DACA214

Digital to analogue audio converter

Crystal Vision

Crystal Vision Ltd., Lion Technology Park, Station Road East, Whittlesford, Cambridge, CB22 4WL, England.
Tel: +44(0) 1223 497049 Fax: +44(0) 1223 497059 sales@crystalvision.tv www.crystalvision.tv

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1 Introduction

The DACA214 is a dual digital to analogue audio converter designed to convert two AES/EBU audio signals to four channels of analogue audio.

Each digital input has its own phase locked loop, which can automatically lock to the incoming signal sample rate. The range is from below 30kHz to above 50kHz. Inputs at 48kHz have the added benefit of a highly stable re-clocking mode.

Control and status monitoring are available from Statesman, the card edge, the frame front panel or from a remote control panel.

In addition to digital to analogue conversion, the DACA214 incorporates a number of powerful features. For example, a channel swap function allows channels 1 and 2 to be transposed, whilst the phase of the right hand channel can be inverted to correct phasing errors. Analogue monitoring can be used to listen to each stereo pair and audio quality is ensured with sophisticated error masking.

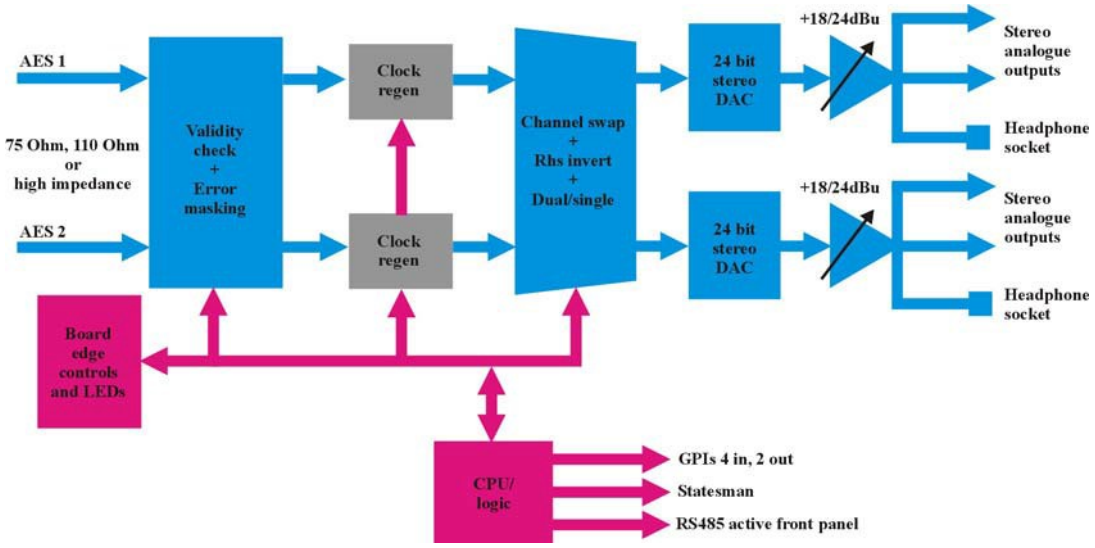
Also 'near silence' detectors monitor the audio signal level in both channels in case they fall below –50 dBFS for more than a selected period of time. Silence warning and loss of input warning status are normally routed by default to the GPI port for each channel.

The main features are as follows:

- 20/24 bit dual digital to analogue audio converter
- output level range of +12dBu to +28dBu for 0dBFS digital
- output level pre-sets for +18dBu and +24dBu
- accepts 110 Ohm balanced, 75 Ohm unbalanced and high impedance inputs
- choice of rear connectors to accommodate I/O format options
- wide ranging 'Auto' mode for sample rates between 30kHz and 50kHz
- precision, re-clocking 'Xtal' mode for 48kHz inputs
- channel swap and RH channel invert
- loss of AES input and sustained silence warning via indicators and external alarms
- GPIs for 'Xtal' and 'Auto' mode change, channel swap and loss of input/silence warning
- control and status monitoring via Statesman, board edge or frame/remote control panel
- audio error masking

System overview

The converter is configured as two independent converter channels each with their own error masking, validity checking and regeneration circuitry. Intelligent audio routing provides for channel swapping, single channel mode and phase inversion.



There are two operational modes, 'Auto' allows flexible Phase Locked Loop sample rate control to accept a wide input frequency range, whilst the 'Xtal' mode is provided for crystal locked operation at 48kHz.

Control of the card is on a first come first served basis from the card edge, Statesman, the frame control panel (if fitted) or a remote control panel.

Two stereo pairs are output for each channel from the 24 bit Digital to Analogue converters and are buffered to provide duplicate outputs and headphone monitoring.

There are also three different types of rear module to provide a wide range of I/O options. Further details of the rear modules can be found in the installation chapter.

Control

The control of the DACA214 will always follow the last control surface used. For example, if a card edge lever is moved the unit will switch to and remain in the 'Local Control Mode'. If any control panel menu is used, then the unit will switch to and remain in the 'Remote Control Mode'. The settings made will be remembered after a power down and the last control mode used will be retained.

The auto-configuration process performed when a DACA214 is first powered up, detects the current configuration settings and restores the appropriate control.

Once this initialisation procedure is complete, the card can be controlled or configured from Statesman, the card edge, the frame's local control panel or from a remote control panel.

2 Statesman

The Crystal Vision Statesman PC control software is designed to control a range of Crystal Vision modules via serial control from a PC. The main Statesman application communicates with each module in a frame through an active control panel with or without a LCD display. Statesman will not be able to detect modules used in a frame with only a passive front panel.

2.1 Installing Statesman

Minimum pre-requisites:

- A PC running Windows 98, NT4 with SP 5 or higher Windows 2000 or Windows XP
- A parallel port dongle supplied with the Statesman software package
- An RS422 serial connection from the host PC to the Remote 2 connector on an FR1AV or FR2AV Crystal Vision frame with at least one DACA214 module and/or other Statesman compatible module
- An active control panel MUST be fitted to the frame with version 1.63 or above firmware – if it is an Indigo frame the firmware must be V1.04 or above
- An optional RS422 to RS232 converter if the PC has no RS422 ports

Installing Statesman

- Refer to the readme and/or help file on the CD before proceeding
- To view all application windows, set graphics resolution to at least 1024 x 768
- Remove any previous version of the Statesman software using the Add/Remove Programs application in the Windows Control Panel
- Ensure that the Statesman dongle is fitted to the parallel port of the host PC
- Insert the Statesman CD and the installation should start immediately – if it does not, run the setup.exe file on the CD
- Obey any installation program prompts and restart the PC when prompted

Running Statesman for the first time

The Statesman PC Control System may be run from the Crystal Vision programs folder via the Start menu or by double-clicking on the Crystal Vision.exe file in the installed program directory. When the program runs it will require licence information and an administrator name and password. It will also need to know which computer port is being used to connect to a Crystal Vision frame(s).

Note: For further details of Statesman configuration please refer to the Statesman manual.

