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*ADC8 Mk IV*

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**USER MANUAL V1.2**



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# A/D Converter ADC8 Mk IV

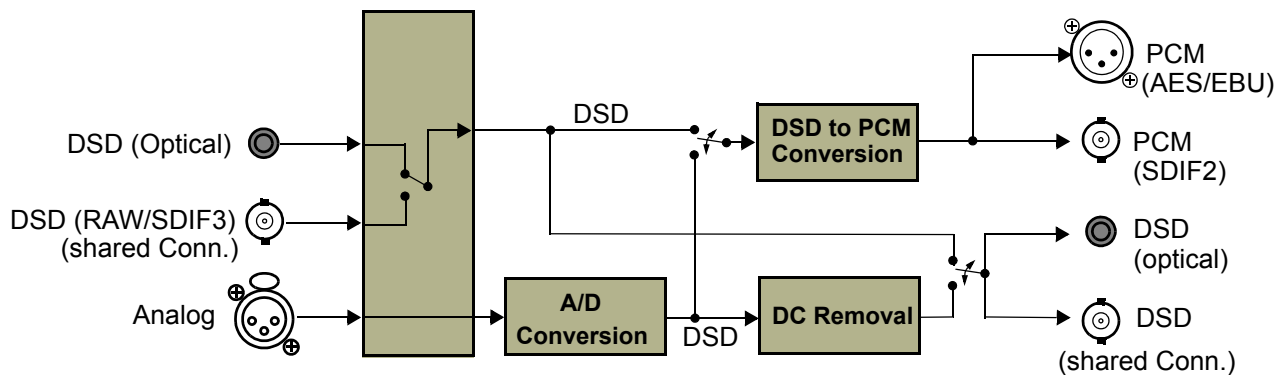
The EMM Labs 8-channel A/D converter is a 4th generation design to meet the highest standards in professional audio recording applications. It offers conversion between analog and digital audio of various different formats, as well as conversion between digital audio formats.

## Features

- 8-channel conversions:
  - from analog to PCM (16/24 bits selectable and 44.1kHz - 96kHz)
  - from analog to DSD
  - from DSD to PCM (44.1kHz - 16/24 bits selectable)
  - from DSD on optical to DSD on BNC connectors
  - from DSD on BNC to DSD on optical connectors
- Supported output formats:
  - AES/EBU (4 connectors) for PCM
  - "RAW DSD" (legacy format for DSD on BNC connectors)
  - SDIF-3 for DSD on BNC connectors
  - SDIF-2 for PCM on BNC connectors
  - ST Fiber optic for DSD
- Supported input formats:
  - Balanced analog 8dbu - 32dbu (pin 2 hot), switchable ranges 8dbu-20dbu / 20dbu - 32 dbu.
  - "RAW DSD" (legacy format for DSD on BNC connectors)
  - SDIF-3 for DSD on BNC connectors
  - ST Fiber optic for DSD
- Power supply
  - power factor corrected
  - auto ranging 85V - 240V, 50/60Hz
  - power consumption: 60W
- Analog input impedances
  - in HI gain position: 30k $\Omega$  balanced, 15k $\Omega$  unbalanced
  - in LO gain position: 68k $\Omega$  balanced, 34k $\Omega$  unbalanced

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## Signal flow



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**Note:** Analog inputs are balanced with pin 2 hot, pin 3 cold and pin 1 GND. For unbalanced inputs just connect to pin 2 and tie pin 3 to GND.

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## Function Switches

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**Note:** Some configurations require long settling times of up to several seconds after changing switch positions.

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**Note:** The powerup sequence and initial calibration of the unit takes about 20 seconds after power is applied.

