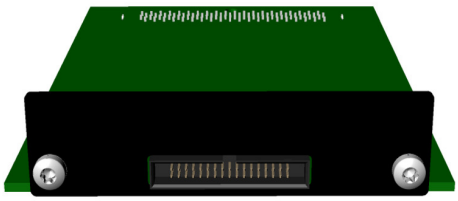
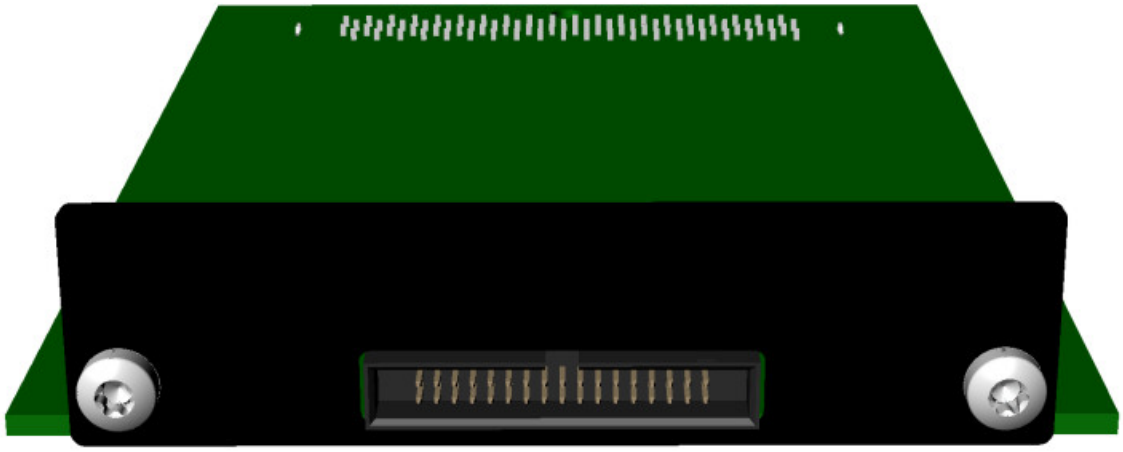


Appsys AUX-TDM 64×64 Channel Time Division Multiplexing I2S Card for FLX Devices User Manual

AppsysProAudio

flexiverter



AUX-TDM
64×64 channel Time Division Multiplexing/I2S Card for FLX devices
User's Manual

Contents

DESCRIPTION

The AUX-TDM card provides up to 64×64 channels Time Division Multiplexing (TDM) interface on a 3.3V LVCMOS I/O. It supports four lines of data plus BCLK/LRCLK/MCLK/MUTE outputs, and four lines of data plus BCLK/LRCLK/MUTE inputs.
It can be fitted into every flexiverter (FLX) device for the following purposes:

- to use the FLX as standalone converter between the built-in interface and this extension card
- to add extra output splits to existing FLX devices by “tapping” channels of another conversion
- to add additional channels/protocols to the FLX when it is used in doubleflexiverter or flexiverter+multiverter configurations

For a detailed description of possible configurations, please refer to the manual of your base FLX device.

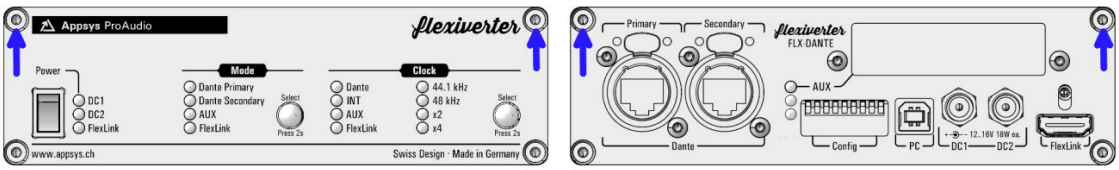
1.1. Box Contents

- 1 AUX-TDM card
- 1 Slot cover plate
- 34-pin, 0.635mm pitch ribbon cable, 30cm/1ft.
- This manual

