

# SD-4

## In-picture audio meter Series III

From the range of in-picture audio meters by Chromatec

### User instructions



DISTRIBUTED WORLDWIDE:  
MICHAEL STEVENS & PARTNERS LTD  
INVICTA WORKS ELLIOTT ROAD BROMLEY KENT BR2 9NT UK  
TEL: +44 (0)20 8460 7299 FAX: +44 (0)20 8460 0499  
E-MAIL: SALES@MICHAEL-STEVENSON.COM  
WEB: [HTTP://WWW.CHROMATEC.COM](http://www.chromatec.com)

# SD-4

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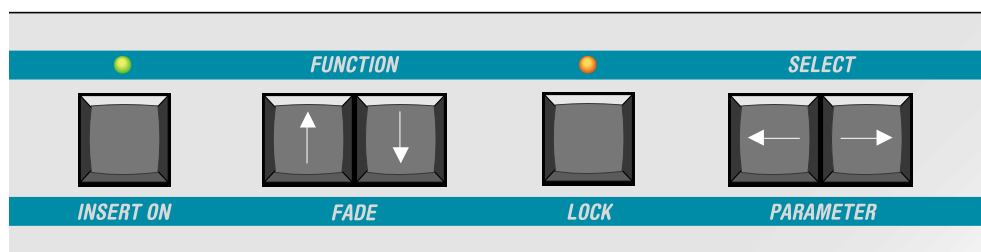
## Model overview

The Model SD-4D is a serial digital in-picture audio meter for displaying up to four channels of audio in bargraph form. The audio may be derived from any one of the four embedded audio groups, from two pairs of external AES/EBU inputs or two pairs of external analogue inputs. The audio bargraphs and on-screen data are mixed in the digital domain with the outgoing SDI signal and may be converted to provide both YUV/RGB and composite video outputs also with superimposed bargraphs. Two AES/EBU outputs together with four corresponding analogue outputs are provided so that the incoming audio, whether embedded or AES/EBU may be converted to analogue.

A comprehensive on-screen menu allows the user to configure the SD-4 according to requirements including bargraph height, bar colours, position on screen, level references, etc. Any one of the four embedded audio groups or external audio sources may be displayed as audio level bargraphs together with sum & difference (M&S) meters, Loudness\* meters and two phase correlation meters. Six standard meter scales and their corresponding ballistics are available together with VU superimposed on PPM. Alarms are provided for audio loss, carrier loss, over level, Loudness over and sustained anti-phase with TTL outputs and on-screen indication in an alarm condition. There is provision for a wired remote control, duplicating the operation of the front panel buttons.

*\*Based on the Thames Television – ITC standard.*

## Front panel buttons



### Insert on

The "Insert On" button switches the bargraphs on or off according to the bar groups pre-selected from the Menu and at the previously set fade level. When in the Menu mode the Insert button also acts as a "shift" key when changing values in the third column.

### Function/fade

The Fade buttons determine the mix level of the bargraphs superimposed on the outgoing video and operate only when the unit is locked (with the red LED off). When the unit is unlocked and in the Menu mode, these buttons are used to move the cursor up or down the Menu line in order to select a function.

### Lock

The "Lock" button performs three functions depending in which mode the unit is operating. When in the locked mode with the red LED off, pressing the button briefly will reset the peak hold indicators and loudness

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alarm/latch. Unlock is activated by keeping the button pressed for about 3 seconds after which the red LED will be lit and the on-screen Menu appears, disabling the Fade function. While in the Menu mode some actions require confirmation which is carried out by pressing both Lock and Insert buttons simultaneously (see below). After carrying out changes within the Menu, pressing the Lock button again will save the settings and return the SD-4 to the normal meter mode.

### Select parameter

When the unit is unlocked the Select Parameter buttons are used to change the system settings depending on the Menu line selected. In the normal locked mode the "Select Parameter" buttons may be pressed, briefly, together with the "Lock" button in order to change the television standard of the internal black generator.