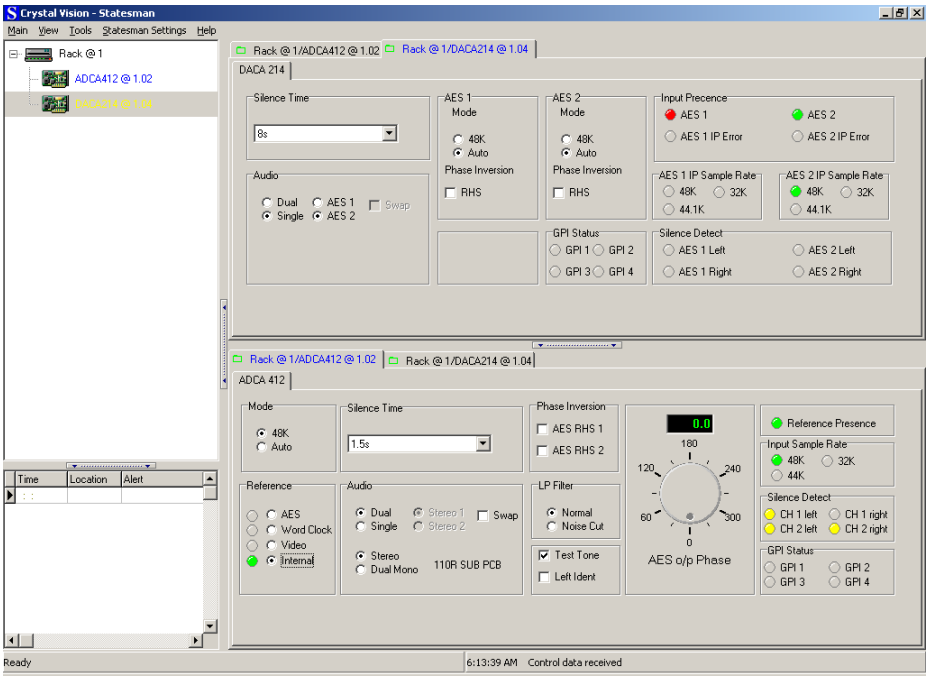
Statesman operation

Once Statesman is configured it should automatically detect any Statesman compatible modules in the connected frame or frames and display them in the main application left hand explorer-style window.

Open any frame by clicking on the '+' sign or by double clicking on a frame. Installed modules should be shown with module icons. Frame and module icons can be named as desired by right-clicking or using the edit menu and choosing rename.

To aid user recognition of module and frame status quickly, the following colour and size coding is used:

- A module is shown present by full colour and absent by greyed colour
- A module is shown open by large icon size and closed by small icon
- A module is the source of an active alarm if red and not alarmed if green Double-clicking on a module will enable the display of the main application menus.



Statesman main application window

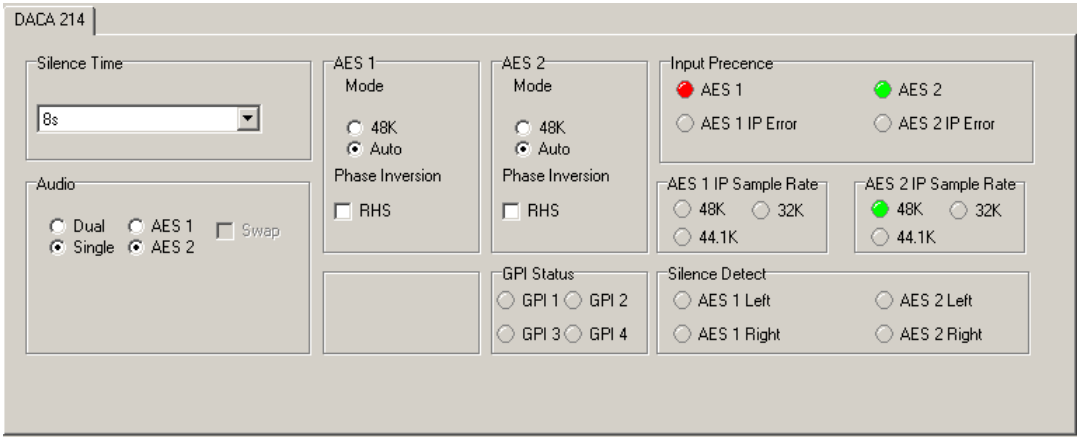
The two large control panes shown in the upper and lower halves of the window may display different menus for the same card, or controls for different cards. Click on the horizontal button-bar between the two panes to close the lower plane or drag the button to vary the size of the panes.

Note: For further details of Statesman configuration and operation please refer to the Statesman manual.

Using DACA214 controls

The configuration controls are as follows:

- Silence time – 1.5 to 120 seconds
- AES1/2 Mode – 48K or Auto
- Phase inversion
- Audio channel assignment
- Status – Input presence, input sample rate, silence detect, GPI state



Configuration

Selecting silence options

The digital audio processing circuits include 'near silence' detectors. If the audio signal levels are sustained at below –50 dBFS for more than a selected period of time, a LED indicator comes on.

Silence detect indicators show if the left or right channel of the stereo AES1 and/or AES 2 signals have been silent.

Silence warning and loss of input warning status are normally routed by default to the GPI port for each channel. To prevent silence detection from raising alarms via GPI lines please refer to the Using Card edge controls chapter.

To change the time required for a sustained silence to raise alarms and display warnings click on the Silence Time drop down box and select from the following range:

Threshold
1.5 seconds
8 seconds
Every 8 seconds until...
120 seconds

Selecting the sample rate mode

Each DACA214 AES input channel operates in two main modes 48K and Auto. Make the selection with the mouse by placing a selection dot against the required mode for each channel.

The primary mode is for the input sample rate clock to be locked to the AES input using a 48kHz crystal oscillator to achieve optimum distortion figures. This is referred to as 'Xtal' mode and should be used at all times if possible.

The second mode uses built in phase locked loops and VCOs to accept an AES input which may vary from below 30 kHz to above 50 kHz. This is referred to as 'Auto' mode, and should be used when an AES input rate is outside 48 kHz +/- 50 PPM.

Channel swapping, single channel mode and phase inversion

Channel routing logic following the regeneration circuits allows the incoming digital signals to be assigned to outputs in a variety of ways.

The possible variations are as follows:

- channels may be swapped so that AES 1 feeds Stereo Output 2 and AES 2 feeds Stereo Output 1
- both output stages may be assigned to either AES 1 or AES 2, effectively doubling the duplicate outputs for a single digital input
- the phase of the right hand output of Stereo Output 1 OR Stereo Output 2 may be inverted Make the selection with the mouse by placing a selection dot against the required options.

Note: When used as a single input converter, the unused AES input will be disabled and therefore silent, even if an active AES feed is present. GPI connections to the shuffling mode lines will override card edge switches if asserted to logic low or grounded.

Setting channel gain and input termination

Please refer to the Hardware configuration section of the Installation chapter for channel gain and input termination settings.

Audio Monitoring

Audio monitoring is provided at the card edge with two miniature stereo jack socket. The left hand socket is connected to the Stereo 1 input signal and the right hand socket is connected to the Stereo 2 input signal.

