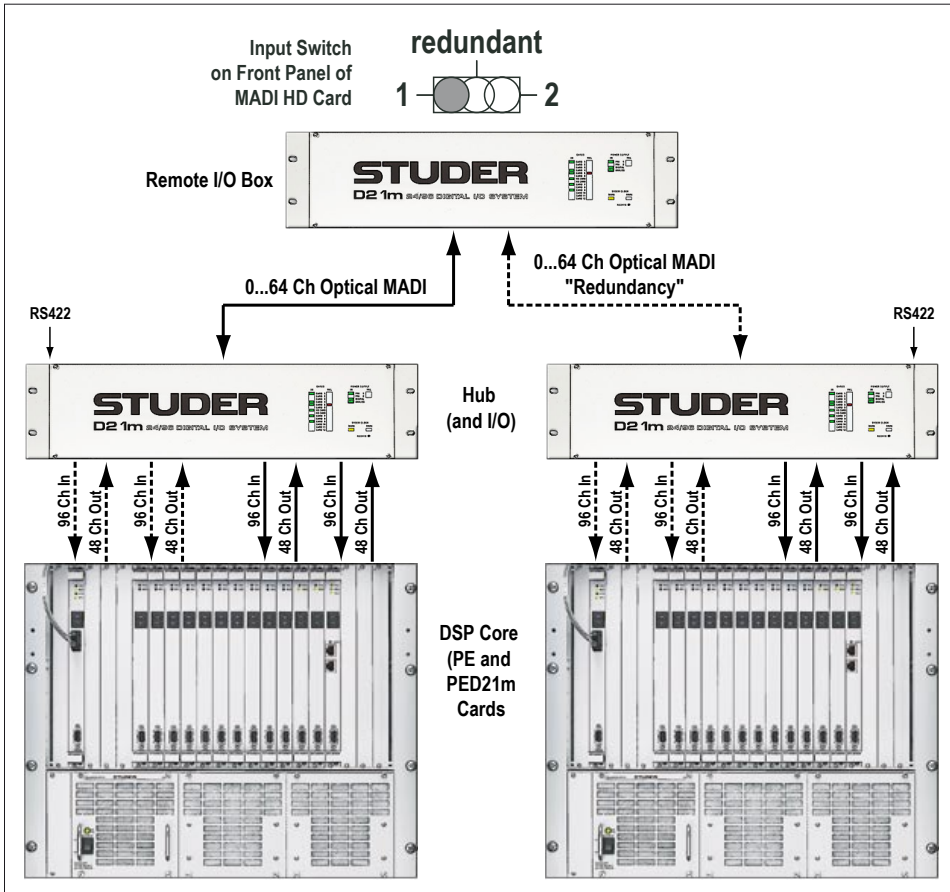
The channel count of the MADi link may be adjusted using card-internal DIP switches in steps of eight channels. In order to provide synchronization and surveyor

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.

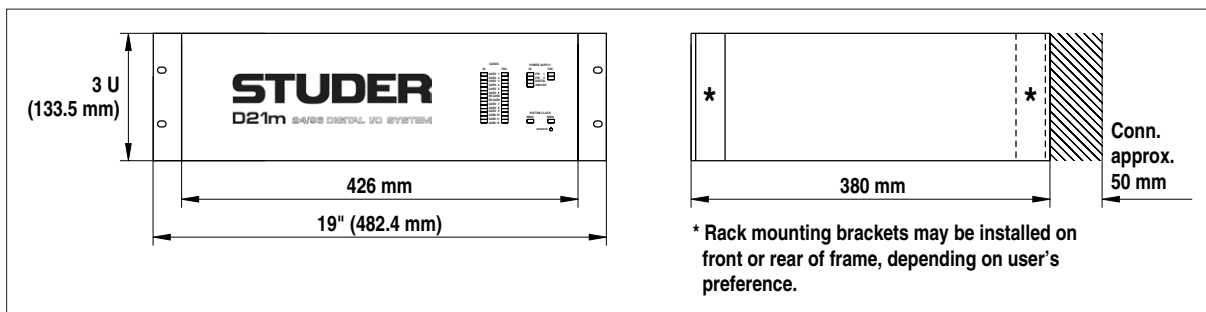
Application: Shared I/O



It is possible to connect one remote I/O box to two hubs/consolas at the same time. This allows sharing of one box between two consoles. While the audio inputs to the consoles 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.

