DEC102S

Composite or Y/C to SDI decoder

USER MANUAL

Crystal Vision

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Contents

1 Introduction

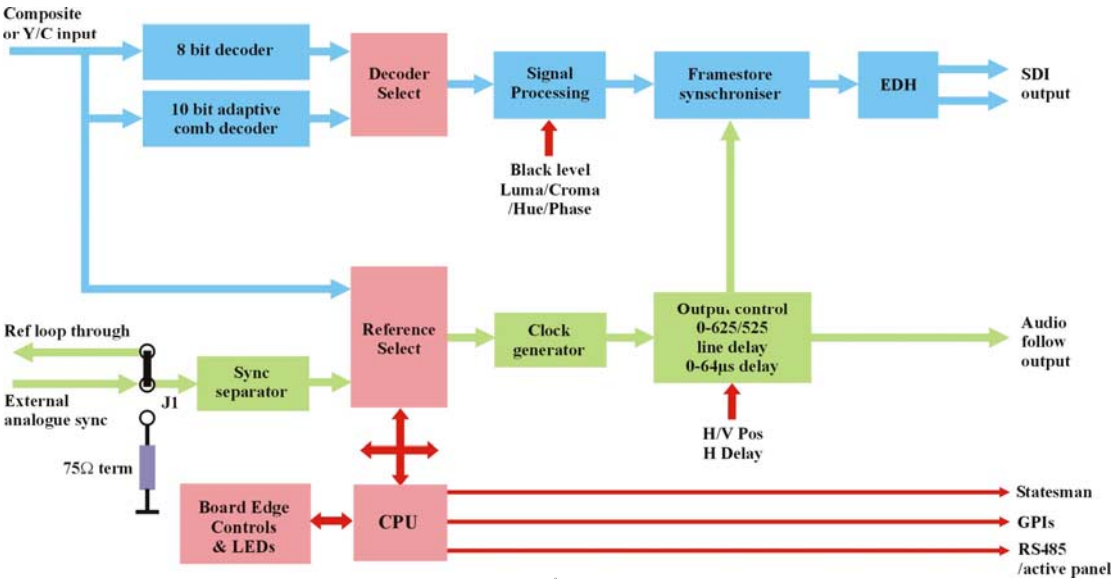
The DEC102S is an analogue composite or Y/C to serial digital video decoder. It contains a 10-bit synchroniser allowing the serial digital output to be timed to an analogue reference.

Two main operating modes are supported, 10-bit for professional quality PAL or NTSC video and 8-bit for less stable PAL or NTSC video, as is often the case with VHS or satellite feeds.

The decoder is fitted with a line based adaptive comb. It is also designed to accommodate jittery or damaged signals and will automatically switch to its tolerant 8-bit decoder mode when a non-stable signal is received.

The main features are as follows:

- compact single height module
- converts any composite or Y/C signal to SDI
- frame synchroniser
- 10-bit adaptive comb plus 8-bit input modes
- automatic or manual PAL/NTSC standard selection
- adjustable timing, gain and black level
- audio follow pulse for audio to video delay tracking
- loop or terminate external analogue video reference input
- card edge, Statesman and remote control facilities



The DEC102S analogue composite or Y/C to serial digital video decoder

The DEC102S is a 100mm x 266mm module, which fits in the all standard frames and can be integrated with any boards from the company's full product range. It uses the single height RM01, double height RM18 and triple height RM02 rear connectors in Indigo and other Crystal Vision frames.

Operating modes

To provide optimum performance with a wide range of sources the DEC102S can operate in a number of different modes.

10-bit input modes	Description
10-bit Comb PAL/NTSC composite	Uses a line-based comb decoder, which mixes to simple decoder when the comb would produce artefacts.
10-bit Y/C (S-video)	Suitable for use with well-timed sources.
8-bit composite **8-bit Y/C (S-video)**	All 8-bit modes use a robust simple decoder. These highly tolerant modes are particularly suitable for use with poorly timed sources such as VHS recorders or satellite feeds.

Each operating mode has its own luminance and chrominance gain, offset and phase settings and both 525 and 625 line standards have separate horizontal and vertical timing settings. All these parameters are automatically maintained when power is cycled.

Output timing

Horizontal and vertical timing adjustments are provided that operate relative to one of three analogue timing references. These are an external reference, the video input or an internal free-running clock. The external reference can be video or composite syncs although a composite black and burst plus 300mV syncs into 75 Ohm as per EBU N14-1988 is preferred.

If no analogue reference is provided the board will either time itself relative to the composite or Y/C video input in 10 bit modes, or it will time its output to a free running clock in 8 bit modes.

A horizontal offset delay adjustment varies the timing of the input video relative to input syncs and blanking in 10-bit mode whichever source is the active reference.

Audio follow pulse

To allow an audio delay to track the delay through the DEC102S, a TTL level pulse is provided. This pulse is output every frame. The length of the pulse (the time between the rising and falling edge) is the same as the delay through the synchroniser.

Manual scope

This manual refers to module firmware version 6.86 or later.

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 an 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 DEC102S 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.

2.2 Statesman operation

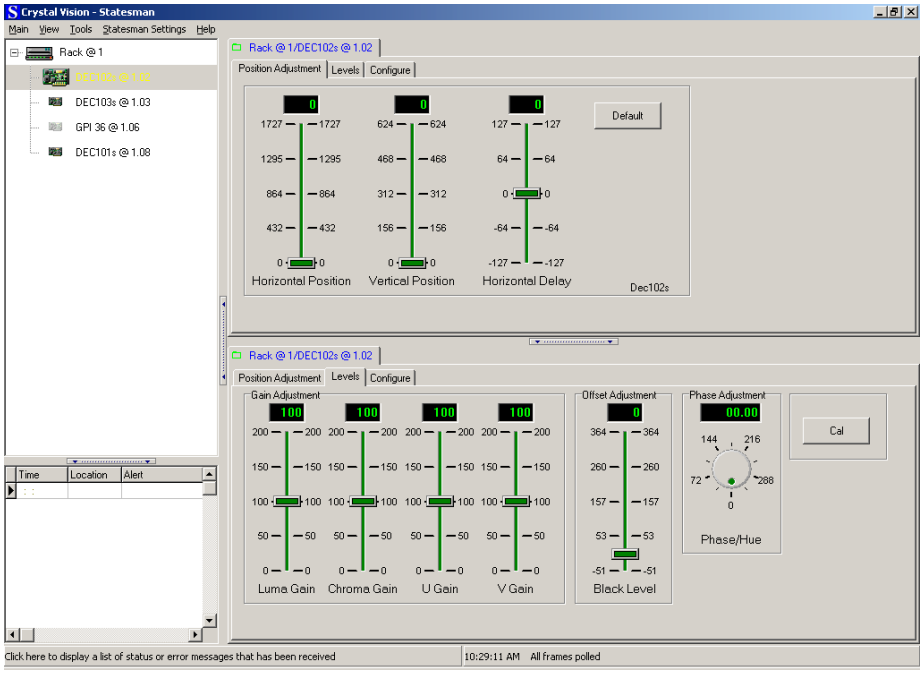
Once Statesman is configured it should automatically detect any statesman compatible modules in the connected frame or frames and display them in the main application left hand explorer-style window.