3 Using the front control panel

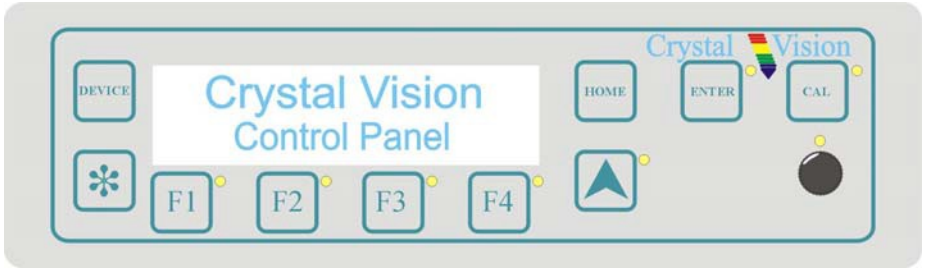
This operational guide assumes that the panel has been setup according to the Panel setup procedure described in the Crystal Vision Controls Panel manual.

Note: It is **ESSENTIAL** that the Panel setup procedure is followed and any old or unknown passwords cleared prior to using the panel for the first time.

At power up, the two line 20-character screen will display 'Crystal Vision' followed by the firmware version number for the control panel. All eight control panel key LEDs will illuminate.

The Crystal Vision control panel start up display

'Control Panel' then briefly replaces the version number display.



If the control panel firmware has been updated for Statesman control (version 1.5.0 or higher), Statesman Mode will be entered and the message, 'Press CAL to Exit' will be displayed and the CAL LED will light.

Statesman mode is entered by default

To continue with control panel operation or configuration, press the 'CAL' key once. A second press of the 'CAL' key will return to Statesman control.

The control panel will display the name of the card that first responds to the polling request together with its location number.

The location number consists of the frame number plus the card position in the frame.

Selecting the DACA214

To select a particular card in a frame, press the DEVICE key to go to the Device menu. The top line of the display will show 'Available Cards X', where X is the number of cards that have responded so far to the polling request.

The available cards menu

Rotate the shaft encoder and the bottom row will display the successfully polled cards by name and location or slot number.

In the example above, the card displayed is located in the first frame in slot number 1. When the desired card is selected press the ENTER key to access that card's HOME menu.

If remote control has been enabled, the control panel will then enter card mode and communicate with the selected module at the node number last displayed in the available cards list.

The DACA214 home menu

Navigating the display

The functions assigned to control panel keys are dependent on the card selected for control, and the panel mode. The following list illustrates the functions when controlling the DACA214:

- DEVICE – enters Device menu to select a card or card to control / enter Panel setup when held down during power up / shows frame status when pressed from Statesman mode
- CAL – Enter or leave Statesman mode / enter panel diagnostics mode when held down during power up / updates the display
- Asterisk – enters board rename menu from the Device menu
- F1 to F4 – soft keys, function assigned within each menu
- HOME – moves the display to the home menu
- ENTER – accept current selection
- Upward arrow – used to move up the menu structure / enter lock panel menu from the Device menu
- Rotary control – shaft encoder used to select options or variable data

Note: Please refer to the Crystal Vision Control Panel manual for details of the Panel Setup, Lock Panel and Diagnostic menus.

Updating the display

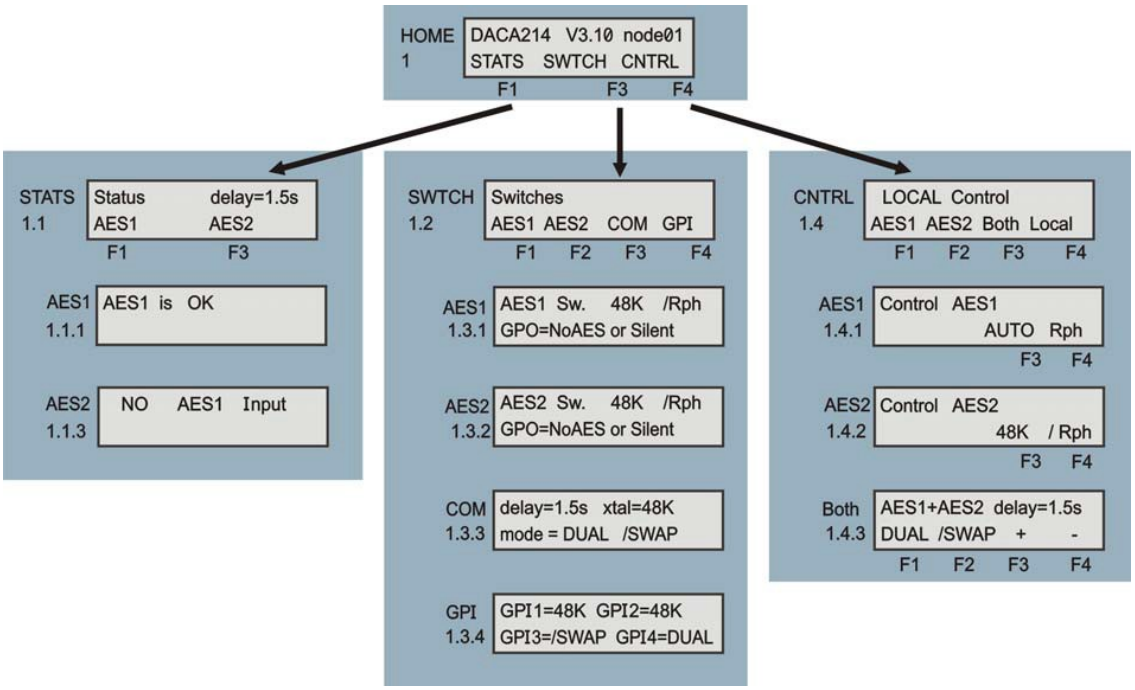
The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If mode changes occur through the use of Statesman, card edge controls or through automatic response to the input video signal, the text displayed on the active front panel will not be updated immediately. If necessary, press CAL to update the display.

The DACA214 menu structure

The main top-level menus are obtained by pressing the F1, F3 and F4 keys from the HOME menu. Menu keys are illuminated when active and when further menus are available. The three top-level menus are:

- STATS (Status) – press F1
- SWTCH (Switch) – press F3
- CNTRL (Control) – press F4

The following chart shows the available menus. The actual menus available may vary slightly as DACA214 software is updated.



The DACA214 menu tree

Note: Function keys and shaft encoder LEDs are illuminated when active.
The use of STATUS or SWITCH monitoring functions does not affect whether the DACA214 is operating in 'LOCAL CONTROL MODE', or 'REMOTE CONTROL MODE'.
The STATUS display data may differ from the actual settings due to Statesman, GPI inputs or remote CONTROL settings from the front panel overriding the front PCB control settings. Press the CAL button to update the display.

Menu numbering scheme

This manual uses a simple menu numbering convention based on the sequence of keys required to reach each menu from the top level home menu. For example, menu 1.1.2 is reached from the home menu by pressing F1, then F2. Menu 1.1.2.1 is reached by pressing F1, F2 and then F1 again.

