# Contents

# 1 Introduction
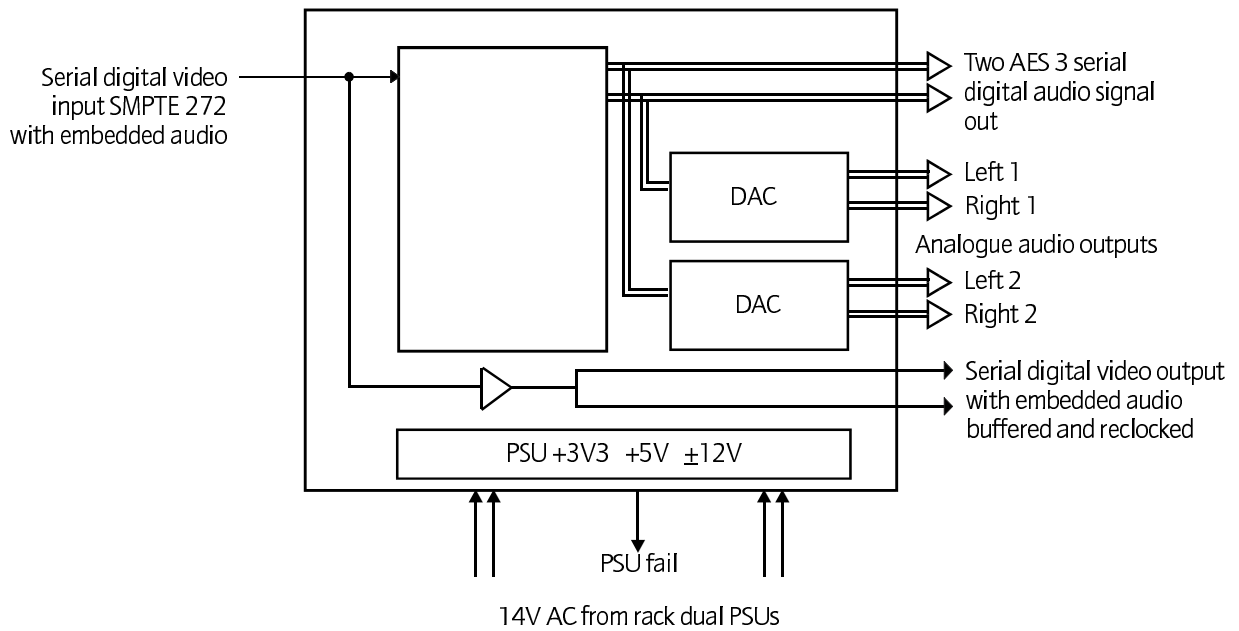
The 6683 permits the extraction of up to two dual channel digital audio signals and four analogue audio signals from a serial digital video input. User controls permit decoding of the four groups available. The 6683 automatically adjusts to receive signals encoded to the continuous and SMPTE-272 standards. Equalised and regenerated copies of the digital video input are provided.

Other important features of this submodule are:-

- 270Mbit/s component only (SMPTE 259M level C)
- The module will recover from illegal input signals within one second of a legal signal being restored.
- AES output synchronous with 270 Mhz, or Asynchronous.

Block diagram

Serial digital video
input SMPTE 272
with embedded audio

DAC

DAC

PSU +3V3  +5V  ±12V

Two AES 3 serial
digital audio signal
out

Left 1
Right 1

Analogue audio outputs

Left 2
Right 2

Serial digital video output
with embedded audio
buffered and reclocked

PSU fail

14V AC from rack dual PSUs

# 2 Installation and configuration

## 2.1 Card insertion

The module is inserted and removed by the user as follows:

• slide the card along the guide rail of the required slot, taking care to push it fully home until it marries up with the connector on the motherboard

## 2.2 Card removal

To remove the card proceed as follows:

• lift up the card ejector on the base card and gently pull the card out

## 2.3 Fitting the rear connector panel

To fit the rear panel the procedure is as follows:

• attach the 1671 back panel to the motherboard, ensuring that the pins and socket mate on a one-to-one basis and that there is no offset either vertically or horizontally

• secure the back panel to the metal work using the M2.5 crosshead screws supplied.  If the screw holes do not align then the panel is fitted wrongly.