Mechanical Dimensions



Available Cards

Analog I/O Cards						
Name	I/O Format	# of Input Channels	# of Output Channels	Connector Type	Width (Slots)	Order No.
Mic/Line Input (incl. Dir. Outs)	Mic/Line	4	(4 Dir. Outs)	D25 f	single	1.949.427
Analog Insert *	Line	4	4	D25 f	single	1.949.428
Analog Line In	Line	8	—	D25 f	single	1.949.428
Analog Line Out	Line	—	8	D25 f	single	1.949.420
* The Analog Insert card belongs to the Mic/Line Input card to its left. It does not communicate with the HD card. The insert send signal is always present and may be used as an additional direct output. The insert is activated by the software (console).						
Digital I/O Cards						
Name	I/O Format	# of Input Channels	# of Output Channels	Connector Type	Width (Slots)	Order No.
AES I/O (no SFC)	AES/EBU	8 stereo (16 mono)	8 stereo (16 mono)	2 × D25 f	double **	1.949.422
AES I/O (SFC on Inputs)	AES/EBU	8 stereo (16 mono)	8 stereo (16 mono)	2 × D25 f	double **	1.949.423
AES I/O (SFC on Inputs and Outputs)	AES/EBU	8 stereo (16 mono)	8 stereo (16 mono)	2 × D25 f; ext. sync XLR	double **	1.949.424
MADI I/O *** / ****	MADI	64 at 48 kHz (32 with red., 64 without red. at 96 kHz)	64 at 48 kHz (32 with red., 64 without red. at 96 kHz)	SC (optical)	double **	1.949.430 1.949.431
ADAT I/O	ADAT	16 at 48 kHz (8 at 96 kHz)	16 at 48 kHz (8 at 96 kHz)	TOSLINK (optical)	single	1.949.425 1.949.429
TDIF I/O	TDIF	16 at 48 kHz (8 at 96 kHz)	16 at 48 kHz (8 at 96 kHz)	2 × D25 f	double **	1.949.426
SDI I/O	SDI / HD SDI	8	8	BNC	double **	1.949.442
** 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 MADI 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.						
Miscellaneous Cards						
Name	I/O Format	# of Input Channels	# of Output Channels	Connector Type	Width (Slots)	Order No.
HD S	HD Link	max. 96	max. 96	RJ45	single	1.949.412
MADI HD	MADI	64 at 48 kHz (32 with red., 64 without red. at 96 kHz)	64 at 48 kHz (32 with red., 64 without red. at 96 kHz)	SC (optical)	double	1.949.411 1.949.413
Serial	RS422	-	-	D9 f	single	1.949.437
Serial RJ45	RS422	-	-	RJ45	single	1.949.439
Serial Merger	RS422	-	-	2 × D9 f	single	1.949.438
Dual Merger	RS422	-	-	4 × RJ45	single	1.949.440
GPIO	GPIO	16	16	2 × D25 f	double	1.949.435
GPIO w. Relays	GPIO	16	16	2 × D37 f	double	1.949.436



Mic/Line in

1.949.427

Four analog microphone/line inputs, electronically balanced, with 24 bit, 44.1/48/88.2/96 kHz delta-sigma A/D converters (mic/line sensitivity, gain setting in 1 dB steps, low-cut filter, soft clipping and 48 V phantom power on/off controlled by console software); four analog

split outputs, electronically balanced. Green “signal present” and yellow “phantom power” indicators per channel. Inputs and split outputs on standard 25-pin D-type connector (female).

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	(Ri 200 Ω, max. gain) -124 dBu
Crosstalk (1 kHz)	< -110 dB
Frequency response (30 Hz...20 kHz)	-0.2 dB
THD&N (35 Hz...20 kHz, -1 dB _{FS} , min. gain)	< -97 dB _{FS}
(1 kHz, -30 dB _{FS} , min. gain)	< -111 dB _{FS}
(input level 6 dBu, min. gain)	< -107 dB _{FS}
Low-cut filter	75 Hz / 12 dB/oct.



