Studer D19m

Digital System Components – Technical Product Information

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CONTENTS

1 D19m SYSTEM BASICS

1.1 Introduction

The D19m series consists of single cards with a width of 100 mm (Eurocard width) that can be plugged into a 19" frame (3 or 1 height units). The output of the input cards feeds a time-division multiplex (TDM) bus. The purpose of this bus is to multiplex all the input signals, so that they can directly feed a MADI connection (multiplexer unit/MUX) via a MADI interface. Just the other way round, the signal coming from a MADI connection can be fed into the TDM bus, too, from where again all output cards can derive their information (demultiplexer unit/DEMUX). Beyond that, most card types can be used in standalone applications, too.

TDM Bus

The TDM bus is a 16-bit wide bus with 128 time slots. The format is similar to the AES/EBU format, however distributed in parallel on two words. This means that 64 audio channels with 24 bits plus additional information (U-bits, C-bits etc..) can be transferred. The time slot allocation is given by the card addresses hardwired on the backplane. Thus an A/D converter card plugged into the first slot automatically gets the address 0 and writes to the bus only during its own, assigned time slots. Since ADAT and TDIF input cards occupy multiple channels on the bus, their address must be set with on-card DIP switches. All remaining cards are 4-channel and can be easily exchanged, e.g. an analog card may be replaced by a digital card. The clock signals (CK128, frame and sync) are sent by the MADI card (unless it is switched to slave mode) or the MADO card and are distributed on the backplane.

The AES/TDM signal selects between standalone and TDM bus operation for the individual cards. This signal is controlled by the MADI or MADO card, too. It decides e.g. whether the D/A converter card takes its input signal from the TDM bus or from the AES/EBU input, or whether the A/D converter card may write to the TDM bus or not. If individual cards in the rack should operate in standalone mode, an additional jumper is available on the backplane in order to interrupt this select signal for every card individually.

Synchronization

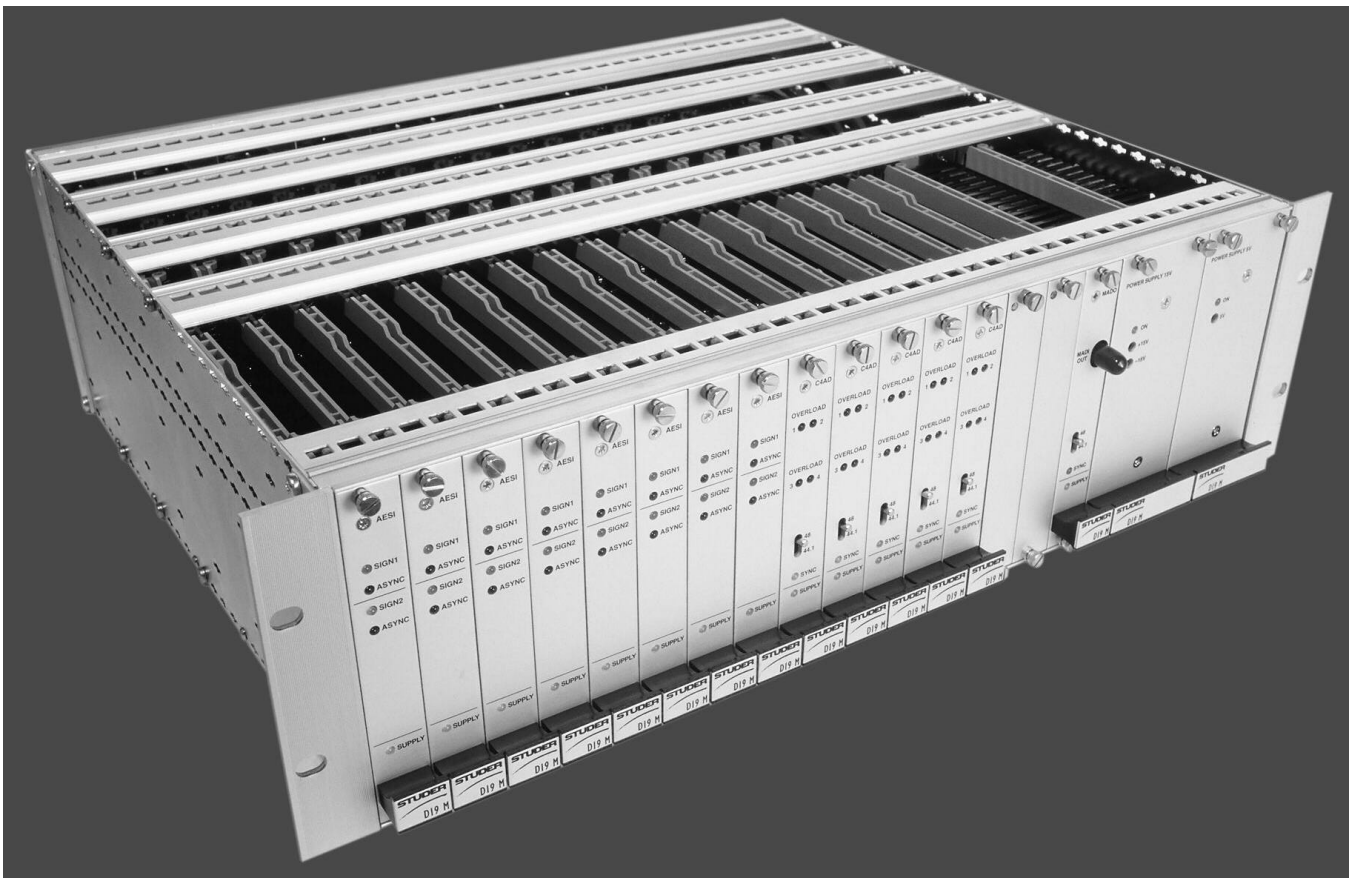
Except for the AESI and AESO cards, all cards have a separate sync input. Depending on the jumper setting, this input receives the sync signal from the bus (AES/EBU signal with TTL level) or from a separate input (standard balanced AES/EBU signal according to AES11). Thanks to the AES/EBU inputs and outputs, the converter cards also can operate in standalone mode. It is possible to extract a sync signal from the MADI (when using MADI optical). However, this feature should be used only for large distances and stagebox systems. Otherwise it is recommended to use the AES/EBU sync line. This results in a smaller error probability (having two PLLs less in the path), reduced jitter, and allows the use of variable speed.

Split Rack Configuration

A MADI and a MADO card can share the TDM bus in a common "split rack". The available channels have to be split for MUX and DEMUX channels. In such a system, using the MADI card's sync out should be avoided whenever possible. Since the MADO card is always considered as a master by the software, a hardware modification is necessary in such a case. Therefore, it is recommended to use separate racks for MUX and DEMUX (refer to example in chapter 2.3.1).

Routing The MADI card transfers the MADI input signal to the TDM bus, and the MADO card converts the TDM bus signal to the MADI format. Without external control, the channels will transmit the signals in the MADI data stream and on the TDM bus in the same sequence. When using the RS485 interface it is possible, however, to arbitrarily change the allocation on the MADO card (application e.g. in Route56).

1.2 D19m 3U Frames



Ordering Information:

	w. Backplane 1.940.550	w. Backplane 1.940.551
Standard Rack	1.940.592.xx-V	1.940.591.xx-V
Deep Rack (recessed front)	1.940.595.xx-V	1.940.594.xx-V

The same frames can be used for MUX and DEMUX units. The 19" frames have a height of 3U and are equipped with backplane, two power supply units (+5 V, ±15V), and a connector panel with supply and control connectors.

The D19m series cards are plugged to the backplane. On the rear side of the backplane, connectors for the power supply, the audio and control signals can be found. Apart from the supply, also the clock, synchronization, and control signals are distributed. A jumper determines for each card whether it is linked to the TDM bus or operating in standalone mode.

1.2.1 Power Supplies

The 3U frames contain two supply units:
+5 V/20 A (1.940.606 or, in earlier racks, 1.940.601)
±15 V/3.4 A (1.940.607 or, in earlier racks, 1.940.602)

The supply units are plug-in modules. For redundant supply configurations, a special rear panel is required.

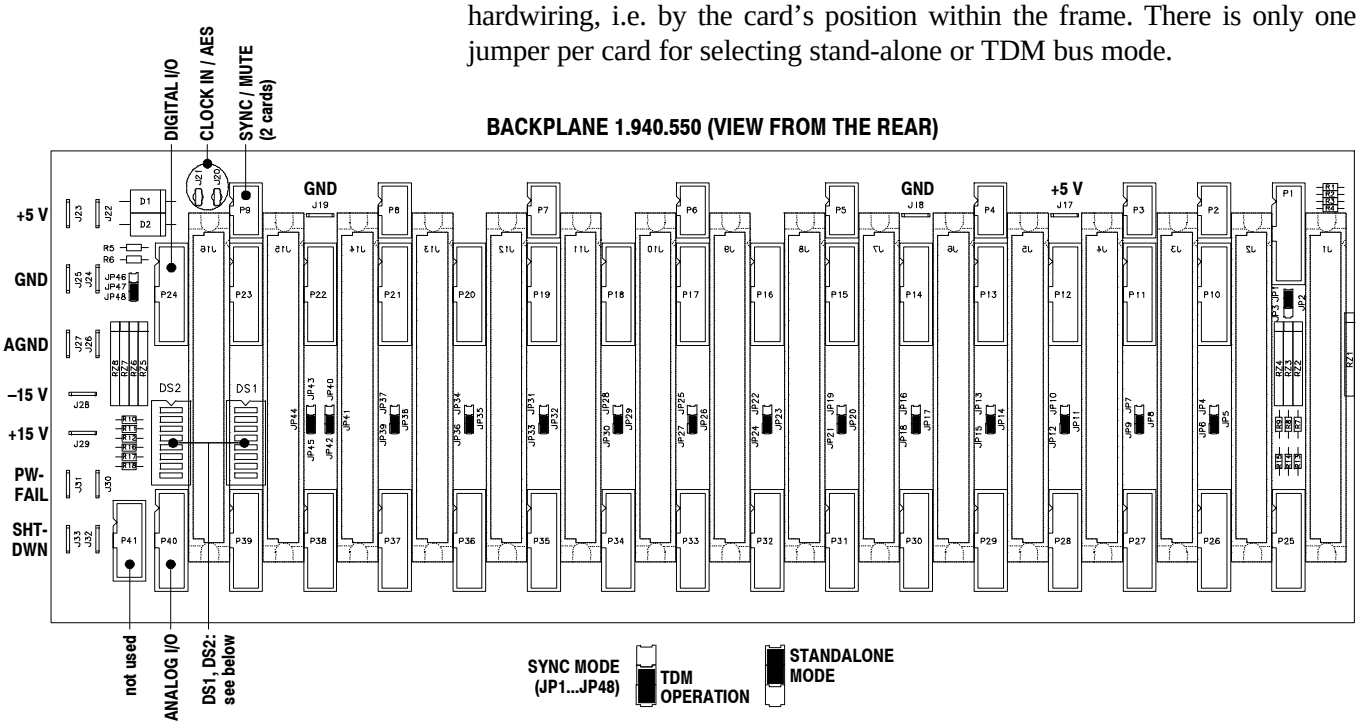
1.2.2 Connector Panels

For audio signals, a variety of connector panels can be used (see chapter 1.4).

1.2.3 Backplane 1.940.550

(installed in Rack versions 1.940.592.xx-V and 1.940.595.xx-V)
The .550 backplane is used for applications with up to 16 audio cards. *However, it cannot be used together with the RCC controller card and Mic/Line input cards.*
16 identical card locations are available. The sync input is connected to the last, i.e. the 16th card location. The card address is given by the backplane hardwiring, i.e. by the card's position within the frame. There is only one jumper per card for selecting stand-alone or TDM bus mode.

BACKPLANE 1.940.550 (VIEW FROM THE REAR)



For the connection to the rear panel, there are connectors for digital I/O, analog I/O, and sync/mute for each card location (see table).

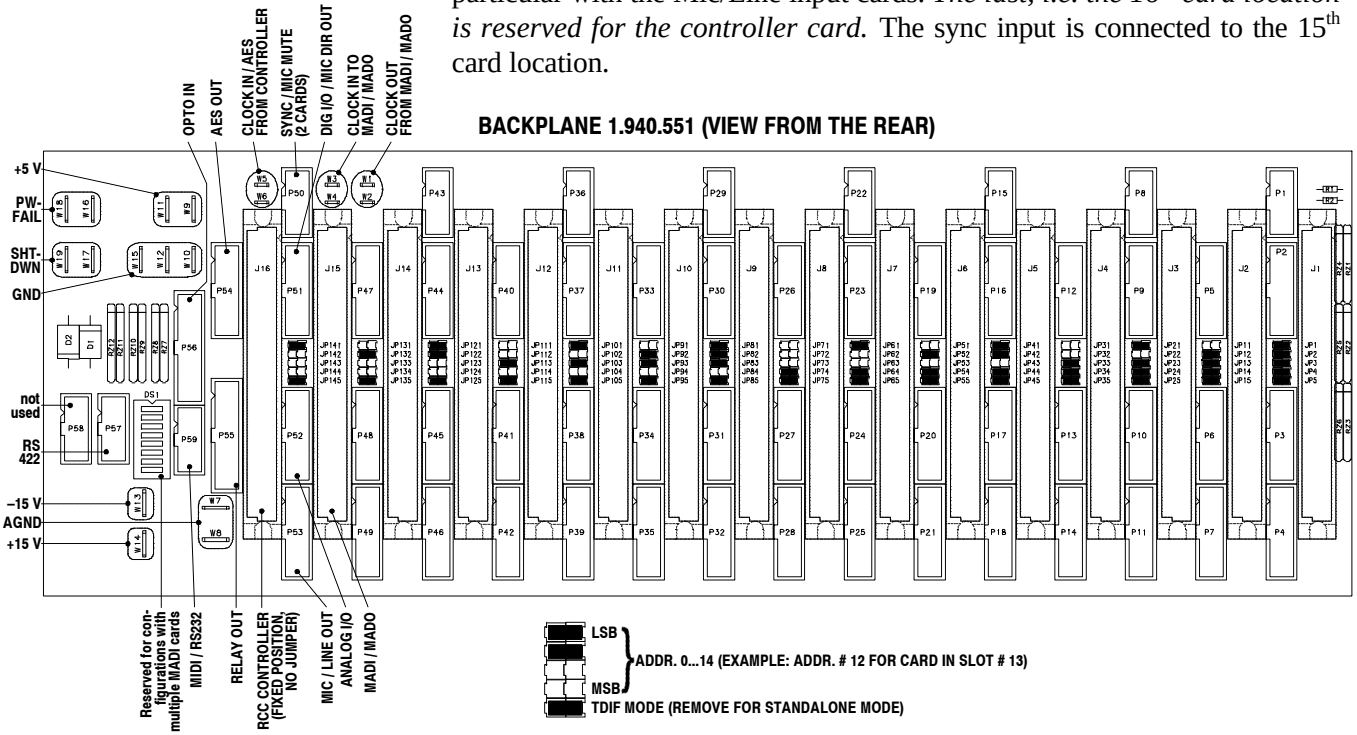
Card Location	Digital I/O	Analog I/O	Sync/Mute	Sync Mode
1 (J1)	P1 (1...4)	P24 (1...4)	P2 (1)	JP1...JP3
2 (J2)	P10 (1...4)	P25 (1...4)	P2 (2)	JP4...JP6
3 (J3)	P11 (1...4)	P26 (1...4)	P3 (1)	JP7...JP9
4 (J4)	P12 (1...4)	P27 (1...4)	P3 (2)	JP10...JP12
5 (J5)	P13 (1...4)	P28 (1...4)	P4 (1)	JP13...JP15
6 (J6)	P14 (1...4)	P29 (1...4)	P4 (2)	JP16...JP18
7 (J7)	P15 (1...4)	P30 (1...4)	P5 (1)	JP19...JP21
8 (J8)	P16 (1...4)	P31 (1...4)	P5 (2)	JP22...JP24
9 (J9)	P17 (1...4)	P32 (1...4)	P6 (1)	JP25...JP27
10 (J10)	P18 (1...4)	P33 (1...4)	P6 (2)	JP28...JP30
11 (J11)	P19 (1...4)	P34 (1...4)	P7 (1)	JP31...JP33
12 (J12)	P20 (1...4)	P35 (1...4)	P7 (2)	JP34...JP36
13 (J13)	P21 (1...4)	P36 (1...4)	P8 (1)	JP37...JP39
14 (J14)	P22 (1...4)	P37 (1...4)	P8 (2)	JP40...JP42
15 (J15)	P23 (1...4)	P38 (1...4)	P9 (1)	JP43...JP45
16 (J16)	P24 (1...4)	P39 (1...4)	P9 (2)	JP46...JP48

The DIP switches DS1 and DS2 are reserved for configurations with multiple MADI cards.
For pinout details of the flat cable connectors please refer to chapter 1.4.

1.2.4 Backplane 1.940.551

(installed in Rack versions 1.940.591.xx-V and 1.940.594.xx-V)
This frame is intended for the application of the RCC controller card and Mic/Line input cards.
This backplane has additional connectors for the second output ("split out") and the mute input of the pre-amps. With this backplane the addresses are jumper-selected, allowing a more flexible allocation of the card positions, in particular with the Mic/Line input cards. *The last, i.e. the 16th card location is reserved for the controller card.* The sync input is connected to the 15th card location.

BACKPLANE 1.940.551 (VIEW FROM THE REAR)

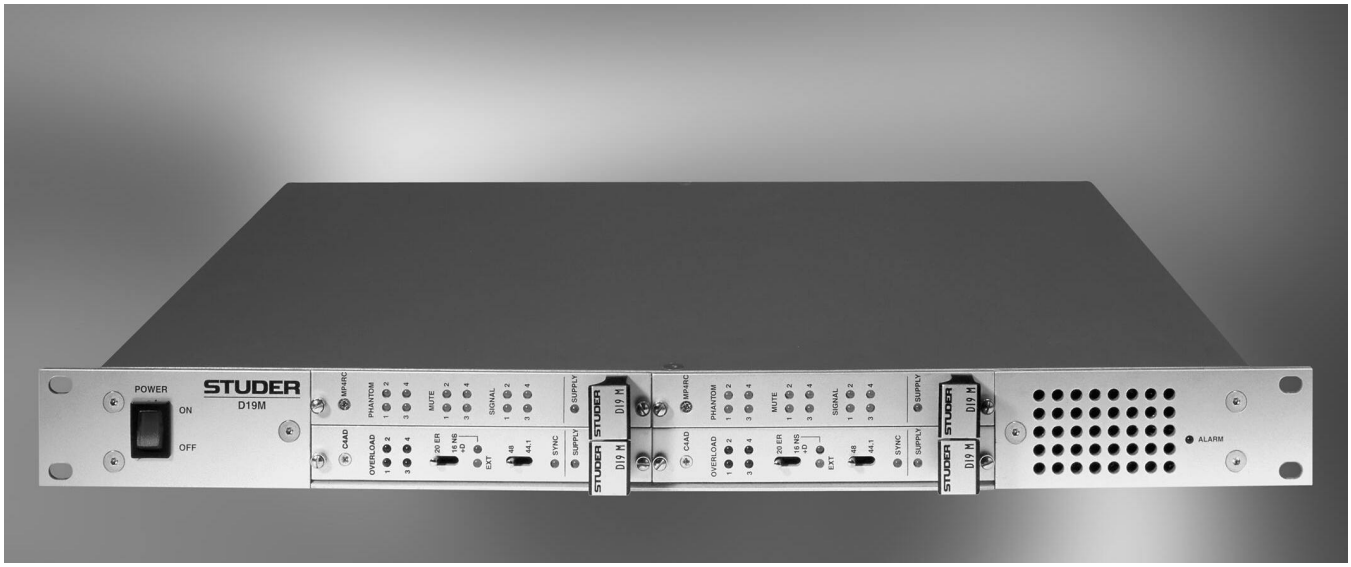


For the connection to the rear panel, there are connectors for digital I/O, analog I/O, mic/line out, and sync/mute for each card location (see table).

Card Location	Digital I/O	Analog I/O	Mic/Line Out	Sync/Mute
1 (J1)	P2 (1...4)	P3 (1...4)	P4 (1...4)	P1 (1)
2 (J2)	P5 (1...4)	P6 (1...4)	P7 1...4)	P1 (2)
3 (J3)	P9 (1...4)	P10 (1...4)	P11 (1...4)	P8 (1)
4 (J4)	P12 (1...4)	P13 (1...4)	P14 (1...4)	P8 (2)
5 (J5)	P16 (1...4)	P17 (1...4)	P18 (1...4)	P15 (1)
6 (J6)	P19 (1...4)	P20 (1...4)	P21 (1...4)	P15 (2)
7 (J7)	P23 (1...4)	P24 (1...4)	P25 (1...4)	P22 (1)
8 (J8)	P26 (1...4)	P27 (1...4)	P28 (1...4)	P22 (2)
9 (J9)	P30 (1...4)	P31 (1...4)	P32 (1...4)	P29 (1)
10 (J10)	P33 (1...4)	P34 (1...4)	P35 (1...4)	P29 (2)
11 (J11)	P37 (1...4)	P38 (1...4)	P39 (1...4)	P36 (1)
12 (J12)	P40 (1...4)	P41 (1...4)	P42 (1...4)	P36 (2)
13 (J13)	P44 (1...4)	P45 (1...4)	P46 (1...4)	P43 (1)
14 (J14)	P47 (1...4)	P48 (1...4)	P49 (1...4)	P43 (2)
15 (J15)	P51 (1...4)	P52 (1...4)	P53 (1...4)	P50 (1)
16 (J16)	fixed position for the RCC Controller card			

For pinout details of the flat cable connectors please refer to chapter 1.4.

1.3 D19m 1U Frame

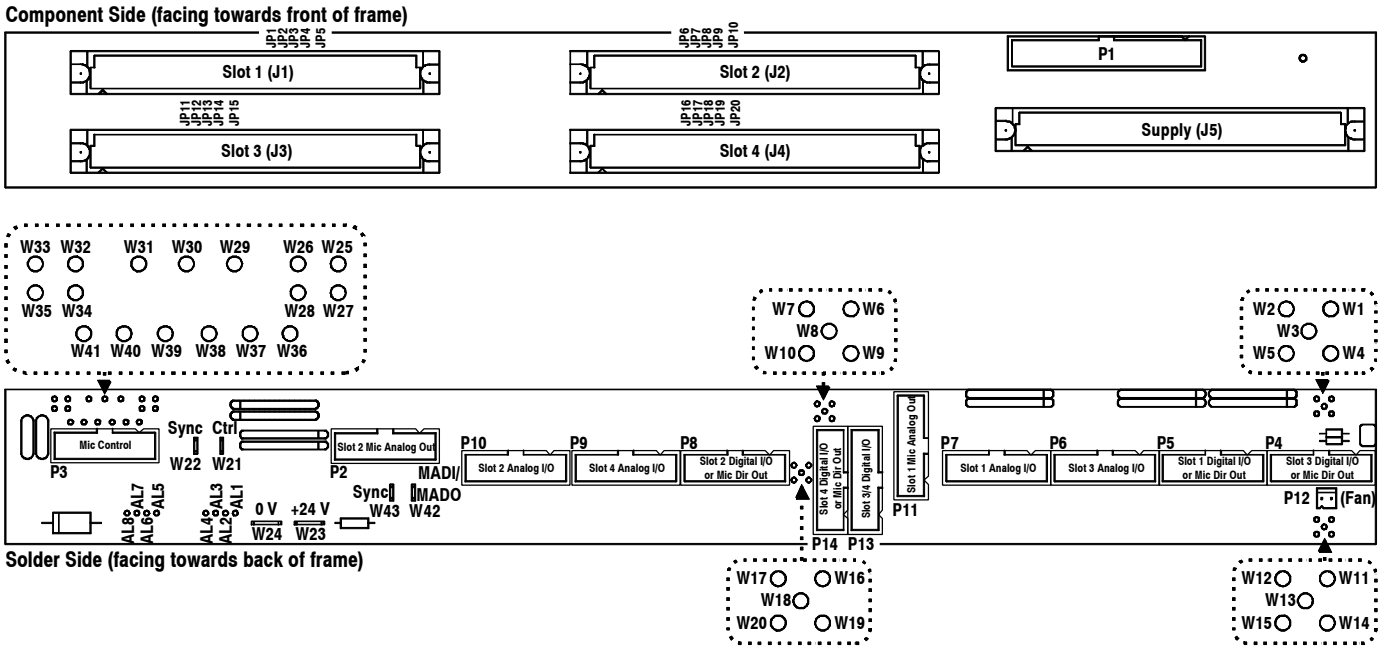


The system consists of a 1-unit 19" frame containing a power supply and a backplane (mother board) on which the complete TDM bus is wired. Up to four cards from the D19m family can be inserted.
The ±15 V and +5 V supplies are integrated. The mains voltage range is 90 to 250 V_{AC}. A sync input amplifier and a small processor system for the control of the Mic/Line cards is contained as well.
The built-in fan is temperature-controlled, an overheat condition is indicated by a front-panel LED.
For rear-panel wiring, the standard D19m system connector panels can be used (see chapter 1.4).

Typical Configuration Examples: 2 × Mic/Line cards and 2 × A/D cards in stand-alone mode, or
1 × MADI In card and 3 × D/A cards, or
3 × ADAT In cards and 1 × MADI Out card.

Ordering Information: Standard 1U Frame 1.940.400.00

1.3.1 Backplane 1.940.553



Connector Allocation:

Connector	for Slot	Signals	Pinout
P2	2	Mic/Line Card, line out	M
P3	-	Control port	
P4	3	Digital In/Out (or Mic/Line Card Direct Out)	D
P5	1	Digital In/Out (or Mic/Line Card Direct Out)	D
P6	3	Analog In/Out	A
P7	1	Analog In/Out	A
P8	2	Digital In/Out (or Mic/Line Card Direct Out)	D
P9	4	Analog In/Out	A
P10	2	Analog In/Out	A
P11	1	Mic/Line Card, line out	M
P12	-	Fan	
P13	3, 4	Digital In/Out	D
P14	4	Digital In/Out (or Mic/Line Card Direct Out)	D

If slots 3 and 4 are equipped with Mic/Line cards, their line outputs will not be available. In such a case the resistors R173, 273, 373, and 473 must be removed on the Mic/Line cards. Instead, the 0 Ω bridges R174, 274, 374, and 474 must be inserted in order to have the line out signal at the card's direct out pins.

The audio connectors (P2, P4...P11, P14) have the same standard pin assignment that is used for the 3U frame. This means that all the connector panels from the D19m system can be used for the 1U frame as well.

For more information on the audio connector pinout, please refer to chapter 1.4.

P13: P13 allows to connect two AES/EBU inputs or outputs to the slots 3 and 4 with a flat cable.

If this connector has to be connected directly to a 15-pin D-type connector on the rear panel, a special adapter must be assembled. The easiest way to achieve this is using a 15-pin flat cable pressed to the D-type connector. On the other end, cut off the 15th wire; the remaining 14 wires are split in the

center and pressed to the flat cable connector in such a way that the pins 8 and 9 are left free. For details, refer to the table below.

P13, pin no.	D-type, pin no.	P13, pin no.	D-type, pin no.
1	1	10	12
2	9	11	5
3	2	12	13
4	10	13	6
5	3	14	14
6	11	15	7
7	4	16	15

Control Port (15-pin D-Type):

Pin	Signal
1	24 V_{DC} output, 1.6 A max.
2	24 V_{DC}, ext. supply input for redundancy
3	connected to solder pad W36
4	GND
5	RS 422 input – (RB)
6	RS 422 input + (RA)
7	RS 422 output + (TA)
8	RS 422 output – (TB)
9	GND
10	24 V_{DC}, ext. supply input for redundancy
11	connected to solder pad W37
12	connected to solder pad W38
13	connected to solder pad W39
14	connected to solder pad W40
15	connected to solder pad W41

Further Wiring:

For special applications, several signals are routed to solder pads (W...). So it is possible, for instance, to wire the MUTE signals of the Mic/Line cards, or to use the GPIO signals on the Supply Board.

W1...W20 can be used for mute signals (MP4RC four-channel mic amplifier cards) or for AES/EBU sync inputs (all cards, except AESI and AESO cards).

MUTE for:	Slot 1 (J1)	Slot 2 (J2)	Slot 3 (J3)	Slot 4 (J4)
Ch 1	W1	W6	W11	W16
Ch 2	W2	W7	W12	W17
Ch 3	W4	W9	W14	W19
Ch 4	W5	W10	W15	W20
GND	W3	W8	W13	W18

AES/EBU Sync In:	Slot 1 (J1)	Slot 2 (J2)	Slot 3 (J3)	Slot 4 (J4)
AESS0x +	W1	W6	W11	W16
AESS0x –	W2	W7	W12	W17

W21, W22 / W42, W43

For synchronizing the cards, an AES/EBU signal is fed via a MADI or a MADO card in slot 4. For this application the pins of the XLR connector must be wired to solder pads W42 and W43. P1 and P2 on the Supply Board must not be connected.

If neither a MADI nor a MADO card is installed, for synchronization the receiver on the Supply Board can be used. For this case, the pins of the XLR connector must be wired to the solder pads W21 and W22, and pins P1 and P2 of the Supply Board must be connected, the default input termi-

nation is 110 Ω. If a high-Z termination is required, remove the jumper P4-P5 on the Supply Board.