**WARNING:  The screws form an essential chassis connection for EMC compliance and must not be omitted.**
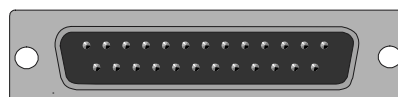
Fitting rear connector panels
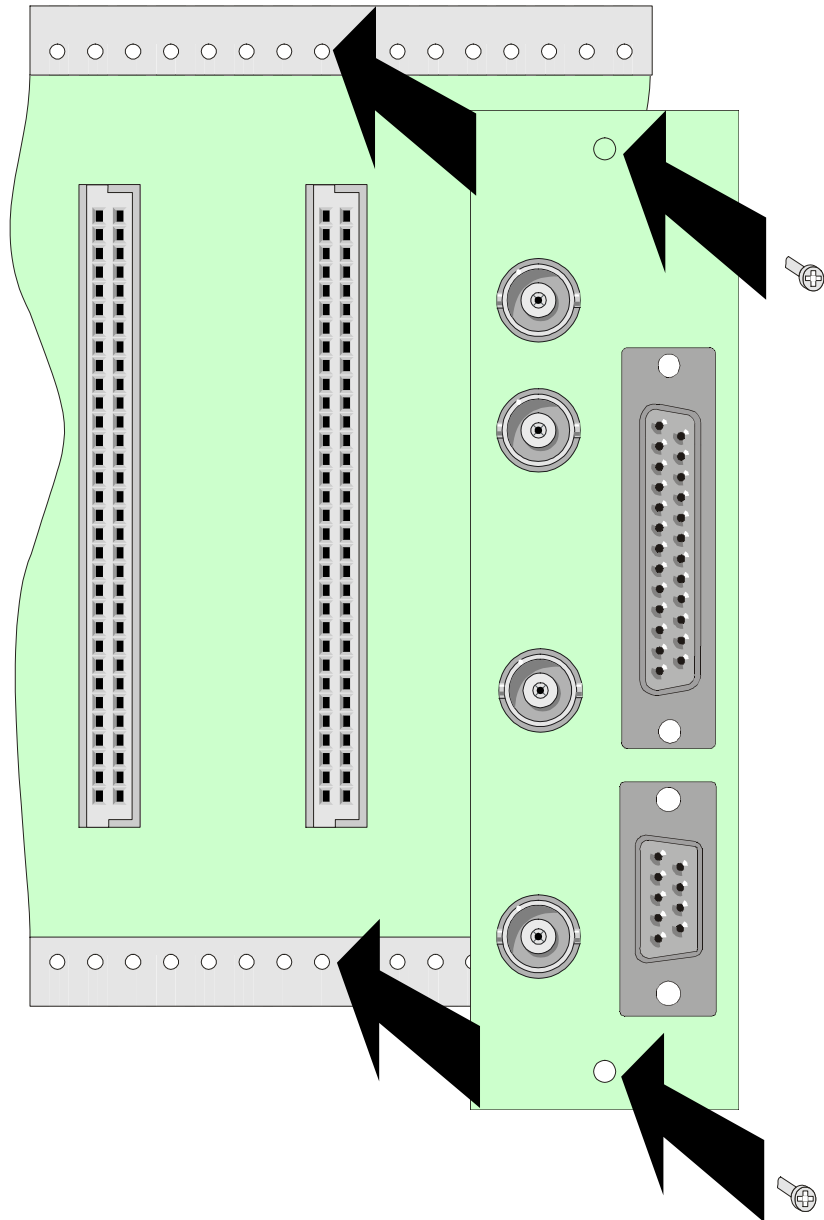
# 2.4 Rear panel connections
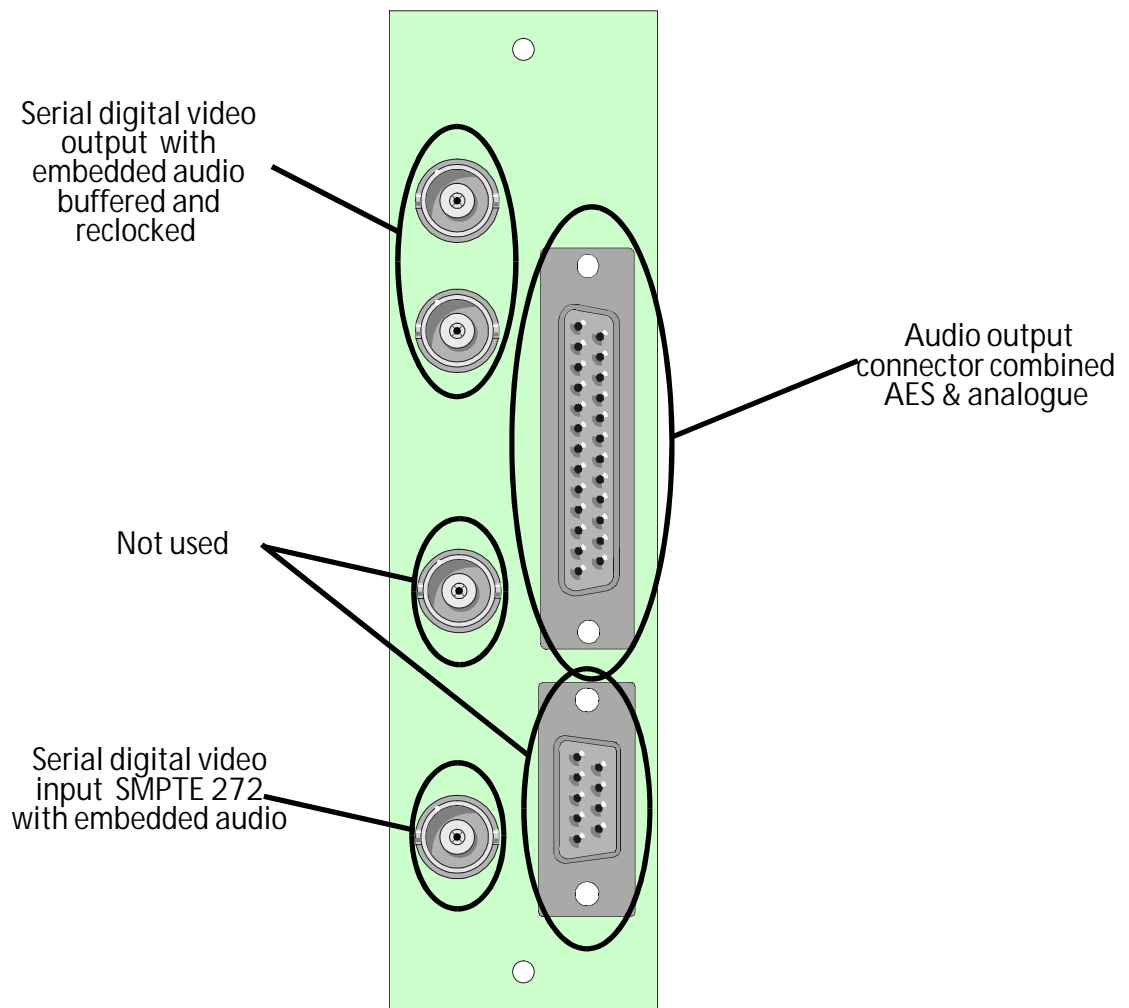
The 1671 rear panel has six connectors.

