ENC116

SDI to composite or Y/C encoder

USER MANUAL

Crystal Vision

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

Contents

1 Introduction 3
Frame packing density 4
2 Statesman PC control 5
2.1 Installing Statesman 5
2.2 Statesman operation 6
Timing and status 7
Setting burst and Chroma phase 8
Adjusting levels 9
Adjusting VBI and test pattern options 10
3 Using the active control panel 11
Selecting the ENC116 12
Navigating the display 13
Updating the display 13
3.1 The ENC116 menu structure 14
Menu numbering scheme 14
3.2 Adjusting signal timing 15
3.3 Setting Chroma and burst phase 16
3.4 Adjusting signal gains and offsets 17
Adjusting Y/C gain 18
3.5 Setting advanced options 19
Setting advanced options - more 20
4 Card edge operation 21
4.1 Card edge controls 21
4.2 Setting control mode options 21

4.3 Display software version and node address 22
4.4 Adjusting signal timing 22
4.5 Adjusting signal gain and offsets 22
4.6 Recalling factory gain settings 23
4.7 Recalling all factory settings 23
4.8 Setting output options 23
4.9 Setting reference options 24
4.10 Setting VBI options 24
4.11 Checking TBC operation 24
5 Hardware installation 25
5.1 Universal rear connectors 25
RM18 Connections 25
RM01 connections 26
RM23 connections 26
RM02 connections 27
5.2 External remote control connections 28
Remote control configuration 29
5.3 Output configuration and sync termination 31
5.4 Selecting the SDI timing reference signal 32
5.5 Factory adjustments 32
6 Problem solving 33
Card edge status LEDs 33
Active Control Panel status messages 34
Basic fault finding guide 34
7 Specification 36

1 Introduction

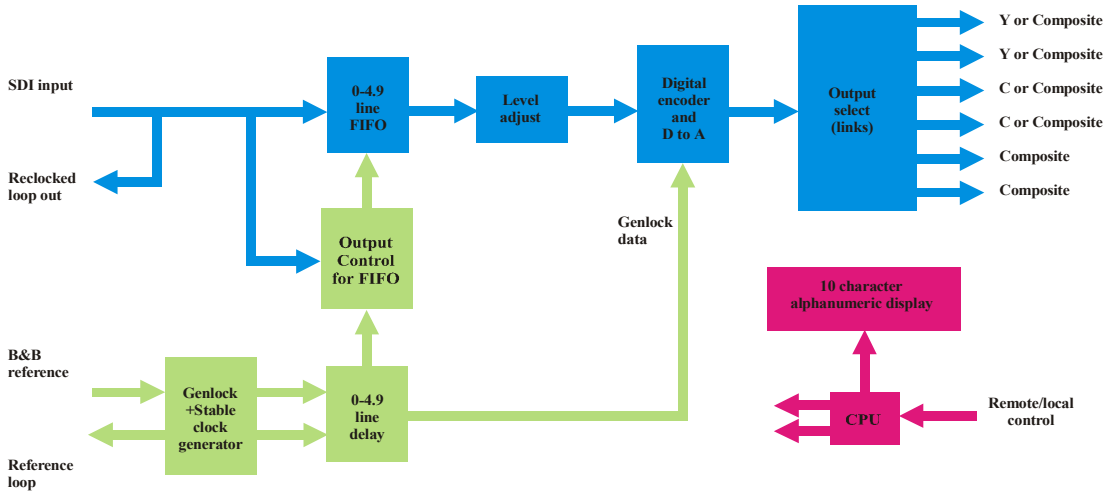
The ENC116 is a 10-bit broadcast quality Serial Digital to Analogue Composite converter. It accepts either 625 or 525 line input, with automatic detection.

There is one reclocked serial digital output and six analogue PAL/NTSC outputs. The available outputs depend on the rear module used. Normal single height rear modules allow access to three of the analogue outputs, whilst an extra three analogue outputs and one analogue reference loop-through are available in certain frames with alternative rear modules. On-board links allow the selection of all composite outputs, or a mixture of composite and Y/C outputs.

Remote control is possible from a front panel control and a remote panel using RS-422 or RS-232.

The main features are as follows:

- compact single height module
- converts SDI signals to composite and Y/C
- genlock and free-run modes
- 4.9 line time-base corrector
- automatic or manual PAL/NTSC standard selection
- adjustable timing, gains and levels
- card edge, Statesman and active panel control



The ENC116 10-bit SDI converter

A 4.9 line time-base corrector is included on both reference & video paths, which allows serial digital video which has been delayed through prior processing to be re-timed without the use of external delays or a multi-output SPG.

Two main operational modes are available: genlock mode and free-run mode. In genlock mode, the composite output is time-base corrected & phase-locked to reference. In free-run mode, the composite output is locked to the syncs embedded in the serial digital data stream with phase reset every 8 fields.

If the reference is removed, the encoder switches to freerun mode and output timing continues as if the reference were still present. If the reference returns, the encoder genlocks after 1.5 seconds.

If the serial input is removed, the encoder outputs black & burst or one of 3 test patterns selectable from the local/remote menu. PAL/NTSC standard selected by DIL switch 3.

Note: There may be some picture disturbance as the encoder switches modes or after a change of standard as the encoder re-acquires genlock.

Output timing can be set to be the same as the analogue reference, or it can be offset to be between 4µs earlier than the reference and 4.9 lines later. The SDI video input must be earlier than the required output by a minimum of 4.3µs and a maximum of 4.9 lines. If the input is outside this window, a valid composite output will still be created, but the picture content will be vertically offset.

Frame packing density

The ENC116 is a 100mm x 266mm module, which fits in the three standard frames and can be integrated with any boards from the company's full product range. It may be used with the single slot RM01 and RM23 rear connectors, the double slot RM18 rear connector and the quadruple slot RM02 rear connector.

The RM01 and RM23 single slot rear connectors allows up to 12 modules in a 2U frame, 6 modules in a 1U frame and 2 modules in a desktop box. The RM18 double slot rear connector accommodates one module but provides access to all ENC116 I/O connections. The quadruple slot RM02 rear connector accommodates three modules and provides a mix between packing density and I/O access. It can only be used in 2U frames.

2 Statesman PC control

The Crystal Vision Statesman PC control software is designed to control a range of Crystal Vision modules via serial control from a PC. Statesman provides a user friendly means of configuring and operating Crystal Vision modules with the benefit of see-at-a-glance status monitoring. Most functions can be accessed from Statesman menus.

The main Statesman application communicates with each module in a frame through an active or Statesman enabled control panel. Statesman control is not possible with only a passive panel.

Minimum pre-requisites:

- A PC running either Windows 2000 or Windows XP is recommended
- A parallel port dongle for Statesman PCs with attached Crystal Vision frames
- An RS422 serial connection from the host PC to the Control/422 RJ45 or Remote/RMT 2 connector on Crystal Vision frames
- An active or Statesman enabled 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

2.1 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

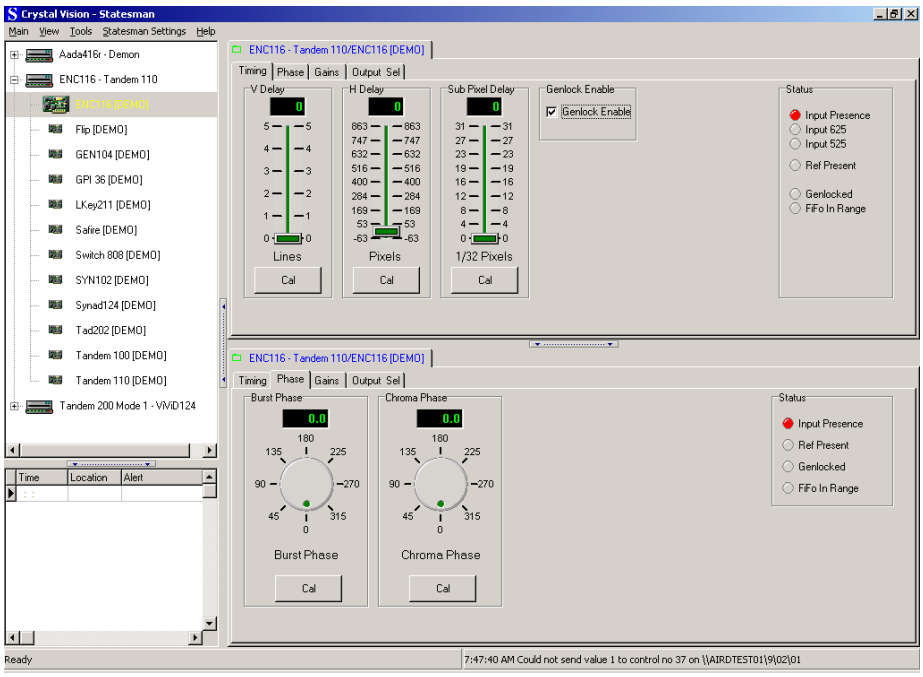
Once Statesman is configured it should automatically detect any statesman compatible modules in the connected frame or frames and display them in the main application left hand explorer-style window.