Analog Insert

1.949.428

This card is intended for use with a D21m Mic/Line In card 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.

In/out level (for 0 dB _{FS})	15 dBu
	(6 or 24 dBu w. soldering jumper)
Input impedance	10 kΩ
Output impedance	50 Ω



Line In

1.949.421

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} , min. gain)	< -97 dB _{FS}
(1 kHz, -30 dB _{FS} , min. gain)	< -111 dB _{FS}
Crosstalk (1 kHz)	< -110 dB

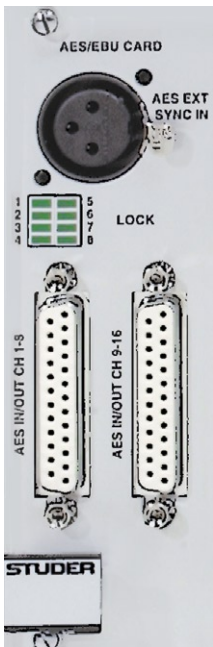


Line Out

1.949.420

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



AES/EBU I/O

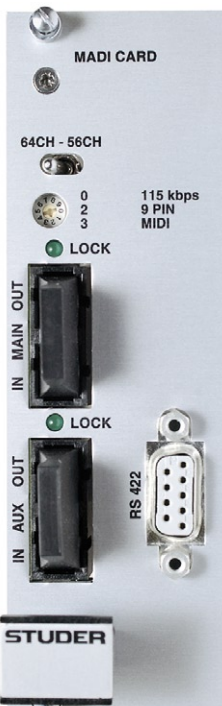
1.949.422, 1.949.423, 1.949.424

AES/EBU input/output card with 16 Ch I/O. Version with input and output SFCs (1.949.424), with input SFCs only (1.949.423), or without SFCs (1.949.422). Selectable output sampling rates: 96 kHz, 48 kHz, 44.1 kHz, or external reference (22...108 kHz). Input SFCs can

be bypassed individually. Output SFCs 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 are on standard 25-pin D-type connectors (female).

Input / output impedance
Input sensitivity
Output level (into 110 Ω)
SFC range

110 Ω
min. 0.2V
5V
22...108 kHz



MADI I/O

1.949.430, 1.949.431

The MADI I/O card can establish a 64-channel MADI input and output to the D21m frame, with 44.1/48/88.2/96 kHz operation. Optical inputs and outputs are provided on SC connectors available in multi-mode and single-mode versions.

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.

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.

Max. cable length
Input frequencies

(1.949.430, multi-mode fibre) 500 m
(1.949.431, single-mode fibre) 1000 m
44.1/48/88.2/96 kHz ±100 ppm



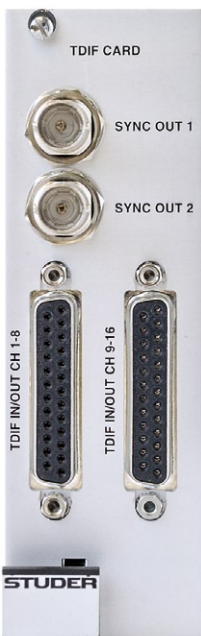
ADAT I/O

1.949.425, 1.949.429

Two optical eight-channel ADAT inputs and outputs. fibre) and PCF (plastic-clad fibre) versions. In 96 kHz 44.1/48/88.2/96 kHz operation; optional long-distance operation, the number of channels is limited to eight, version 1.949.429. Optical inputs and outputs are provided on TosLink connectors available in APF (all-plastic i.e. four per I/O.

Max. distance (1.949.425, APF version) 5 m
 (1.949.429, PCF version) 300 m*

* distances up to 1000 m are possible (available upon special request).



TDIF I/O

1.949.426

This card provides two eight-channel TDIF I/O interfaces In 96 kHz operation, the number of channels is limited to eight, i.e. four per I/O. 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).

TDIF inputs/outputs

according to TDIF specifications



HD S

1.949.412

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 frequency (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



MADI HD Link

1.949.411, 1.949.413

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. The two optical 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.