W23, W24 The 24 V_{DC} supply voltage from the AC/DC converter is fed to the 6.3 mm AMP flat pins W23 (+24 V) and W24 (GND). External devices with a current consumption of up to 1.6 A @ 24 V_{DC} can be supplied from pin 1 of the control port. A maximum total supply current of 3.5 A must never be exceeded.
For redundancy, an additional external supply can be connected to pins 2 and 10 of the control port.

W25...W28 For monitoring, signaling, supply supervision and similar purposes, two opto-coupler control inputs with integrated current sink are provided on the Supply Board (1.940.578). The current sink automatically limits the opto-coupler current to approx. 4 mA for an input voltage range of 2.5...48 V_{DC}.

Pad	Signal
W25	IN1+
W26	IN2+
W27	IN1–
W28	IN2–

W29 +24 V supply
W30 GND
W31 +5 V supply

W32...W35 For monitoring, signaling, supply supervision and similar purposes, two open-collector control outputs are provided on the Supply Board (1.940.578) as standard. If required, these transistors optionally can control a relay each; the PCB has been designed in such a way that the relays as well as additional components for their correct function and for N/O-N/C relay contact selection can be retrofitted.
The relay contact rating is 1 A, 100 V, 30 W.

Pad	Signal
W32	R1G
W33	R2G
W34	R1A
W35	R1A

W36...W41 On the Control Port connector P3, there are six free pins available for additional, customer-specific wiring.

Solder pad	P3, pin no.	Control Port (D-type), pin no.
W36	5	3
W37	6	11
W38	8	12
W39	10	13
W40	12	14
W41	14	15

Address Setting: When using the TDM bus or Mic/Line cards, the slots have to be addressed. This is done with solder bridges (i.e., pad pairs that can be connected with a tiny drop of solder) on the component side of the backplane board, according to the following table:

Slot	LSB ...	Address ...		MSB	TDM
1	JP 1	JP 2	JP 3	JP 4	JP 5
2	JP 6	JP 7	JP 8	JP 9	JP 10
3	JP 11	JP 12	JP 13	JP 14	JP 15
4	JP 16	JP 17	JP 18	JP 19	JP 20

Connected pad pairs correspond to a logical „0".

The solder bridges JP5, 10, 15, and 20 are used to switch over from stand-alone to TDM operation; if these bridges are connected, this means „TDM operation".

Supply Board 1.940.578

On the Supply Board, a +5 V (IC8) and a ±15 V supply (IC19, Q8 and T2) are implemented. Furthermore, a small processor system (IC16, IC9, IC10, IC11) is controlling the Mic/Line cards, and converting the RS422 signals to the I^2C protocol.

The RS422 interface (IC2) can be replaced by an RS232 interface (IC1) or a MIDI interface (IC4, IC5).

The baud rate can be set to 31.25 kBd (jumper P8-P9 inserted) or to 38.4 kBd (jumper P7-P8 inserted).

In addition, two relays for the general-purpose output can be installed.

For synchronizing the cards in stand-alone mode, an AES/EBU input is provided; its termination impedance can be switched to high-Z (jumpers P5-P6 off, P4-P5 on). If a MADI or MADO Card is used in the system, the sync signal sent to the backplane must be disabled (P1-P2 on, P2-P33 off).

The DIP switches are only used for factory tests and must always be set to OFF.

Connector Panels

For audio signals, the same connector panels as known from the 3U frame system can be used (see chapter 1.4). In addition, a 15-pin D-type connector panel is available, allowing to wire four AES/EBU inputs or outputs; so it is possible to realize, e.g., eight XLR inputs and four AES/EBU outputs in a single 1U unit.

1.4 Connector Panels

All audio and some control (sync, mute) signals are fed to flat cable connectors on the rear (solder) side of the backplane PCBs. A range of connector panels can be mounted at the rear of the frames; they are used for linking the frames to the outside world. All connector panels come with flat cables that plug into the flat cable connectors of the backplane PCBs.

As not only analog, but also digital audio and control signals are used, the pin assignment of the 16-pin (audio I/O) and 6-pin (sync) or 10-pin (sync or mute) flat cable connectors on the different backplanes is not identical in each case and needs some consideration. Please note as well that each sync/mute and sync connector is used for two cards.

Backplane:	1.940.550 (3U)	1.940.551 (3U)	1.940.553 (1U)
Digital I/O or Mic/Line Dir Out	P1, P10...P24	P2, P5, P9, P12, P16, P19, P23, P26, P30, P33, P37, P40, P44, P47, P51	P4, P5, P8, P14
Analog I/O	P25...P40	P3, P6, P10, P13, P17, P20, P24, P27, P31, P34, P38, P41, P45, P48, P52	P6, P7, P9, P10
Mic/Line Out	not available	P4, P7, P11, P14, P18, P21, P25, P28, P32, P35, P39, P42, P46, P49, P53	P2, P11, P4*, P14*
Mute/Sync (1 connector per 2 cards)	P2...P9	P1, P8, P15, P22, P29, P36, P43, P50	wired to solder pads W1...W20
	*HW modification on Mic/Line card required		

16-Pin Flat Cable Pin Assignment (Audio I/O):

Pin	Analog I/O, Mic/Line Dir Out	Digital I/O	Pin	Analog I/O, Mic/Line Dir Out	Digital I/O
1	CH 1+	AES CH1/CH2+	9	n.c.	n.c.
2	CH 1–	AES CH1/CH2–	10	n.c.	n.c.
3	MGND	MGND	11	CH 4+	AES CH7/CH8+
4	MGND	MGND	12	CH 4–	AES CH7/CH8–
5	CH 2–	AES CH3/CH4–	13	MGND	MGND
6	CH 2+	AES CH3/CH4+	14	MGND	MGND
7	n.c.	n.c.	15	CH 3–	AES CH5/CH6–
8	n.c.	n.c.	16	CH 3+	AES CH5/CH6+

6-Pin Flat Cable Pin Assignment (Sync, on 1.940.550 only):

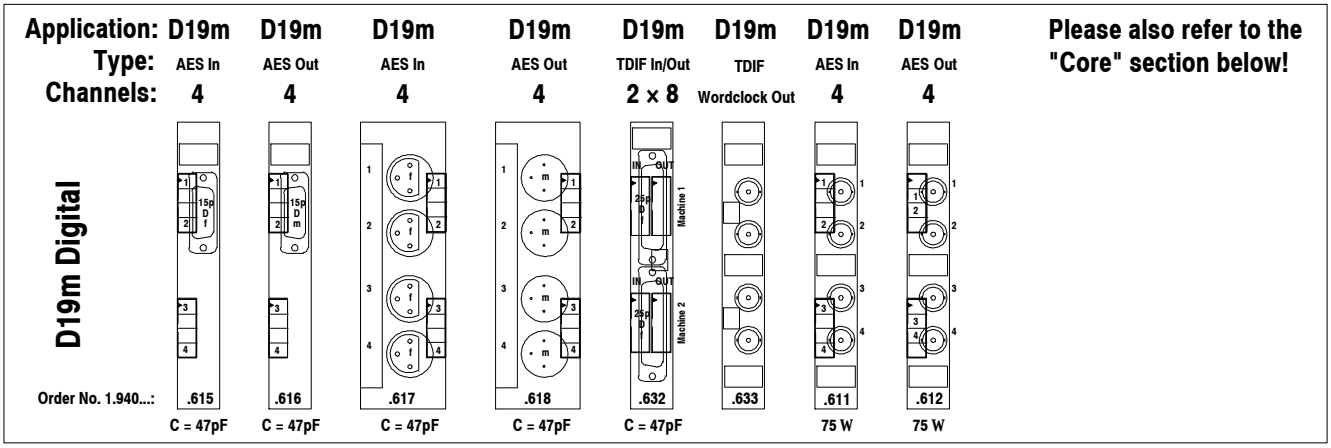
Pin	Sync IN (2 cards)	Pin	Sync IN (2 cards)
1	AES Sync 1 +	4	MGND
2	AES Sync 1 –	5	AES Sync 2 –
3	MGND	6	AES Sync 2 +

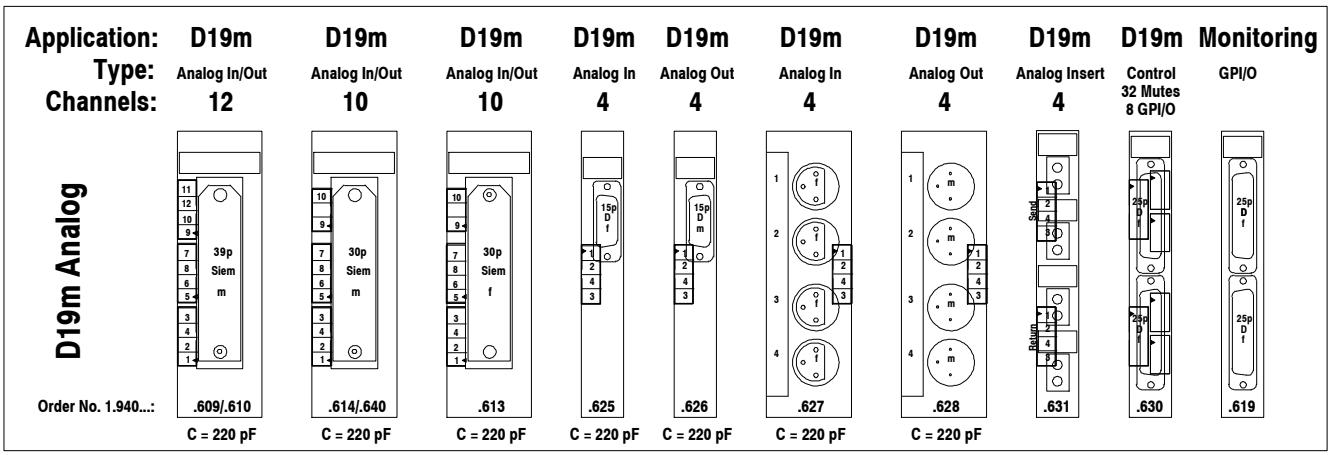
10-Pin Flat Cable Pin Assignment (Sync or Mute, on 1.940.551 only):

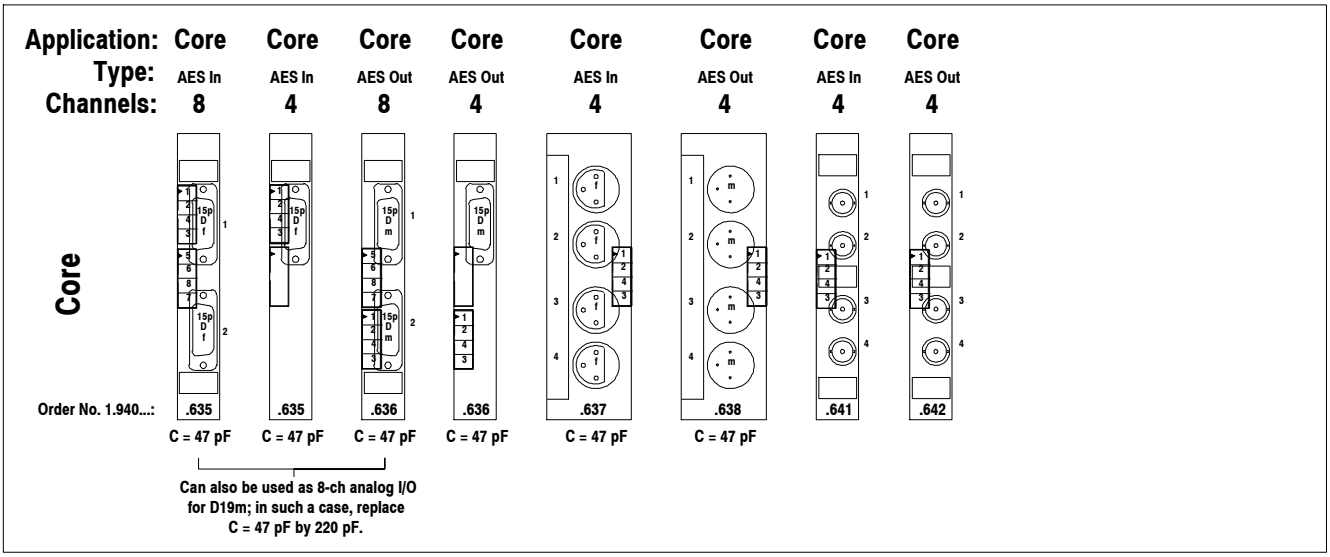
Pin	Sync IN (2 cards)	Mute IN (2 cards)	Pin	Sync IN (2 cards)	Mute IN (2 cards)
1	AES Sync 1 +	Mute 1 / 1	6	AES Sync 2 –	Mute 2 / 2
2	AES Sync 1 –	Mute 1 / 2	7	-	Mute 2 / 3
3	-	Mute 1 / 3	8	-	Mute 2 / 4
4	-	Mute 1 / 4	9	GND	GND
5	AES Sync 2 +	Mute 2 / 1	10	GND	GND

All rear connector panels available as well as the allocation of connector panels to the D19m plug-in cards are listed in the illustrations and tables below.

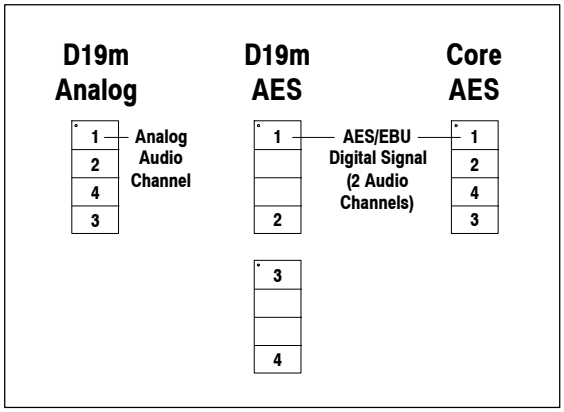
Considering the rack size, *please note that the connector panels may require more space than the plug-in cards*, depending on type and number of required connectors.







Please also note that the 16-pin flat cables are *not always* used for *four* I/O channels, according to the illustration below:



Available Connector Panels:

Order No.	Connector Type	Mono CH	Function	Width
1.940.609	1 × Siemens 39p, male, gold cont.	12	Analog IN/OUT (D19m Analog)	8 TE
1.940.610	1 × Siemens 39p, male	12	Analog IN/OUT (D19m Analog)	8 TE
1.940.611	4 × BNC (for D19m rack)	8	AES/EBU IN (D19m Digital)	4 TE
1.940.612	4 × BNC (for D19m rack)	8	AES/EBU OUT (D19m Digital)	4 TE
1.940.613	1 × Siemens 30p, female	12	Analog IN (D19m Analog)	8 TE
1.940.614	1 × Siemens 30p, male	12	Analog OUT (D19m Analog)	8 TE
1.940.615	1 × D-type 15p, female	8	AES/EBU IN (D19m Digital)	4 TE
1.940.616	1 × D-type 15p, male	8	AES/EBU OUT (D19m Digital)	4 TE
1.940.617	4 × XLR, 3p, female	8	AES/EBU IN (D19m Digital)	8 TE
1.940.618	4 × XLR, 3p, male	8	AES/EBU OUT (D19m Digital)	8 TE
1.940.619	2 × D-type 25p, female	4	GPI/O	4 TE
1.940.625	1 × D-type 15p, female	4	Analog IN (D19m Analog)	4 TE
1.940.626	1 × D-type 15p, male	4	Analog OUT (D19m Analog)	4 TE
1.940.627	4 × XLR, 3p, female	4	Analog IN (D19m Analog)	8 TE
1.940.628	4 × XLR, 3p, male	4	Analog OUT (D19m Analog)	8 TE
1.940.630	2 × D-type 25p, female	-	Control port (D19m Analog)	4 TE
1.940.631	4 × Bantam jack	4	Insert (RCC remote signals, D19m Analog)	4 TE
1.940.632	2 × D-type 25p, female	2 × 8	Dual TDIF in/out (D19m Digital)	4 TE
1.940.633	4 × BNC	4	Word Clock Out (D19m Digital)	4 TE
1.940.635	2 or 1 × D-type 15p, female	8 or 4	AES/EBU IN (Core), or Analog IN (D19m Analog)	4 TE
1.940.636	2 or 1 × D-type 15p, male	8 or 4	AES/EBU OUT (Core), or Analog OUT (D19m Analog)	4 TE
1.940.637	4 × XLR, 3p, female	8	AES/EBU IN (Core)	8 TE
1.940.638	4 × XLR, 3p, male	8	AES/EBU OUT (Core)	8 TE
1.940.640	1 × Siemens 30p, male, gold cont.	12	Analog OUT	8 TE
1.940.641	4 × BNC (for D950/Route5000 core)	8	AES/EBU IN	4 TE
1.940.642	4 × BNC (for D950/Route5000 core)	8	AES/EBU OUT	4 TE
1.940.590.02	Blank panel	-	-	4 TE
1.940.590.03	Blank panel	-	-	8 TE

1.4.1 Connector Panel Application

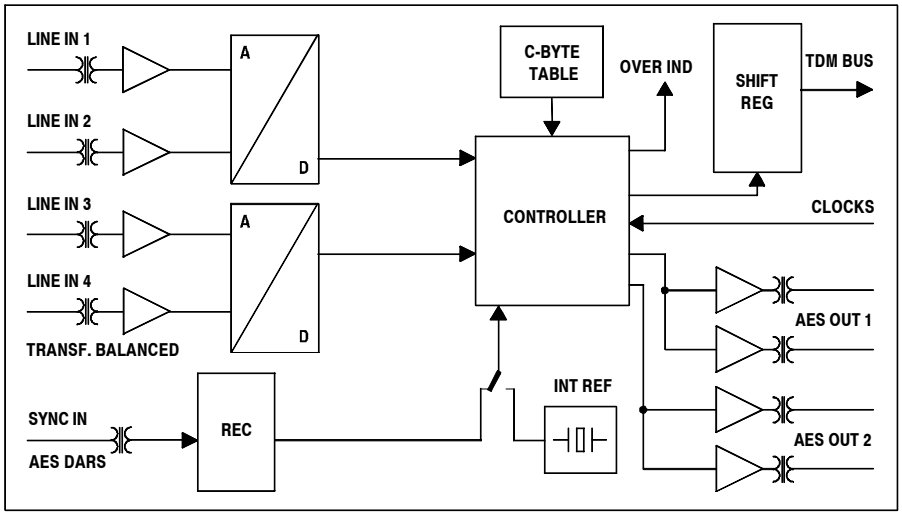
		Mono Ch	Width TE	Connector panels 1.940....	
A/D and D/A Cards					
1.940.562	D19m C4AD quad 24 bit A/D converter	4	4	**609, 610, 613**	**625, 627**
1.940.563	D19m C4AD quad 24 bit A/D converter w. noise shaping	4	4	**609, 610, 613**	**625, 627**
1.940.571	D19m C4DA quad 24 bit D/A converter	4	4	**609, 610, 614**	**626, 628**
1.940.575	D19m MP4RC quad remote controlled mic/line preamp	4	4	**609, 610, 613**	**625, 627**
1.940.576	D19m RCC controller for up to 14 MP4RC cards	56 (control only)	4	**630**	
AES/EBU I/O Cards					
1.940.540	D19m AESI SFC dual AES/EBU in w. SFC	4	4	**611, 615, 617**	
1.940.580	D19m AESI dual AES/EBU in	4	4	**611, 615, 617**	
1.940.585	D19m AESO dual AES/EBU out	4	4	**612, 616, 618**	
1.940.470	D19m AESO dual AES/EBU out w. dithering/SFC	4	4	**612, 616, 618**	
MADI I/O Cards					
1.940.500	D19m MADI in for coaxial cable	56	4	***Sync in***	
1.940.511	D19m MADI in for optical cable (SC)	56	4	***Sync in/out***	
1.940.512	D19m MADI in for optical cable (SC) w. redundant in	56	4	***Sync in/out***	
1.940.520	D19m MADO out for coaxial cable	56	4	***Sync in/out***	
1.940.531	D19m MADO out for optical cable (SC)	56	4	***Sync in/out***	
1.940.532	D19m MADO out for optical cable (SC) w. dual out	56	4	***Sync in/out***	
TDIF I/O Cards					
1.940.480	D19m TDIFI dual 8-channel TDIF in	16	4	**632**	
1.940.481	D19m TDIFI dual 8-channel TDIF in w. AES/EBU out	16	4	**632**	***(+ AESO)***
1.940.485	D19m TDIFO dual 8-channel TDIF out	16	4	**632**	
1.940.486	D19m TDIFO dual 8-channel TDIF out w. AES/EBU in	16	4	**632**	***(+ AESI)***
ADAT I/O Cards					
1.940.490	D19m ADATI dual 8-channel ADAT in	16	4	**-**	
1.940.491	D19m ADATI dual 8-channel ADAT in w. AES/EBU out	16	4	**-**	***(+ AESO)***
1.940.495	D19m ADATO dual 8-channel ADAT out	16	4	**-**	
1.940.496	D19m ADATO dual 8-channel ADAT out w. AES/EBU in	16	4	**-**	***(+ AESI)***
Miscellaneous Assemblies					
1.940.557	D19m sync receiver				
1.940.558	Optical/coax interface				
1.940.579	RS422/optical converter				

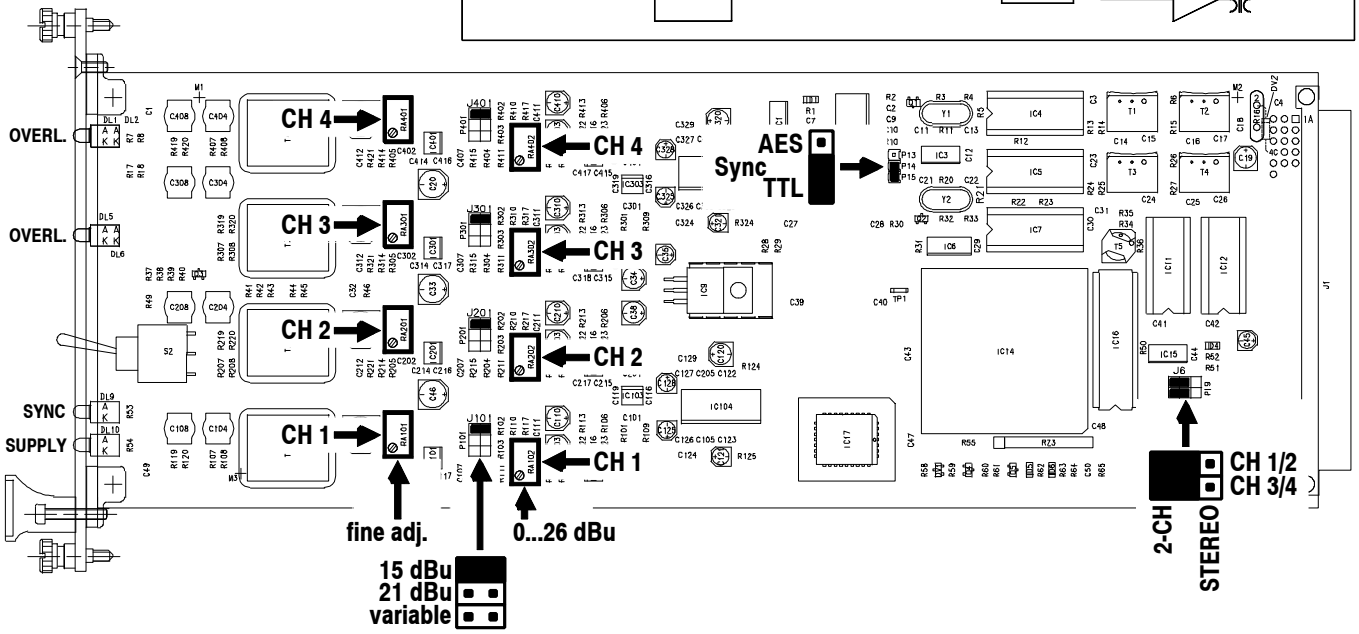
2 D19m MODULES

2.1 A/D and D/A Cards

2.1.1 D19m C4AD/24 – Quad 24 bit A/D Converter 1.940.562

The A/D card uses high-end 24 bit Delta-Sigma converters and can be used for standalone applications as well as for the D19m rack. On one card, four analog inputs (mono) are converted to two AES/EBU outputs; if a MADO card is used in the system, these signals can be converted to a MADI link.
If the external sync signal fails or if the card is used in standalone applications, the sampling frequency will be generated on-board. For such cases the sampling frequency can be selected at the front panel (44.1 or 48 kHz).
The channel status information contains the sampling frequency as well as source channel information depending on the card address.
Jumper diagram of the earlier version 1.940.560 at the end of this chapter.





LEDs: *OVERLOAD 1...4* For each of the 4 channels an LED indicates when 0 dB_{FS} level has been reached.
SYNC Indicates that the digital outputs are synced.
SUPPLY Indicates "power on" status.

Jumpers:

Input level 3 positions: 15 dBu (fixed), 21 dBu (fixed), or variable (0...26 dBu).

Sync AES / TTL *AES:* The sync input from the AES/EBU sync input is used (in case of standalone use of the A/D card).
TTL: The sync input from the D19m rack is used. The internal TTL sync signal is generated by the MADO card in a D19m MUX frame respectively by the MADI card in a DEMUX frame.

2-CH / STEREO Defines the channel mode in the channel status bit.

Alignment:

Set jumper to 15 dBu or 21 dBu. Feed an analog signal with a level of +6 dBu or +12 dBu, respectively, to one of the analog inputs. Measure the digital level either locally on the AES/EBU outputs or via the TDM bus on the MADI output. Adjust the level with the corresponding FINE ADJUST trimmer potentiometer to –9 dB_{FS}. If no digital measuring equipment is available, feed an analog signal with a level of +15 dBu or +21 dBu to the analog input and adjust the level with the corresponding FINE ADJUST trimmer potentiometer so that the overload LED just comes on. If an other input sensitivity has to be adjusted, set the jumper to position VARIABLE and use the 0...26 dBu trimmer potentiometer to adjust the desired level.

Technical Data:

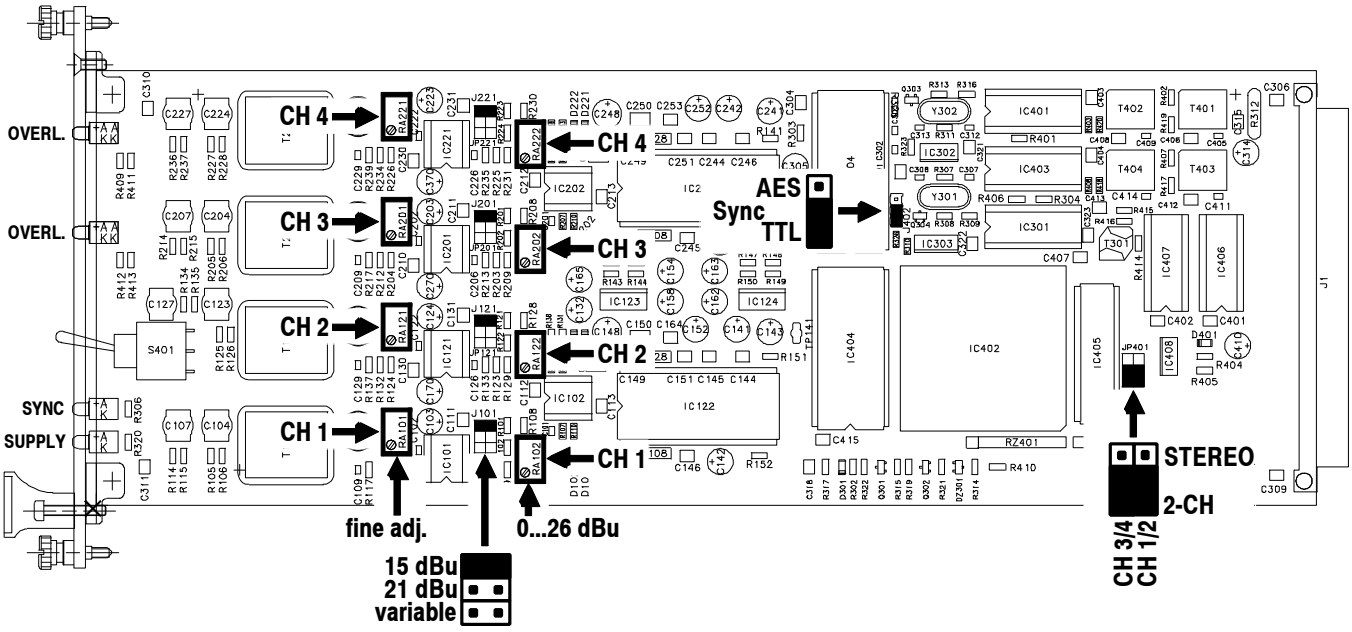
AES/EBU sync input	Impedance	110 Ω
	Sensitivity	min. 200 mV
AES/EBU outputs	Impedance	110 Ω
	Output level (into 110 Ω)	5 V
Analog Input	Transformer-balanced	
Level (for 0 dB_{FS}) jumper-selectable	+15 dBu, +21 dBu, 0...26 dBu	Adjustable with trimmer potentiometer
Impedance		> 10 kΩ
Frequency response	20 Hz...20 kHz	–0.2 dB
THD + N	20 Hz...20 kHz, –1 dB_{FS})	< –97 dB_{FS}
	1 kHz, –30 dB_{FS}	< –108 dB_{FS}
Crosstalk	@ 1 kHz	< –110 dB_{FS}
Power consumption	5 V	max. 0.4 A
	+15 V	max. 0.25 A
	–15 V	max. 0.06 A
Sampling frequency	external sync	28 kHz...55 kHz
	internal sync (standalone)	44.1/48 kHz
Operating temperature range		0...+40° C

Pin Assignment: 96-pin DIN 41612 female

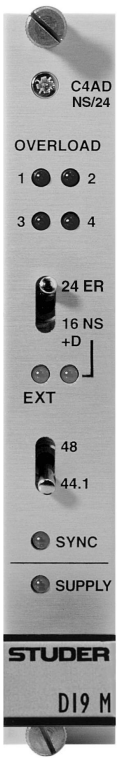
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AES1AOUT+	GND	AES1AOUT–
7	AES1BOUT+	GND	AES1BOUT–
8	AES2AOUT+	GND	AES2AOUT–
9	AES2BOUT+	GND	AES2BOUT–
10	/D0	/BA0	/D8
11	/D1	/BA1	/D9
12	/D2	/BA2	/D10
13	/D3	/BA3	/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22	ANA1IN+		ANA1IN–
23	MGND	MGND	MGND
24	ANA2IN+		ANA2IN–
25	MGND	MGND	MGND
26	ANA3IN+		ANA3IN–
27	MGND	MGND	MGND
28	ANA4IN+		ANA4IN–
29	AGND	AGND	AGND
30	–15V	–15V	–15V
31	+15V	+15V	+15V
32	MGND	MGND	MGND

MGND	Chassis
GND	Ground
SYNC	Sync input TTL
AES/DSD BUS	Switchover standalone/TDM
BA0 .. BA3	Card address
/D0.../D15	Inverted data on the TDM bus
/FRAME, /CK128	Clocks TDM Bus

Earlier Version 1.940.560:



2.1.2 D19m C4AD NS/24 – Quad 24 bit A/D with Noise Shaping 1.940.563



The A/D card uses high-end 24 bit Delta-Sigma converters and can be used for standalone applications as well as for the D19m rack. On one card, four analog inputs (mono) are converted to two AES/EBU outputs; if a MADO card is used in the system, these signals can be converted to a MADI link. The converted signal is also available as 16 bit word by using dithering or dithering and noise shaping algorithms.