## System Menu

In order to change the numerous parameters of the SD-4 it is necessary to enter the system Menu by pressing the Lock button for approximately 3 secs, whereupon the red LED above the Lock button will light and the Menu will appear on-screen. In all cases the "Select Parameter" buttons select the value shown in the centre column of the menu. Where applicable, the adjustable values shown in the third column are carried out by using the "Insert" button as a "shift" key together with the "Select Parameter" buttons. Those menu lines that have a red flashing cursor require confirmation of an action which is carried out by pressing both the "Insert" and "Lock" buttons simultaneously, whereupon the cursor stops flashing. See following Menu pages.

*Note - The order of the following menu lines may vary according to the software release of your SD-4.*

### Menu Page 1

#### USER CONFIGURATION SELECT

The SD-4 has two user memories, User 1 and User 2, where all configuration settings are stored. Depending which user is currently shown or subsequently selected, exiting the menu will store any changes made in the menu to that user. In the unlikely event that a system reset is required then all user settings will be returned to the factory default settings.

#### USER CONFIGURATION COPY/RESET

It is possible to copy one user configuration to the other user or reset users to the factory default settings. Each option has a flashing red cursor indicating that confirmation of this action is required. This is carried out by pressing the Insert and Lock buttons simultaneously whereupon the red cursor will stop flashing.

#### METER DISPLAY HORIZ POSITION

Horizontal adjustment of the whole audio meter display (including phase meters if displayed) may be adjusted. The menu marker provides an approximation of it's relative position on screen.

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### METER DISPLAY VERT POSITION

Vertical adjustment of the whole meter display (including phase meters and timecode reader if displayed) may be adjusted. The menu marker provides an approximation of it's relative position on screen.

### METER GROUP HEIGHT

The main bargraph group height may be set to Normal (full height), Half or Quarter depending on the vertical meter resolution required.

### METER GROUPS VERT POSITION

Allows vertical adjustment of the bargraph groups. The menu marker provides an approximation of their relative position on screen.

### AUDIO SOURCE SELECT

The SD-4 may be switched to display audio derived from the incoming SDI video feed (embedded), external AES/EBU or external analogue. In all cases a maximum of four channels may be displayed at any one time. When viewing de-embedded audio it is possible to select one of the four groups available.

## Menu Page 1/2

### METER GROUP [X] DISPLAY

Up to four bargraph groups, A,B,C & D may be displayed, by default A & B are located to the left of the screen and C & D to the right. Each of these groups can be assigned to display Level, Sum & Difference, Sum only and Loudness, or turned off.

### METER GROUP [X] CHANNELS ASSIGN

Any combination of channel assignments may be selected.

### METER GROUP [X] HORIZ POSITION

Allows horizontal adjustment of the bargraph group. The menu marker provides an approximation of it's relative position on screen. When moving a group and another group is in the way, one group will "push" the other one along. However, if a group is opened and the position conflicts with a group already being displayed then both groups will be displayed in outline mode only until one group is moved clear of the other.

### METER GROUP [X] SCALES POSITION

Whichever scale is selected (see Menu p4), it may be placed to the left or right of the bargraph or turned off.

## Menu Page 3

### BAR WIDTH

When selecting this line a small red cursor appears on the bargraph at it's base according the bargraph selected. The bargraph width value (in pixels) may then be changed by using the Insert button as a "shift" key together with the Select Parameter buttons. Selecting "All Bars" applies the value chosen to all bargraphs.

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### BAR SPACING

When selecting this line a small red cursor appears between the bargraphs at their base according to the group selected. The bargraph spacing value (in pixels) may be changed by using the Insert button as a "shift" key together with the Select Parameter buttons. Selecting "All Groups" applies the value chosen to all Groups.