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

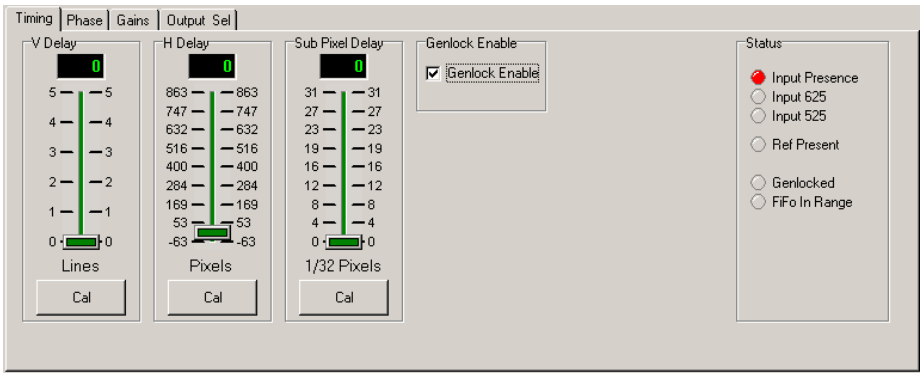
The two large control panes shown in the upper and lower halves of the window may display different menus for the same card, or controls for different cards. Click on the horizontal button-bar between the two panes to close the lower plane or drag the button to vary the size of the panes.

Warning: Always ensure that the active front panel (if fitted) is in STATESMAN mode. If the front panel is active, control via Statesman will be subject to high latency and the response to changes will be slow.

Timing and status

The timing tab provides access to the following

- Vertical delay in lines
- Horizontal delay in pixels
- Fine horizontal delay in 1/32 pixel steps
- Genlock enable
- Status



Timing tab

Vertical delay

Slider adjusts delay from 0 to 5 lines in one-line steps. CAL button zeros the current setting.

Horizontal delay

Slider adjusts delay from –4µs to 1 line in 7 pixel (approx. 0.5 µsec) steps. CAL button minimises the current setting.

Sub-pixel delay

Slider adjusts delay from 0 to 1 pixels in 1/32 pixel (2ns) steps. CAL button zeros the current setting.

Genlock enable

Place a tick by Genlock Enable to ensure that the output is sync and burst locked to the supplied reference. Remove the tick and the output will be sync-locked to the serial digital input.

If Genlock is ticked but the reference input is absent, the output will be sync-locked to serial digital input. If there are no SDI or reference inputs the output will be black & burst (or test patterns if selected).

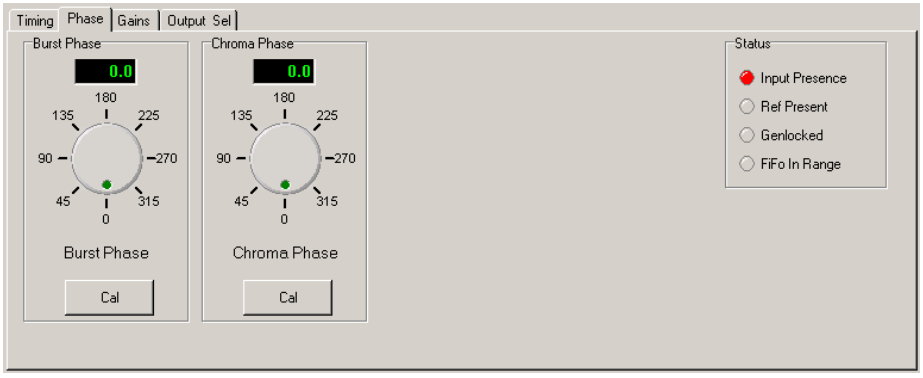
Status

Input, reference presence and standard are shown along with FIFO and Genlock status.

Setting burst and Chroma phase

The Phase tab provides access to the following:

- Burst phase
- Chroma phase
- Status



Setting Burst and Chroma phase

Burst phase

Knob adds ScH phase offset from 0° to 360° in 1/16° steps. CAL button zeros the current setting.

Chroma Phase

In NTSC, Chroma knob adds ScH to Chroma phase offset from 0° to 360° in 1/16° steps.

In PAL this control provides a ± 2° ScH to Chroma phase offset.

CAL button zeros the current setting.

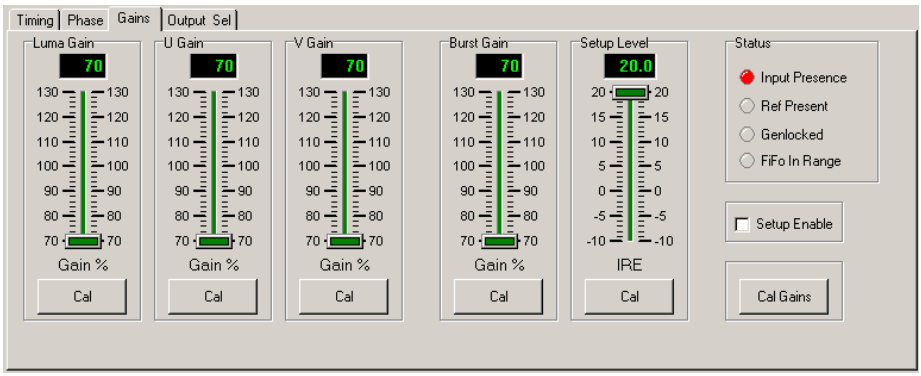
Status

Input and reference presence is shown along with FIFO and Genlock status.

Adjusting levels

The Gain tab provides access to the following:

- Luma gain
- U Gain/V Gain
- Burst Gain
- Setup Level/ Setup enable
- Status



Gain settings

Luma gain

Slider varies Y gain from 70% to 130% in 0.1% steps. CAL button clears the current setting to 100%.

U/V gain

U slider varies Cb gain from 70% to 130% in 0.1% steps. V slider varies Cr gain from 70% to 130% in 0.1% steps. CAL button clears the current setting to 100%.

Setup gain (NTSC only)

When NTSC Setup is enabled (place tick in Setup Enable box, the IRE slider varies NTSC Setup in 0.3 IRE steps from –10 IRE to +20 IRE. CAL button clears the current setting to 0 IRE.

Burst gain

Slider varies burst gain in 0.1% steps from 70 to 130% of nominal. CAL button clears the current setting to 100%.

Status

Input and reference presence is shown along with FIFO and Genlock status.

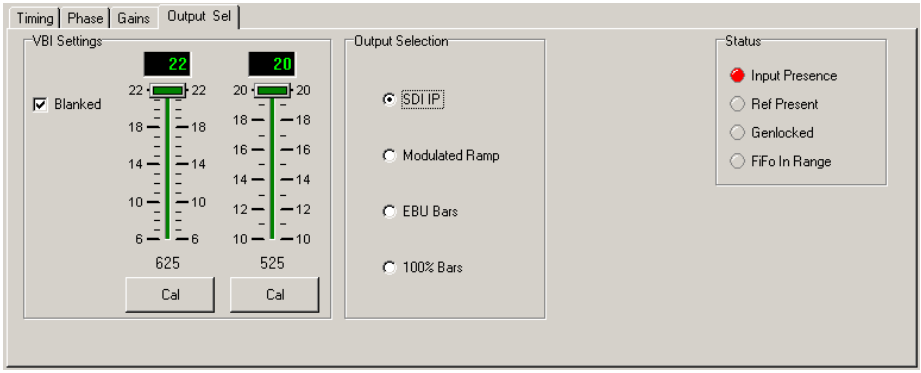
Cal Gains

All sliders are returned to their default positions.