- one 25 way 'D' type socket for the AES/EBU audio/output (see following table below)
- one 9 way 'D' type socket, not used
- three BNC connectors for video input and output
- one BNC connector, not used

**AES audio output connector**

| AES audio output connector | | Pin | Function |
|---|---|---|---|
| Pin | Function | | |
| 1 | AES 1- | 14 | Audio 1- |
| 2 | AES 1+ | 15 | Audio 1+ |
| 3 | Ground | 16 | Ground |
| 4 | N/C | 17 | Audio 2- |
| 5 | N/C | 18 | Audio 2+ |
| 6 | Ground | 19 | N/C |
| 7 | N/C | 20 | Ground |
| 8 | Ground | 21 | Audio 3- |
| 9 | AES 2- | 22 | Audio 3+ |
| 10 | AES 2+ | 23 | Ground |
| 11 | Ground | 24 | Audio 4- |
| 12 | N/C | 25 | Audio 4+ |
| 13 | N/C | | |

Rear connector panel used with 6673 extractor

Serial digital video output with embedded audio buffered and reclocked

Audio output connector combined AES & analogue

Not used

Serial digital video input SMPTE 272 with embedded audio

## 2.5 Setting the operating mode

The rotary HEX switch, SW1, mounted on the front edge of the module sets the audio group to be extracted as detailed in the table below. The Asynchronous mode should be used in situations where the embedded AES3 audio is unlocked.