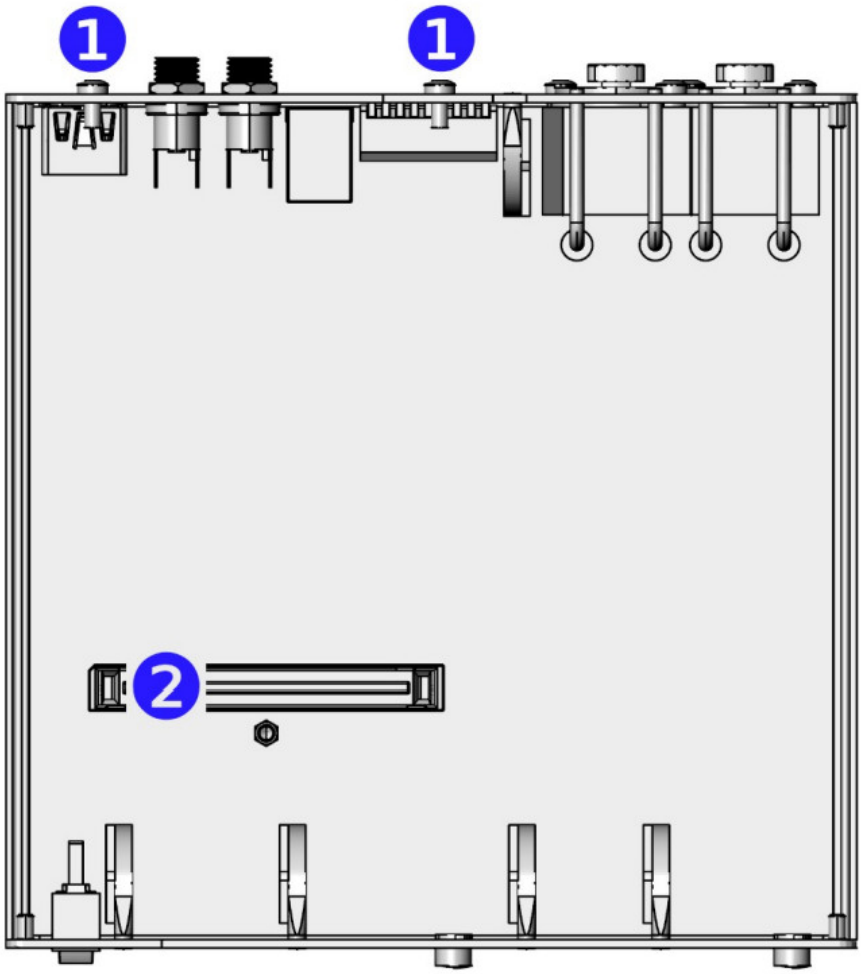
INSTALLATION

2.1. Opening the flexiverter

- Required: Torx T10 screwdriver
- Power off the device and detach all cables to avoid short-circuit or damage
- Detach the device from the rack-mount kit
- Remove the four top screws and the top cover by pulling it upwards:



2.2. Flexiverter Inside View



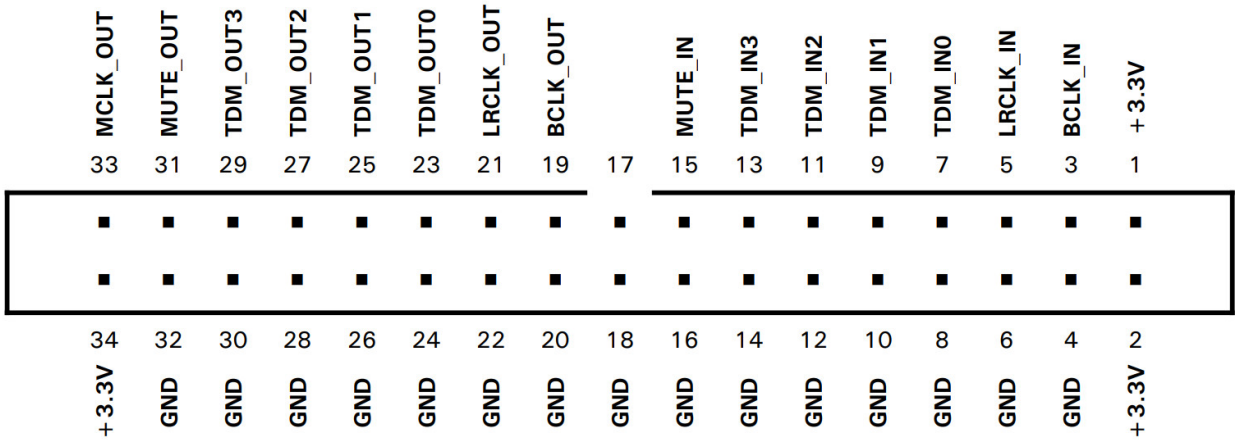
1. Screws for AUX cover plate
2. AUX card connector