Adjusting VBI and test pattern options

The output selection tab provides access to the following:

- VBI enable/blank and first line setting
- Test output or normal
- Status



Output selection settings

Adjusting the VBI

To enable VBI data (unblank) remove any tick in the 'Blanked' box, place a tick to disable or blank VBI data.

Slider varies First Active Line (end of VBI). PAL lines 6 - 22 and 320 – 335 or NTSC lines 10 – 20 and 273 – 282 when VBI lines are unblanked.

CAL button selects First Active Line as 22/335 for PAL or 20/282 for NTSC.

Output selection

Selects video output from incoming Serial Digital Video, modulated ramp, EBU bars or 100% bars.

Status

Input and reference presence is shown along with FIFO and Genlock status.

3 Using the active control panel

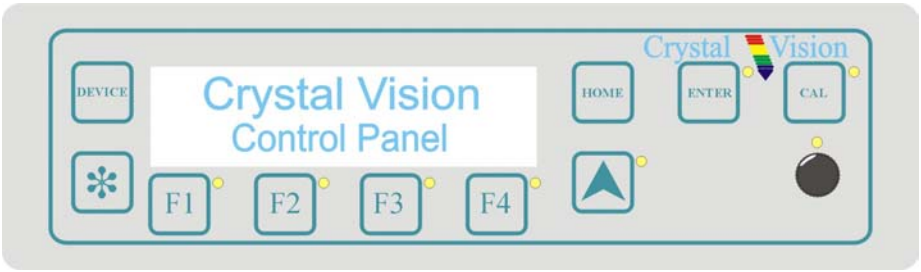
This operational guide assumes that the panel has been setup according to the Panel setup procedure described in the Crystal Vision Controls Panel manual.

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 keys 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, 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

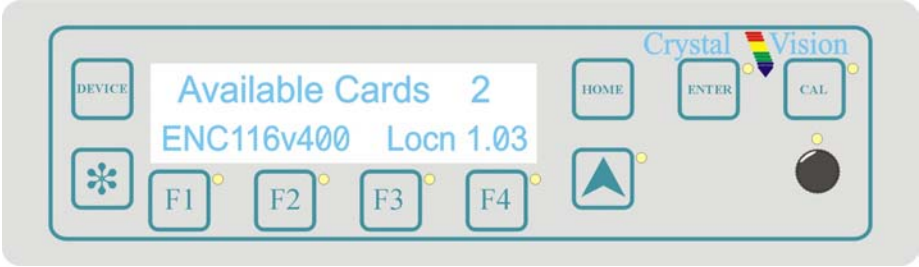
To continue with control panel operation or configuration, press the ‘CAL’ key once. A second press of the ‘CAL’ key will return to Statesman control.

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 ENC116

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.



Device menu showing available cards

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 12.

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 ENC116 at the node number last displayed in the available cards list. If the card is in local mode, 'Remote Ctrl Disabled' will be displayed.

The ENC116 home menu

Note: Card edge DIL switch lever 2 must be DOWN and Jumper links J8 and J9 MUST be set to ‘422’ to enable an active front panel control in a Crystal Vision Frame. Refer to Installation Chapter for serial port settings.

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 an ENC116.

- 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 / used to calibrate or clear chosen parameter(s)
- 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 – no function assigned
- 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

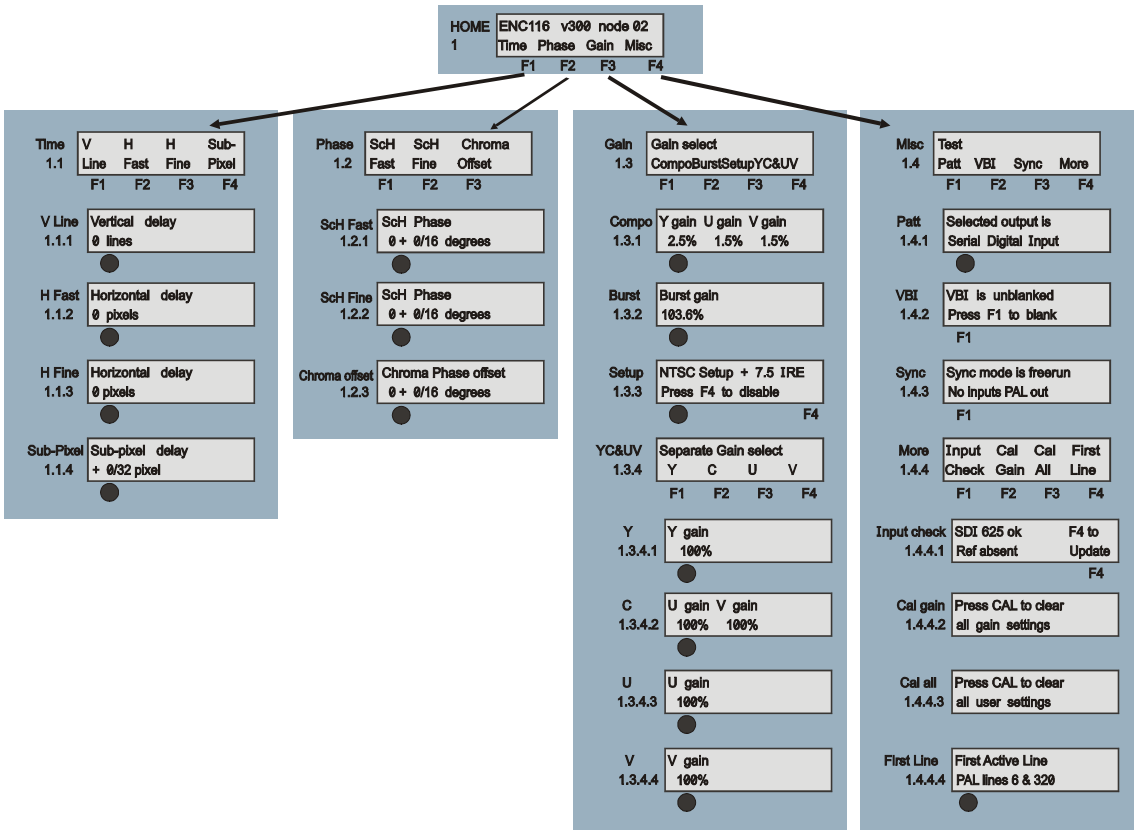
The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If mode changes occur through the use of card edge controls or through automatic response to the input video signal, the text displayed on the active front panel will not be updated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

3.1 The ENC116 menu structure

The main top-level menus for a module are obtained by pressing the F1, F2, F3 and F4 keys from that module's HOME menu. Menu keys are illuminated when active and when further menus are available. The three top-level menus are:

- Time (Output/Ref delay) – press F1
- Phase (ScH and Chroma phase adjustment) – press F2
- Gain (Level and offset) – press F3
- Misc. (Calibrate, Blanking, Test Patterns, and Status) – press F4

The following chart shows the available ENC116 menus.



The ENC116 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.

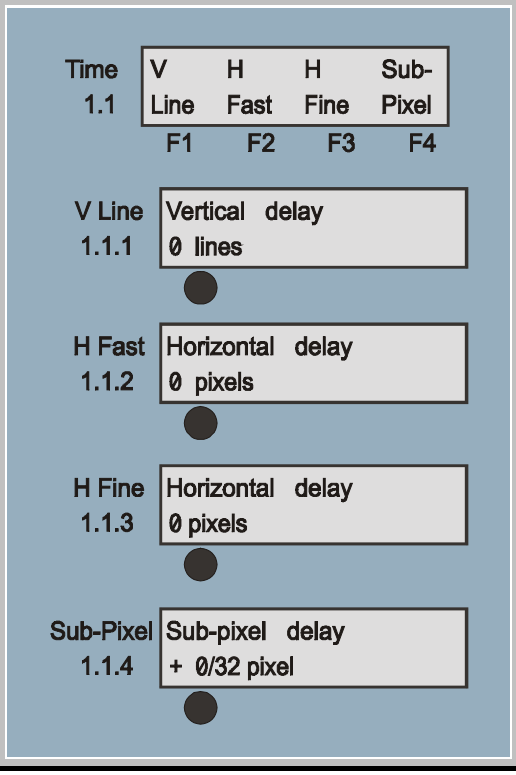
Menu numbering scheme

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.