The card detects all other I/O cards that are inserted into 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.

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.

Card versions [1.949.411.23](#), [1.949.413.22](#), [1.949.414.20](#) or newer feature a switch to make the card generate a MADI signal that can be directly fed to a second, remote I/O box ("Digital Snake").

The card extracts the system clock from the incoming MADI signals and provides it to the entire remote I/O box. It detects all other I/O cards that are inserted into the D21m system and displays their presence on the

By connecting a separate serial control cable it is possible to control a remote I/O box from a PC running Studer Remote Control software (see page 12).

Max. cable length	(1.949.411, multi-mode fibre)	500 m
	(1.949.413, single-mode fibre)	1000 m
Input frequencies	44.1/48/88.2/96 kHz \pm 100 ppm	



Serial

1.949.437

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 remote I/O box. 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.

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 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



Serial RJ45

1.949.439

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.

on the serial device connected. Standard Ethernet UTP wiring for connecting the hub frame to the serial card may be used.

The pinout of the 8-pin RJ45 connector can be set to “device” or “controller” with a DIP switch, depending

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



Serial Merger

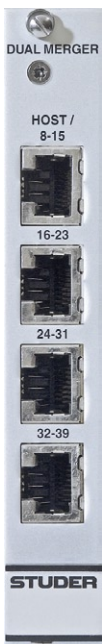
1.949.438

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 MASTER connector of the card.

In case of an OnAir 3000 console, the SLAVE connector may be used to connect a second local I/O box.

Max. RS422 cable length

1000 m



Dual Merger

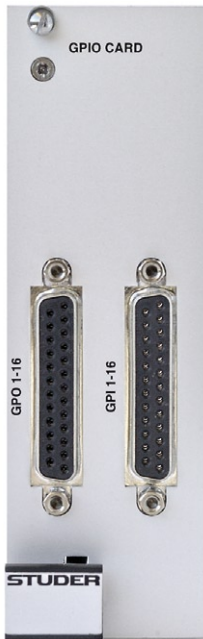
1.949.440

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 boxes.

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

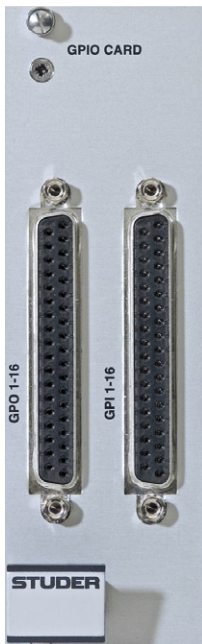


GPIO

1.949.435

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

Please note that this card is currently **not** available for use with Studer Vista systems.



GPIO with Relay Outputs

1.949.436

For general-purpose applications requiring total electrical isolation, this card provides 16 electrically isolated opto-coupler inputs with integrated current sink ($5 \dots 24 V_{DC}$)

and 16 electrically isolated outputs using SPST relay contacts. $5 V_{DC}$ supply pins are available. Inputs and outputs on standard 37-pin D-type connectors (female).



SDI I/O

I.949.442

The HD/SD SDI 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 hardware 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 hardware 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 both for audio inputs (de-embedding) as well as the audio outputs (embedding). So the mixing console can run independent of the video sync used for SDI. Both sampling rate converters can be bypassed individually. When bypassed, the SDI card is fully compatible to transmitting Dolby E audio format.

Modes

8-ch console output (embedder),
8-ch console input (de-embedder), or

8-ch console input and 8-ch console output (de-embedder/embedder)

Selectable SDI groups

1&2, or 3&4

Video connectors

INPUT, OUTPUT, THROUGH (BNC, 75Ω)



Studer D21m I/O System

Adding Studer Sound across your facility

Previously only available for Studer digital mixing consoles, the renowned Studer sound of the D21m I/O system is now opened up for use with any audio equipment. With the introduction of the D21m Remote Control Software, Studer makes its microphone preamplifiers and A/D converters with their extensive dynamic range of 150 dB available to a wide range of applications such as recording, broadcast and live sound.

A D21m I/O rack can be connected to any 3rd party device using its optical MAD1 interface. The Studer Remote Control Software runs on a PC, connected to the I/O rack over an additional RS422 serial connection. This software may even run at the same time as certain workstation software.