Shorthand codes

The following shorthand codes are used in the control panel menus:

Menu code	Function description
AES1/2	AES/EBU digital audio signal
COM (or Both)	1/2 Common to both channels
GPI	General Purpose Interface INPUT
GPO	General Purpose Interface OUTPUT
/	Indicates no-effect when used in front of menu code
/Rph	NO phase inversion of right hand channel
Rph	Right hand channel IS phase inverted
AUTO	Follows ref input clock frequency between 30 and 50kHz
48K	Locked to 48kHz crystal oscillator
DUAL	Dual channel operation
SWAP	Inputs are swapped
/SWAP	Inputs are NOT swapped
SNGL	Single channel mode
delay	Time period required for signal to remain below threshold before input silent is asserted
s	Audio signal silent (below –50dBs FS longer than delay period)

Note: Remember, the '/' symbol negates the effect of a menu code it precedes.

Setting channel gain and input termination

Please refer to the Hardware configuration section of the Installation chapter for channel gain and input termination settings.

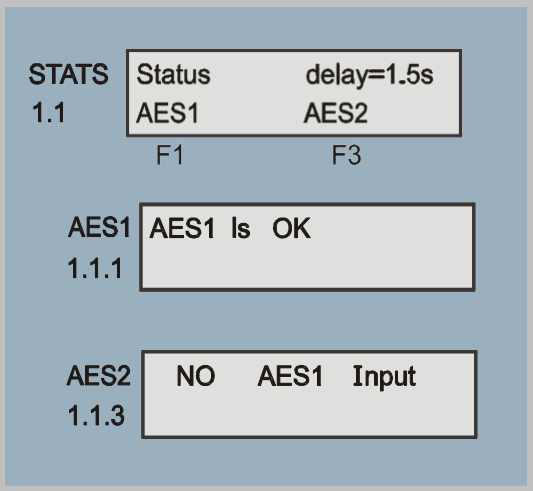
Audio Monitoring

Audio monitoring is provided at the card edge with two miniature stereo jack socket. The left hand socket is connected to the Stereo 1 input signal and the right hand socket is connected to the Stereo 2 input signal.

Status menus

Pressing F1 from the home menu will bring up the top status menu. The status menus provide the following information:

- Audio silence sustain delay
- AES1 and AES2 status

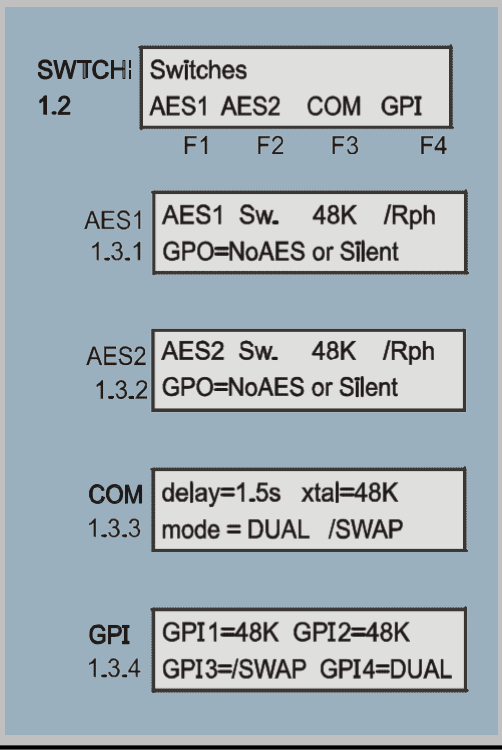
Status menu structure	Description
	The top menu line displays the currently selected sustained silence delay before the 'Silence' LEDs are illuminated, and (optionally) the relevant GPI outputs are asserted low. The F1 and F2 function keys select the AES1 or AES2 channel status displays. The AES1 or AES2 menus show if the AES input is 'OK', 'ERR', or 'missing'. If present (OK), the actual current input sample rate and sample rate tolerance is displayed. The standard tolerance shown is <400 PPM or <4%. Active audio channels are indicated by the numbers 12 (Left = 1, Right = 2). Any silent channels are indicated by the symbol 's'.

Note: 'ERR' indicates that the AES input signal does not match the operating conditions. For example, the input sample rate is 32 kHz or 44.1 kHz, when the DACA channel is set to '48 kHz Xtal Mode'.
Each input channel is equipped with 'near silence' detectors. If audio signal levels are sustained at below –50 dBFS for more than a selected period of time, a LED indicator for each channel comes on and an appropriate GPI output can be asserted low.
Stereo 1 silent in either audio channel 1 or 2 will illuminate 'silent' LEDs and assert GPO5 low if enabled. Stereo 2 silent in either audio channel 3 or 4 will illuminate 'silent 2' LED and assert GPO6 low if enabled.

Switch menus

Pressing F3 from the home menu will bring up the top Switch status menu. This menu provides the following information:

- Further AES channel status
- Mode selected status
- GPI status

Switch menu structure	Description
	The 'SWTCH' menu displays the current module settings. The AES1 menus shows the current status of the following settings 1 (AUTO/48K mode), 5 (Rph – phase of right hand channel) and 7 (GPO 5 enabled or disabled) The AES2 menus shows the current status of the following settings 2 (AUTO/48K mode), 6 (Rph or /Rph – phase of right hand channel) and 8 (GPO 6 enabled or disabled) The COM menu (bottom line) shows the current status effect of the following 3 (SNGL/DUAL) and 4 (/SWAP or SWAP) The GPI menu shows the status of GPI inputs 1 to 4

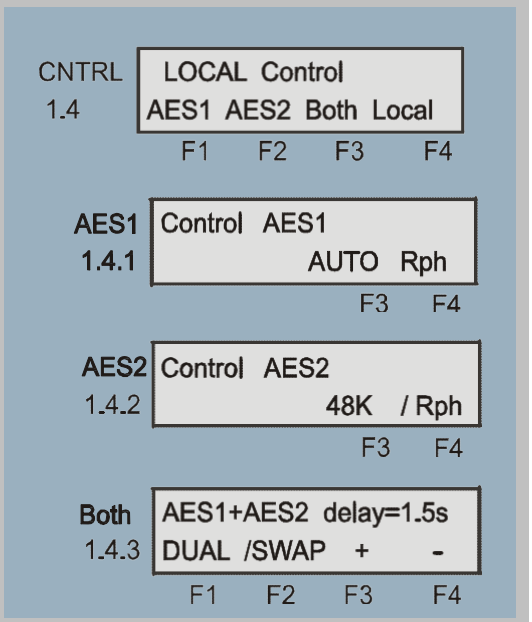
Note: The STATUS display data may differ from the SWITCH settings due to Statesman, GPI inputs or remote CONTROL settings from the front panel overriding the front PCB control settings. Press the CAL button to update the display.

Control menus

Pressing F4 from the home menu will bring up the top Control menu. The control menu allows the module's front PCB switches to be overridden if desired to allow control of:

- AUTO/Xtal lock
- Right hand channel phase

- Single or Dual mode selection
- Silence threshold delay
- Re-establish LOCAL control

Control menu structure	Description
	The CNTRL menu allows remote access to the functions normally controlled by front PCB controls. Use F3 and F4 in the AES1 menu to controls the following functions; AUTO/48K mode (PCB SW1) and Rph – phase of right hand channel (PCB SW5) Use F3 and F4 in the AES2 menu to control the following function; AUTO/48K mode (PCB SW2) and Rph – phase of right hand channel (PCB SW6) The BOTH menu controls the following functions; SNGL/DUAL (PCB SW3), /SWAP or SWAP (PCB SW4) and silence delay (HEX switch SIL T) Silence delay may be increased using the F3 '+' or decreased using F4 '-' between 1.5s and 120s in 8s steps. In SNGL mode use F2 to select the AES channel before changing the delay.