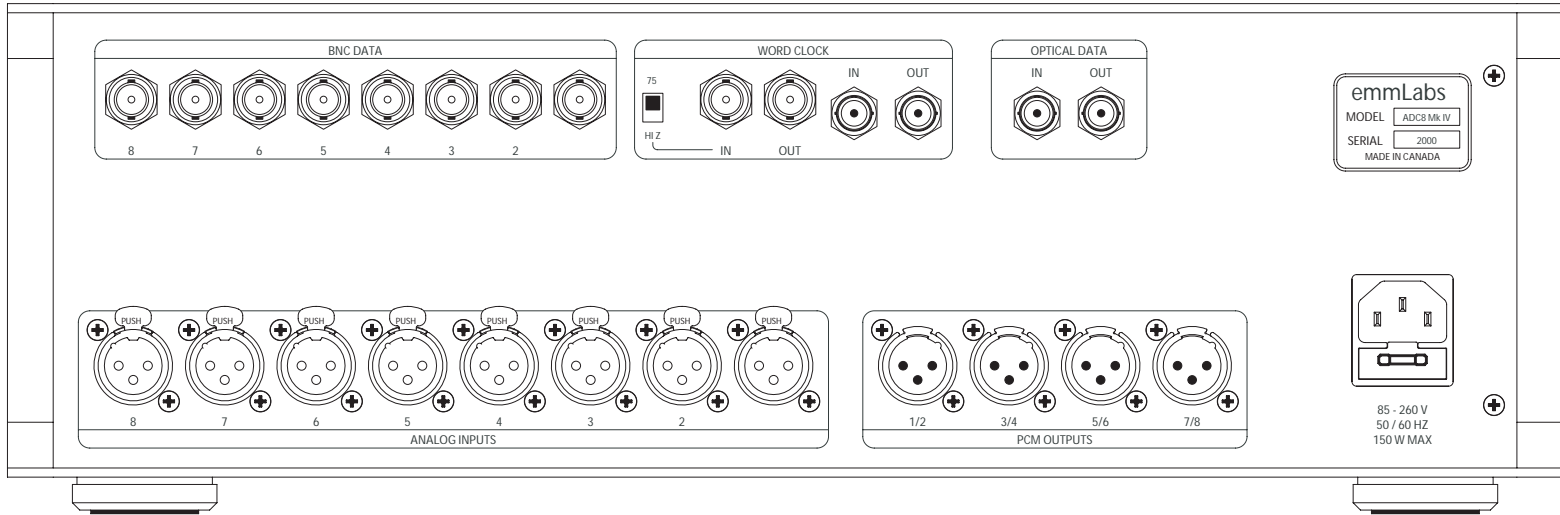
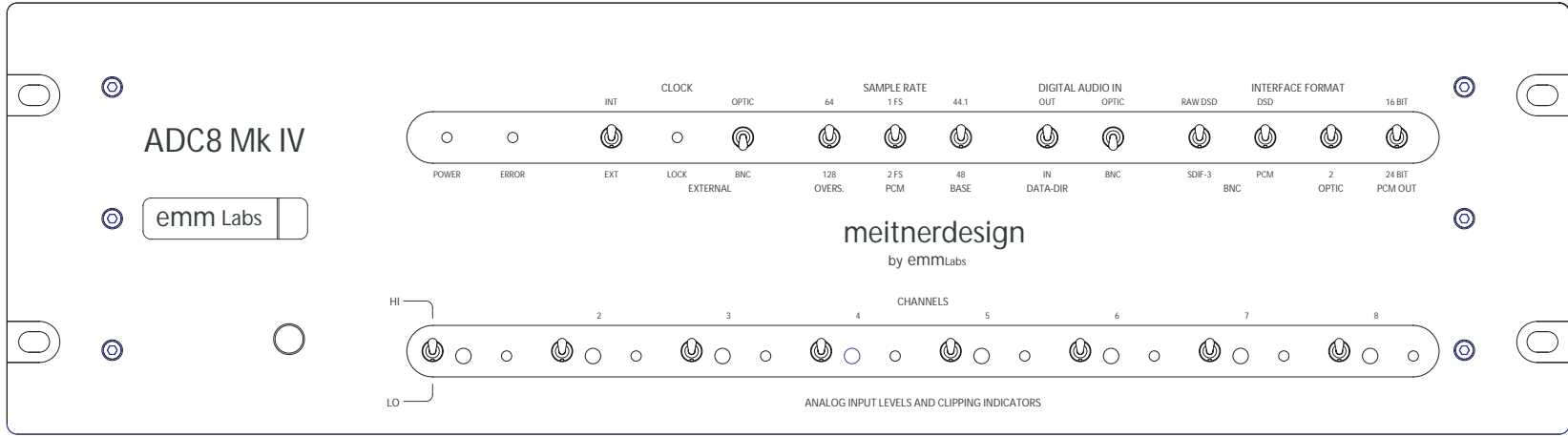
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### Clock Section

