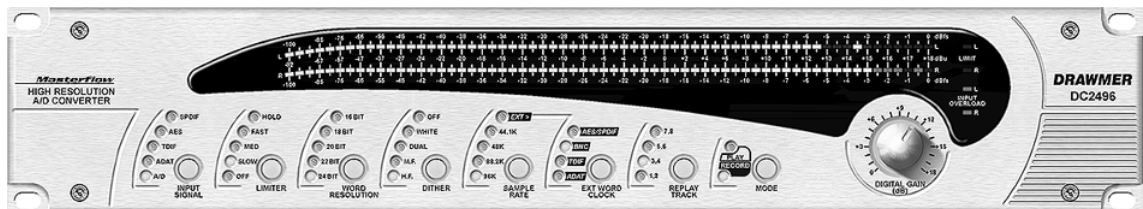


Masterflow

DC2496



HIGH RESOLUTION ANALOGUE TO DIGITAL CONVERTER

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CHAPTER 1

DRAWMER DC2496 HIGH RESOLUTION ANALOGUE TO DIGITAL CONVERTER

INTRODUCTION

The Drawmer DC2496 is an extremely sophisticated, high resolution analogue to digital converter designed for use in demanding recording and broadcast applications. Both analogue (balanced XLR) and digital (AES/EBU, S/PDIF, ADAT 8 Channel light pipe and TDIF 8 Channel) I/O is provided as standard. The audio converters are 24-bit and the digital output can be either 16, 18, 20, 22 or 24-bit at sample rates of up to 96kHz. Noise shaped dithering is included and Word Clock input and output is available.

NOT JUST AN A/D CONVERTER BUT ALSO DIGITAL INTERFACE FOR RECORDING FROM ONE UNIT TO ANOTHER - WITH A BACKUP AT THE SAME TIME!

Why 96kHz?

Digital processing has until now been confined to 48kHz sampling frequency. In order to achieve the required bandwidth for professional audio, a very severe low pass filter at 23kHz is required to separate analogue signal frequencies from the clock frequency otherwise unpleasant aliasing will occur. This requires the use of a FIR digital filter which is part of the A/D and D/A converters. Unfortunately these filters cause what is known as 'time smear', where short transients are smeared over a longer time period giving loss of HF detail. At 96kHz sample frequency, the low pass filter is less severe and at twice the frequency, so time smear is considerably reduced.

A second important consideration is the increased audio bandwidth up to 40kHz. This allows harmonics which extend above human hearing to be generated and preserved. These harmonics, although not audible themselves, make a contribution to the sound quality.

Key Features

96k 24bit A/D with 130dB dynamic range and very low THD.

Simultaneously record 96k/48k 24bit stereo input to 48K (three) or 96K (six) tracks to ADAT or TDIF 8 track digital tape recorder and stereo 48k 16bit backup (to tracks 7/8) and record an independant backup copy at 48/44.1 20/16bits to DAT (using internal Sample Rate Convertor)

Sample Rate Convertor with bit reduction and dither to reduce 96/88.2K 24bit recordings to 48/44.1K 16/20bit for CD masters.

Built in 96/48K high quality D/A to monitor digital signals or record to analog tape.

Dual time constant Stereo Limiter allows up to 18dB stereo gain to be applied to the input signal without clipping.

100dB range 64 element stereo signal meter with peak hold. Metering in both dBfs (digital) and dBu (analogue) for ease if use.

Selection of Noise shaped dither and bit rounding to reduce 96/48/44.1K recordings to 22, 20, 18 or 16 bits.

Digitally copy 8 track stereo or Hi-Res ADAT/TDIF recordings to or from TDIF/ADAT.

Auto identify Stereo or Hi-Res recordings upon ADAT or TDIF replay.

Inputs from A/D ADAT optical, TDIF, AES, SPDIF, Outputs to D/A ADAT optical, TDIF, AES, SPDIF.

Seperate Digital Word Sync from D/A TDIF, ADAT, AES, SPDIF or BNC .

Rear panel show which sockets are active for easy hookup using Green (for input signal) and Yellow (for word clock inputs) LEDs.