### BAR COLOUR OVER-RANGE

The "Over-Range" portion of the bargraph is at the top. The required bargraph is selected and then colours may be changed by using the Insert button as a "shift" key together with the Select Parameter buttons. Selecting "All" applies the colour chosen to all bargraphs.

### BAR COLOUR UPPER-RANGE

The "Upper-Range" portion of the bargraph is at the centre. The required bargraph is selected and then colours may be changed by using the Insert button as a "shift" key together with the Select Parameter buttons. Selecting "All" applies the colour chosen to all bargraphs.

### BAR COLOUR LOWER-RANGE

The "Lower-Range" portion of the bargraph is at the bottom. The required bargraph is selected and then colours may be changed by using the Insert button as a "shift" key together with the Select Parameter buttons. Selecting "All" applies the colour chosen to all bargraphs.

### BAR BACKGROUND COLOUR

The required bargraph is selected and then colours may be changed by using the Insert button as a "shift" key together with the Select Parameter buttons. Selecting "All" applies the colour chosen to all bargraphs.

### METER GROUP BACKGROUND COLOUR

The required background colour may be chosen.

### METER GROUP SCALES COLOUR

The required scales colour may be chosen.

### METER GROUP LABELS COLOUR

The labels are situated at the base of the bargraph groups. The required colour may be chosen.

### METER SCALES SELECT

By default standard AES/EBU digital scales are displayed. However, these may be substituted with any of five internationally recognised analogue scales (together with their respective ballistics). In this case it is necessary to set the Digital/Analogue Scale Reference as shown below.

### ANALOGUE UPPER-RANGE POINT

This value sets the upper colour transition point of the bargraph when displayed with an analogue scale.

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### ANALOGUE LOWER-RANGE POINT

This value sets the lower colour transition point of the bargraph when displayed with an analogue scale.

## Menu Page 4

### ANALOGUE 0dB REFERENCE

The selected value is the level (in dBu) of the analogue input signal that is to be displayed at 0dB when using an analogue scale. This value should also be taken into account when displaying an analogue input signal on the AES/EBU digital scale as the relationship between the analogue and digital scale is fixed by the Digital/Analogue Scale Ref (see above)

### DIGITAL UPPER-RANGE POINT

This value sets the upper colour transition point of the bargraph when displayed with the AES/EBU digital scale.

### DIGITAL LOWER-RANGE POINT

This value sets the lower colour transition point of the bargraph when displayed with the AES/EBU digital scale.

### DIGITAL/ANALOGUE SCALE REF

It is necessary to set this value when displaying a digital input signal on an analogue scale or an analogue input signal on a digital scale. The European default value is  $-18\text{dB}$  whereas in the USA this is usually  $-20\text{dB}$ .

### PHASE BAR OPERATING MODE

In the Independent mode both phase correlation bars appear as horizontal bargraphs. In the Inc Group mode they are included as a vertical bargraph included in the main group of the respective audio level meter.

### PHASE BAR [X] ASSIGN

Assigns Phase Bar A to the selected channels or bargraph group.

### PHASE BAR [X] HORIZ POSITION

Allows horizontal adjustment of the selected phase bar. The menu marker provides an approximation of it's relative position on screen.

### PHASE BAR [X] VERT POSITION

Allows vertical adjustment of the selected phase bar. The menu marker provides an approximation of it's relative position on screen.

### PHASE BARS MAX HOLD ENABLE

A maximum hold cursor may be selected to indicate any negative phase excursion. This may be reset by briefly pressing the Lock button when in the normal operating mode.

### PHASE BAR COLOURS

After selecting Phase In or Phase Out the colours may be selected by pressing the Insert button as a "shift" key together with the Lock button.

## Menu Page 5

### SUM LEVEL SET

Depending on operating requirements the sum level may be adjusted.