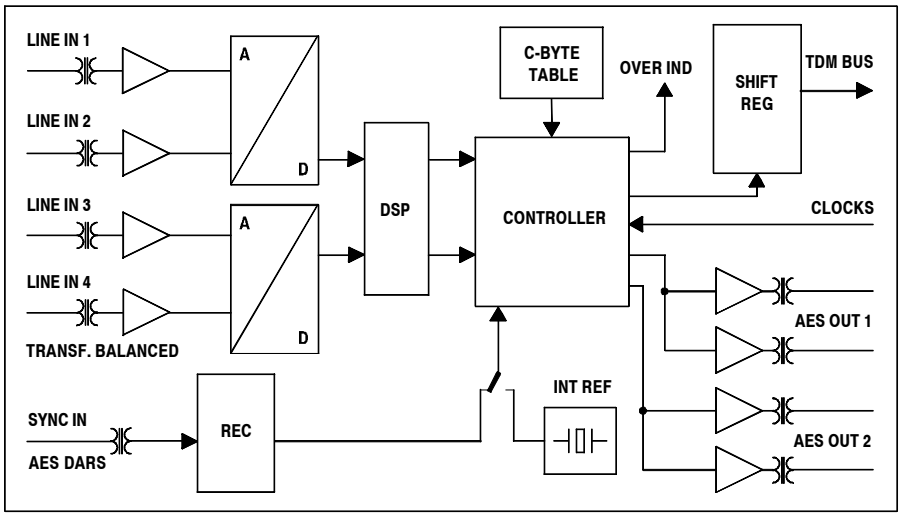
If the external sync signal fails or if used in standalone applications, the sampling frequency will be generated on-board. For such cases the sampling frequency can be selected at the front panel (44.1 or 48 kHz).

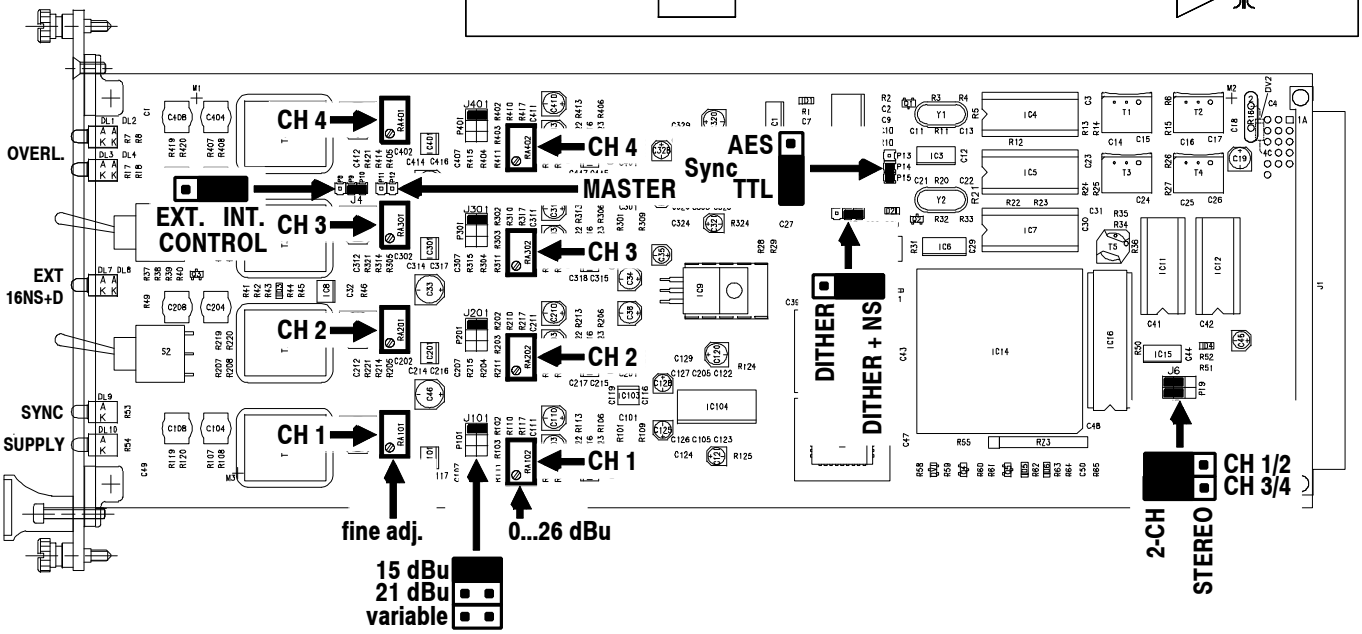
The channel status information contains the sampling frequency as well as source channel information depending on the card address.

Dithering and Noise Shaping:

The card is equipped with 24-bit converters. If there is a need for 16 bit resolution, dithering *and* noise shaping or dithering only can be activated. Dithering helps to improve the low level signals whereas noise shaping allows to have almost the dynamic range of a 24 bit converter in the mid frequency range.

Jumper diagram of the earlier version 1.940.561 at the end of this chapter.





LEDs:

OVERLOAD 1...4 For each of the 4 channels an LED indicates when 0 dB_{FS} level has been reached.

16 NS+D Indication for 16-bit output with dithering, or noise shaping and dithering.

SYNC Indicates that the digital outputs are synced.

SUPPLY Indicates "power on" status.

Jumpers:

Input level 3 positions: 15 dBu (fixed), 21 dBu (fixed), or variable (0...26 dBu).

Sync AES / TTL *AES:* The sync input from the AES/EBU sync input is used (in case of standalone use of the A/D card).
TTL: The sync input from the D19m rack is used. The internal TTL sync signal is generated by the MADO card in a D19m MUX frame respectively by the MADI card in a DEMUX frame.

2-CH / STEREO Defines the channel mode in the channel status bit.

DITHER / DITHER + NS Dithering and noise shaping, or dithering only.

MASTER Card is master for activating noise shaping and dithering in a D19m frame.

EXT./INT. CONTROL External noise shaping and dithering control (front panel switch has no effect), or noise shaping and dithering activated by front panel switch.

Alignment: Set jumper to 15 or 21 dBu position. Feed an analog signal with a level of +6 dBu or +12 dBu, respectively, to one of the analog inputs. Measure the digital level either locally on the AES/EBU outputs or via the TDM bus on the MADI output. Adjust the level with the corresponding FINE ADJUST trimmer potentiometer to –9 dB_{FS}. If no digital measuring equipment is available, feed an analog signal with a level of +15 dBu or +21 dBu to the analog input and adjust the level with the corresponding FINE ADJUST trimmer potentiometer so that the overload LED just comes on. If an other input sensitivity has to be adjusted, set the jumper to position VARIABLE and use the 0...26 dBu trimmer potentiometer to adjust to the desired level.

Technical Data:

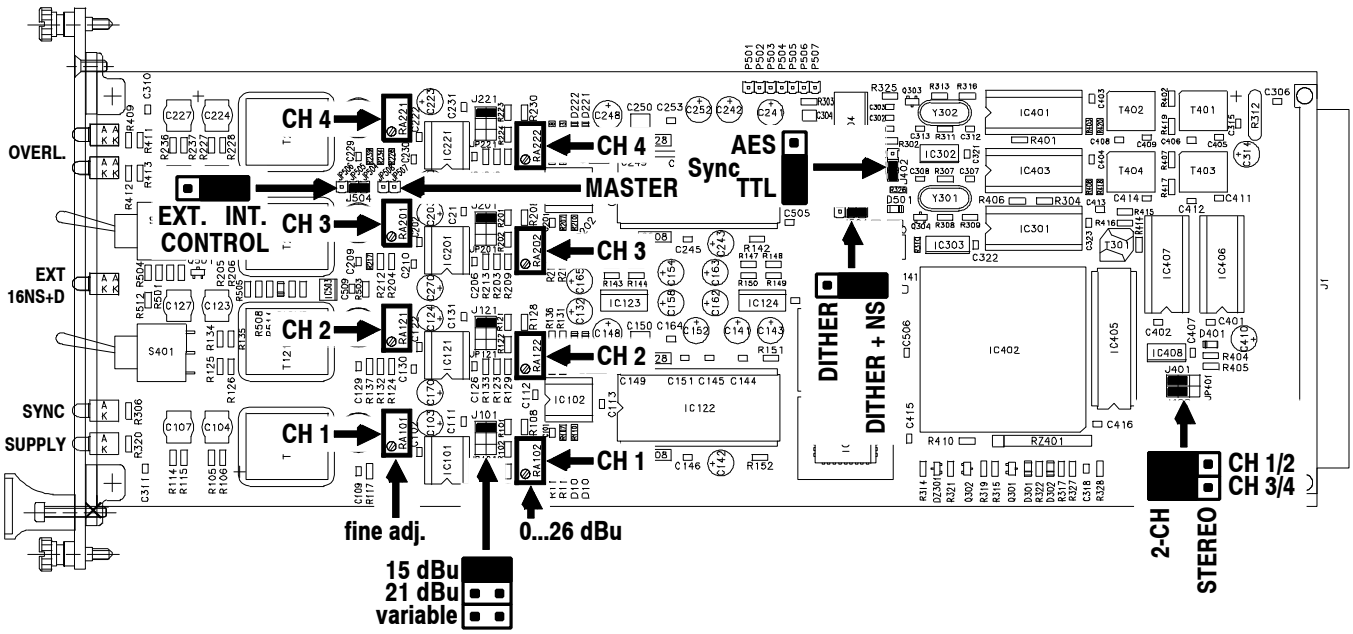
AES/EBU sync input	Impedance	110 Ω
	Sensitivity	min. 200 mV
AES/EBU outputs	Impedance	110 Ω
	Output level (into 110 Ω)	5V
Analog Input	Transformer-balanced	
Level (for 0 dB_{FS}) jumper-selectable	+15 dBu, +21 dBu, 0...26 dBu	adjustable with trimmer potentiometer
Impedance		> 10 kΩ
Frequency response	20 Hz...20 kHz	–0.2 dB
THD + N (noise shaping OFF)	20 Hz...20 kHz, –1 dB_{FS}	< –97 dB_{FS}
	1 kHz, –30 dB_{FS}	< –108 dB_{FS}
Crosstalk	at 1 kHz	< –110 dB_{FS}
Power consumption	5V	max. 0.6 A
	+15V	max. 0.25 A
	–15V	max. 0.06 A
Sampling frequency	with external sync	28 kHz...55 kHz
	internal Sync (standalone)	44.1/48 kHz
Temperature range		0°...+40 C

Pin Assignment: 96-pin DIN 41612 female

Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AES1AOUT+	GND	AES1AOUT–
7	AES1BOUT+	GND	AES1BOUT–
8	AES2AOUT+	GND	AES2AOUT–
9	AES2BOUT+	GND	AES2BOUT–
10	/D0	/BA0	/D8
11	/D1	/BA1	/D9
12	/D2	/BA2	/D10
13	/D3	/BA3	/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	/U
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22	ANA1IN+		ANA1IN–
23	MGND	MGND	MGND
24	ANA2IN+		ANA2IN–
25	MGND	MGND	MGND
26	ANA3IN+		ANA3IN–
27	MGND	MGND	MGND
28	ANA4IN+		ANA4IN–
29	AGND	AGND	AGND
30	–15V	–15V	–15V
31	+15V	+15V	+15V
32	MGND	MGND	MGND

MGND	Chassis
GND	Ground
SYNC	Sync input TTL
AES/DSD BUS	Switchover standalone/TDM
BA0 .. BA3	Card address
/D0.../D15	Inverted TDM bus data
/FRAME, /CK128	Clocks TDM Bus
/U	Noise shaping/dithering on/off

Earlier Version 1.940.561:



2.1.3 D19m C4DA/24/96 – Quad 24 bit D/A, 96 kHz Operation 1.940.571

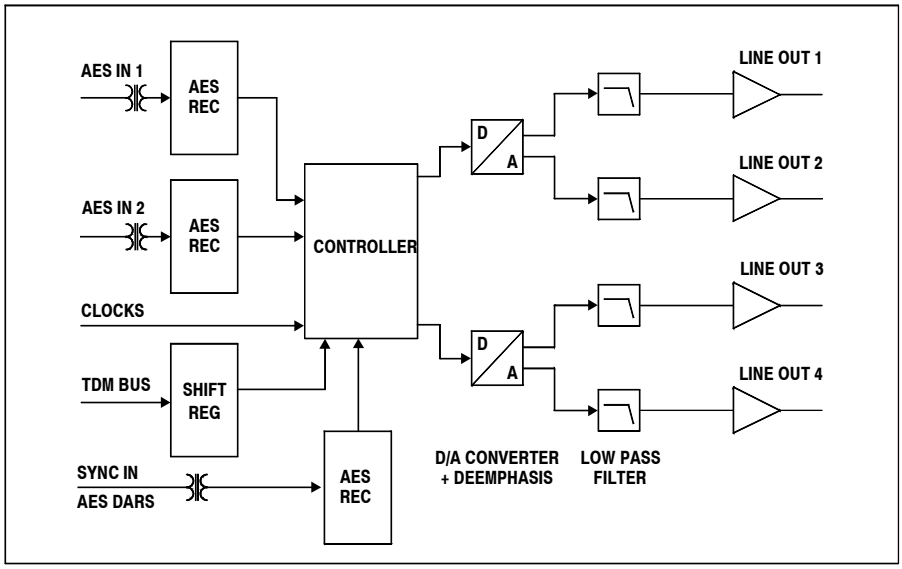
The C4DA/24/96 card can be used for standalone applications as well as in the D19m rack for TDM application. On one card, four digital channels are converted to four analog outputs. The converters receive their input signals either from the AES/EBU inputs (standalone application) or from the TDM bus.

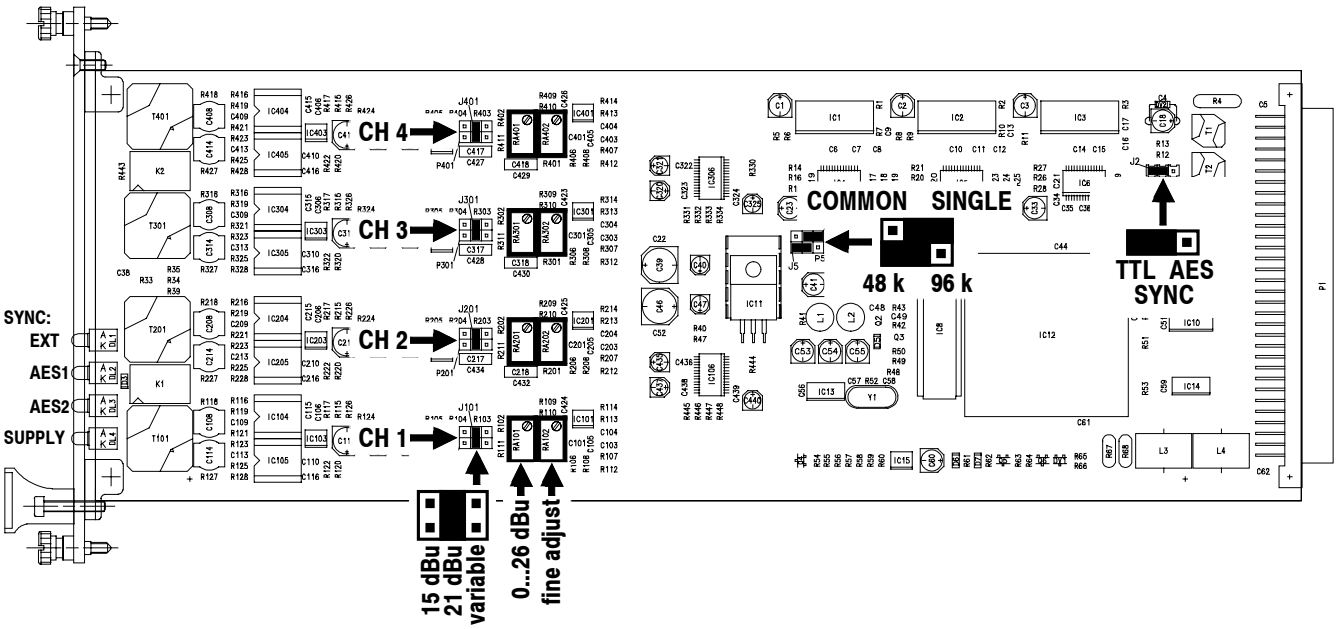
The C4DA/24/96 card can be used next to the other D19m cards in a D19m rack. If in standalone applications the synchronization should fail, the clock will be generated from one of the AES/EBU inputs.

The channel status bits contain the source channel defined by the card address as well as the sampling frequency information.

96 kHz Operation: The card can be used for sampling frequencies of 32 through 48 kHz. For standalone operation, also twice these values are allowed. When using the AES/EBU inputs in standalone mode, only the mode with two channels per line (transmitted with twice the transmission speed) is supported, but not the mode with one channel per line (CH1 in AES/EBU format corresponds to the first, CH2 to the second sample).

Jumper diagram of the earlier version 1.940.570 at the end of this chapter.





LEDs:

SYNC EXT Indication if the card is synced from the AES/EBU input or from the TTL sync clock.

SYNC AES1 is ON when the external sync fails, and the sync of the AES1 input is used to synchronize the card.

SYNC AES2 is ON when the external sync fails, and the sync of the AES2 input is used to synchronize the card (if no signal is connected to AES1).

SUPPLY Indicates "power on" status.

Jumpers:

Output level 15 dBu fixed, 21 dBu fixed, or 0...26 dBu variable.

SYNC AES / TTL *AES:* The unit will be synced from the AES/EBU input (in case of standalone use of the D/A card).
TTL: The sync input from the D19m rack is used. The internal TTL sync signal is generated by the MADO card in a D19m MUX frame or by the MADI card in a DEMUX frame.

48 k / 96 k For correct 96 kHz operation, the "96 k" jumper must be set for standalone application.

COMMON / SINGLE When setting the jumper to "common", a common switchover for several cards is allowed by pulling pin 18C on the backplane to GND; *in such a case, the 48/96 k jumper must be set to the 48 k position.*

Alignment: Feed a digital audio signal with a level of –10 dB_{FS} either via one of the AES/EBU inputs or via the TDM bus to the C4DA/24/96 card. Set the jumpers to either 15 or 21 dBu and measure the corresponding analog outputs. Use the corresponding FINE ADJUST trimmer potentiometers to set the output to +5 or +11 dBu, respectively. If a different output level is required, set the jumper to position VARIABLE and use the 0...26 dBu trimmer potentiometers to adjust the desired level.
Repeat this alignment for the second AES/EBU input.

Technical data (sampling frequency 48 kHz, output level 15 dBu @0 dB_{FS}):

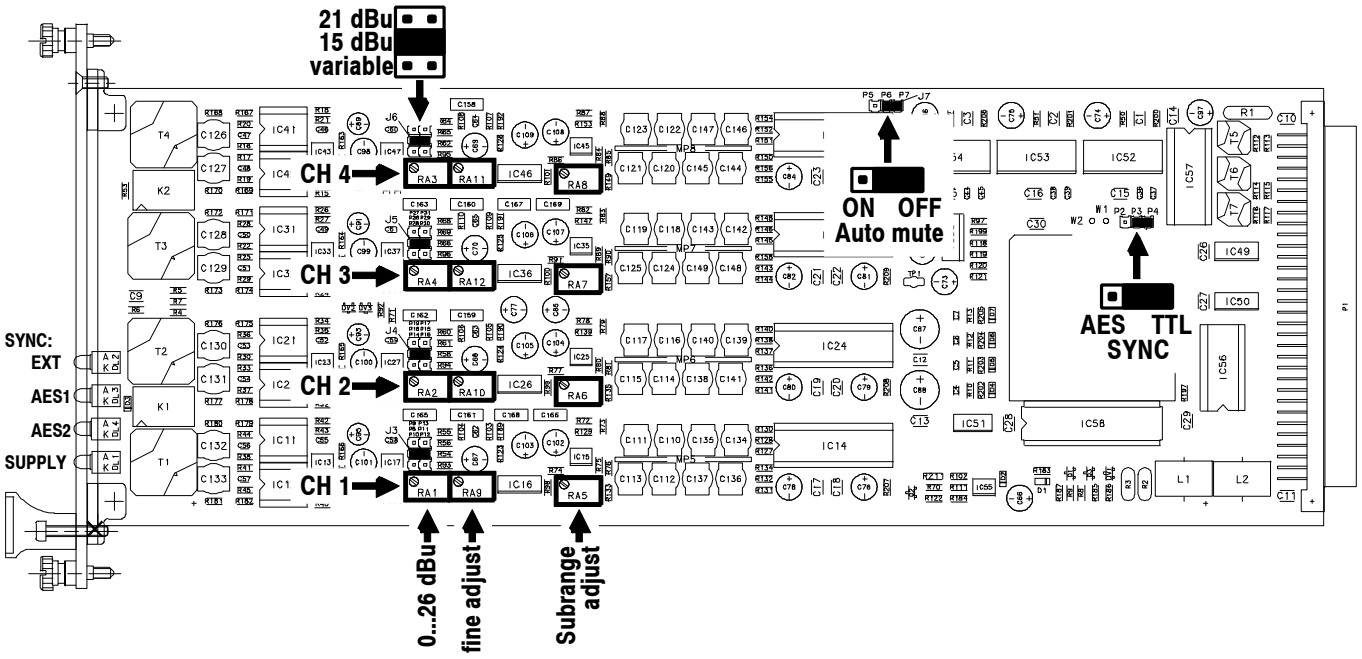
AES/EBU inputs	Impedance	110 Ω
	Sensitivity	min. 200 mV
Analog output		Electronically balanced
Frequency response	20 Hz...20 kHz	–0.2 dB
THD + N	20 Hz...20 kHz, –1 dB_{FS}	< –87 dB_{FS}
	1 kHz, –30 dB_{FS}	< –110 dB_{FS}
Crosstalk	@ 1 kHz	< –110 dB_{FS}
Output impedance (analog output)		< 40 Ω
Minimum load at maximum level	+24 dBu	300 Ω
Analog output level	for 0 dB_{FS}, jumper-selectable	+15 dBu, +21 dBu; 0...26 dBu (adjustable with on-board trimmer potentiometer)
Power consumption	5 V	max. 0.2 A
	+15 V	max. 0.25 A
	–15 V	max. 0.15 A
Sampling frequency		30 kHz...54 kHz, or 60 kHz...108 kHz
Operating temperature range		0...+40° C

Pin Assignment: 96-pin, DIN 41612, female

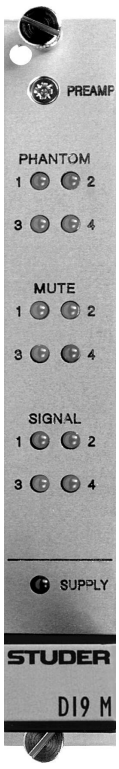
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AES1IN+	GND	AES1IN–
7		GND	
8	AES2IN+	GND	AES2IN–
9		GND	
10	/D0	/BA0	/D8
11	/D1	/BA1	/D9
12	/D2	/BA2	/D10
13	/D3	/BA3	/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	/U
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22	ANA1OUT+		ANA1OUT–
23	MGND	MGND	MGND
24	ANA2OUT+		ANAOUT–
25	MGND	MGND	MGND
26	ANA3OUT+		ANA3OUT–
27	MGND	MGND	MGND
28	ANA4OUT+		ANA4OUT–
29	AGND	AGND	AGND
30	–15V	–15V	–15V
31	+15V	+15V	+15V
32	MGND	MGND	MGND

MGND	Chassis
GND	Ground
SYNC	Sync Input TTL
AES/DSD BUS	Switchover standalone/TDM bus operating
BA0...BA3	Card address (ID)
/D0.../D15	Inverted data on the TDM bus
/FRAME, /CK128	Clocks TDM bus
/U	Switchover to twice the sampling frequency

Earlier Version 1.940.570:

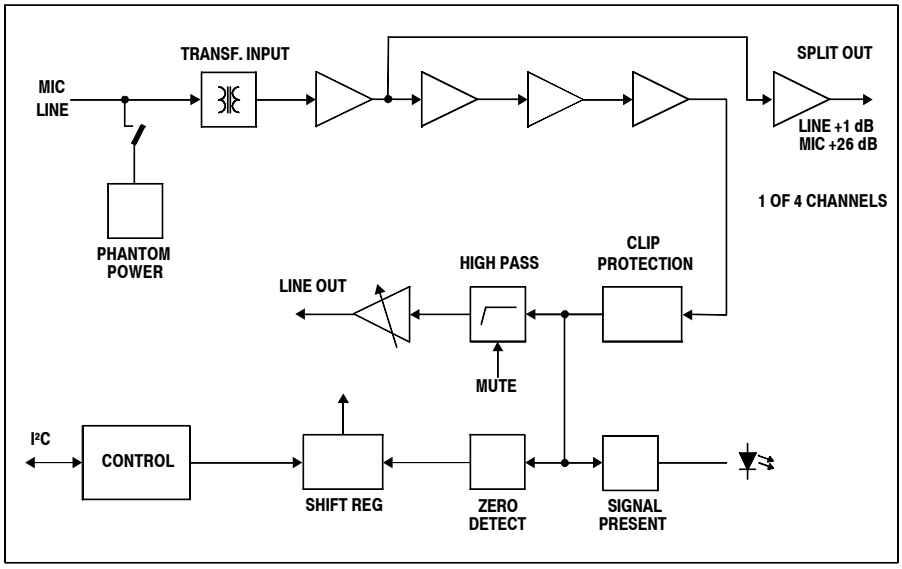


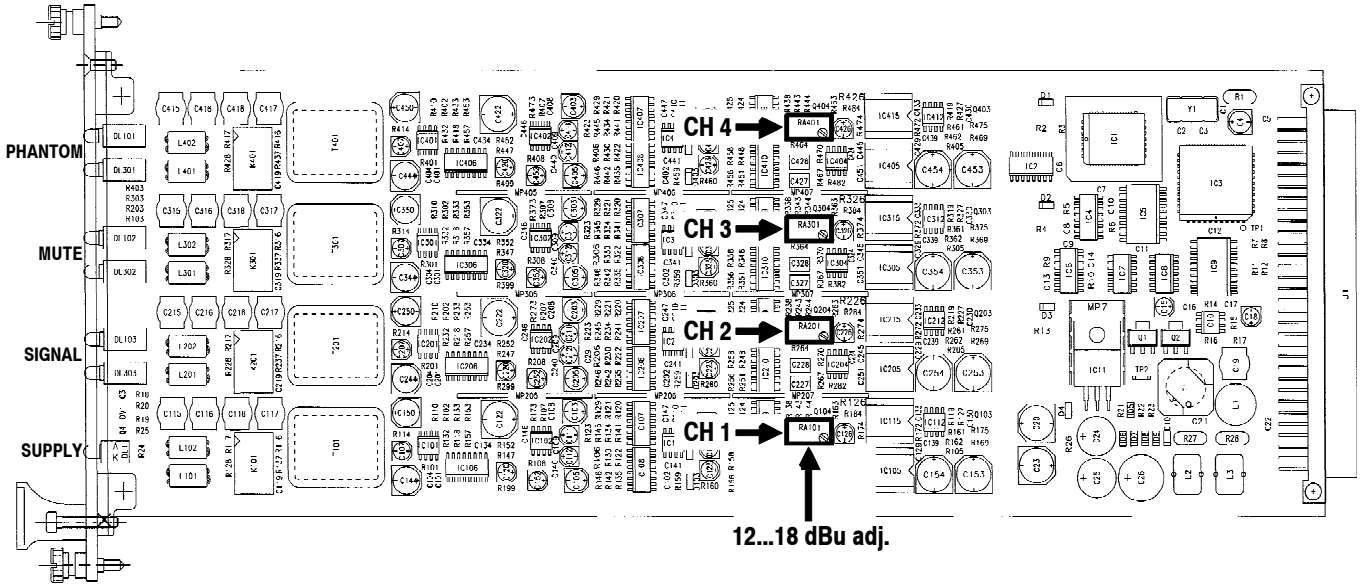
2.1.4 D19m MP4RC – Quad Remote Controlled Mic/Line In 1.940.575



The Mic/Line inputs (pre-amps) are equipped with 4 high-quality preamplifiers. The gain can be controlled in 1 dB steps over a wide range. The inputs are transformer-balanced and switchable between microphone and line level sensitivity. Phantom power, high-pass filter and gain are remote controlled for each channel individually. A simple limiter (clip protection) can be activated for all 4 channels in common. Control of the Mic/Line inputs is performed by an I²C bus coming from the D19m RCC remote controller card 1.940.576 via the backplane.