Silence warning and loss of input warning status are normally routed by default to the GPI port for each channel. To prevent silence detection from raising alarms via GPI lines please refer to the Using Card edge controls chapter.

Accessing any remote CONTROL menu will always establish REMOTE CONTROL MODE. If any PCB switch levers or the rotary hex switch is altered, the module will switch back to 'LOCAL CONTROL MODE', and operate in accordance with the front of PCB switch settings. It will remain that way until any remote control command is received. The LOCAL button, F4 in the CNTRL menu will also return the unit to local control.

4 Using card edge controls

The front edge of the card provides power rail monitoring, a configuration dip-switch, analogue audio monitoring outputs, and a rotary control to set the silence threshold delay.

LEDs monitor power rails, input presence, input sample rate and local/remote mode.

Selecting the sample rate mode

The DACA214 channel operates in two main modes. The primary mode is for 48 kHz sample rates using crystal oscillators to re-clock the digital audio input to achieve optimum distortion figures. This is referred to as 'Xtal Mode' and should be used at all times if possible.

The second mode uses built in phase locked loops and VCOs to accept any sample rate from 30 kHz to 50 kHz. This is referred to as 'Auto Mode', and should be used when the incoming sample rate is outside 48 kHz +/- 50 PPM.

The sample rate mode for each channel can be controlled from the card edge using the first two levers of the DIL switch as explained in the following table:

Lever	Function
1	Down = Ch 1 in Auto (30-50kHz) mode, Up = Ch 1 in Xtal (48kHz) mode
2	Down = Ch 2 in Auto (30-50kHz) mode, Up = Ch 2 in Xtal (48kHz) mode

Note: GPI connections to the 'Auto'/ 'Xtal' mode change lines will override card edge switches if asserted to a logic low or grounded.

Channel swapping, single channel mode and phase inversion

Channel routeing logic following the regeneration circuits allows the incoming digital signals to be assigned to outputs in a variety of ways.

The possible variations are as follows:

- channels may be swapped so that AES 1 feeds Stereo Output 2 and AES 2 feeds Stereo Output 1
- both output stages may be assigned to either AES 1 or AES 2, effectively doubling the duplicate outputs for a single digital input
- the phase of the right hand output of Stereo Output 1 **OR** Stereo Output 2

may be inverted The various channel shuffling modes are selected as follows:

Lever	Function
3	Down = Channels swapped, Up = Normal
4	Down = Single channel mode – AES 1 feeds all outputs, Up = Normal
	(Note: Lever 3 also Down will swap channels so AES 2 feeds all outputs)
5	Down = CH 1 output RHS inverted, Up = CH1 normal
6	Down = CH 2 output RHS inverted, Up = CH2 normal

Note: When used as a single input converter, the unused AES input will be disabled and therefore silent, even if an active AES feed is present. GPI connections to the shuffling mode lines will override card edge switches if asserted to logic low or grounded.

Selecting silence warning options

The digital audio processing circuits include 'near silence' detectors. If the audio signal levels are sustained at below –50 dBFS for more than a selected period of time, a LED indicator comes on.

The top amber 'SIL' LED indicates that either the left or right channel of the stereo AES1 signal has been silent, while the bottom 'SIL' LED shows that either the left or right channel of the stereo AES 2 signal has been silent.

Silence warning and loss of input warning status are normally routed by default to the GPI port for each channel.

Silence detection can be prevented from raising alarms via these GPI outputs as follows:

Lever	Function
7	Down = Disable Stereo 1 silence warning, Up = Enable
8	Down = Disable Stereo 2 silence warning, Up = Enable

Note: The routeing of 'Loss of AES 1 or AES 2 input' warnings to the GPI port cannot be disabled. Loss of AES 1 input always asserts GPO5 low. Loss of AES 2 input always asserts GPO6 low.

Setting the silence threshold

The Hex rotary switch, 'SIL TIME' is used to set the required sustained silence period before the LED indicators are illuminated and associated warnings raised. Switch position '0' provides 1.5 seconds of sustained silence. Positions '1' through to 'F' provide a range of 8 to 120 seconds in 8-second increments.

The following table shows each silence threshold timing available:

SIL TIME	Threshold	SIL TIME	Threshold
0	1.5 seconds	**8**	64 seconds
1	8 seconds	**9**	72 seconds
2	16 seconds	**A**	80 seconds
3	24 seconds	**B**	88 seconds
4	32 seconds	**C**	96 seconds
5	40 seconds	**D**	104 seconds
6	48 seconds	**E**	112 seconds
7	56 seconds	**F**	120 seconds

Audio Monitoring

Audio monitoring is provided at the card edge with two miniature stereo jack socket. The left hand socket is connected to the Stereo 1 output signal and the right hand socket is connected to the Stereo 2 output signal.

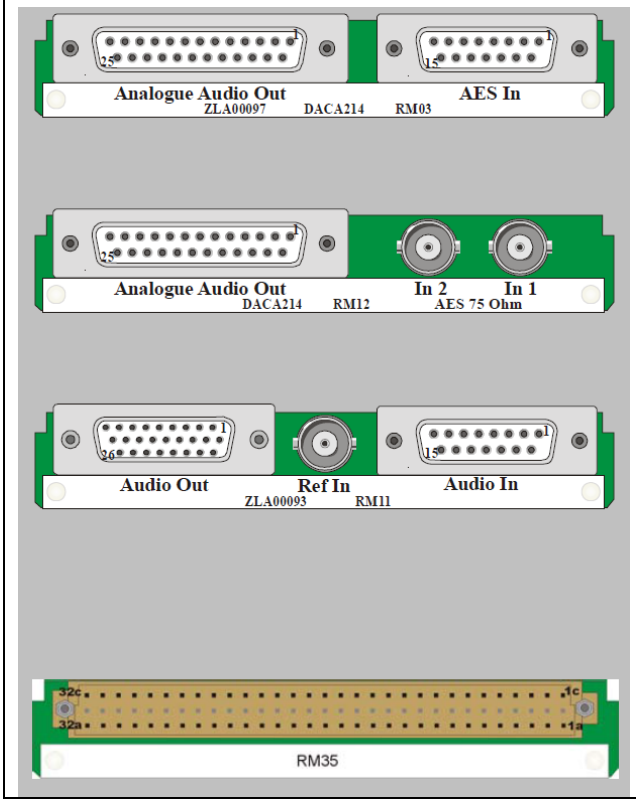
Setting channel gain and input termination

Please refer to the Hardware configuration section of the Installation chapter for channel gain and input termination settings.

5 Installation

Four different Rear Connector Modules (RM) may be used with DACA214. Each RM is a single slot high, so that up to 12 such modules, in any mix could be fitted onto an FR2AV frame. Other Crystal Vision RM and Interface PCBs can be mixed in any quantity with DACA214 PCBs, up to a maximum of 12 PCBs, providing the other PCBs do not exceed the power rating of the PSU chosen (normally 150 watts).