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

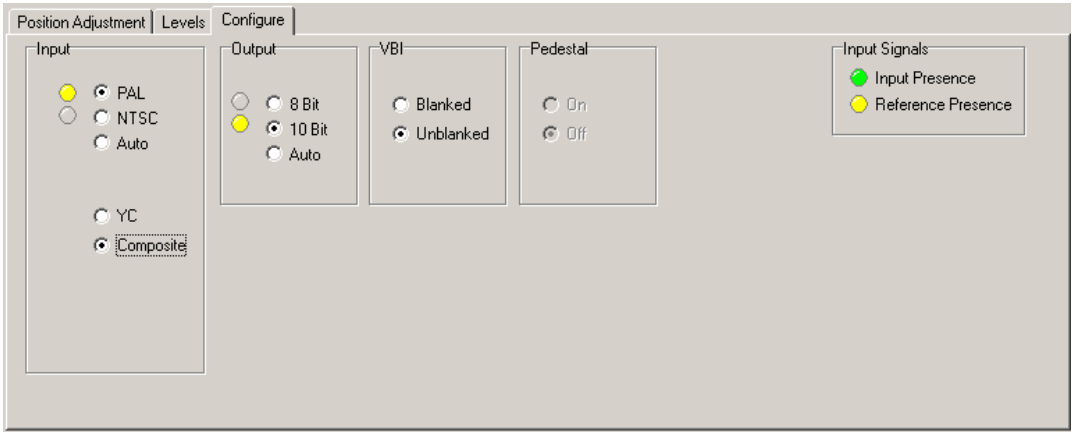
The two large control panes shown in the upper and lower halves of the window may display different menus for the same card, or controls for different cards. Click on the horizontal button-bar between the two panes to close the lower plane or drag the button to vary the size of the panes.

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

Configuration

The configuration tab provides access to the following:

- PAL/NTSC/Auto - standard selection
- YC/Composite – format selection
- 8 Bit/10 Bit – decoding quality
- Blank or unblank the VBI interval
- Pedestal – pass or block the NTSC pedestal
- Status – input and reference presence



Configuration

Input settings

Input settings are as follows:

Input setting	Description
PAL/NTSC/Auto	Force input standard or allow automatic switching between PAL and NTSC
YC /Composite	Select Y/C (S-Video) or composite input format

Output settings

Output settings are as follows:

Output setting	Description
8 bit/10 bit/Auto	Force 10 or 8 bit output quality or allow automatic selection.
VBI Blanked /Unblanked	VBI data blocked or passed unprocessed (unblanked) on luminance channel
Pedestal (NTSC only)	ON: 7.5 IRE subtracted from black level, gain increased OFF: Black level and gain settings assume no 7.5 IRE offset

Note: Vertical Blanking Interval data is normally present in PAL on lines 7-22 and 319-335 and in NTSC on lines 10-20 and 273-282.

Status

Status indications are as follows:

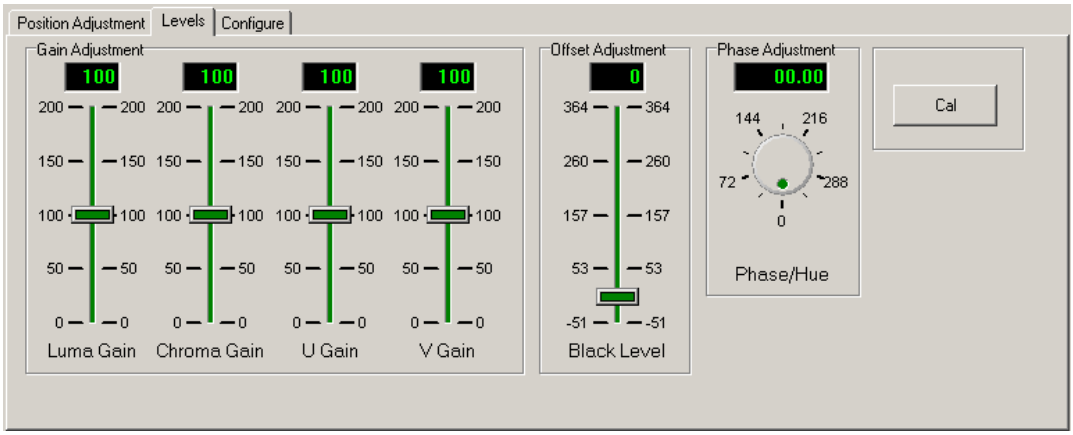
Input setting	Description
Input presence	Green when input detected. Grey when no input detected.
Reference present	Yellow when analogue reference detected. Grey when no input detected.

Note: Refer to the installation section for details of the external analogue reference input loop or terminate link on the module itself.

Gain, black level and phase adjustment

The level adjustment tab provides access to the following:

- Luma and Chroma gain
- U and V gain
- Black level
- Phase/Hue – 10 bit mode only



Level adjustment controls

Setting gain and black level

The gain and black level adjustments are independent for 8 and 10 bit modes as well as Composite and Y/C modes. For example, if the unit is set up in 10 bit mode and subsequently adjusted in 8 bit mode, the 10 bit adjustments are maintained and will be restored when 10 bit operation is resumed.

There are effectively four sets of independent gain and black level adjustments; 8 bit composite, 10 bit Composite, 8 bit Y/C and 10 bit Y/C.

Adjusting phase/hue

The phase adjustment is separate for each video standard and for composite and Y/C inputs. This adjustment is available in 10-bit mode only.

The Phase/Hue control adjusts chroma phase relative to burst. The range of adjustment is 360 degrees, in steps of roughly 0.1degrees. When the maximum adjustment is reached the value wraps around to zero.

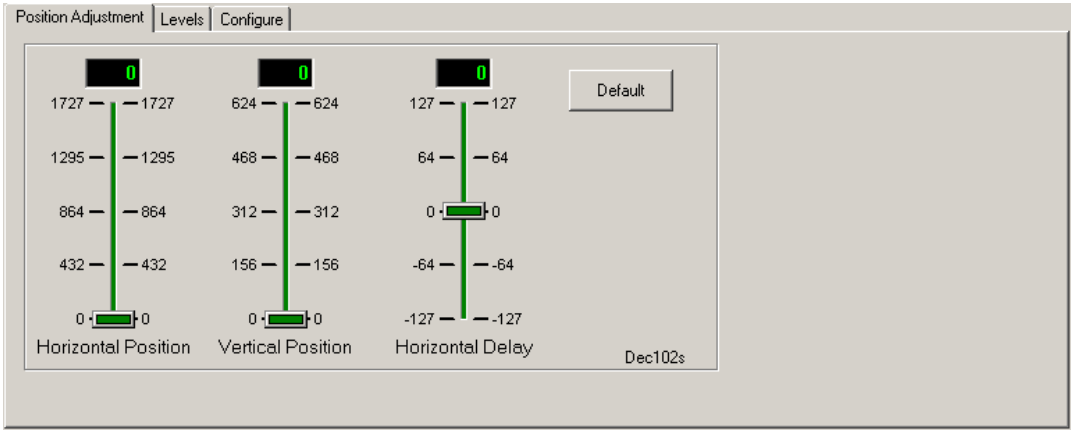
Recalling defaults

To recall default settings press the 'Cal' button.

Timing adjustment

The position adjustment tab provides access to the following:

- Horizontal position - output timing in 37ns steps
- Vertical position - output timing in one line steps
- Horizontal delay - input timing in 37ns steps (10 bit mode only)



Position adjustment controls

Different horizontal and vertical timing adjustments can be maintained for 625 and 525 line operation. However, the horizontal delay is common to both 525 and 625

Note: The horizontal delay and phase controls are not available in 8-bit mode.

The active output timing reference

The horizontal and vertical timing adjustments operate relative to one of three analogue timing references. These are an external reference, the composite or YC input or an internal free-running clock. Which of these is the active reference is dependent on the presence of an external reference or whether an 8-bit or 10-bit mode is in operation.

When an external analogue timing reference is present serial output timing is maintained relative to the external analogue reference.

When no external analogue timing reference present the serial output timing depends on whether the decoder is in 10 or 8-bit mode. In 10-bit mode the serial output is timed to the composite or Y/C input. In 8-bit mode the output is timed to a free running factory set clock.