A mute input signal per Mic/Line input permits to mute the signal independent of the remote control signal. The line output is electronically balanced. The Split Out supplies, regardless of the current gain setting, a signal which is 26 dB above the mic input signal or 1 dB above the line input signal).





LEDs:

PHANTOM 1...4	Indicates active phantom powering for each channel.
MUTE 1...4	Indicates external mute, if active, for each channel.
SIGNAL 1...4	Indicates present signal for each channel.
SUPPLY	Indicates "power on" status.

Alignment:

- Set the mic input gain to minimum.
- Feed a balanced 0 dBu test signal into one of the mic inputs.
- Then adjust the level at the corresponding line output to 15 dBu, using the correct trimmer potentiometer according to the illustration.

Technical Data:

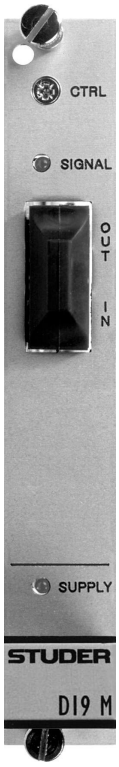
Input		Transformer-balanced	
Input sensitivity (for 15 dBu output level)	Mic	–60...0 dBu (adjustable in 1 dB steps)	
	Line	–10...+24 dBu (adjustable in 1 dB steps)	
Input impedance	Mic	> 1 kΩ	
	Line	> 2 kΩ	
Phantom power		48 V	
Output		Electronically balanced	
Output level	Line Out	15 ±3 dBu (adjustable with trimmer pot)	
	Split Out	26 dB above mic input level, 1 dB above line input level	
Output impedance	Line Out, Split out	50 Ω each	
Min. load	Line Out, split out	600 Ω each	
High-pass filter		–3 dB @ 75 Hz, 12 dB/oct.	
Frequency response	Line	30 Hz...20 kHz	±0.1 dB
	Mic	30 Hz...20 kHz	±0.4 dB
THD + N	Line (0 dB gain, +10 dBu in)	95 dB_{FS}	
	Mic (30 dB gain, –20 dBu in)	95 dB_{FS}	
Equivalent input noise (source 200 Ω)	Mic (max gain)	–124 dBu	
Crosstalk	Mic (35 dB gain) @ 1 kHz	< 110 dB_{FS}	
	@ 15 kHz	< 90 dB_{FS}	
	Line (0 dB gain) @ 1 kHz	< 110 dB_{FS}	
	@ 15 kHz	< 90 dB_{FS}	
Power consumption	5 V / +15 V / –15 V	0.25 A / 0.30 A / 0.25 A	
Operating temperature range		0...40° C	

Pin Assignment: 96-pin DIN 41612 female

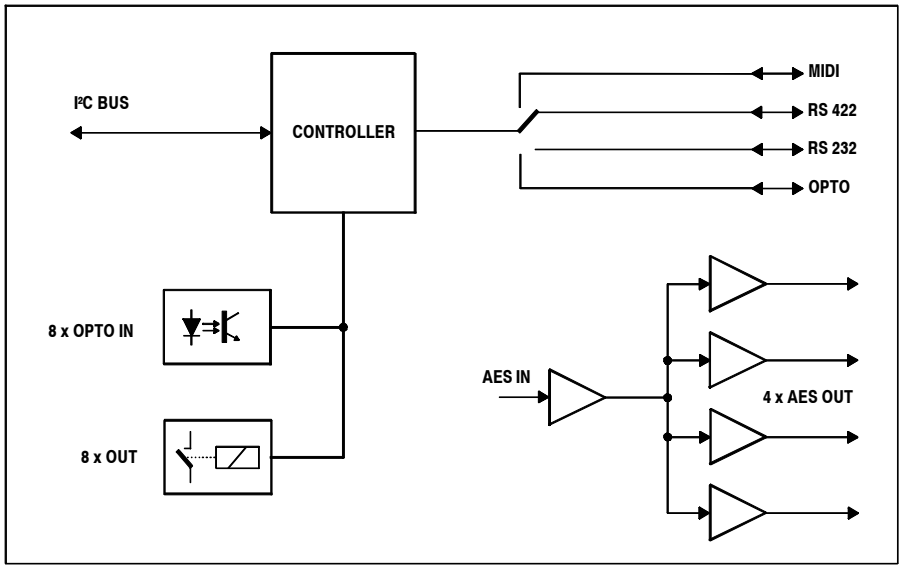
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC	SCL	SDA
4	GND	GND	GND
5	/MUTE1	GND	/MUTE2
6	DIR OUT1+	/MUTE3	DIR OUT 1–
7	DIR OUT2+	/MUTE4	DIR OUT 2–
8	DIR OUT 3+	GND	DIR OUT 3–
9	DIR OUT 4+	GND	DIR OUT 4–
10		/BA0	
11		/BA1	
12		/BA2	
13		/BA3	
14		GND	
15			
16		GND	
17		GND	
18			
19	MGND	MGND	OUT2–
20	OUT1+	OUT1–	OUT2+
21	MGND	MGND	MGND
22	ANA1IN+		ANA1IN–
23	MGND	MGND	MGND
24	ANA2IN+	MGND	ANA2IN–
25	MGND	MGND	MGND
26	ANA3IN+	MGND	ANA3IN–
27	MGND	MGND	MGND
28	ANA4IN+	OUT4–	ANA4IN–
29	AGND	AGND	AGND
30	–15V	–15V	–15V
31	+15V	+15V	+15V
32	OUT3+	OUT4+	OUT3–

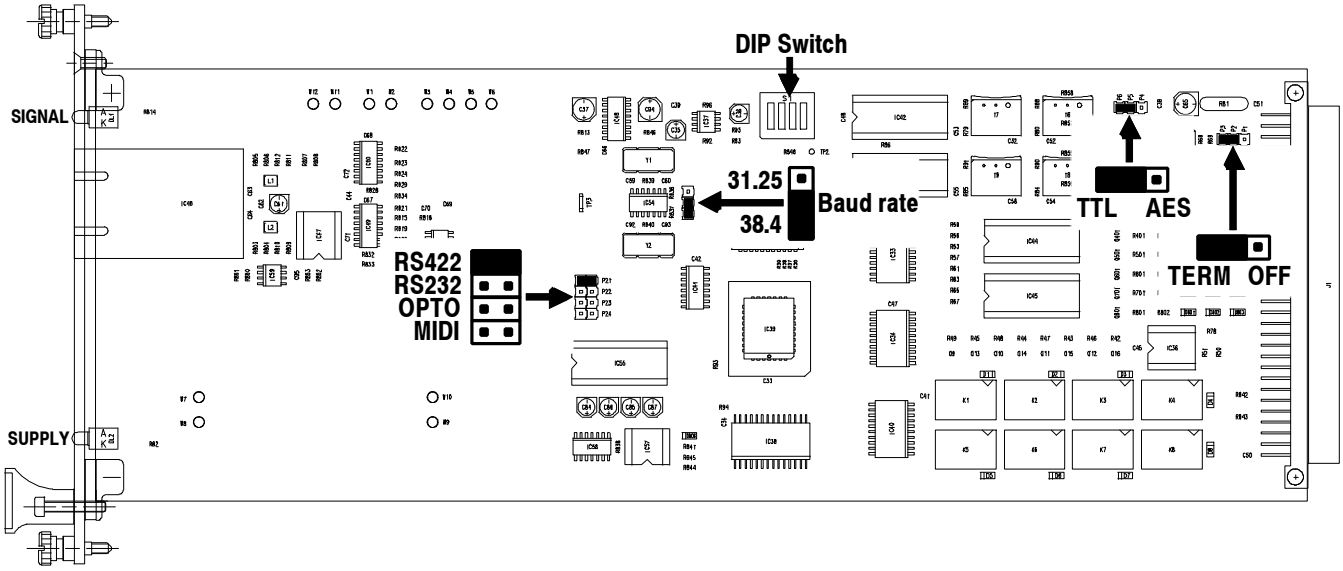
MGND	Chassis
GND	Ground
SCL, SDA	I^2C Bus
/MUTE ..	Mute input (low active)
BA0 .. BA3	Card address
ANA..IN	balanced Mic/Line input
OUT...	balanced output
DIR OUT	Split Out

2.1.5 D19m RCC – Remote Ctrl. Card for MP4RC Mic/Line In 1.940.576



The purpose of the RCC card is controlling up to 14 Mic/Line input cards (pre-amps). Gain, high-pass filter, phantom powering and limiter (clip protection) can be set. In contrast to the audio cards, this card *must* be inserted into the 16th slot, i.e. the last one on the backplane, *and it works only in conjunction with the backplane version 1.940.551*. Control of the Mic/Line inputs is performed by an I²C bus on the backplane. For various signaling purposes, 8 opto-coupled inputs and 8 relay outputs can be used. An AES/EBU signal can be distributed to 4 outputs, primarily used for sync signal distribution. The standard 110 Ω input impedance of this AES/EBU input can be switched to hi-Z by means of a jumper, which allows to use the same signal also for syncing e.g. a MADO card.
Usually the D19m rack is controlled by a D950 mixing console (stagebox system). In this application, an RS422 signal is used for control. This control signal can be transmitted in balanced mode or via an optical interface. For other purposes, RS232 or MIDI control is possible as well. The baud rate of the control link can be jumper-selected to 31.25 or 38 kBaud.
If more than one stagebox is used, they must be linked to the mixing console in a star configuration.





LEDs:	*SIGNAL*	Indicates "control interface active".
	SUPPLY	Indicates "power on" status.
Jumpers:	*RS422*	Control interface via RS422.
	RS232	Control interface via RS232.
	OPTO	Control interface via fiber optics.
	MIDI	Control interface via MIDI.
	Baud rate	Switchable 38/31.25 kBaud (MIDI).
	TTL / AES	Sync input from bus or from AES/EBU input.
	TERM / OFF	Termination for AES/EBU input (110 Ω – "TERM", or hi-Z – "OFF").
DIP Switch:	*#1...4*	For factory testing only; *standard setting for normal operation: all **OFF***.

Technical Data:

AES/EBU input	Input impedance	110 Ω or hi-Z (selected w. jumper)
	Input sensitivity	min. 200 mV
AES/EBU output	Output impedance	110 Ω
	Output level (into 110 Ω)	5 V
Input level signaling		2.5...48 V
Relay output		1 A, 100 V, 30 W
Current consumption 5 V (with optical interface)		max. 0.9 A
Operating temperature range		0...40° C

Pin Assignment: 96-pin DIN 41612 female

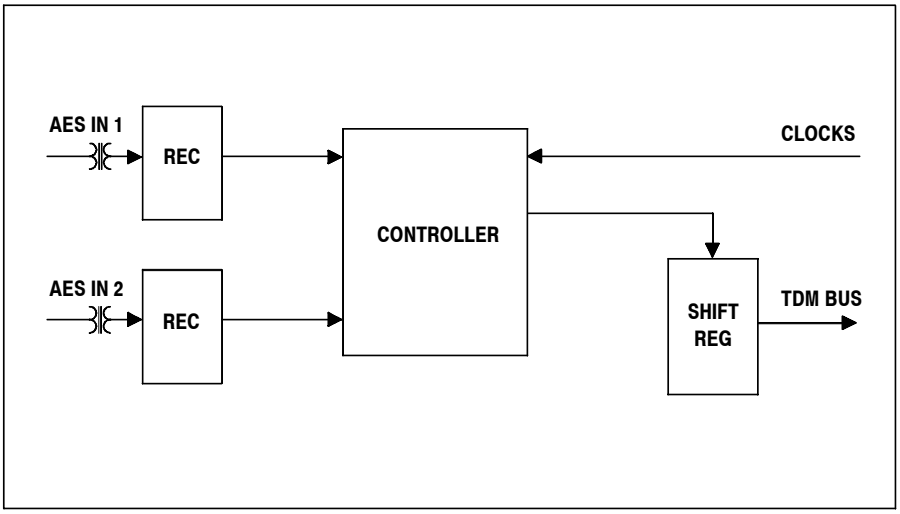
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC	SCL	SDA
4	GND	GND	GND
5	AESIN+	GND	AESIN–
6	AES1OUT+		AES1OUT–
7	AES2OUT+		AES2OUT–
8	AES3OUT+	GND	AES3OUT–
9	AES4OUT+	GND	AES4OUT–
10	IN1+		IN1–
11	IN2+		IN2–
12	IN3+		IN3–
13	IN4+		IN4–
14	IN5+	GND	IN5–
15	IN6+	RS232RX	IN6–
16	IN7+	GND	IN7–
17	IN8+	GND	IN8–
18	TA		TB
19	RA	MGND	RB
20	R1A	R1R	R1G
21	R2A	R2R	R2G
22	R3A	R3R	R3G
23	R4A	R4R	R4G
24	R5A	RS232TX	R5G
25	R6A	MIDI IN+	R6G
26	R7A	MIDI IN–	R7G
27	R8A	MIDI T+	R8G
28	MIDI T–	MIDI O+	MIDI O–
29			
30			
31			
32	MGND	MGND	MGND

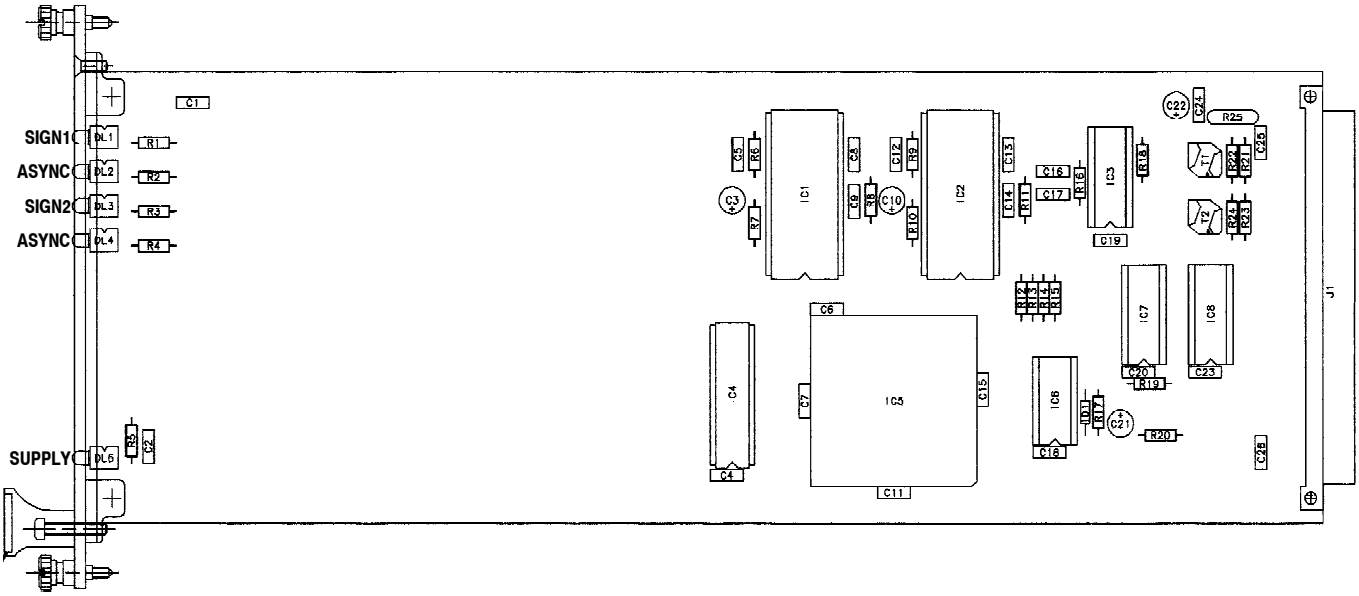
MGND	Chassis	MIDI XXX	MIDI control interface
GND	Ground	R..A	Relay output: Normally open contact
SYNC	Sync input TTL	R..R	Relay output: Normally closed contact (relay 1 to 4 only)
SCL, SDA	I^2C Bus	R..G	Relay output: Common
TA, TB	RS422 control output		
RA, RB	RS422 control input		
RS232 RX, TX	RS232 control interface		

2.2 AES/EBU I/O Cards

2.2.1 D19m AESI – Dual AES/EBU In 1.940.580

The AESI card routes two AES/EBU input signals to the TDM bus, where they are read from a MADO card and can then be output through a MADI link. The sampling frequency can be between 28 kHz and 55 kHz.
The channel status information is transmitted to the TDM bus without changes





LEDs:

SIGN 1/2 The LEDs are ON when a valid AES/EBU signal is available at the inputs IN1 or IN2.

ASYNC 1/2 The LEDs are ON when the input signal is not synchronized to the system clock.

SUPPLY Indicates "power on" status.

Technical Data:

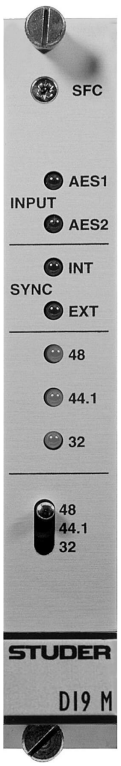
AES/EBU inputs	Impedance	110 Ω
	Sensitivity	min. 200 mV
Power consumption	5 V	Max. 0.3 A
Input sampling frequency		28 kHz...55 kHz
Operating temperature range		0...+40° C

Pin Assignment: 96-pin DIN 41612 female

Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3			
4	GND	GND	GND
5		GND	
6	AES1IN+	GND	AES1IN–
7		GND	
8	AES2IN+	GND	AES2IN–
9		GND	
10	/D0	/BA0	/D8
11	/D1	/BA1	/D9
12	/D2	/BA2	/D10
13	/D3	/BA3	/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22			
23	MGND	MGND	MGND
24			
25	MGND	MGND	MGND
26			
27	MGND	MGND	MGND
28			
29			
30			
31			
32	MGND	MGND	MGND

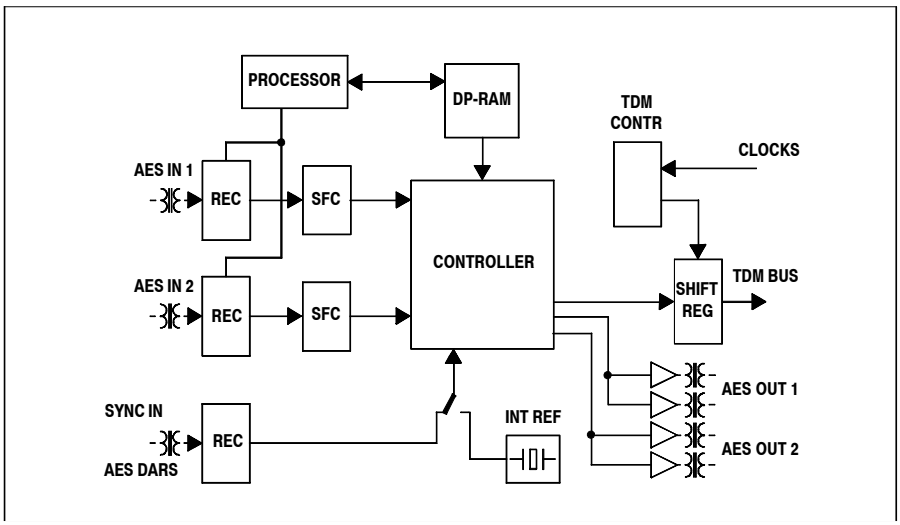
MGND	Chassis
GND	Ground
AES/DSD BUS	TDM bus active
BA0...BA3	Card address (ID)
/D0.../D15	Inverted data on the TDM bus
/FRAME, /CK128	Clocks TDM bus

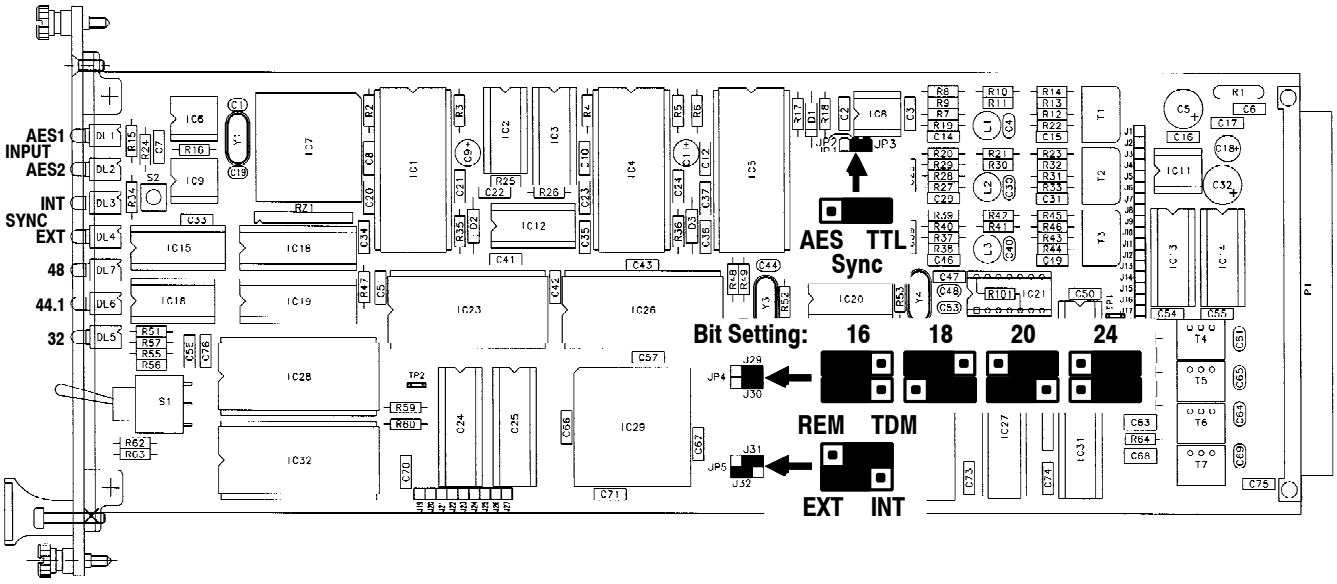
2.2.2 D19m AESI SFC – Dual AES/EBU In w. Asynchronous SFC 1.940.540



The AESI SFC card can be used for standalone applications as well as for the D19m rack. It routes two asynchronous AES/EBU input signals to the TDM bus, where they are read from a MADO card and can then be output through a MADI link. At the same time, each of the two AES/EBU inputs is fed to two AES/EBU outputs.

The AESI SFC card can be used next to the other D19m cards in a D19m rack. Incoming AES/EBU signals are converted via a sampling frequency converter either to an internal sampling frequency (32 kHz, 44.1 kHz, or 48 kHz, selectable with a front panel switch), or to the sampling frequency of an external sync signal. When the external sync signal fails, the internal sync reference will be used automatically. The input and output sampling frequencies can be between 25 kHz and 55 kHz, and their ratio must be between 0.5 and 2. The channel status information will be transmitted from the inputs to the outputs, and the sampling frequency information will be corrected correspondingly.





LEDs:

INPUT AES1/2 The LEDs are on when a valid AES/EBU signal is available at the input IN1 or IN2.

SYNC INT/EXT Depending on how the card is synced, the corresponding LED is on.

SYNC INT = the internal sync generator is used (in case no external sync signal is available).
SYNC EXT = TTL sync or AES sync input is used.

48/44.1/32 The current sampling frequency of the digital output will be indicated.

Jumpers:

AES / TTL *AES:* The sync input from the AES/EBU input is used (in case of standalone use of the SFC card).
TTL: The sync input from the D19m rack is used. The internal TTL sync signal is generated by the MADO card in a D19m MUX frame.

Bit Setting 16, 18, 20, 24 bit.

REM / TDM *TDM* (default): no U-bit handling.
REM (remote): will be used for additional external U-bit handling (not implemented yet).

EXT / INT *INT* (internal): the internal reference is used, independent of the sync input.
EXT (external): the card is synced to the AES sync input (jumper AES-TTL set to AES) or to the TTL sync (jumper AES-TTL set to TTL).

Technical Data:

AES/EBU inputs	Impedance	110 Ω
	Sensitivity	min. 200 mV
AES/EBU outputs	Impedance	110 Ω
	Output level (into 110 Ω)	4 V
Dynamic range	20 Hz...20 kHz, –60 dB_{FS}	> 120 dB
THD + N	20 Hz...20 kHz, 0 dB_{FS}	< 94 dB_{FS}
	1 kHz, 0 dB_{FS}, f_s in/ f_s out 0.7...1.4	< 106 dB_{FS}
Audio delay		3 ms
Power consumption	5 V	max. 0.55 A
Input sampling frequency		25 kHz...55 kHz
Operating temperature range		0...+40 C

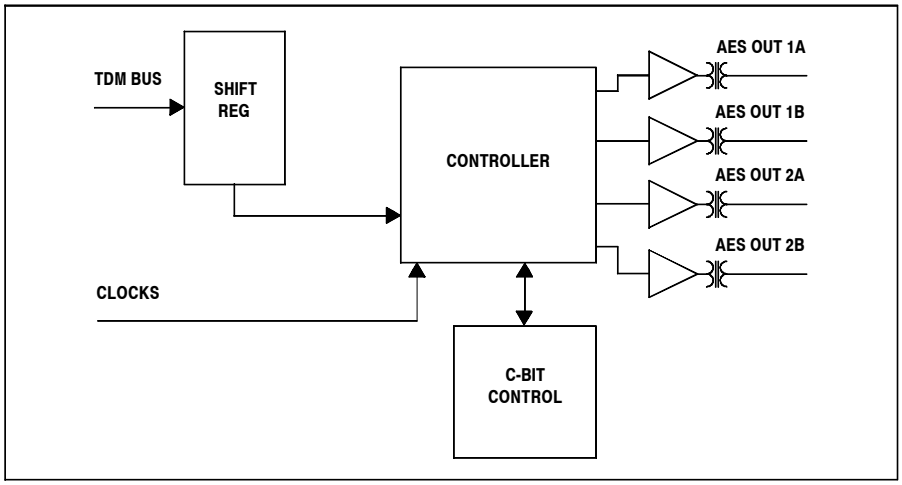
Pin Assignment: 96-pin, DIN 41612, female

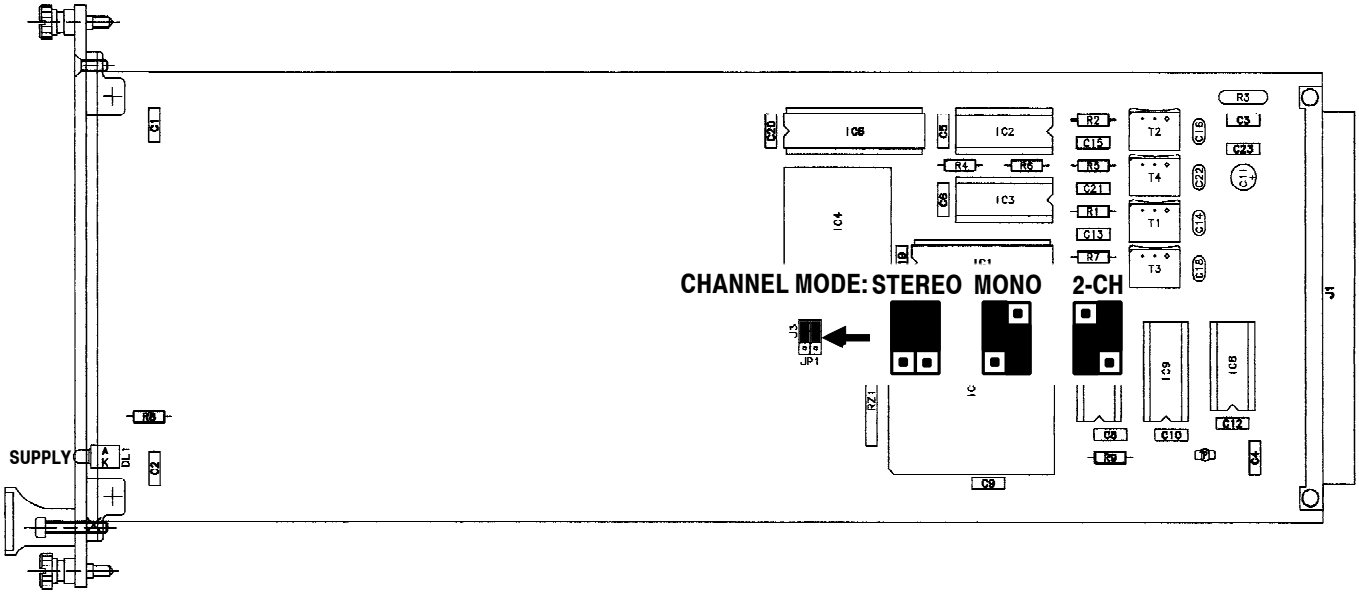
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC	/H I^2C	/D I^2C
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AES1IN+	GND	AES1IN–
7		GND	
8	AES2IN+	GND	AES2IN–
9		GND	
10	/D0	/BA0	/D8
11	/D1	/BA1	/D9
12	/D2	/BA2	/D10
13	/D3	/BA3	/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	/U
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22	AES1AOUT+		AES1AOUT–
23	MGND	MGND	MGND
24	AES1BOUT+		AES1BOUT–
25	MGND	MGND	MGND
26	AES2AOUT+		AES2AOUT–
27	MGND	MGND	MGND
28	AES2BOUT+		AES2BOUT–
29			
30			
31			
32	MGND	MGND	MGND

MGND	Chassis
GND	Ground
SYNC	Sync input TTL
AES/DSD BUS	Switchover between standalone and TDM application
BA0...BA3	Card address (ID)
/D0.../D15	Inverted data on the TDM bus
/U	Inverted U-bit
/FRAME, /CK128	Clocks TDM bus

2.2.3 D19m AESO – Dual AES/EBU Out 1.940.585

The AESO card has been developed for the use in the D19m rack. On one card, four channels coming from the TDM bus are converted to either two AES/EBU outputs (stereo or two-channel), or to 4 AES/EBU outputs (mono). The signal on the TDM bus is normally coming from the MADI card (input). The channel status information is transmitted from the TDM bus to the AES/EBU outputs, according to the jumper settings.