- INT /EXT: Selects internal or external clock source. LOCK LED is lit when A/D converter is locked to external clock.
- OPTIC / BNC: Selects external clock between optical and BNC formats.

### Sample Rate Section

- 64 / 128: Selects oversampling ratio. 128 position does not allow 2FS PCM generation (error light on).
- 1FS / 2FS: Selects the sample rate for PCM data. FS is the base frequency (see 44.1 / 48 switch). 2FS position will mute outputs when the oversampling ratio is set to 128.
- 44.1 / 48: Selects the base frequency (only 44.1kHz is allowed for DSD outputs and inputs).



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### Digital Audio Input Section

- OUT / IN: OUT position selects conversion from analog to digital.  
IN position selects conversion from digital to digital.
- OPTIC / BNC: If the DATA DIR switch is set to IN, this selects data input between optical or BNC connectors (data format is selected in Interface Format Section).

### Interface Format Section

- RAW / SDIF-3: When DSD is on BNC the user has the choice between RAW and SDIF-3 formats.
- DSD / PCM: This switch selects DSD or PCM format on the BNC connectors (in both directions).
- OPTIC1 / OPTIC2: Selects format 1 or 2 for both input and output (currently not implemented - only 1 format).
- 16 / 24 BITS: The wordlength of the PCM outputs can be selected between 16 and 24 bits. The 16 bit position uses noise shaping to convert original format of 24 bits to 16 bits.

**Error Indicator is lit for illegal switch positions (audio outputs are muted)**

### Analog Input Level

- LO / HI: The LO position allows the user to set levels between +20dbu and +32dbu.
- The HI position allows the user to set the levels between +8dbu and +20dbu.

### Clipping indicators

The clipping LED's come on when the level on the PCM outputs reach 0dbFS. This level corresponds to 0dbSACD on all DSD outputs. However, the levels on the DSD outputs are allowed to go up to +3dbSACD.

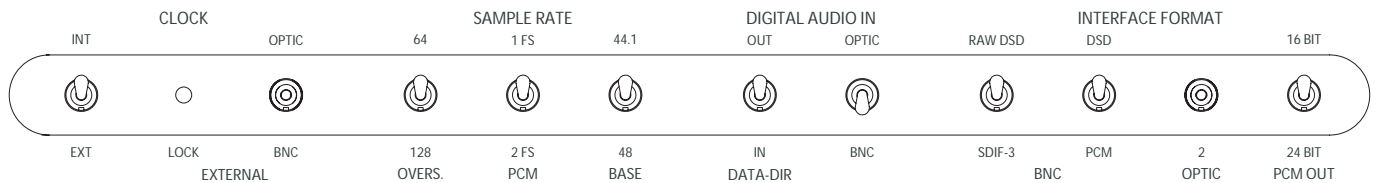
**Table 1: Functional Modes of A/D**

Conversion	BNC	Analog In	AES/EBU	Optical In	Optical Out
Analog to DSD, PCM	DSD Out	In	PCM Out	-	DSD Out
Analog to DSD, PCM	PCM Out (SDIF-2)	In	PCM Out	-	DSD Out
DSD to DSD, PCM	DSD In	-	PCM Out	-	DSD Out
DSD to DSD, PCM	DSD Out or PCM Out	-	PCM Out	DSD In	DSD Out

## Basic Operation

In addition to the basic conversion modes shown below, the ADC8 Mk IV converts between DSD on optical and DSD on BNC (RAW DSD or SDIF-3) and back again.

### Conversion from Analog to DSD and PCM



“Empty” switches are ignored.