2.3. Installing the card

- Remove the screws holding the cover plate, and the blank cover plate ❶
- Insert the AUX card from inside, using the supplied cover plate.
  CAUTION: The slot cover must be located on the inside the slot.
  Make sure it is correctly fitted to the card connector❷
- Secure the card using two cover screws ❶
- The card has been installed correctly if you are able to select an audio routing mode involving AUX (long-press MODE button to enter Route Mode Selection).

TDM INTERFACE PINS

3.1. Pinout (when looking on the card connectors mating face)



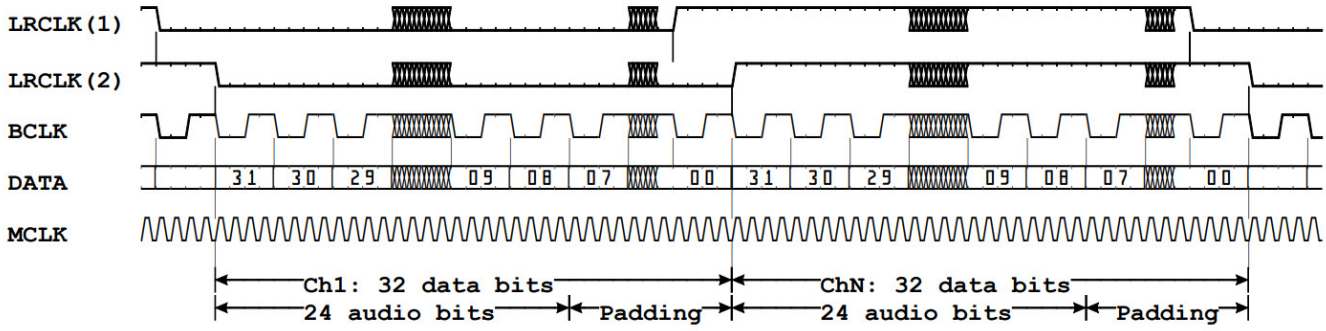
3.2. Pin descriptions

Pin	Signal	Direction	Description	TDM16	TDM8	TDM4	TDM2(Stereo)
1, 2, 3 4	+3.3V	Output	Supply for external circuit (1.5A max). Do not connect when external circuit has its own power supply				
4,6,8,10,12,14,16,18, 20,22,24,26,28,30,32			Ground. All GND lines on the external circuit should be connected to ensure proper shielding between data lines				
3	BCLK_IN	Input	Bit Clock input. TDM_IN* lines are sampled on the rising edge of this signal	512* LRCLK_IN	256* LRCLK_IN	128* LRCLK_IN	64* LRCLK_IN
5	LRCLK_IN	Input	Left/Right Clock input (Wordclock). Must be a 50% duty cycle. First half of the TDM_IN* audio channels are read during LRCLK_IN=0, second half of TDM_IN* channels during LRCLK_IN=1				
7	TDM_IN0	Input	Audio data input line 0. Must be 32 bit per channel, left-justified or I2S depending on DIP setting. Only the first 24 bits of each channel are read, the rest is ignored.	Ch 1-16 (512 bit per LRCLK)	Ch 1-8 (256 bit per LRCLK)	Ch 1-4 128 bit per LRCLK)	Ch 1-2 (64 bit per LRCLK)
9	TDM_IN1	Input	Audio data input line 1	Ch 17-32	Ch 9-16	Ch 5-8	Ch 3-4
11	TDM_IN2	Input	Audio data input line 2	Ch 33-48	Ch 17-24	Ch 9-12	Ch 5-6
13	TDM_IN3	Input	Audio data input line 3	Ch 49-64	Ch 25-32	Ch 13-16	Ch 7-8
15	MUTE_IN	Input	L: Normal operation H: Mute inputs, input data is ignored				
17	Reserved						
19	BCLK_OUT	Output	Bit Clock output. TDM_OUT* audio data changes on falling edge and is valid on rising edge	512* LRCLK_OUT	256* LRCLK_OUT	128* LRCLK_OUT	64* LRCLK_OUT