### PEAK HOLD ENABLE

The peak hold indicator is a small coloured line located at the top of each audio level meter and may be turned off if not required. All signal peaks are displayed for the time period selected unless updated by a higher peak in the meantime. If Infinite is selected then the peak levels of a complete programme may be monitored. Reset is carried out by briefly pressing the lock button when in the normal operating mode.

### PEAK HOLD INDICATOR COLOUR

The required indicator colour may be chosen.

### SUPERIMPOSE VU METER

When using a PPM scale (analogue or digital) a VU meter may be superimposed enabling both peak and average readings simultaneously. This may be displayed as a split bargraph or a small coloured bar.

### SUPERIMPOSED VU COLOUR

The required indicator colour may be chosen for the selected channels.

### LOUDNESS DEFAULTS

The loudness defaults are those as originally developed by Thames Television in conjunction with the ITC and commonly accepted as the "Loudness" standard. However, some operating requirements may dictate modification of these default parameters in which case they may be switched off.

### LOUDNESS OVER-RANGE POINT

This value sets the single colour transition point of the Loudness bargraph.

### LOUDNESS INTEGRATION TIME

This value determines the integration time of the Loudness bargraph.

### LOUDNESS ALARM ENABLE

Separate alarms are provided for both Loudness meters. These may be activated individually, both together or turned off.

### LOUDNESS ALARM SET LEVEL

Determines the point on the loudness bargraph at which the alarm is activated. A red flashing alarm indicator appears at the top of the bargraph together with small red alarm latch indicators (see below).

### LOUDNESS ALARM SET LATCH

The value selected determines how long an alarm condition remains activated before automatically resetting. When set to Infinite any alarm condition remains activated until manually reset. There are eight Latch indicators, each one turning on when another alarm condition has

occurred. If and when all eight indicators are displayed a ninth alarm condition will result in all eight indicators flashing on/off. The Latch condition may be reset by briefly pressing the Lock button (when in normal operating mode).

## Menu Page 6

### ALARM INDICATORS

The on-screen alarm indicators comprise small coloured squares placed at the top of the respective bargraph groups. These are colour coded for each type of alarm condition. They may be hidden if not required.

### ALARMS MASTER RESET

All alarms may be reset. The flashing red cursor indicates that confirmation of this action is required. This is carried out by pressing the Insert and Lock buttons simultaneously whereupon the red cursor will stop flashing.

### ALARMS AUTO RESET

When activated, in an alarm condition the relevant alarms will automatically be reset after the selected time period subject to no further alarm conditions occurring in the interim. The timing of each individual alarm is independent and is taken from the point that the alarm is triggered or re-triggered.

### ALARM, SDI LOSS ENABLE

When turned on, this alarm will be triggered if the SDI input is lost.

### ALARM, CARRIER LOSS ENABLE

When turned on, this alarm will be triggered if both of the AES/EBU inputs are lost.

#### SET TIME

Sets the time before the alarm is triggered when the AES/EBU inputs carrier signals are lost.

### ALARM, AUDIO OVER ENABLE

When turned on, this alarm will be triggered if the selected audio channels exceed the selected level.

#### SET LEVEL

The range of levels shown will change depending whether the scale displayed is analogue or digital. The correlation will change according to the value set in the Digital/Analogue Scale Ref line of the menu.

### ALARM, AUDIO LOSS ENABLE

When turned on, this alarm will be triggered if the selected audio channels do not reach the selected threshold within the time set below.

#### SET TIME

Sets the time before the alarm is triggered.

#### SET THRESHOLD

Sets the threshold level below which the alarm will be triggered.



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### ALARM, ANTI-PHASE ENABLE

When turned on, this alarm will be triggered if the selected phase bars are out of phase according to the parameters set below.

#### SET TIME

Sets the time before the alarm is triggered.

#### SET THRESHOLD

Sets the threshold in degrees beyond which the alarm will be triggered.