**Note:** DSD and PCM is only generated simultaneously when the base frequency 44.1kHz and 1FS are selected.

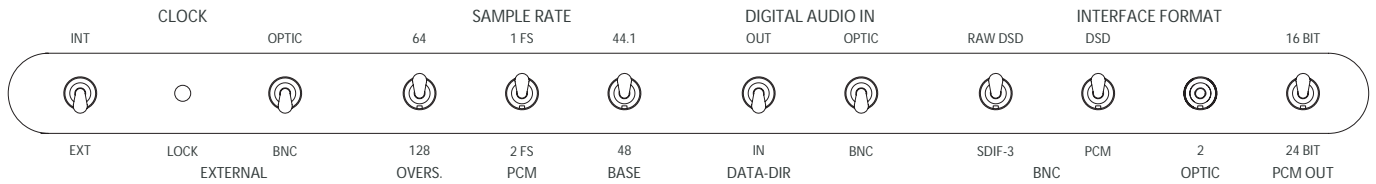
**Note:** The PCM sample rate of 2FS can only be selected for the oversampling ratio of 64FS

Optional selections:

- Oversampling ratio 64FS / 128FS: this changes the bit rate of the DSD output. No optical DSD output is generated for 128FS. When 128FS is selected DSD is generated at 128FS in either RAW DSD or SDIF-3 format.
- Wordlength of PCMOUT 16bit / 24 bit
- The PCM data can also be routed to the BNC outputs (SDIF-2 format) with the DSD / PCM switch.

- DSD format on BNC connectors RAW DSD / SDIF-3

## Conversion from DSD to PCM



“Empty” switch positions are ignored.

DSD input can be on BNC or optical connectors. Appropriate selections have to be made in the CLOCK and DIGITAL AUDIO IN sections (OPTIC / BNC).

DSD data rate at input can be either 64FS or 128FS as selected by Oversampling ratio.

**Note:** 2FS PCM generation is only possible from 64FS DSD and not from 128FS.

Optional selections:

- Wordlength of PCMOOUT 16bit / 24 bit
- The PCM data can also be routed to the BNC outputs (SDIF-2 format) with the DSD / PCM switch, in case the DSD input is optical.

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# D/A Converter DAC8 Mk IV

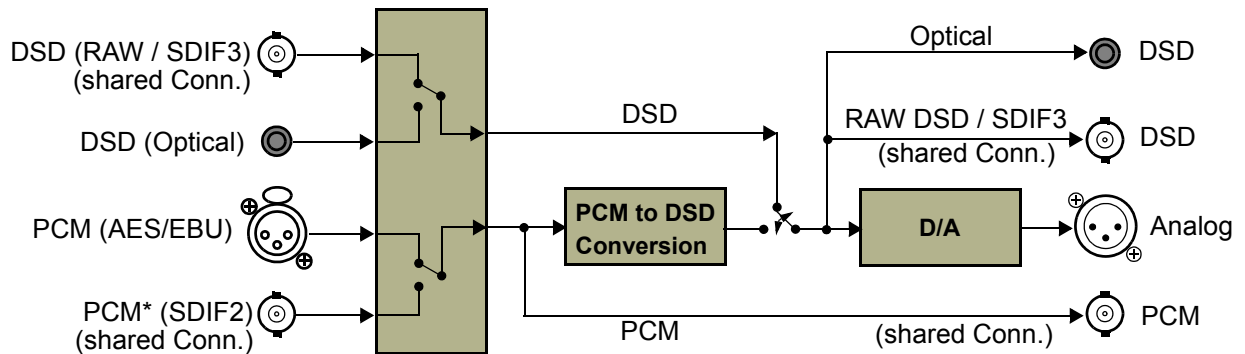
The EMM Labs 8-channel D/A converter is a 4th generation design to meet the highest standards in professional audio recording applications. It offers conversion between digital audio of various different formats and analog, as well as conversion between digital audio formats.