Built in 100Hz, 1kHz, 10kHz and dual sine wave generator (100Hz Left Ch, 1K Right Ch) sine tone at -40dB, -20dB and variable -24db to -6dB output level to aid connection difficulties and troubleshooting.

Dual PLL for low jitter

AUDIO CONNECTIONS

Analogue Inputs

The inputs and outputs to the DC2496 are electronically balanced and would normally be connected to your system via a patchbay. Should unbalanced operation be required, simply ground pin 3 on the XLR connectors.

If earth loop hum problems are encountered, **do not** disconnect the mains earth but instead, try disconnecting one end of the signal screen on the cables connecting the DC2496 to the patchbay. If such measures are necessary, balanced operation is recommended.

AES/EBU

Is via an XLR connector designed to be used with standard balanced microphone cable (20 metres maximum), wired pin 1 screen, pin 2 and 3 balanced data, and the XLR shell connected to the chassis. Having many short cables joined together is not advisable as each connector can cause undesirable signal reflections.

The output socket fully conforms to the EMC standards; if the unit is to be used where it may be exposed to high levels of disturbance, such as found close to a TV or radio transmitter, it is suggested that the screen of the data cable be connected to the chassis connection on the XLR type connector rather than to pin 1.

If ground loop problems are encountered, never disconnect the mains ground, but instead, try disconnecting the signal screen on one end of each cable connecting the outputs.

S/PDIF

Is via a high quality RCA type phono jack where the data conforms to the Sony® Phillips® Digital InterFace format. Because this connector only provides an unbalanced termination, the recommended maximum length for this cable is 3 metres, even with very high quality cable.

Word Clock

For external clock synchronisation or when the DC2496 is providing the clock to another source, this is carried out via the 50W BNC connector.

ADAT

Connect via an Optical Cable (Light Pipe) with a maximum recommended length of three metres. The cable supports 8 channels at a 24 Bit word resolution. The Drawmer DC2496 provides separate ADAT input and output as standard.

TDIF

Is via a 25 pin D connector. This is a unique cross-wired cable, supplied by Tascam. It has 8 inputs, 8 outputs all at 24 Bit word resolution as well as TDIF word clock in and out all in the one connector. The maximum recommended length is three metres.

Note: When the TDIF D plug is inserted the main BNC Word Clock out is shifted by 90 degrees for TDIF use only.

N.B.

Because a TDIF module (such as the Tascam DA-88) provides power to the DC2496 via the TDIF cable always ensure that the Drawmer DC2496 is switched on before a TDIF module. Similarly it should always be switched off before the DC2496.

INSTALLATION PRECAUTIONS

Should a fuse blow, replace it only with the same type and value as the one fitted.

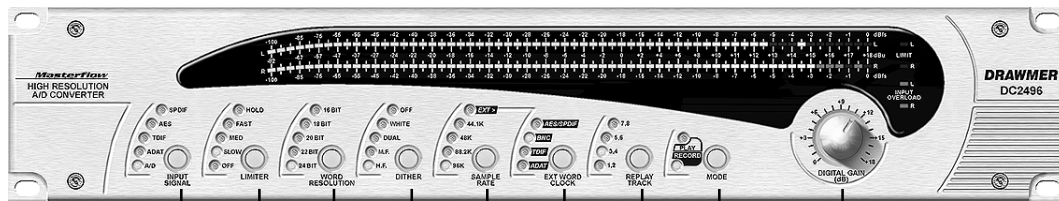
When installing the DC2496, ensure that it is allowed sufficient ventilation and avoid mounting it next to excessively hot pieces of equipment or devices emitting a strong magnetic field such as is often the case with power amplifiers. If the unit is to be used in a mobile situation, it

is strongly recommended that the rear of the unit is supported in the carrying rack to avoid bending the front panel rack mounting 'ears'.

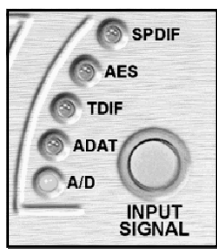
Should the unit require cleaning, use a damp cloth with a little liquid detergent; do not use thinners or spirit cleaners as these may attack the finish.