## Menu Page 7

### AES/EBU OVERSAMPLES STATUS

This is a status page showing the number of oversamples per channel and verification that the incoming AES/EBU signal is error free. The sampling frequency is also displayed. These values may be reset by pressing the Insert and Lock buttons simultaneously whereupon the red cursor will stop flashing.

## Menu Page 8

### VIDEO MODE

The component video output may be set to YUV or RGB. The SDI and composite outputs are independent of this setting.

### VIDEO DISPLAY

In the Auto mode, if the incoming SDI feed is lost the SD-4 will automatically switch to internally generated black enabling the external analogue and AES/EBU audio still to be viewed. If the SDI signal is reinstated the SD-4 will automatically revert to displaying the video from this feed. When set to Internal, any audio feed (SDI embedded, AES/EBU or analogue – as selected in Page 1 of the menu) may be viewed on internal black if in-picture audio metering is not required. In this mode, by default, the fade level of the bargraphs is set to maximum but they may subsequently be faded down if required.

### VIDEO STANDARD INTERNAL

If the SD-4 is used as a dedicated audio meter in Internal mode only it will be necessary to set the outputs to 525 line NTSC or 625 line PAL.

Although the incoming SDI video standard is detected automatically it is still necessary to set the internal black generator manually so that if the incoming video is lost (and Auto mode is selected) then the SD-4 will output the required television standard.

**NOTE!** It is also possible to change the internal black generator's standard by briefly pressing the Lock and both Select Parameter buttons simultaneously when the unit is in the normal operating mode.

### NTSC PEDESTAL

The NTSC pedestal of the outgoing video may be set on or off.

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### VIDEO FUNCTIONS

Various video test functions may be selected. After use, press the Lock button for a few moments to return to the system menu and then to turn off the test functions.

### DATA PORT 1 ASSIGN

Assign the data port to the required external device.

### TIMECODE READER ENABLE

NOTE! This is a system option. If fitted, either LTC or VITC may be selected. LTC is derived externally (see connectors). If present on the internal video, VITC may be displayed.

### TIMECODE HORIZONTAL POSITION

Allows horizontal adjustment of the timecode reader. The menu marker provides an approximation of it's relative position on screen.

### TIMECODE VERTICAL POSITION

Allows vertical adjustment of the timecode reader. The menu marker provides an approximation of it's relative position on screen.

### TIMECODE BACKGROUND COLOUR

The required background colour may be chosen.

### TIMECODE NUMBERS COLOUR

The required numbers colour may be chosen.

## Master Reset

Master Reset is achieved by turning off the power for a few seconds, and turning it back on again while pressing both Fade/Function buttons until the bargraphs appear. A Master Reset is employed to return all settings to the factory default, or it may be carried out in the unlikely event that the unit fails to respond to the front panel push buttons. **Please note that all user settings will be lost.**

## Connections

### SDI

The SD-4 is normally connected in-line with an SDI monitor feed via the appropriate 75ohm BNC connectors and is designed to accept 525 or 625 line SMPTE 259M serial digital video. A loop-through copy output is also provided.

### Analogue video

Both YUV component and composite outputs are on 75ohm BNC connectors. These are an analogue copy of the SDI input plus superimposed audio bargraphs.

### Audio

Two pairs of AES/EBU and two pairs of analogue inputs are provided to accompany the SDI when separate audio and video feeds are employed.

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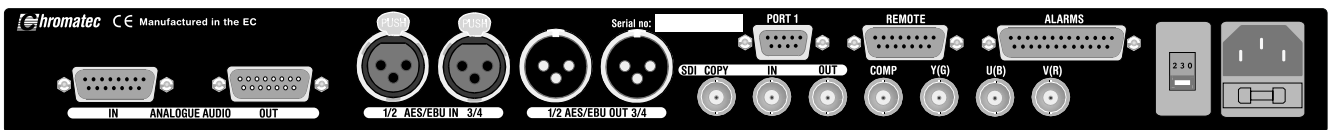
## In-picture audio meter

Two pairs of AES/EBU outputs are available which may comprise the corresponding AES/EBU inputs or de-embedded audio from any of the four available groups contained in the SDI feed. Four analogue outputs are also provided.