3.2 Adjusting signal timing

Pressing F1 from the home menu will bring up the Time menu, which allows the output to be delayed with respect to the external reference from –4µs to 5 (4.9) lines. The following controls are provided:

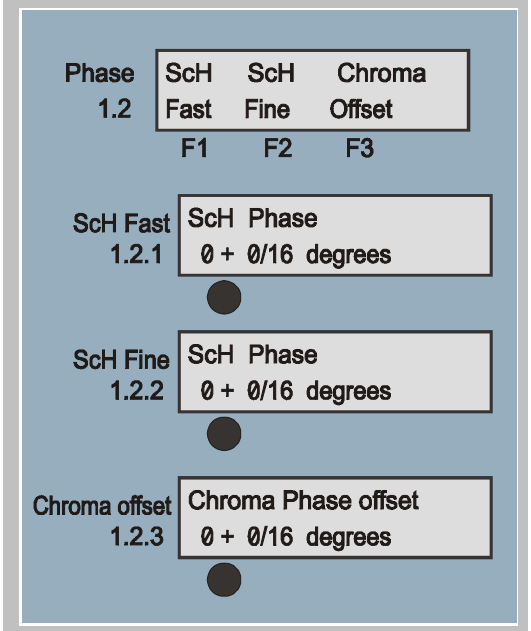
- Line delay adjustment
- Fine (pixel) and 'Fast' (.5µs) delay adjustment
- Sub-pixel delay adjustment

Timing menu structure	Description
	Use the F keys to select the required delay sub-menu Vertical delay Shaft encoder adjusts delay from 0 to 5 lines in one-line steps. CAL button zeros the current setting. Horizontal delay - Fast Shaft encoder adjusts delay from –4µs to 1 line in 7 pixel (approx. 0.5 µsec) steps. CAL button zeros the current setting. Horizontal delay – Fine Shaft encoder adjusts delay from –4µs to 1 line in pixel steps. CAL button zeros the current setting. Sub-pixel delay Shaft encoder adjusts delay from 0 to 1 pixels in 1/32 pixel (2ns) steps. CAL button zeros the current setting.

3.3 Setting Chroma and burst phase

Pressing F2 from the home menu will bring up the Phase menu, which allows ScH (Chroma+burst to line phase) and Chroma phase offset to be adjusted. The following controls are provided:

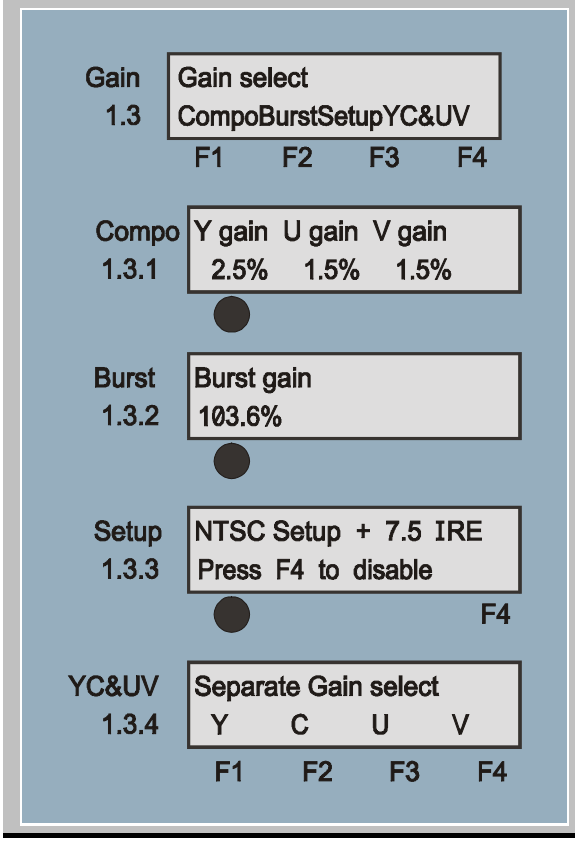
- Fine (1/16°) and Fast (.5°) ScH phase
- Chroma phase (NTSC Hue) offset

Phase menu structure	Description
	Use the F1, F2 and F3 keys to select the required phase sub-menu. ScH phase – Fast Shaft encoder adds ScH phase offset from 0° to 360° in 0.5° steps. CAL button zeros the current setting. ScH phase - Fine Shaft encoder adds ScH phase offset from 0° to 360° in 1/16° steps. CAL button zeros the current setting. Chroma Phase (NTSC Hue) offset In NTSC shaft encoder adds ScH to Chroma phase offset from 0° to 360° in 1/16° steps. In PAL this control provides a ± 2° ScH to Chroma phase offset. CAL button zeros the current setting.

3.4 Adjusting signal gains and offsets

Pressing F3 from the home menu will bring up the Gain menu, which provides the following functions:

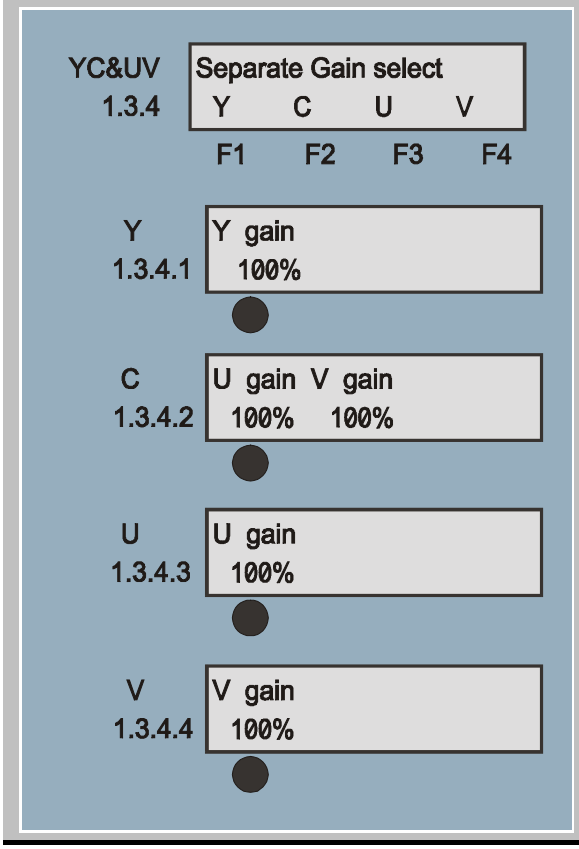
- Composite luminance and Chroma level adjustment
- Burst gain adjustment
- NTSC Setup
- Y/C gain adjustment

Gain menu structure	Description
	Use the F keys to select the required Gain sub-menu Composite gain Shaft encoder varies YU&V gains simultaneously in 0.1% steps from 0 to 130% of nominal. CAL button clears the current setting to 100%. Burst gain Shaft encoder varies burst gain in 0.1% steps from 80 to 120% of nominal. CAL button clears the current setting to 100%. Setup Gain (NTSC only) When NTSC Setup is enabled (press F4 to enable/disable), the shaft encoder varies NTSC Setup in 0.3 IRE steps from –22 IRE to +22 IRE. CAL button clears the current setting to +7.5 IRE. Y/C Gain Use the F keys to select the required Y/C sub-menu (described in the next section).