CHAPTER 2

DC2496 BASIC EFFECTS



Input Signal



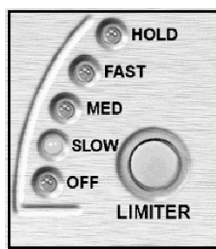
INPUT SIGNAL shows the selected input source. This signal is also indicated on the rear panel by lighting the selected signal Green LED.

The WORD CLOCK must be set to the appropriate source otherwise clicks, pops or even loud white noise may be heard. When setting up for a new signal source firstly select the mode for RECORD or PLAY (each mode has its own set of input, Limiter, Word Res etc. settings).

When TDIF input is selected then the Sample Rate/Ext Word Clock automatically selects TDIF.

ALWAYS reduce to monitor volume before changing the input signal or word clock source to prevent damage to ears or speakers.

Limiter

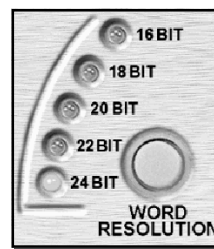


The limiter will only have any effect when 'DIGITAL GAIN' is set greater than 0dB.

There are several attack/decay settings: use 'SLOW' for least intrusive signal leveling with up to 18dB of gain, 'MED' to increase to perceived volume with up to +12dB of gain, 'FAST' for transient capture.

Note: if more than +9dB of 'DIGITAL GAIN' is applied then it is possible hear the limiter pumping, use 'HOLD' to normalise the signal to exactly 0dB. Select 'HOLD', play the track using +18dB of 'DIGITAL GAIN' then rewind and the track will be ready to play with its max peaks unlimited at 0dB. Re-select the 'HOLD' LED to re-set the hold level. The 'LIMIT' meter LED will remain lit when 'HOLD' is selected and the input signal has been limited, until the 'LIMITER' button is pressed. The 'LIMIT' LED will also remain lit for up to 10 seconds as the limiter releases when 'SLOW' and the input signal has been severely limited.

Word Resolution

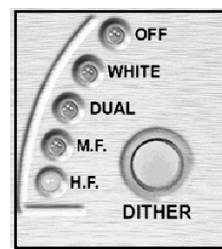


WORD RESOLUTION defines the number of bits per audio sample, ie: Standard audio CD is 16bits.

This must match the recording medium otherwise 'Truncation' distortion will occur. Truncation distortion cannot be removed after recording by adding dither to a truncated signal. When word resolution is reduced to less bits than the original then dither must be added to mask the distortion that is caused when the bits are lost.

If the DC2496 A/D is 24bit resolution, when reducing this to 16bits for a DAT recording normally best results are obtained with HF dither.

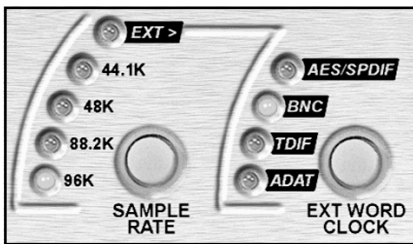
Dither



H.F dither generally removes the low level distortion on low signal levels with the least noticeable noise. M.F dither produces the lower distortion with a slight increase in noise over H.F dither. DUAL dither produces the lowest distortion but still has much less perceived noise than White noise dither.

White noise is the standard dither added to prevent distortion on low level signals when the WORD RESOLUTION of a signal is reduced, ie. 24bit recording reduced to 16bits. It offers poor performance in terms of perceived noise.

Sample Rate / Ext Word Clock



SAMPLE RATE selects the required highly accurate internal crystal controlled dual PLL clock signal. This can be 44.1, 48, 88.2,96k or EXT which can use an external Word Clock signal.

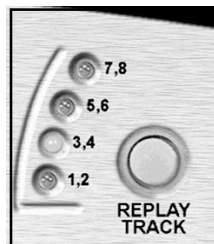
EXT WORD CLOCK selects the source for the word clock (indicated by a yellow LED on the rear panel). It must be within the range 30kHz to 100kHz. The signal will be sent to the DC2496 dual PLL for clock cleaning to reduce distortion that can be caused by jitter on the clock signals.