## Power

The SD-4 will operate from a nominal 115VAC or 230VAC mains supply. The mains input voltage is selected by the switch located on the rear panel next to the power inlet.

## Rear panel layout

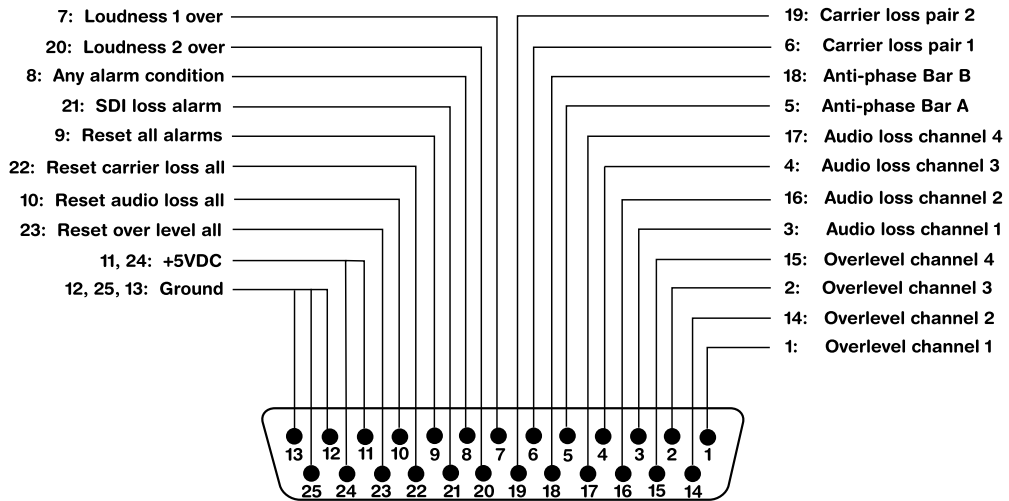


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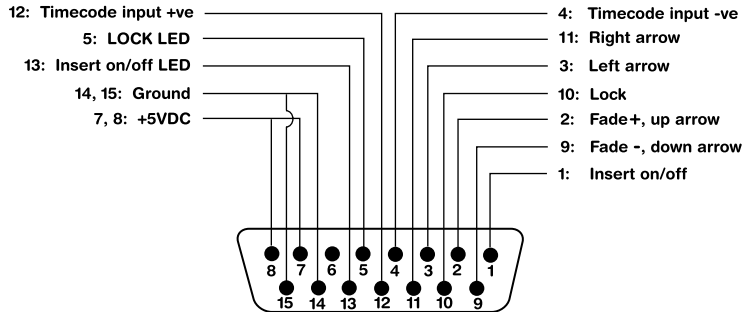
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## Connection details

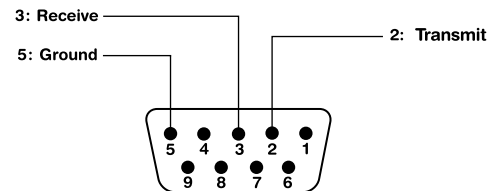
### Alarms 25 pole 'D' type (female)



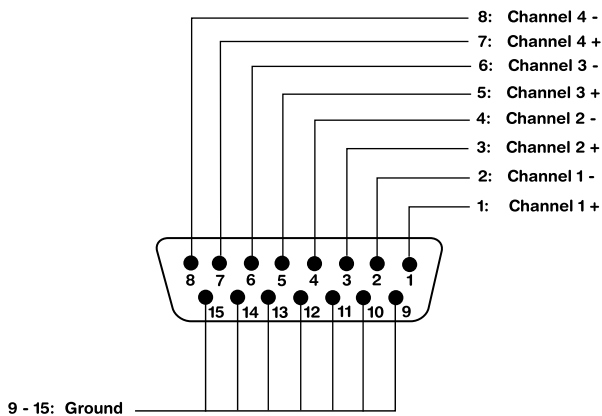
### Remote control 15 pole 'D' type (female)