## Features

- 8-channel conversions:
  - from PCM (44.1kHz - 96kHz) to analog
  - from DSD to analog
  - from PCM (44.1kHz, 88.2kHz) to DSD
  - from DSD on optical to DSD on BNC connectors
  - from DSD on BNC to DSD on optical connectors
  - from PCM on AES/EBU to PCM (SDIF-2)
- Supported input formats:
  - AES/EBU (4 connectors) for PCM
  - “RAW DSD” (legacy format for DSD on BNC connectors)
  - SDIF-3 for DSD on BNC connectors
  - SDIF-2 for PCM on BNC connectors
  - ST Fiber optic for DSD
- Supported output formats:
  - Balanced analog 14dbu - 24dbu (pin 2 hot)
  - “RAW DSD” (legacy format for DSD on BNC connectors)
  - SDIF-3 for DSD on BNC connectors
  - SDIF-2 for PCM on BNC connectors
- Power supply
  - power factor corrected
  - auto ranging 85V - 240V, 50/60Hz
  - power consumption: 60W
- Analog output impedances
  - 100Ω balanced, 50Ω unbalanced



## Signal Flow



**Note:** \*SDIF2 inputs expect 24-bits (or 0-filled 16 bits) of PCM

**Note:** Analog outputs are balanced with pin 2 hot, pin 3 cold and pin 1 GND. For unbalanced outputs just connect to pin 2 and leave pin 3 open ended

## Function Switches

### Clock Section

INT / EXT: Selects internal or external clock source. LOCK LED is lit when D/A converter is locked to external clock.

### Sample Rate Section

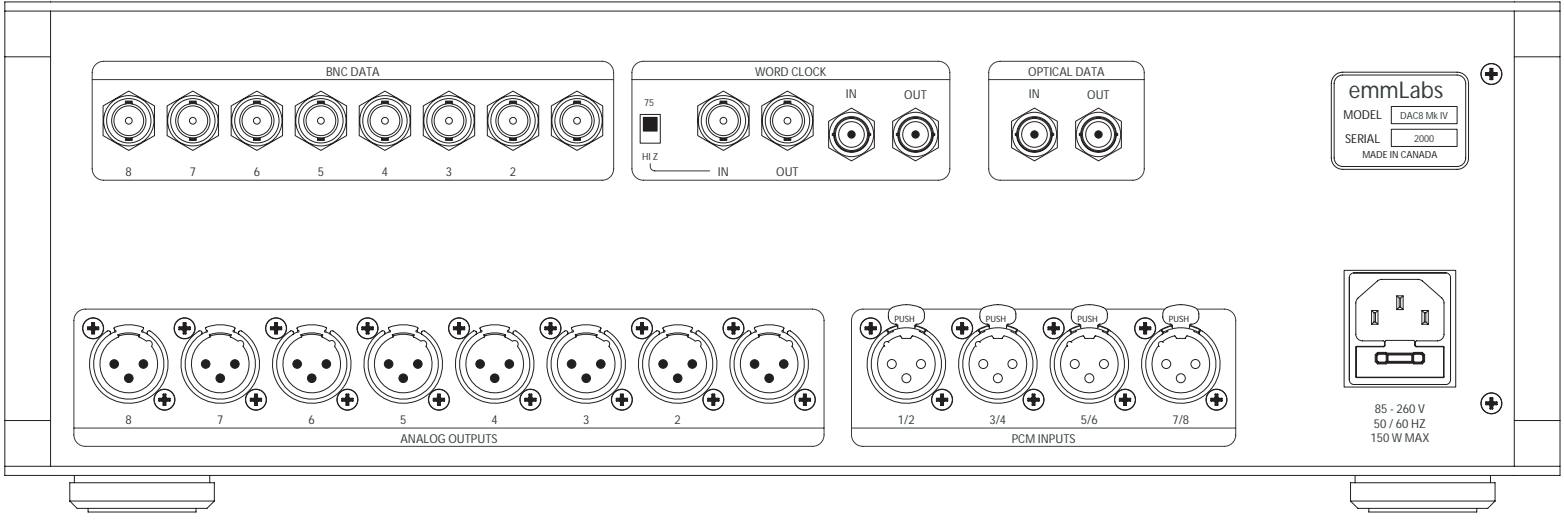
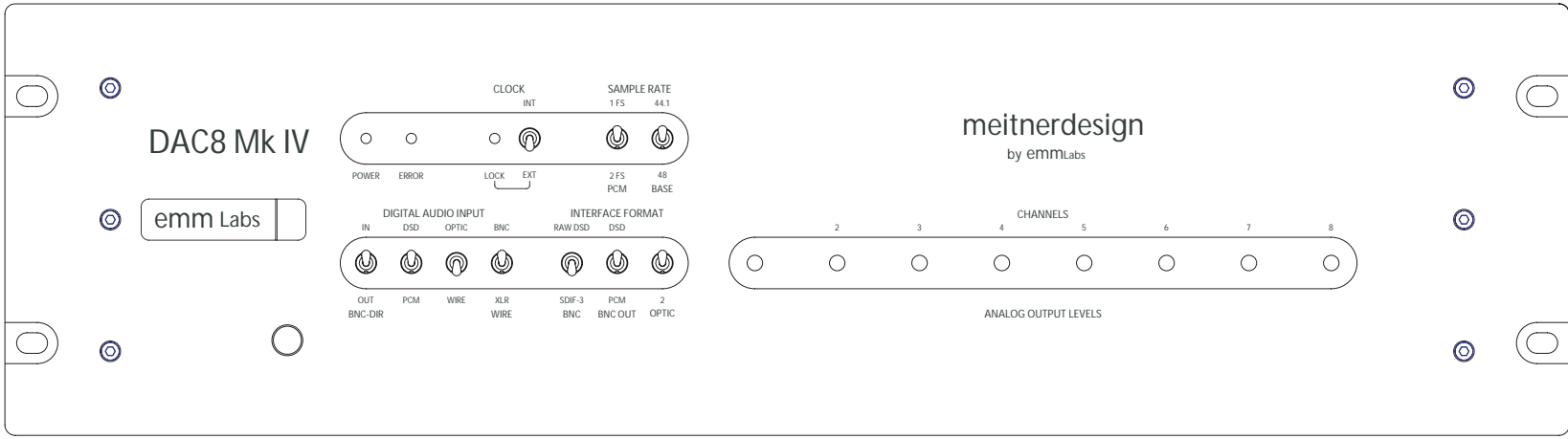
1FS / 2FS: Selects the sample rate for PCM data. FS is the base frequency (see selector switch for base).