The I/O rack itself is highly modular, and it is possible to choose from a variety of I/O cards. Thanks to two MAD1 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. In 48 kHz mode the second MAD1 interface serves as a digital split output for feeding any additional audio device or as redundant audio link.

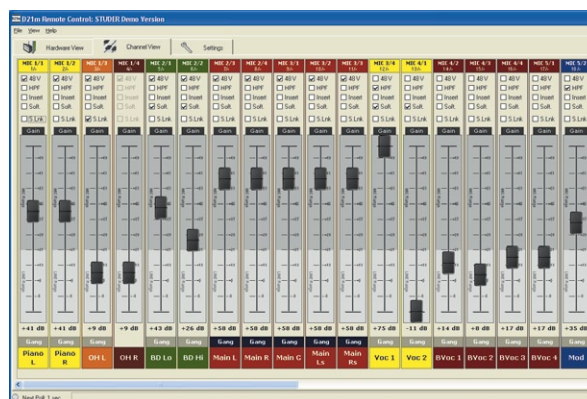
In facilities containing Studer Vista consoles, the investment is broadened by the extreme versatility of the D21m stage boxes. One day they can be used on stage, connected to the Studer console and the next day in the recording studio in order to bring superb audio quality to lower-cost recording equipment.

The Studer D21m Remote Control 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 control over the microphone preamplifiers:

- 48 V phantom power
- 75 Hz high pass filter
- Softclip
- Analogue insert
- Input level between -60 dBu and +26 dBu
- Label and color coding of microphone inputs
- Stereo-Linking of two subsequent channels

These parameters may be stored and recalled using snapshot files. Spare inputs may be hidden from the screen view while used ones can be arranged in any order. The speed of operation is maximized by the ability to group inputs in a Vista-like way (“ganging”).



Available D21m I/O cards (Overview)

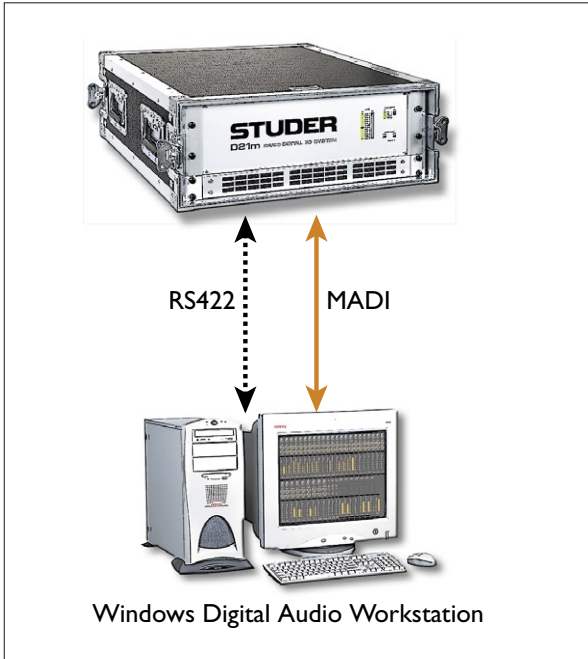
- 4-channel microphone preamplifier with A/D converters: electronically balanced inputs, analog split outputs
- 4 channels of analogue inserts for use with microphone input card
- 8-channel line in
- 8-channel line out
- 8 input & 8 output AES/EBU with optional sample rate converters on input and outputs
- 16-channel ADAT
- 16-channel TDIF