LED: *SUPPLY* Indicates "power on" status.

Jumpers:

MONO Each TDM channel will be set to an AES/EBU channel, e.g.:
CH1 – AES out 1a / CH2 – AES out 1b
CH3 – AES out 2a / CH4 – AES out 2b.

STEREO Two channels from the TDM bus are available as STEREO pair on two AES/EBU channels, e.g.:
CH1/CH2 – AES out 1, LEFT/RIGHT
CH3/CH4 – AES out 2, LEFT/RIGHT.

2-CH Two TDM channels are available as a two-channel pair on two AES/EBU channels, e.g.:
CH1/CH2 – AES out 1, CH1/CH2
CH3/CH4 – AES out 2, CH3/CH4.

Technical Data:

AES/EBU outputs	Impedance	110 Ω
	Output level with 110 Ω load	5 V
Power consumption	5 V	max. 0.3 A
Input sampling frequency		28...55 kHz
Temperature range		0...+40° C

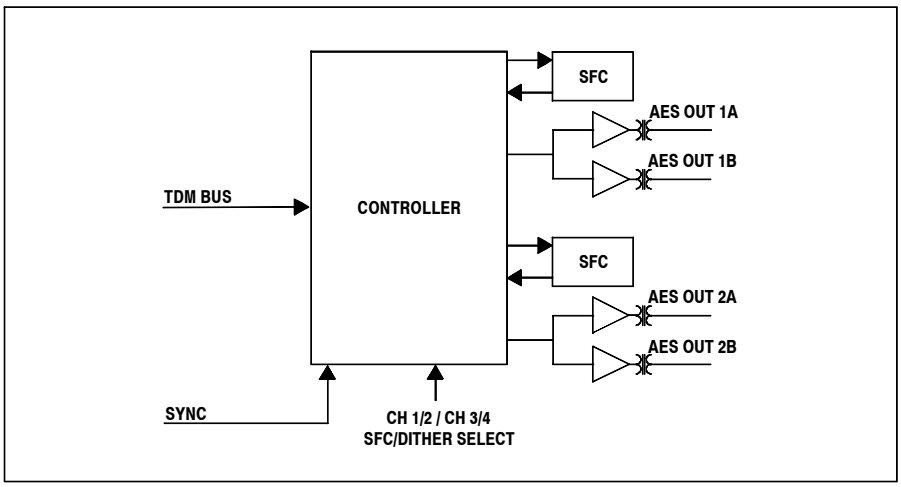
Pin Assignment: 96-pin, DIN 41612, female

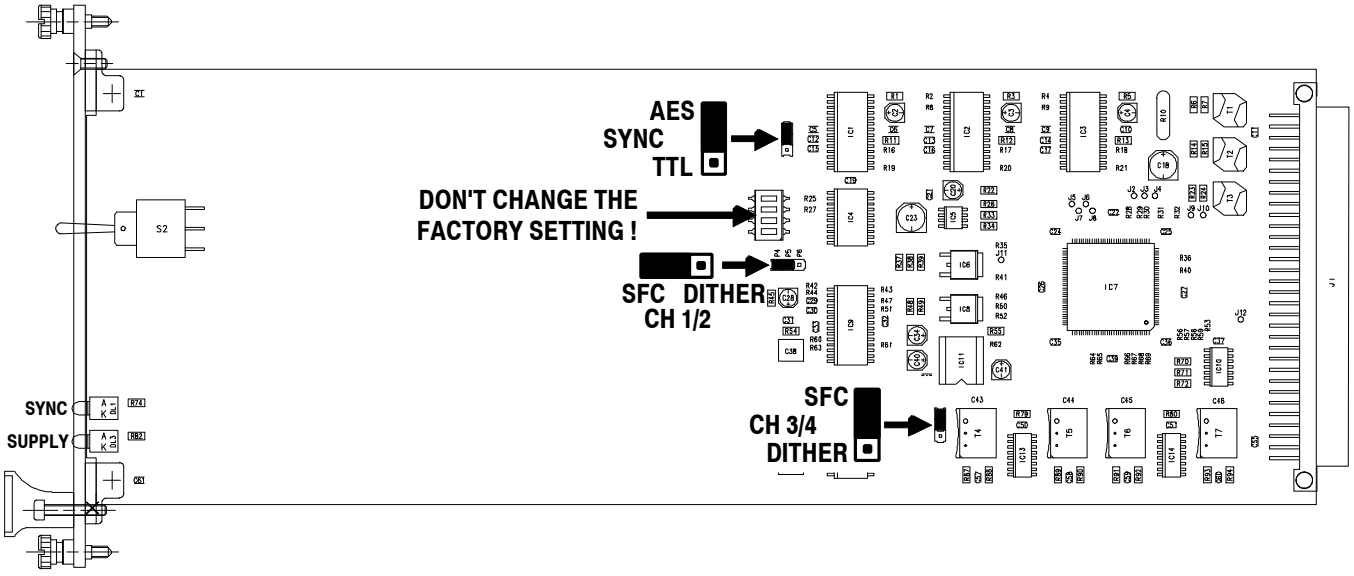
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3			
4	GND	GND	GND
5		GND	
6	AES1AOUT+	GND	AES1AOUT–
7	AES1BOUT+	GND	AES1BOUT–
8	AES2AOUT+	GND	AES2AOUT–
9	AES2BOUT+	GND	AES2BOUT–
10	/D0	/BA0	/D8
11	/D1	/BA1	/D9
12	/D2	/BA2	/D10
13	/D3	/BA3	/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22			
23	MGND	MGND	MGND
24			
25	MGND	MGND	MGND
26			
27	MGND	MGND	MGND
28			
29			
30			
31			
32	MGND	MGND	MGND

MGND	Chassis
GND	Ground
BA0...BA3	Card address (ID)
/D0.../D15	Inverted data on the TDM bus
/FRAME, /CK128	Clocks TDM bus

2.2.4 D19m AESO – Dual AES/EBU Out, w. Dithering or SFC 1.940.470

The AESO card has been developed for the use in the D19m rack. On one card, four channels coming from the TDM bus are converted to two AES/EBU outputs. The signal on the TDM bus is normally coming from the MADI card (input).
For each of the two AES/EBU outputs individually, either reduced word length with dithering, or sampling frequency conversion can be jumper-selected. In dithering mode, output signal resolution is 16 or 20 bit (with dithering), or 24 bit (without dithering), depending on the front-panel switch setting. In sampling frequency converter (SFC) mode, the output sampling frequency is identical to the one of the signal at the AES/EBU sync input.





LED:
- *SYNC* — Indicates that a valid synchronization signal for the SFC is detected at the AES/EBU sync input.
- *SUPPLY* — Indicates "power on" status.

Jumpers:
- *SYNC AES / TTL* — This jumper must always be in the SYNC AES position.
- *SFC / DITHER* — Selects the sampling frequency converter or dithering mode, separate for the two channel pairs 1/2 and 3/4.

Technical Data:

SYNC input (AES/EBU signal)	Impedance	110 Ω
	Sensitivity	min. 200 mV
AES/EBU outputs	Impedance	110 Ω
	Output level with 110 Ω load	5 V
Input sampling frequency		28...56 kHz
Output sampling frequency		28...108 kHz
Input/output sampling frequency ratio		1:3 ... 3:1
Power consumption	5 V	max. 0.35 A
Temperature range		0...+40° C

Pin Assignment: 96-pin, DIN 41612, female

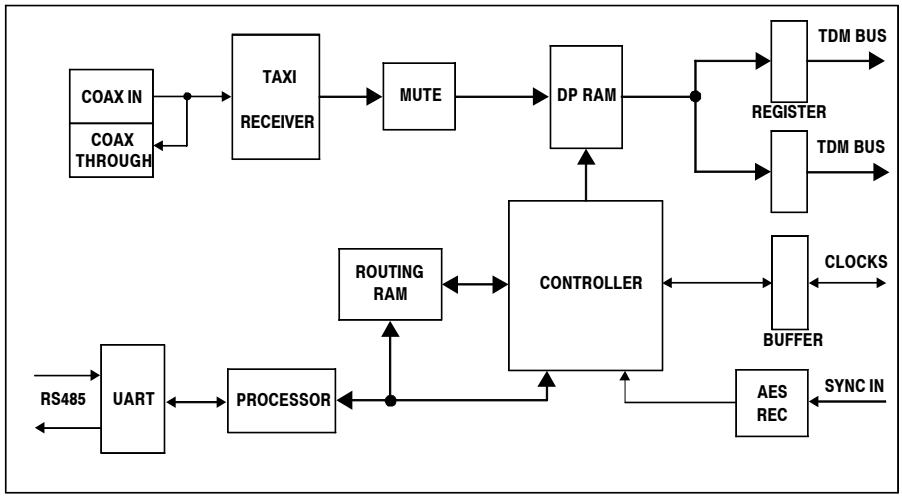
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AES1AOUT+	GND	AES1AOUT–
7	AES1BOUT+	GND	AES1BOUT–
8	AES2AOUT+	GND	AES2AOUT–
9	AES2BOUT+	GND	AES2BOUT–
10	/D0	/BA0	/D8
11	/D1	/BA1	/D9
12	/D2	/BA2	/D10
13	/D3	/BA3	/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22			
23	MGND	MGND	MGND
24			
25	MGND	MGND	MGND
26			
27	MGND	MGND	MGND
28			
29			
30			
31			
32	MGND	MGND	MGND

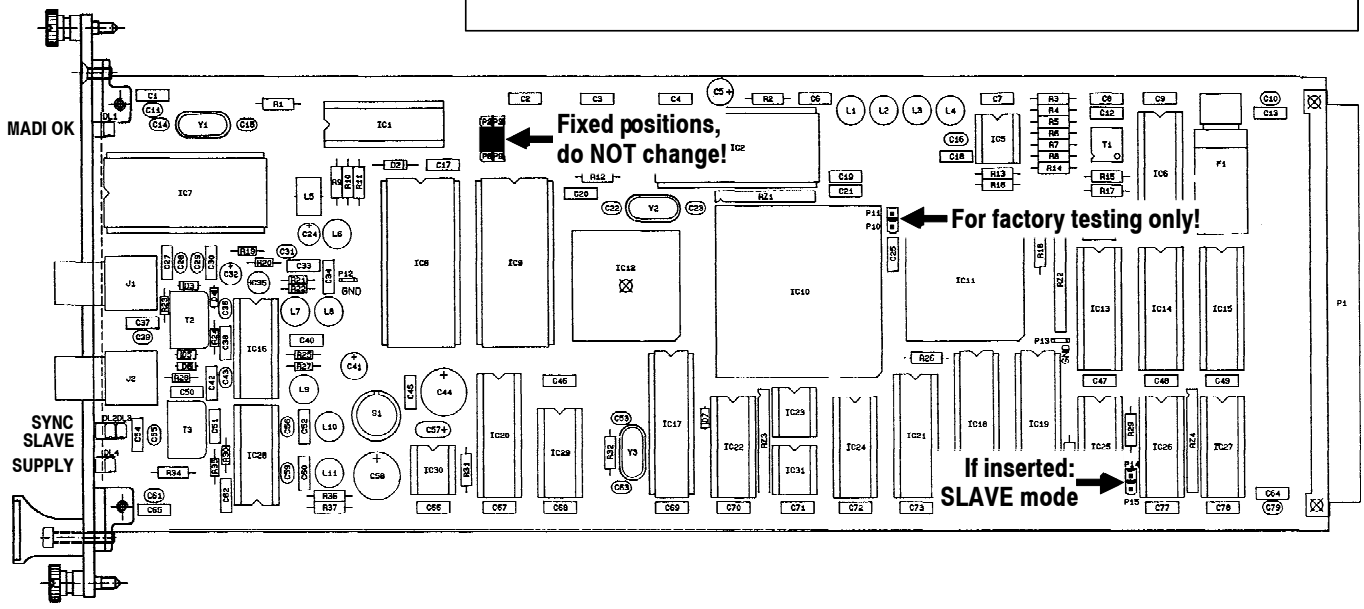
MGND	Chassis
GND	Ground
SYNC	Sync input TTL
BA0 .. BA3	Card address
/D0.../D15	Inverted data on the TDM bus
/FRAME, /CK128	Clocks TDM Bus

2.3 MADI I/O Cards

2.3.1 D19m MADI – MADI In for Coaxial Cable 1.940.500

The MADI card is used as a demultiplexer for the MADI input signal in a D19m rack. The MADI input signal will be converted to the TDM bus. AESO cards as well as A/D cards (output cards) receive their signals from the TDM bus. Any MADI channel can be routed to any output card.
The MADI card is equipped with a coaxial input (BNC connector) as well as a BNC "through" output.
In standard applications the MADI card is synchronized via the AES sync input of the D19m rack. It generates the required clock signal for the TDM bus as well as the TTL sync signal for the output cards.
If the MADI card is set to SLAVE mode, it will receive the sync and clock signals from the backplane.
Via the RS485 interface the MADI card can be remote controlled. In that case the frame address will be set via the DIP switches on the backplane.





LEDs:

MADI OK	Indicates that a valid MADI input signal is connected.
SYNC	Indicates that the card is synchronized to the sync source.
SLAVE	Card is configured as slave on the TDM bus.
SUPPLY	Indicates "power on" status.

Jumpers: *SLAVE* If this jumper is inserted, the clock and the sync signals will be read from the bus; otherwise, the MADI card writes the clock and the sync signals to the bus.

Technical Data:

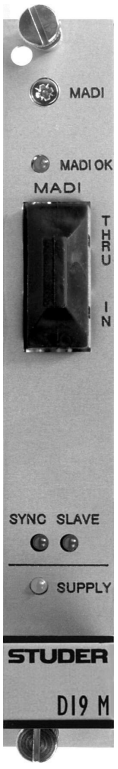
AES/EBU sync input	Impedance	110 Ω
	Sensitivity	min. 200 mV
MADI input coaxial	Connector type	BNC
	Impedance	75 Ω
	Maximum cable length	50 m
Power consumption	5 V	Max. 0.8 A
Temperature range		0...+40° C

Pin Assignment: 96-pin DIN 41612 female

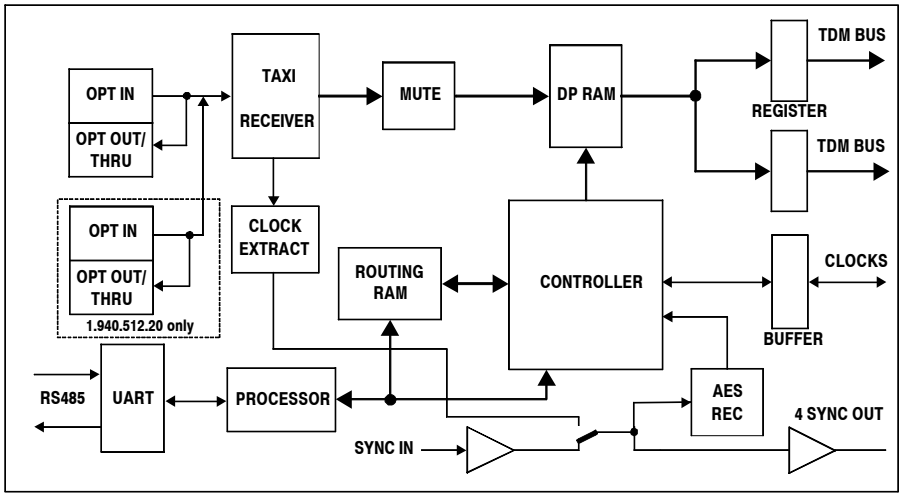
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6		GND	
7		GND	
8		GND	
9		GND	
10	/D0		/D8
11	/D1		/D9
12	/D2		/D10
13	/D3		/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19			
20		CA0	
21		CA1	
22	TA	CA2	TB
23		CA3	
24	RA	CA4	RB
25		CA5	
26		CA6	
27		CA7	
28			
29			
30			
31			
32	MGND	MGND	MGND

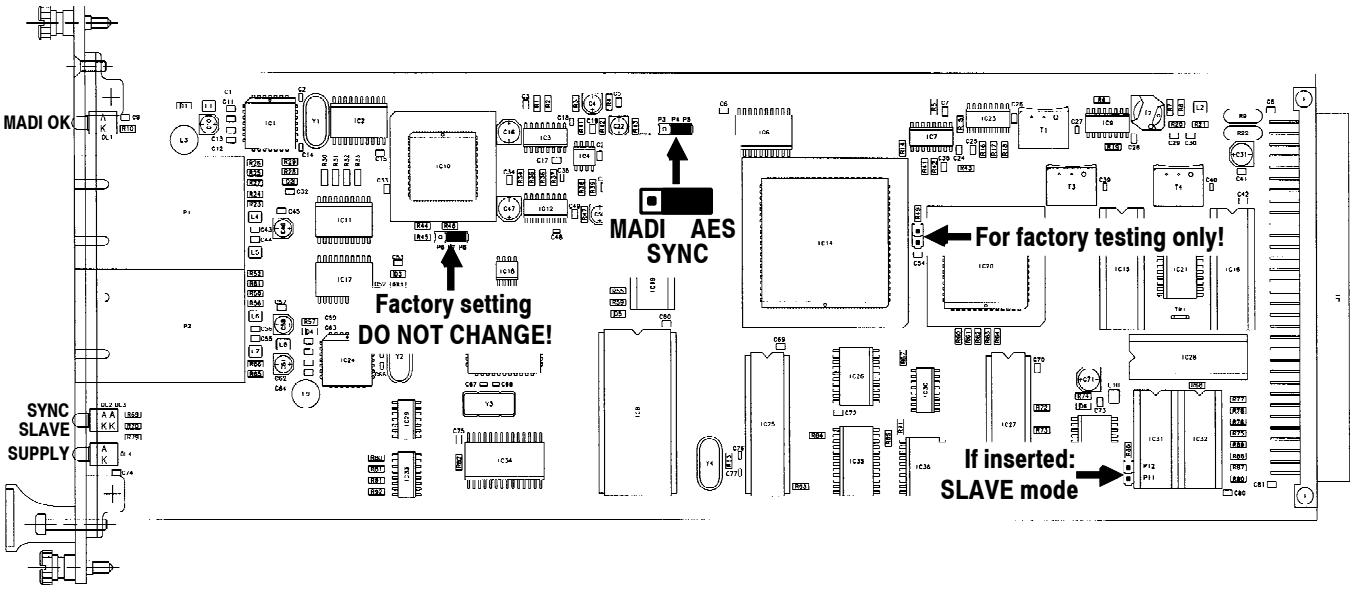
MGND	Chassis
GND	Ground
SYNC	Sync Input TTL
AES/DSD BUS	Switchover standalone/TDM bus operating
BA0...BA3	Card address (ID)
/D0.../D15	Inverted data on the TDM bus
/FRAME, /CK128	Clocks TDM bus

2.3.2 D19m MADI – MADI In for Optical Fibre Cable 1.940.511/1.940.512



The MADI card is used as demultiplexer for the MADI input signal in a D19m rack. The MADI input signal will be converted to the TDM bus. AESO cards as well as A/D cards (output cards) receive their signals from the TDM bus. Any MADI channel can be routed to any output card.
The MADI card 1.940.511 is equipped with an optical input (SC connector) as well as an optical "through" output. Version 1.940.512 (D19m MADI RED) has an additional MADI input for redundancy.
In standard applications, the MADI card is synchronized via the AES sync input of the D19m rack. It generates the required clock signal for the TDM bus as well as the TTL sync signal for the output cards.
If the MADI card is set to SLAVE mode, it will receive the sync and clock signals from the backplane. If necessary, the sync signal can be extracted from the MADI stream. However, this method is recommended only for long distances and stagebox applications, because the fault tolerance is lower and the jitter is higher (2 PLLs involved). Besides, varispeed is impossible in such a case.
Via the RS485 interface the MADI card can be remote controlled. In that case the frame address will be set via the DIP switches on the backplane.
The earlier version 1.940.510 is equipped with an ST connector instead of the SC connector (jumper diagram at the end of this chapter).





LEDs:
MADI OK Indicates that a valid MADI input signal is connected.
SYNC Indicates that the card is synchronized to the sync source.
SLAVE Card is configured as slave on the TDM bus.
SUPPLY Indicates "power on" status.

Jumpers:
SYNC MADI / AES Synchronization from MADI or AES/EBU.
SLAVE If this jumper is inserted, the clock and the sync signals will be read from the bus; otherwise, the MADI card writes the clock and the sync signals to the bus.

Technical Data:

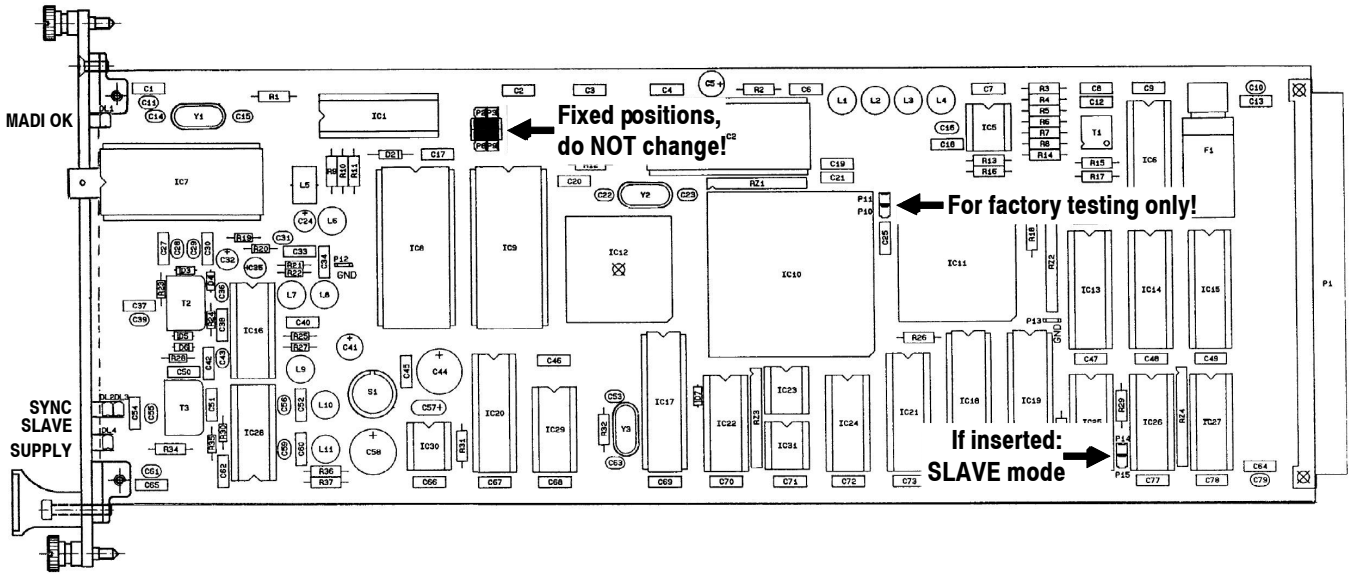
AES/EBU sync input	Impedance	110 Ω
	Sensitivity	min. 200 mV
AES/EBU sync output	Impedance	110 Ω
	Output level (into 110 Ω)	5 V
MADI input optical	Connector type	SC
	Wave length	1300nm
	Fiber cable type multimode	62.5/120 µm
	Maximum cable length	500 m
Power consumption	5 V	max. 1.2 A
Temperature range		0...+40 C

Pin Assignment: 96-pin DIN 41612 female

Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC	HIIC	DIIC
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AESOUT1+	GND	AESOUT1–
7	AESOUT2+	GND	AESOUT2–
8	AESOUT3+	GND	AESOUT3–
9		GND	
10	/D0		/D8
11	/D1		/D9
12	/D2		/D10
13	/D3		/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19			
20		CA0	
21		CA1	
22	TA	CA2	TB
23		CA3	
24	RA	CA4	RB
25		CA5	
26		CA6	
27		CA7	
28			
29			
30			
31			
32	MGND	MGND	MGND

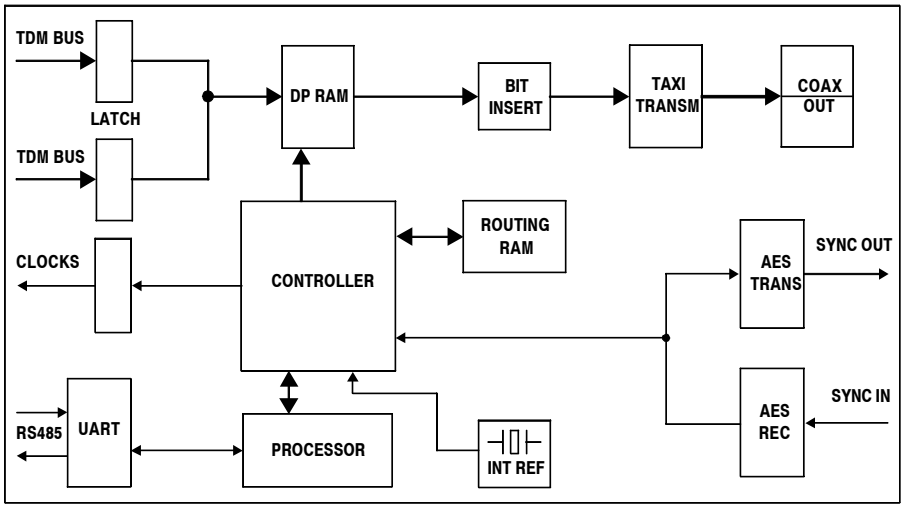
MGND	Chassis	/D0.../D15	Inverted TDM Bus data
GND	Ground	/FRAME, /CK128	Clocks TDM Bus (Input in Slave Mode)
SYNC	Sync output TTL (Input in Slave Mode)	TA, TB	RS485 Output
		RA, RB	RS485 Input
AES/DSD BUS	Switchover stand alone / TDM (Input in Slave Mode)	AESOUT	Sync Output
AESSYNC	Sync Input		
CA0 .. CA7	Frame address		

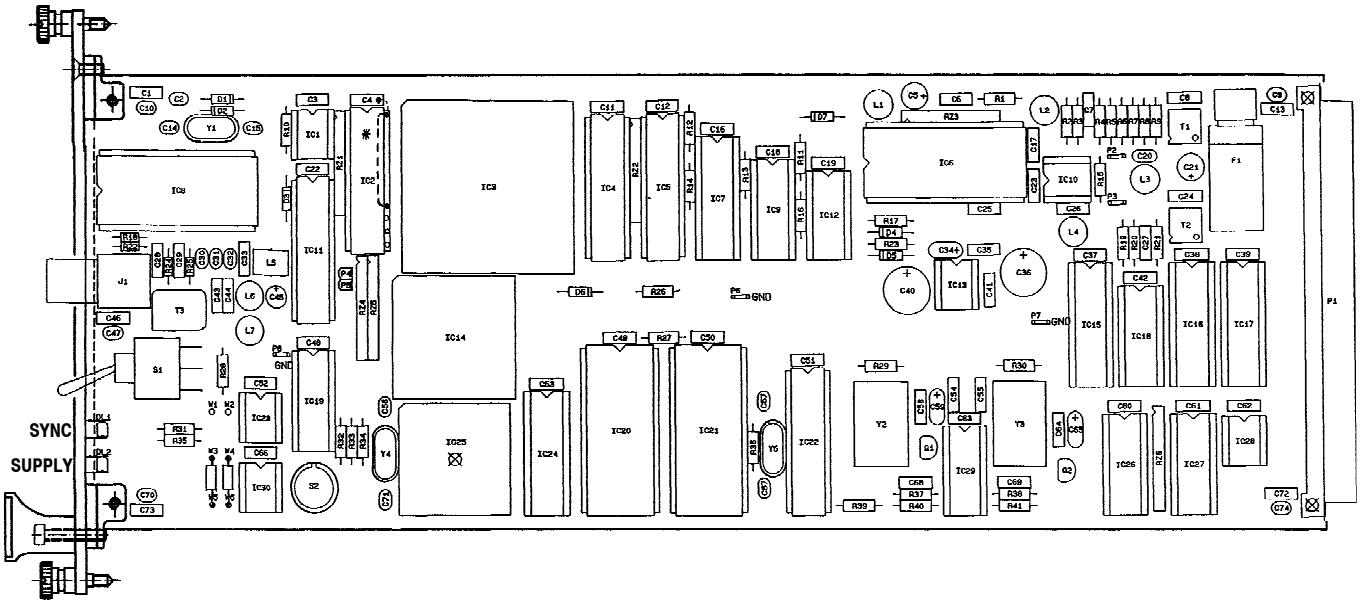
Earlier Version 1.940.510:



2.3.3 D19m MADO – MADI Out for Coaxial Cable 1.940.520

The "MADO" MADI output card serves as multiplexer in a D19m rack. The TDM bus data, written by analog or digital input cards to the bus, are read and output as a MADI signal. The channel allocation can be selected by the control software.
The card is synchronized by the sync input and distributes the clock signals required for the TDM bus. Four additional AES/EBU sync outputs are available. If the external sync signal is invalid, the internal generator is automatically activated and generates a sync signal. Since the frequency accuracy is ±1 ppm and an AES/EBU signal is output as sync signal, this can be used for the synchronization of a studio.
The MADO cards can be controlled by RS485 from an external device. The frame address is set by a DIP switch on the backplane.