44.1 / 48: Selects the base frequency (only 44.1kHz is allowed for DSD outputs and inputs)

### Digital Audio Input Section

IN / OUT: Selects the data direction on the BNC connectors. DSD and PCM data can be received or transmitted.

DSD / PCM: Selects digital audio input format.



OPTIC / WIRE: Selects the physical connector for input data (optical or WIRE). For the WIRE selection an additional switch is necessary to define WIRE as either BNC or XLR.

BNC / XLR (WIRE): Selects BNC or XLR as input when OPTIC / WIRE switch is set to WIRE

**Interface Format Section**

RAW / SDIF-3: When PCM is on BNC this switch is ignored, when DSD is on BNC this switch selects between RAW and SDIF-3 formats

DSD / PCM: Selects format for BNC output for all situations where PCM is selected as input format to D/A converter. This switch has to be in DSD position when DSD is the selected input format via optical to the D/A and is ignored when BNC DIR is set to IN.

OPTIC1 / OPTIC2: Selects format 1 or 2 for both input and output (currently not implemented - only 1 format).

**Error Indicator Is lit for illegal switch positions**

**Table 2: Functional Modes of D/A**

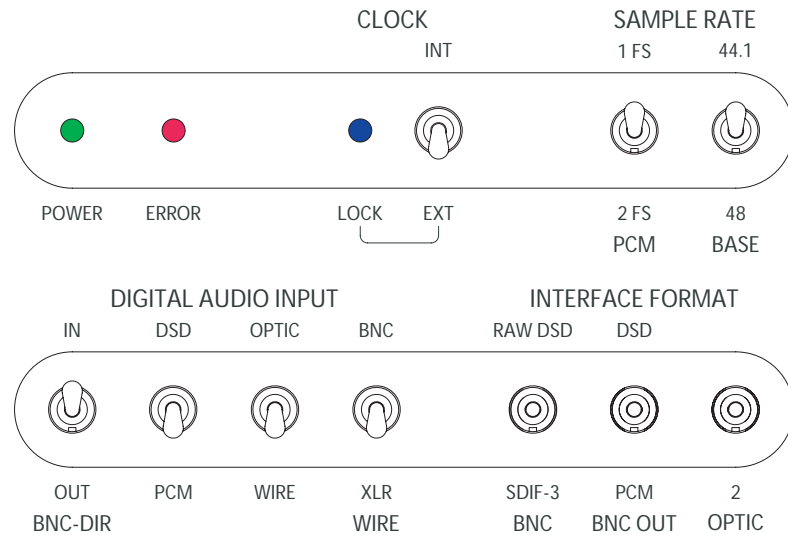
Conversion	BNC	Analog	AES/EBU	Optical In	Optical Out
DSD to DSD, analog	DSD In	Out	-	-	DSD
PCM to DSD, analog	PCM In	Out	-	-	DSD
PCM to DSD, analog	PCM Out or DSD Out or -	Out	PCM In	-	DSD
DSD to DSD, analog	DSD Out	Out	-	DSD	DSD

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## Basic Operation

In addition to the basic conversion modes shown below, the DAC8 Mk IV converts between DSD on optical and DSD on BNC (RAW DSD or SDIF-3) and back again.

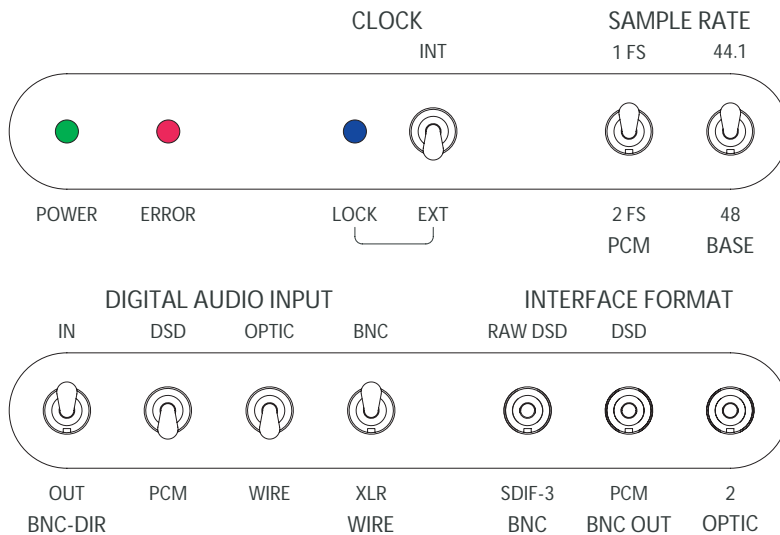
### Conversion from PCM on AES/EBU to Analog



Additional selections for 44.1 / 48 / 88.2 / 96kHz sample rate can be made with the sample rate switches.

“Empty” switch positions are ignored.

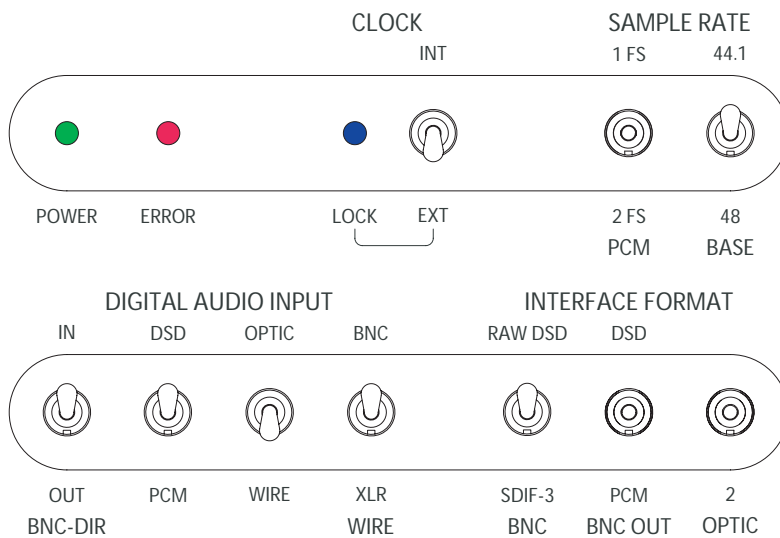
## Conversion from PCM on BNC (SDIF-2) to Analog



Additional selections for 44.1 / 48 / 88.2 / 96kHz sample rate can be made with the sample rate switches.