The following tables summarises the possible output timing reference sources:

Active timing reference	Ext Ref	Mode
External analogue input	Present	10 or 8 bit
Composite or Y/C input	Not present	10 bit
Free running internal clock	Not present	8 bit

Adjusting horizontal and vertical timing

The horizontal position slider adjusts output timing relative to the active analogue reference in steps of 37ns. The range of adjustment is one video line.

The vertical position slider adjusts the output timing relative to the active analogue reference in steps of one video line. The range of adjustment is one video frame. When the maximum adjustment is reached the slider will move to zero.

Note: Attempts to exceed 524 on the vertical slider graticule in NTSC mode will reset the slider to zero.

When both horizontal and vertical position settings are zero the serial output will be timed to the active analogue reference as per ITU-R BT.601. Increasing the vertical position setting will delay the output relative to the reference in increments of one video line. Increasing the Horizontal position setting will increase this delay in increments of 37ns.

With an external analogue timing reference present the delay through the board depends on this adjustment and the relative timing of the serial input and the external analogue reference.

When both vertical position and horizontal position are set to zero the delay through the board will be at a minimum. The minimum delay through the board is approximately 1.7 lines in 10-bit mode and 0.7 lines in 8-bit mode.

The horizontal and vertical timing adjustments are separate for 625 and 525 line operation and the settings are automatically maintained when the unit is powered off and restored when the unit is powered back on.

Adjusting input video timing

The horizontal delay adjustment varies the timing of the input video relative to input syncs and blanking in 10 bit mode whichever source is the active reference.

Mode	Input video timing
10 bit	Relative to input video syncs and blanking
8 bit	No horizontal delay available

The horizontal delay slider adjusts the input video timing with respect to the input video syncs in steps of 37ns. This adjustment is available in 10-bit mode only. The available range is -128 to +127 steps (roughly +/- 4.5 microseconds) relative to the factory default position. The value cannot be adjusted outside this range.

Recalling defaults

To recall default settings press the 'Default' button.

3 Using the front control panel

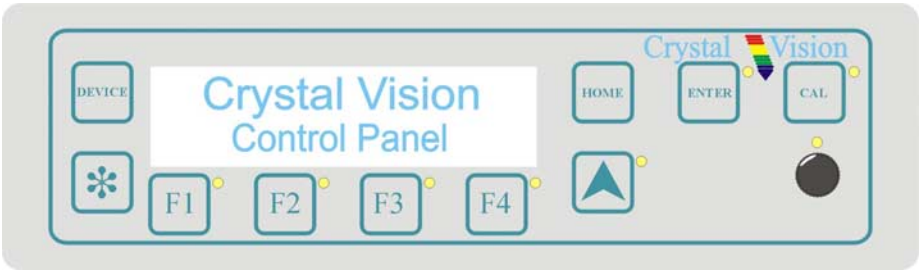
This operational guide assumes that the panel has been setup according to the Panel setup procedure described in the Crystal Vision Controls Panel manual.

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

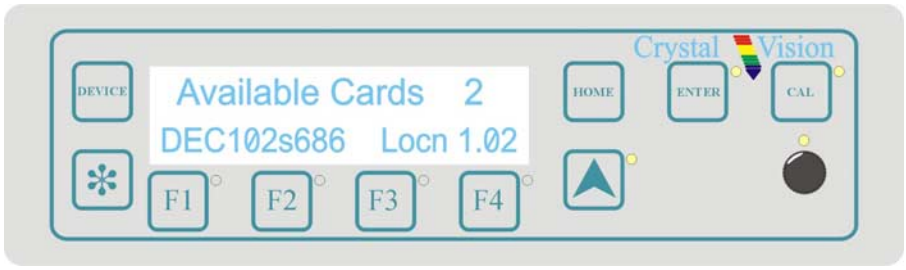
To continue with control panel operation or configuration, press the 'CAL' key once. A second press of the 'CAL' key will return to Statesman control.

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 DEC102S

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 DEC102S at the node number last displayed in the available cards list.

The DEC102S 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 DEC102S:

- 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

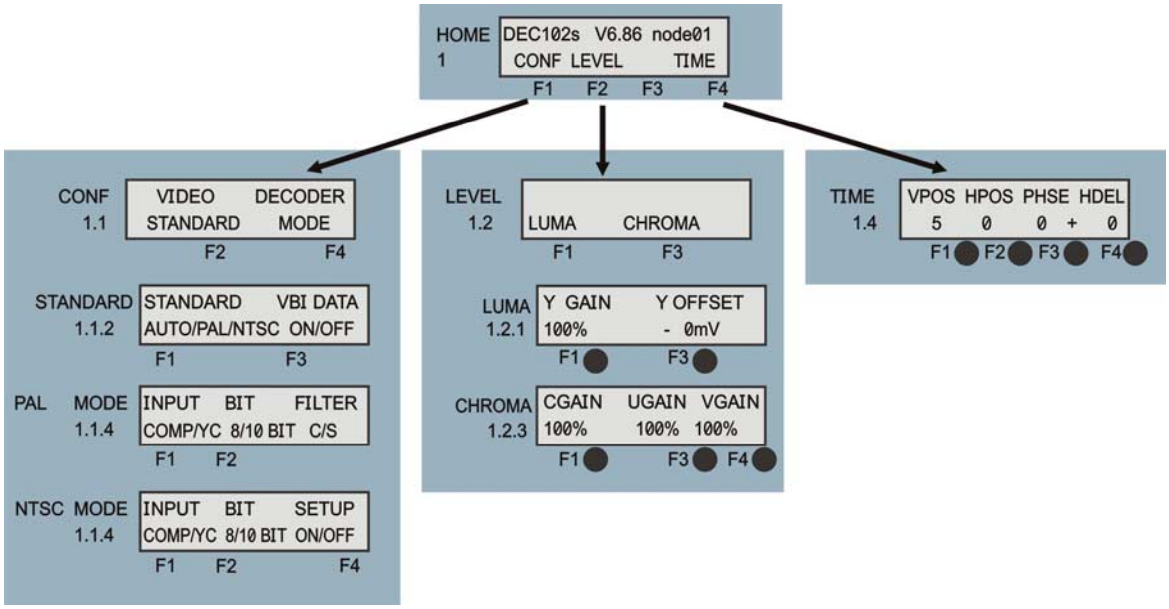
The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If mode changes occur through the use of Statesman, card edge controls or through automatic response to the input video signal, the text displayed on the active front panel will not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

The DEC102S menu structure

The main top-level menus are obtained by pressing the F1, F2 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:

- CONF (Configuration) – press F1
- LEVEL (Level adjustment) – press F2
- TIME (Input/output timing and phase) – press F4

The following chart shows the available DEC102S menus. The actual menus available may vary slightly as software is updated.



The DEC102S menu tree

Note: Function keys and shaft encoder LEDs are illuminated when active.
Menus or function keys associated with the shaft encoder for changing assigned values are shown with a black circle.

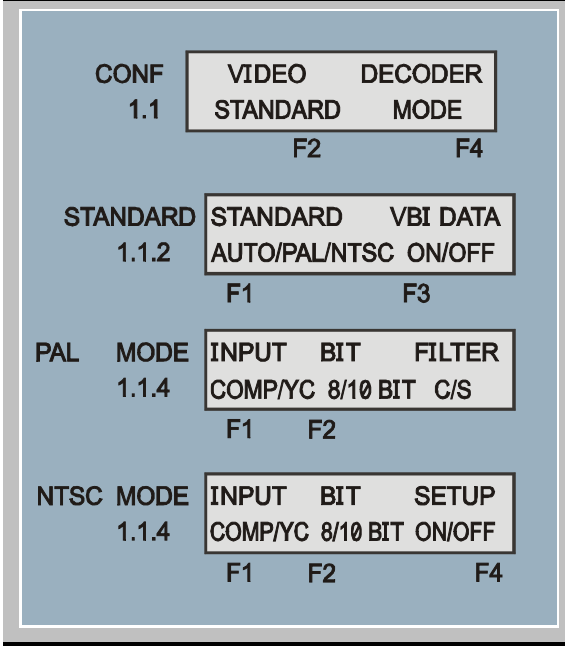
Menu numbering scheme

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 1.2.3 is reached by pressing F2 and then F3.