21	LRCLK_OUT	Output	Left/Right Clock output (Wordclock), 50% duty cycle. First half of the TDM_IN* audio channels are written during LRCLK_IN=0, second half of TDM_IN* channels during LRCLK_IN=1				
23	TDM_OUT0	Output	Audio data output line 0. 32 bit per channel, left-justified or I2S depending on DIP setting. Output is always 24 bits of audio plus 8 padding bits per channel. Data is valid on the rising edge of BCLK_OUT	Ch 1-16 (512 bit per LRCLK)	Ch 1-8 (256 bit per LRCLK)	Ch 1-4 (128 bit per LRCLK)	Ch 1-2 (64 bit per LRCLK)
25	TDM_OUT1	Output	Audio data output line 1	Ch 17-32	Ch 9-16	Ch 5-8	Ch 3-4
27	TDM_OUT2	Output	Audio data output line 2	Ch 33-48	Ch 17-24	Ch 9-12	Ch 5-6
29	TDM_OUT3	Output	Audio data output line 3	Ch 49-64	Ch 25-32	Ch 13-16	Ch 7-8
31	MUTE_OUT	Output	L: Normal operation H: Output data is invalid and should be muted				
33	MCLK_OUT	Output	Master clock output	256*LRCLK			

⚠ Do NOT leave any input pins floating. Connect unused pins to GND or VCC, preferrably with a 10k resistor.

3.3. I/O Waveforms



(1) in I2S mode (DIP6: down). Data is delayed by 1 BCLK cycle
(2) in left-justified mode (DIP6: up)

3.4. Electrical I/O characteristics

Pins	Parameter	Value			Unit
		Min	Typ	Max	
+3.3V	VCC	3.135	3.3	3.465	V
	ICC			1.5	A
BCLK_IN, LRCLK_IN, TDM_IN *, MUTE_IN	VIH	2.0		VCC+0.5	V
	VIL	-0.5		0.8	V
BCLK_OUT, LRCLK_OUT, TDM_OUT*, MUTE_OUT, MCLK_OUT All	VOH	3.2	3.3	VCC	V
	VOL	0		0.1	V
	IO ESD protection			±20	mA
		IEC 61000-4-2 Level 4 ESD Protection ±15-kV Contact Discharge / ±15-kV Air-Gap Discharge IEC 61000-4-4 EFT Protection: 80 A (5/50 ns) IEC 61000-4-5 Surge Protection: 3 A (8/20 µs)			

DIP SETTINGS

The behavior of the card can be controlled by DIP switches 4..6 on the FLX device.
Changing the DIP settings will come immediately into effect.

TDM mode		*TDM16. Each I/O line carries 16 channels of 32 bit audio data each (512 bits/BCLK cycles per LRCLK)
		TDM8. Each I/O line carries 8 channels of 32 bit audio data each (256 bits/BCLK cycles per LRCLK)
		TDM4. Each I/O line carries 4 channels of 32 bit audio data each (128 bits/BCLK cycles per LRCLK)
		TDM2 (Stereo). Each I/O line carries 2 channels of 32 bit audio data ea. (64 bits/BCLK cycles per LRCLK)
Format selection		*Left-justified, 32 bit per ch (24 bit audio data + 8 bits zero padding)
		I2S-Format, 32 bit per ch (24 bit audio data + 8 bits zero padding) Data is delayed by 1 BCLK cycle

* Default setting

SELF-TEST

The card can be tested for correct operation by the user. This is done using the special self-test mode, in which a special random test pattern is output on all channels. This pattern is looped back via an external cable into the corresponding inputs, where it is checked for consistency.
Note: A special loopback plug is required for this. The plug must connect pins 1-9, 2-10, 3-11, 4-12, 5-13, 6-14, 7-15, 8-16.

- Attach the loopback plug
- Turn off the FLX, and hold down Mode button while switching on again
- Press Mode again until the “CLOCK” LEDs show “INT/48kHz” in cyan color. The device is now in self-test mode.
- The “AUX” LED in the MODE sections shows the result of the self-test:
  red: error/no connection
  green (loopback data received ok)
- Press Mode again or power off the device to exit self-test mode.