LEDs: *SYNC* Indicates "sync" status.
SUPPLY Indicates "power on" status.

Jumper: *Pins P4/P5* For factory testing purposes only.

Technical Data:

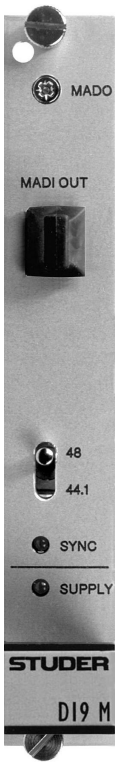
AES/EBU sync input	Input impedance	110 Ω
	Input sensitivity	min. 200 mV
AES/EBU sync output	Output impedance	110 Ω
	Output level (into 110 Ω)	5 V
Internal reference 44.1/48 kHz	Clock accuracy	±1 ppm
MADI output coaxial	Connector type BNC, impedance	75 Ω
	max. length of transmission	50 m
Current consumption 5 V		max. 0.8 A
Operating temperature range		0...40° C

Pin Assignment: 96-pin DIN 41612 female

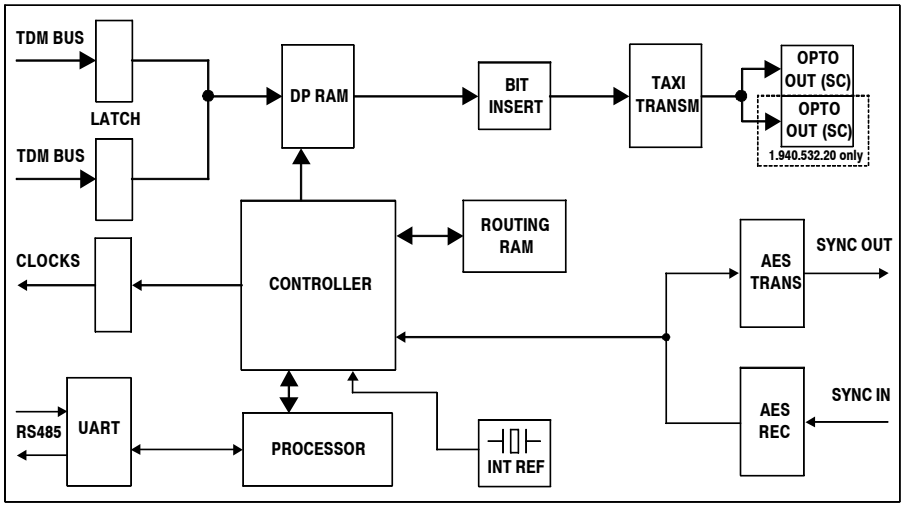
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AESOUT+	GND	AESOUT–
7		GND	
8		GND	
9		GND	
10	/D0		/D8
11	/D1		/D9
12	/D2		/D10
13	/D3		/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19			
20		CA0	
21		CA1	
22	TA	CA2	TB
23		CA3	
24	RA	CA4	RB
25		CA5	
26		CA6	
27		CA7	
28			
29			
30			
31			
32	MGND	MGND	MGND

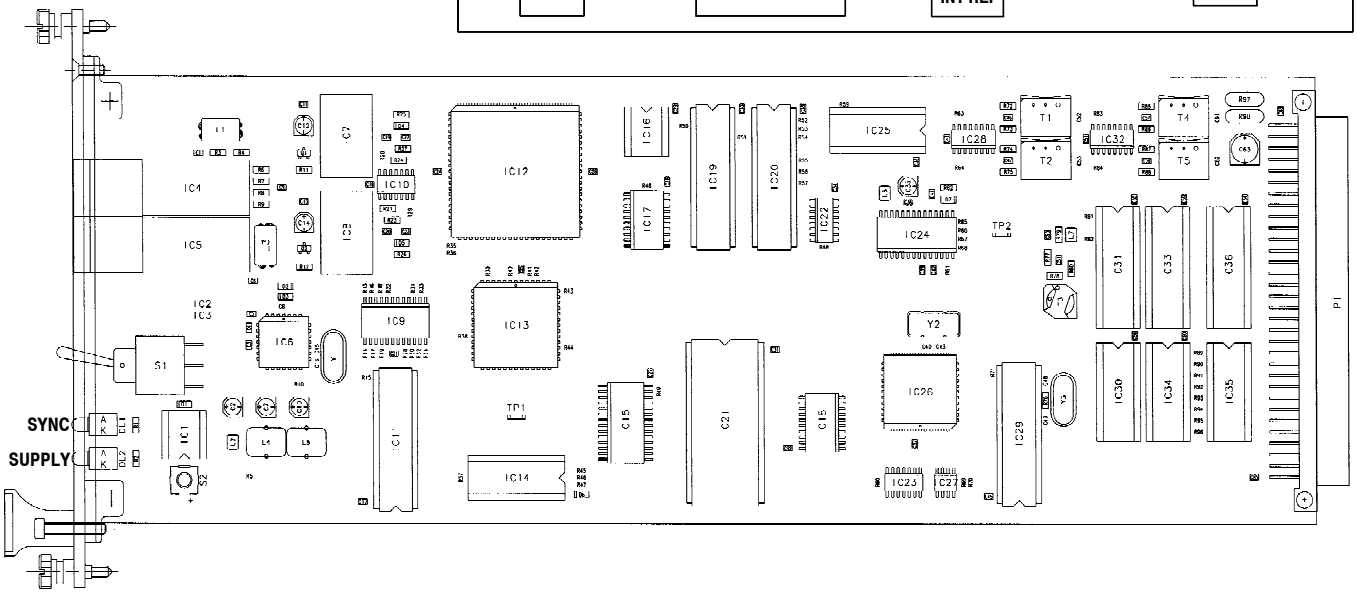
MGND	Chassis
GND	Ground
SYNC	Sync output TTL
AES/DSD BUS	Switchover standalone/TDM
AESSYNC	Sync Input
AESOUT	Sync Output
CA0 .. CA7	Frame address
/D0.../D15	Inverted data TDM bus
/FRAME, /CK128	Clocks TDM bus (input in slave mode)
TA, TB	RS485 output
RA, RB	RS485 input

2.3.4 D19m MADO – MADI Out for Optical Fibre Cable 1.940.531/1.940.532



The "MADO" MADI output card serves as multiplexer in a D19m rack. The TDM bus data, written by analog or digital input cards to the bus, are read and output as a MADI signal on an SC optical connector. The channel allocation can be selected by the control software.
A second, optional optical transmitter can be installed in order to establish a redundant output (D19m MADO RED – order no. 1.940.532).
The card is synchronized by the sync input and distributes the clock signals required for the TDM bus. Four additional AES/EBU sync outputs are available. If the external sync signal is invalid, the internal generator is automatically activated and generates a sync signal. Since the frequency accuracy is ±1 ppm and an AES/EBU signal is output as sync signal, this can be used for the synchronization of a studio.
The MADO cards can be controlled by RS485 from an external device. The frame address is set by a DIP switch on the backplane.
The earlier version 1.940.530 is equipped with an ST connector instead of the SC connector (diagram at the end of this chapter).





LEDs:

	SYNC	Indicates "sync" status.
	SUPPLY	Indicates "power on" status.

Technical Data:

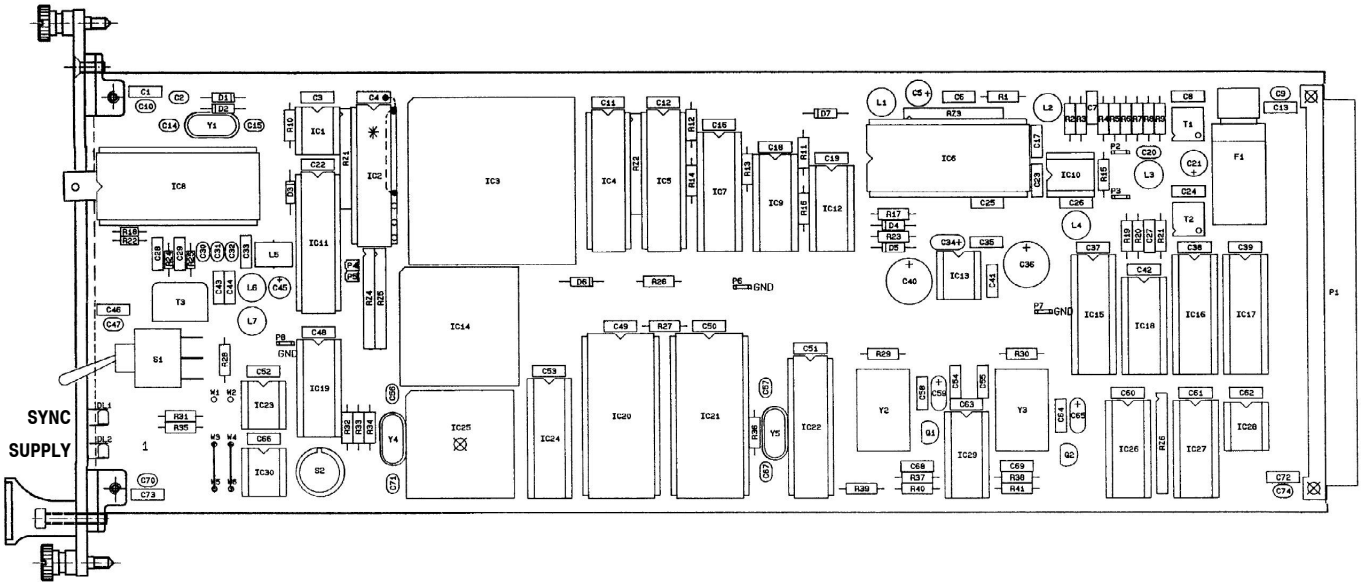
AES/EBU sync input	Input impedance	110 Ω
	Input sensitivity	min. 200 mV
AES/EBU sync output (4x)	Output impedance	110 Ω
	Output level (into 110 Ω)	5V
Internal reference 44.1/48 kHz	Clock accuracy	±1 ppm
MADI output optical	Connector type	SC
	Wave length	1300nm
	Fiber cable type multimode	62.5/120 µm
	max. length for transmission	500 m
Current consumption 5V		max. 1 A
Operating temperature range		0... 40°C

Pin Assignment: 96-pin DIN 41612 female

Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AESOUT1+	GND	AESOUT1–
7	AESOUT2+	GND	AESOUT2–
8	AESOUT3+	GND	AESOUT3–
9	AESOUT4+	GND	AESOUT4–
10	/D0		/D8
11	/D1		/D9
12	/D2		/D10
13	/D3		/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19			
20		CA0	
21		CA1	
22	TA	CA2	TB
23		CA3	
24	RA	CA4	RB
25		CA5	
26		CA6	
27		CA7	
28			
29			
30			
31			
32	MGND	MGND	MGND

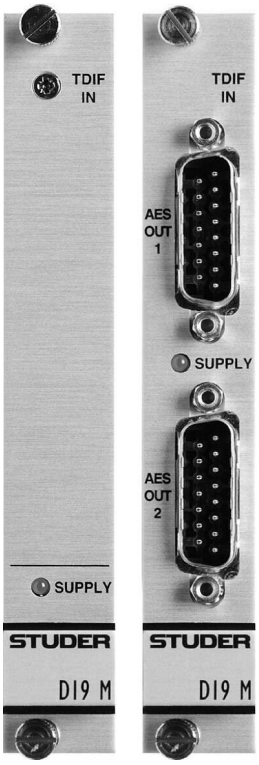
MGND	Chassis
GND	Ground
SYNC	Sync Output TTL
AES/DSD BUS	Switchover standalone/TDM
AESSYNC	Sync Input
AESOUT	Sync Output
CA0 .. CA7	Frame address
/D0.../D15	Inverted TDM bus data
/FRAME, /CK128	Clocks TDM bus (input in slave mode)
TA, TB	RS485 Output
RA, RB	RS485 Input

Earlier Version 1.940.530:



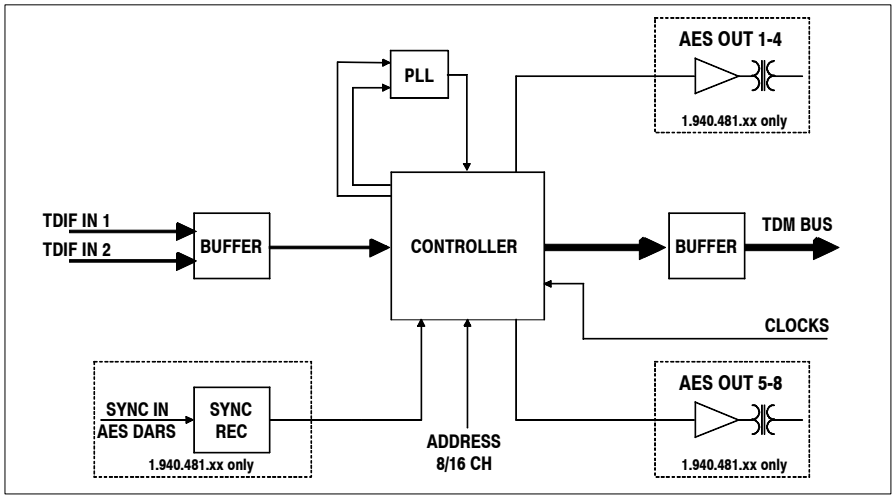
2.4 TDIF I/O Cards

2.4.1 D19m TDIFI – Dual 8-Channel TDIF In 1.940.480/1.940.481



Two TDIF inputs are routed to the TDM bus, where they are read from a MADO card and can then be output through a MADI link.
The second version of this card (1.940.481) is equipped with additional AES/EBU outputs for standalone applications. For this purpose, also an AES/EBU receiver for synchronization, output transformers, and drivers are provided.
The input sampling frequency can be between 28 kHz and 55 kHz.
The TDM output occupies the addresses of 4 slots (16 signals). The addresses are set via DIP switches. In cases where only one TDIF input is needed, it is possible to use eight TDM signals only by setting a jumper (8/16CH) on the card.

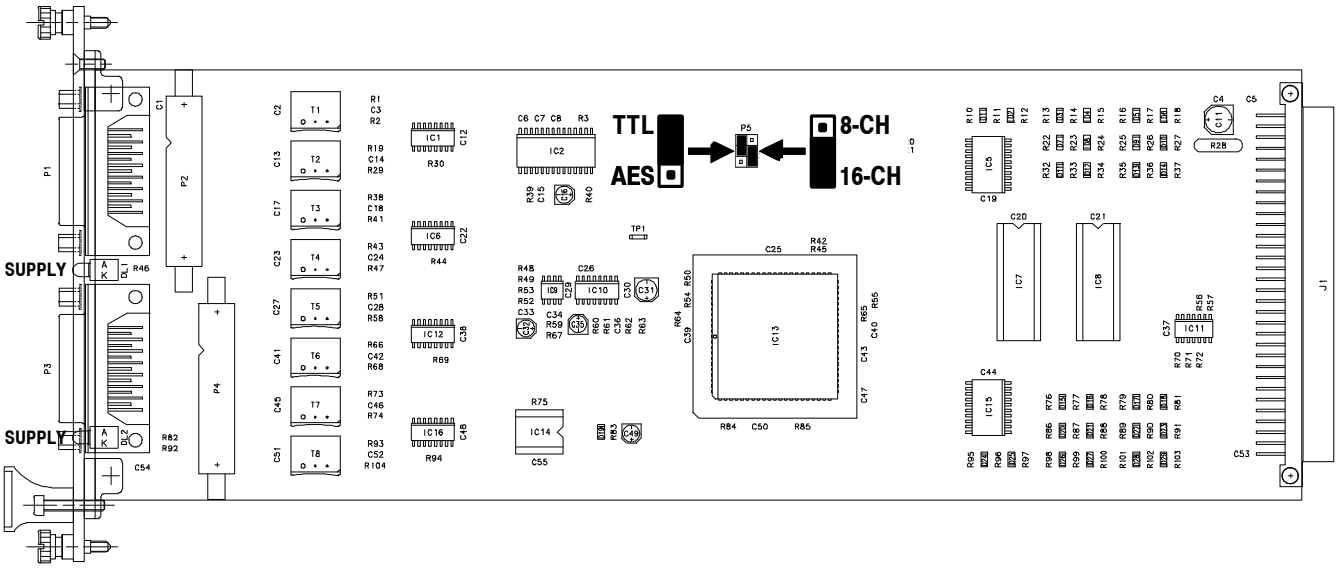
Sync: The synchronization comes usually from the TDM bus. In standalone applications an AES/EBU sync input provides the synchronization.



Configuration: On standard cards, the card address is given by the physical slot on the backplane itself; this means that the card in slot 0 occupies the channels 1 to 4, the second slot corresponds to channels 5 to 8, etc. Since the TDIF card provides 16 inputs instead of 4, the card addresses have to be configured via DIP switches (card addresses 0 to 12).

Please be careful to correctly set the card addresses because of potential conflicts with other cards. Typically, the lower slots are used for standard 4-channel cards; the TDIF interfaces are moved to the higher addresses.

Card address	CH no., single input used	CH no., both inputs used	DIP Switch 1	2	3	4
0	1...8	1...16	on	on	on	on
1	5...12	5...20	**off**	on	on	on
2	9...16	9...24	on	**off**	on	on
3	13...20	13...28	**off**	**off**	on	on
4	17...24	17...32	on	on	**off**	on
5	21...28	21...36	**off**	on	**off**	on
6	25...32	25...40	on	**off**	**off**	on
7	29...36	29...44	**off**	**off**	**off**	on
8	33...40	33...48	on	on	on	**off**
9	37...44	37...52	**off**	on	on	**off**
10	41...48	41...56	on	**off**	on	**off**
11	45...52	not allowed	**off**	**off**	on	**off**
12	49...56	not allowed	on	on	**off**	**off**



LED: *SUPPLY* Indicates "power on" status *(this LED is located in different positions for the two versions 1.940.480 and 1.940.481).*

Jumpers: *8-CH / 16-CH* Switchover between 8 or 16 channels to TDM bus.
TTL / AES Sync selection – from TDM bus, or from AES/EBU sync input *(this jumper is available for version 1.940.481 only).*

Technical Data:

AES/EBU input (1.940.481 only)	Input impedance		110 Ω
	Input sensitivity		min. 200 mV
AES/EBU outputs (1.940.481 only)	Output impedance		110 Ω
	Output level (into 110 Ω)		5 V
TDIF input			according to TDIF specifications
Current consumption	5 V	1.940.480	max. 0.3 A
		1.940.481	max. 0.7 A
Input sampling frequency			28...55 kHz
Operating temperature range			0...40° C

TDIF Interface PCB

Both a TDIF input and a TDIF output card can be connected to one of the two 25-pin D-type sockets on the TDIF Interface PCB 1.940.632. In this way, the inputs and outputs of two 8-channel digital recorders (e.g. DA-88) may be connected with one single cable each.
For the connection to the backplane, two 16-pin flat cables are used. Furthermore, the TDIF Interface PCB connects to a BNC connector panel handling the sync signals.

Note: The TDIF interface is suitable for short distances only. Even with high-quality cable, a length of 5 m must not be exceeded.

DA-88 Synchronization:

When using, for example, a DA-88 unit, a word clock signal must be sent over a separate line, because the DA-88 cannot sync to the LRCK signal. For this purpose, the BNC Board 1.940.633 is available. It can be connected to the TDIF Interface Card 1.940.632.

Note: *The phase position of the word clock signal is very critical. No other word clock signal must be used in this application.*

Pin Assignment: TDIF Interface (25-pin D-type female):

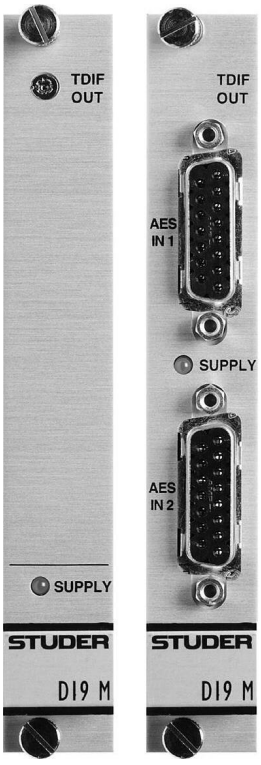
Pin	Signal	Pin	Signal
1	(DOUT 1/2)	14	(GND)
2	(DOUT 3/4)	15	(GND)
3	(DOUT 5/6)	16	(GND)
4	(DOUT 7/8)	17	(GND)
5	(LRCK OUT)	18	(EMPHASIS OUT)
6	(FS 1 OUT)	19	(FS 0 OUT)
7	-	**20**	**FS 0 IN**
8	**FS 1 IN**	**21**	**EMPHASIS IN**
9	**LRCK IN**	**22**	**GND**
10	**DIN 7/8**	**23**	**GND**
11	**DIN 5/6**	**24**	**GND**
12	**DIN 3/4**	**25**	**GND**
13	**DIN 1/2**		

Pin Assignment: 96-pin DIN 41612 female

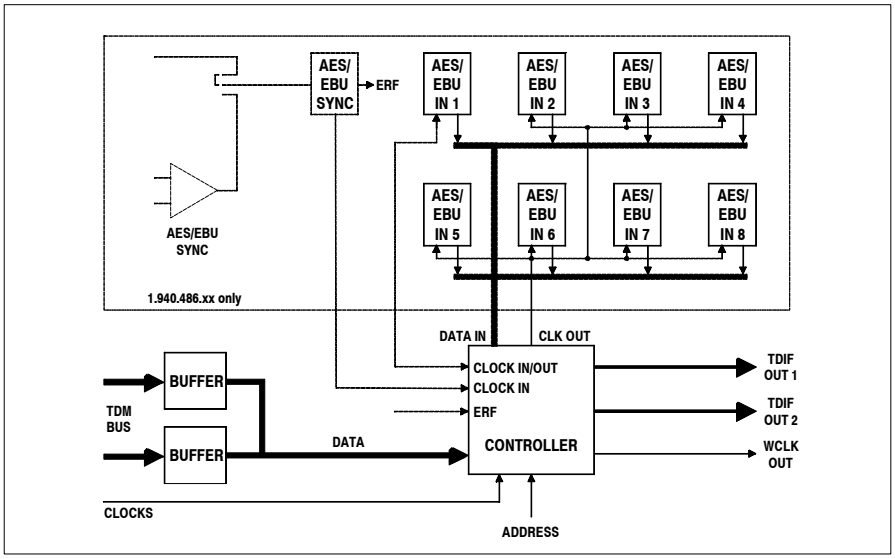
Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC-
6	/TD 0 IN	GND	/TD 2 IN
7	/TD 4 IN	GND	/TD 6 IN
8		GND	FS 2 0 IN
9	LRCK 0 IN	GND	/EMPH 0 IN
10	/D0		/D8
11	/D1		/D9
12	/D2		/D10
13	/D3		/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22	/TD 8 IN		/TD 10 IN
23	MGND	MGND	MGND
24	/TD 12 IN		/TD 14 IN
25	MGND	MGND	MGND
26			FS 2 1 IN
27	MGND	MGND	MGND
28	LRCK 1 IN		/EMPH 1 IN
29			
30			
31			
32	MGND	MGND	MGND

MGND	Chassis
GND	Ground
AES/DSD BUS	TDM bus active
/TD 0 ... 14	TDIF input data
/D0...D15	TDM bus data inverted
/FRAME, /CK128	Clocks TDM Bus

2.4.2 D19m TDIFO – Dual 8-Channel TDIF Out 1.940.485/1.940.486

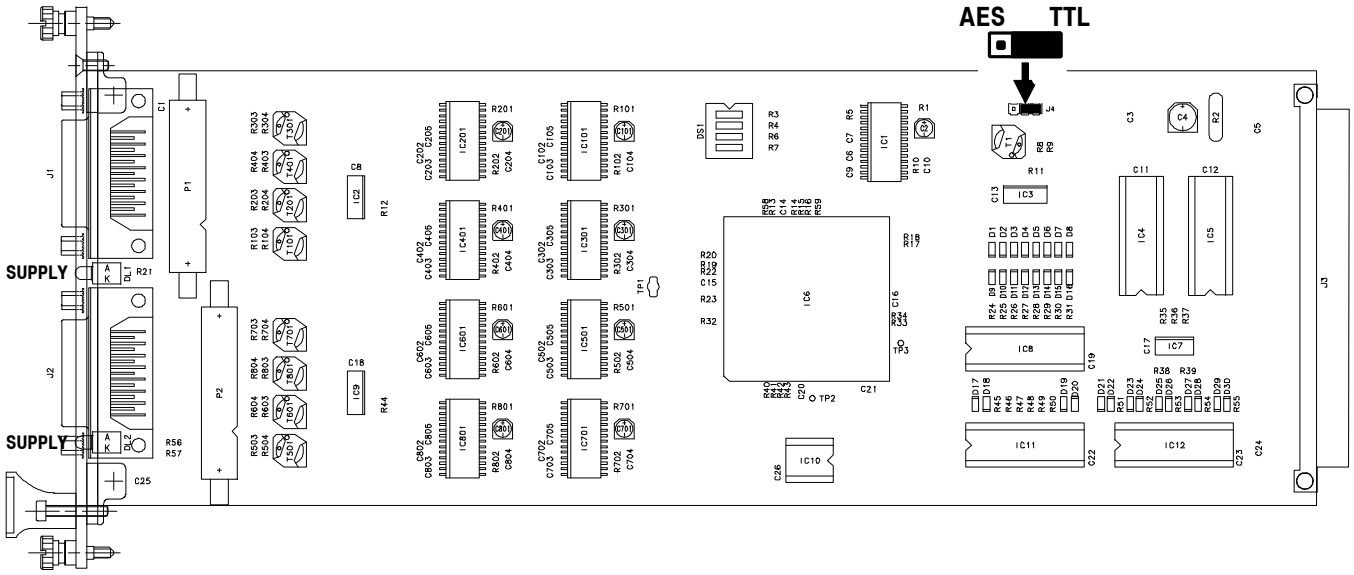


The TDIFO card converts the TDM bus signals to the TDIF format. 2 × 8 channels can be processed simultaneously, audio resolution is 24 bit. Emphasis information is taken from the first channel, because the TDIF format has a common emphasis information for all channels only. The card is synchronized with the frame and the CK128 clocks of the TDM bus.
The addressing must be done with four DIP switches on the backplane. For this card, it cannot be performed automatically because more than four audio channels are processed.
The second version of the TDIFO card (1.940.496) is designed for standalone mode. It is equipped with four additional AES/EBU receivers per TDIF output. A jumper on the backplane switches the ITDM signal that selects whether the card reads from the TDM bus or from the AES/EBU receivers. In standalone mode, a separate AES/EBU signal is used for synchronization of the card. The source of this sync signal is selected with a jumper, either from the TDM bus or from a separate input. If the sync signal should be missing, the synchronization is automatically taken from the first AES/EBU input.



Configuration: Usually, the D19m cards are addressed just by plugging them into a slot of the D19m rack. The first card has address 0 (CH1...4), the second card has address 1 (CH5...8), etc. The TDIFO card, however, processes 16 mono channels, and thus requires a specific address setting.

DIP switch No.				
1	2	3	4	Address
on	on	on	on	1...16
off	on	on	on	5...20
on	**off**	on	on	9...24
off	**off**	on	on	13...28
on	on	**off**	on	17...32
off	on	**off**	on	21...36
on	**off**	**off**	on	25...40
off	**off**	**off**	on	29...44
on	on	on	**off**	33...48
off	on	on	**off**	37...52
on	**off**	on	**off**	41...56
off	**off**	on	**off**	45...60
on	on	**off**	**off**	49...64



LED: *SUPPLY* Indicates "power on" status *(this LED is located in different positions for the two versions 1.940.485 and 1.940.486).*

Jumper: *AES / TTL* The standalone version 1.940.486 has a jumper, selecting the synchronization from the separate sync input (AES) or from the TDM bus (TTL).

Technical Data:

AES/EBU input (1.940.496 only)	Input impedance		110 Ω
	Input sensitivity		200 mV
TDIF output			according to TDIF specifications
Current consumption	5 V	1.940.485	max. 0.25 A
		1.940.486	max. 0.35 A
Sampling frequency			28...55 kHz
Operating temperature range			0...40° C

TDIF Interface PCB

Both a TDIF input and a TDIF output card can be connected to one of the two 25-pin D-type sockets on the TDIF Interface PCB 1.940.632. In this way, the inputs and outputs of two 8-channel digital recorders (e.g. DA-88) may be connected with one single cable each.