"Empty" switch positions are ignored.

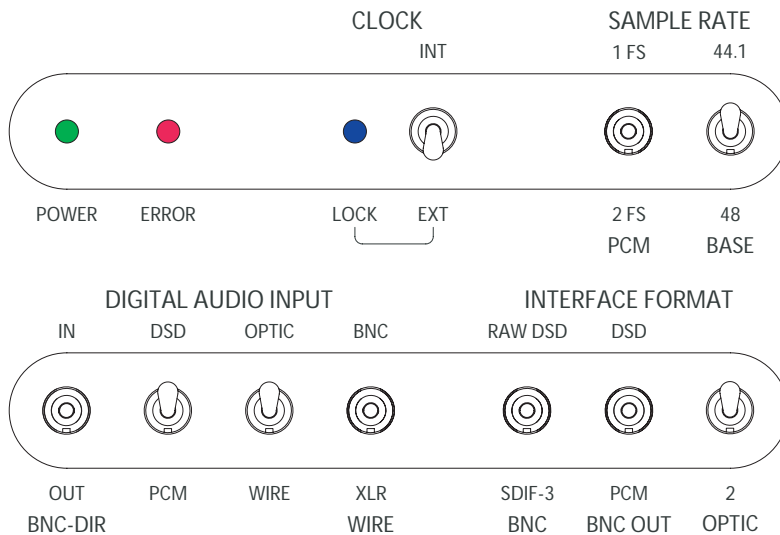
## Conversion from DSD on BNC (RAW DSD or SDIF-3) to Analog



Additional selection for RAW DSD or SDIF-3 format for DSD input can be made with interface format switch.

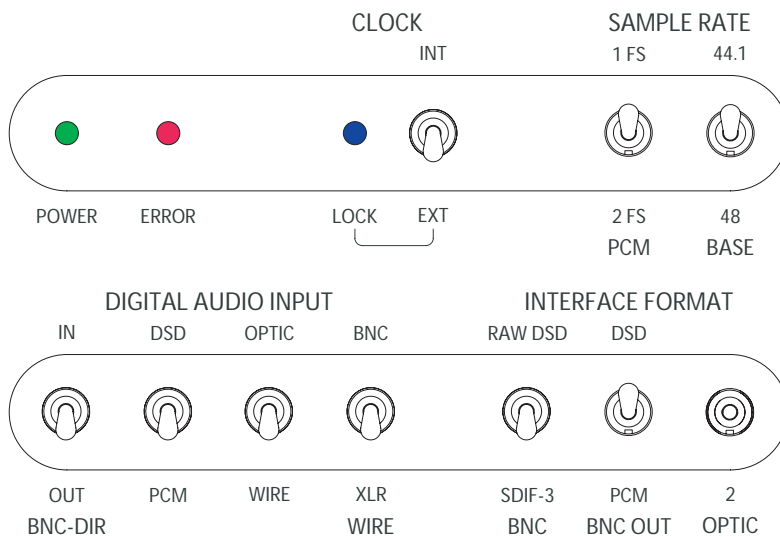
"Empty" switch positions are ignored.

## Conversion from DSD on Optical to Analog



“Empty” switch positions are ignored.

## Conversion from PCM on AES/EBU to DSD on BNC (RAW DSD or SDIF-2) and Optical



Only 44.1kHz based PCM can be converted to DSD. Additional selections can be made for 1FS / 2FS for PCM input and for RAW DSD / SDIF-3 for DSD output.

“Empty” switch positions are ignored.