| Hex switch settings | | |
|---|---|---|
| Mode | Group | Sync/Async |
| 0 | 1 | Sync |
| 1 | 2 | Sync |
| 2 | 3 | Sync |
| 3 | 4 | Sync |
| 4 | 1 | Async |
| 5 | 2 | Async |
| 6 | 3 | Async |
| 7 | 4 | Async |

SW1
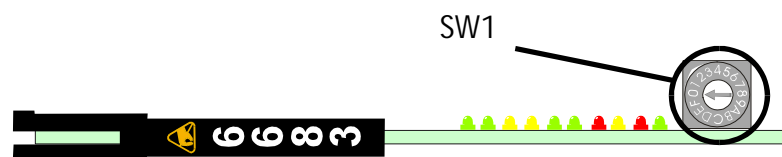
# 2.6 Enabling the audio outputs

### AES output

The AES output of the extractor may be enabled/disabled by jumper PL2 and is described in the following table.

| Enabling the AES output | |
|---|---|
| **Position** | **Function** |
| Enable | Enables the AES output |
| Disable | Disables the AES output |

### Analogue Audio output

The audio output of the extractor may be enabled/disabled by jumper PL3 and is described in the following table.

| Enabling the audio output | |
|---|---|
| **Position** | **Function** |
| Enable | Enables the analogue output |
| Disable | Disables the analogue output |

Jumper positions



AES          Analogue          Analogue Level Adjust
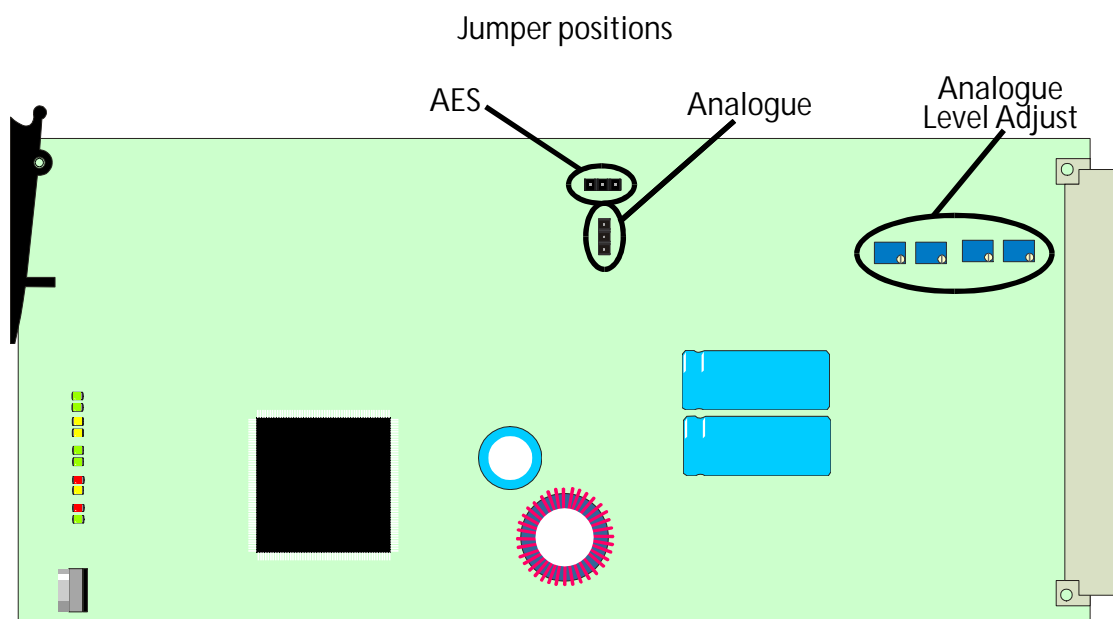
# 3 Theory of operation

The purpose of this module is to extract the audio component from a digital video signal meeting the standard SMPTE 272M or the earlier slightly different, format used by Sony Betacam equipment.  This signal may contain up to sixteen individual audio channels in groups of four.  The 6683 can extract any one group, ie channels 1-4,5-8,9-12 or 13-16, but not combinations.  If only two channels are embedded it can successfully extract those.  Since these channels are typically in stereo pairs, or at any rate derived from AES3 stereo/ two channel digital audio signals, the output of the module is in the form of two AES3 signals containing channels 1 and 2, 3 and 4 respectively, or 5 and 6, 7 and 8 etc according to which group has been selected for extraction by setting the card edge switch (see 2.5). The four separate channels are also made available in balanced analogue form.