Selecting video standard and decoder modes

Press F1 from the home menu to display the configuration menu with the following options:

- Video standard selection
- VBI pass/blank select
- Decoder mode display
- Setup on/off in NTSC

Configuration menu structure	Description
	Use F2 to select Video Standard menu and F4 to select Mode menu Video Standard F1 selects PAL, NTSC or AUTO F3 selects VBI data ON or OFF Decoder Mode (PAL) F1 selects COMP (Composite) or Y/C F2 selects 8 bit, 10 bit or Auto Filter is adaptive Comb in 10 Bit mode and Simple in 8-bit mode. Decoder Mode (NTSC) F1 selects COMP (Composite) or Y/C F2 selects 8 bit, 10 bit or Auto F4 selects SETUP ON/OFF

Video standard

Press F1 to switch the video standard through AUTO, PAL and NTSC in turn. In AUTO mode, the board will switch automatically to the correct video standard based on the input signal.

If VBI (Vertical Blanking Interval) data is set to ‘ON’, the data is passed as undecoded luminance. In PAL this affects lines 7 to 22 and 319 to 335, in NTSC it affects lines 10 to 20 and 273 to 282.

Decoder mode

Press F1 to switch the input between COMP for a composite input signal and Y/C for an S-Video input signal.

Press F2 to switch through AUTO, 8 bit and 10 bit. AUTO allows the board to switch to the appropriate bit mode based on the input signal timing stability.

In PAL the Filter is updated automatically as the board switches between bit modes. Simple decoding is automatically selected for 8-bit modes and Comb is automatically selected for 10-bit modes.

In NTSC, F4 is used to toggle SETUP ON or OFF.

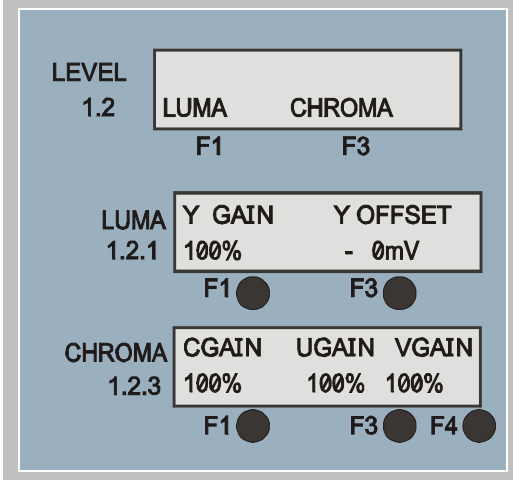
Setting gain and black level

Press F2 from the home menu to display the top Level menu providing the following functions:

- Luminance gain and black level
- Chrominance gain

The gain and offset adjustments are independent for 8 and 10 bit modes as well as Composite and Y/C modes. For example, if the unit is set up in 10 bit mode and subsequently adjusted in 8 bit mode, the 10 bit adjustments are maintained and will be restored when 10 bit operation is resumed.

There are effectively four sets of independent gain and offset adjustments; 8 bit composite, 10 bit composite, 8 bit Y/C and 10 bit Y/C.

Level menu structure	Description
	Use F1 to select Luminance menu and F3 to select Chrominance menu F1 allows ADJ shaft encoder to set luminance gain F3 allows ADJ shaft encoder to set black level CAL sets gain and black level to unity values F1 allows ADJ shaft encoder to set overall chroma gain F3 allows ADJ shaft encoder to set U chroma gain F4 allows ADJ shaft encoder to set V chroma gain CAL sets all chroma gains to unity values

Note: The displayed number varies as the shaft encoder is rotated to give an indication of the setting relative to the factory default

Setting luminance gain and black level

Select the 'LUMA' menu to allow the luminance gain and offset (black level) for the current mode to be adjusted.

Press the 'F1' button to allow the shaft encoder to adjust the luminance gain. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'Y GAIN'. Use the shaft encoder to adjust the luminance gain from 0 to 200%.

Press the 'F3' button to allow the shaft encoder to adjust the black level. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'Y OFFSET'. Use the shaft encoder to adjust the black level from –30 to +385mV.

Press the 'CAL' button at any time while in this menu to set gain and offset to their default values (100% and 0mV).

Setting chrominance gains

Select the 'CHROMA' menu to allow the chrominance gains for the current mode to be adjusted.

Press the 'F1' button to allow the shaft encoder to adjust the combined chrominance gain from 0 to 200%. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'CGAIN'. The shaft encoder will adjust both the U and V gains by the same proportion of their default values. The 'CGAIN' value is an average of the U and V values.

Press the 'F3' button to allow the shaft encoder to adjust the U gain from 0 to 200%. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'UGAIN'.

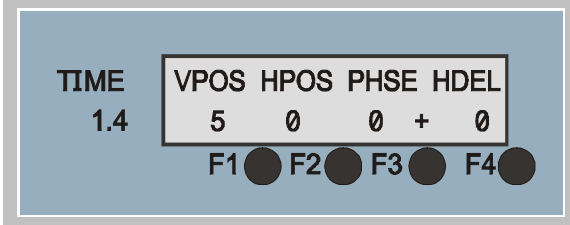
Press the 'F4' button to allow the shaft encoder to adjust the V gain from 0 to 200%. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'VGAIN'.

Press the 'CAL' button at any time while in this menu to set all gains to their default values (100%).

Adjusting signal timing

Press F4 from the home menu to display the Timing menu, which provides the following timing functions:

- Output timing relative to the external reference
- Chroma phase relative to burst (10 bit mode only)
- Input video timing (10 bit mode only)

Timing menu structure	Description
	Use the 'F' buttons below each function to enable the ADJ shaft encoder to change values. F1: ADJ sets VPOS (output timing in one line steps) F2: ADJ sets HPOS (output timing in 37ns steps) F3: ADJ sets PHSE (chroma timing in 0.1° steps) F4: ADJ sets HDEL (input timing in 37ns steps)

Different horizontal and vertical timing adjustments can be maintained for 625 and 525 line operation. However, the horizontal delay is common to both 525 and 625

Note: The horizontal delay (HDEL) and phase control (PHSE) are not available in 8-bit mode.

The active output timing reference

The horizontal and vertical timing adjustments operate relative to one of three analogue timing references. These are an external reference, the composite or YC input or an internal free-running clock. Which of these is the active reference is dependent on the presence of an external reference or whether an 8-bit or 10-bit mode is in operation.

When an external analogue timing reference is present serial output timing is maintained relative to the external analogue reference.

When no external analogue timing reference present the serial output timing depends on whether the decoder is in 10 or 8-bit mode. In 10-bit mode the serial output is timed to the composite or Y/C input. In 8-bit mode the output is timed to a free running clock.

The following tables summarises the possible output timing reference sources:

Active timing reference	Ext Ref	Mode
External analogue input	Present	10 or 8 bit
Composite or Y/C input	Not present	10 bit
Free running internal clock	Not present	8 bit

Adjusting horizontal and vertical timing

Increasing the vertical position setting will delay the output relative to the reference in increments of one video line. Press the 'F1' button to allow the shaft encoder to adjust the vertical output timing. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'VPOS'. The range of adjustment is one video frame. When the maximum adjustment is reached the value wraps around to zero.

Increasing the horizontal position setting will delay the output relative to the reference in increments of 37ns. Press the 'F2' button to allow the shaft encoder to adjust the horizontal output timing. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'HPOS'. The range of adjustment is one video line.