MAD1 Interface

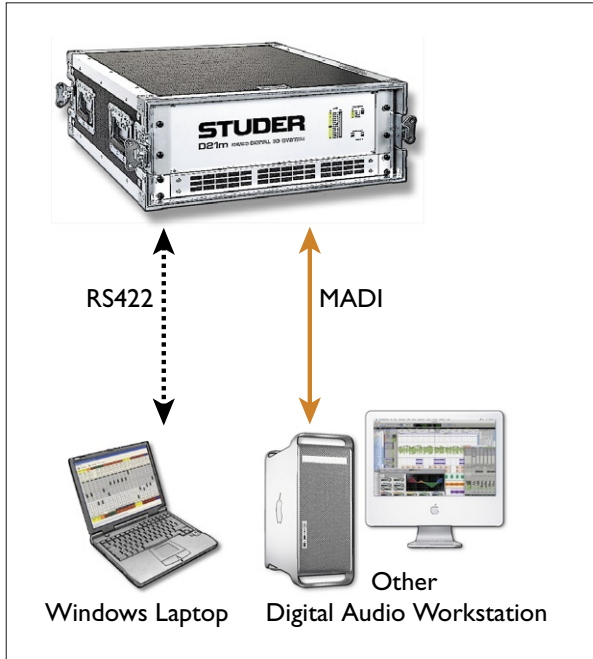
The MAD1 interface of the D21m I/O rack supports both the standard MAD1 protocol with a maximum of 56 channels as well as the extended protocol with 64 audio channels. This protocol type is selectable on the front panel of the rack.

The Studer D21m I/O acts as a clock slave and synchronizes to the optical MAD1-signal. It therefore automatically detects the clock rate of the connected audio device. Supported clock rates are 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz.

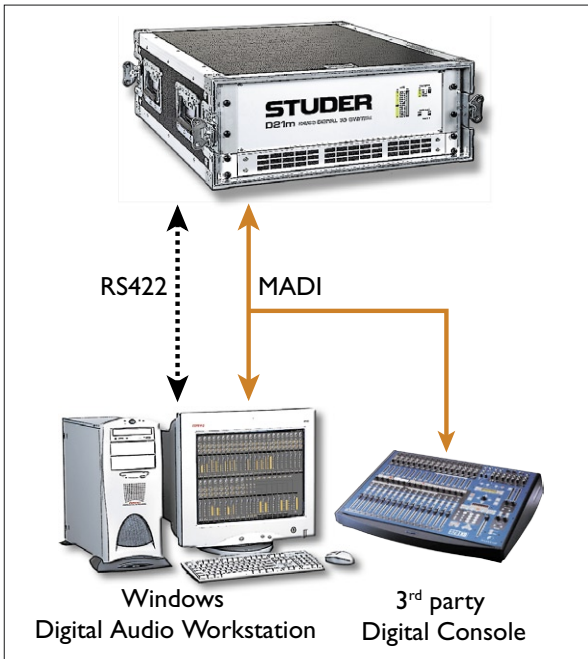
In 44.1 kHz and 48 kHz mode the two MAD1 interfaces work in parallel. One of them may be used as a digital split output or for redundancy. In 88.2 kHz and 96 kHz mode the MAD1 interface only transmits a maximum of 32 channels. Therefore the second MAD1 interface is used to bring back the original total channel count.



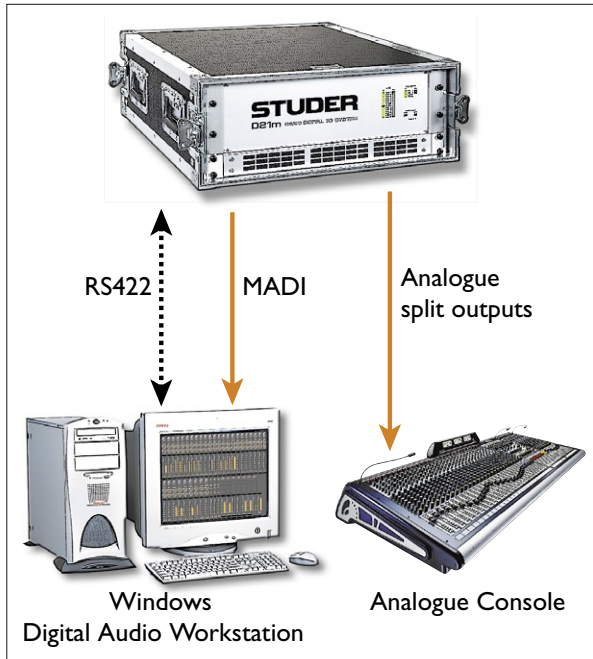
Recording with Windows DAW



Recording with other DAW



Live recording with 3rd party digital PA console



Live recording with analogue PA console



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