Adjusting Y/C gain

The Y/C Gain menu provides the following functions:

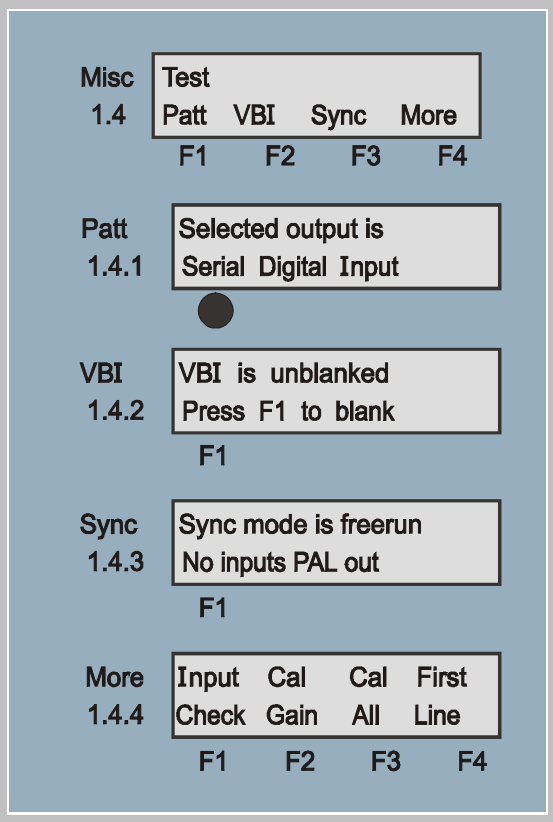
- Luminance (Y) level adjustment
- Chrominance (U +V) level adjustment
- Separate U and V level adjustment

Gain (Y/C) menu structure	Description
	Use the F keys to select the required Y/C gain sub-menu Luminance gain Shaft encoder varies Y gain in 0.1% steps from 0 to 130% of nominal. CAL button clears the current setting to 100%. C gain Shaft encoder varies U & V gain simultaneously in 0.1% steps from 0 to 130% of nominal. CAL button clears the current setting to 100%. U gain Shaft encoder varies U gain in 0.1% steps from 0 to 180% of nominal. CAL button clears the current setting to 100%. V gain Shaft encoder varies V gain in 0.1% steps from 0 to 130% of nominal. CAL button clears the current setting to 100%.

3.5 Setting advanced options

Pressing F4 from the home menu will bring up the miscellaneous menu, which provides the following functions:

- Pattern to be output when input is absent or deselected
- VBI blanking options
- Sync mode
- Quick settings calibration
- Input status

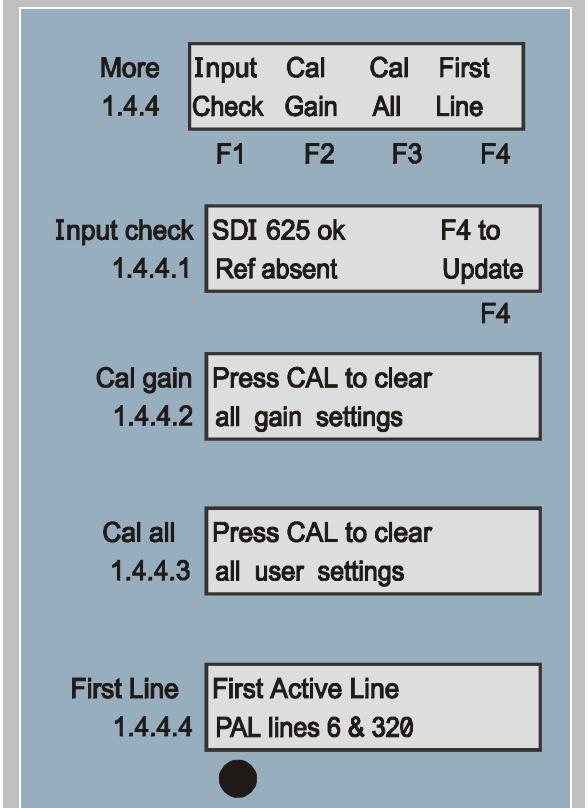
Miscellaneous menu structure	Description
	Use the F keys to select the required Misc. sub-menu Pattern select Shaft encoder selects video output from incoming Serial Digital Video, modulated ramp, EBU bars or 100% bars. VBI F1 blanks or unblanks VBI data interval. (PAL lines 7 to 22 & 320 to 335, NTSC lines 10 to 20 & 273 to 282) Sync F1 changes encoder between Genlock mode (output phase locked to reference sync input) and Freerun mode (output sync locked to SDI input). More Use the F keys to select the required sub-menu (described in the next section).

Note: Choose Serial Digital Input if black and burst should be output when the input signal is absent.

Setting advanced options - more

Pressing F4 from the miscellaneous menu brings up the More menus, which provides the following functions:

- Input status
- Return all gain and offsets to factory defaults
- Return all settings to factory defaults
- PAL VBI options

Miscellaneous (More) menu structure	Description
	Use the F keys to select the required sub-menu Input check Displays status of SDI and Reference Sync inputs. F4 updates the display with the current status. See table in Trouble Shooting chapter for status messages shown. Cal Gains CAL sets current values of Y, U, V, Burst and NTSC Setup gains to 100% of the nominal values. Cal all CAL clears all user adjustments and returns the board back to factory default settings. First Line Shaft encoder varies First Active Line (end of VBI). PAL lines 6 - 22 and 320 – 335 or NTSC lines 10 – 20 and 273 – 282 when VBI lines are unblanked.

4 Card edge operation

4.1 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.

The ENC116 front view

In general the four position DIL switch changes mode or options whilst the rotary SELECT control is used to select one of the configuration menus and the rotary ADJ control is used to assign values to configuration variables.

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

4.2 Setting control mode options

The piano switch to the right of the card edge is used to configure the following options:

- CAL or adjust mode
- Board edge control or serial remote control
- 525, 625 black or test output when input is absent

DIL lever	UP	DOWN
1 – CAL	ADJUST control CHANGES selected parameter	ADJUST control CALIBRATES selected parameter
2- Remote	Card edge control	Serial remote control (incl. Active Panel)
3 – 525	PAL output with no input	NTSC output with no input
4 - Spare	Not used	Not used

Note: The card edge display shows the last local menu accessed if REM mode is selected.

4.3 Display software version and node address

Rotate the SELECT control to display the chosen status menu:

Menu	Display Text	Function
Home	ENC116v400	Displays software version number
Node	Node *nn*	Displays the remote node address (00 to 31)

4.4 Adjusting signal timing

Rotate the SELECT control to display the chosen menu and the ADJUST control to change (DIL lever 1 UP) or calibrate (DIL lever 1 DOWN) the affected parameter:

Menu	Display Text	Function
V delay	Vdel nline	Adds reference to output delay in lines from 0 to 5.
H coarse	H c nnpix	Adds reference to output delay from –4µs to 1 line in 7 pixel (approximately 0.5µs) steps.
H fine	H f nnpix	Adds reference to output delay from –4µs to 1 line in 1 pixel (74ns) steps.
Sub-Pixel	Spix +nn/32	Varies reference to output timing in approx. 2ns steps.
ScH coarse	ScHc nn. nn	Adds ScH phase offset from zero to 360° in ½° steps
ScH fine	ScHf nn. nn	Adds ScH phase offset in 1/16° steps.
Chroma Phase	Cph nn. nn	Adds a Burst to Chroma phase offset in 1/16° steps.

4.5 Adjusting signal gain and offsets

Rotate the SELECT control to display the chosen menu and the ADJUST control to change (DIL lever 1 UP) or calibrate (DIL lever 1 DOWN) the affected parameter:

Menu	Display Text	Function
Composite gain	Gainnnn.n%	Varies YUV gains simultaneously from 0 to 130% in 0.1% steps.
Burst gain	Brstnnn.n%	Varies Burst gain from 80% to 120% in 0.4% steps.
Pedestal height	Pedst+nn.n	When Setup is on, varies setup (pedestal) level from –22 IRE to +22 IRE in approximately 0.3 IRE steps. Calibration value of +7.5 IRE.
	Pedst Off	Setup (pedestal) is disabled (zero.) Enable with Setup menu.
Setup enable (NTSC only)	Setup On	Setup on (in conjunction with Pedestal height.).
	Setup Off	Setup off.
Luma gain	Ygn nnn.n%	Varies Y gain from 0 to 130% in 0.1% steps.
Chroma gain	Cgn nnn.n%	Varies U & V gains simultaneously.
U gain	Ugn nnn.n%	Varies Cb gain from 0 to 180% in 0.1% steps.
V gain	Vgn nnn.n%	Varies Cr gain from 0 to 130% in 0.1% steps.

4.6 Recalling factory gain settings

Rotate the SELECT control to display the chosen menu and the ADJUST control to return gains to factory default values:

Menu	Display Text	Function
Clear gain	Clear gain	Clears all user adjustable gains – returns ENC116 to factory gain settings.
	Clear done	ENC116 gains returned to factory defaults.