With an external analogue timing reference present the delay through the board depends on these adjustments and the relative timing of the serial input and the analogue reference. When both horizontal and vertical position settings are zero the delay thorough the board will be minimum and the serial output will be timed to the analogue reference as per ITU-R BT.601. The minimum delay through the board is approximately 1.7 lines in 10-bit mode and 0.7 lines in 8-bit mode.

Adjusting chroma phase

Press the 'F3' button to allow the shaft encoder to adjust the chroma phase relative to burst. This adjustment is available in 10-bit mode only. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'PHSE'. The range of adjustment is 360 degrees, in steps of roughly 0.1degrees. When the maximum adjustment is reached the value wraps around to zero.

Adjusting input video timing

The horizontal delay adjustment varies the timing of the input video relative to input syncs and blanking in 10 bit mode whichever source is the active reference.

Mode	Input video timing
10 bit	Relative to input video syncs and blanking
8 bit	No horizontal delay available

Press the 'F4' button to allow the shaft encoder to adjust the input video timing with respect to the input video syncs in steps of 37ns. This adjustment is available in 10-bit mode only. The shaft encoder LED will illuminate and an asterisk will appear on the display next to 'HDEL'. The available range is -128 to +127 steps (roughly +- 4.5 microseconds) relative to the factory default position. The value cannot be adjusted outside this range.

Recalling defaults

There is no 'CAL' function for the timing adjustments. Defaults may be restored from Statesman. See also 'Restoring factory defaults' in the Card-edge operation section.

4 Card edge operation

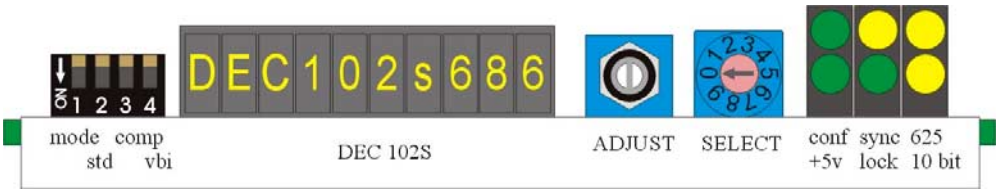
The control of the DEC102S will always follow the last control surface used. For example, if a card edge lever is moved the unit will switch to and remain in the 'Local Control Mode'. If Statesman or any control panel menu is used, then the unit will switch to and remain in the 'Remote Control Mode'. The settings made will be remembered after a power down and the last control mode used will be retained.

Piano switch and jumper settings are only read when they are changed. However, the board will configure itself according to local configuration changes even if the changes occurred while the board had been powered down.

The auto-configuration process performed when a DEC102S 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 the card edge, the frame's local control panel, from a remote control panel or from Statesman.

Card edge controls

The front edge of the card provides LED status and power rail monitoring, menu selection, rotary set-up controls and a ten-digit visual status display.



In general the four-lever switch changes mode or options whilst the SELECT switch is used to select one of the main configuration menus and the ADJ shaft encoder is used to assign values to configuration variables.

A change made using the shaft encoder is generally implemented immediately and there is no need for a separate 'save' or 'enter' function.

Displaying module type and firmware

To display the module type and firmware rotate switch (SEL) to position 7, 8 or 9.

SEL 7, 8 or 9	Description
Module type	DEC102s686

Setting video standard and decoder options

The four-lever switch to the left of the card edge matrix display is used to configure the main options in conjunction with on-board jumper links:

- 10 bit or 8 bit processing
- 525, 625 or automatic line standard selection
- Composite or Y/C decoder input
- VBI blanking ON/OFF

Lever	UP	DOWN
Lever 1	Automatic switching between 10 and 8 bit mode	10 or 8 bit mode selected manually using jumper link J5
Lever 2	Automatic switching between 625 and 525 line standard	625 or 525 standard selected manually using jumper link J3
Lever 3	Composite input	Y/C (S-video) input.
Lever 4	VBI data passed unprocessed on luminance channel	VBI data blanked

Forcing the video standard

The video standard can be forced by using jumper link J3 in conjunction with lever 2 of the four-lever switch on the card edge:

Link	Position	Function
J3	Towards edge connector	Manually select video standard when piano switch 2 is DOWN Link to the rear – forces 625 line standard Link to the front – forces 525 line standard

The location of jumper links is shown in the module configuration section of the Installation chapter.

Note: Vertical Blanking Interval data is normally present in PAL on lines 7-22 and 319-335 and in NTSC on lines 10-20 and 273-282.

Setting decoder modes

There are four decoder modes, selected by a combination of four-lever switch, Adjust control and on-board jumpers:

- 10 bit composite – uses a line-based comb decoder, which mixes to simple decoder when the comb would produce artefacts
- 8 bit composite – robust simple decoder suitable for use with poorly timed sources such as VHS recorders
- 10-bit YC – Y/C (S-video) mode selected for well-timed inputs
- 8-bit YC – Y/C (S-video) robust mode suitable for use with poorly timed sources such as VHS recorders

If switch lever 1 is left in the UP position 10-bit or 8-bit mode is selected automatically. If switch lever 1 is left in the DOWN position the choice can be made using an on-board jumper link, J5.

Link	Position	Function
J5	Board centre	Manually select 10 or 8-bit operation when piano switch 1 is DOWN Link to the rear – forces 8-bit operation Link to the front – forces 10-bit operation

The decoder modes and the required lever, jumper and ADJ control settings are summarised below:

Desired setting	Mode lever and jumper settings
Composite, 10 bit	Lever 3 UP and Lever 1 UP (or Lever 1 DOWN with J5 in 10-bit position – away from edge connector)
Composite, 8 bit	Lever 3 UP and Lever 1 UP (or Lever 1 DOWN with J5 in 8-bit position – towards edge connector)
Y/C, 10 bit	Lever 3 DOWN and Lever 1 UP (or Lever 1 DOWN with J5 in 10-bit position – away from edge connector)
Y/C, 8 bit	Lever 3 DOWN and Lever 1 UP (or Lever 1 DOWN with J5 in 8-bit position – towards edge connector)

Notes: Decoder modes are not shown on the display but will be adaptive Comb in 10 Bit mode and Simple in 8-bit mode.

The location of jumper links is shown in the module configuration section of the Installation chapter.

Setting gain and black level

Use rotary switch (SEL) positions 0 to 4 and the shaft encoder to change the following:

- Luminance gain and offset (black level)
- Chrominance gains

The gain and offset adjustments are independent for 8 and 10 bit modes as well as Composite and Y/C modes. For example, if the unit is set up in 10 bit mode and subsequently adjusted in 8 bit mode, the 10 bit adjustments are maintained and will be restored when 10 bit operation is resumed.

There are effectively four sets of independent gain and offset adjustments; 8 bit composite, 10 bit composite, 8 bit Y/C and 10 bit Y/C.

SEL	Display Text	Description
0	Ygain% 100	The shaft encoder can be used to adjust the luminance gain
1	Yoff+mV 3	The shaft encoder can be used to adjust the luminance offset (black level)
2	CGain% 100	The shaft encoder can be used to adjust both the U and V chrominance gains
3	Ugain% 100	The shaft encoder can be used to adjust the U chrominance gain
4	Vgain% 100	The shaft encoder can be used to adjust the V chrominance gain

Note: The displayed number varies as the shaft encoder is rotated to give an indication of the setting relative to the factory default

Select position 0 (Ygain) with the 'SEL' control to allow the shaft encoder to adjust the luminance gain from 0 to 200%.

Select position 1 (Yoff) with the 'SEL' control to allow the shaft encoder to adjust the black level from –30 to +385mV.

Select position 2 (Cgain) with the 'SEL' control to allow the shaft encoder to adjust the overall chrominance gain from 0 to 200%.

Select position 3 (Ugain) with the 'SEL' control to allow the shaft encoder to adjust the U chrominance gain from 0 to 200%.