The different RM connectors provide for both balanced and unbalanced audio connectors. The available rear connectors are as follows:

Rear connectors	Description
	**RM03** • 12 modules per 2U frame • For 110 Ohm balanced AES inputs • GPI lines also available at frame remote connectors • All frame slots can be used **RM12** • 12 modules per 2U frame • For 75 Ohm unbalanced AES inputs • GPI lines also available at frame remote connectors • All frame slots can be used **RM11** • 12 modules per 2U frame • For 110 Ohm balanced AES inputs and if high density 26 way output connector preferred • Ref In connector not used • GPI lines also available at frame remote connectors • All frame slots can be used **RM35** • 12 modules per 2U frame • All frame slots can be used

Notes: The RM11 is similar to the RM03, but has an additional BNC input for the reference signals required for DACA214 PCBs, and has a high density 26 way D connector instead of the standard 25 way D connector. If the rack frame has a mixture of DACA214 and DACA214 PCBs, the user may wish to standardise on one common RM11 for both DACA214 and DACA214 board types.
The RM03 can accept 75 Ohm circuits if required.

Rear module connections

RM03 Audio Out connector 25 way D-Type socket (cable has plug on it)

Pin Number	Function	Comments	
1	GPI-1	AES 1 XTAL / Auto	input
2	GPI-3	Normal / Swap Channels	input
3	GPI-5	AES 1 Alarm	output
4	GND		
5	OP1+L1	Stereo 1, Left 1 output	
6	OP1-L1		
7	OP1+L2	Stereo 1, Left 2 output	
8	OP1-L2		
9	OP2+L1	Stereo 2, Left 1 output	
10	OP2-L1		
11	OP2+L2	Stereo 2, Left 2 output	
12	OP2-L2		
13	GND GPI-		
14	2 GPI-4	AES 2 Auto / XTAL	input
15	GPI-6	Single / Dual Channels	input
16	GND	AES 2 Alarm	output
17	OP1+R1		
18	OP1-R1	Stereo 1, Right 1 output	
19	OP1+R2		
20	OP1-R2	Stereo 1, Right 2 output	
21	OP2+R1		
22	OP2-R1	Stereo 2, Right 1 output	
23	OP2+R2		
24	OP2-R2	Stereo 2, Right 2 output	
25			

Notes: The GPI 1- to - 4 lines are also available on the rear of the 2U Indigo/FR2AV frame:
Remote 1 (26way HD D-Type socket) for slot positions 1, 2, 5, 6, 9 & 10
or Remote 3 (26way HD D-Type socket) for slot positions 3, 4, 7, 8, 11 & 12
The GPI-5 and GPI-6 lines are also available on the rear of the Indigo/FR2AV frame at Remote 2 (26way HD D-Type plug) for slot positions 1, 2, 5, 6, 9 & 10
or Remote 4 (26way HD D-Type plug) for slot positions 3, 4, 7, 8, 11 & 12

RM03 Audio In connector 15 way D-type socket (cable has plug on it)

Pin number	Function		Comments
1	AES1-LO		Low (screen) for signal pair 1
2	AES+1	}	Stereo 1 AES Input
3	AES-1		
4	N/C		
5	N/C		
6	AES2-LO		Low (screen) for signal pair 2
7	N/C		
8	N/C		
9	AES+2	}	Stereo 2 AES Input
10	AES-2		
11	N/C		
12	N/C		
13	GND		
14	N/C		
15	N/C		

RM11 Audio Out connector 26 way High Density D-Type socket (cable has plug on it)

Pin number	Function	Comments
1	GND	
2	OP2+R1	} Stereo 2, Right 1 output
3	OP2-R1	
4	OP2+L1	} Stereo 2, Left 1 output
5	OP2-L1	
6	OP2+R2	} Stereo 2, Right 2 output
7	OP2-R2	
8	OP2+L2	Stereo 2, Left 2 output (+)
9	GND	
10	OP1+R1	} Stereo 1, Right 1 output
11	OP1-R1	
12	OP1+R2	} Stereo 1, Right 2 output
13	OP1-R2	
14	OP1+L1	} Stereo 1, Left 1 output
15	OP1-L1	
16	OP1+L2	} Stereo 1, Left 2 output
17	OP1-L2	
18	OP2-L2	Stereo 2, Left 2 output (-)
19	GND GP1-	
20	1 GP1-2	AES 1 Auto / XTAL input
21	GP1-3	AES 2 Auto / XTAL input
22	GP1-4	Normal / Swap Channels input
23	GP1-5	Dual / Single Channels input
24	GP1-6	AES 1 Alarm output
25	GND	AES 2 Alarm output
26		

Notes: The GPI 1- to - 4 lines are also available on the rear of the 2U Indigo/FR2AV frame:
Remote 1 (26way HD D-Type socket) for slot positions 1, 2, 5, 6, 9 & 10
or Remote 3 (26way HD D-Type socket) for slot positions 3, 4, 7, 8, 11 & 12
The GPI-5 and GPI-6 lines are also available on the rear of the Indigo/FR2AV frame at Remote 2 (26way HD D-Type plug) for slot positions 1, 2, 5, 6, 9 & 10
or Remote 4 (26way HD D-Type plug) for slot positions 3, 4, 7, 8, 11 & 12

RM11 Audio In connector 15 way D-type socket (cable has plug on it)

Pin number	Function		Comments
1	AES1-LO		Low (screen) for signal pair 1
2	AES+1	}	Stereo 1 AES Input
3	AES-1		
4	N/C		
5	N/C		
6	AES2-LO		Low (screen) for signal pair 2
7	N/C		
8	N/C		
9	AES+2	}	Stereo 2 AES Input
10	AES-2		
11	N/C		
12	N/C		
13	GND		
14	N/C		
15	N/C		

RM12 Audio Out connector 25 way D-Type socket (cable has plug on it)

Pin Number	Function	Comments
1	GPI-1	AES 1 XTAL / Auto input
2	GPI-3	Normal / Swap Channels input
3	GPI-5	AES 1 Alarm output
4	GND	
5	OP1+L1	Stereo 1, Left 1 output
6	OP1-L1	
7	OP1+L2	Stereo 1, Left 2 output
8	OP1-L2	
9	OP2+L1	Stereo 2, Left 1 output
10	OP2-L1	
11	OP2+L2	Stereo 2, Left 2 output
12	OP2-L2	
13	GND GPI-	
14	2 GPI-4	AES 2 Auto / XTAL input
15	GPI-6	Single / Dual Channels input
16	GND	AES 2 Alarm output
17	OP1+R1	
18	OP1-R1	Stereo 1, Right 1 output
19	OP1+R2	
20	OP1-R2	Stereo 1, Right 2 output
21	OP2+R1	
22	OP2-R1	Stereo 2, Right 1 output
23	OP2+R2	
24	OP2-R2	Stereo 2, Right 2 output
25		

Notes: The GPI 1- to - 4 lines are also available on the rear of the 2U Indigo/FR2AV frame:
Remote 1 (26way HD D-Type socket) for slot positions 1, 2, 5, 6, 9 & 10
or Remote 3 (26way HD D-Type socket) for slot positions 3, 4, 7, 8, 11 & 12
The GPI-5 and GPI-6 lines are also available on the rear of the Indigo/FR2AV frame at Remote 2 (26way HD D-Type plug) for slot positions 1, 2, 5, 6, 9 & 10
or Remote 4 (26way HD D-Type plug) for slot positions 3, 4, 7, 8, 11 & 12