Note: Clear gain ignores DIL switch position 1 (CAL).

4.7 Recalling all factory settings

Rotate the SELECT control to display the chosen menu and the ADJUST control to return gains to factory default values:

Menu	Display Text	Function
Clear ALL	Clear all	Clears all user setting – returns ENC116 to factory settings.
	Clear done	ENC116 user settings return to factory defaults.

Note: Clear ALL ignores DIL switch position 1 (CAL).

4.8 Setting output options

Rotate the SELECT control to display the chosen menu and the ADJUST control to change the affected parameter:

Menu	Display Text	Function
Output select	SDI out	Output is Serial Digital Input.
	Mod Ramp	Output is Chroma-modulated Luma ramp.
	75% bars	Output is 75% colour bars.
	100.0% bars	Output is 100% colour bars.

Note: Choose Serial Digital Video if black and burst should be output when the serial input signal is absent.

4.9 Setting reference options

Rotate the SELECT control to display the chosen menu and the ADJUST control to change the affected parameter:

Menu	Display Text	Function
Sync mode	Genlock	Output is sync- & burst-locked to reference input
	Freerun	Output is sync-locked to serial digital input
	No Sync In	Reference input is absent, output is sync-locked to serial digital input
	No Inputs	SDI & Reference inputs are absent, output is black & burst (or test patterns if selected)

4.10 Setting VBI options

Rotate the SELECT control to display the chosen VBI menu and the ADJUST control to change the affected parameter:

Menu	Display Text	Function
VBI Blanking	VBI Blnked	Vertical Blanking Interval (PAL lines 7-22 & 320-335 and NTSC lines 10-20 & 273-282) is blanked.
	VBI Unblnk	Vertical Blanking Interval (PAL lines 7-22 & 320-335 and NTSC lines 10-20 & 273-282) is unblanked.
First Active Line	L23 First	All VBI lines are blanked – use the VBI Blanking menu to unblank PAL line 7 – 22 & 320 – 335 first.
	L nn First	Rotation of the Adjust control varies First Active Line (end of VBI). PAL lines 6 - 22 and 320 – 335 or NTSC lines 10 – 20 and 273 – 282 when VBI lines are unblanked.

Note: VBI blanking and PAL L6 blanking menus are NOT adjacent – continue rotating the SELECT control to locate all the VBI menus.

4.11 Checking TBC operation

Rotate the SELECT control to display the TBC check menu:

Menu	Display Text	Function
TBC check	625line OK	625-line input. Time-Base Corrector is OK.
	525line OK	525-line input. Time-Base Corrector is OK.
	SDInnnlate	Time-Base Corrector out of range – Serial Digital input is nnn lines after Reference Sync input.

Note: Refer to Trouble shooting chapter for help with optimising TBC range timing.

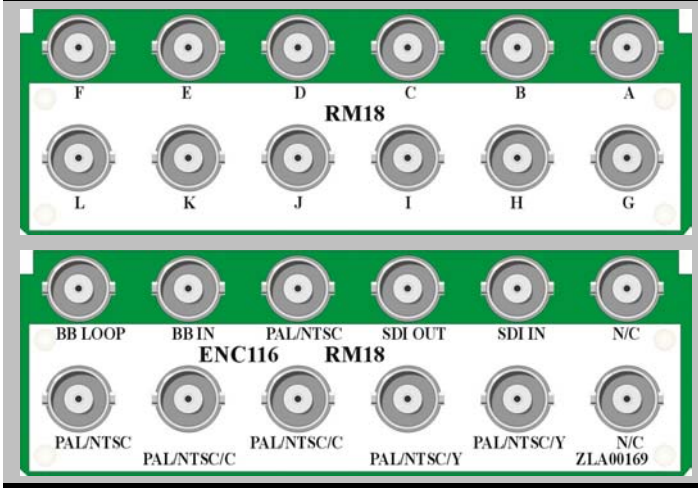
5 Hardware installation

The ENC116 encoder fits into all Crystal Vision rack frames. All modules can be plugged in and removed while the frame is powered without damage.

5.1 Universal rear connectors

Up to twelve single height modules may be fitted in a 2U Indigo frame depending on the choice of rear connector. The two types of rear connector available provide system flexibility by allowing a mix between access to all connections and maximum module packing density. All modules can be plugged in and removed while the frame is powered without damage.

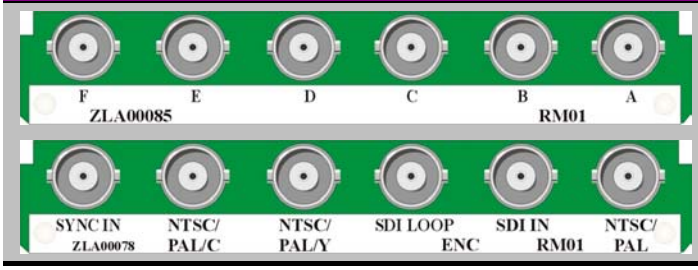
RM18 Connections

RM18 fits in all frames	Description
	**RM18 artwork** • 6 modules in 2U, 3 in 1U, 1 in a desktop box • 1 module per rear connector • 6 connections available • Card fits in upper slot • No card fits in lower slot

BNC	BNC	Connection
A	**N/C**	Not used
B	**SDI IN**	Serial Digital Input
C	**SDI OUT**	Re-clocked SDI loop-through
D	**PAL/NTSC**	Composite Video
E	**BB IN**	Black & Burst in
F	**BB LOOP**	Black & Burst loop-through selected by J1
G	**N/C**	Not used
H	**PAL/NTSC/Y**	Y+Sync or Composite Video selected by J4
I	**PAL/NTSC/Y**	Y+Sync or Composite Video selected by J2
J	**PAL/NTSC/C**	C or Composite Video selected by J5
K	**PAL/NTSC/C**	C or Composite Video selected by J3
L	**PAL/NTSC**	Composite Video

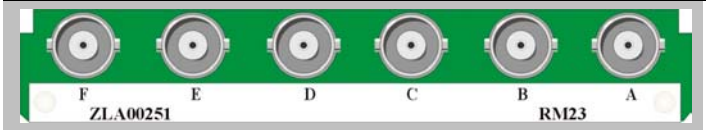
Note: Only the RM18 provides access to all outputs.

RM01 connections

RM01 fits in all frames	Description
	**RM01** • 12 ENC116 modules per 2U frame, 6 per 1U frame, 2 in desktop box • Composite sync loop through and extra outputs not available • All frame slots can be used

BNC	BNC	Function
NTSC/PAL	**A**	Composite Video
SDI IN	**B**	Serial Digital Input
SDI LOOP PAL	**C**	Re-clocked Serial Digital Output
NTSC/PAL/Y	**D**	Composite Video or Y plus Sync (set by J4)
NTSC/PAL/C	**E**	Composite Video or C (set by J5)
SYNC IN	**F**	Black & Burst input

RM23 connections

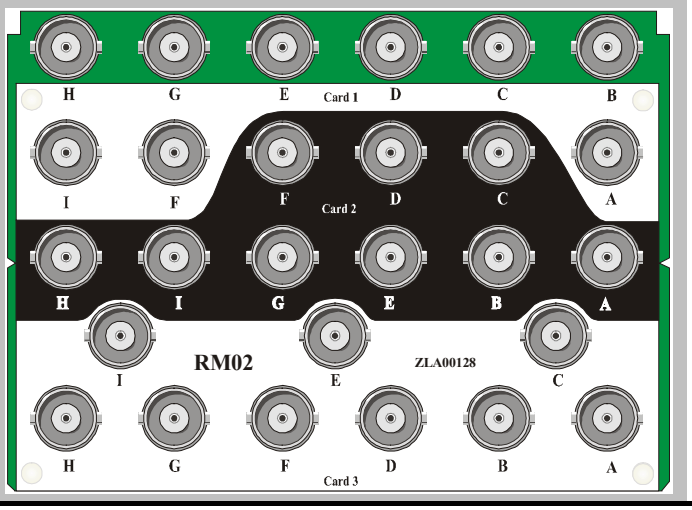
RM23 fits in all frames	Description
	**RM23** • 12 ENC116 modules per 2U frame, 6 per 1U frame, 2 in desktop box • Composite sync loop through and extra outputs not available • All frame slots can be used

BNC	Function
A	Black & Burst input
B	Serial Digital Input
C	Re-clocked Serial Digital Output
D	Composite Video or Y plus Sync (set by J4)
E	Composite Video or C (set by J5)
F	Black & Burst loop-though (J1 must be in 'loop' position to avoid double-terminating syncs)

Note: Placing J1 in the 75Ω position does not remove the sync loop through on the RM23. This rear connector allows loop through syncs to remain even when the ENC116 is removed since the loop-through is actually on the RM23 rear connector itself.