Select position 4 (Vgain) with the 'SEL' control to allow the shaft encoder to adjust the V chrominance gain from 0 to 200%.

Adjusting signal timing

Use rotary switch (SEL) positions 5, 6, 8 and 9 together with the shaft encoder to change the following:

- Output timing relative to the active reference
- Chroma phase relative to burst (10 bit mode only)
- Input video timing (10 bit mode only)

The horizontal and vertical timing adjustments relative to the active reference are separate for 625 and 525 line operation. The settings for composite and Y/C (S-video) phase are also stored separately, as are the phase settings for PAL and NTSC. This gives a total of four separate phase adjustments, two each in PAL and NTSC.

All these parameters are automatically maintained when the unit is powered off and restored when the unit is powered back on.

SEL	Display Text	Description
5	H Pos 0	The shaft encoder adjusts the output video timing relative to the active analogue timing reference in increments of 37ns. When the maximum adjustment of one line is reached the value wraps round to zero and the Vpos adjustment is modified.
6	V Pos 0	The shaft encoder adjusts the output video timing relative to the active analogue timing reference in increments of whole video lines. When the maximum adjustment of one frame is reached the value wraps round to zero.
8	Phase 0 (version number shown in 8 bit mode)	In 10-bit mode chroma phase relative to burst can be adjusted in steps of approximately 0.1°. The display shows the difference from the default setting in whole degrees.
9	H del +0 (version number shown in 8 bit mode)	In 10-bit mode the timing of the input video relative to the input syncs can be adjusted in 37ns steps. The range is -128 to +127, giving approximately +/- 4.75 microseconds relative to the factory default timing. The display indicates the number of adjustment steps used. Do not leave the SEL switch in position 9 as it also used as a power-up factory reset function.

The active output timing reference

The horizontal and vertical timing adjustments operate relative to one of three analogue timing references. These are an external reference, the composite or YC input or an internal free-running clock. Which of these is the active reference is dependent on the presence of an external reference or whether an 8-bit or 10-bit mode is in operation.

When an external analogue timing reference is present serial output timing is maintained relative to the external analogue reference.

When no external analogue timing reference present the serial output timing depends on whether the decoder is in 10 or 8-bit mode. In 10-bit mode the serial output is timed to the

composite or Y/C input. In 8-bit mode the output is timed to a free running factory set clock.

The following tables summarises the possible output timing reference sources:

Active timing reference	Ext Ref	Mode
External analogue input	Present	10 or 8 bit
Composite or Y/C input	Not present	10 bit
Free running internal clock	Not present	8 bit

The horizontal delay adjustment varies the timing of the input video relative to input syncs and blanking in 10-bit mode whichever source is the active reference.

Mode	Input video timing
10 bit	Relative to input video syncs and blanking
8 bit	No horizontal delay available

Adjusting horizontal and vertical timing

The output timing can be adjusted through an entire frame using the Vpos and Hpos settings.

Increasing the vertical position setting will delay the output relative to the reference in increments of one video line. Select position 6 (V Pos) with the 'SEL' control to allow the shaft encoder to adjust the vertical output timing. The range of adjustment is one video frame. When the maximum adjustment is reached the value wraps around to zero.

Increasing the horizontal position setting will delay the output relative to the reference in increments of 37ns. Select position 5 (H Pos) with the 'SEL' control to allow the shaft encoder to adjust the horizontal output timing. The range of adjustment is one video line. When the Hpos setting reaches the end of a video line it wraps round and the Vpos setting is changed to provide continuous adjustment.

With an external analogue timing reference present the delay through the board depends on these adjustments and the relative timing of the serial input and the analogue reference. When both horizontal and vertical position settings are zero the delay thorough the board will be minimum and the serial output will be timed to the analogue reference as per ITU-R BT.601. The minimum delay through the board is approximately 1.7 lines in 10-bit mode and 0.7 lines in 8-bit mode.

Using the phase control

Select position 8 (Phase) with the 'SEL' control to allow the shaft encoder to adjust the chroma phase relative to burst. This adjustment is available in 10-bit mode only. The range of adjustment is 360 degrees, in steps of roughly 0.1degrees. When the maximum adjustment is reached the value wraps around to zero.

Note: The firmware version number is shown in 8 bit mode when SEL 8 is selected.

The timing adjustments are separate for 625 and 525 line operation and the settings are automatically maintained when the unit is powered off and restored when the unit is powered back on.

Adjusting input video timing

The horizontal delay adjustment varies the timing of the input video relative to input syncs and blanking in 10-bit mode whichever source is the active reference.

Mode	Input video timing
10 bit	Relative to input video syncs and blanking
8 bit	No horizontal delay available

Select position 9 (H del) with the 'SEL' control to allow the shaft encoder to adjust the input video timing with respect to the input video syncs in steps of 37ns. This adjustment is available in 10-bit mode only.

Note: The firmware version number is shown in 8 bit mode when SEL 9 is selected. Do not leave the SEL switch in position 9 as it also used as a power-up factory reset function.

The available range is -128 to +127 steps (roughly +- 4.5 microseconds) relative to the factory default position. The value cannot be adjusted outside this range.

Setting 525 (NTSC) Setup

Use rotary switch (SEL) position 7 together with the shaft encoder in 5**25(NTSC)** mode **ONLY** to switch Setup (pedestal) compensation ON or OFF:

SEL 7 Display Text	Description
Setup on	7.5 IRE subtracted from black level, gain increased
Setup off	Black level and gain settings assume no 7.5 IRE offset

Note: When the board is in 525 line (NTSC) mode, the shaft encoder can be used to switch setup (pedestal) compensation on and off.
When setup compensation is ON the display will show “setup on”. The 7.5 IRE offset will be subtracted from the black level and the gain will be increased to compensate. This does not affect the Y Gain and Y Offset settings.
When setup compensation is OFF the display will show “setup off”. The black level and gain will be set assuming no 7.5 IRE offset, in the same way as for PAL inputs.
The setup mode is preserved through 625-line operation and power down.

Restoring factory defaults

If required all settings can be returned to default values. This is done by powering the module with rotary switch (SEL) in position 9 and piano switch lever 4 UP. The display text will be 'DEFAULTS?' To restore default settings set piano switch lever 4 DOWN.

Note: Moving the rotary switch away from position 9 will set the board to normal operation without overwriting the previous settings.
On no account should the SEL switch be left in position 9.

5 Hardware installation

The DEC102S single height module uses the RM01, RM18 and RM02 rear connector and fits into all Crystal Vision rack frames. All modules can be plugged in and removed while the frame is powered without damage.

5.1 Rear modules and signal I/O

The FR2AV and Indigo 2U frame will house up to 12 single height modules and dual power supplies. The FR1AV and Indigo 1U frame will house 6 single height modules and a single power supply. The DTBAV and Indigo 1U high Desk Top Box has built-in power supply and will house up to 2 single height modules.

RM01

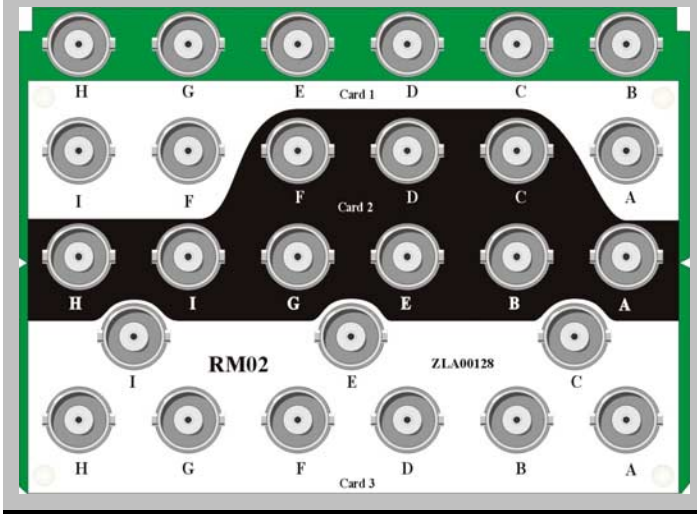
Modular rear connectors	Description
	**RM01** • 12 DEC102 modules per FR2AV or 2U Indigo frame • Composite sync loop through output not available • All frame slots can be used

Note: One DEC102S card can be fitted to each RM01 rear module.