RM12 Digital Audio In AES 75 Ohm BNC connectors

BNC	Function
IN 1	Stereo 1 AES input
IN 2	Stereo 2 AES input

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Pin number	Function	Comments		Pin number	Function	Comments	
c1	NC	No user connection		**a1**	GND	Chassis	
c2 c3	GND NC	Chassis No user connection		**a2 a3**	AES+2 AES-2	} Stereo 2 AES input	
c4	NC	No user connection		**a4**	AES2LO	Low (screen) for signal pair	2
c5 c6	NC NC	No user connection No user connection		**a5 a6**	AES+1 AES-1	} Stereo 1 AES input	
c7	NC	No user connection		**a7**	AES-	Low (screen) for signal pair	1
c8	NC	No user connection		**a8**	NC	No user connection	
c9	NC	No user connection		**a9**	NC	No user connection	
c10	NC	No user connection		**a10**	NC	No user connection	
c11	NC	No user connection		**a11**	NC	No user connection	
c12	NC	No user connection		**a12**	NC	No user connection	
c13	GPI_1	Single/Dual mode	input	**a13**	NC	No user connection	
c14	GPI_2	Swap/AES inputs	input	**a14**	NC	No user connection	
c15	GPI_3	Auto/Xtal	input	**a15**	NC	No user connection	
c16	GPI_4	Video Sync REF	input	**a16**	NC	No user connection	
c17	GPI_5	Stereo 1 alarm	output	**a17**	NC	No user connection	
c18	GPI_6	Stereo 2 alarm	output	**a18**	NC	No user connection	
c19	NC	No user connection		**a19**	NC	No user connection	
c20	GND	Chassis		**a20**	GND	Chassis	
c21	OP1+L1	} Stereo 1, left 1	output	**a21**	OP1+R1	} Stereo 1, right 1 output	
c22	OP1-L1			**a22**	OP1-R1		
c23	GND	Chassis		**a23**	GND	Chassis	
c24	OP1+L2	} Stereo 1, left 2	output	**a24**	OP1+R2	} Stereo 1, right 2 output	
c25	OP1-L2			**a25**	OP1-R2		
c26	GND	Chassis		**a26**	GND	Chassis	
c27	OP2+L1	} Stereo 2, left 1	output	**a27**	OP2+R1	} Stereo 2, right 1 output	
c28	OP2-L1			**a28**	OP2-R1		
c29	GND	Chassis		**a29**	GND	Chassis	
c30	OP2+L2	} Stereo 2, left 2	output	**a30**	OP2+R2	} Stereo 2, right 2 output	
c31	OP2-L2			**a31**	OP2-R2		
c32	GND	Chassis		**a32**	GND	Chassis	

Signal earthing

Audio inputs are designed to have floating 'signal low' connections for cable screens, with internal RC networks connected between cable screens and chassis ground. This helps reduce the risk of high earth currents when AC power is induced into the cable, or when an offset voltage exists between the product chassis and the local signal source ground or chassis.

The internal RC network components fitted in the DACA214 PCB are as follows:

Component	Signal low (screen)	Chassis ground
1µF capacitor	AES-1LO / AES-2LO AES-	PCB GND
10K ohm resistor	1LO / AES-2LO	PCB GND

Note: Video and audio output cable screens are normally hard-wired directly to local chassis ground.

Using GPIs

GPI input assignments

The DACA214 supports four GPI input lines, which are assigned functions as follows:

	Effect when GPI input is asserted low
GP1-1	Changes AES1 from Xtal Mode to Auto Mode
GP1-2	Changes AES2 from Xtal Mode to Auto Mode
GP1-3	Swaps AES1 input circuit with AES2 input circuit to exchange the two stereo audio outputs one with the other
GP1-4	Changes dual input circuits to just one single AES input feeding all audio outputs. The unused AES input will be disabled and therefore silent.

The GPI inputs override the switch settings and remote control settings, unless the existing setting selects the same operation, as the GPI input would have done, in which case there is no change of operation.

Each input looks like a TTL/CMOS input and has a 10k pull up to +5V, and is 'asserted' by pulling down to 0v.

GPI output assignments (alarms)

The DACA214 supports two GPI output lines, which are assigned functions as follows:

	Alarms are active when asserted low
GP1-5	AES 1 Alarm - loss of input and silence detected
GP1-6	AES 2 Alarm - loss of input and silence detected

Silence warning and loss of input warning status are normally routed by default to the GPI port for each channel. To prevent silence detection from raising alarms via GPI lines please refer to the Using Card edge controls chapter.

GPI Connections

GPI lines 1 to 6 of each card are brought to one of the four remote connectors at the rear of the FR2AV frame as follows:

Slot no.	GPI 1		GPI 2		GPI 3		GPI 4		GPI 5		GPI 6	
	pin	rem	pin	rem	pin	rem	pin	rem	pin	rem	pin	rem
1	8	1	9	1	18	1	26	1	19	2	20	2
2	7	1	16	1	17	1	25	1	10	2	11	2
3	8	3	9	3	18	3	26	3	19	4	20	4
4	7	3	16	3	17	3	25	3	10	4	11	4
5	5	1	6	1	15	1	24	1	1	2	2	2
6	4	1	14	1	13	1	23	1	3	2	4	2
7	5	3	6	3	15	3	24	3	1	4	2	4
8	4	3	14	3	13	3	23	3	3	4	4	4
9	3	1	12	1	22	1	21	1	12	2	13	2
10	10	1	11	1	19	1	20	1	21	2	22	2
11	3	3	12	3	22	3	21	3	12	4	13	4
12	10	3	11	3	19	3	20	3	21	4	22	4

Note: Remote 1 and Remote 3 are 26 way high density ‘D’ type female sockets and frame ground is pin 2 in each case.
Remote 2 and Remote 4 are 26 way high density ‘D’ type male plugs and frame ground is pin 6 in each case.

Hardware configuration

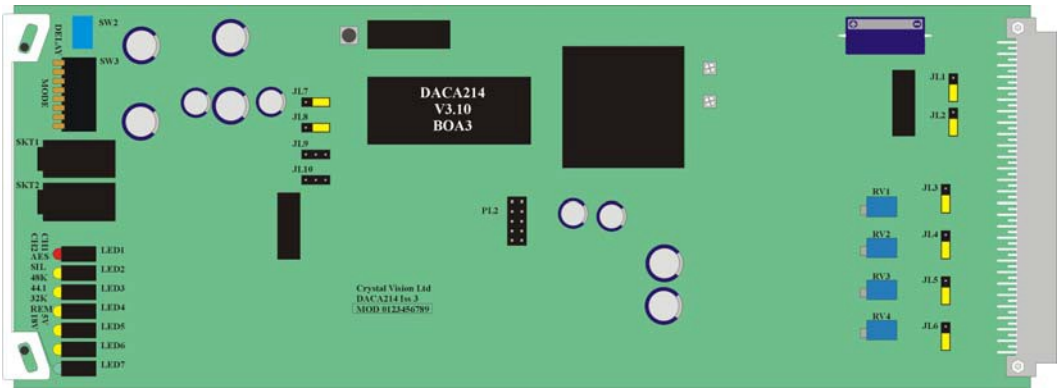
This section deals with hardware jumper links to change channel gain and input termination.