For the connection to the backplane, two 16-pin flat cables are used. Furthermore, the TDIF Interface PCB connects to a BNC connector panel handling the sync signals.

Note: The TDIF interface is suitable for short distances only. Even with high-quality cable, a length of 5 m must not be exceeded.

Pin Assignment:

TDIF Interface (25-pin D-type socket):

Pin	Signal	Pin	Signal
1	**DOUT 1/2**	**14**	**GND**
2	**DOUT 3/4**	**15**	**GND**
3	**DOUT 5/6**	**16**	**GND**
4	**DOUT 7/8**	**17**	**GND**
5	**LRCK OUT**	**18**	**EMPHASIS OUT**
6	**FS 1 OUT**	**19**	**FS 0 OUT**
7	**-**	20	(FS 0 IN)
8	(FS 1 IN)	21	(EMPHASIS IN)
9	(LRCK IN)	22	(GND)
10	(DIN 7/8)	23	(GND)
11	(DIN 5/6)	24	(GND)
12	(DIN 3/4)	25	(GND)
13	(DIN 1/2)		

Synchronization:

When using, for example, a DA-88 unit, a word clock signal must be sent over a separate line, because the DA-88 cannot sync to the LRCK signal. For this purpose, the BNC Board 1.940.633 is available. It can be connected to the TDIF Interface Card 1.940.632.

Note: *The phase position of the word clock signal is very critical. No other word clock signal must be used in this application.*

Pin Assignment:

96-pin DIN 41612 female

Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESS+	GND	AESS-
6	/TD0 OUT	GND	/TD2 OUT
7	/TD4 OUT	GND	/TD6 OUT
8	WSYNC OUT	GND	FS1 OUT
9	LRCK OUT	GND	/EMPH OUT
10	/D0		/D8
11	/D1		/D9
12	/D2		/D10
13	/D3		/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22	/TD8 OUT		/TD10 OUT
23	MGND	MGND	MGND
24	/TD12 OUT	MGND	/TD14 OUT
25	MGND	MGND	MGND
26	WSYNC OUT	MGND	FS2 OUT
27	MGND	MGND	MGND
28	LRCK OUT	MGND	/EMPH OUT
29	AGND	AGND	AGND
30			
31			
32	MGND	MGND	MGND

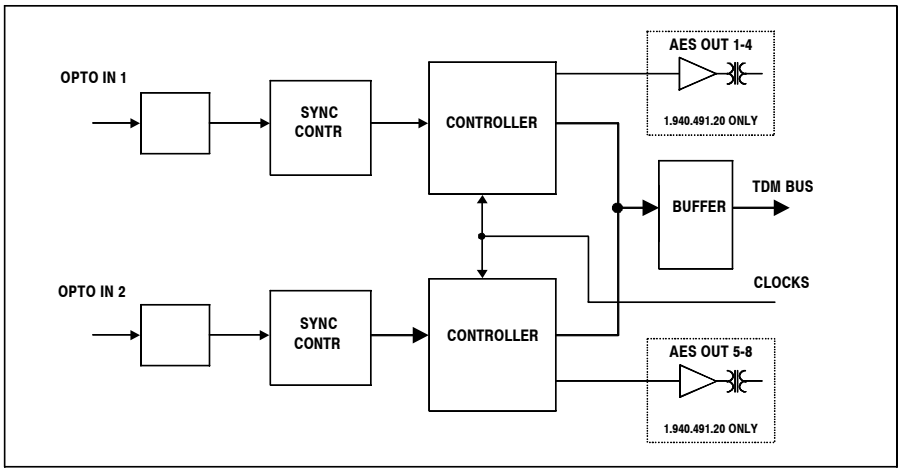
SYNC	AES/EBU SYNC TTL
AESS	AES/EBU SYNC balanced
/TD0 ... /TD14	TDIF data
WSYNC	Word clock for sync
/AES/DSD BUS	
/D0 ... /D15	TDM DATABUS

2.5 ADAT I/O Cards

2.5.1 D19m ADATI – Dual 8-Channel ADAT In 1.940.490/1.940.491

Two optical ADAT inputs are routed to the TDM bus, where they are read from a MADO card and can then be output through a MADI link.
The card 1.940.491 is equipped with additional AES/EBU outputs for standalone applications. For this purpose, also an AES/EBU receiver for synchronization, output transformers, and drivers are provided.
The input sampling frequency can be between 25 kHz and 55 kHz.
The ADAT format does not contain channel status information, the C-bits are set to default (not indicated). Max. 24 bits of audio are transmitted.
The TDM output occupies the addresses of 4 slots (16 signals). The addresses are set via DIP switches. If only one optical input is needed, it is possible to use eight TDM signals only by setting a jumper (8/16CH).

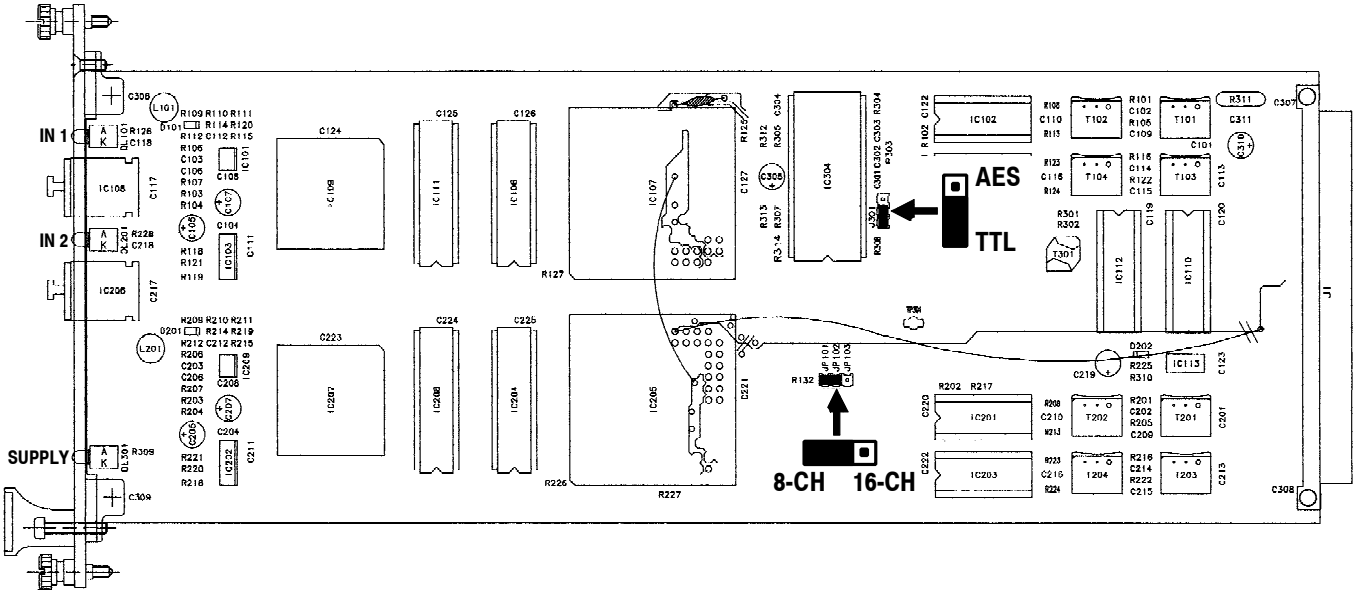
Synchronization: The synchronization comes usually from the TDM bus. In standalone applications an AES/EBU sync input or the optical input provides the synchronization.



Configuration: On standard cards, the card address is given by the physical slot on the backplane itself; this means that the card in slot 0 occupies the channels 1 to 4, the second slot corresponds to channels 5 to 8, etc. Since the ADAT card provides 16 inputs instead of 4, the card addresses have to be configured via DIP switches (card addresses 0 to 12).

Please be careful to correctly set the card addresses because of potential conflicts with other cards. Typically, the lower slots are used for standard 4-channel cards; the ADAT interfaces are moved to the higher addresses.

Card address	CH no., single input used	CH no., both inputs used	DIP Switch 1	2	3	4
0	1...8	1...16	on	on	on	on
1	5...12	5...20	**off**	on	on	on
2	9...16	9...24	on	**off**	on	on
3	13...20	13...28	**off**	**off**	on	on
4	17...24	17...32	on	on	**off**	on
5	21...28	21...36	**off**	on	**off**	on
6	25...32	25...40	on	**off**	**off**	on
7	29...36	29...44	**off**	**off**	**off**	on
8	33...40	33...48	on	on	on	**off**
9	37...44	37...52	**off**	on	on	**off**
10	41...48	41...56	on	**off**	on	**off**
11	45...52	not allowed	**off**	**off**	on	**off**
12	49...56	not allowed	on	on	**off**	**off**



LEDs:

	IN 1/2	Lock status for each ADAT input.
	SUPPLY	Indicates "power on" status.

Jumpers:

	8-CH / 16-CH	Switchover between 8 or 16 channels to TDM bus.
	AES / TTL	Synchronization from TDM Bus or from AES/EBU input.

Technical Data:

AES/EBU input (1.940.491 only)	Input impedance		110 Ω
	Input sensitivity		min. 200 mV
AES/EBU output (1.940.491 only)	Output impedance		110 Ω
	Output level (into 110 Ω)		5 V
Current consumption	5 V	1.940.490	max. 0.7 A
		1.940.491	max. 1.1 A
Input sampling frequency			28...55 kHz
Operating temperature range			0...40° C

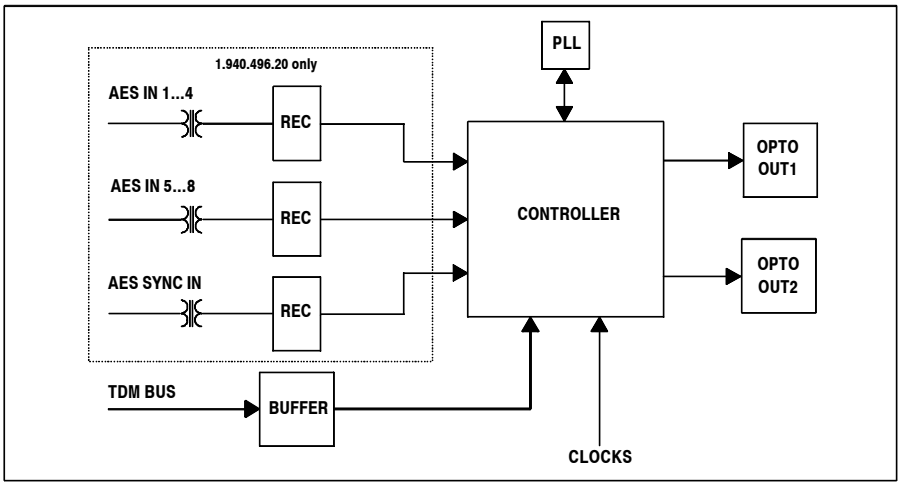
Pin Assignment: 96-pin DIN 41612 female

Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESSYNC+	GND	AESSYNC–
6	AES1OUT+	GND	AES1OUT–
7	AES2OUT+	GND	AES2OUT–
8	AES3OUT+	GND	AES3OUT–
9	AES4OUT+	GND	AES4OUT–
10	/D0	/BA0	/D8
11	/D1	/BA1	/D9
12	/D2	/BA2	/D10
13	/D3	/BA3	/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22	AES5OUT+		AES5OUT–
23	MGND	MGND	MGND
24	AES6OUT+		AES6OUT–
25	MGND	MGND	MGND
26	AES7OUT+		AES7OUT–
27	MGND	MGND	MGND
28	AES8OUT+		AES8OUT–
29			
30			
31			
32	MGND	MGND	MGND

MGND	Chassis
GND	Ground
AES/DSD BUS	TDM Bus active
BA0 .. BA3	Card address
/D0.../D15	Inverted TDM bus data
/FRAME, /CK128	Clocks TDM Bus

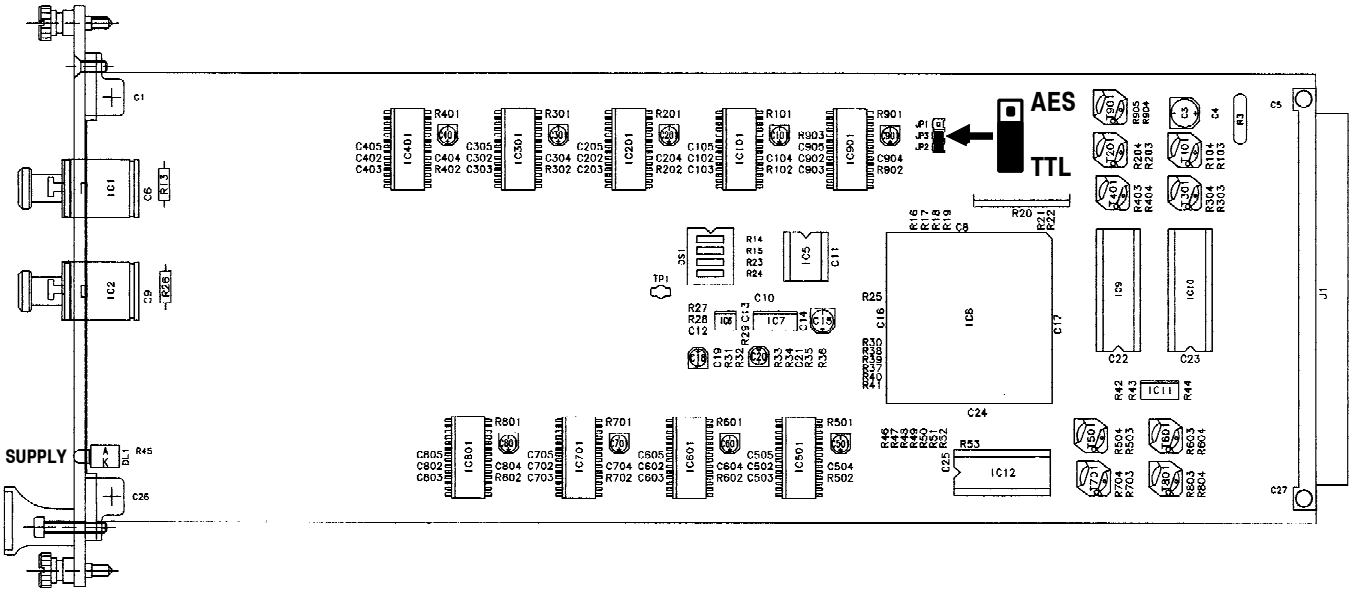
2.5.2 D19m ADATO – Dual 8-Channel ADAT Out 1.940.495/1.940.496

The ADATO card converts the TDM bus signals into the optical ADAT format. The card supports two 8-channel outputs for (plastic) optical fibre with a word length of up to 24 bits. The synchronization is taken from the TDM bus (CK128 clock). A PLL increases the clock rate to 256 × FS. The channel status bit is not supported by the ADAT format.
The addressing must be done with four DIP switches on the backplane. For this card, it cannot be performed automatically because more than four audio channels are processed.
The card can also be equipped with eight AES/EBU receivers and a separate sync input for standalone applications (order no. 1.940.496). The ITDM jumper on the backplane decides whether the sync signal is taken from the TDM bus or from the card itself. If it comes from the card itself, the sync is either taken from the separate sync input (as long as a valid signal is available) or from the first AES/EBU input.



Configuration: Usually, the D19m cards are addressed just by plugging them into a slot of the D19m rack. The first card has address 0 (CH1...4), the second card has address 1 (CH5...8), etc. The ADATO card, however, processes 16 mono channels, and thus requires a specific address setting.

DIP switch No.				
1	2	3	4	Address
on	on	on	on	1...16
off	on	on	on	5...20
on	**off**	on	on	9...24
off	**off**	on	on	13...28
on	on	**off**	on	17...32
off	on	**off**	on	21...36
on	**off**	**off**	on	25...40
off	**off**	**off**	on	29...44
on	on	on	**off**	33...48
off	on	on	**off**	37...52
on	**off**	on	**off**	41...56
off	**off**	on	**off**	45...60
on	on	**off**	**off**	49...64



LED: *SUPPLY* Indicates "power on" status.

Jumper: *TTL / AES* This jumper is available only on the standalone version (1.940.496) and defines whether the sync signal is taken from the TDM bus or from the separate sync input.

Technical Data:

AES/EBU input (1.940.496 only)	Sensitivity	200 mV
	Impedance	110 Ω
Optical output	Wave length	660 nm
	max. transmission distance	Approx. 3 m (optical fibre)
Power consumption	1.940.495: 5 V	0.2 A
	1.940.496: 5 V	0.4 A
Input sampling frequency		28...55 kHz
Temperature range		0...+40° C

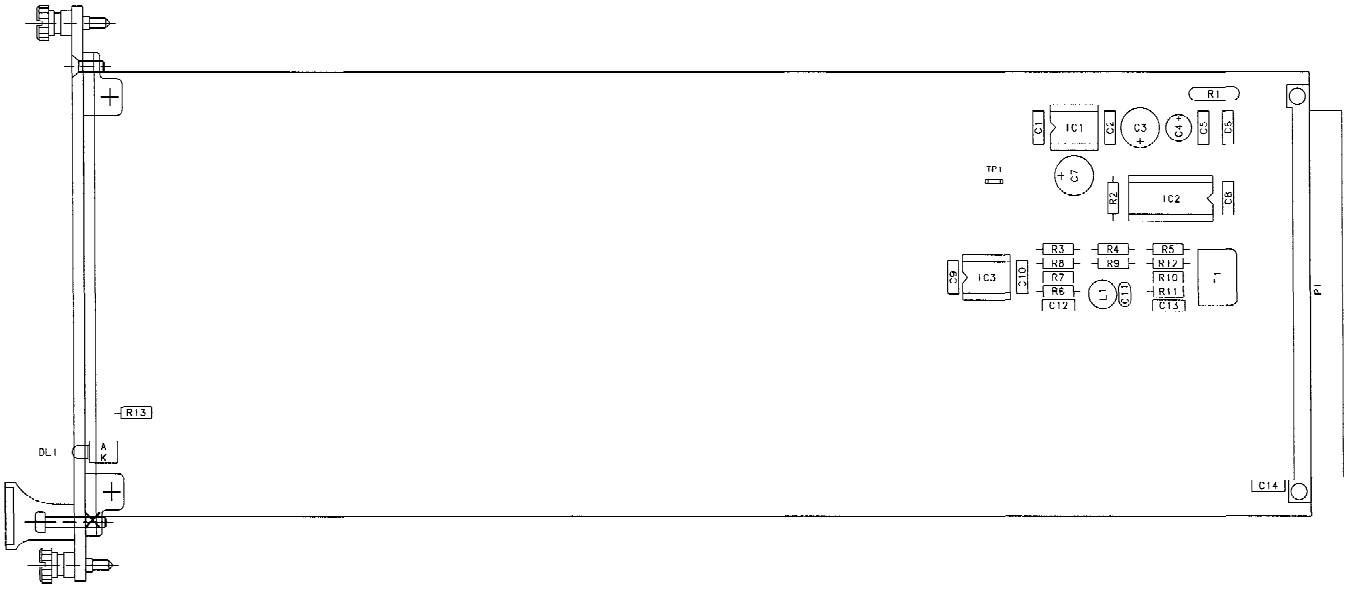
Pin Assignment: 96-pin DIN 41612 female

Pin	A	B	C
1	MGND	MGND	MGND
2	+5V	+5V	+5V
3	SYNC		
4	GND	GND	GND
5	AESS+	GND	AESS–
6	AES IN 1+	GND	AES IN 1–
7	AES IN 2+	GND	AES IN 2–
8	AES IN 3+	GND	AES IN 3–
9	AES IN 4+	GND	AES IN 4–
10	/D0		/D8
11	/D1		/D9
12	/D2		/D10
13	/D3		/D11
14	/D4	GND	/D12
15	/D5	/AES/DSD BUS	/D13
16	/D6	GND	/D14
17	/D7	GND	/D15
18	/FRAME	/CK128	
19	MGND	MGND	MGND
20			
21	MGND	MGND	MGND
22	AES IN 5+		AES IN 5–
23	MGND	MGND	MGND
24	AES IN 6+	MGND	AES IN 6–
25	MGND	MGND	MGND
26	AES IN 7+	MGND	AES IN 7–
27	MGND	MGND	MGND
28	AES IN 8+	MGND	AESIN 8–
29	AGND	AGND	AGND
30			
31			
32	MGND	MGND	MGND

SYNC	AES/EBU SYNC TTL
AESS	AES/EBU SYNC SYM
AES IN XX	AES/EBU inputs
AES/DSD BUS	Switchover standalone/TDM (Input in Slave Mode)
/D0.../D15	TDM DATABUS

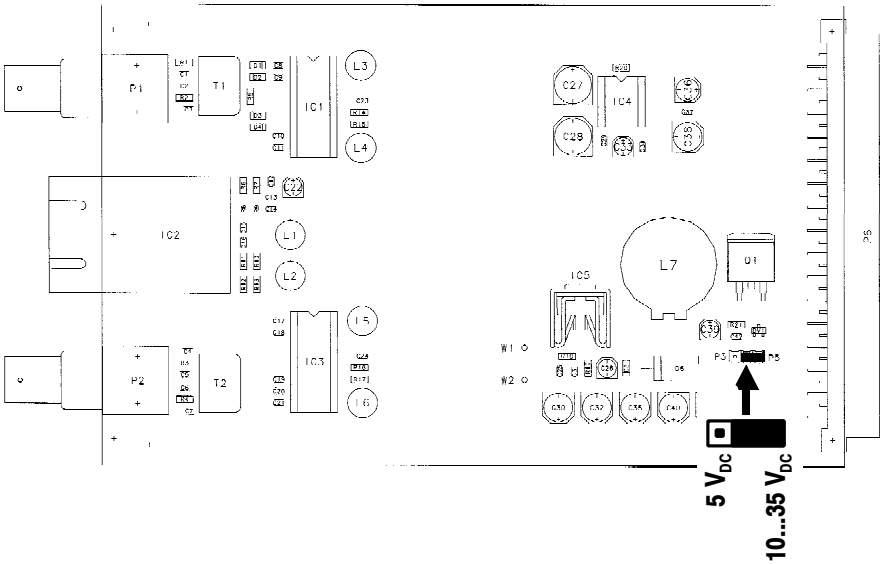
2.6 Miscellaneous Cards

2.6.1 D19m Sync Receiver 1.940.557



The sync receiver distributes an AES/EBU sync signal on the backplane and is required if several cards are used in standalone mode, without a MADI or a MADO card. This unit prevents that a separate sync signal must be wired for each card.

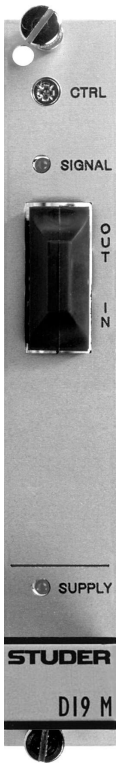
2.6.2 Optical/Coax Interface 1.940.558



The Optical/Coax Interface is used for converting MADI signals from optical into electrical signals and vice versa. It is a Euro card unit normally used for standalone application, e.g. in a 1U high ASC rack. For integration into a system, additional information is required; please apply to Studer in such a case.

It can be powered either with 5 V_{DC} or a with variable supply voltage of 10...35 V_{DC}, depending on the jumper setting.

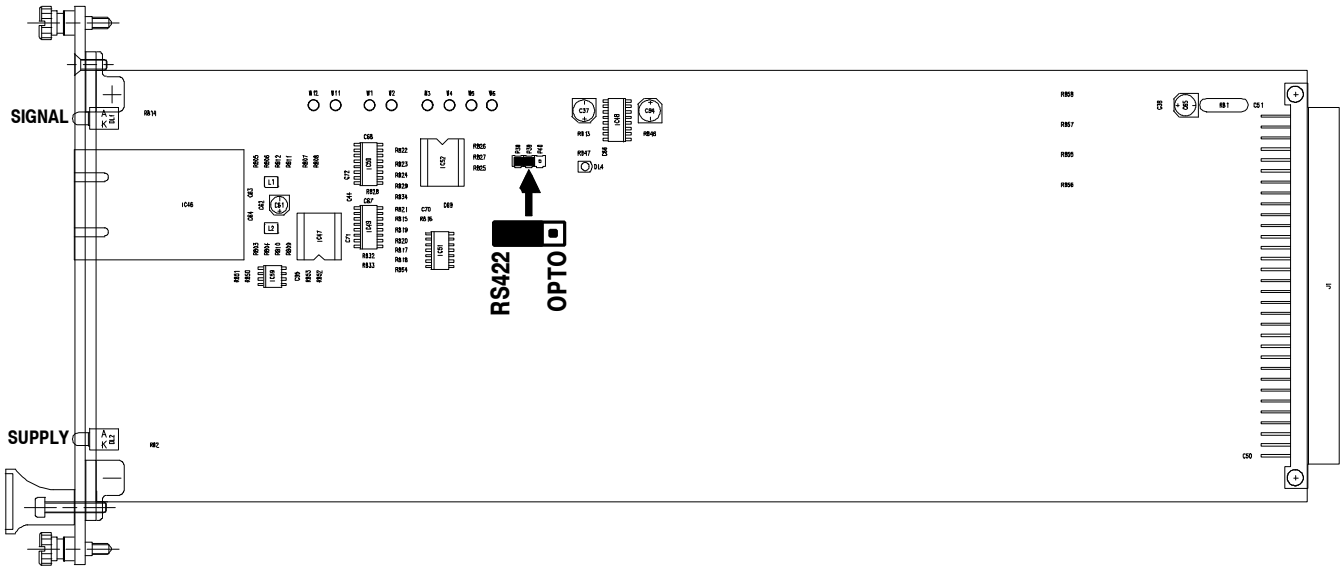
2.6.3 RS422-to-Optical Converter 1.940.579



This assembly is a partially equipped version of the D19m RCC card 1.940.576. It is used for the conversion of a balanced RS422 signal to an optical signal and vice versa between the stallion box and the RCC card.
It can be installed in any free slot of a D19m rack; operating voltage is 5 V.
The front panel LED displays either the send or the receive signal (jumper-selectable).
The RS422 signal is wired to the 96-pin DIN 41612 female connector.
Jumper diagram of the earlier version 1.940.577 at the end of this chapter.

Pin assignments:

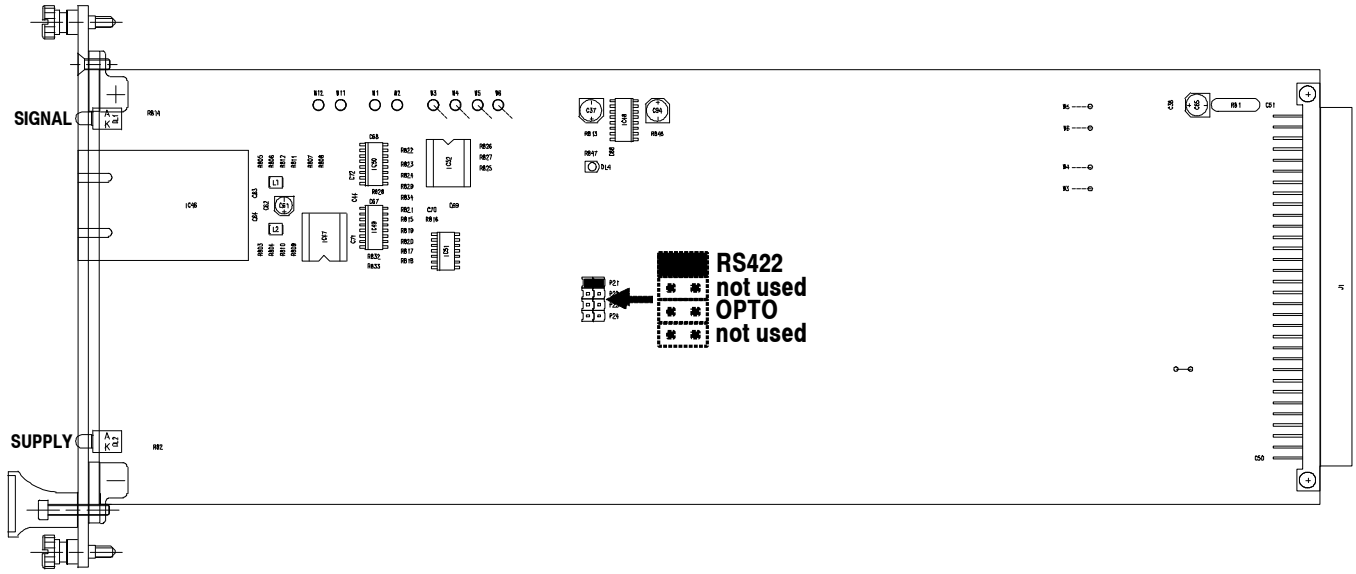
Signal	Pin on 96-pin DIN 41612 connector	Pin on flat cable connector on backplane
RA	7c	5
RB	7a	6
TA	6a	1
TB	6c	2



LED:
SUPPLY Indicates "power on" status.
SIGNAL Indicates the RS422 (send) or the OPTO (receive) signal, depending on the jumper setting.