BNC	Function
SDI OUT (1)	Serial Digital Output
SDI OUT (2)	Serial Digital Output.
PAL/C IN	Analogue Composite Video or C input.
Y IN	Analogue Y plus sync input (active in Y/C input mode only)
SYNC IN	Composite Sync (B & B) input
DELAY PULSE OUT	TTL pulse output for audio follow delay

For details of fitting rear connectors please refer to the appropriate frame manual.

RM02

Modular rear connectors	Description
	**RM02 (ZLA00128 artwork)** • 9 DEC102S modules per FR2AV or 2U Indigo frame • 3 modules per rear connector • All connections available • Card 1 fits in slots 1, 5 and 9 • Card 2 fits in slots 2, 6 and 10 • Card 3 fits in slots 4, 8 and 12 • No card fits in 3, 7 or 11

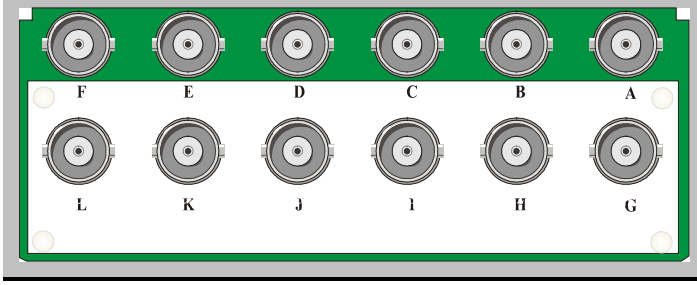
Note: Three DEC102S cards can be fitted to each RM02 rear module.
Card 1 fits in the top position, card 2 in the second from the top and card 3 fits in the lowest slot position. No card is fitted in the third from top slot.

For details of fitting rear connectors please refer to the appropriate frame manual.

BNC_U	BNC_1	Function
A	**IN**	Serial Digital Output (1).
B	**1**	Serial Digital Output (2)
C	**2**	Analogue Composite Video or C input.
D	**3**	Not used, connected to frame ground
E	**4**	Analogue Y plus sync input (active in Y/C input mode only)
F	**5**	TTL pulse output for audio follow delay
G	**6**	Composite Sync Loop through (set by J1).
H	**7**	Not used, connected to frame ground
I	**8/IN2**	Composite Sync (B & B) input

Note: BNC_U refers to ZLA00128 universal artwork labeling.
BNC_1 refers to ZLA00110 artwork used when the RM02 is supplied with other products.
There are no GPI connections for the DEC102S

RM18

RM18 modular rear connector	Description
	**RM18 (ZLA00158 artwork)** • 6 DEC101S modules per FR2AV frame Odd numbered slots can be used

Note: One DEC102S cards can be fitted to each RM18 rear module, but only odd numbered slots can be used.

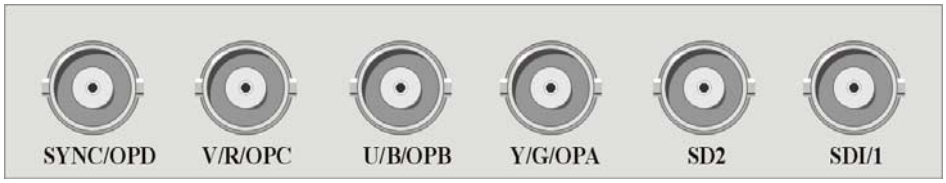
General Label (ZLA00158)	Function
A	Not used
B	Serial Digital Ouput (1).
C	Serial Digital Output (2)
D	Composite Sync Loop through (set by J1).
E	Composite Sync (B & B) input
F	Not used, connected to frame ground
G	Not used
H	Analogue Composite Video or C input.
I	Not used, connected to frame ground
J	Analogue Y plus sync input (active in Y/C input mode only)
K	Not used, connected to frame ground
L	TTL pulse output for audio follow delay

For details of fitting rear connectors please refer to the appropriate frame manual.

5.2 FR1-6, FR2-12 and FR2-8 frame rear connectors

The 1U FR1-6 frame for 6 modules includes rear panel BNC connections and plug-in power supply. The 2U FR2-12 frame houses up to 12 modules and dual power supplies. The 2U FR2-8 frame houses 8 modules each with extra rear panel BNC connections.

The modules can be plugged in and removed while the frame is powered without damage.



FR1-6 & FR2-12 rear connectors

FR1-6 & FR2-12 connections

BNC	Description
SDI/1	Serial Digital Output
SD2	Serial Digital Output.
Y/G/OPA	Analogue Composite Video or C input.
U/B/OPB	Analogue Y plus sync input (active in Y/C input mode)
V/R/OPC	TTL pulse output for audio follow delay
SYNC/OPD	Composite Sync (B & B) input

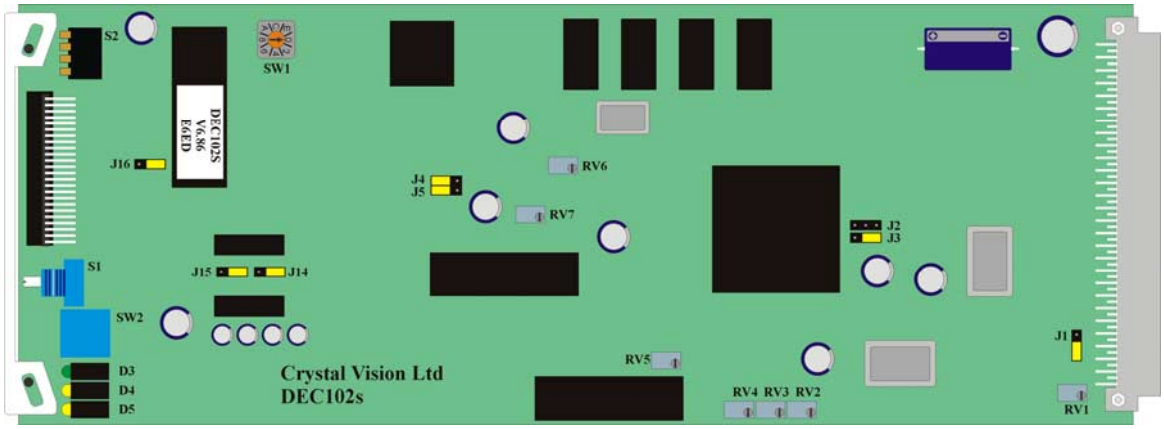
Note: There are no GPI connections for the DEC102S

FR2-8 connections

BNC	Description
SDI/1	Serial Digital Ouput (1).
SD2	Serial Digital Output (2)
Y/G/OPA	Analogue Composite Video or C input.
Y/G/OPA(2)	Not used, connected to frame ground
U/B/OPB	Analogue Y plus sync input (active in Y/C input mode only)
U/B/OPB(2)	Not used, connected to frame ground
V/R/OPC	TTL pulse output for audio follow delay
V/R/OPC(2)	Composite Sync Loop through (set by J1)
SYNC/OPD	Composite Sync (B & B) input
SYNC/OPD(2)	Not used

5.3 Module configuration

The DEC102S has jumper links and analogue gain adjustments present on the module PCB. Many of the jumper links are set in conjunction with the front card edge controls. Analogue gain settings are pre-set at the factory and should not require re-adjustment.