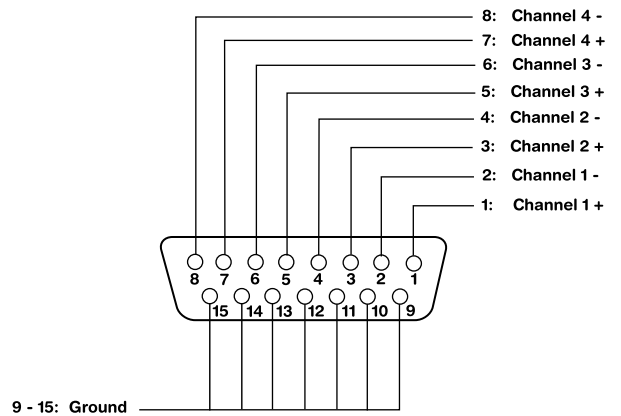
### RS232 Data port 9 pole 'D' type (female)



### Audio Input 15 pole 'D' type (female)



### Audio Output 15 pole 'D' type (male)



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## SD-4 Specifications

(subject to change without notice)

### Inputs:

- 1 x SMPTE 259M Serial digital 525/625 75ohm BNC.
- 2 x Pairs AES/EBU digital audio, 110ohm balanced
- 2 x Pairs analogue audio, balanced, 30kohm impedance

### Outputs:

- 1 x SMPTE 259M Serial 525/625 75ohm BNC
- 1 x SMPTE 259M Serial 525/625 75ohm BNC copy output
- 1 x YUV Component video, 1Vp-p, PAL/NTSC 75ohm BNC  
Or/ RGB Component video (sync on green), 1Vp-p, PAL/NTSC 75ohm BNC
- 1 x Composite video, 1Vp-p, PAL/NTSC 75ohm BNC
- 2 x Pairs AES/EBU digital audio, 110ohm balanced
- 2 x Pairs analogue audio, balanced maximum output level +20dB  $\pm$ 0.5dB

### Embedded audio extraction:

Sampling rate: 32-48kHz variable, automatically detected  
Digital audio processing resolution: 16 bits  
Audio channels extracted: Any one of four groups (four channels)

### Scales & ballistics:

- AES/EBU: Overall dynamic range: 60dB (0dBu to -60dBu)  
Attack time: 1 sample  
Decay time: 1.5secs per 20dB
- DIN PPM: Overall dynamic range: 55dB (+5dB to -50dB)  
Attack time: 10ms  
Decay time: 1.5secs per 20dB
- BBC PPM: Overall dynamic range: 28dB (+12dB to -16dB)  
Attack time: 10ms  
Decay time: 2.8secs per 24dB
- Nordic PPM Overall dynamic range: 60dB (+12dB to -48dB)  
Attack time: 10ms  
Decay time: 1.7secs per 20dB
- VU: Overall dynamic range: 23dB (+3dB to -20dB)  
Attack time: 300ms  
Decay time: 300ms per 20dB
- VU EXTD: Overall dynamic range: 80dB (+10dB to -70dB)  
Attack time: 300ms  
Decay time: 300ms per 20dB
- Loudness: Perceived loudness scale: L-12 to L+12  
(Default settings) Line-up point: L+4 which corresponds to 0dB (BBC PPM 4)  
on steady tone at 1kHz (only)  
Integration time: 4 secs  
(Based on the Thames Television/ ITC Standard)

### Phase correlation:

- Attack time: 1sec for 0 to  $\pm$ 1 deviation
- Decay time: 1sec for  $\pm$ 1 to 0 deviation
- Input dynamic range: 45dB
- Minimum input level: -50dB