Setting channel gain

The DACA214 has four gain-set jumper links at the right hand (bottom half) rear end of the PCB.

JL3 (Stereo 1 Left), JL4 (Stereo 1 Right), JL5 (Stereo 2 Left), and JL6 (Stereo 2 Right).

Move the links to the upward position for +18 dBu full-scale output, or to the downward position for +24 dBu full-scale output. Other full-scale outputs from +12 dBu to +28 dBu can be achieved by selection of these jumper links together with adjustment of the gain calibration potentiometers, RV1 to RV4.



The DACA214 module

Setting input terminations

The DACA214 has two termination jumper links at the right hand (top half) rear end of the PCB. The jumpers are JL1 for AES1, and JL2 for AES2.

Move the links to the downward position for 110 Ohm input termination, or to the upward position for 75 Ohm input termination. Fit the link lengthways so it is only connected to the middle pin for higher impedance inputs. This is useful when a number of circuits share the same 110 Ohm or 75 Ohm source signal. The final PCB in the loop normally has to be set as the signal termination (110 Ohm or 75 Ohm) if only a few PCBs share the same signal source.

Other adjustments

- JL7 and JL8 near the Eprom always have links fitted on pins 2+3 (rearwards)
- JL10 and JL11 have no jumper link fitted and PL2 has nothing fitted

Note: Pin 1 of all links has a square pad on the PCB underside.

Wiring XLR breakout leads

Digital input: XLR to 15 way male 'D' plug leads		
XLR female pin-	**15 way male 'D' plug pin-out**	
	AES CH 1/2	AES CH 3/4
1 (screen)	1	6
2 (+)	2	9
3 (-)	3	10

Analogue output: XLR to 25 way male 'D'plug leads								
XLR female pin-out	**25 way male 'D' plug pin-out**							
	CH1 L1	CH1 L2	CH2 L1	CH2 L2	CH1 R1	CH1 R2	CH2 R1	CH2 R2
1 (screen)	4-7-13 tinned copper wire common ground link							
2 (+)	5	7	9	11	18	20	22	24
3 (-)	6	8	10	12	19	21	23	25

Analogue output: XLR to 26 way male 'HD'plug leads								
XLR female pin-out	**26 way male 'HD' plug pin-out**							
	CH1 L1	CH1 L2	CH2 L1	CH2 L2	CH1 R1	CH1 R2	CH2 R1	CH2 R2
1 (screen)	1-9-19-26 tinned copper wire common ground link							
2 (+)	14	16	4	8	10	12	2	6
3 (-)	15	17	5	18	11	13	3	7

6 Problem solving

The front edge of the card provides LED indicators are provided to monitor power rails, input presence/silence, input sample rate and local/remote mode.

In the following table the top row yel/green LEDs are for AES1 and the bottom row yel/green LEDs are for AES2:

Name	LED Colour	Description
±5V and ± 18V	**Green**	Illuminates when on-board power is OK
AES IN	**Red**	Illuminates when AES 1/2 input error exists
Rem	Yellow	Illuminates when AES channel 1/2 has been last accessed by remote control
Sil	Yellow	Silence detected on input 1/2
48k, 44k, 32k or Auto	Yellow	Sampling Frequency (32, 44.1, or 48 kHz) or Automatic AES Reference Mode (for 30-50 kHz)

Notes: The ±18V supply takes a few seconds after power is initially applied before it is enabled.

The actual time will vary from slot to slot, so that all of the PCBs will not enable their ±18V supply at the same moment.

Status is also available using an active control panel and Statesman control. Please refer to the appropriate chapter for further information.

Basic fault finding guide

The Power OK LEDs are not illuminated

Check that the frame PSU is functioning – refer to the appropriate frame manual for detailed information

There is no audio output

Check that valid AES inputs are present and that any cabling is intact

Check that the silence threshold delay is not set too low

Audio phase is incorrect

Check the audio phase inversion of the right hand channel

Audio levels are incorrect

Check the appropriate input termination and gain settings

Input ERR LED is illuminated

AES input signal may not match the operating conditions. For example, the input sample rate is 32 kHz or 44.1 kHz, when the relevant channel is set to '48 kHz Xtal Mode'.

The card no longer responds to Statesman/front panel control

Check that the card is seated correctly and that the Power OK LED is lit

Check that the Comms LED in an Indigo frame flashes when Statesman communication control is attempted

Check any active control panel/Statesman cabling

Check if the control panel/Statesman can control another card in

the same rack If necessary re-set the card

Statesman settings change unexpectedly

Active control panel or card edge control settings may have overridden Statesman settings if they were changed more recently

Card edge settings have changed unexpectedly

Statesman or active control panel settings may have overridden card edge control settings if they were changed more recently

Active control panel settings change unexpectedly

Statesman or card edge control settings may have overridden control panel settings if they were changed more recently

Re-setting the card

If required, the card may be reset by simply removing the rack power and re-applying power after a few seconds or by removing the card from the rack re-inserting the card. It is usually safe to reinsert the card whilst the rack is powered.

7 Specification

Inputs	Audio:	2 x 20 bit stereo pairs. AES3 110ohm or HiZ (balanced) D Type, or AES3-id (unbalanced) 75 Ohm BNC. Set by on-board links.
	Input sampling frequency:	Crystal re-clocking for 48 kHz sample rate, for minimum THD and maximum AES input signal jitter rejection. From 30 kHz to 50 kHz in 'Auto' Mode. Automatic locking with no reference required. The 2 AES channels are independent and may be at different sampling frequencies.
Outputs	Audio:	2 analogue stereo pairs or 4 mono channels, 20 bit quantising A to Ds, Low output impedance (66 Ohm) balanced.
Performance	Noise:	< -100dB wrt 0dBFS AES/EBU input.
	THD+N:	<0.0025% at +18 dBu or +24 dBu analogue output, 48 kHz Crystal re- clocking mode.
	Output range:	Min +12 dBu, Max +28 dBu output swing with THD <0.005%. Default level: 0dBFS = +18dBu or +24dBu by on-board link.
Monitoring		2 x miniature front mounted audio jacks for stereo audio analogue output monitoring. Also available on rear connector.
Shuffle modes		Channels may be swapped so that AES 1 feeds Stereo Output 2 and AES 2 feeds Stereo Output 1. Both output stages may be assigned to either AES 1 or AES 2 (DUAL mode). The phase of the right hand output of Stereo Output 1 **OR** Stereo Output 2 may be inverted.
Silence threshold delay		Silence threshold delay for both sides is pre-settable for the amount of time a signal is allowed to remain below –50dB wrt Full Scale before a silence error is flagged. Values start at 1.5 seconds, 8 seconds and then in increments of 8 seconds to 120 seconds.
GPIs		Four GPIs are available for external control of AUTO/Xtal mode per channel, Dual/Single mode and Channel Swap. Two GPIs are available to provide alarm

	monitoring of input missing and silence detection (optional).
Status monitoring	Front card edge visual monitoring with LED indicators. Remote control panel also available.
Weight	200g