DEC 102S showing jumper link positions

Loop or terminate the external reference

The external analogue reference may be terminated with 75Ω or allowed to provide a loop through output. Set jumper link J1 at the bottom right hand corner of the module to the lower position (as shown) to terminate the external reference. Set jumper J1 to the upper position for a loop through output.

Link	Position	Select loop through or termination of reference syncs
J1	Bottom right hand corner near edge connector	Link to the top – ext syncs looped through Link to the bottom – ext syncs terminated on board

Card-edge control - video standard and 8/10 bit jumper location

When the module is operated from the card-edge controls, the video standard and 8/10 bit modes can be forced by using jumper links J3 and J5 in conjunction with the four-lever switch on the card edge.

Link	Position	Function
J3	Towards edge connector	Manually select video standard when piano switch 2 is DOWN Link to the rear – forces 625 line standard Link to the front – forces 525 line standard
J5	Board centre	Manually select 10 or 8-bit operation when piano switch 1 is DOWN Link to the rear – forces 8-bit operation Link to the front – forces 10-bit operation

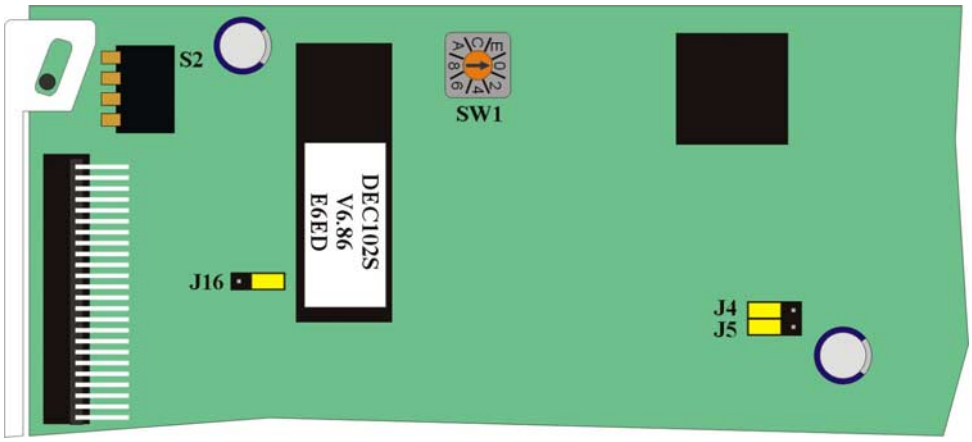
Setting node addresses

Most Crystal Vision cards have their unique node or card location address assigned automatically by the panel processor based on the slot occupied in the frame and the range address setting of the frame. Two ranges are provided to allow one control panel to control two frames.

Older cards may have a special 16 position node switch for use with older frames such as the FR2-12 or FR1-6.

In all of the current frames, this node switch should be set to zero (factory default) and link J4 should be towards the front of the module.

Note: Setting J4 to the rear of the card may cause incorrect node addressing on this and other boards in current frames.



DEC 102S front section showing jumper link positions

Setting the node address in older frames

Frame	Node address setting
FR1-6	Set the remote node address in conjunction with link J4 as follows:
FR2-12	J4 to front of card – set node addresses from 0 to 15 with SW1
FR2-8	J4 away from front – set node addresses from 16 to 31 with SW1 (15 is added to switch setting)
	The node address setting is only read on power up.

Note: Node addresses 0-15 correspond to 0-F on SW1 in HEX with J4 towards the front.
Node addresses 16-31 correspond to 0-F on SW1 in HEX with J4 as shown.
(only every other HEX number may be shown on certain switches)

Please refer to the appropriate Frame Manual for further information about node and range addresses.

Note: Other jumper links on the board are for factory use only and should not be changed.

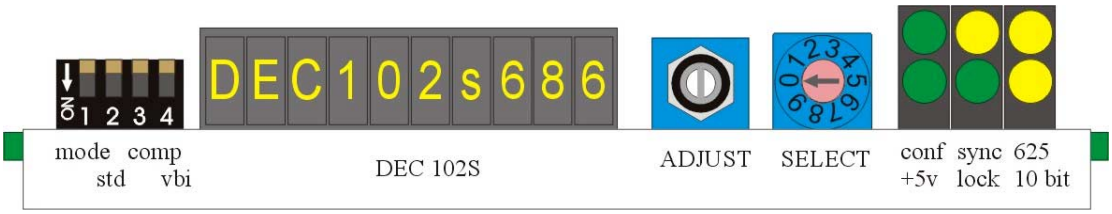
6 Trouble shooting

Card edge monitoring

Once the start-up initialisation procedure is complete, the DEC102S can be controlled or configured from the card edge, from an active control panel or the Statesman PC interface. This chapter will concentrate on the card edge monitoring LEDs.

Status LEDs

Board edge LEDs provide status reporting and may be useful when fault finding.



DEC102S front view showing controls and LEDs

The following table summarises the card edge LED functions and colours:

LED Colour	Position	Description
Green	Conf	Illuminates when board power-on configuration is complete
Yellow	Sync	Illuminates when analogue timing reference is absent. The board output will be timed relative to the composite or Y input in 10-bit mode and a free running clock in 8-bit mode.
Yellow	625	Illuminates when board is in 625 line mode
Green	+5V	Illuminates when the board is powered
Green	Lock	Illuminates when the composite or Y input is present
Yellow	10-bit	Illuminates when the board is 10-bit mode

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 video output

Check that a valid input is present (Lock LED ON) and that any cabling is intact

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 card-edge Rx and Tx LEDS flash (Comms LED in an Indigo frame) 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

The video output is not synchronous with other sources

Check that a valid synchronous reference is connected, that the Sync LED is lit and that the correct video standard is selected

Check that output phasing is set correctly

The video output is disturbed when the horizontal delay is adjusted.

If the chroma burst is absent for more than a second during adjustment, the input video timing logic automatically may reset itself a number of times. Because of this there will be a periodic disturbance of the output for several seconds, if the input timing is set so far out that the burst is not detected.

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

Active control panel and/or Statesman does not work as expected

Check that a unique node address is being used in the frame the module is fitted into

Module powers up with invalid video

Check that the SEL switch has not been left in position 9 (factory default recall)

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.

It is also possible to recall factory defaults by following the procedure at the end of the Card-edge operation chapter.

7 Specification

General

Dimensions	100mm x 266 mm module with DIN 41612 connector
Weight	200g
Power consumption	8W

Inputs

Analogue video input	Composite or Y/C video input, 1 volt with syncs
	625 line PAL or 525 line NTSC
Analogue reference	Analogue black and burst, mixed syncs or video. Amplitude of syncs 150mV to 4V
	Link on PCB selects 75 Ohm termination or high impedance with loop through (via PCB)
Blanking	To analogue PAL/NTSC specifications with selectable VBI blanking
	PAL lines 7 to 22 and 319 to 335
	NTSC lines 10 to 20 and 273 to 282

Outputs

Audio follow output	TTL output, pulse length same as delay through store
Video SDI output	2 x 270Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M

Analogue performance

Frequency response with comb active	+/- 0.3dB to 5.5mHz
Gain error	<1%
Differential phase and gain in 10-bit mode	<1.5°, <1.5%

Ordering information

DEC102S	10 bit PAL/NTSC or Y/C to SDI adaptive comb decoder with TBC/framestore
Indigo 2	2U frame without active control panel for up to 12 modules
Indigo 1	1U frame without active control panel for up to 6 modules
Indigo DT	1U Desk top box without active control panel for up to 2 modules
Indigo 2A	2U frame with active control panel for up to 12 modules
Indigo 1A	1U frame with active control panel for up to 6 modules
Indigo DTA	1U Desk top box with active control panel for up to 2 modules
Indigo 2S	Statesman enabled only 2U frame for up to 12 modules
Indigo 1S	Statesman enabled only 1U frame for up to 6 modules
Indigo DTS	Statesman enabled only 1U Desk top box for up to 2 modules