There are two modes of operation, depending on whether the embedded audio is known to be synchronous with the video component or possibly asynchronous. The audio samples are embedded in the video signal during the line blanking period.  However, there are 1920 samples to be spread over 625 video lines (for 625/25 video) requiring that some lines will carry three samples per audio channel and some will carry four, in a pattern 3,3,3,4,3,3,3,4 with occasional extra '3s' and some blocks of '4s'.  If the audio is synchronous with the video the pattern is stable, and depends on the phasing of the input signal.  If it is asynchronous, the pattern drifts through the video, with the '4s' moving up or down a line at a time. The groups of 4 channels are labelled electronically, and are not necessarily inserted in the obvious order, ie the first group in the waveform may be group 2, the next group 4, and then group 1etc.  The channels within the group are fixed, but the pattern can vary from any stereo pair to another, leading to some confusing visual displays.

In the first case, there  are always exactly 1920 audio samples per channel in every video frame for 625/25 video, or 8008 samples in every five frames for 525/29.94 (NTSC) video.  It is then possible and preferable to derive the clock frequencies for the AES3 output from the video bitstream clock.  The signal is received by common serial digital video silicon chips and converted to parallel form at a rate of 27MHz (in both video cases).  This clock can be divided to 12kHz and used to phase-lock a digital audio clock at 12.288MHz also divided to 12kHz.  The bursts of three or four samples are extracted as they arrive and are put into a FIFO.  Then the derived AES3 clock takes the output from the FIFO, keeping it about half-full, at a regular rate as required for the AES3 output and analogue converters.  In the

second, asynchronous, case the AES3 clock cannot be locked to the video, so the 12.288MHz oscillator is controlled by the quantity of samples in the FIFO, speeding up the clocking out process if it gets too full and slowing down if it empties.  This mode works for synchronous signals as well, but leads to difficulties when switching sources.

The mode is selected by the group switch on the card edge, see 2.5.

There is a small difference between the SMPTE standard and the original Sony implementation in that the pattern specified by SMPTE requires that two lines are not occupied by audio during the video frame blanking period, to support error detection and handling (EDH) and to avoid corruption  due to switch during the switching line.  It is this that leads to blocks of '4s' while the embedder catches up after the forbidden lines.  The 6683 copes with both signals.

There are a number of front edge indicators listed in section 4 (Fault finding).  The 6683 is designed to recover on its own from any illegal input condition, having internal checking processes to guarantee that false states in the programmable logic and FIFOs will be detected and appropriate reset actions taken.

# 4 Fault finding

## The power LED is  not illuminated

- check mains power to the frame is turned on
- check the card is plugged in securely
- check to see if one of the resetable fuses have operated, perhaps after recent servicing work on the board.  To do this turn the power off, wait for thirty seconds and then restore the power.

## The lock LEDs are not illuminated

- check the power supply LED is illuminated
- check that the input cable is connected securely to the BNC socket on the rear panel
- check that the digital video signal generator is generating a signal of the correct format.  If only one audio channel is locked then only one LED is illuminated
- try module in asynchronous mode
- LEDs will not be illuminated when module is in asynchronous mode
- check that neither of the reset LEDs are illuminated

## The video present LED is not illuminated or module Reset LED flashes

- check the power supply LED is illuminated
- check that the input cable is connected securely to the BNC socket on the rear panel
- check that the digital video signal video generator is generating a signal of the correct format
- check that there is a digital video signal of the correct format connected
- check that neither of the reset LEDs are illuminated
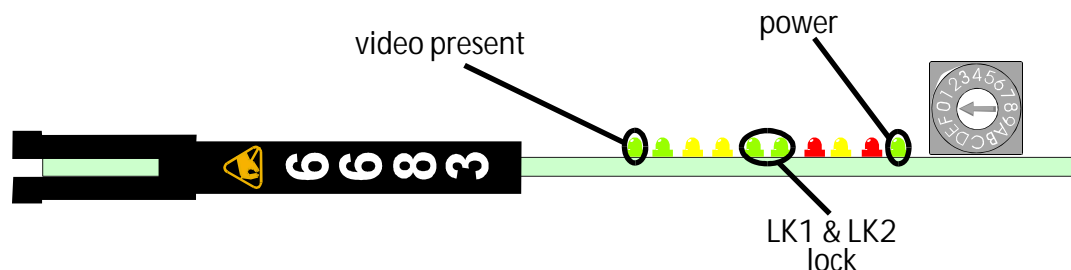
## The audio present LED is not illuminated