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

RM02 connections

RM02 fits in all 2U frames	Description
	**RM02** • 9 ENC116s modules per 2U frame • 3 modules per rear connector • 9 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 ENC116 cards can be fitted the RM02 rear modules. Card 1 fits in the top position, card 2 in the second from the top and card 3 fits in the bottom. No card is fitted in the 3rd slot position.

BNC_1	BNC_U	Function
IN	**A**	Serial Digital Input
1	**B**	Reclocked Serial Digital Output
2	**C**	Composite Video or Y plus Sync (set by J4)
3	**D**	Composite Video or Y plus Sync (set by J2)
4	**E**	Composite Video or C (set by J5)
5	**F**	Composite Video
6	**G**	Composite Video
7	**H**	Black & Burst Loop through (set by J1)
8/IN2	**I**	Black & Burst input

Note: BNC_U refers to universal artwork labelling.
BNC_1 refers to ZLA00110 artwork labelling used when the RM02 is supplied with other products.

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

5.2 External remote control connections

The external control lines 'a' to 'f' at the frame remote connectors may be used as either serial or GPI lines to provide remote control of the module.

1U Indigo GPI connections

Control lines ‘a’ to ‘f’ of each card connect to one of two rear remote connectors as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
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	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
4	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
5	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
6	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)

Table shows Pin number (Remote number)

Note: Remote 1: 26 way high-density D-type socket. Frame ground is pin 2 and +5V @500mA is pin 1.
Remote 2: 26 way high-density D-type plug. Frame ground is pin 6 and +5V @500mA is pin 15.

2U Indigo GPI Connections

Control lines ‘a’ to ‘f’ of each card connect to one of four rear remote connectors as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
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)

Table shows Pin number (Remote number)

Note: Remote 1 and Remote 3 are 26 way high density ‘D’ type female sockets and frame ground is pin 2 and +5V @500mA is pin 1 in each case.
Remote 2 and Remote 4 are 26 way high density ‘D’ type male plugs and frame ground is pin 6 and +5V @500mA is pin 15 in each case.

Desk Top Box GPI connections

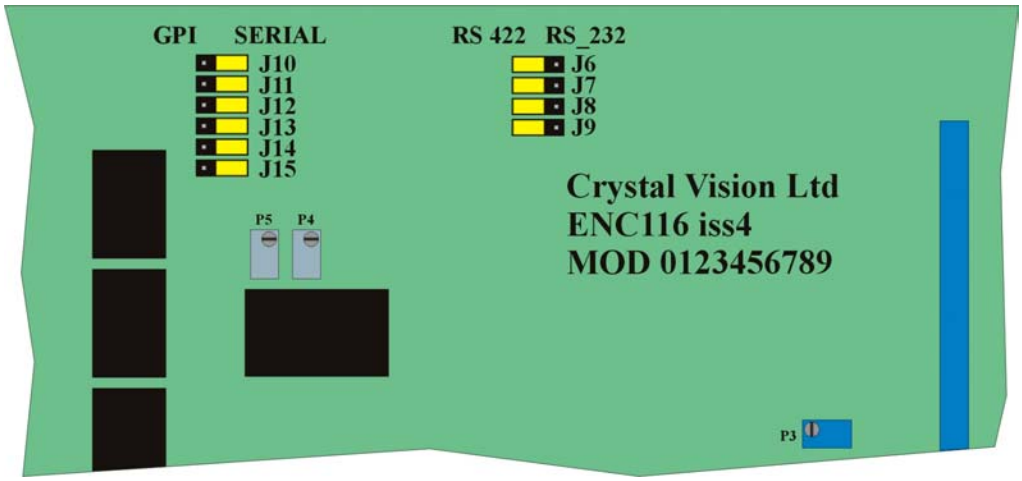
Control lines ‘a’ to ‘f’ of each card connect to the rear remote connector as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	1	2	3	4	5	6
2	9	10	11	12	13	14

Note: Remote connector is 15 way normal density D-type socket. Frame ground is pin 15.

Remote control configuration

Jumpers J10 to J15 determine if the ‘GPI’ connections labelled ‘a’ to ‘f’ provide serial or GPI functions. Jumpers J6 to J9 determine if the serial communication is RS422 or RS232.



The GPI/Serial link jumpers on the ENC116 SDI Encoder

Control lines ‘a’ to ‘d’ can be used to provide RS422 communication whilst ‘e’ and ‘f’ can be used to provide RS232 communication.

Link	Position	Function
J10 to J15	Towards card front	GPI control
	Away from card front	Serial control

Placing jumpers J10 to J13 in the Serial (RS) position and placing jumpers J6 and J7 in the RS422 position provides RS-422 communication. This will provide a single RS-422 port (Remote 1) with the following pin-out:

Remote 1 (RS-422)	RS-422 function
a	RX-
b	RX+
c	TX+
d	TX-
Frame ground	Ground

Placing jumpers J14 to J16 in the Serial (RS) position and placing jumpers J8 and J9 in the RS232 position provides RS-232 communication. This will provide a single RS-232 port (Remote 2) with the following pin-out:

Remote 2 (RS-232)	RS-232 function
e	TX
f	RX
Frame ground	Ground

Note: Jumper links J8 and J9 MUST be set to '422' to enable an active front panel control in a Crystal Vision Frame.

The following table summarises the remote control link positions:

J10-15	J6-7	J8-9	'a'	'b'	'c'	'd'	'e'	'f'
RS	422	232	Remote 1 RS422 communication				Remote 2 RS232	
GPI			Remote 1 GPI connections				Remote 2 GPI	

Note: The pin-out tables should be read in conjunction with the GPI pin-out tables at the start of this section.

Remote control settings

The standard remote control port settings are as follows:

Baud Rate	19k2
Parity	None
Data Bits	8
Stop Bits	1
Hand shaking	None

Other standards are available on request. Please contact factory for remote protocol

5.3 Output configuration and sync termination

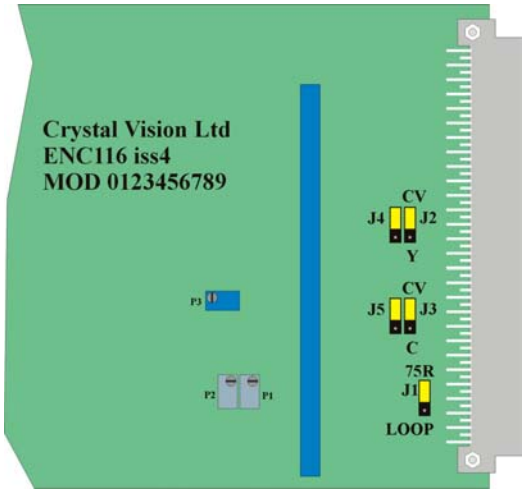
Link jumpers J1 to J4 select the following output options:

- Composite sync termination – J1
- Composite video or luminance (Y) plus sync – J2 and J4
- Composite video or Chroma (C) – J3 and J5

Rear modules with outputs that are configurable are listed in the following table:

Link No & Position	RM01	RM23	RM18	RM02	Signal
J4 – CV	D Or NTSC/PAL/Y	D	H Or NTSC/PAL/Y	2 Or C	Composite Video.
J4 – Y					Y plus sync
J2 – CV			I Or NTSC/PAL/Y	3 Or D	Composite Video
J2 – Y					Y plus sync
J5 – CV	E Or NTSC/PAL/C	E	J Or NTSC/PAL/C	4 Or E	Composite Video
J5 – C					C
J3 – CV			K Or NTSC/PAL/C		Composite Video
J3 – C					C
J1 – 75R	F Or SYNC IN	A	E Or BB IN	8 /IN2 Or I	Composite sync 75Ω input
J1 – LOOP					Composite sync 1MΩ input
J1 – 75R		F*	F Or BB LOOP	7 Or H	No connection
J1 – LOOP					Composite sync Loop through

Note: *J1 should be in the LOOP position on the RM23 to avoid double terminating the sync input.