The Front panel yellow 'EXT WORK CLOCK' LED will flash quickly if a clock is unstable or will flash slowly if no clock is connected.

Ensure the correct Sample Rate & EXT WORD CLOCK are selected otherwise a small amount of distortion on the signal, regular click, pops or a repeating 'Zwang' type sound may occur (this applies to all digital equipment).

Note: after the sample rate has been changed, the A/D will require an audio signal for 1 minute to settle back to its full dynamic range.

Replay Track



REPLAY TRACK is only lit when ADAT or TDIF input signal has been selected.

The number of LEDs lit depends on the tracks being replayed from the multitrack tape recorder:

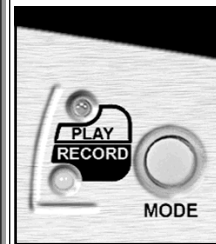
Normal stereo signals light one LED allowing 4 pairs of stereo signals to be monitored.

When 2 LEDs are lit (only when the tape is playing) then a Hi-Res triple track has been detected which will be replayed as stereo output of 24bits at 48kHz.

When 3 LEDs are lit then a 96 or 88.2kHz 'Hex' track has been detected which will be replayed at 96kHz from the Main digital outputs and D/A but 48Khz from the Sample Rate Converter digital outputs and the Multitrack outputs.

If the replay track changes from normal 16/20 bit mode to Hi-Res mode there will be a short burst of white noise for a couple of hundred mS. This is due to tracks 3/4 which sound like 0dB white noise being audible while the DC2496 auto detects the Hi-Res mode.

Mode



RECORD/PLAY selects between two sets of all the other button settings.

Select the mode before altering any other parameter.

Digital Gain



GAIN of up to +18dB can be applied.

Be aware that digital distortion can occur whenever gain is applied therefore the Limiter should be switched on (see LIMITER section).

CHAPTER 3

SPECIAL OPERATION NOTES

Recording Hi-Resolution 'Bit splitting' tracks on a Digital Tape Recorder (ADAT or TDIF)

When recording Triple (48k) or Hex (96k) Hi-Resolution tracks to tape the Aux Digital Outputs (upper) AES & SPDIF digital outputs will monitor tracks 7/8 @ 20 or 16bit resolution depending on the rear panel push switch.

When TDIF 'D' plug is inserted the DC2496 BNC Word Clock output will be phase shifted by 90 degrees at a rated 44.1k @ 88.2k and 48k @ 96khz. This is the clock for TDIF Word Sync.

When using A/D, ADAT or TDIF as the input signal and SAMPLE RATE is set to EXT with AES/SPDIF then the DC2496 will get its EXT word clock from the AES digital input (XLR socket), not the SPDIF digital input socket.

The Main Digital (lower) SPDIF and AES output sockets both support 88.1 and 96K 24bit signals if selected on the front panel. The EXT SPDIF word clock input is only available when SPDIF input signal is also selected.

The Sample Rate Converted AES & SPDIF output sockets are rounded to 16/20bits and HF dither added regardless of front panel settings according to the rear panel switch.

The 'Setup tone' frequency will only be accurate to a few percent of its correct value when an EXT clock source is used.

The Rear panel 'Green audio signals OK' LEDs are lit when the PLL is locked and signals are output.

ADAT and TDIF track outputs will always be at 44.1/48Khz even if A/D or Digital input is at 88.2 or 96K.

There are two Hi-Resolution recording modes:
Triple (3) track 24bit 44.1 or 48Khz on either or both tracks 123 or 456, or,
Hex (6) track 24bit 88.2 or 96Khz on tracks 123456.
Both triple and hex track modes also have a stereo backup 16bit 44.1 or 48k recording on tracks 7/8

When recording a 48/44.1K Hi-Res triple track it is preferable to use tracks 4,5,6.

If tracks 123 only are recorded then their noise will be heard when monitoring tracks 5,6. This is correct and is the 'Remainder' track of the Hi-Res signal.

If track triple 4,5,6 is recorded or both sets of Triple tracks then this noise will not be heard.