- check the power supply LED is illuminated
- check that the input cable is connected securely to the BNC socket on the rear panel
- check that the digital video signal video generator is generating a signal of the correct format
- check that there this a digital video signal of the correct format connected
- check Hex switch is set for correct mode of operation
- check that neither of the reset LEDs are illuminated

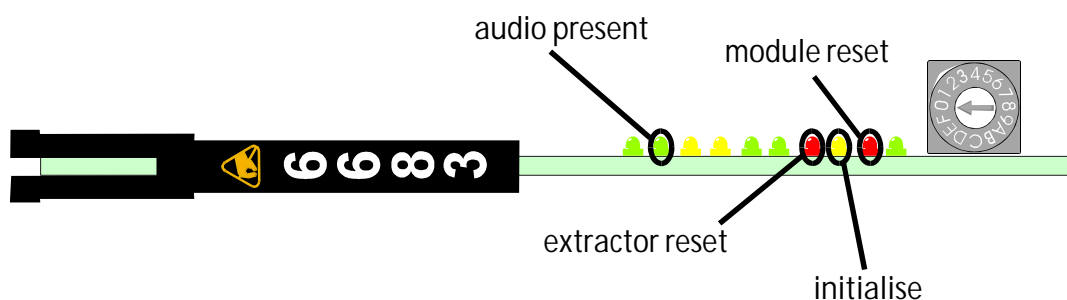## The module reset LED flashes or stays illuminated

- Check that there is a digital video signal connected
- there is a fault with the module

## The extractor reset LED is illuminated

Check the audio present LED is illuminated.  If it is then the extractor is receiving invalid data.

## The initialise LED stays illuminated

- there is a problem initialising the card

# 5 Specification

## Inputs
- One serial digital video to SMPTE 259 Component 625/50 or 525/59, with audio embedded to SMPTE 272M-A, i.e. 48kHz sampling rate, locked to video.

## Outputs
- two serial digital video as input, buffered
- two digital audio to AES3-1992, balanced 110 Ohm
- four analogue from two 4742 DACs or similar

## Links/switches
- Hex switch/ links to select between groups 1 to 4

## Power requirements
- from 1176 supply, 14-0-14 Volts AC, 3.5 Watts
- requires 500mA from +5 Volts (digital only)  +12 Volts at 38mA and -12 volts at 15mA for analogue

# 6  Warranty statement

**Hardware Products**

Hardware Products are warranted for a period of two years from the date of shipment. During this period Pro-Bel, at its discretion, will repair or exchange products proved to be defective providing that the products are returned to Pro-Bel, carriage pre-paid. The Company will use its best efforts to ensure that returned items are repaired and despatched within ten working days of receipt.  Third party items, including PC hardware or any outsourced equipment is limited to the original manufacturers warranty, typically one year.

**Software Products**

Software Products are warranted for a period of ninety days from the date of shipment. During this period Pro-Bel undertakes to rectify products proved not to conform to the published specification provided with the product, when used in accordance with PC hardware and operating systems approved by Pro-Bel.

**Loans**

Within the warranty period, the Company will, at its discretion and subject to availability, provide loan units pending the repair of returned items. Loans are offered on a no charge basis providing that the loan units are returned to Pro-Bel within a period of twenty one days following the date of despatch of the repaired items. In the event that the loan units are not returned within this period, the loan units will be subject to a monthly overdue charge, details of which are available on request. Carriage charges apply to all loans.

**NON WARRANTY PERIOD**

Outside the stated warranty period, the Company will use it's best endeavours to rectify equipment failures through the provision of spare parts or in house repair services. Loan units may also be provided subject to availability. All services and carriage costs are subject to a scale of charges, details of which are available on request.