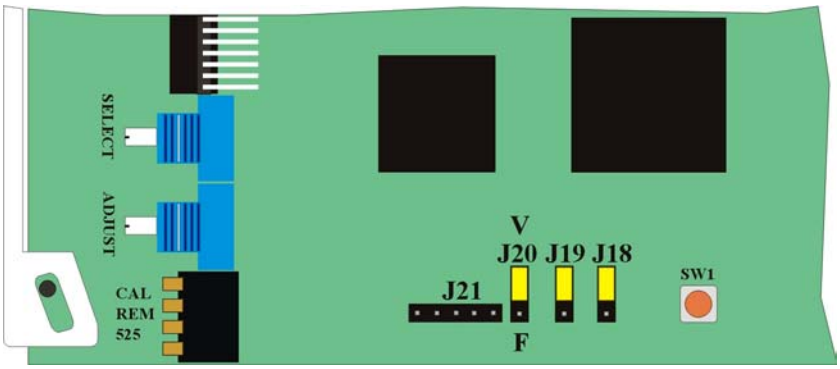
Output and reference jumper links J1 to J5 are near the edge connector

5.4 Selecting the SDI timing reference signal

With J20 in the V position (recommended), the V-bit in a 625-line SMPTE-259M data stream triggers the start of a new field. This allows cuts between two sources in the vertical blanking interval without disturbance to the active picture.

With J20 in the F position, the V-bit is ignored and the F-bit triggers the start of a new field. Cuts between two SDI sources may result in some picture disturbance.

Link	Position	TRS select filed synchronisation
J20	Towards card edge	F-bit in SDI
	Away from card edge	V-bit in SDI



TRS settings

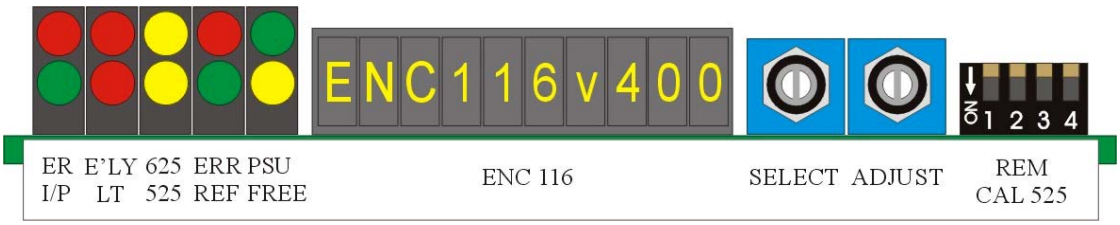
5.5 Factory adjustments

The level adjustments potentiometers and jumpers J16, J18 and J19 are set at the factory and should not require re-adjustment. SW1 is a board level reset switch used when testing the board and is not accessible in a normal installation. Refer to the Problem Solving chapter for help with re-setting the card.

6 Problem solving

Card edge status LEDs

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



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

LED	Colour/position	Meaning
ER (Error)	Red (top)	Serial digital input lock error
I/P	Green (bottom)	Input present
E'LY (SDI Early)	Red (top)	See table below
LT (SDI Late)	Red (bottom)	See table below
625	Yellow (top)	625-line output
525	Yellow (bottom)	525-line output
ERR (Error)	Red (top)	Reference input lock error or mis-terminated
REF (Reference)	Green (bottom)	Reference input detected
PSU	Green (top)	Power supply voltage present
FREE	Yellow (bottom)	Output not phase-locked to reference

The following table summarises the Time Base Corrector LED functions and colours:

E'RY/LT LED	VERTICAL DELAY	COMMENTS
None	Any	Time-Base Corrector is in range – Composite output is 4.3µs to 4.9 lines after Serial Digital Input.
EARLY	0	Sync input is 5 to 10 lines after serial digital input. Make Sync 5 lines earlier or SDI 5 lines later.
EARLY	5	Composite output is 5 to 10 lines after serial digital input. Decrease V delay or make SDI 5 lines later.
LATE	0	Sync input is up to 5 lines before serial digital input. Make SDI 5 lines earlier or increase V delay.
LATE	5	Sync input is 5 to 10 lines before serial digital input. Make SDI 5 lines earlier or Sync input 5 lines later.
Both	Any	TBC is out of range - Sync input is greater than 10 lines before or 10 lines after SDI.

Note: When the time-base corrector is out of range, output timing may be automatically adjusted by approx. 0.5µs to prevent picture disturbance.

Active Control Panel status messages

The following messages may be displayed on the Input Check menu on an Active Control Panel. Please refer to section 3 for details of the Active Control Panel menu structure.

Status message	Meaning
SDI 625 ok	625-line SDI input detected & locked
SDI 525 ok	525-line SDI input detected & locked
SDI absent	No SDI source connected
SDI error	SDI lock error
SDI nnn late	SDI input is nnn lines later than Sync input
Ref PAL ok	PAL composite or Black & Burst detected & phase locked
Ref NTSC ok	NTSC composite or Black & Burst detected & phase locked
Ref absent or poor	No Sync input connected
Ref no burst	Sync input has no burst
Ref burst unlocked	Sync input has excessive phase jitter

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 video output

Check that a valid SDI input is present (I/P LED ON) and that any cabling is intact

The video output is not synchronous with other sources

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

Check that output phasing is set correctly

Card edge settings have changed unexpectedly

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

Active control panel settings change unexpectedly

Statesman or Card edge control settings may have overridden control panel settings if they were accessed more recently

Statesman settings change unexpectedly

Card edge or active control panel settings may have overridden Statesman settings if they were accessed more recently

Active control panel does not work as expected

Check that the REM DIL lever is DOWN

The card no longer responds to Statesman or front panel control

Check that the card is seated correctly and that the Power OK LEDs are lit

Check any active or Statesman enabled control panel cabling

Check if the control panel can control another card in the same rack

If necessary re-set the card by simply removing the rack power and re-applying power after a few seconds or by removing the card from the rack and then re-inserting the card

It is safe to re-insert the card whilst the rack is powered

Why is it recommended to place J1 in the LOOP position for the RM23?

This is to avoid double terminating the sync input. Placing J1 in the 75Ω position does not remove the sync loop through on the RM23. This rear connector allows loop through syncs to remain even when the ENC116 is removed since the loop-through is actually on the RM23 rear connector itself.

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 safe to reinsert the card whilst the rack is powered.

7 Specification

General

Dimensions	100mm x 266 mm module with DIN 41612 connector
Weight	210g
Power consumption	7W

Inputs

Video SDI	270Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M
Analogue sync	Composite black & burst plus 300mV syncs to EBU N14-1988

Outputs

Analogue sync	Composite reference loop through – depending on frame type, rear module and board link position
Analogue outputs	Three or Six analogue outputs are available – depending on frame type, rear module and board link position. Link selection includes: 6 composite 4 composite plus one Chroma (C) and one Y plus sync 2 composite plus two Chroma (C) and two Y plus sync
Video SDI	Reclocked loop through. Will drive >200m Belden 8281 or equivalent

Analogue performance

Frequency response	+/- 0.1dB to 5.5MHz
Differential gain	<1%
Differential phase	<1°
Blanking	Selectable VBI - PAL lines 7-22 & 320-335 and NTSC lines 10-20 & 273-282. PAL lines 6 or 319 may also be blanked by menu selection.
Delay	Reference input to composite output: -4µs to 4.9 lines. For zero delay, serial video input must be 4.3µs before output.

Ordering information

ENC116	10-bit broadcast quality serial digital to analogue composite video converter
RM01	Single slot rear connector for one module
RM23	Single slot rear connector for one module with sync input loop through
RM18	Double slot rear connector for one module
RM02	Quadruple slot rear connector for three modules (2U frames only)
Statesman	PC Control System
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