SPECIFICATIONS

Parameter	Value
Dimensions	118x80mm (WxH)
Weight	40 g
Operating temperature	0..+55°C, non-condensing
Storage temperature	-40..+85°C, non-condensing
Inputs	Up to 64 channels TDM16 (4 lines with 16ch each) Up to 32 channels TDM8 (4 lines with 8ch each) Up to 16 channels TDM4 (4 lines with 4ch each) Up to 8 channels stereo (4 lines with 2ch each) LRCLK (left/right clock). Polarity: frame starts with falling edge BCLK (bitclock): Data is sampled on rising edge
Outputs	Up to 64 channels TDM16 (4 lines with 16ch each) Up to 32 channels TDM8 (4 lines with 8ch each) Up to 16 channels TDM4 (4 lines with 4ch each) Up to 8 channels stereo (4 lines with 2ch each) LRCLK (left/right clock). frame starts with falling edge BCLK (bitclock): Data changes on falling edge MCLK: 256*LRCLK
Cable lengths	30cm / 1 ft. maximum
Sample rates	44.1/48kHz 88.2/96kHz (channel count is halved) 176.4/192kHz (channel count is quartered)
Latency	Interface <> Flexiverter internal: 2 samples

APPENDIX

7.1. Available AUX cards

At the time of writing (2021-11), the following AUX cards are available. More will come, please check www.appsys.ch for updates.

Item	Description
AUX-ADAT	16x16ch ADAT I/O (2x Toslink In+2x out). Supports also S/PDIF
AUX-ADAT-64	64x64ch ADAT I/O (8x Toslink In+8x out on external breakout box)
AUX-AES3	8x8ch AES3 I/O on 1x DB25, fully transformer isolated
AUX-AES67	64x64ch AES67 network card
AUX-DANTE	64x64ch DANTE network card
AUX-MADI-COAX	64x64ch MADI for coaxial cable (BNC connectors)
AUX-MADI-OPTO	64x64ch MADI optical, SC connector (Multimode 125um 1310 nm)
AUX-MADI-SFP	64x64ch MADI for SFP (Small-Factor Pluggable) modules
AUX-WORDCLOCK	BNC wordclock I/O

7.2. Available FLX devices

At the time of writing (2024-04), the following FLX devices are available. More will come, please check **www.appsys.ch** for updates.

Item	Description
FLX-AES3	16×16 channel AES3 flexiverter (with AUX slot)
FLX-AES3/SRC	16×16 channel AES3 flexiverter with optional independent SRCs on the AES3 inputs (wi th AUX slot)
FLX-AES50	96×96 channel AES50 flexiverter (with AUX slot)
FLX-AES67	64×64 channel AES67 flexiverter (with AUX slot)
FLX-DANTE	64×64 channel DANTE flexiverter (with AUX slot)
FLX-MADI	128×128 channel MADI SFP & MADI coaxial module (with AUX slot)

7.3. Warranty

We offer a full two (2) year warranty from the date of purchase. Within this period, we repair or exchange your device free of charge in case of any defect*. If you experience any problems, please contact us first. We try hard to solve your problem as soon as possible, even after the warranty period.
* Not covered by the warranty are any damages resulting out of improper use, willful damage, normal wear-out (especially of the connectors) or connection with incompatible devices.

7.4. Manufacturer contact

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Mobile: +41 76 747 07 42

7.5. Recycling

According to EU directive 2002/96/EU, electronic devices with a crossed-out dustbin may not be disposed into normal domestic waste. Please return the products back for environment-friendly recycling, we'll refund you the

shipping fees.

7.6. Document Revision History

1: Initial release

7.7. About this document

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All information provided here is subject to change without prior notice.
Document Revision: 1 · 2024-05-02

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Documents / Resources

	Appsys AUX-TDM 64x64 Channel Time Division Multiplexing I2S Card for FLX Devices [pdf] User Manual AUX-TDM, AUX-TDM 64x64 Channel Time Division Multiplexing I2S Card for FLX Devices, 64x64 Channel Time Division Multiplexing I2S Card for FLX Devices, Time Division Multiplexing I2S Card for FLX Devices, Multiplexing I2S Card for FLX Devices, I2S Card for FLX Devices, FLX Devices, Devices

References

- User Manual