Special Digital Tape Recorder (ADAT or TDIF) Play cases:

When replaying a normal ADAT or TDIF recording, all 8 tracks will be directly copied to the 8 TDIF and ADAT output tracks. Limiter, Gain, Word resolution, dither etc will not modify the 8 track signals.

The Main digital output will have Gain, Limit etc. and will monitor the selected replay track LEDs.

The 48/44.1Khz SRC digital output will exactly monitor the selected replay track LEDs (without Gain, Limiter etc).

When replaying a Hi resolution triple or hex track recording (made when both 24 and 16 bit WORD RESOLUTION LEDs are lit) the Sample Rate Converter digital AES/SPDIF, the Main AES/SPDIF digital output and TDIF and ADAT track outputs 7/8 will replay the stereo signal from the tracks shown by the REPLAY TRACK LEDs. Gain, limiter, Bit rounding & dither can all be applied.

The TDIF and ADAT output tracks 1 thru 6 will be an exact bit copy of the triple or hex track Hi-res recording.

For best results when reducing a 96K 24bit recording to 44.1 @ 16 bits leave the front panel LED set to 24bits and reduce the signal to 16bits @ 44.1Khz on the Aux Digital Output rear panel grey push switches.

The DC2496 cannot record or play normal stereo signals @ 96k to ADAT or TDIF. You must select the WORD RESOLUTION as 2 LED (16 and 24) bit splitting mode and Sample Rate as 44.1/48K.

Up to 4 x DC2496 can be used to simultaneous record 48K 24bit signals (if the recorder allows) to TDIF using a special splitter lead. The Word Clock must be EXT TDIF on the DC2496's with the TDIF machine providing the Word Clock. This cannot be done using ADAT light pipe

Several DC2496 units can be synchronised to sample accuracy (better than 0.2uS) by setting the master unit SAMPLE RATE to Internal clock 96/88.2/48/44.1 FS then setting the other units as EXT BNC word clock slaves.

CHAPTER 6

DC2496 DATA
SPECIFICATION**Analogue Input**

Connectors	XLR Balanced (Pin 2 Hot)
Impedance	10 K Ω
Max. Input Level	+24 dBu
Input CMR	Better than -50dB
A to D Conversion	24 Bit
Dynamic Range	A/D >129dBFs A Weighted at 48KHz
Crosstalk	-100dB @1kHz -90dB@10kHz
Sample Rate	44.1, 48, 88.2, 96kHz, EXT

Analogue Output

Connectors	XLR Balanced (Pin 2 Hot)
Impedance	50 Ω
Max. Output Level	+21 dBu
Output Balance	-35dB@1KHz
D to A Conversion	24 Bit
Dynamic Range	-108dB Unweighted
THD	<0.008%@1KHz,
+10dBu	
Frequency Response	96kHz 7Hz - 44kHz
@ -1dB	88.2kHz 7Hz - 41kHz 48kHz 7Hz - 22kHz 44.1kHz 7Hz - 20kHz

Digital Inputs and Outputs

Main AES/EBU In/Out	XLR
Main S/PDIF In/Out	Coaxial, RCA Type
TDIF	25 pin D plug. 8 Channel
ADAT	Light Pipe (Optical Cable).8 Channel
Sample Rates	44.1, 48, 88.2 and 96KHz
Word Length	16, 18, 20, 22, 24 Bits

Aux Digital Outputs (SRC)

Aux AES/EBU In/Out	XLR
Aux S/PDIF In/Out	Coaxial, RCA Type
Sample Rates	44.1kHz, 48kHz
Word Length	16, 20 Bits

Multi-Track I/O**ADAT Optical**

In and Out on all eight channels using Light Pipe

TDIF

In and Out on all eight channels using Tascam Digital Interface (25 pin DSUB)

General

Power Requirements	40VA
Fuse Rating	T160mA at 220 Volts, T320mA at 110Volts CONFORMING TO: BS EN 60127-2:1991 SHEET III
Fuse Type	20mm x 5mm, Class 3 Slow - Blow 250Volt working
Case Size (mm)	482(w) x 88(h) x 250(d)
Weight (incl packaging)	5KG

BLOCK DIAGRAM