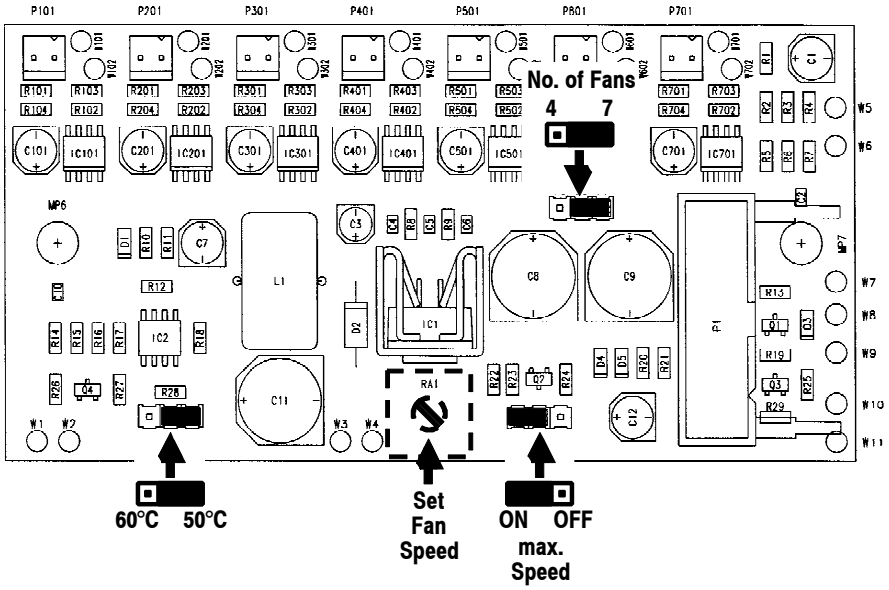
Jumper:
RS422 / OPTO In position "RS422", the SIGNAL LED indicates the send signal; in position "OPTO", it indicates the receive signal.

Earlier Version 1.940.577:



2.6.4 Fan Module 1.940.597

The Fan Module can be equipped with four or seven fan units. It contains the Fan Regulation Board 1.940.596. On this board, each fan unit is monitored, their speed can be adjusted, and if one of the fans should fail or be blocked, the alarm output and an optional LED are activated.
If temperature has to be monitored, too, an optional NTC can be connected; if the temperature exceeds a threshold (50 or 60° C, jumper-selectable), the alarm output is activated, too.



Jumpers/Settings:

RA1	To set the normal fan speed.
No. of Fans	This jumper must be set according to the number of used fans (4 or 7).
max. Speed	ON: If the selected temperature threshold is exceeded, the fans are switched to full speed (prerequisite: the optional NTC is connected).
60°C / 50°C	Selection of the threshold temperature.

Pin Assignment: 15-pin D-type

Pin	Signal	Pin	Signal
1	+15 V	2	n.c.
3	GND	4	n.c.
5	Alarm Relay +	6	n.c.
7	GND	8	n.c.
9	GND	10	n.c.
11	NTC	12	n.c.
13	GND	14	n.c.
15	Alarm LED +		

Alarm LED: An optional alarm LED can be connected between pin15 and one of the GND pins; a internal series resistor is provided. Also refer to the "Higher Supply Voltages" paragraph below.

Alarm Relay: The alarm relay is connected between the Alarm Relay + output and one of the GND pins. The output supplies 15 V; the output current must be matched to the relay coil with an appropriate series resistor. Max. output current is 100 mA. Also refer to the "Higher Supply Voltages" paragraph below.

Temperature Monitoring: For temperature monitoring, an NTC (57.99.0801) can be connected between pin11 and one of the GND pins. The NTC has to have the following specs:
Nominal resistance: 330 kΩ, @ 50° C: 100 kΩ, @ 60° C: 65 kΩ.

Supply: The usual supply voltage is 15 V. In a MUX or DEMUX rack, usually the negative supply rail is less loaded, so it can be sensible to connect the Fan Module to the negative supply rail as follows: Pin1 (+15 V) to supply GND, and one of the GND pins (3, 7, 9, or 13) to the –15 V supply.

Higher Supply Voltages: Supply voltages up to 30 V may be used.

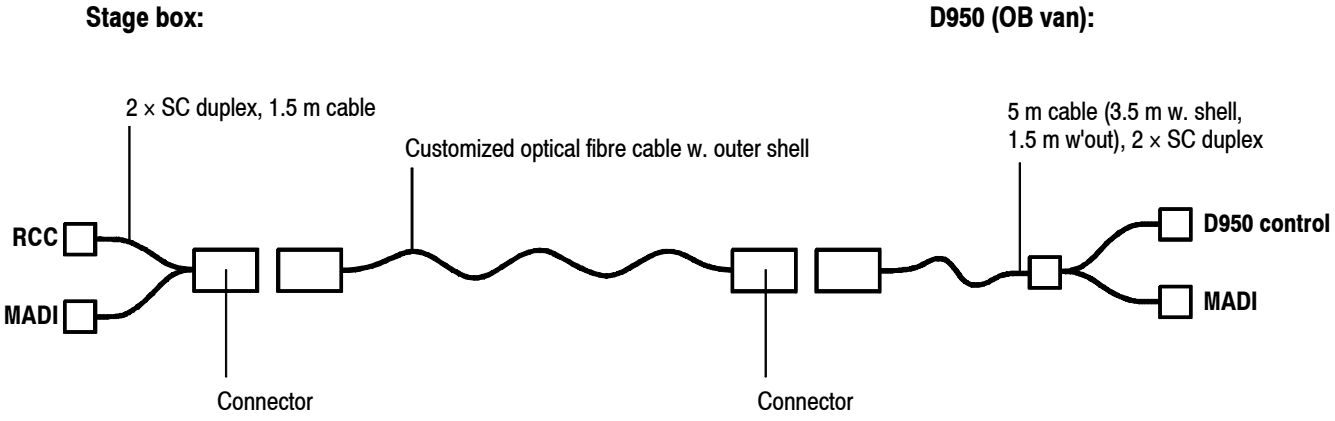
However, the "max. fan" jumper must always be set to OFF in such a case; otherwise, the fans would get too high a full-speed operating voltage at over-temperature conditions. The alarm relay and the alarm LED series resistor, too, must then be matched to the corresponding, higher operating voltage.

3 STAGEBOX APPLICATION FOR D950 MIXING SYSTEM

Some points have to be considered for a stagebox setup with the mixing console D950:

- The D950 is always the star point if multiple stageboxes are used; the Stageboxes *cannot* be connected in series, because the control signals cannot be transferred from one Remote Controller Card (RCC) to another, and the control signals for two cards cannot be merged.
- A frame can hold input and output cards (mixed arrangement); in such a case, the ratio of inputs to outputs is defined in the MADO software (EPROM).
- The connection to the D950 can be done in two ways. Standard is to use four optical fibre cables for MADI and control signals (MADI in/out, control receive/transmit). The other way is to use four separate copper cables or a combination of both for the four signals. The control signals are standard RS232/RS422 or MIDI connections. This also gives the possibility to connect the system to another mixing console, provided the correct software protocols are implemented.
- Cooling is a important point to be carefully considered in designing a stagebox. A fan is absolutely necessary as soon as the system holds more than 5...6 Mic/Line and A/D pairs.
- It is possible to combine D19m Mic/Line cards with D19 MicADs in a D950 system. However, in such a combination separate control lines are required for the two systems.

3.1 Example: Stage Box for OB-Van with Optical Fibre Cables



Customized optical fibre cable units, consisting of:
LEMO series 4K connectors on both ends:
- for 4 type F2 ceramic optical fibre contacts
- with anti-kink bush, black, type FGG.4K.03C.CLZ.800A, and 4 type F2, FFS.F2.BB2.LCE30 contacts.

Cable type:
- M.051.04.A.9, roll on/roll off, camera cable
- 4 x 62.5/125, approx. 6.6 mm dia.
- Cable length can be customized.

In addition, on both the stage box and the D950 ends, a customized cable is required.

D950 Side 1 (rear panel):
- LEMO panel socket with strain-relieve, Type PKG.4K.03C.CLZ.800A

Side 2 (MADI card, Control card):
- 2 x SC-Duplex, cable type LM.051.04.A.9, cable length 5.0 m, 1.5 m of which without outer shell

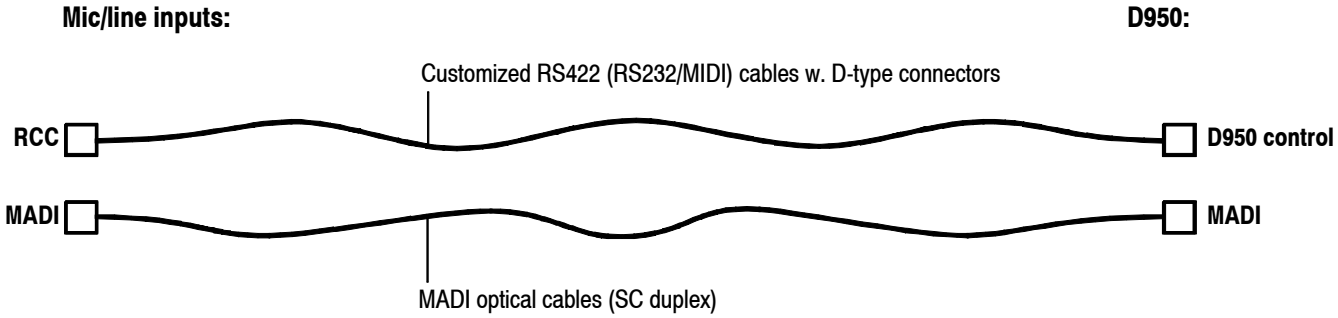
Stagebox as above, but with following cable type: Single lines from LM.051.04.A.9, length 1.5 m.

The connecting card on the D950 is identical with the RCC (same card), but is inserted in two different ways:

Standard The connecting card is inserted into a D19m frame, which is in most cases available in the main D950 rack. The D19m frame is used for mechanical hold and power supply. From there, a serial cable goes to the Stallion box, and optical cables to the stagebox.

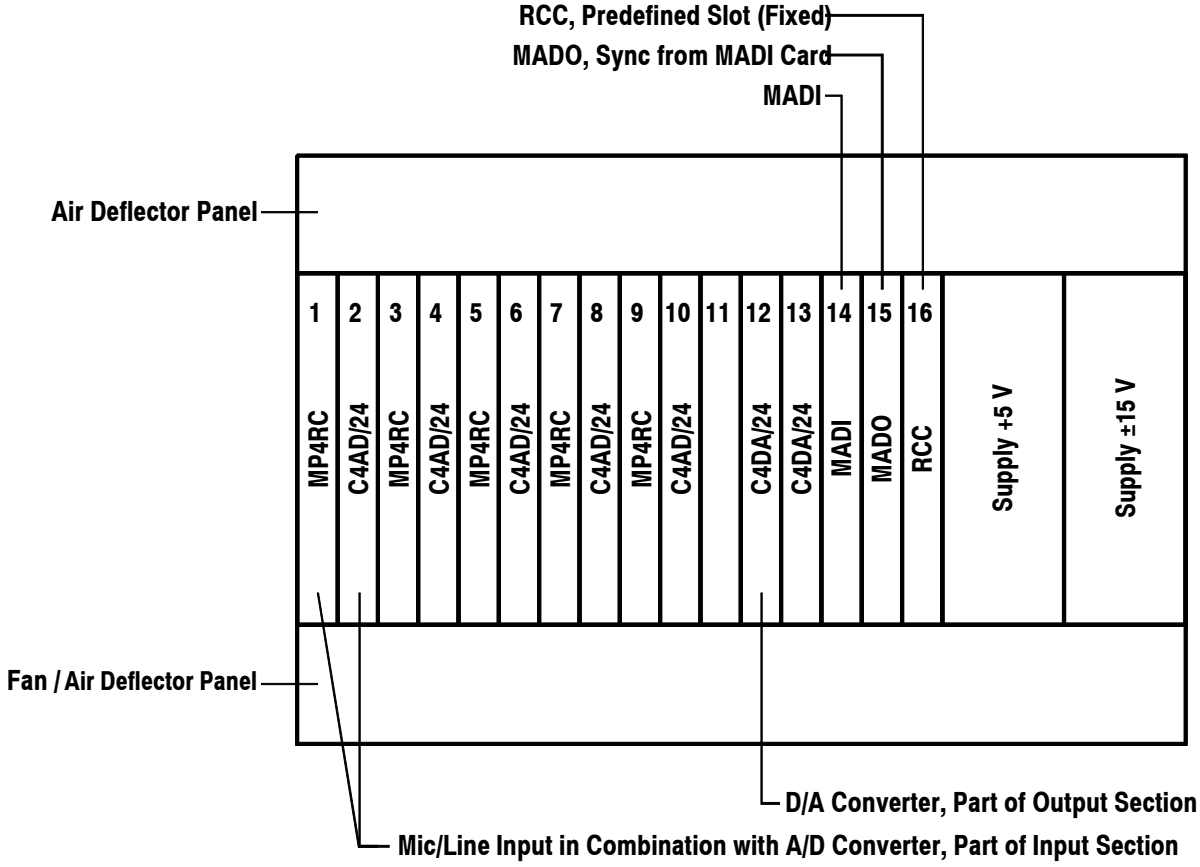
Alternative The connecting card is installed into a separate box with its own power supply and connectors.

3.2 Example: Mic/Line Inputs for Stationary Application



3.3 Typical Stagebox Configurations

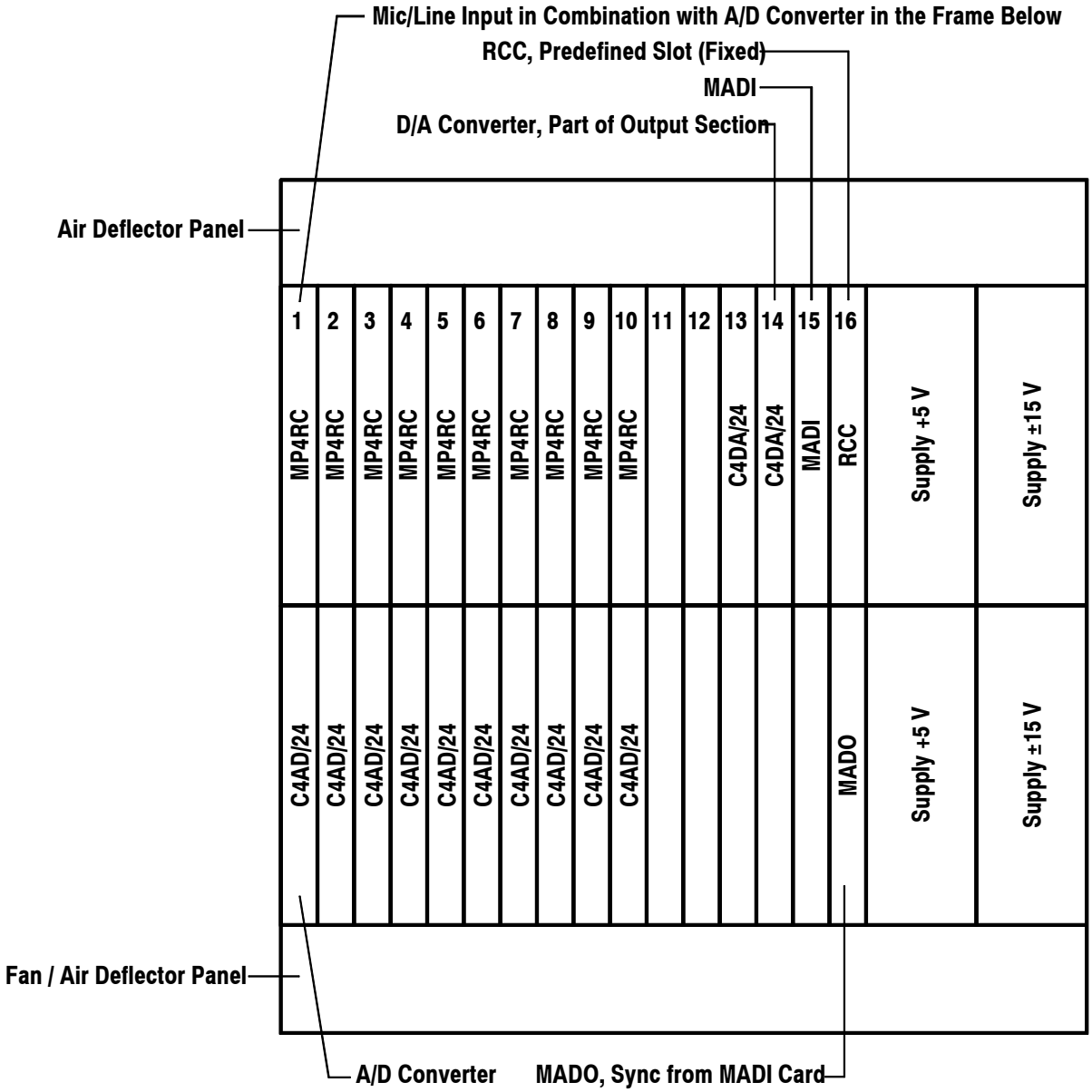
3.3.1 Single Rack with Mic/Line Inputs and Line Outputs (min. height 5 units)



Note: The size of the input and output sections is set in the MADO software.

Alternate possibility: If no output cards are installed within the system, it can be used as a standard MUX frame for Mic/Line inputs.

3.3.2 Double Rack with Mic/Line Inputs and Line Outputs (min. height 8 units)



Note: The size of the input and output sections is set in the MADO software.

Alternate Possibility: If no output cards are installed within the system, it can be used as a standard MUX frame for Mic/Line inputs.

4 RCC/MP4RC – MIDI SOFTWARE PROTOCOLS

STUDER D19m STAGE BOX (MP4RC) MIDI Implementation Date: 14.01.99
I. MIDI Implementation Chart Version: Preliminary

Function		Transmitted	Recognized	Remarks
Basic	Default	1	1	
Channel	Changed	1 - 16	1 - 16	Memorized
Mode	Default			
	Messages		Mode 3	
	Altered			
Note		x	x	
Number	True Voice			
Velocity	Note ON	x	x	
	Note OFF	x	x	
After	Key's	x	x	
Touch	Channel's	x	x	
Pitch Bender		x	x	
Control			16 - 19	MIC Sensit. Ch.1-4
Change			24 - 27	LINE Sensit.Ch.1-4
			67	SOFT CLIP ON/OFF
			68 - 71	MIC/LINE Selector
			72 - 75	Phantom Power
			76 - 79	HiPass Filter
			80 - 81	MIC STEREO LINK
			85 - 86	LINE STEREO LINK
			91 - 92*	Relay 1-8 Pattern
		93 - 94*	93 - 94*	Opto Coupl.1-8 Pat.
			120	Gain Test Ch. 1-4
				* only valid on MIDI Channel 16
Program		x	x	
Change	True#			
System Exclusive		o	o	
System	:Song Pos	x	x	
	:Song Sel	x	x	
Common	:Tune	x	x	
System	:Clock	x	x	
Real Time	:Commands	x	x	
Aux	:Local ON/OFF	x	x	
Mes-	:All Notes OFF	x	x	
sages	:Active Sense	x	x	
	:Reset	x	o	

Mode 1: OMNI ON, POLY Mode 2: OMNI ON, MONO o: Yes
Mode 3: OMNI OFF, POLY Mode 4: OMNI OFF, MONO x: No

STUDER D19 STAGE BOX (MP4RC) MIDI Implementation

II. Recognized MIDI Messages

1.0 Control Change

Status	1011nnnn	(Bn) n = MIDI channel number-1		Note 1
Controller no.	0ccccccc			
Controller val.	0vvvvvvv			
c = 16	MIC Sensit.Ch.1	v = 20	+00 dBu dig. fullscale	
		v = 21	-01 dBu "	"
		. . ..	... ... "	"
		. . ..	... ... "	"
		v = 39	-19 dBu "	"
		v = 40	-20 dBu "	"
		v = 41	-21 dBu "	"
		. . ..	... ... "	"
		. . ..	... ... "	"
		v = 79	-59 dBu "	"
		v = 80 - 127	-60 dBu "	"
c = 17	MIC Sensit.Ch.2	v = 20 - 127	+00 dBu .. -60 dBu	
c = 18	MIC Sensit.Ch.3	v = 20 - 127	+00 dBu .. -60 dBu	
c = 19	MIC Sensit.Ch.4	v = 20 - 127	+00 dBu .. -60 dBu	
c = 24	LINE Sensi.Ch.1	v = 0	+24 dBu dig. fullscale	
		v = 1	+23 dBu "	"
		. . ..	... ... "	"
		. . ..	... ... "	"
		v = 23	+ 1 dBu "	"
		v = 24	+ 0 dBu "	"
		v = 25	- 1 dBu "	"
		. . ..	... ... "	"
		. . ..	... ... "	"
		v = 34 - 127	-10 dBu "	"
c = 25	LINE Sensi.Ch.2	v = 0 - 127	+24 dBu .. -10 dBu	
c = 26	LINE Sensi.Ch.3	v = 0 - 127	+24 dBu .. -10 dBu	
c = 27	LINE Sensi.Ch.4	v = 0 - 127	+24 dBu .. -10 dBu	
c = 67	SOFT CLIPPER	v = 0	Soft Clip OFF	Note 2
		v = 1 - 127	Soft Clip ON	
c = 68	MIC/LINE Ch.1	v = 0	Input Selector MIC	
		v = 1 - 127	Input Selector LINE	
c = 69	MIC/LINE Ch.2	v = 0 - 127	Input Selector MIC/LINE	
c = 70	MIC/LINE Ch.3	v = 0 - 127	Input Selector MIC/LINE	
c = 71	MIC/LINE Ch.4	v = 0 - 127	Input Selector MIC/LINE	
c = 72	Phantom P. Ch.1	v = 0	Phantom Power OFF	
		v = 1 - 127	Phantom Power ON	
c = 73	Phantom P. Ch.2	v = 0 - 127	Phantom Power ON/OFF	
c = 74	Phantom P. Ch.3	v = 0 - 127	Phantom Power ON/OFF	
c = 75	Phantom P. Ch.4	v = 0 - 127	Phantom Power ON/OFF	
c = 76	HiPass Flt.Ch.1	v = 0	HiPass Filter OFF	
		v = 1 - 127	HiPass Filter ON	
c = 77	HiPass Flt.Ch.2	v = 0 - 127	HiPass Filter ON/OFF	
c = 78	HiPass Flt.Ch.3	v = 0 - 127	HiPass Filter ON/OFF	
c = 79	HiPass Flt.Ch.4	v = 0 - 127	HiPass Filter ON/OFF	
c = 80	STEREO MIC 1/2	v = 0	Independent MIC 1/2	
		v = 1 - 127	STEREO MIC 1/2	Note 5
c = 81	STEREO MIC 3/4	v = 0 - 127	STEREO MIC 3/4	

c = 85	STEREO LINE 1/2	v =	0	Independent LINE 1/2
		v =	1 - 127	STEREO LINE 1/2 Note 5
c = 86	STEREO LINE 3/4	v =	0 - 127	STEREO LINE 3/4
c = 91	REL.1-4 Pattern	v =	0000xxx0	Relay 1 OFF
		v =	0000xxx1	Relay 1 ON
		v =	0000xx0x	Relay 2 OFF
		v =	0000xx1x	Relay 2 ON
		v =	0000x0xx	Relay 3 OFF
		v =	0000x1xx	Relay 3 ON
		v =	00000xxx	Relay 4 OFF
		v =	00001xxx	Relay 4 ON
c = 92	REL.5-8 Pattern	v =	0000yyyy	Relay 5-8 ON/OFF
c = 93	OPTO 1-4 Req.	v =	0	OPTO 1-4 Request without sending Update on next Change
		v =	1	OPTO 1-4 Request with sending Update on next Change
c = 94	OPTO 5-8 Req.	v =	0 - 1	OPTO 5-8 Request
c = 120	GAIN TEST	v =	0	Gain test OFF Note 3
		v =	1	Gain Test on Ch. 1
		v =	2	Gain Test on Ch. 2
		v =	3	Gain Test on Ch. 3
		v =	4	Gain Test on Ch. 4
c = 121	SYSTEM RESET	v =	0	Set Default val. Note 4

Note 1: Preamp related Parameters on MIDI ch. 1 - 15
Relay res. Opto 1-8 Pattern (c = 91,92 resp. 93,94) only on MIDI ch. 16

Note 2: Soft Clip ON/OFF common for all 4 Preamp channels

Note 3: Gain Test set to OFF on any other Control Change message

Note 4: Individual MP4RC System Reset if recognized on MIDI ch. 1 - 15
Global D19 Stagebox Reset (all MP4RCs) if recognized on MIDI ch.16

Note 5: If STEREO MIC or LINE LINK is active, all channel related parameters on ch.1&2 resp. on ch.3&4 are controlled in parallel from ch.1 resp. ch.3 except for the Sensitivity parameters. If STEREO MIC LINK is ON and STEREO LINE LINK is OFF all channel related parameters including MIC Sensitivity but excluding LINE Sensitivity are linked and vice versa. Leaving the STEREO LINK Mode all channel settings on ch.2 resp. ch.4 must be restored to the state before the STEREO LINK was active.

Examples to Note 5:

1. Suppose STEREO MIC & LINE LINK 1/2 is OFF

	Channel 1	Channel 2
MIC Sens:	25	35
LINE Sens:	5	10
MIC/LINE Sel:	MIC	LINE
Phantom P:	ON	OFF
HiPass Flt.:	OFF	ON

2. STEREO MIC LINK 1/2 OFF->ON; STEREO LINE LINK remains OFF

	Channel 1	Channel 2
MIC Sens:	25	25
LINE Sens:	5	10
MIC/LINE Sel:	MIC	MIC
Phantom P:	ON	ON
HiPass Flt.:	OFF	OFF

3. MIC Sens Ch.1 25->30, Ch.2 35->40; LINE Sens. Ch.1 5->8, Ch.2 10-15; MIC/LINE Ch.1 MIC->LINE, Ch.2 LINE->MIC

	Channel 1	Channel 2
MIC Sens:	30	30
LINE Sens:	8	15
MIC/LINE Sel:	LINE	LINE
Phantom P:	ON	ON
HiPass Flt.:	OFF	OFF

4. STEREO MIC LINK 1/2 ON->OFF; STEREO LINE LINK OFF->ON

	Channel 1	Channel 2
MIC Sens:	30	40
LINE Sens:	8	8
MIC/LINE Sel:	LINE	LINE
Phantom P:	ON	ON
HiPass Flt.:	OFF	OFF

5. STEREO MIC LINK 1/2 remains OFF; STEREO LINE LINK ON->OFF

	Channel 1	Channel 2
MIC Sens:	30	40
LINE Sens:	8	15
MIC/LINE Sel:	LINE	MIC
Phantom P:	ON	OFF
HiPass Flt.:	OFF	ON

2.0 System Exclusive

No device-specific System Exclusive messages implemented

Status	11110000	F0	System Exclusive
Manufactor ID		00 00 11	STUDER ID
Product ID		02	D19 (MP4RC) STAGE BOX ID
Device ID	0000nnnn		n = MIDI channel no-1
Command ID	0ccccccc		see below
Data	0ddddddd		see below
	.....		
	.....		
	0ddddddd		
checksum	0ccccccc		1-complement (data)
Status	11110111	F7	End of Sys. Exclusive

3.0 Universal System Exclusive Non-real-time Inquiry Message

Status		F0 7E 0n(or 7F)	Universal Sysex Non-real time header n = MIDI channel no-1 (7F: response anyway)
General Info	00000110	06	Sub ID # 1
Device Inquiry	00000001	01	Sub ID # 2
Status	11110111	F7	End of Sys. Exclusive

III. Transmitted MIDI Messages

1.0 Control Change

Status	1011nnnn	(Bn) n = MIDI channel number-1	Note 1
Controller no.	0ccccccc		
Controller val.	0vvvvvvv		

c = 93	OPTO Cpl.1-4 P.	v =	0000xxx0	Opto Coupler 1 inactive
		v =	0000xxx1	Opto Coupler 1 energized
		v =	0000xx0x	Opto Coupler 2 inactive
		v =	0000xx1x	Opto Coupler 2 energized
		v =	0000x0xx	Opto Coupler 3 inactive
		v =	0000x1xx	Opto Coupler 3 energized
		v =	00000xxx	Opto Coupler 4 inactive
		v =	00001xxx	Opto Coupler 4 energized
c = 94	OPTO Cpl.5-8 P.	v =	0000yyyy	Opto Coupler 5-8 inactive/energized

Note 1: Opto Coupler 1-8 Pattern (c = 93,94) only on MIDI ch. 16

2.0 System Exclusive

no device-specific System Exclusive messages implemented

Status	11110000	F0	System Exclusive
Manufactor ID		00 00 11	STUDER ID
Product ID		02	D19 (MP4RC) STAGE BOX ID
Device ID	0000nnnn		n = MIDI channel no-1
Status ID	0sssssss		see below
Data	0ddddddd		see below
	.....		
	.....		
	0ddddddd		
checksum	0ccccccc		1-complement (data)
Status	11110111	F7	End of Sys. Exclusive

3.0 Universal System Exclusive Non-real-time Device ID Message

Status		F0 7E 0n	Universal Sysex Non-real time header n = MIDI channel no-1
General Info	00000110	06	Sub ID # 1
Device ID msg	00000010	02	Sub ID # 2
Manufactor ID		00 00 11	STUDER ID
Dev. Fam code		00 00	D19 Serie
Fam. Member code		00 02	(MP4RC) STAGE BOX
Power ON state		0000000p	Power ON state: 0: 2.and further Inq Req. after Power ON 1: first Inq. Req. after Power ON (only valid on RCC resp. MIDI channel 16)
Softw. Version		0aaaaaaa	Software Version
		.....	(20 byte ASCII String)
		.....	
		0zzzzzzz	
Status	11110111	F7	End of Sys. Exclusive